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ENERGY SECURITY POLICIES OF THE CENTRAL ASIAN COUNTRIES: HYDROCARBONS AND ELECTRIC POWER SECTORS

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ERI Books No: 11
ISBN 978-601-7805-12-8

This edition is published by Eurasian Research Institute
Almali Avdani, Mametova 48, 050004, Almaty, Kazakhstan

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Distributed by Eurasian Research Institute
Almali Avdani, Mametova 48, 050004, Almaty, Kazakhstan

Printed and bound in Kazakhstan by Delux Printing, Almaty

1st Edition: April 2018, Almaty

ABSTRACT

The Central Asian countries' energy sectors were built during the Soviet period and designed without concern for what are today national borders. The resource sharing mechanism ensured the security of the Central Asian Energy System (CAES)—reliable and stable energy supplies to meet the needs of both the people and the economy. Since the Central Asian energy sectors were initially designed to operate within a unified system, security of the energy system requires coordinated policies by all relevant actors in such major areas of interaction as hydrocarbons and electric power sectors. Energy policy-priorities, however, which stress self-reliance and self-control, have been threatening, to a different extent, Central Asian states' energy security. Thus, addressing energy insecurities without reinstated intra-Central Asian energy trade seems a difficult task to accomplish. The book explains factors shaping energy policy priorities in developing hydrocarbons, hydro-power and renewables sectors of the Central Asian countries, as well as cooperative and conflicting dynamics within the Central Asian Energy Systems.

Key words: energy security, Central Asian Energy System, hydrocarbons, electric power sectors.

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LIST OF ABBREVIATIONS

CAC	Central Asia Center
CAES	Central Asian Energy System
CAGP	Central Asia–China gas pipeline
CAI	Central Asian Initiative on Sustainable Development
CAPS	Central Asian (Electric) Power System
CASA	Central Asia–South Asia
CASAREM	Central Asia South Asia Regional Electricity Market
CCGT	Combined-Cycle Gas Turbines
CDD	Central Dispatching Departments
CNPC	China National Petroleum Corporation
EIA	Energy Information Administration
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse gas
GTL	Gas-to-Liquids
GW	Gigawatts
HPP	Hydro-power plant
INGO	International non-governmental organization
KM	Kilometer
KNOC	Korea National Oil Corporation
KV	Kilovolts
KWh	Kilowatts hour
M	Meter
MW	Megawatts
NGO	Non-governmental organization
PD	Prisoner's dilemma
PSA	Product-sharing agreement
PV	Photovoltaic
SH	Stag-hunt
SES	Single Economic Space
TAPI	Turkmenistan–Afghanistan–Pakistan–India
TPP	Thermal power plants
UNDP	United Nations Development Programme

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INTRODUCTION

The Central Asian Energy System (CAES), a complex network of gas pipelines and electric power grids, was designed and built during the Soviet period. The resource-sharing mechanism of the CAES ensured reliable and stable energy supplies to meet both population and economic needs, even after the disintegration of the Soviet Union. Hydrocarbons-producing Kazakhstan, Turkmenistan, and Uzbekistan provided a continuous supply of oil products and natural gas, as well as thermal electricity to the neighbouring upstream Tajikistan and Kyrgyzstan. Tajikistan and Kyrgyzstan, in return, released the required amount of water for irrigation purposes and exported hydroelectricity to downstream countries in summer. While downstream countries, within the resource-sharing mechanism, were primarily interested in water release, huge hydro-power potential of upstream neighbours' also provided some prospects for increasing the share of clean and renewable energy sources in the overall consumption balance. However, newly emerged geopolitical and economic challenges including monetization of the energy (oil products, gas and electricity) trade while preserving water sharing type interactions, increasing energy export capacity to external markets at the expense of domestic and intra-Central Asian consumption, the shift from water to energy operation mode of the hydro-power sector started challenging the effectiveness of the mechanism. As a result, the CAES has undergone a transformation, in which state actors now pursue energy policies that distance them from each other, thus negatively affecting the security of energy supplies within the region. This book shades light on why the CAES is in the process of disintegration despite the fact that everyone is worse off as a result of the breakdown and what measures are necessary to improve the level of energy security.

Central Asian countries' energy sectors were initially designed to operate within a unified energy system. Management of highly interdependent Central Asian energy sectors required coordinated actions to be taken by all parties involved. Even though there is no longer a supranational body controlling coordinated operation of these sectors, Central Asian countries, to a varying extent, still remain dependent on each other in ensuring their energy security and energy-led economic growth as well as mutually beneficial water management. Within such interdependence, the importance of using regional level approach, to study energy security challenges that Central Asian countries are facing and searching for possibilities to overcome them, should not be underestimated.

Central Asia enjoys an abundance of energy resources capable of ensuring sufficient energy supplies for intra-regional consumption and, to some extent, meeting external demand by major customers such as Russia, China, India, and the European Union. While competing energy interests of these powers may affect their own geopolitical and economic gains, it is the impact of these competing interests on the level of energy security that poses threat to the security of the CAES. The external demand for Central Asian resources, along with obligations by regional producers to meet the volume of expected energy supplies, is growing faster than the energy-production capacities of the region. The temptation of revenues from exporting large quantities of energy to external markets, on the one hand, and the inability to unilaterally redirect energy supplies due to asymmetry in power balance, on the other, force Central Asian producers to increase the volume of exports even at the expense of domestic and intra-Central Asian energy consumption. Limited availability of energy resources within the region resulted in escalation of tensions over the construction of large hydro-power plants, disputes over the price for fossil fuels and unstable energy supplies. Asymmetrical interdependence among energy actors and strategic interests in states' energy export/import relations imply that energy resources are used for purposes other than to ensure energy security in Central Asia, thus causing frequent energy supply disruptions, especially when it is needed the most (winter period).

During the Soviet period, the energy security of the Central Asian region was ensured through intra-regional cooperation and by introducing large power generation and energy production capacities. In the 1990s, parallel operation of energy systems within the framework of the resource-sharing mechanism under the condition of mutual trust secured the sufficiency of energy supplies within the

region. Currently, however, the absence of a resource-sharing mechanism has affected the level of cooperation in the energy sector within Central Asia, leading to greater energy insecurity. Isolationist energy policies, both in terms of full self-reliance and self-control, without the establishment of self-sustaining independent energy systems threaten the security of the CAES, in which everyone's energy security interests are supposed to be met simultaneously.

Designed to operate within a unified energy system, the Central Asian energy sectors were regulated from Tashkent, but all supranational decisions were made in Moscow. After gaining independence, Central Asian governments reached a common understanding regarding the benefits of sustaining close regional energy cooperation. Interestingly, however, these same governments later started pursuing policies that distanced countries from each other, leading to the disintegration of the CAES. An attempt to break interdependent regional energy system into separate entities (national energy systems), has, to varying extents, affected the level of energy security in all five countries. Energy security can thus be most efficiently addressed through increasing the intra-Central Asian energy trade and greater regional cooperation. Yet, the CAES has undergone disintegration process. This book studies the development of the Central Asian countries' energy sectors and explains the consequences of the energy systems' disintegration on the region's energy security.

Exploring the compatibility of Central Asian states' energy policies, by presenting key features of the hydrocarbons, hydro-power and renewables sectors in each of the states, to ensure the security of the CAES as well as external factors affecting intra-Central Asian energy trade is both timely and important. Newly signed gas supply agreements between China and Central Asian countries almost doubled the volume of gas to be exported to China, thus forcing regional producers to increase export capacity, even at the expense of domestic and intra-regional consumption. Recent drops of water levels in reservoirs and severe energy insecurities caused by energy supply cuts from downstream neighbours forced Central Asian upstream countries to promote their giant hydro-power plant (HPP) projects. In its final assessment for the Rogun HPP in Tajikistan, which found that a 335m high dam is economically the most efficient with acceptable environmental and social impacts, the World Bank practically gave a green light to Tajik authorities to pursue the construction of the project, which is capable of affecting the water-energy balance in the region. Uzbekistan opposes construction of large dams, because it fears that its upstream neighbours could interfere with the water supply necessary for the downstream irrigation and particularly cotton industry, upon which Uzbek economy is dependent. Fundamental disagreements between the region's demand for water for irrigation and the use of water to generate electricity, along with disputes over the price for fossil fuels and energy trade, can seriously escalate the conflict between upstream and downstream countries.

By identifying the roots of the major energy security challenges preventing intra-Central Asian energy cooperation/trade, this book aims to contribute to the broader literature on conflictive and cooperative dynamics of interaction in the strategically important energy sector. While most of the literature focuses on explaining why actors fail to achieve greater levels of cooperation, this particular work focuses on conditions in which—despite a long history of mutually beneficial cooperation—regional actors suddenly decided to pursue myopically self-interested energy policies. The governance of the CAES represents a unique case in which energy security, provided by a highly authoritative supra-national management system—later replaced by cooperative relationships based solely on trust—now faces serious challenges, despite the fact that several main regional-level energy governance mechanisms were put in place to deal with insecurity of the unified system.

The analysis in this book draws on both qualitative and quantitative analysis. Based on the analysis of primary (government publications, state agencies' websites, official speeches, reports and statistical data) and secondary sources as well as extended semi-structured expert interviews, this book analyzes the level of energy insecurity, the main factors preventing Central Asian state actors from achieving greater cooperation in the energy sector.

A modified set of criteria developed by Vlado Vivoda was chosen to assess Central Asian countries' level of energy security. It contains a comprehensive list of measurement criteria (supply and demand security, economic, environmental, political/security, and technological), and also includes a policy dimension, which is important for the evaluation of Central Asian countries' capability to respond to energy security challenges. Analysis of the regional state actors' energy policies is useful to understand the extent to which governments prioritize regional energy cooperation.

Information for the assessment was primarily collected from international databases such as the International Energy Agency, US Energy Information Administration and the World Bank, which provide information for all countries simultaneously. Sometimes, the latest available statistical data for the Central Asian region in these sources is dated two to three years back; however, given that there has been no energy production boom, technological development leap, or major energy crises since then, those statistics mostly reflect the current situation.

Since Central Asian governments have not adopted specific energy strategies highlighting energy security policy priorities, in an attempt to determine state actors' priority areas in the energy sector development, information provided in a number of governmental portals and state agencies' official websites have been analyzed in the book.

Semi-structured expert interviews with state officials, representatives of non-governmental organizations and experts in the areas of energy, economics, policy development, and security from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan were used for the analysis of the cooperative/conflictive dynamics among Central Asian countries in the energy sector.

This book is organized as follows. The introduction presents the problem statement, methods used for data collection, and theoretical framework that can best map non-cooperative dynamics in the energy sector in Central Asia. Chapter I looks at broader literature explaining the evolution of the energy security concept, major energy security threats, and possible solutions to challenges affecting the sufficiency and sustainability of energy supplies while taking into account specific characteristics of the Central Asian region. Chapter II introduces the system level approach to energy security in Central Asia. The following three chapters assess the level of energy security in Central Asia, focusing on the specific energy sector for concrete countries, and analyze the compatibility of regional state actors' competing energy policy priorities to sustain regional cooperation in the energy sector. In addition, chapters contain analysis of the specific energy systems. Chapter III, IV and V study conflictual and cooperative dynamics of natural gas, oil and electricity supply relations within the Central Asian region and between regional exporters and external customers. Chapter VI, "Security of the Central Asian Energy Systems through Energy Trade," highlights the direct contribution of intra-regional energy cooperation on the level of energy security of the Central Asian states. The concluding chapter explains the changing power dynamics affecting regional actors' ability to coordinate their actions to achieve a maximally secure CAES. This section ends with several practical recommendations to reinstate energy trade and facilitate cooperation in the energy sector in Central Asia.

CHAPTER I.

UNDERSTANDING THE CONCEPT OF ENERGY SECURITY

WHAT IS ENERGY SECURITY?

A large amount of work has been conducted on energy security within the framework of national security, economic gains, international politics, energy interdependence and the diversification of energy sources/energy export routes. Various scholars have examined the concept from different angles, but they have failed to produce a universal definition of energy security.[1]

One group of scholars argues that energy security is constructed around the recognition that oil, gas, and their renewable counterparts need to be considered first and foremost as commodities. Thus, energy export/import relations are to be exercised through market-based transactions.[2] Others emphasize the linkage between energy security, international politics, and national security.[3] State actors are usually guided by a particular type of logic, suggesting that they cannot trust energy security to market forces alone. Thus, state actors often interpret threats to energy security as threats to national security.[4] For instance, in choosing routes to export energy, states often consider the political implications of various route options.[5]

There have been two major shifts in the literature in defining the concept of energy security. The first shift is characterized by broadening sources vital to providing energy security. The evaluation of energy security is no longer limited to the security of oil and gas supplies as well as diversification of energy transporting routes and energy markets. Increasing the share of alternative energy sources such as wind, solar, nuclear, and hydro-power in the overall energy production balance has become an important aspect of energy security to ensure the long-term security of energy supplies.[6] Having feared depletion of hydrocarbons and environmental risks associated with excessive usage of fossil fuels forced energy actors to develop renewable energy sources in the overall energy consumption.[7] Employment of new technologies to increase efficiency of energy production, storage, and transportation can contribute as much as increasing the production of fossil fuels.[8]

The second shift is about expanding the range of actors whose energy security concerns must be considered. Conventional understanding of energy security emphasizes the importance of energy (mainly oil and gas) supplies for importing countries. As a result, energy security has been associated with energy self-sufficiency and the security of energy supplies. When a country begins importing a large amount of oil and gas, it becomes vulnerable to potential energy sanctions. This compromises its energy security, understood as the security of energy

1 Felix Ciuta, "Conceptual Notes on Energy Security: Total or Banal Security?" *Security Dialogue* 41, no. 2 (2010): 126, doi:10.1177/0967010610361596.

2 Andreas Goldthau and Jan Martin Witte, "From Energy Security to Global Energy Governance," *Journal of Energy Security* (2010), accessed March 18, 2017, energy-governance&catid=103:energysecurityissuecontent&Itemid=358.

3 Daniel Moran and James A. Russell, *Energy Security and Global Politics: The Militarization of Resource Management* (London: Routledge, 2009); Filippos Proedrou, *EU Energy Security in the Gas Sector Evolving Dynamics, Policy Dilemmas and Prospects* (Aldershot: Ashgate, 2012); Roy Allison and Lena Jonson, *Central Asian Security The New International Context* (London: Royal Institute of International Affairs, 2001); Sascha Muller-Kraenner, *Energy Security: Re-Measuring the World* (London: Earthscan, 2008).

4 Moran and Russell, *Energy Security and Global Politics*, 2.

5 Brenda Shaffer, *Energy Politics* (Philadelphia: University of Pennsylvania Press, 2009).

6 Christian Winzer, "Conceptualizing Energy Security," *Energy Policy* 46 (2012); Benjamin K. Sovacool, "The Methodological Challenges of Creating a Comprehensive Energy Security Index," *Energy Policy* 48 (2012); David V. Hippel et al., "Energy Security and Sustainability in Northeast Asia," *Energy Policy* 39, no. 11 (2011), doi:10.1016/j.enpol.2009.07.001.

7 Hippel, "Energy security and Sustainability in Northeast Asia"; Vlado Vivoda, "Evaluating Energy Security in the Asia-Pacific Region: A Novel Methodological Approach," *Energy Policy* 38 (2010), doi:10.1016/j.enpol.2010.05.028; Winzer, "Conceptualizing Energy Security"; Sovacool, "The Methodological Challenges."

8 International Energy Agency, *Energy Efficiency Governance: Handbook* (Paris: International Energy Agency, 2010): 226, accessed April 7, 2015, http://www.iea.org/publications/freepublications/publication/gov_handbook-1.pdf.

supplies.[9] "[C]onventional energy security seeks to assure supply while assuming that demand is given [...]."[10]

Recent studies on energy security have shifted the definition of energy security from a sole focus on the importers' perspective to the relationship between energy importers and exporters, thus emphasizing the vulnerability of the latter in energy export/import relations. The main line of argument is that "exporters worry about energy demand the way energy importers worry about energy supply."[11] Energy security, from the exporters' perspective, is defined as the security of demand to generate economic growth and to maintain social stability,[12] which can be threatened by a variety of factors, such as resource wars or economic sanctions imposed by importing states.[13]

The most recent approach to energy security places individuals' energy needs at the centre of interest because an abundance of energy resources in a country does not necessarily mean that individuals are continuously provided with sufficient energy.[14] The human dimension of energy security, or the so-called "energy services security," places individuals at the centre of interest in designing energy policy and emphasizes individuals' access to energy resources in sufficient volume at an affordable price.[15]

9 Michael Wesley, *Energy Security in Asia* (New York, NY: Routledge, 2007), 43.
10 Vivoda, "Evaluating Energy Security."
11 Gawdat Bahgat, *Energy Security: An Interdisciplinary Approach* (Chichester, West Sussex, U.K.: Wiley, 2011), 226.
12 Daniel Yergin, The Quest: Energy, Security and the Remaking of the Modern World (New York: Penguin Press, 2011), 267.
13 Allison and Jonson, Central Asian Security.
14 Shaffer, Energy Politics, 91; Stefan Buzar, Energy Poverty in Eastern Europe: Hidden Geographies of Deprivation (Burlington, VT: Ashgate, 2007).
15 Anas F. Alhaji, "What Is Energy Security? Definitions and Concepts (Part 3/5)," *Middle East Economic Survey* 50, no. 45 (2007), accessed September 20, 2011, http://archives.mees.com/issues/213/articles/8255.

ENERGY SECURITY THREATS

While some associate the availability of energy with massive deposits of natural resources, what happens above ground is more likely to impact the level of energy security than what is available underground.[16] Natural resources lying underground have no intrinsic value to ensure availability of energy for both economic and population needs. Energy resources acquire such value when they are extracted and transported to energy markets.[17] However, the list of factors that can threaten the security of energy supply is quite inclusive: "internal instability, civil wars, ethnic violence that can disturb energy production; terroristic attacks on energy infrastructure; politically motivated suspension of oil and gas supply; economic sanctions against energy producing countries; war between energy producers; territorial disputes that can significantly slow down cooperation among parties in the energy sector and so on."[18] The list can be extended to underinvestment in the development of renewables, improving efficiency of energy production, transportation and consumption facilities, as well as non-market mechanisms regulating the energy sector.

Energy Infrastructure Insecurity

Energy security threats in relation to infrastructure vary depending on energy transportation means. For a landlocked region, pipelines are the most cost-efficient way of transporting resources. However, oil and gas pipelines often run over long distances through sparsely populated and therefore only poorly guarded territory. Once damage has been done, it often takes considerable time until the status quo is restored.[19] Some scholars argue that terrorists have little incentive to attack energy supply infrastructure. Because attacks can be costly but very limited in terms of casualties, striking energy infrastructure possesses a relatively low symbolic meaning across terrorist ideologies and attacks on energy transmission infrastructure can diminish the support of a terrorist group by the wider population.[20] Others believe that since energy infrastructures are often strategically important for sustaining political regimes, they are quite vulnerable to terrorist or insurgent attacks.

Militarization of Energy Resources

Pipeline infrastructure projects link states and reflect relations. In choosing routes to export energy, states naturally consider the political ramifications of various route options. Brenda Shaffer lists 19 points in which energy and international politics interlink. The main point is that energy and politics are inseparable and they affect each other all the time. Among many aspects of the energy-politics nexus, she highlights "peace pipelines," interdependence between supplier and consumer, the power of transit countries to affect energy relations, resource wars, the physical vulnerability of the energy trade, and the threat of climate change.[21] Daniel Moran and James A. Russell argue that energy security is central to national security and that threats to the former are liable to be reflexively interpreted as threats to the latter.[22] Scholars claim that the militarization of energy—resource management such as the direct seizure of energy assets by military means, destruction of energy assets to deny their use to rivals, military protection of, or attacks upon the energy production and transportation infrastructure, including oil fields,

16 Bahgat, *Energy Security*, 16.
17 George Joffe, "Threats to Energy Security," *Center for International Studies University of Cambridge* (n.d.), 12.
18 Bahgat, *Energy Security*, 15.
19 Muller-Kraenner, *Energy Security*, 23.
20 Peter Toft, Arash Duero and Arunas Bieliauskas, "Terrorist Targeting and Energy Security," *Energy Policy* 38, no. 8 (2010): 4416, doi:10.1016/j.enpol.2010.03.070.
21 Shaffer, *Energy Politics*, 6.
22 Moran and Russell, *Energy Security and Global Politics*, 2.

refineries, pipelines, and so on—may occur due to national security reasons.[23] A legacy of suspicion, mistrust, tensions among ethnic groups and political parochialism can escalate a conflict over the control of and access to natural resources.[24]

Despite Saddam Hussein's promise not to take aggressive actions against Kuwait, which started drilling too much oil, causing the oil price to go down, he started a war against Kuwait in 1990.[25] Iraqi soldiers destroyed many oil fields in Kuwait to destabilize the export system of the country. The logic of war in energy security implies that "energy is a security issue because it is either a cause or an instrument of war or conflict."[26] From the geopolitical perspective, consumer states may decide to intervene to ensure the security of supply if conditions inside producing countries threaten the supply flows.[27] There have been a few such cases in the past: the 1951–1953 crisis in Iran, the 1991 intervention over Kuwait, and the 2003 intervention in Iraq.[28]

The Energy Weapon

Although hypothetically both importers and exporters are interested in stable and reliable energy markets, this stability can sometimes be sacrificed for purposes other than to ensure energy security. While states usually refrain from engaging in war over resources, energy actors often employ less radical means to pursue their national interests to get access to energy or to use energy leverage to achieve goals in other areas of activity. Economic sanctions against Iran and gas export disruptions from Turkmenistan to Russia show that both importing countries and exporting can be exposed to the threat of "energy weapon."[29] Oil and gas markets in which pipelines are the main means of transportation may seem to be less vulnerable to the manipulation of both price and production, because export/import relations are based on long-term contracts.[30] Yet such agreements are sometimes incapable of securing the energy markets and stable supply relations from short-term energy crises. Since there is no universal regulatory mechanism, and it is difficult to come to agreement concerning profit and rent-sharing, price manipulation may take place in the relationships between parties, especially if they are asymmetrically dependent on each other.[31]

Increasing Export at the Expense of Domestic Consumption

Building energy infrastructure requires significant upfront investments. With direct interest in importing energy, consumers often take part in projects designed to extract and transport resources. Once invested, consuming states seek to ensure that their investments are protected and they receive the expected volume of resources.[32] There is, however, often a conflict of interests in which, on the one hand, investors (customers) are interested in acquiring energy while, on the other hand, it may affect availability of energy for domestic needs if the overall production capacity is limited. If they are tempted by revenues from exporting resources, energy producers may increase the volume of export, even at the expense of domestic consumption.

23 Moran and Russell, *Energy Security and Global Politics,* 7.
24 Charles K Ebinger, *Energy and Security in South Asia Cooperation or Conflict?* (Washington, D.C.: Brookings Institution Press, 2011), ix.
25 Yergin, *The Quest*, 9.
26 Ciuta, "Conceptual Notes on Energy Security," 129.
27 Joffe, "Threats to Energy Security", 9.
28 Joffe, "Threats to Energy Security," 17.
29 Shaffer, *Energy Politics*, 1.
30 Joffe, "Threats to Energy Security", 8.
31 Paul Stevens, *Transit Troubles: Pipelines As a Source of Conflict* (London: Chatham House, 2009).
32 Shaffer, *Energy Politics*, 52.

The Problem of Sustainability of Energy Sectors

Some challenges are not perceived by state actors as a threat per se right now, but would most likely have a negative effect on energy security in the long-run. Very often, state actors' perception of energy security is limited to ensuring the highest possible price for exporters' oil and gas and securing continuous supplies of hydrocarbons for importing countries through the diversification of energy supply routes.[33] The reason for such a limited understanding of energy security is that states are interested in promoting one aspect of energy security more than others.[34] However, it is impossible to address the complex set of energy security issues by having just one part of it in mind.[35] Equating energy security to the stability of energy supplies would mean that in the best-case scenario, oil and gas supplies' security is ensured. Long-term energy security, however, requires the development of alternative energy sources.

Lack of Energy Security Policy

For exporting countries, moving energy out to external markets does not contribute to their energy security in terms of availability of resources for domestic consumption. Energy sectors dominated by market mechanisms can naturally eliminate the difference between domestic and external energy prices, thus increasing the attractiveness of exporters' internal markets. However, the development of energy sectors extensively controlled and subsidized by state actors requires government policies that are specifically adopted to ensure energy security. In this case, lack of attention by state actors toward developing alternative energy sources and inability to coordinate their policies with other energy actors to increase efficiency of energy production and transportation by employing new technologies significantly weakens the security of the energy system. The development of the energy sector in various directions, however, requires clearly defined but also quite flexible (responsive to emerging energy security threats) energy security policy/strategy. According to Vivoda, "if a state does not have a clearly stated energy security policy, which addresses in detail, the traditional and new energy security challenges, this allows that this state may not have the capacity and/or commitment to [timely and adequately] ensure energy security."[36]

33 Gawdat Bahgat, "Central Asia and Energy Security," *Asian Affairs* 38, no. 1 (2006), doi:10.1080/03068370500456819.
34 Shaffer, *Energy Politics*, 93.
35 Hippel, "Energy Security and Sustainability"; Sovacool, "The Methodological Challenges.
36 Vivoda, "Evaluating Energy Security," 5259.

System-level Energy Security and Asymmetrical Interdependence

There are indeed many factors affecting energy security at the local, state, and international levels. What is equally important, however, is that threats at one particular level can and usually do affect energy security at the other. Consequently, as Barry Buzan rightfully puts it, [energy] security at the local level is closely interlinked to security at the state and international system levels and the other way around.[37]

At the international level, energy security threats usually emerge as a result of interstate relations, in which they interact with each other, and impact their overall security.[38] Daniel Yergin considers energy security as a system "composed of the national policies and international institutions that are designed to respond in a coordinated way to energy supply disruptions."[39] The ways states interact with each other often depends on changes in the regional balance of power or as a result of change in historical amity and enmity patterns. Most of the projects/initiatives in the energy sector do not change the distribution of power or enmity patterns retaining the status quo in relations. Some projects, however, may cause tensions, leading to the break up of the existing security complex. There are also cases when new energy actors move into the complex (external transformation) and significantly change the existing power balance (overlay).[40] Many scholars argue that mutually beneficial power balance in energy supply relations is maintained when engaging parties are interdependent.

Importing states are interested in getting access to energy resources. Exporters are driven by the desire to generate revenues from moving energy out to external markets. The role of a so- called "good transit country," which tends to produce predictable conditions for the most cost- efficient transportation of energy to consumers with minimal disruptions and has internal security and stable government, is also crucial.[41] Robert Jackson and Georg Sørensen argue that interdependence between producers and transit countries may produce incentives to avoid conflicts and compel states to engage in more intensive forms of cooperation.[42]

However, if relationships are not based on confidence, then high interdependence may be seen as a negative factor. Mutually dependent states are rarely equally or symmetrically dependent on each other. Taking into account the fact that the less dependent state in energy-supply relations is the one for which the termination or drastic alteration of the relationship in supply chain costs least, it may use its power to manipulate the relationships to achieve leverage not only in the specific issue area (energy sector), but also in various areas of general interaction affected by spillover effects (broader political and economic spheres). According to Robert O. Keohane and Joseph S. Nye, "an unequal distribution of gains and expenses lies at the heart of asymmetrical interdependence," which can incentivize or force least-privileged actors to defect, causing the conflict.[43] In this sense, asymmetrical interdependence can be as dangerous as dependence itself.

The key aspect of asymmetrical interdependence is the power capacity of one country to direct the decisions and actions of another state or states.[44] However, sometimes it is not actual depend-

37 Barry Buzan, "Peace, Power, and Security: Contending Concepts in the Study of International Relations," Journal of Peace Research 21, no.2 (1984): 121.
38 Yergin, The Quest, 264.
39 Yergin, The Quest, 267.
40 Barry Buzan, Ole Waever and Jaap de Wilde, Security: A New Framework for Analysis (Boulder [u.a.]: Rienner, 1998), 13-14.
41 Stevens, Transit Troubles Pipelines, 11.
42 Robert St. Jackson and Georg Sørensen, Introduction to International Relations: Theories and Approaches (Oxford: Oxford University Press, 2007), 100–115.
43 Robert O. Keohane and Joseph S. Nye, Power and Interdependence: World Politics in Transition (Boston: Little, Brown, 2001), 9.
44 Charles Freeman, Arts of Power: Statecraft and Diplomacy (Washington, DC: United States Institute of Peace

ence, but the overall relationships among actors that matter the most. The state with friendly relations to another state might not consider 50 percent energy dependency as a security challenge and would further develop joint cooperation, while two states with relatively opposed relations might perceive even 10 percent dependency as a serious obstacle to developing further relations. Moreover, interacting parties often try to minimize their dependence on others and at the same time increase others' dependence on them.[45]

An issue of interdependence that generates conflicts is highly sensitive when it comes to pipeline transit infrastructure. Energy transit infrastructure is a very complex network of supply system to the end-user. Transit pipelines have a tendency to produce long- or short-term conflicts or tensions in the relations between producer and transit country as a result of gas transit disruptions.[46] The fact that a pipeline has to cross the territory of a sovereign country or countries, which in practice has the capacity, although not the right, to unilaterally abrogate any agreement on energy supply, makes the situation quite complicated.

Press, 1997), 2.
45 Paul R. Viotti and Mark V. Kauppi, International Relations Theory: Realism, Pluralism, Globalism (New York: Macmillan, 1993), 57.
46 Stevens, Transit Troubles Pipelines, 1.

HOW TO ACHIEVE ENERGY SECURITY?

There is no universal definition of energy security. Thus, the extent and type of energy security threats vary from region to region. The measures needed to address those challenges also vary. While some scholars emphasize diversification of energy sources and suppliers, building strategic storage reserves, establishing country/region-wide energy infrastructure and flexibility to shift fuels,[47] others expand the list to include the availability of high-quality and timely information sharing, collaboration among energy actors, investment flows, research, and development.[48] For a landlocked region, in which energy security is dependent on pipeline and electricity transmission infrastructure, diversification of dependence between energy actors is often perceived as the best way to ensure stability and reliability of energy supplies.

Interdependence Through Diversification

A large amount of work has been done on energy security issues and the diversification of consumers' energy dependency within the framework of national security, economic gains, international politics, energy interdependence, and military power.[49] Shaffer argues that energy security can be provided when suppliers and consumers are interdependent in the supply relations.[50] The extent to which each side possesses alternative supply or market options, including transport infrastructure, determines the extent of interdependence in energy relations.[51] Diversification of energy export routes ensures alternative ways of transporting energy for consumers (decreases the effect of energy supply disruptions by one actor) and alternative markets for energy producers to sell energy at world prices.[52] There are a number of different factors that may ensure the success of such diversification, including: geography (distance between exporting and importing countries, security/vulnerability of transport routes), political relations, availability of energy resources and transport infrastructure, refining capacity, policy (commitment to implement), and resources (capacity and willingness to pay the price to secure access to alternative energy).[53]

There are other techniques to decrease asymmetry in interdependence and prevent energy supply disruptions. One of the possibilities is to build strategic reserves. Strategic petroleum reserves can serve as insurance from very short-term supply disruptions for energy-importing countries.[54] Such reserves do not solve the problem of prolonged supply disruptions. Another possibility is to bind importers and exporters with a formal agreement.[55] However, sometimes energy exporters and importers, as well as transit countries, are criticized for using energy as a "weapon" by breaking the terms of contract. Regional energy relations are very often interest-driven and lack an effective enforcement mechanism to respect the contracts. That is why, as Shaffer puts it right, "one of the major components of the cost of a project can be compensating for the perceived risk: regime's political orientation, how likely it is to respect signed contracts, its propensity to be involved in regional conflict, etc."[56]

47 Shaffer, Energy Politics, 93.
48 Bahgat, Energy Security, 2.
49 Shaffer, Energy Politics; Goldthau and Witte, "From Energy Security to Global Energy"; Moran and Russel, Energy Security and Global Politics; Muller-Kraenner, Energy Security: re-measuring; etc.
50 Shaffer, Energy Politics, 39.
51 Thrassy N. Marketos, China's Energy Geopolitics: The Shanghai Cooperation Organization and Central Asia (Abingdon, Oxon: Routledge, 2009).
52 Vaclav Hubinger, "Southern Corridor: A Strategy for Sustainable Energy Cooperation with Central Asia," EUCAM Watch, no. 4 (2009), accessed June 1, 2016, http://www.fride.org/download/EUCAM_Newletter4_ENG_may09.pdf
53 Vlado Vivoda, "Diversification of Oil Import Sources and Energy Security: A Key Strategy or an Elusive Objective?" Energy Policy 37 (2009): 4620, doi:10.1016/j.enpol.2009.06.007.
54 Yergin, The Quest, 271.
55 Joffe, "Threats to Energy Security," 13-14.
56 Shaffer, Energy Politics, 2.

Market Mechanisms

State actors often overemphasize the relationships between energy security and national security. They tend to perceive energy resources as a strategic commodity and are willing to use energy as leverage for purposes other than that to ensure stable and reliable supplies of resources for economic and population needs. Andreas Goldthau and Jan Martin, however, argue that energy security should be constructed around recognition that oil, gas, and their renewable counterparts need to be considered first and foremost as commodities.[57] So, for the consumers to access energy resources at fair prices, energy exporters should also exercise their price bargaining power through market-based transactions.[58]

Market mechanisms can provide effective instruments to deal with energy insecurity.[59] Many energy security experts consider market integration to be the most effective way to ensure energy security.[60] Among the major advantages of market mechanisms are innovation, flexibility and cost-effectiveness, all of which government agencies often ignore.[61] Non-market mechanisms can also be employed and sometimes might be a necessary condition to address energy security challenges, but only after market mechanisms fail. Governments can take a leading role in addressing suddenly emerging energy security challenges; however, market mechanisms come first, not the other way around. Long-term energy security can be ensured through proper functioning of market mechanisms in combination with government regulatory instruments operating within a free market.[62] It is quite difficult to establish well-functioning market mechanisms in an environment dominated by unaccountable and non-transparent government institutions.[63]

Governance Mechanisms

Taking into account the evolving nature of energy security threats, it has become difficult for governments alone to adequately address energy security problems.[64] In some cases, approaching a whole set of energy security challenges might not be in the short-term interests of state actors. A governance approach, on the other hand, provides a mechanism/platform to coordinate state policies to make sure that states take into account the interests of other actors and develop those aspects of energy security that otherwise would barely receive appropriate attention.[65]

57 Goldthau and Witte, "From Energy Security to Global Energy Governance."
58 Padgett, "External European Union Governance in Energy: Full Research Report," RES-000-22-2562, Swindon: ESRC, 2009.
59 Filippos Proedrou, EU Energy Security in the Gas Sector Evolving Dynamics, Policy Dilemmas and Prospects (Aldershot: Ashgate, 2012), 69.
60 Adrian Gheorghe and Liviu Muresan, Energy Security International and Local Issues, Theoretical Perspectives, and Critical Energy Infrastructures (Dordrecht: Springer Netherlands, 2011), 14.
61 Carlos Pascual and Jonathan Elkind, Energy Security Economics, Politics, Strategies, and Implications (Washington, DC: Brookings Institution Press, 2010), 279.
62 Youngho Chang and Swee Lean Collin Koh, "Rethinking Market Governance and Energy Security," (Chapter 2), 14 in Energy and Non-Traditional Security (NTS) in Asia, edited by Mely Caballero Anthony, Youngho Chang, and Nur Azha Putra, Berlin: Springer, 2012 DOI: 10.1007/978-3-642-29706-9_2
63 "Providing Security of Supply Efficiently Using Market Mechanisms. Industry Proposal for a Decentralized Capacity Market," June 2014, 3, accessed March 1, 2015, https://www.bdew.de/internet.nsf/res/595D1657AAB9ED-23C1257D5E00314BAB/$file/Branchenvorschlag_fuer_einen_dezentralen_Leistungsmarkt_Kurzbeschreibung_en_final.pdf
64 Keohane and Nye, Power and Interdependence.
65 Dries Lesage, Thijs van de Graaf and Kirsten Westphal, Global Energy Governance in a Multipolar World (Farnham, Surrey, England: Ashgate, 2010), 4. Also see: James N. Rosenau and Ernst Otto Czempiel, Governance Without Government: Order and Change in World Politics (Cambridge [England]: Cambridge University Press, 1992); Susan Strange, The Retreat of the State: The Diffusion of Power in the World Economy (New York: Cambridge University Press, 1996).; Jan Aart Scholte, Globalization: A Critical Introduction (New York: Palgrave Macmillan, 2005); Angel Saz and Keegan Pierce, "Towards a Global Governance of Energy," ESADEgeo Position Paper 9, January 2011.

Governance can be defined as "the coordinated, polycentric management of issues purposefully directed toward particular outcomes."[66] While there can be different political (power dynamics, identity and ideology, internal and external threats, domestic politics, leadership) as well as economic (high level of economic interdependence, trade, the complementarity of economies and policies, a desire to stimulate trade and attract investments through creation of a larger market) factors driving regionalism,[67] governance mechanisms are an important instrument to sustain cooperative dynamics.

Therefore, there are three important pillars upon which governance innovation is based:

- First, diversity and proliferation of governors—international governmental organization,[68] international non-governmental organizations (INGOs), governments, state agencies, private energy companies, civil society, epistemic communities,[69] networks as actors,[70] etc.;
- Second, cooperation among those actors on different levels of interaction—local/municipal levels,[71] intergovernmental, or supra-national levels;[72]
- Third, different forms of interaction—formal intergovernmental arrangements,[73] informal networks,[74] gatherings of leading economic, political, and cultural leaders.[75]

It is difficult to come up with a single universal formula for ensuring energy sectors' sustainability through energy governance mechanisms, because there are many ways of making progress in this direction and each depends on the particular characteristics of a country/region.[76] The following chapter presents the analysis of the main characteristics of the Central Asian countries' energy sectors, the level of energy insecurity and energy policy areas that the authorities are currently prioritizing.

66 David A. Welch, "What Is 'Governance,' Anyway?" Canadian Foreign Policy Journal 19, no. 3 (2013): 257, http://www.tandfonline.com/loi/rcfp20.
67 Margaret P. Karns and Karen A. Mingst, International Organizations: The Politics and Processes of Global Governance (Boulder, Colo: Lynne Rienner Publishers, 2010), 150–152.
68 Darren G. Hawkins, Delegation and Agency in International Organizations (Cambridge, UK: Cambridge University Press, 2006).
69 Peter M. Haas, "Introduction: Epistemic Communities and International Policy Coordination," International Organization 46, no. 1 (1992), 2, doi:10.1017/S0020818300001442.
70 Miles Kahler, Networked Politics: Agency, Power, and Governance (Ithaca: Cornell University Press, 2009), Chapter1, 2-3.
71 Charles Elworthy, "The Energy Commons. A Governance Framework for Climate Stability and Energy Security," July 2011, https://www.academia.edu/834236/The_Energy_Commons_A_Governance_Framework_for_Climate_stability_and_Energy_Security.
72 Kal Raustiala and David G. Victor, "The Regime Complex for Plant Genetic Resources," International Organization 58 (Spring 2004): 277–309, doi:10.1017/S0020818304582036; and Sol Picciotto, "Regulatory Networks and Global Governance," St. G. Hart Legal Workshop, 2006 accessed March 25, 2013 http://eprints.lancs.ac.uk/232/1/Reg_Networks_&_Glob_Gov.pdf.
73 Kal Raustiala and David G. Victor, "The Regime Complex for Plant Genetic Resources."
74 Anne-Marie Slaughter, A New World Order (Princeton: Princeton University Press, 2004).
75 Klaus Dingwerth and Philipp Pattberg, "Arenas, Actors and Issues in Global Governance," (2009) in: Jim Whitman, Global Governance (New York: Palgrave Macmillan, 2009), 41-65.
76 Neil Gunningham, "Regulation, Economic, Instrument, and, Sustainable, Energy," Climate and Environmental Governance Network Working Paper 12 (2012): 4.

CHAPTER II.

SYSTEM LEVEL APPROACH TO ENERGY SECURITY IN CENTRAL ASIA

Chapter II. System Level Approach to Energy Security in Central Asia

There are several factors suggesting that studying energy security problems, which emerged as a result of the CAES ongoing disintegration and exploring compatibility of the Central Asian states' energy security policies to sustain regional energy cooperation are both timely and important. The World Bank has released the assessment results for the Rogun HPP, according to which 335m high dam is found economically the most efficient with acceptable environmental and social impacts. Tajikistan's desire to build the tallest dam in the world was approved by the World Bank expert panel, yet objection by the Uzbek government may further escalate the conflict over the water-energy balance and negatively impact the level of energy security in Central Asia. Decreasing levels of water in reservoirs due to overuse for electricity production over the last couple of years affects future production volume in upstream Central Asian states, preventing people from simply meeting their basic human needs. With relatively limited oil and gas extraction capacities, Central Asian downstream countries' attempt to increase the volume of export affects sufficiency of hydrocarbon supplies for domestic and intraregional consumption. Transition from subsidized to market prices while ensuring affordability of energy resources through policy initiatives turned out to be a difficult, but necessary, task. Excessive dependence on imported oil products and lack of cooperation to use existing refineries in the most efficient way further complicate energy security of the Central Asian countries, turning them more vulnerable. Addressing these and some other energy security problems requires greater regional cooperation promoted by prioritized energy policies. Before closely studying energy security policy priorities of the Central Asian states, the following section defines energy security and security of the CAES.

DEFINING ENERGY SECURITY AND ENERGY POLICY PRIORITIES OF THE CENTRAL ASIAN STATES

During the Soviet era, the stability and reliability of energy supply flows in Central Asia were ensured by: first, instructions coming from a single political centre (Moscow); and, second, the resource-sharing mechanism, in which Central Asian upstream countries released water and supplied hydroelectricity in summertime, while downstream neighbours channelled fuel and thermal electricity in winter. After the disintegration of the Soviet Union, Russia inherited the infrastructure that the Central Asian states needed to transport energy out of the region, creating excessive dependence on the Russian pipeline network and energy market. In the 1990s, the Central Asian states continued to barter energy with each other and Russia, in almost the same way as they had in the unified Soviet energy system. However, regional energy exporters' dissatisfaction with the terms of the energy trade dictated by Russia and the willingness of other external customers to invest in the construction of pipeline networks to transport energy while avoiding Russia transformed the relationships among state actors within the CAES. As a result, two interlinked levels of relationships emerged that affect the security of the CAES: first, energy supply relations within the Central Asian region; and second, energy export/import between Central Asian producers and external customers.

In this book, energy security is defined as a condition states enjoy when they can be confident that they will have adequate and sustainable energy supplies for population and economic needs for the foreseeable future. Adequate energy supplies indicate that states have enough energy resources to meet their needs. Sustainability of energy supplies implies that the present needs are met without compromising energy supplies for future generations. Sustainability of energy can be promoted by increasing the share of renewable energy sources (hydroelectricity, wind energy, solar energy, etc.) in the overall energy balance and improving energy efficiency by introducing new technologies.

Given the above-mentioned definition of energy security, the security of the CAES is the condition in which all Central Asian states enjoy sufficiency and sustainability of energy supplies (for both population and economy needs) simultaneously. The system entails balancing among the energy interests of all. Reaching consensus is difficult, but necessary if the end goal is to make sure that everyone is enjoying energy security.

The following chapters study the level of energy insecurity in the region, resource potential that provides some prospects and Central Asian countries' energy security policies separately for natural gas, electric power, oil and renewables sectors, affecting regional cooperation.

The current energy policies of the Central Asian countries prioritize establishing and strengthening national energy systems by increasing energy production capacity as well as building countrywide energy transportation networks. Government officials also claim to be interested in attracting investment to improve energy efficiency and develop renewable energy sources. The chapter emphasizes that the development of energy sectors in these directions can improve the level of energy security only in combination with restoring intra-Central Asian energy trade, which may take the form of both long-term formal trading arrangements or swap, barter, and other exchange type mechanisms. However, the analysis of competing energy policies of the Central Asian states shows that intra-regional energy trade is currently not prioritized. Lack of intra-Central Asian energy trade may not be very surprising given what we know about the lack of regional cooperation in general. It is, nonetheless, important to analyze measures prioritized by the Central Asian governments to improve the level of energy security in their respective countries with three interlinked energy systems (natural gas, electric power and oil) and the practical affect these measures can possibly have, because such analysis is helpful to understand irrationality behind establishing independent energy systems.

Table 1. Energy Security Measurement Criteria.

Energy Security Dimension	Attribute	Interpretation (Preferred)	KAZ	KGZ	TJK	TKM	UZB
Energy supply	(a) Fraction of primary energy as imports	Low	Low	High	High	Low	Low
	(b) Diversification (by fuel type)	High	Low	Low	Low	Low	Low
	(c) Diversification (by source)	High	Med	Low	Low	Low	Med
	(d) Diversification (by transport routes)	High	Med	Low	Low	Low	Med
	(e) Diversification of electricity generation (by fuel type)	High	Low	Low	Low	Low	Med
	(f) Quality of electricity transmission and energy transportation networks	High	Low	Low	Low	Low	Low
	(g) Stocks (i.e. strategic petroleum reserves) as a fraction of imports	High	Med	Low	Low	Low	Low
	(h) Refining/fuel processing capacity as a fraction of primary energy consumption	High	Med	Low	Low	Med	Med
	(i) Reliance on market/non-market mechanisms to secure energy imports or export markets	Market	N/M	N/M	N/M	N/M	N/M
Demand management	(a) Evidence of fossil fuel demand reduction (through conservation/ substitution) as a result of policy initiatives	Yes	No	No	No	No	No
	(b) Exposure to demand-side risks:						
	• Demand surges—periods of peak demand in response to extreme conditions	Low	Low	Med	Med	Low	Med
	• Increasing export at the expense of domestic (intra-Central Asian) consumption	No	No	No	Yes	Yes	Yes
Efficiency	(a) Energy efficiency (Gross domestic product (GDP) per unit of energy use (PPP $ per kg of oil equivalent))	Low	Med	High	High	Low	Med
Economic	(a) Total fuel costs/GDP	Low	Med	High	High	Low	Med
	(b) Fuel imports (% of GDP)	Low	Low	High	High	Low	Low
	(c) Fuel exports (% of GDP)	High	High	Low	Med	High	Med
Environmental	(a) Reliance on fossil fuels as a fraction of primary energy consumption	Low	High	Med	Med	High	High
	(b) Carbon Dioxide Emissions	Low	High	Low	Low	High	Med
Human security	(a) Fraction of population with access to basic energy services (i.e. electricity)	High	High	High	High	High	High

Energy Security Dimension	Attribute	Interpretation (Preferred)	KAZ	KGZ	TJK	TKM	UZB
Military-Security	(a) Exposure of critical energy infrastructure to energy related military/security risks (i.e. terrorism, conflict over resources, etc.)—conflict may occur over water, but not energy	Low	Low	Low	Low	Low	Low
Domestic socio-cultural-political	(a) Exposure to social or cultural energy-related risks (i.e. NIMBYism, energy sector labor unrest)	Low	High	Low	Low	Low	Low
	(b) Exposure to political energy-related risks:						
	• Strong oil or gas lobby	Low	High	High	High	High	High
	• Disagreements among leaders	Low	Med	Low	High	Low	High
Technological	(a) Diversification for key energy-related industries (i.e. power generation) by technology type	High	Low	Low	Low	Med	Low
International	(a) Commitment to regional and other international cooperation on energy-related issues (i.e. to increased regional energy security cooperation or energy related international agreements)	High	High	Med	Med	High	Low
Policy/mechanism (Yes/No)	(a) Existence of energy security strategy	Yes	No	No	No	No	No
	(b) Transparency of energy security policy	High	Med	Med	Low	Low	Low
	(c) Regular policy reviews	Yes	No	No	No	No	No
	(d) Supply issues prioritized in policy	Yes	Yes	Yes	Yes	Yes	Yes
	(e) Demand management issues prioritized in policy	Yes	No	Yes	Yes	No	Yes
	(f) Efficiency issues prioritized in policy	Yes	Yes	Yes	Yes	No	Yes
	(g) Economic issues prioritized in policy	Yes	Yes	Yes	Yes	No	Yes
	(h) Environmental issues prioritized in policy	Yes	Yes	No	No	No	No
	(i) Human security issues prioritized in policy	Yes	No	Yes	Yes	No	No
	(j) Military/security issues addressed in policy	Yes	No	No	No	No	Yes
	(k) Socio-cultural and political issues prioritized in policy	Yes	Yes	Yes	No	No	No
	(l) Technological issues addressed in policy	Yes	Yes	No	No	Yes	No
	(m) International cooperation issues addressed in policy	Yes	Yes	Yes	Yes	Yes	Yes

Source: Vlado Vivoda, "Evaluating Energy Security in the Asia-Pacific Region: A novel Methodological Approach," *Energy Policy* 38 (2010), 5261—Energy security criteria were modified to capture main attributes of the Central Asian Energy System. N/M = non-market.

Exchange of energy resources ensured the stability and reliability of energy supplies within the CAES. While Central Asian countries' desire to establish and strengthen their national energy systems is understandable, it requires a gradual transition from current interdependence into independently operated and self-sufficient energy systems. In other words, the pace of decreasing intra–regional energy trade should be symmetrical to increasing energy production and extending energy supply networks in each country. Central Asian countries' energy policies, however, prioritize establishing independent energy systems, while underestimating the importance of intraregional energy trade to ensure energy security along the above-mentioned transition.

SECURITY OF THE CENTRAL ASIAN ENERGY SYSTEM

Central Asia is one of the regions in the world that enjoys an abundance of energy resources. There is also a demand for Central Asian energy both within the region and by external customers such as Russia, China, Europe and potentially India. Due to relatively limited production capacity, inefficient energy sectors, and the necessity to meet domestic needs, Central Asian producers may experience difficulties to entirely meet growing demand by those customers. The temptation of revenues coming from exporting large quantities of energy to external markets and binding obligations to supply agreed amounts of resources force Central Asian producers to increase export capacity, even at the expense of domestic and intraregional energy consumption.

The resource-sharing mechanism ensured reliable and stable energy supplies during the Soviet era and right after the disintegration of the Soviet Union. The mechanism was quite simple: the upstream countries of Kyrgyzstan and Tajikistan ensured a continuous flow of water and a certain amount of electricity during the summer to the downstream countries, Kazakhstan, Turkmenistan, and Uzbekistan, which channelled thermal electricity, gas, and light oil products to them in return.[77] The CAES, which operated within the resource-sharing mechanism and ensured sufficiency of energy supplies simultaneously to all five countries, mainly consisted of the Central Asian gas pipeline system, the Central Asian electric power grids and a very limited exchange of crude oil and light oil products. With the collapse of the Soviet Union, Soviet supranational energy sector management system also broke down into smaller units. Central Asian energy sectors, which were initially designed to function within its own unified system, continued to operate by inertia in coordination with each other by retaining high level of interdependence. However, the level of interdependence has been gradually decreasing since then. After the disintegration of the Soviet Union, introducing a pricing policy for the oil and gas trade while simultaneously sharing water resources and increasing and diversifying exports to external markets all put strains on the mechanism, particularly in a context of rising prices. The Almaty Agreement of 1992 was supposed to keep the mechanism functioning "until the states could reach a solution amenable to all parties."[78] Fundamental disagreement between the region's demand for water for irrigation and the use of water to generate electricity, along with disputes over the price for fossil fuels and many other factors have led to a conflict between upstream and downstream countries.

Central Asia is not the only region where non-cooperative dynamics between states in the energy sector affect the availability of sufficient and stable energy supplies. What distinguishes this region from the rest of the world, however, is the fact that, initially, Central Asian countries' energy sectors were designed to operate within a unified energy system. Interdependence of energy sectors implies that energy security challenges, which go beyond the scope of one state, require coordinated actions to be taken by all parties involved. However, intra-Central Asian energy trade within the framework of the resource-sharing mechanism that ensured stability

77 Murodbek Laldjebaev, "The Water–Energy Puzzle in Central Asia: The Tajikistan Perspective," *International Journal of Water Resources Development* 26, no. 1 (2010): 24, doi:10.1080/07900620903391812.
78 Ariel Dinar et al., *Bridges Over Water: Understanding Transboundary Water Conflict, Negotiation and Cooperation* (New Jersey: World Scientific, 2007), 294.

of energy supplies in the region is being compromised by producers' desire to increase export capacity to external markets at the expense of intraregional consumption: (a) trade between Central Asian oil and natural gas exporters and external energy importers (Russia, China, Iran, indirectly Europe, and potentially Afghanistan, Pakistan, and India); (b) hydro-power export from mainly Tajikistan, Uzbekistan, and possibly Kyrgyzstan to South Asia (Afghanistan and Pakistan), and potentially to China and India; and, (c) export of crude oil to external market, instead of supplying to the refineries of the neighbouring countries and exchanging light oil products.

The security of the CAES, within which Central Asian states are highly dependent on intraregional gas pipeline networks and oil products supply chains as well as electric power grids, is complicated both by the region's landlocked status and the fact that Central Asia is surrounded by larger powers, such as China, Russia, India, and Europe, which often compete for the region's resources.[79] These powers are currently avoiding major confrontation and relatively peacefully co-existing in Central Asia by largely pursuing distinct (non-competing) strategic interests (political influence for Russia, energy interest and stability in Xinjiang for China, partnership within a number of areas, including human security, good governance, etc. for Europe).[80] However, perhaps to a different extent at the moment, they all are interested in Central Asian energy resources. And, it is not the consequences of competing interests of these powers for their own energy sectors, economies and geopolitical gains that this book is concerned about. It is rather the impact of bigger powers' competing energy interests on the availability of sufficient energy resources for domestic and intra-Central Asian consumption that is placed in the center of this particular book. In addition, there are already signs that diversified energy markets, which significantly increase the demand for the region's resources, affect and will continue to threaten sufficiency of energy supplies for internal and intraregional needs.

The landlocked geographical location not only limits Central Asian states' access to global energy markets, but also makes pipeline networks the only economically efficient way to transport oil and gas from Central Asia. Building pipelines requires significant upfront investments that Central Asian producers, due to their limited financial capabilities, cannot afford to cover. The same applies to the construction of large HPPs and electricity transmission lines connecting Central Asian producers and external customers. Taking loans forces regional producers to agree upon the distribution of control over resources, which often does not serve their best interest. Due to asymmetrical interdependence among actors and strategic interest that states input in their energy export/import relations, energy has sometimes been used for purposes other than to ensure energy security, causing supply disruptions in Central Asia, especially when it is needed the most (during the winter period). The problem of cooperation and coordination in the energy sector among Central Asian countries can be explained using the analytical tools provided by the game theories. While Prisoners' Dilemma is often used for explaining non–cooperative dynamics in the region. The analysis in this book, however, highlights that taking into account system level interlinkage of the energy sectors the Stag Hunt game theory best explains non–cooperative relationships among Central Asian countries.

ENERGY GAMES AND THE PROBLEM OF REGIONAL COOPERATION WITHIN THE GAS SUPPLY RELATIONSHIPS

There are a number of studies that approach the issue of regional cooperation in Central Asia from different perspectives. Some of the studies explain why regionalism/ regional cooperation occur

79 Gawdat Bahgat, "Central Asia and Energy Security," *Asian Affairs* 38, no. 1 (2006): 3, doi:10.1080/03068370500456819.

80 Alexander Cooley, *Great Games, Local Rules: The New Great Power Contest in Central Asia* (New York: Oxford University Press, 2012).

in one area (environment or political/security) and is largely neglected in another (economic). Others explore the impact of domestic politics (patrimonialism with a particular focus on rent seeking) on regional cooperative dynamics. Kathleen Collins, for instance, demonstrates direct relationships between patrimonialism and regionalism in Central Asia. Ruling elites of the Central Asian countries, being concerned mainly about their regime survival and personal enrichment, successfully promote cooperative dynamics in the security area, which reinforce their patrimonial regimes. At the same time having formally acknowledged the importance of economic regionalism these same elites in practice resist regional economic integration fearing the liberalization of economies that can affect their ability to extract personal benefit. While some patrimonial regimes (Kazakhstan, Kyrgyzstan, Tajikistan and now Uzbekistan) proclaim greater openness to regional economic cooperation than others (Turkmenistan) do, Collins argues that economic regionalism has been limited in all Central Asian states.[81] She concluded highlighting that patrimonial leaders are driven by survival motives through mainly coercive measures and economic regionalism requires liberalization of Central Asian economies, which may affect formal and informal mechanisms through which elites personally benefit.[82] In this regard, Central Asian state leaders would support any sort of regionalism initiative only as long as it contributes to sustaining their regimes, especially when there is no or weak domestic political contestation.[83]

After operating within the common energy system for a long time, Central Asian countries have reoriented their energy policies toward establishing independent, both separately regulated/administered as well as unconnected, national energy systems, causing disintegration of the CAES. Governments of the Central Asian countries have a decisive role in almost all areas of domestic and foreign relations, including cooperation in the energy sector, and are often blamed for the decreasing level of cooperation, consequently resulting in a lower level of energy security in the region. Irrational-actor explanation can be offered to explain the ongoing disintegration of the CAES without claiming that there are no other possible explanations. The analysis examines the extent of a function of the rational pursuit of individual states' self-interests (economic and political gains as well as certain energy security concerns) that is negatively affecting intraregional cooperation, consequently leading to greater energy insecurity in Central Asia. The most important question, however, is whether cooperation in the energy sector between regional state actors is currently, and overall, less preferred to individual gains that Central Asian countries can hypothetically achieve or if it is simply a problem of coordination that is preventing these actors from gaining the highest possible rewards. The prisoner's dilemma (PD) game, in which actors fail to cooperate because there is high incentive for players to cheat in an environment of uncertainty, and the stag-hunt (SH) model, which explains the problem of coordination of common strategy to achieve a big payoff, are good frameworks through which to map the energy security challenges of the CAES.

The Prisoner's Dilemma Game

Actors behave rationally when they choose the most preferred outcome out of several alternatives.[84] The PD is a cooperation game, in which the main concern is how to get the players to cooperate when there are high incentives to cheat. If an actor has no confidence that the other will not cheat or will simply be tempted by the fact that he or she may gain the most

81 Kathleen Collins, "Economic and Security Regionalism among Patrimonial Authoritarian Regimes: The Case of Central Asia," *Europe-Asia Studies* 61, no. 2 (2009): 250.

82 Kathleen Collins, "Economic and Security Regionalism," 251.

83 Erika Weinthal and Pauline Jones Luong, "Prelude to the Resource Curse: Explaining Oil and Gas Development Strategies in the Soviet Successor States and Beyond," *Comparative Political Studies* 34, no. 4 (2001): 367-399.

84 Stephen Quackenbush, "The Rationality of Rational Choice Theory," *International Interactions* (2004): 95, doi:10.1080/03050620490462595.

by defecting, cooperation will most definitely fail.

	Cooperate	Defect
Cooperate	(R) 2, 2	(S, T) 0, 3
Defect	(T, S) 3, 0	(P) 1, 1

(2, 2) represents the reward that players can receive for choosing to cooperate. Zero is what the player who cooperated while others defected gets. Under the condition that a player defects and others do not he or she can get the highest possible payoff of 3. If everyone fails to cooperate, players are punished by receiving only some rewards represented by (1, 1) in the table. This, however, is less than what they can achieve in cases they both choose not to cheat. The formula explaining the PD has to satisfy the following inequalities:

$$(S)\ 0 < (P)\ 1 < (R)\ 2 < (T)\ 3$$

Hypothetically, cooperation should be preferred to defection because the total reward players get is higher than any other outcome:

$$2+2 > 0+3/3+0/1+1$$

Players, however, may still choose to cheat on others, seeking the highest possible individual payoff (3) they can get in an environment of uncertainty and lack of trust.[85] The easiest way to explain the joint defection outcome in PD is to say that no matter what the other player does, one is better off defecting.

In the PD, players do not take moral considerations into account. Actors do not fear possible moral revenge from others for their actions.[86] They are, however, concerned about the same type of defection by other players (tit-for-tat), which affect their payoff. Defection may not always be determined by a strong desire to cheat, but might be instigated by a simple lack of knowledge and trust. "If each player is rational and knows that the other is rational, but neither knows that the other knows that he is rational, then nobody is cheated, but everybody has an interest in acting as if he were being cheated," argues Cristina Bicchieri.[87] Alternatively, to one-shot tit-for-tat strategy, Pavlov presents the win–stay, lose–shift fundamental behavioural mechanism. After a round of mutual defection caused by tit-for-tat, players will most likely choose to return to joint cooperation and stick to it.[88] Similarly, while the main problem in PD is the mistrust among players, if players are rational and playing iterated PD, then according to Robert M. Axelrod, cooperation will emerge organically. Encouraging cooperation and resolution of conflict depends on four conditions: "avoiding unnecessary conflict by cooperating when the other player cooperates, retaliating for unprovoked defection, forgiveness after retaliating, and clarity of behaviour, allowing the other player to adapt to one's pattern of behaviour."[89] However, since the CAES is still in the process of disintegration, and despite several rounds of defection, regional state actors have not shown any sign of cooperative dynamics, we can

85 Anatol Rapoport, Albert M. Chammah, and Carol J. Orwant, *A Study in Conflict and Cooperation* (Ann Arbor: University of Michigan Press, 1965), 34.
86 Michael P. Marks, "The Prison as Metaphor: Recasting the 'Dilemma' of International Relations," *Alternatives: Global, Local, Political* 26, no. 3 (July/August 2001): 363.
87 Cristina Bicchieri, Richard C. Jeffrey, and Brian Skyrms, *The Dynamics of Norms* (Cambridge: Cambridge University Press, 1997), 222.
88 Martin Nowak and Karl Sigmund, "A Strategy of Win-stay, Lose-shift That Outperforms Tit-for-Tat in the PD Game," *Nature* 364 (July 1993): 56, doi:10.1038/364056a0.
89 Robert M. Axelrod and St. D. Hamilton, *The Evolution of Cooperation* (New York: Basic Books, 1984), in Curtis S. Signorino, "Simulating International Cooperation Under Uncertainty," *The Journal of Conflict Resolution* 40, no. 1 (March 1996): 154.

dismiss the PD game as the main device to study the problem of regional cooperation in the energy sector.

The Stag-Hunt Game

If the PD (cooperation game) is about a high incentive to cheat and mistrust, which results in a lack of cooperation, the SH game is better understood as a coordination game. In other words, SH is about getting players to coordinate a common strategy to get the big payoff—the stag.[90] The SH satisfies the following equation:

$$(R)\ 2 > (T)\ 1 > (P)\ 1 > (S)\ 0$$

If a stag appears right in the beginning of hunting, hunters would most definitely go after it and enjoy the highest possible gains. But the stag rarely appears in the beginning of hunting, which requires certain patience from all hunters. Waiting for a stag to show up may take some time testing hunters' true commitment to the common cause and trust among each other. The most challenging part of prolonged stag hunting is to make sure that hunters would not defect when a hare emerges from the bush. If any of the hunters shoots the hare, the noise would scare the stag in the area. The hunter that chooses to defect can have sufficient meat today, but would get hungry again tomorrow, like the others.[91]

The dilemma in the SH game is whether to go after the smaller hare with promising chances of catching it, or risk ending up with nothing in order to increase the chance of catching the stag.[92] A hunter who chooses to go for a stag takes a risk that others may choose not to. A hunter that goes for a hare runs no such risk, because his payoff does not depend on others. However, he sacrifices the potential gains in case of a successful SH.[93] In this regard, players have to make a difficult choice of whether to achieve selfish gains immediately with lower risks, or collective benefits in the long term running some risk of losing everything.[94] There should be two conditions that would encourage hunters to go for a stag: guarantee that others would not defect; and the fact that hunters gain more by hunting a stag than if they separately capture all possible hares.

	Stag (cooperate)	Hare (defect)
Stag (cooperate)	(R) 2, 2	(S, T) 0, 1
Hare (defect)	(T, S) 1, 0	(P) 1, 1

In the PD game, achieving cooperation with fewer players may seem to have a greater chance of realization, because there is no need to try to calculate the intentions of many actors in an environment of uncertainty. While in the PD the larger the group, the more difficult it is to

90 Robert Kelly, "The Six-Party Talks as a Game Theoretic 'Stag-Hunt' (1): N. Korea is the Stag," *Asian Security Blog*, April 26, 2010, accessed January 29, 2014, https://asiansecurityblog.wordpress.com/2010/04/29/the-six-party-talks-as-a-game-theoretic-Stag-hunt-2-china-likes-the-rabbit-too-much/.

91 Walter C Clemens, *Dynamics of International Relations: Conflict and Mutual Gain in an Era of Global Interdependence* (Lanham, MD: Rowman & Littlefield Publishers, 2004), 211.

92 Jack Donnelly, *Realism and International Relations* (Cambridge [England]: Cambridge University Press, 2000), 152.

93 Brian Skyrms and U. C. Irvine, "The Stag Hunt," *Pacific Division of the American Philosophical Association*, March 2001, accessed February 6, 2014, http://www.socsci.uci.edu/~bskyrms/bio/papers/StagHunt.pdf.

94 Pushpesh Pant, *International Relations in 21st Century* (India: Tata McGraw-Hill Education, 2011), 35.

achieve cooperation, conversely in the SH it would be quite challenging to hunt a stag with two participants. A higher number of participants increase the chance to hunt a stag. Differently from the PD, in the SH there is a cooperative equilibrium where if others cooperate the player has to do his or her part as well.[95] Robert Pahre believes that one of the most effective mechanisms for sustaining multilateralism is asymmetric enforcement. Large enforcers of small cheaters will provide basis for multilateral cooperation.[96] An asymmetrical power balance might be an important instrument to sustain multilateral cooperative dynamics, but does not necessarily imply that the interests of all parties are equally secured. Within such relationships, less powerful members are vulnerable to unilateral manipulation from dominant players.

Players may choose selfish gains when they could clearly be better off within collective benefits' distribution, because players prioritize immediate short-term benefits against achieving long-term gains.[97] Stephen J. Majeski and Shane Fricks argue that the role of communication between states and its effect on players' decision to cooperate should not be underestimated. States cooperate more and defect less when they are engaged in communication. Players fail to cooperate because they know little about the others and thus fear them. Communication is a good tool to alleviate that fear. There are two forms of communication. The first form consists of signals. Signals are costly and directly affect the payoffs. In the energy sector, the cost of signals may vary from certain payments necessary to establish a well-functioning energy system to the costs associated with resource wars. The second form of communication is cheap talks. Cheap talks do not bear any cost, but also do not necessarily affect the outcomes of interaction.[98] Communication provides parties with more information and the possibility to better calculate expected choices. Communication can show players that there is little to fear about others and that it is a mistake to cheat on each other, thus encouraging greater cooperation, which can bring higher payoffs.[99]

The analysis in this work studies factors affecting the extent of multilateral cooperation in the energy sector among Central Asian countries and with external customers, as well as the problem of miscommunication that prevents state actors from developing a coordinated strategy to improve the security of the CAES within the framework of the SH game. While none of the Central Asian states has adopted a document clearly determining energy policy priority areas or energy security strategies, based on the analysis of various official documents, state programs, governmental information agencies as well as interviews with experts and state officials, the analysis in the sections below highlights areas of the energy sector development that are of high priority for Central Asian countries in their energy policies and system level interactions within the Central Asian energy systems: (a) Central Asian gas supply network: Uzbekistan, Kazakhstan and Turkmenistan; (b) Central Asian electric power system: Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan and Kazakhstan; (c) Central Asian oil sector: Kazakhstan, Turkmenistan and Uzbekistan. The following sections analyze major flaws of those policies and highlight their, to a different extent, limited contribution to improving the level of energy security in the region.

95 Jorge M. Pacheco et al., "Evolutionary Dynamics of Collective Action in N-Person Stag Hunt Dilemmas," *Biological Sciences* 276, no. 1655 (January 2009): 315, doi:10.1007/978-3-0348-0122-5_7.
96 Robert Pahre, "Multilateral Cooperation in an Iterated PD," *Journal of Conflict Resolution* 38, no. 2 (June 1994): 339.
97 Robert Axelrod, "The Evolution of Strategies in the Iterated PD," in *The Dynamics of Norms by* Cristina Bicchieri, Richard C. Jeffrey, and Brian Skyrms, (Cambridge: Cambridge University Press, 1997), 222.
98 Stephen J. Majeski and Shane Fricks, "Conflict And Cooperation in International Relations," *Journal of Conflict Resolution* 39, no. 4 (December 1995): 627, doi:10.1177/0022002795039004002.
99 Majeski and Fricks, "Conflict And Cooperation in International Relations," 628.

CHAPTER III.

PIPELINE POLITICS OF THE CENTRAL ASIAN GAS SYSTEM

Chapter III. Pipeline Politics of the Central Asian Gas System

Possessing reserves of approximately 20 trillion m^3 of natural gas,[100] Central Asia is becoming increasingly attractive to energy-thirsty larger powers surrounding the region. While gas importers address the need to ensure steady imports of gas and the security of gas supplies, Central Asian exporters aim to secure their ability to constantly export it to obtain a steady income. Central Asian countries can roughly be divided into net consumers (Tajikistan and Kyrgyzstan) and net producers (Kazakhstan, Turkmenistan, and Uzbekistan). The CAES during the Soviet period was constructed in such a way that the stability and reliability of gas supplies were maintained through a resource-sharing mechanism. Although there is still a demand for gas by the consumer countries, relatively recently emerged geopolitical and economic realities have challenged the effectiveness of this exchange mechanism. The analysis in this book highlights that the regional gas politics is dictated by the domestic natural gas sector development. Thus, this chapter first studies key characteristics of the gas sectors in three major gas-producing countries and, then, pipeline politics of the Central Asian gas system.

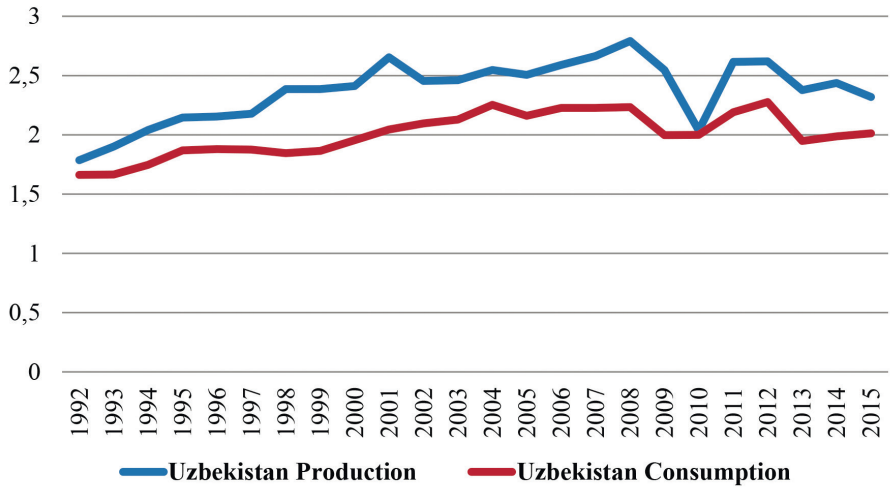
UZBEKISTAN: ENJOYING ENERGY INDEPENDENCE, BUT NOT ENERGY SECURITY

Uzbek authorities believe that Uzbekistan is among the few countries in the world that have sufficient energy supplies to meet their energy demands. Guided, in part, by the belief of self-sufficiency, Uzbekistan withdrew from the CAPS and signed a number of agreements on exporting natural gas to external markets. To keep prices affordable, the government of Uzbekistan is subsidizing its energy sector. The sustainability of the Uzbek energy sector is another area that authorities often highlight in their speeches. The evidence, however, shows that Uzbekistan neither enjoys energy security, nor is capable of continuing to subsidize its energy sector without negatively affecting its economy.

Uzbekistan is one of the countries in the world that enjoy abundance of fossil fuels and considerable renewable energy potential sufficient enough to fully meet domestic needs and supply energy resources to external markets. The country is not only resource rich, but also possesses considerable processing capacity to supply refined gas products to its domestic consumers and external customers. There are, however, a number of challenges preventing Uzbekistan from achieving the highest level of energy security and energy–led economic development: (a) the country is a major producer, but also the largest consumer of energy in the region; (b) energy production, transportation and distribution as well as consumption facilities are outdated and highly inefficient; (c) intra–Central Asian energy trade is no longer a priority energy policy and Uzbekistan aims to increase energy export to external customers; and, (d) the government of Uzbekistan is prioritizing establishing/strengthening independent energy system, which affected the resource-sharing mechanism that ensured stability and reliability of energy supplies for decades.

100 British Petroleum Company, *BP Statistical Review of World Energy* June 2017.

Figure 1. Primary Energy Production and Consumption (quadrillion BTU) of Uzbekistan.



Source: US EIA, *International Energy Statistics—Uzbekistan* (Washington, DC: US EIA, n.d), accessed January 7, 2018, https://www.eia.gov/beta/international/data/browser/#/?c=0000000000000000000000a000000000000000000001g008&ct=0&vs=INTL.44-2-UZB-QBTU.A&ord=CR&vo=0&v=H&start=1980&end=2014&s=INTL.44-2-UZB-QBTU.A.

Uzbekistan is extensively dependent on hydrocarbons–97 percent of the total primary energy balance and particularly on natural gas. Alternative energy sources such as hydro, coal and renewables represent only 3 percent. Natural gas reserves of the country are estimated at the amount of 1.1 trillion m^3 Oil reserves of Uzbekistan account for approximately 0.6 billion barrels. It also possesses around 1900 million tonnes of coal.[101] Uzbekistan may not be the richest country in the region, but without doubt, it is and has always been one of the major producers of oil and gas as well as thermal power in Central Asia. The current energy policy of the country is based on the perception that Uzbekistan is fully self-sufficient in energy supplies and is prioritizing strengthening its energy independence. Islam Karimov, the first President of the Republic of Uzbekistan, talking about the importance of energy sector development highlighted that: "the Republic will be fully independent when it gains the energetic [energy] independence".[102] As the first stage of its energy strategy the government of Uzbekistan aimed at achieving: (a) energy independence; (b) access to the energy supplies by the entire population; and, (c) low energy prices.[103] Uzbekistan has, to some extent, achieved these goals, as it has established a countrywide gas pipeline and electricity transmission grids, enjoys considerable oil and gas as well as electric power production capacity, and keeps the energy prices low enough to make energy affordable to the population through governmental subsidies. Guided, in part, by the belief of self-sufficiency, Uzbekistan has been altering the resource-sharing mechanism that ensured stability of energy supplies within the region and energy trading arrangements with its Central Asian neighbours. The new leadership in Uzbekistan, however, has changed country's overall policy in regards to Central Asian energy cooperation. Because, at this stage cooperative dynamics are taking place largely in the electric power sector, Uzbekistan's new energy priorities

101 British Petroleum Company, BP Statistical Review of World Energy June 2017 (London: British Petroleum Co., 2017), accessed January 10, 2018, https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review-2017/bp-statistical-review-of-world-energy-2017-full-report.pdf.

102 Uzbekenergo, "Energetikaning Joriy Holati va Rivojlanish Istiqbollari (About the Current State and Prospects of Power Development)," 2015, accessed January 10, 2016, http://www.uzbekenergo.uz/uz/activities/energy/

103 Temur Salikhov, "Stages and Results of Energy Strategy Realization in Uzbekistan," *Journal of Economic Review*, 2004, 48.

will be discussed in chapter IV.
According to the Global Legal Insights "Along with Kazakhstan and Turkmenistan, Uzbekistan is one of the few countries in Eurasia that is totally energy independent, self-sustaining and rich enough to subsidise domestic consumption and export energy resources." The analysis of the gas sector development in Uzbekistan, however, does not entirely support the statement. There are signs that decreasing intra–Central Asian energy trade will continue affecting sufficiency and sustainability of energy supplies in Uzbekistan (to meet energy needs of its population and the economy in the short- to medium-term perspectives) unless the government succeeds to accelerate its renewable energy sources' development and solve the problem of energy inefficiency. Hypothetically, the total primary energy production has always matched the consumption level in Uzbekistan, thus providing physical capacity to ensure self-sufficiency of energy supplies. Any attempt to significantly increase energy export, however, without boosting domestic production, large-scale introduction of the energy efficiency technologies and reforming energy pricing mechanisms will have a negative effect on the availability of sufficiency and sustainability of energy supplies for internal consumption.

Gas sector development of Uzbekistan: limited capacity to sustain self–sufficiency

Uzbekistan is one of the major fossil fuels producers in Central Asia. Uzbekneftegaz, a state-owned oil and gas company, estimates 60 percent of Uzbekistan's territory has a potential for oil and gas extraction. Two hundred and eleven hydrocarbon fields had been discovered in the country: 108 gas and gas condensate, 103 oil and gas, oil condensate and oil. Over 50 percent of them are being exploited, while 35 percent are under development. Currently, oil and gas production accounts for 86 million tonnes of oil equivalent, which increased by 60 percent comparing to 1991. Uzbekistan has the capacity to not only extract, but also refine most of the gas produced.[104]

In 2013, Uzbekistan celebrated the 60th anniversary of its gas industry. The largest gas field in the country, Gazli (Bukhara region), has the capacity to provide 500 billion m^3 of gas. Most of the gas production (around 45–50 billion m^3 per year out of annual 60–70 billion m^3) comes from the Bukhara–Khiva region from such fields as Gazli, Shurtan, Kutak, Alan, Zevardy, Umid, South Kemachi, Kruk and Urtabulak.[105] Gas to the Bukhara, Samarkand and Tashkent regions through the Dzharkak–Tashkent gas pipeline is supplied from this field. Gas from Gazli is transported to Ural through a pipeline that is 2000 km long.[106] This gas field also fills the Uzbek section of the Central Asian Gas Pipeline.

Total primary energy production matches the consumption level in Uzbekistan. Natural gas constitutes the major part of primary energy production. With the capacity of over 60 billion m^3 per year, it is one of the major producers of gas in the region. However, Uzbekistan consumes most of its produced gas. Gas consumption represented approximately 88 percent of the primary energy consumption level. Hydroelectricity accounts for the remaining 5 percent of the share.[107] Installed capacity of all electric power plants in Uzbekistan exceeds 12.3 GW, with TPPs contributing more than 11 GW and HPP around 1.3 GW, which equals 50 percent of all generating capacities of the interconnected CAPS.[108] The largest share of thermal electricity

104 Uzbekneftegaz, *Osnovnie Pokazateli (Key Indicators)* (Tashkent: Ung.uz, 2014), accessed June 1, 2016, http://www.ung.uz/ru/business/indicators.
105 Simon Pirani, "Central Asian and Caspian Gas Production," 35.
106 Uzbekneftegaz, *Perviy Gaz Uzbekistana (Uzbekistan's First Gas)* (Tashkent: Uzbekneftegaz, 2013), accessed June 1, 2016, http://www.ung.uz/press_center/smi/pervyj_gaz_uzbekistana/.
107 US EIA, *Uzbekistan—Overview/Data* (Washington, DC: US EIA, n.d), accessed January 7, 2018, http://www.eia.gov/beta/international/country.cfm?iso=UZB.
108 Government of the Republic of Uzbekistan, *Energy Resources of Uzbekistan* (Tashkent: Governmental Portal of the Republic of Uzbekistan, n.d), accessed July 1, 2014, http://www.gov.uz/en/helpinfo/energy/10004.

production comes to the gas-fired TPPs.

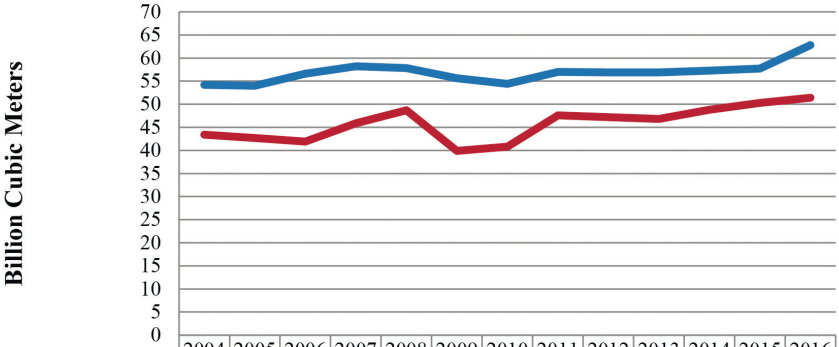
Established in 1992, Uzbekneftegaz is responsible for maximizing the development of Uzbekistan's energy potential and increasing the level of production to fully meet domestic needs and keep up with external demand, introducing new technologies to improve processing capacities as well as creating favourable conditions to attract foreign direct investments in the gas sector. To increase and diversify gas exports, the Uzbek government plans to increase gas production by attracting foreign investors for the exploration and development of hard-to-recover fields and committing additional volumes for the Central Asia-China Gas Pipeline. In an effort to increase gas exports, the government also plans to use more coal and alternative energy for TPP and domestic consumption.[109]

Natural Gas Production Capacity

The gas production in Uzbekistan dates back to 1950s. The first Uzbek gas was extracted from the Setalan-tepe field in the Kyzylkum desert in 1953. Most of the gas production comes to the Bukhara–Khiva region, including the largest gas field in the country – Gazli, which accounts for 500 billion m^3 of proven gas reserves. After putting in operation the Gazli field in 1962 two major transboundary gas pipelines (Bukhara–Ural and Central Asia Center gas pipelines) were built to move Uzbek gas to Russia.[110]

While Uzbekistan is the major producer of gas, it is also the largest consumer of it, which limits its gas export capacity. Out of 62.8 billion m^3 of gas produced in the country, 51.4 billion m^3 was consumed domestically in 2016.[111] Natural gas is the main source for the domestic energy mix in Uzbekistan. Excessive reliance on gas for electricity generation, heating and fuel supply, inefficient gas production, distribution and consumption facilities and a large population (over 30 million) equalling nearly half the population of the Central Asian region explain the high rate of gas consumption in the country.

Figure 2. Gas Production and Consumption in Uzbekistan (2004 - 2014).



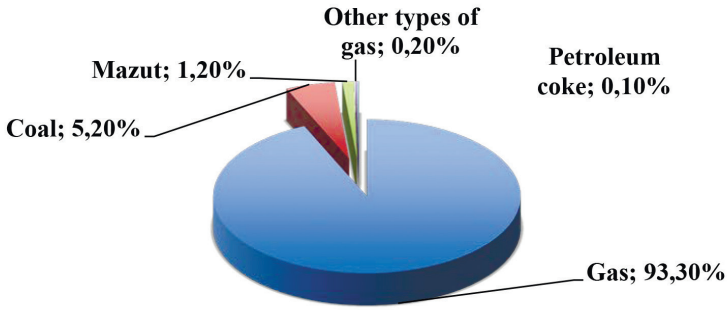
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Production	54,2	54	56,6	58,2	57,8	55,6	54,4	57	56,9	56,9	57,3	57,7	62,8
Consumption	43,4	42,7	41,9	45,9	48,7	39,9	40,8	47,6	47,2	46,8	48,8	50,3	51,4

Source: BP Statistical Review of World Energy, June 2017.

109 "Uzbekistan: Energy 2017," 5th Edition Global Legal Insights, accessed May 10, 2015, https://www.globallegalinsights.com/practice-areas/energy/global-legal-insights---energy-5th-ed./uzbekistan#chaptercontent2.
110 Uzbekneftegaz, "Perviy gaz Uzbekistana (Uzbekistan's first gas)," http://www.ung.uz/press_center/smi/pervyj_gaz_uzbekistana.
111 BP Statistical Review of World Energy June 2017, 29.

So, gas accounts for approximately 88 percent of the primary energy consumption level; with oil products and coal representing 5 percent and 2 percent, respectively.[112] As was mentioned above, it is also the main fuel for electric power production in the country.

Figure 3. Thermal Power Production by Energy Sources (2014)



Source: Uzbekenergo, Technical-economic indicators," 2014, accessed March 30, 2017, http://www.uzbekenergo.uz/uz/activities/technical-and-economic-indicators/.

Massive Gas Processing Facilities

Uzbekistan does not only possess considerable production, but also has the largest gas processing capacity in Central Asia totaling over 50 billion m^3 of gas per year. The gas refinery complex of Uzbekistan consists of Mubarek and Shurtan complexes. Mubarek has the annual gas processing capacity of 30 billion m^3 and Shurtan around 20 billion m^3.[113]

Mubarek gas processing plant, built in 1972 with the capacity of 30 billion m^3 of gas processing capacity, is one of the biggest in the world. Gas products from the Mubarek plant are supplied to both domestic and external markets. Shurtan gas processing plant was built in 1980 and possesses 20 billion m^3 processing-capacity.[114] Sixty percent of polyethylene produced in Shurtan plant is exported to the European (Poland, Hungary, Lithuania, Latvia, Turkey), Asian (Iran, Pakistan, China), Commonwealth of Independence States (Ukraine, Russia, Azerbaijan, Kazakhstan), and other countries.[115]

Gas processing plants are backed by several gas storage facilities designed to meet gas demand peaks in case of emergency. Kodzhaabad, the largest storage in Uzbekistan, is operational since 1999 with the total storage capacity of up to 1 billion m^3 of gas. Facility is located in the far Eastern region of Andijan and is designed to supply gas within the Fergana valley. Smaller size gas storage in Fergana valley is located in Kokand area.[116] These storage facilities bare strategic importance. Fergana valley is the region with the highest population density and limited gas

112 US Energy Information Administration, "Uzbekistan—overview/data," n.d., accessed January 7, 2018, http://www.eia.gov/beta/international/country.cfm?iso=UZB.
113 Uzinfoinvest, "Oil and Gas Sector," (n.d), accessed May 10, 2015, http://www.uzinfoinvest.uz/eng/investment_opportunities/by_industry/oil_and_gas_sector/.
114 Uzinfoinvest, "Oil and gas sector," n.d.
115 Uzbekneftegaz, "Osnovnie Pokazateli (Key indicators)", March 17, 2015, http://www.ung.uz/ru/business/indicators.
116 Artur Kochnakyan, Sunil Kumar Khosla, Iskander Buranov, Kathrin Hofer, Denzel Hankinson and, Joshua Finn, "Uzbekistan Energy/Power Sector Issues Note," *International Bank for Reconstruction and Development / The World Bank,* 2013, 8.

production capability. Thus, it is extremely important to have availability of extra gas to meet peak demand in this area. There is also a small size gas storage facility located in Bukhara, which is also built with the purpose of regulating seasonal fluctuations of gas demand.

Shurtan gas chemical complex, which was put into operation in 2001 produces 125 thousand tons of polyethylene, 110 thousand tons of liquefied gas and 100 thousand tons of light condensate. Polyethylene from the complex is being exported to Commonwealth of Independent States, including neighbouring Central Asian countries, Europe, China, Iran and many other countries. Another gas chemical complex is Ustyurt, which processes annually up to 4.5 billion m^3 of gas and 115 thousand tons of condensate. Ustyurt gas chemical complex was commissioned in 2012 and cost investors US$ 4 billion. Processed gas products are currently delivered from this facility to domestic market as well as Turkey and East Asia.[117]

In the middle of 2000s, Uzbekistan turned into oil products importing country. Not surprisingly, such dependence is seen as a threat to energy security interests of the country. To reduce its dependence on imported light oil products, Uzbek authorities are promoting projects to increase gas processing capacity so that to produce even more added–value products. In 2013, for instance, Uzbekneftegaz, "KOGAZ" and Honam Petrochemical put into operation petrochemical joint venture to process 4.5 billion m^3 of gas from the Surgil fields to produce and sell methane, ethane, condensate for petrochemical production, polyethylene. Uzbekenergo has also completed the construction of the external power supply Ustyurt gas chemical complex, worth about US$ 45 million. The capacity of the natural gas chemical complex will allow 4 billion m^3 of natural gas to be processed annually, along with the production of 400,000 tonnes of polyethylene and 100,000 tonnes of polypropylene. The total cost of the project is US$ 4.2 billion. [118]

Partnership with External Actors for the Development of Gas Sector

Uzbek authorities are trying to engage external actors in the development of the gas sector of Uzbekistan. The Russian oil company Lukoil, for instance, has commenced the implementation of the active phase of the Kandym Early Gas Project for the construction of a gas processing plant and the arrangement of the Kandym group of deposits in the Bukhara region worth US$ 2.66 billion. The gas processing plant will be built by 2019 with a projected capacity of 8.1 billion m^3 of gas per year. It is planned that, in the initial stage of the fields' operation, 2.2 billion m^3 of gas will be produced annually and transported to the Mubarek gas processing plant. Moreover, Lukoil has started testing the operation of two preliminary gas-processing terminals in the area of North Shady, and deposits in Kuvachi-Alat in the Bukhara region of Uzbekistan, as part of the "Early Kandym gas" project. The total capacity of the units is 2.2 billion m^3 of gas per year. The launch of the new facilities will allow Lukoil to significantly increase the volume of gas produced in Uzbekistan. Lukoil has also reported that it is in the process of negotiations with South Korean agencies to raise US$ 2 billion to finance these projects in Uzbekistan. [119]

Unfortunately, not everything is going as smoothly as expected. Uzbekistan has also been affected by falling oil prices. And, foreign energy companies are postponing or withdrawing their share from some of the energy projects:[120]

a) Sasol, Petronas and Uzbekneftegaz signed an agreement to establish a joint venture for developing a gas-to-liquid project on the basis of the Shurtan Gas chemical facility, which was expected to convert 3.5 billion m^3 of natural gas and condensates into about 1,743,000

117 "Unlocking Region's Enormous Potential in Today's Economic Realities," 4th International Annual Conference, Post–Conference Report 2016, November 2017, accessed March 30, 2017, http://www.globuc.com/wp-content/uploads/2017/02/Downstream-Central-Asia-2016-Post-Conference-Report-ENG.pdf.
118 "Uzbekistan: Energy 2017," 5th Edition Global Legal Insights, https://www.globallegalinsights.com/practice-areas/energy/global-legal-insights---energy-5th-ed./uzbekistan#chaptercontent2.
119 "Uzbekistan: Energy 2017," 5th Edition Global Legal Insights.
120 "Uzbekistan: Energy 2017," 5th Edition Global Legal Insights.

tons per year of hydrocarbon products. The project costs US$ 5 billion and was expected to start operating already in 2017. There might be delays in commencing the project, however, because as consequence of oil price decline, Sasol is considering leaving the venture.
b) Kossor Operating Company, a wholly owned subsidiary of PetroVietnam Exploration and Production in Uzbekistan, has suspended its exploration work at the Kossor investment block in the country's Ustyurt region. It was announced that the work had been suspended due to adverse oil and gas market conditions.

Energy Insecurity of Uzbekistan

Uzbekistan has always enjoyed extensive energy production and processing capacity. Within the energy sector development initiatives for 2015–2019 authorities are planning to invest 18.6 billion US$ in 54 projects in the oil and gas industry for the construction of region's largest GTL (gas-to-liquids)–plant on the basis of Shurtan Gas Chemical Complex, modernization of Fergana and Bukhara refineries as well as Ustyurt and Mubarek gas complexes. [121] One of the primary goals of the initiative, however, is to address the problem of energy insecurity in the country.

No major gas production sites have been exploited in the last decade, which could boost the production level. Having extensively relied on natural gas consumption, Uzbek authorities are trying to boost gas production. Gas production increase in the country, however, is not promising. Gas production in 2017 in the country has only increased by 0.5 percent compared to previous year. Meanwhile, oil production decreased by 6.3 percent in 2017. Downwards trends show energy security challenges the country has been facing over the past several years. Statistics indicate that in between 2010-2016, gasoline production decreased by 26.2 percent, diesel fuel by 8.3 percent, while imports of hydrocarbons increased 1.3 times.[122]

Over 60 percent of all oil and gas deposits are located in the Bukhara–Khiva region. Gazli gas field, which is the largest gas deposit in the country and two new pipeline had been constructed to link a few newly discovered deposits to the central gas transporting infrastructure: Gazli–Kagan and Gazli–Nukus.

Most of the gas produced in Uzbekistan is consumed domestically. Uzbekneftegaz, a state owned gas company, supplied 51.4 billion m^3 of gas out of produced 62.8 billion m^3 to domestic consumers in 2016.[123] The population of around 30 million people (almost equal to other Central Asian countries' population combined) is a factor that can explain the higher rate of energy consumption compared to other Central Asian states. Most importantly, however, highly inefficient energy production, transportation and consumption facilities account for 60 percent of primary energy loss and affect the consumption level.[124] Due to its considerable gas production capacity Uzbekistan avoids severe and prolonged gas crises. Uzbekistan's electric power generation capacities saved it from experiencing serious electricity supply shortage even when it left the CAPS. However, it is not an issue of survival, but rather the question of sufficient gas and electricity supplies to meet economic and population needs for the foreseeable future that constitutes the core of energy security of the country. Electricity blackouts and gas supply shortages, especially for the population needs, are indicators of energy security challenges that Uzbekistan has to deal with.

121 "Unlocking Region's Enormous Potential in Today's Economic Realities," 4th International Annual Conference, Post–Conference Report 2016.
122 Kamila Aliyeva, "Gas Production Up, Oil Production Down in Uzbekistan," *Azerinews,* January 12, 2018, accessed January 15, 2018, https://www.azernews.az/region/125428.html.
123 BP Statistical Review of World Energy June 2017, 29.
124 World Bank, "Uzbekistan: The Economics of Efficiency. Uzbekistan Pushes to Reduce Energy Consumption in Industry," (Washington, DC: World Bank), April 30, 2013, accessed May 1, 2016, http://www.worldbank.org/en/results/2013/04/30/uzbekistan-the-economics-of-efficiency.

Temur Salikhov from the Institute of Power Engineering and Automation in Tashkent argued that Uzbekistan achieved self-sufficiency in fuel in 1995 and became fully self-sufficient in energy resources in 1996–1997.[125] However, despite that claim, energy security challenges that Uzbekistan is currently facing prove the fact that the operation of its energy system in isolation mode has its cost. As a first stage of energy strategy, Uzbekistan aimed to achieve: a) energy independence; b) natural gas supplies accessible to the entire population; and c) low energy prices.[126] Uzbekistan has perhaps achieved these goals, as it no longer imports energy, there is a countrywide gas pipeline and electricity transmission lines and energy prices are relatively low. Uzbek authorities, however, failed to sustain sufficient energy supplies and the subsidized energy market cost the budget billions of dollars.

Attracting Foreign Investments to Address Energy Security Challenges

Majority of investments is currently being allocated to the development of the energy sector. These are the major directions of the foreign investment flows break down by sectors: a) oil and gas sectors–36 percent; energy sector–13.9 percent; transport infrastructure–9 percent; telecommunication–8.1 percent; financial–5.9 percent; road infrastructure–5.3 percent; agricultural and water management–4.5 percent; fresh water supplies–4 percent; light industry–3.7 percent; construction sector–3 percent; etc. Of all foreign direct investments over 27 percent is being allocated to the hydrocarbons sector development, while 11 percent to the overall energy sector development.[127] Uzbek authorities have allocated over US$ 600 million for energy projects implementation.[128] In 2016, the investment amount into 164 large production objects accounted for US$ 5.2 billion. The largest investment facilities were Talimarjon power station with the capacity of 450 MW and Angren power station with 130–150 MW.[129] There are, of course, many future projects that require additional investments. The government, for instance, plans to significantly increase the production of oil and gas condensate to keep the country's economy independent of oil imports that normally come from Kazakhstan. There are plans to explore and extract hydrocarbon deposits in the Uzbek part of the Aral Sea. The preliminary cost of this project for 2017–2031 amounts to US$ 300 million.[130]

Attracting foreign investments is always the most important part of the agenda. It is interesting though that authorities are looking for ways to attract investment in an environment of high corruption, unreliable currency exchange and various informal barriers. Perhaps the government should think about addressing fundamental challenges so that foreign investments start flowing into the economy of Uzbekistan by themselves.

Meeting domestic demands and reaching lucrative new export markets are often highlighted as top priority for the government. This is something every state would want to prioritize. Having set quite ambitious goals, however, government fails to achieve many of them. For Uzbekistan, it is important to achieve an optimal balance between exporting energy resources and meeting domestic needs. One of the biggest challenges for Uzbek authorities to ensure sufficiency of processed gas supplies is related to extremely low efficiency of gas production and development

125 Temur Salikhov, "Stages and Results of Energy Strategy Realization in Uzbekistan," *Journal of Economic Review*, October 2004, 49.
126 Temur Salikhov, "Stages and Results of Energy Strategy Realization in Uzbekistan," 48.
127 Ministry of Foreign Trade of the Republic of Uzbekistan, "Statistics on Investment Activity," n.d., accessed December 15, 2015, http://www.mfer.uz/uz/investments/statistics/.
128 "Uzbekistan International Oil and Gas Exhibition, *ITE Oil&Gas,* http://www.oilgas-events.com/OGU-Exhibition.
129 Ministry of Economy of the Republic of Uzbekistan, "Results of the Socio–economic development of Uzbekistan for 2016," *Ministry of Economy website,* February, 2017, accessed July 15, 2015, https://mineconomy.uz/uz/node/1477.
130 "Uzbekistan: Energy 2017," 5th Edition Global Legal Insights.

capacities. Thus, in addition to introducing new production and processing capacities authorities need to address energy inefficiency problem.

Inefficient Gas Sector

Highly inefficient energy processing and delivery facilities, which account for 60 percent of primary energy loss, are the biggest challenge for Uzbekistan along the way toward establishing a fully self-sufficient energy system and increasing the volume of export. Losses caused by outdated and inefficient gas production and transportation infrastructures cost Uzbekistan approximately 4.5 percent of its GDP every year. The largest potential for gas savings in the country accounts for industry and agricultural sectors. US$ 170 million in energy efficiency over the next 10 years may reduce Uzbekistan's industrial electricity (mostly produced in gas-fired TPPs) consumption by 15 percent.[131] Gas flaring is another major concern for Uzbekistan. It is rated among top 20 gas flaring countries in the world.[132] According to the head of sales department of Buxorogaz, a subsidiary of the national holding Uzbekneftegaz, Chinese companies offer solutions to the problem of gas flaring, but instead of simply providing necessary technologies—what Uzbek representatives want—they insist on running the whole process themselves.[133] Without reaching consensus, gas flaring remains unresolved problem in the energy sector of the country.

Securing Affordable Gas Prices and Subsidized Gas Sector

A major component of Uzbekistan's energy security is affordability of gas supplies for domestic consumers. To keep prices lower authorities are subsidizing gas sector of the country. Due to its share in the overall energy consumption, gas sector has the greatest effect on the Uzbek economy. Uzbek household consumers paid US$ 50 per 1,000 m^3 of gas in 2013.[134] The gas export price has considerably decreased, but the overall gap in the domestic-export gas price ratio remains significant. For the comparison, Uzbekistan exported gas for the last several years at around the price of US$ 300 per 1,000 m^3. The government used to subsidize almost US$ 10 billion annually in the country's gas sector alone each year.[135] Currently the subsidization rate accounts around US$ 3.5 billion.[136] Following the oil price drop, the price for exported gas has also decreased starting from 2015. However, the gas sector remains highly subsidized in Uzbekistan. Of course, the lost benefits do not necessarily account for subsidization. Gas production cost is surely below the exported price. Nevertheless, inefficient gas sector of Uzbekistan is still very capital intensive and does not bring much profit to the government.

Since private gas companies refrain from engaging in the distribution and sales of gas in the domestic market, which is highly subsidized and does not correspond to market mechanisms, the state-owned energy provider Uzbekenergo is responsible for covering the cost. Uzbekistan, however, can hardly afford to continue subsidizing its gas sector and keeping prices low without negatively affecting the economy.

131 World Bank Group, "Uzbekistan: the Economics of Efficiency-Uzbekistan Pushes to Reduce Energy Consumption in Industry."
132 "Uzbekistan: Energy 2017," 5th Edition Global Legal Insights.
133 Head of Sales Department of "Buxorogaz," Personal Interview, Bukhara, Uzbekistan, June 23, 2013.
134 Head of Sales Department of "Buxorogaz," Personal Interview, Bukhara, Uzbekistan, June 23, 2013.
135 International Energy Agency, *Fossil Fuel Consumption Subsidy Rates.*
136 IEA, "Fossil Fuels Consumption Subsidies by Country, 2016," accessed December 15, 2017, https://www.iea.org/newsroom/news/2017/december/commentary-fossil-fuel-consumption-subsidies-are-down-but-not-out.html

Table 2. Fossil Fuels Consumption Subsidy Uzbekistan in Million US$, 2016.

	Uzbekistan
Oil	175
Electricity	855
Gas	3,623

Source: IEA, "Fossil Fuel Consumption Subsidy by Country 2016."To keep prices affordable, the government of Uzbekistan is subsidizing its energy sector.

Subsidized domestic energy market is negatively affecting economic development and is one of the major challenges towards attracting more private actors in gas sales and distribution in Uzbekistan. Excessive reliance on fossil fuels and inefficient energy facilities affect sustainability of the energy sector of Uzbekistan. The evidence, however, shows that Uzbekistan is not capable of further pursuing the policy of subsidizing its energy sector without negatively affecting its economy.

Due to financial difficulties, however, Uzbekistan cannot afford to continue subsidizing the gas sector and keeping prices low without negatively affecting the economy. Since private gas companies refrain from engaging in the distribution and sale of gas in the domestic market, which is the highly subsidized Uzbek energy sectors, the state-owned energy provider Uzbekenergo, fully controlled by the government, is responsible for ensuring the affordability of gas.

Despite the fact that gas supplies for domestic consumers are highly subsidized, the affordability of gas is still a serious issue. New leadership in Uzbekistan has started acknowledging the problem of corruption as a challenge to effectively manage energy sector. The problem of gas and thermal power supplies has recently been observed even in major cities, including the hometown of the Presidents of Uzbekistan–Samarkand, especially in the winter months.[137] On the one hand, gas supply disruptions are taking place as a result of rapidly outdating energy infrastructure. On the other hand, disruptions are being initiated for local consumers' inability to pay for gas and thermal power.

Heads of local energy companies explained the causes of the lack of power and gas supplies. Even in major central cities population experience energy insecurity. The reason for limited power and gas supplies is the ever–growing household consumers' debts. In 2016, consumers, in Samarkand region only, owe authorities 601 billion Sum (over US$ 160 million) for natural gas and 660 billion Sum (US$ 176 million) for electricity. Authorities acknowledge that there had been cases of corruption and theft. Over a hundred of employees of the related agencies were prosecuted. It was highlighted that consumers themselves have to take control over the payments.[138] These are a few examples of energy insecurity and lack of financial capability of the population to pay for sufficient energy supplies.

Uzbekistan Energy Hub Within the Central Asian Gas Supply Network

Energy sector of Uzbekistan was initially designed to operate within a unified energy system of Central Asia. Strategically important geographical location turned Uzbekistan into a hub of energy supplies both within the region and to external markets. The country is completely land-

137 International Crisis Group, "Uzbekistan: The Hundred Days," *Europe and Central Asia Report 242,* March 2017, https://d2071andvip0wj.cloudfront.net/242-uzbekistan-the-hundred-days.pdf.

138 "Heads of Companies Explained The Reason for Unsustainable Power and Gas Supplies in Samarkand," Anhor.uz, accessed December 15, 2016, http://anhor.uz/society/rukovoditeli-obyasnili-prichinu-plohogo-elektro-i-gazosnabzheniya-samarkanda.

locked, which makes gas pipeline infrastructure the most cost efficient and widely used means of transportation. Transboundary gas pipeline networks of Uzbekistan constructed during the Soviet period served two major purposes: (a) export of gas to Russia and through Russia to the European market via the Central Asia Center and Bukhara–Ural gas pipelines; and, (b) supply of gas within the Central Asian region through Bukhara–Tashkent–Bishkek–Almaty pipeline and smaller pipelines connecting Uzbekistan with Southern Kyrgyzstan and Tajikistan.

As a supplier of gas to Russia and other Soviet republics, Uzbekistan exported 10.8 billion m^3 of gas within the Russian pipeline networks in 1990, but due to lack of demand reduced the supply volume to less than 1 billion m^3 by the end of 1990s.[139] Supplies of Uzbek gas resumed in the mid–2000s and Uzbekistan supplied annually 15.4 billion m^3 of gas to Russia in 2009. As a result of economic recession, annexation of Crimea and Russia–Ukraine crisis as well as economic sanctions against Russia, it needed no more the Central Asian gas, including supplies from Uzbekistan, and the export volume dropped down to just 1 billion m^3 in 2015.[140] While Russia has always been primarily interested in importing Turkmen gas and Uzbek gas played a complementary role to the gas supplies from the region, Uzbek gas has been an extremely important source of energy supplies within the Central Asian region. In 2016, Russian and Uzbek authorities first agreed to increase gas supply volume a bit and the trade accounted for over 3 billion m^3. News agencies report, however, that Russian Gazprom purchased over 6 billion m^3 of gas from Uzbekistan in 2016. According to the recently signed agreement between the Uzbekistan and Russia 4 billion m^3 will be exported to Russia within the next five years starting from 2017.[141]

Uzbekistan had been annually supplying approximately 10–15 billion m^3 of gas to Russia[142] and 4.5 billion m^3 within the Central Asian region.[143] The leaders of Uzbekistan and China also agreed to reach the total volume of gas supply of 25 billion m^3 by 2016[144] and maintain the annual export volume of 10 billion m^3 through the Line–C of the CAGP. However, outdated and inefficient natural gas transportation systems, growing internal energy demand, and the fact that no major natural gas reserves have recently been developed are indications of Uzbekistan's physical incapability to increase its gas export capacity.

After disintegration of the Soviet Union, Russia inherited gas transport infrastructure and enjoyed a monopsony of gas supplies from the Central Asian region. The newly constructed Chinese gas pipeline networks, however, challenged the Russian dominance in 2009. Excessive domestic consumption and limited production capacity imply that Uzbekistan will be a relatively insignificant supplier of gas to China. At the same time, Uzbekistan enjoys a significant transit power, since 100 percent of Turkmen gas (major contributor of gas supplies to China) passes through the territory of Uzbekistan. Four lines of the Central Asia China gas pipeline with

139 Vladimir Paramonov and Oleg Stolpovsky, and Alexey Strokov, "Russia and Uzbekistan: Oil and Gas Cooperation," *International Affairs,* July 20, 2010, http://en.interaffairs.ru/events/249-russia-and-uzbekistan-oil-and-gas-cooperation.html.

140 Sevinj Mamadova, "Changing Market Dynamics in Central Asia: Declining Russian Interests and Emerging Chinese Presence – Analysis," *Caspian Center for Energy and Environment,* March 6, 2015, accessed March 25, 2017, http://www.eurasiareview.com/06032015-changing-market-dynamics-in-central-asia-declining-russian-interests-and-emerging-chinese-presence-analysis/

141 "Gazprom Signs Five-Year Contract on Uzbekistan's Gas Purchase," *TASS Russian News Agency,* April 5, 2017, accessed May 15, 2017, http://tass.com/economy/939626.

142 Farkhad Sharip, "Uzbekistan's Quest for Aral Sea Oil May Weaken Kazakhstan's Position in the Caspian," *Eurasia Daily Monitor* 9, no. 23 (2012), http://www.jamestown.org/single/?no_cache=1&tx_ttnews%5Btt_news%5D=38962.

143 US EIA, *Kazakhstan—Analysis* (Washington, DC: US EIA, n.d), accessed March 20, 2016, http://www.eia.gov/countries/cab.cfm?fips=KZ.

144 "Uzbekistan i Kitai: Vzaimovigodnoe Sotrudnichestvo (Uzbekistan and China: Mutually Beneficial Cooperation)," June 6, 2012, accessed May 5, 2016, http://russian.china.org.cn/exclusive/txt/2012-06/06/content_25591078.htm.

the total capacity of 85 billion m^3 run through the territory of Uzbekistan.[145] There are factors indicating that China will make sure that this pipeline network operates in its full capacity, which implies that the status of Uzbekistan as a gas supplier and transit country will remain important.

Central Asia–China gas supply relations are different from that of the relationships with Russia both in economic and political terms. First, the Russian government and energy companies did not put significant upfront invests in the construction of the pipeline networks since Russia inherited gas transport infrastructure. Second, Russia can physically meet its own gas demands and needs Central Asian gas to fulfill its commitments to supply gas to Europe. China, on the other hand, almost entirely financed newly established pipeline infrastructure and has to return its investments. Moreover, China is importing Central Asian gas to meet its own rapidly increasing energy needs. Central Asian gas is supposed to feed not only western regions of China, but also industrial centers in the East of the country through trans–Chinese West–East Gas Pipelines. These all add strategic importance to the Central Asia–China pipeline networks and China will do its best to make sure that these pipelines operate in full capacity. Even though the volume of gas trade between Uzbekistan and Russia is decreasing, the Russian government did not lose interest in the Uzbek gas and will most likely try to resume the import once the Russia–Ukraine conflict is resolved.

However, outdated and inefficient natural gas transportation systems, growing internal energy demand, and the fact that no major natural gas reserves have recently been developed are indications of Uzbekistan's physical incapability to significantly increase its gas export capacity and keep up with existing demand in all directions. Uzbekistan is expecting to increase gas supply to China, by symmetrically reducing the volume of its gas export to Russia. Competing interests of external customers for the Uzbek gas negatively affect availability of gas for intra–Central Asian trade.

Future Prospects for Uzbek Gas Export

One of the main energy policy priorities of Uzbekistan is to generate high revenues from increasing the volume of exported gas. Increasing gas production capacity is expected to come from the newly developed gas fields including Samantepa, Girsan, Ghulkuvar, Kumli, and Taylyak. Gas production in these fields is expected to reach 3.8 billion m^3 in 2015 and up to 6.8 billion m^3 by 2020.[146] For the development of these fields, Uzbek government is counting on foreign investments from such companies as Gazprom and Lukoil (Russia), China National Oil and Gas Exploration and Development Corporation (China), PetroVietnam (Vietnam), Korea National Oil Corporation (KNOC), Sasol (South Africa), etc.[147] According to the head of the Uzbekneftegaz, Shokir Fayzullayev, the company is planning to implement 54 investment projects with a total value of US$ 18.65 billion within the framework of the program for the modernization of the oil and gas industry until 2020 that has already been approved by the first President of Uzbekistan Islam Karimov.[148]

Contributions to the gas production increase will most likely come from: (a) development of

145 Chinese National Petroleum Corporation, "Flow of Natural Gas from Central Asia," n.d., accessed December 15, 2017, http://www.cnpc.com.cn/en/FlowofnaturalgasfromCentralAsia/FlowofnaturalgasfromCentralAsia2.shtml.

146 "Uzbekistan's Uzbekneftegaz Completes Development of Five Gas and Condensate Fields," *Oil and Gas Eurasia,* February 9, 2015, accessed September 10, 2016. https://www.oilandgaseurasia.com/en/news/uzbekistan%E2%80%99s-uzbekneftegaz-completes-development-five-gas-and-condensate-fields.

147 Uzbekneftegaz, "Operations of NHC "Uzbekneftegaz," 2015, accessed June 14, 2016, http://www.ung.uz/ru/about/activities.

148 "Uzbekneftegaz to Invest up to US$ 19 billion in Energy," *Gazprom International,* May 15, 2015, accessed May 10, 2017, http://www.zargaz.ru/en/news-media/articles/uzbekneftegaz-invest-19-billion-energy.

seven gas condensate fields including Samantepe, Girsan and Taylyak by the national holding Uzbekneftegaz; (b) development of the East Alat gas condensate field and Khodzhasayat and Khodzhadavlat fields jointly by Uzbekneftegaz, CNPC and Lukoil; (c) Lukoil, being an active actor in the development of gas production in Uzbekistan, is planning to reach the gas production volume of 16 billion m^3 by developing such gas fields as Kandym–Khauzak–Shady and Gissar in the medium term perspective; (d) Uzbekneftegaz in cooperation with South Korean company Kogas is planning to establish almost a US$ 2 billion joint venture to develop the Surgil gas field, which possess around 130 billion m^3 of gas and can increase the gas production capacity of up to 2.8 billion m^3 per year; (e) Gazprom is planning to develop the Dzhel gas field and has already identified 14 horizontal wells.[149]

Uzbekneftegaz is planning to boost gas production and reach the level of 66 billion m^3 of gas production by 2020. By increasing gas production and reducing the level of gas consumption in the industry sector by 7 percent the company expects to increase the total gas export capacity by 20 percent compared to 2013.[150] Gas production in Uzbekistan is also forecasted to increase after 2020. The annual production of gas in Uzbekistan, according to the Business Monitor International, will reach over 70 billion m^3 of gas per year by 2024. However, domestic consumption level is also forecasted to rise almost symmetrically by reaching around 60 billion m^3 of gas by 2024, which will limit Uzbekistan's physical capability to significantly increase the volume of export.[151]

Gas Pipeline Networks

Uzbekistan possesses a comprehensive gas transportation network to meet its countrywide gas consumption needs. Gas transportation system of Uzbekistan consists of 13,000 km of transmission and distribution pipelines and over 250 compressor stations.[152] Uztransgaz, a subsidiary of Uzbekneftegaz, has ten sub-divisions that operate parts of the system including the Bukhara Gas Fields–Tashkent, the Djarjak–Bukhara–Samarkand–Tashkent, the Mubarek–Kagan, the Shurtan–Mubarek, the Kelif–Mubarek, the Kelif–Dushanbe and other lines.[153] Gas to the Bukhara, Samarkand and Tashkent regions through the Dzharkak–Tashkent gas pipeline is supplied from the Gazli field. Gas from Gazli is also transported to Ural via transboundary Bukhara–Ural gas pipeline.[154] This gas field also fills the Uzbek section of the Central Asia–China gas pipeline.

Due to Uzbekistan's strategically important geographical location right in the middle of Central Asia and considerable energy production capacity it was decided by the Soviet leaders to establish gas transportation infrastructure in a way that turned Uzbekistan into a hub of gas supplies in the region. Serving as a hub for energy transportation within the region, Uzbekistan is a major contributor of gas supplies to the neighbouring Tajikistan and Kyrgyzstan. The largest intra–Central Asian gas transportation system is the Bukhara–Tashkent–Bishkek–Almaty gas pipeline. It was constructed in 1964 with the total capacity of 4.5 billion m^3 of gas and designed to supply Uzbek gas to the Southern regions of Kazakhstan, Northern Kyrgyzstan and Almaty city (Kazakhstan). Mubarek–Dushanbe is a smaller gas pipeline connecting Uzbek gas fields with the capital city of Tajikistan. Gas pipeline supplying Tajikistan was initially designed as

149 "Uzbekistan Oil and Gas Report," *BMI*, 2015, 19–20.
150 "Uzbekistan Oil and Gas Report," *BMI*, 2015, 8.
151 "Uzbekistan Oil and Gas Report," *BMI*, 2015, 23.
152 Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note," *International Bank for Reconstruction and Development / The World Bank,* May 15, 2015*,* 8.
153 Jakhongir Kakhkharov, "Uzbek Gas for Export: Will Political Maneuvering between China and Russia Result in Higher Export Price?" MPRA Paper no. 64128, May 5, 2015, 8, accessed March 5, 2016, https://mpra.ub.uni-muenchen.de/64128/1/MPRA_paper_64128.pdf.
154 Uzbekneftegaz, "Perviy Gaz Uzbekistana (Uzbekistan's First Gas)."

Mubarek (Uzbekistan)–Kelif (Turkmenistan)–[through Uzbek territory] Dushanbe (Tajikistan). However, in 2003 Uzbekistan built a bypass pipeline Shurtan–Shurabad and started directly supplying gas to Tajikistan.[155]

There are also several pipeline networks designed to transport significant volume of gas from and through Uzbekistan to external markets:

(a) Central Asia Centre (CAC) gas pipeline consists of 5 pipeline networks and designed to move Central Asian gas to Russia and through Russia. CAC–1, 2, 4, and 5 run through the territory of Uzbekistan, while CAC–3 passes only the territory of Kazakhstan. The first line was built in 1966 and the last was commenced in 1987. CAC gas pipeline networks are currently outdated and due to lack of investment in the maintenance of the system the initial capacity of these pipelines decreased from the initial 90 billion m^3 to 45–50 billion m^3 per year.[156]

(b) Bukhara–Ural is a 2000 km long gas pipeline has been operational since 1965 and was designed to transport Uzbek and Turkmen gas through territory of Kazakhstan to Russia. Over the years, the initial capacity of the pipeline to transport 15 billion m^3 dropped down to approximately 7.5 billion m^3.[157] Because of Russia-Ukraine gas conflict, which resulted in declining interest in Moscow to import Uzbek gas, this pipeline is being operated in reverse direction and is used to transport Russian gas to Kazakhstan.

(c) Central Asia–China gas pipeline is another major gas pipeline network that has been recently put in place. Out of four designed lines (A, B, C and D) to transport Central Asian gas to China, construction of the Line–C through which Uzbekistan is expected to export its gas was started in September 2012. Construction of the line with the capacity to transport annually 25 billion m^3 (10 billion m^3 from Uzbekistan, 10 billion m^3 from Turkmenistan and 5 billion m^3 from Kazakhstan) of gas was projected to be fully operational by the end of 2015–beginning of 2016,[158] but was postponed for an identified period. Still, while it is taking decades to build some pipeline networks, China proved that with sufficient financial and engineering capacities as well as political will putting pipeline online is not a problem.

On June 9, 2010, CNPC signed a framework agreement on purchase and sale of natural gas with Uzbekneftegaz, whereby Uzbekistan will supply 10 billion m^3 of natural gas to China annually. On September 21, 2011, CNPC and Uzbekneftegaz signed an agreement on the construction and operation of Line C of the Central Asia-China Gas Pipeline.[159] This Line of the network was put into operation already in 2015. "Uzbekneftegaz" and Chinese CNPC will begin the construction of the fourth line of the Uzbek section of the gas pipeline "Central Asia-China" at a total cost of US$ 800 million. The gas pipeline, with a capacity of 30 billion m^3 of gas, was planned to be put into operation in 2017.[160] The construction, however, is being postponed for lack of gas export capacity of major gas suppliers and disputes over the pricing policy.

155 Jakhongir Kakhkharov, "Uzbek Gas for Export: Will Political Maneuvering between China and Russia Result in Higher Export Price?" MPRA Paper no. 64128, May 5, 2015, 8.
156 International Energy Agency, "Optimizing Russian Natural Gas. Reform and Climate Policy," 2006, 31, accessed October 31, 2016, http://www.iea.org/publications/freepublications/publication/russiangas2006.pdf.
157 Michael Fredholm, "The World of Central Asian Oil and Gas. Power Politics, Market Forces, and Stealth Pipelines, *Asian Cultures and Modernity Research Report 16,* 2008, 45.
158 Chinese National Petroleum Corporation, "Flow of Natural Gas from Central Asia".
159 "CNPC in Uzbekistan," *CNPC website*, n.d., accessed December 15, 2017, http://www.cnpc.com.cn/en/Uzbekistan/country_index.shtml.
160 "Uzbekistan: Energy 2017," 5th Edition Global Legal Insights.

Shortages of Uzbekistan's Energy Security Policy

Natural gas constitutes the largest share of the primary energy production in Uzbekistan. With the production capacity of over 60 billion m^3 per year, Uzbekistan is one of the major producers of gas in the region. While natural gas prevails in the energy production mix, it consumes most of its produced gas. Inefficient gas production and distribution infrastructures, however, decrease availability of gas for both domestic needs and export. Energy subsidies cost the economy almost US$ 10 billion. Thus, the government of Uzbekistan is highly interested in generating revenues to the budget from increasing the volume of export to external customers. Besides, interests of the rent seeking elites of Uzbekistan and the competing interests of greater power over the country's energy resources imply that the export of energy resources will remain among priorities in the foreign energy policy of Uzbekistan. Taking into account the fact that no major new gas fields have been discovered in the country, any initiative to considerably increase the volume of gas exports will negatively affect gas supply security for internal consumption.

Geographical location and inherited energy infrastructure turned Uzbekistan into an extremely important actor, without which any initiative to improve Central Asian energy cooperation will most likely fail. Over the last years, however, Uzbekistan has been using its infrastructure leverage as well as geographical advantage for purposes other than to improve security of energy supplies within the region. Lack of intra–Central Asian trade, in its turn, also negatively affects sufficiency and sustainability of energy supplies in Uzbekistan.

There is a lack of transparency in the energy sector of Uzbekistan, and it is difficult to provide concrete statistics proving the extent of deficiency of energy in the country, especially in light of official statements about energy full self-sufficiency. However, numerous complaints by the population and periodic electricity blackouts and gas supply shortages in the country indicate that there are serious energy security challenges that require urgent attention by the authorities. While large-scale energy efficiency and development of renewable energy sources are necessary measures to improve availability of energy supplies and energy led economic growth, it is the intra–Central Asian trade that can contribute to the immediate sufficiency and sustainable energy supplies for Uzbekistan.

GASIFICATION INITIATIVES TO ADDRESS ENERGY INSECURITY IN KAZAKHSTAN

Gas Sector Development of Kazakhstan

Kazakhstan also possesses significant gas reserves in the amount of around 1 trillion m^3 [161] and 1.9 trillion m^3 [162] according to different sources. "Reserves–to–production ration" (R/P) for natural gas in the country is 75 years. Around 74 percent of the gas condensate reserves are located in the Karachaganak field, which is also the largest field in the country.[163] It produces an average of 40 billion m^3 of gas, out of which over 20 billion m^3 is market gas, which is supplied for domestic consumption and exported to external markets. The other half of the gas produced in Kazakhstan is pumped back into oil wells to enhance oil production. Karachaganak deposit is the largest contributor (8.5–9 billion m^3 per year) to the gas production in Kazakhstan. Over 90 percent of gas produced in Karachaganak, however, is delivered to Orenburg gas processing plant in Russia, more than half of which is returned back to Kazakhstani customers and the rest remains in Russia.[164] Kazakhstan consumes only half of the marketed gas it produces; it exports the other half due to lack of countrywide gas pipeline infrastructure and imports the same amount from neighbouring countries. According to the agreement on swap deliveries of gas between Gazprom, Uzbekneftegaz, and KazMunayGas on December 27, 2006, gas import is swapped in accordance with the export of the Karachaganak gas field in equal price and equal volume. It also has the capacity to store around 1 billion m^3 in its underground reserves.[165] While the transit volume has reduced due to decreasing export volumes from Turkmenistan and Uzbekistan, export capacity of Kazakhstan remains on the same level.

In 2015, 12 million tons of liquefied hydrocarbons and 18 billion m^3 of gas was extracted in Karachaganak. 8.6 billion m^3 of that gas, however, was pumped back into wells.[166] Twenty-seven percent of gas and condensate resources in the country fall to Atyrau district, 8 percent to Aktyubinsk, 50 percent to the west of Kazakhstan, and 10 percent to Mangistau.[167] The following are the major gas producing companies in Kazakhstan. Karachaganak Petroleum Operating company produces 42 percent of Kazakhstan's total gas. Tengizchevroil produces 34 percent and CNPC–AktobeMunayGas around 8 percent of the overall gas production in the country.[168]

Rich in fossil fuel deposits, Kazakhstan succeeded in attracting foreign investment in developing its energy potential. Increasing energy production ensured stable and reliable supplies of energy to meet its domestic, as well as external, needs. Along with developing oil, gas, and coal

161 British Petroleum Company, *BP Statistical Review of World Energy June 2017* (London: British Petroleum Co., 2017), https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review-2017/bp-statistical-review-of-world-energy-2017-full-report.pdf.
162 Eni, *World Oil and Gas Review for 2014* (Rome: Eni spa), September 2014, accessed June 15, 2015, https://www.eni.com/world-oil-gas-review-2014/sfogliabile/O-G-2014.pdf.
163 "The 11th National Report: On implementation of the Extractive Industry Transparency Initiative in the Republic of Kazakhstan for 2015," *EITI,* 2015, 40, accessed January 5, 2017, ttps://eiti.org/sites/default/files/documents/national_reports_fot_eiti_2015_eng.pdf.
164 Simon Pirani, "Central Asian and Caspian Gas Production and the Constraints on Export," *Oxford Institute for Energy Studies (*2012): 45, http://www.oxfordenergy.org/wpcms/wp-content/uploads/2012/12/NG_69.pdf.
165 Government of the Republic of Kazakhstan, *Koncepciya Razvitiya Gazovogo Sektora Respubliki Kazaxstan do 2030 Goda (Gas Sector Development Concept of the Republic of Kazakhstan until the Period of 2030)*, Online.zakon.kz, December 5, 2014, accessed December 15, 2017, http://online.zakon.kz/Document/?doc_id=31641775.
166 "Karachaganak," PSA, n.d., accessed June 16, 2017, http://www.psa.kz/proekty/?ELEMENT_ID=55.
167 Kulpash Konirova, "Kaspiy Stanet Odnim iz Klyuchevix Regionov Mirovogo Neftyanogo Rinka (Caspian Region Will Turn into Key World Oil and Gas Market)," *Kazenergy* 4, no. 59 (2013), accessed February 5, 2016, http://kazenergy.com/en/4-59-2013/11549-2013-10-30-08-47-58.html.
168 "The National Energy Report 2015," *Kazenergy, n.d.,* 45, accessed January 5, 2017, http://www.kazenergy.com/images/NationalReport15_English.pdf.

sectors, the Kazakh government has recently started to claim that it prioritizes sustainability of energy supplies through the development of renewable energy sources and increasing energy efficiency. As part of the CAES, Kazakhstan has sometimes suffered from disputes over payment, unauthorized withdrawal of energy and supply disruptions from neighbouring countries. To reduce its dependence on Uzbekistan and Kyrgyzstan in supplying its southern regions, the Kazakh government has been promoting energy projects to strengthen the national energy system.

Kazakhstan consumes only half of its produced gas and exports the other half, because it lacks extensive internal gas supply networks to transport it within the country. Gas supplies from the neighbouring Uzbekistan and Russia covered the domestic gas shortages in the country. Having possessed large amount of gas reserves and perceiving dependence on external markets as a threat, Kazakh authorities started looking for alternative options to reduce its dependence. One of the possibilities is to connect its gas-producing regions in western Kazakhstan and Kyzylorda with such gas-consuming giants as Shymkent and Almaty regions. The Beineu–Bozoy–Shymkent pipeline is designed to provide such connections. The government believes that once implemented, this project is expected to double gas consumption in Kazakhstan.[169] The first section of the pipeline—Bozoy–Shymkent was launched in September 2013. The second section was completed by the end of 2015. The main problem with this plan, however, is that if all goes according to plan, it will take another 15 years to significantly increase household gas consumption in southern Kazakhstan using its own resources. Besides, the Beineu–Bozoy–Shymkent gas pipeline, capable of supplying its gas to southern regions, is also expected to fill the Central Asia–China gas pipeline (CAGP), in which China has not only taken part, but also covered most of the construction expenses. Chinese interests in moving gas out of the region may overshadow Kazakhstan's desire to supply a sufficient amount of gas to its southern regions.

Even until now, one-third of gas consumption in Kazakhstan comes from Uzbekistan and Russia. Kazakhstan, however, perceives such dependence as a threat to its energy security. With the amount of explored gas reserves in the country, Kazakhstan can physically meet country's gas needs. Kazakh authorities have recently been counting on gas extraction in Kashagan field to boost gas production level and export capacity. According to the general director Serik Sultangali, 70–80 percent of gas from Kashagan will be supplied for domestic consumers and 30–20 percent will be heading to external markets.[170] Yet the extraction of resources has been postponed several times. Because of limited gas production, gas is heading abroad and the export capacity will be increased in the future even. This, in its turn will negatively affect the level of energy security in the country.

Transregional and Local Gas Pipeline Infrastructure

The current natural gas facilities in Kazakhstan are over 30 thousand kilometers (km) of gas distribution networks, more than 15 thousand km of main gas pipelines, 56 compressor stations with 316 gas compressor units, 3 underground gas storage tanks.

Gas transmission infrastructure of the country consists of the following pipelines:

1. "Central Asia Center" pipeline with the capacity of 60,2 billion m^3, with the length of 3962 km (operator "Intergas Central Asia" JSC);
2. "Bukhara-Ural" pipeline with the capacity of 8 billion m^3, the length of 1 576 km

169 Government of the Republic of Kazakhstan, *Koncepciya Razvitiya Gazovogo Sektora Respubliki Kazaxstan do 2030 Goda (Gas Sector Development Concept of the Republic of Kazakhstan until the period of 2030)*, Online.zakon.kz, December 5, 2014, http://online.zakon.kz/Document/?doc_id=31641775.
170 Oleg Chervinskiy, "How Astana Was Planning to Look for Kashagan on the Ground," February 20, 2017, accessed March 10, 2017, http://www.ratel.kz/outlook/kak_astana_planirovala_iskat_vtoroj_kashagan_na_sushe#comments.

(operator -"Intergas Central Asia" JSC);
3. "Orenburg – Novopskov" pipeline with carrying capacity of 14.6 billion m^3, the length of 382 km (operator "Intergas Central Asia" JSC);
4. "Kazakhstan-China" pipeline (A, B and C lines) – capacity of 55 billion m^3, length of 3 909 km (operator "Asian gas pipeline" LLP);
5. "Zhanaozen-Aktau" pipeline with carrying capacity of 2,8 billion m^3, length of 432 km (operator "KTG-Aimak" JSC);
6. "Beineu-Bozoi-Shymkent" pipeline with the capacity of 2,5 billion m^3, length of 1 454 km;
7. "Bukhara gas-bearing area – Tashkent – Bishkek – Almaty" of 5,8 billion m^3capacity, length of 1 597 km (operator "Intergas Central Asia" JSC).[171]

In 2008, President of Kazakhstan, Nursultan Nazarbaev, highlighted the necessity to build the Beineu–Shymkent gas pipeline to gasify Southern regions of the country. The 1454 km long pipeline is constructed to pass through Mangistau, Aktobe, Kyzylorda and South Kazakhstan regions. The total transportation capacity, according to the initial design during the first two stages, was supposed to reach 10 billion m^3 of gas annually (first stage 2010–2016: 6 billion m^3 and second stage 2014–2017: 10 billion m^3). The pipeline started transporting gas on December 27, 2013.[172] The 1142 km long Bozoi–Shymkent section of the pipeline was put into operation in December 2013 with the capacity to transport 2.5 billion m^3 per year. However, the extension of this network—Beineu–Bozoi–Shymkent pipeline—will be capable of transporting up to 15 billion m^3 of gas. In 2015, construction of the Beineu–Bozoi was finished.[173] Thus, currently this pipeline constitutes an important element of the gasification initiative of Kazakhstan.

Kazakh authorities have adopted a country-wide gasification initiative—General Gasification Scheme 2015–2030, according to which Beineu–Bozoy–Shymkent gas pipeline is supposed to plan an important role. A joint venture with 50 / 50 equity shares from Kazakhstan and China started building almost a US$ 4 billion worth pipeline in 2012. Similar to many other energy projects implemented with the Chinese engagement, in construction of this pipeline Kazakhstan's share was financed by loans provided by the China Development Bank. In its full capacity, Kazakh authorities are planning to transport 15 billion m^3 of gas through this pipeline out of which 5 billion m^3 is for the export to China and 10 billion m^3 to free the Southern regions from extensive dependence on the Uzbek gas supplies. The following gas sources are expected to fill the pipeline to meet domestic gas needs and export demands: Aktobe region, including Zhanazhol gas processing plant, CNPC and KMG's Urikhtau gas field, KMG's Shagyrly–Shomyshty gas field, gas fields in Atyrau and Mangystau regions, including Kashagan.[174]

Kazakh authorities are effectively using environmental concerns to exercise certain influence over foreign energy companies. For instance, all projects run by the CNPC in Kazakhstan (exploration and development, refining and petrochemicals, pipeline transportation or technical services) have to undergo an Environmental Impact Assessment. The assessment has to be made before the project implementation begins, during the construction and when it is put online so that any negative environmental impact is prevented. Kazakh authorities prohibited gas flaring and investing parties now have to introduce new technologies to enhance energy efficiency and prevent environmental impact. Foreign energy companies, including actively engaging Chinese companies, are complying with the requirement. CNPC statement regarding their work in this direction: "In response to the Kazakh government's prohibition on gas flaring, we have made

171 "Transport Infrastructure," *KazMunayGas* website, accessed January 5, 2016, http://www.kmg.kz/en/manufacturing/gas/infrastructure/.
172 "Transport Infrastructure Projects," KazMunayGas website, accessed January 5, 2016, http://www.kmg.kz/en/manufacturing/gas/projects/.
173 "The 11th National Report: On implementation of the Extractive Industry Transparency Initiative in the Republic of Kazakhstan for 2015," *EITI,* 2015, 59.
174 "The National Energy Report 2015," *Kazenergy, n.d.,* 105.

efficient use of oilfield associated gas and achieved significant economic, environmental and social benefits. Our oil and gas processing capability has been enhanced, resulting in increase of output. The recovered associated gas is used for power generation to improve energy efficiency. The remaining associated gas is re-injected to the reservoirs to minimize environmental pollution."[175] Energy sector development of Kazakhstan is turning highly dependent on external investments, especially Chinese. To recoup its investments, China might force Kazakhstan to increase the volume of gas export even at the expense of domestic consumption, particularly in the most vulnerable Southern regions of the country.

Failed Gasification Initiatives in Kazakhstan

Due to its strategic importance energy sector is regulated directly by the President's office and the President himself determines domestic and foreign energy policy of the country. Yet the of the energy sector lies with newly established Ministry of Energy, which regulation encompasses responsibilities of the former Ministry of Oil and Gas, as well as Ministry of Industry and New Technologies and Ministry of Environment and Water Resources. While the new Ministry exercises regulatory and control functions of the entire sector, operation of the energy facilities and investments are prerogative of the state–owned and private energy companies. Kazakhstan's interests in the oil and gas sectors are being promoted by the state–owned company KazMunayGas.[176]

To boost energy led socio-economic development, the government of Kazakhstan is actively promoting initiatives designed to increase the share of indigenous natural gas in the overall consumption balance. Kazakhstan enjoys abundance of natural gas reserves. This type of energy is environmentally friendlier than coal and less expensive than renewable energy sources. Yet the domestic gas production is underdeveloped and Kazakhstan lacks a countrywide gas transportation infrastructure. To address the problem of insufficient gas supplies for population and economic needs authorities adopted several gasification programs: a) Kazakhstan Gasification Program 2004–2010; b) Oil and Gas Sectors Development Program for 2010–2014; c) General Gasification Scheme for 2015–2030.[177] The government, however, measures the success of the gasification initiatives by the length of extended pipeline networks and the number of settlements connected to the major gas pipelines, assuming that this immediately leads to better standards of life and economic growth.

National Operator for gas supply and distribution, KazTransGas, together with local and central authorities has extended the countrywide gas transportation networks in the western and southern regions. The preliminary analysis has shown, however, that the contribution of the gasification initiatives to the socio-economic development has so far been limited. The South Kazakhstan region is one of the most vulnerable regions in this regard. It has the largest population (2.7 million out of total number of 17.5 million people) with huge energy deficit. Bringing gas to people is expected to solve the problem of energy supply shortages. Yet the gasification rate is still quite low. The cost of connection to some households in this region is too expensive. Besides, even those who are connected to the gas distribution system complain about low quality of gas. The region also suffers from extensive dependence on external gas supplies. Gas supply system of the South Kazakhstan region was initially designed to operate within the Central Asian energy system with all the gas supply flow to the southern part of Kazakhstan. Every time harsh winter hits the region, Uzbekistan unilaterally cuts which were projected to be almost entirely financed from the state budget, are now frozen. And, unless new policies to engage non-

175 "CNPC Kazakhstan," *CNPC website,* n.d., accessed December 15, 2017, http://www.cnpc.com.cn/en/Kazakhstan/country_index.shtml.
176 "The National Energy Report 2015," *Kazenergy, n.d.,* 21.
177 Ministry of Energy of the Republic of Kazakhstan, "Level of Gasification of Kazakhstan to Reach 56% by 2030," Energo.gov, November 18, 2015, accessed May 15, 2017, http://en.energo.gov.kz/index.php?id=3895.

state actors in the energy sector are introduced, ensuring sustainable access of the population to energy resources would be problematic.

Currently, authorities are no longer capable of financing gasification initiatives in the country, at least not until economic decline is reversed. The South Kazakhstan region was supposed to be the largest recipient of the government support for gasification projects at this stage. The government planned to allocate 862 million Tenge (over US$ 2,700,000), out of the total investment package of 2.43 billion Tenge (US$ 7.9 million), for the gasification of the South Kazakhstan region in 2015. Due to financial downturn, however, it is deprived of those funds and all projects are now frozen. Construction of gas-fired thermal power generation facilities in the South Kazakhstan region with the cost of 635.8 million Tenge (over US$ 2 million) (second largest after Akmola region) is also postponed.[178]

The Oil and Gas sector development program for 2010–2014 as well as the recently adopted General Gasification Scheme for 2015–2030, in regards to the South Kazakhstan region imply: a) achieving sufficiency for gas supplies; b) extending connections from the "Beneu–Bozi–Shymkent," "Gazli–Shymkent" and "Kazakhstan–China" gas pipeline to the population centers along the routes; c) promoting reconstruction and modernization of gas distribution networks; and, d) building a link Kyzylorda through Zheskazgan, Karaganda with Astana and further to Kokshetau.[179]

The South Kazakhstan region has always been a priority region for the country gasification initiatives. Within the Gasification Program of 2004–2010, authorities allocated 16.5 billion Tenge (US$ 5,070,000)—the largest on budget contribution (out of total 64.3 billion Tenge—over US$ 2 billion)—for the "South Kazakhstan region gas distribution system modernization" project. Over the past decade, the gasification rate of the South Kazakhstan region increased twofold and currently accounts for 43 percent. By 2030, authorities target the level of 53 percent. These figures might not seem to be considerable if compared to the gasification rate in Mangystau, West Kazakhstan region, Atyrau, and Almaty city, which accounts for around 90 percent. However, while the gasification rate of the South Kazakhstan region is way below some of the western regions, in terms of the number of gasified settlements it takes a leading role. For instance, Shymkent city, an administrative center of the South Kazakhstan region, enjoys the second highest number of subscribers (233,347 people) after Almaty city (360,957 people).[180] Yet there is still a huge gap between the region's gas demand and supply, and no economic boom can be expected unless sufficiency of energy supplies is guaranteed. Rural settlements are particularly vulnerable, as gas is supplied only in the regional centers and the relatively large cities. Therefore, the challenges limiting the contribution of the gasification projects on the socio–economic development of the South Kazakhstan region require immediate policy priority and innovative policy measures to efficiently use existing gas transport and distribution facilities as well as secure funds to expand the networks.

Overcoming Obstacles for Successful Implementation of Gasification Initiative

The state budget backed initiatives, what was perceived to be a guarantee for the implementation of the gasification projects, turned to be its major tailback. Apparently, no back up plan has been developed for implementation of gasification projects in case of financial recession. Within the

178 "Gasification and Thermal Power Projects Are Frozen" (Proekti Po Gazifikacii i Teploenergetiki Zamorojeni), *Forbes Kazakhstan,* February 23, 2015, accessed December 15, 2016, http://forbes.kz/news/2015/02/23/newsid_80573

179 Bolat Abylkasymov, "Local Petroleum Will Not Be Cheaper," March 2, 2017, accessed May 5, 2017, HTTP://WWW.RATEL.KZ/RAW/SVOJ_BENZIN_DESHEVLE_NE_BUDET.

180 KazTransGas, "Structure," KazTransGas official website, accessed December 15, 2017, http://www.kaztransgas.kz/index.php/en/main-page/structure.

gasification initiatives authorities only developed a worst, normal and best case scenarios. The worst-case scenario implied gasification of only western and southern regions of the country. However, the financial crisis hit so hard that all state-sponsored activities to bring gas to the people, especially in the South Kazakhstan region, are now postponed for undefined period. In this regard, policy innovations are to be introduced to attract private sector and enlist support of the ordinary people to expand the coverage of gas supplies in the region. However, it will be difficult to engage non-state actors into the initiatives being implemented in an information vacuum, where no one has clear understanding of what is being done and how. It is, thus, extremely important to make the process more transparent and accountable. Policy steps on how to make the gasification process more transparent will be discussed in details in this section.

Gasification is often evaluated in terms of extended networks to reach nearby villages and cities along the major pipeline routes, but not necessarily the number of households physically connected to the system. While the KazTransGas and its operators take the responsibility for the extension of pipelines to the population centers, independent contractors manage households' physical connections to the networks. Because they charge the households around 300,000 Tenge, not all of them and in some cases majority of the households cannot afford to take full advantage of the gasification initiatives.[181] This implies that the so-called successful gasification does not necessarily improve the living standards of the ordinary people, such as sufficient and stable supply of gas for cooking and heating purposes. Therefore, the gas distribution policy has to be amended to ensure guaranteed access to gas for the settlements connected to the pipeline networks. Subscribers, for instance, can be given discounts or pay by stated installments.

Stability of gas supplies in the South Kazakhstan region is currently highly tied up to the gas flow through major regional pipelines, which are designed to move resources out to external markets. Having connected local communities to those pipelines, the government has to make sure that the domestic supplies are not compromised. For instance, the Beineu–Bozoy–Shymkent gas pipeline, capable of supplying its gas to southern regions, is also expected to fill the Central Asia–China gas pipeline, in which China has not only taken part, but also covered most of the construction expenses. Chinese interests in moving gas out of the region may overshadow Kazakhstan's desire to supply a sufficient amount of gas to its southern regions.

181 Interview conducted with local population in South Kazakhstan Region, September 2014.

TURKMENISTAN: NEUTRALITY AND INTEGRATION INTO THE GLOBAL ENERGY SYSTEM

Natural Gas Giant in the Region

Turkmenistan, with the amount of 17.5 trillion m^3, enjoys the fourth-largest natural gas reserves after Russia, Iran, and Kuwait.[182] The Turkmen government is even more optimistic suggesting the reserves of 24 trillion m^3.[183] The country's first gas production infrastructure was put in place in the 1970s.[184] Turkmengaz, state gas company, is currently developing around 30 gas and gas condensate deposits, including such unique fields as Galkynysh, Dovletabad, Shatlyk, Malay, Kerpichli, Garashsizligin 10 Yilligi, Gazlidepe, Bagadja, Garabil, Gurrubil, etc. Overall, gas extraction accounts for over 1000 gas wells in the country. In 2014, Turkmenistan produced 76 billion m^3 and exported 45 billion m^3.[185] In 2016, Turkmenistan exported around 30 billion m^3 of gas. High consumption level is explained by the fact that even the electric power sector of Turkmenistan is completely dependent on gas-fired TPP and the country possesses significant amount of gas to meet its domestic demand. On the XVII People's Council in 2006 the government adopted the "Oil and Gas Industry Development Programme of Turkmenistan for the period till 2030" according to which it is targeting to reach the volume of gas production in the amount of 230 billion m^3 annually by 2030.[186] There is a potential for significantly increasing gas production in Turkmenistan, since having fourth largest gas reserves in the world, the volume of Turkmen gas production is almost 10 to 9 times lower than in the United States (728.3 billion m^3) or Russia (578.7 billion m^3).[187] Many experts, however, doubt that Turkmenistan can reach the targeted level due to lack of investments as well as technical and geographical constraints to reach external energy markets.

The development of natural gas is the priority area in Turkmenistan's energy sector. However, due to a large number of sparsely located population spots it is economically too costly to develop a countrywide gas supply network. The government has made certain progress in supplying majority of its population with gas. The Turkmen government initiated the construction of an "East–West" gas pipeline capable of transporting 30 billion m^3 in order to increase the availability of natural gas to some distant parts of the country, as well as to raise its export capacity. However, a 770 km long pipeline starting from Mary going through Axal and ending at the Balkan regions will only be justified if extended gas extraction starts in the giant Galkynysh gas field with total reserves estimated at around 13.1 to 21.2 trillion m^3.[188] This pipeline is designed to transport natural gas from Galkynysh field (South Yolotan, Osman, and Yashlar) to the western regions.[189] Turkmenistan is counting on recently explored (2006) giant Galkynysh gas field to significantly increase its gas production capacity, the first stage of production on which was commenced in 2013.[190] The "West–East" gas pipeline has integrated all major gas deposits in the country into a

182 British Petroleum Company, *BP Statistical Review of World Energy June 2017.*
183 The Ministry of Foreign Affairs of Turkmenistan, "Economy," n.d., accessed May 15, 2015, http://www.mfa.gov.tm/en/tukrmenistan/economy.
184 Institute of Strategic Studies and Analysis, *Centralnaya Aziya. Geopolitika i Ekonomika Regiona (Central Asia. Geopolitics and Economy of the Region)* (2010), 50, http://www.isoa.ru/docs/central_asia-book.pdf.
185 Kurganguly Yaziev, "Potencial Turkmenistana po Narashivaniyu Eksporta Prirodnogo Gaza (Potential for the Gas Export of Turkmenistan)," *Ministry of Oil and Gas Industry and Mineral Resources Journal*, 2015, accessed June 1, 2015, http://www.oilgas.gov.tm/publikatsii/item/329.
186 "Obespechenie Globalnoy Energobezopasnosti – Faktor Ustoychivogo Razvitiya (Global Energy Security is a Guarantor of Sustainable Development)," *Ministry of Oil and Gas Industry and Mineral Resources Journal*, May 28, 2015, accessed December 1, 2017, http://www.oilgas.gov.tm/publikatsii/item/435.
187 British Petroleum Company, *BP Statistical Review of World Energy June 2017.*
188 Economist Intelligence Unit, "Turkmenistan Gas: Galkynysh Gas Output will Boost Growth in 2014," September 24, 2013, accessed April 15, 2015, http://performance.ey.com/wp-content/uploads/downloads/2013/10/EY-Performance-Turkmen-gas-and-growth.pdf.
189 "Global Energy Security is a Guarantor of Sustainable Development," *Ministry of Oil and Gas Industry.*
190 "Galkynysh Gas Field, Turkmenistan," *Hydrocarbons-technologies,* n.d., accessed June 1, 2016, http://www.hydrocarbons-technology.com/projects/-galkynysh-gas-field-turkmenistan/.

single system thus making it physically possible to increase export volume in all/any direction.[191]

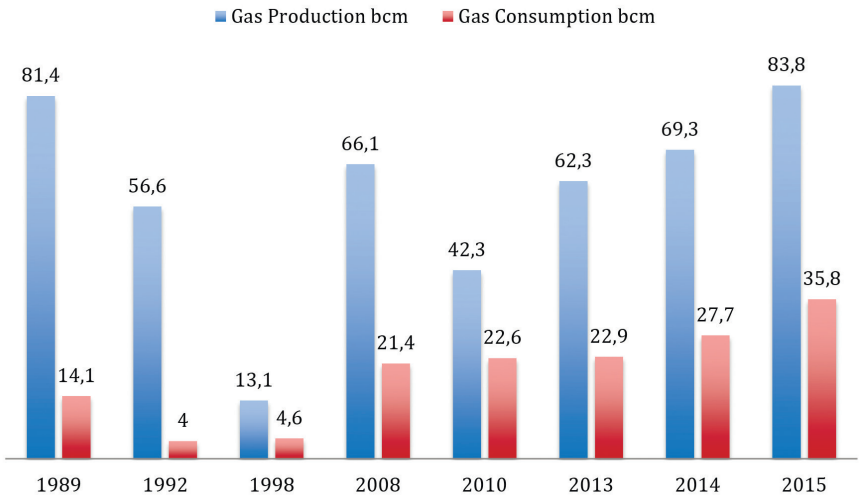
Turkmengaz controls 90 percent of all hydrocarbon fields. The remaining 10 percent belongs to the state oil company Turkmenneft.[192] According to the Law adopted by the former Turkmen President, Saparmurat Niyazov, no energy assets can be privatized until 2020.[193] Even though Turkmenistan declared the country "open for business," the Turkmen government reserved the right to develop its onshore fields itself. International oil companies are limited to exploration only. As well, the government officials decided to sign new service contracts and not the PSAs.[194] Companies that still operate within the PSA signed their agreements back in the 1990s. However, the fuel complex development of Turkmenistan is largely dependent on foreign investments and to attract major Chinese investors the government of Turkmenistan agreed to PSA format of agreements. During the visit of the President of Turkmenistan Gurbanguly Berdymukhamedov to the People's Republic of China on July 17, 2007, PSA agreement on development of Bagtiyarlik on the Amu Darya river territory was signed between parties. China is obliged to develop the field and build infrastructure and gas processing plants. This was an important precondition of the strategy to build the Turkmenistan–China gas pipeline two years later.[195]

Neutrality has always been an important part of Turkmenistan's foreign policy. During the Summit of the Organization for Security and Cooperation in Europe in July 1992, Turkmen representatives declared "positive neutrality" as one of its foreign policy pillars. General Assembly of the United Nations, for the first time in the history of International Relations, adopted special resolutions on "Turkmenistan's Permanent Neutrality" on December 12, 1995. Twenty years passed, but neutrality remains the priority in its regional and global foreign policy as indicated in the "Foreign policy concept of Turkmenistan for the period of 2013–2020".[196]

Turkmenistan's domestic energy policy is almost completely linked with its international energy interests. Its total primary energy production and consumption levels show that, Turkmenistan has sufficient production capacity to meet its energy needs. Natural gas constitutes the main source in the primary energy mix of Turkmenistan. However, the largest share of its gas production has been exported. After the collapse of the Soviet Union, lack of investment in maintaining the Turkmen gas sector and lower demand for gas all over the former Soviet space meant the level of primary energy production decreased up until the end of the 1990s.[197]

191 "International Cooperation in the Turkmenistan's Oil and Gas Sector: Achievements and Prospects," *State News Agency,* November 20, 2014, accessed March 1, 2015, http://tdh.gov.tm/en/official-news-2/12015-2014-11-20-16-17-00.
192 Institute of Strategic Studies and Analysis, *Central Asia. Geopolitics,* 50.
193 International Crisis Group, "Central Asia: Decay and Decline," 25.
194 Gawdat Bahgat, "The Geopolitics of Energy in Central Asia and the Caucasus," *The Journal of Social, Political, and Economic Studies* 34, no. 2 (2009): 143.
195 "State Agency for Management and Use of Hydrocarbon Resources under the President of Turkmenistan," *Ministry of Oil and Gas Industry and Mineral Resources Journal*, n.d. accessed September 15, 2016, http://www.oilgas.gov.tm/minagenstvo.html.
196 "Neytralitet Turkmenistana: Politika Mira, Dobrososedstva i Razvitiya (Neutrality of Turkmenistan: Politics of Peace, Good Neighbourhood and Development)," *Ministry of Oil and Gas Industry and Mineral Resources Journal*, n.d., accessed March 20, 2015, http://www.oilgas.gov.tm/neftegazovyj-sektor/item/316.
197 Institute of Strategic Studies and Analysis, *Central Asia. Geopolitics*, 50.

Figure 4. Natural Gas Production and Consumption, Turkmenistan.



Source: Annette Bohr, "Turkmenistan: Power, Politics and Petro-Authoritarianism," *Russia and Eurasia Programme*, March 2016, https://www.chathamhouse.org/sites/files/chathamhouse/publications/research/2016-03-08-turkmenistan-bohr.pdf.

Increasing demand for natural gas in Europe prompted Russia to use its transit leverage to gain economic revenues from re-exporting Turkmen gas and to boost gas production in the country again. A second sudden drop in gas production was instigated by Russia's inability to re-sell Central Asian gas to European markets due to the Russia–Ukraine gas crisis. While the gas crisis caused a temporary disruption, the 2008–2009 financial crisis had a longer-lasting effect on the gas supply cuts. Construction of a pipeline connecting Turkmen gas with the Chinese market instigated the second major gas production increase in the country in 2010. These ups and downs indicate that the gas production rate has always been dictated by external demand for Turkmen gas and not necessarily by the desire of the government to improve the country's energy security by connecting remote areas of Turkmenistan to the central pipeline networks.

Integration into the Global Energy System

With one of the richest natural gas reserves in the world, the government of Turkmenistan prioritizes integration into the global energy system and for the moment refrains from active cooperation with other Central Asian states.[198] "Oil and Gas Industry Development Programme of Turkmenistan for the period till 2030" is an important document in determining the country's energy security strategy.[199] Almost complete dependence on Russian pipelines to move gas out of the country had negative consequences for Turkmenistan, and the country wants to diversify export routes in all possible directions (China, South Asia, and Europe) with long-term commitments, including swap deals. The government of Turkmenistan is currently referring to the "World Energy Outlook 2014" and the "Global Vision for Gas" forecast, which shows significant and continues increase of natural gas demand and Turkmenistan's potential to play even bigger role in supplying this particular type of energy source. It is expected that gas consumption in China and India will amount to 603 billion m^3 and 202 billion m^3, respectively,

198 Government of the Republic of Turkmenistan, *Towards New Paradigm of Global Energy Space* (Ashgabat: State News Agency of Turkmenistan, 2011), accessed June 5, 2014, http://turkmenistan.gov.tm/_eng/?id=105.
199 "An Enlarged Session of the Cabinet of Minister of Turkmenistan," *State News Agency of Turkmenistan*, July 7, 2014, accessed December 5, 2014, accessed December 5, 2014, http://tdh.gov.tm/en/politics/news/10466-2014-07-07-23-14-51.

by 2040. And, Turkmenistan would be able to increase its gas production up to 230 billion m^3, by 2040, to partially meet this growing demand.[200] By highlighting the above-mentioned figures, the government of Turkmenistan is trying to emphasize its contribution to the global energy security, which was possible due to its neutral status, vast gas reserves and geographical location on the crossroads of Europe and Asia.[201] While the government prioritizes integration into the global energy system in its foreign energy policy, which basically implies connecting its oil and gas reserves with external energy markets, so far it has only succeeded in swapping Russian patronage for Chinese.

Having realized the possible consequences of such dependence, Turkmen government has been claiming the desire to establish gas export corridors toward European and South Asian directions. Current Turkmen elites show particular interest in the construction of the TAPI pipeline with the capacity of 33 billion m^3. Turkmengaz, Afghan gas corporation, Pakistani Inter State Gas systems (Private) Limited and GAIL (India) Limited form the operating team of the TAPI Ltd. Project participants have already signed purchase agreements and determined sources, including Galkynysh giant gas field, to provide gas supplies. With the support of the Asian Development Bank, project participants expressed willingness to start the construction of the pipeline as soon as possible, even in 2015.[202] Among various planned projects to export Central Asian natural resources, the Turkmenistan–Afghanistan–Pakistan–India (TAPI) pipeline—1,099-miles [1,820 km] long, with a capacity of 33 billion m^3 of natural gas per year from the Dauletabad field in Turkmenistan—is considered the most challenging. While geography creates various challenges for the TAPI pipeline, it is not so much physical as commercial and political/security obstacles that are causing the delay in project realization. After the construction of the Baku–Tbilisi–Ceyhan pipeline (an extremely difficult project from an engineering point of view),[203] the chances of building the TAPI pipeline significantly increased.

Officials of the South Asian Pakistan and Afghanistan, as well as Turkmen authorities continuously reported the new beginning of the TAPI construction. Inter State Gas Systems Managing Director, Mobin Saulat highlighted that: "Officials from Turkmenistan have reached along with a high level delegation and an inaugural ceremony will be held on Friday (3 March, 2017) to start work on route survey and detailed engineering in Pakistan." This is preconstruction engineering and a feasibility study work before construction begins. For the TAPI project, it is expected to invest up to US$ 25 billion, out of which US$ 10 billion will be spent on the lining up the 1680 km long pipeline.[204] The money that none of the participating states possesses, at the moment.

At the same time, the region's vulnerability to such security threats as terrorism and conflict, and doubts concerning the consuming countries' capability to compete with Chinese and European prices for Central Asian energy have significantly slowed the project down. As a result, no significant progress has been made so far in terms of physical construction of the pipeline.

200 "Posledovatel'niy Rost Znachimosti Turkmenistana na Mejdunarodnom Gazovom Rinke (Increasing Role of Turkmenistan in the International Gas Market)," *Ministry of Oil and Gas Industry and Mineral Resources Journal,* April 28, 2015, accessed May 5, 2015, http://www.oilgas.gov.tm/neftegazovyj-sektor/item/402.
201 "Osnovnie Napravleniya Razvitiya Energeticheskoy Diplomatii Turkmenistana na Sovremennnom Etape (Turkmenistan's Energy Diplomacy: Its Main Development Directions in the Contemporary World)," *Ministry of Oil and Gas Industry and Mineral Resources Journal,* January 21, 2015, accessed March 4, 201, http://www.oilgas.gov.tm/neftegazovyj-sektor/item/59.
202 "Global Energy Security is a Guarantor of Sustainable Development," *Ministry of Oil and Gas Industry*.
203 The BTC was labelled "the first great engineering project of the twenty-first century." There were doubts that the construction of the BTC is feasible, because this 1,099-mile[1,820 km]-long pipeline had to cross a number of difficult areas (1,500 rivers and water courses, high mountains and several major earthquake fault zones) while meeting environmental and social impact standards (Yergin, *The Quest*, 62).
204 Anna Nicklin, "TAPI Project Is Making Progress," World Pipelines, March 2, 2017, accessed May 1, 2017, https://www.worldpipelines.com/project-news/02032017/tapi-project-is-making-progress/.

The Deputy Minister of Oil and Gas Industry and Mineral Resources, Kurganguly Yaziv, highlighted gas export diversification roots currently prioritized by the government:

- Turkmenistan–China: 65 billion m^3;
- Turkmenistan–Russia: 10 billion m^3, but the existing pipeline capacities allow exporting way more [Turkmenistan–Iran: 20 billion m^3;
- TAPI: 33 billion m^3;
- Turkmenistan–Europe: 30 billion m^3 through the Trans–Caspian Gas pipeline.[205]

With the current level of gas export capacity, it will be quite challenging for Turkmenistan to supply gas in all directions. Once major gas supplier to Russia, Turkmenistan has been gradually reducing export volume and stopped supplying in 2016. To keep up with gas supply obligations to the Chinese market, Turkmenistan stopped exporting gas to Iran, as well. Lack of gas transporting infrastructure, along with political and security issues, prevent Turkmen government from exporting gas in the European and South Asian directions.[206]

Implementing Major Energy Projects

To meet external gas demand, Turkmenistan has to develop the giant gas field Galkynysh[207] (in the East) and connect it to some major gas pipelines located in the western parts of the country via the "East–West" trans–Turkmen gas pipeline.[208] Only by developing this field and increase extraction of gas in other fields, Turkmenistan will be able to fulfill its obligations to external customers, but it is happening very slowly. As planned in the first stage of the development of this field, several gas-extracting facilities were completed allowing the development of 30 billion m^3. During the second stage gas production capacity is targeting to reach 60 billion m^3. Gas field, which began production in 2013 is expected to add 20 billion m^3 annualy by 2020.[209] It was expected to increase the volume of gas production up to 83,8 billion m^3 and export 48 billion m^3 of it in 2015.[210] The field, however, is being developed with some delays. To get close to this numbers, the government had to speed up the development of this giant gas field. However, dropped gas prices, which are linked to the oil prices that also collapsed, resulted in decreased gas production volume.

Given that Turkmenistan is the least-connected country in the region, and is not dependent on other Central Asian countries' energy resources, it is not surprising that the Turkmen government decided to largely isolate itself from tensions over the shared management of water and energy resources in the region.[211] Without doubt, the importance of revenues, generated from selling gas to external markets, for the development of Turkmen energy sector, should not be underestimated. Exporting gas to external customers does not directly contribute to the energy security of the country; however, the export of gas to neighbouring Uzbekistan in case of emergency and potentially to Tajikistan and Kyrgyzstan via the CAGP Line–D or swap gas

205 Kurganguly Yaziev, "Potential for the Gas Export of Turkmenistan."
206 "Turkmenistan Boosting Gas Exports to China," *Energy Global,* February 11, 2015, accessed April 15, 2015, http://www.energyglobal.com/downstream/gas-processing/11022015/Turkmenistan-boosting-gas-exports-to-China-230/.
207 "President of Turkmenistan Gurbanguly Berdymukhamedov Initiated a Start-up to the Second-phase Development of the Supergiant Deposit 'Galkynysh'," *State News Agency of Turkmenistan*, May 8, 2014, accessed December 5, 2014, http://tdh.gov.tm/en/politics/news/10010-2014-05-08-03-52-22.
208 Alexei Chernayev, *High Paces to Scale Construction* (Ashgabat: Government of the Republic of Turkmenistan, 2012), accessed March 10, 2016, http://turkmenistan.gov.tm/_eng/?id=1129.
209 "Turkmenistan Boosting Gas Exports to China," *Energy Global.*
210 "Energeticheskaya Politika Turkmenistana: Diversifikaciya Eksporta Gaza (Energy Policy of Turkmenistan: Gas Export Diversification)," *Ministry of Oil and Gas Industry and Mineral Resources Journal*, accessed May 25, 2015, http://www.oilgas.gov.tm/publikatsii/item/416.
211 Rustam Berdiev, Procurement/Asset Management Assistant, Organization for Security and Co-operation in Europe, Center in Ashgabat, Turkmenistan, September 7, 2013.

deals through Uzbekistan and in exchange receiving (cheaper and environmentally cleaner) electricity from upstream Central Asian countries does. Arranging delivery of Turkmen gas to Kyrgyzstan and Tajikistan via swap arrangements with Uzbekistan and supply of upstream countries' electricity to Turkmenistan again through swap agreements with Uzbekistan have the potential to contribute to the level of energy security in the region. The fact that Turkmen and Uzbek gas is currently transported to China through Kazakh territory only adds strategic importance to the Line–D pipeline, from the Chinese perspective that feels uncomfortable of complete dependence on solely Kazakhstan's pipeline infrastructure. Line–D with a capacity of 30 billion m^3 per year, which is designed to move natural gas avoiding Kazakhstan, and thus, has a very high chance of realization. However, the conflict between Uzbekistan and upstream countries may negatively affect any sort of swap arrangements to move and transit gas within Central Asia. Construction of Line–D started in 2014 in Tajikistan. There have been many delays with the construction. In the beginning of March 2017, CNPC and Uzbekneftegaz have agreed on an indefinite postponement of the construction of the Uzbek section. There are currently three operational lines of the Central Asia China pipeline. At its full capacity Lines A, B and C are supposed to meet 20 percent of the Chinese demand for natural gas.[212] The first three lines of the network were built in a very short period of time with high efficiency. However, political constraints between Central Asian upstream and downstream countries may further delay the construction of the last Line–D of the network. Yet, even without the last line, Turkmenistan has turned into excessive dependence on China both in terms of external debt and export of natural gas.

Prospects and Challenges for Turkmen Gas Sector Development: Cooperation with China

Turkmenistan has recently turned into complete dependence on the Chinese market. China is highly interested in importing natural gas from Central Asia to meet its growing energy demand. Also, natural gas is expected to reduce environmental impact. Fifty–five billion m^3 of gas, which would constitute around 20 percent of the natural gas consumption, thus replacing 73 million tons of coal cutting 78 million tons of carbon dioxide and 1.21 million tons of sulfur dioxide emissions annually. [213]

CNPC has been taking part in oil and gas sector development in Turkmenistan since 2002. In 2007, CNPC signed a production sharing agreement to explore and develop Amu Darya River basin gas reserves. According to the agreement, Turkmenistan took the responsibility to supply 30 billion m^3 of gas for next 30 years from this field. Gas Processing Plant of the Amu Darya Project with the capacity of around 5 billion m^3 was commenced in 2009. In 2013, Chuanqing Drilling Engineering Company completed a 10 billion m^3 gas project at Galkynysh gas field in Turkmenistan. The facility became operational in 2014 according to the schedule. In September 2013, CNPC and Turkmengaz State Concern signed a new contract to build another facility with the capacity to produce 30 billion m^3 gas at Galkynysh gas field, which is due to be completed by the end of 2018.[214]

China is a reliable partner for Turkmenistan in terms of importing natural gas from the region. It has to be mentioned, however, that initially Chinese market was expected to be complementary to the existing Russian and Iranian markets. However, the excessive dependence on a single Chinese market is now negatively affecting Turkmen economy. Turkmenistan is experiencing serious financial difficulties related to the dropped oil and gas prices. Turkmen economy is

212 Ky Krauthamer, "China Signals Shrinking Demand for Central Asian Gas," March 7, 2017, accessed December 15, 2017, http://www.tol.org/client/article/26748-turkmenistan-gas-china-pipeline-central-asia-export.html.

213 "CNPC in Uzbekistan," *CNPC* website, n.d.

214 "CNPC in Turkmenistan," *CNPC* website, n.d., accessed December 15, 2017, http://www.cnpc.com.cn/en/Turkmenistan/country_index.shtml.

highly dependent on export of hydrocarbons. Over 31 percent of the GDP comes from gas and oil export revenues. Earnings, however, have been declining over the last years. If Turkmen GDP growth accounted for 14.7 percent in 2011, it constituted only 10.3 in 2014 and 6.5 in 2015. The GDP growth is expected to further decline in the coming years. Declining revenues from oil and gas exports resulted in dropping governmental subsidies, social spending and initiatives in public infrastructure. Differently from other potential customers of the Turkmen gas, China is financing both pipeline construction and infrastructure for gas extraction. Over the past 8 years, since the CNPC was granted a license for the development of energy sector in Turkmenistan, China provided US$ 8 billion in loans in 2011 and have been continuously supporting other projects.[215] Being land–locked, Turkmenistan, of course, is quite limited in terms of diversifying its gas export. However, having possessed diversified gas pipeline networks, Turkmen authorities might use this leverage to improve its bargaining power against China.

215 Getty Paul Stronski, "Turkmenistan at Twenty–Five: The High Price of Authoritarianism," January 30, 2017, accessed January 5, 2018, http://carnegieendowment.org/2017/01/30/turkmenistan-at-twenty-five-high-price-of-authoritarianism-pub-67839.

SECURITY OF THE CENTRAL ASIAN GAS SYSTEM

Almost complete dependence on Russian pipeline network in exporting natural gas put Central Asian states in a very vulnerable position (low prices for oil and gas, economic dependence, political pressure, etc.). Thus, diversification of such dependence by building alternative pipeline networks promoted by regional and global gas customers was highly supported by Central Asian exporters. Projects to move gas to Europe avoiding Russia, increasing the capacity of the gas pipeline network to Iran and a TAPI project hypothetically significantly redrew regional energy map. However, so far only China succeeded to significantly challenge Russian monopsony on Central Asian gas import by constructing the longest gas pipeline in the world from Turkmenistan to China through Uzbekistan and Kazakhstan and oil pipeline from Kazakhstan to China.

Having experienced the negative impacts of excessive dependence on Russian pipelines, Central Asian exporters are now pursuing the diversification of gas export routes to obtain access to various gas markets while avoiding Russian territory. However, pipelines are the only cost-efficient way to transport gas from this land-locked region, and Central Asia is surrounded by larger powers (Russia, China, Europe, and India) that often compete for region's resources. Thus, particular consideration is required when pursuing the diversification of gas export routes. Since the Central Asian region is considered to be a source of energy for external customers, desire to increase the volume of imported gas may and is affecting availability of this particular type of resource for domestic and intra-regional consumption. From the energy security perspective external customers are those juicy hares that Central Asian countries chose to go after sacrificing the possibility to hunt a stag—a stable functioning of the unified Central Asian energy system.

This section discusses factors that may threaten and that are already affecting security of gas supplies for the Central Asian countries, such as asymmetrically interdependent supply relations among state actors within the CAES, in which these actors interact and affect each other's security; insufficient volume of natural gas production to meet external demand without compromising internal consumption needs and gas exports to the neighbouring consumer countries.

Diversification of Central Asian Gas Exports

To secure reliable gas supplies regional exporters are attempting to establish symmetrical interdependent relations with major customers so that there is less incentive on either side to cause gas supply disruptions. Brenda Shaffer argues that energy security is provided when suppliers and consumers are interdependent in gas supply relations. The extent to which each side possesses alternative supply or market options, including transport infrastructure, determines the extent of interdependence in gas relations.[216] On the one hand, the diversification of gas export routes ensures alternative ways of transporting it for energy consumers, which decreases the impact of technical failures or gas supply disruptions by either exporters or transit countries. On the other hand, diversification provides alternative energy markets for producers, which increases exporting countries' bargaining power so that they can sell gas at the highest possible price.[217] In addition to the existing Turkmenistan-Iran gas pipelines, the newly constructed CAGP that runs from Turkmenistan through Uzbekistan and Kazakhstan to China decreased regional gas exporters' dependence on Russia. The dependence on China, however, has significantly increased.

There is clearly a demand for the region's gas resources, both within the region and by external customers. Taking into account the fact that Central Asia (mainly Kazakhstan, Turkmenistan,

216 Brenda Shaffer, *Energy Politics* (Philadelphia: University of Pennsylvania Press, 2009), 4.
217 Vaclav Hubinger, "Southern Corridor: A Strategy for Sustainable Energy Cooperation with Central Asia," *EUCAM Watch*, no. 4 (2009).

and Uzbekistan) possesses significant reserves, providing sufficient gas for both economic and population needs should not be a problem. However, despite considerable reserves, the overall gas supply-demand relations are far from being stable and reliable within the CAES.

Although, hypothetically, the diversification of gas transporting routes benefits both exporters and importers, many factors determine the success of such diversification:

- geography (the distance between exporting and importing countries; security/ vulnerability of transport routes),
- political relations among energy actors,
- availability of sufficient energy resources to meet energy demand and transport
- infrastructure,
- policy (commitment to implement),
- resources (capacity and willingness to pay the price to secure access to alternative energy).[218]

Central Asian gas exporters' desire to further diversify export routes is understandable. However, policy makers must consider particular characteristics of the region and natural gas supply deals when pursuing the further diversification of export routes because supplying gas to alternative markets may not necessarily contribute to overall security within the CAES.

For a landlocked region such as Central Asia, cross-border pipelines are the only cost- efficient way to export gas. The construction of such pipelines requires significant investments from both the producer and customer sides. Because new international gas pipelines need to operate for at least fifteen to twenty years before investments can be recouped, natural gas is often traded within the framework of long-term supply contracts.[219] These characteristics of the gas trade and the fact that the region is surrounded by major powers that often compete for energy resources establish a particular type of gas supply relations in which actors might be willing to use various political, economic, and military tools to force Central Asian exporting countries to fulfill their obligations at any cost. Although there have been partially successful efforts to diversify away from Russia and possibly obtain higher prices for the exported gas, this strategy is constrained by a lack of production capacity and the conflict between export desire and regional consumption needs.

The Monopsony of the Russian Pipeline System

In an attempt to decrease its dependence on Russia's pipeline network, some former Soviet republics adopted a "two-track" or "offend no one" foreign policy strategy. For instance, Azerbaijan could not afford to offend Russia but wanted to export its oil to the US and Europe. Thus, Azerbaijan opted for two export routes, one through Russia and another through Georgia. When the Russian route was closed due to the war in Chechnya in 1999, the two-track strategy proved to be very useful because Azerbaijan could still use the pipeline to Georgia.[220] However, Central Asian energy producers did not or could not adopt a "two-track" strategy and remained significantly dependent on the Russian pipeline system for a long time.

There are two critical conditions that have always determined gas supply relations between Central Asian exporters and Russia: (a) Russia needs Central Asian gas to fulfill its commitments to the European customers; (b) Central Asian exporters used to be almost completely dependent

218 Vlado Vivoda, "Diversification of Oil Import Sources and Energy Security: A Key Strategy or an Elusive Objective?" *Energy Policy* 37 (2009): 4620, doi:10.1016/j.enpol.2009.06.007.
219 Shaffer, *Energy Politics*, 38.
220 Daniel Yergin, *The Quest: Energy, Security and the Remaking of the Modern World* (New York: Penguin Press, 2011), 58.

on Russian pipeline infrastructure to move their resources to external markets. The Russian government effectively used Central Asian exporters' dependence on Russian pipelines to promote its economic and political interests. Central Asian gas producers had to sell their resources to Moscow, which partially re-exported that gas to Europe at two and sometimes three times the purchase price and also supplied its southern regions with the gas. Prior to the 2000s, the price paid by Russia for natural gas not only did not correspond to the market value of the gas, but was also often in the form of barter.

Turkmenistan has always been a major supplier of gas to and through Russia. However, after the collapse of the Soviet Union the demand for Turkmen gas started decreasing. Disagreements between Russian Gazprom and Turkmenistan in 1994 resulted in gas export disruption of Turkmen gas to Europe, because Russia no longer allowed Turkmen gas to flow through its pipelines. Russian representatives' visited Ashgabat in 1998 to resolve the tensions but failed to achieve any positive outcomes. Turkmenistan due to large debts by Ukraine, Georgia and Armenia also stopped exporting gas to these countries in 1997. As a result, gas production in Turkmenistan dropped to the level of only 17 billion m^3 in 1997. Revenues from exporting gas accounted for two-thirds of GDP in the mid-1990s and thus gas export cuts seriously hit the budget and the overall economy.[221]

Turkmenistan cut gas export to Ukraine due to a debt of US$ 700 million in 1997. By the end of 1997, US$ 185 million was paid off and two countries signed new agreement according to which Turkmenistan was supposed to supply up to 20 billion m^3 up until 2005. It was agreed that Turkmenistan would receive 40 percent of payment in hard currency and 60 percent in goods and services.[222] Turkmenistan delivered 20 billion m^3 of gas to Russia in 2000, which was paid in hard currency (40 percent) at the price of US$ 36 and in food and commodities (60 percent). Turkmen side, however, was unhappy about the price for gas. During negotiations on gas supply to Russia, President of Turkmenistan Saparmurat Niyazov insisted on gas price of US$ 42–45 per 1000 m^3, but Russia considered it too high and proposed the price of US$ 36 per 1000 m^3, to what he stated: "let's calculate: You sell gas to Europe for US$ 85 per 1000 m^3 and you want to buy from us for US$ 36."[223]

In the end of 1990s and the beginning of 2000s, there were no long-term gas contracts and Russia purchased very small amount of Turkmen gas on an annual and semiannual basis. All attempts by the Russian side to draw Turkmenistan into a Russian-led alliance of gas exporting countries failed, because Niyazov refused to join any alliance unless Russia allowed Turkmenistan to export gas to Europe using Russia as a transit country only. To loosen up the tensions, Russia instead allowed Turkmenistan to supply gas to Ukraine. In May 2001, Turkmenistan signed another agreement with Ukraine to export around 250 billion m^3 of gas in 2002–2006 with the payment of 50 percent in hard currency and remaining 50 percent in goods, services and investments. Russia, in its turn, benefited even from such trading arrangements as: a) it received transit fees; b) filling up Ukrainian market with Turkmen gas allowed Russia to increase export of its own gas to Europe at much higher price; c) Russia reduced gas export to Ukraine, which had a reputation for falling behind in its payments.[224]

Since 2006, gas trade relations between Russia and Central Asian producers have taken the form of cash payments only. Discriminatory pricing, however, remained part of the Russian energy policy toward Central Asian producers. Russia purchased Turkmen gas at the price of US$ 60

221 Nazar Alaolmolki, *Life after the Soviet Union: The Newly Independent Republics of the Transcaucasus and Central Asia* (Albany: State University of New York Press, 2001), 102.
222 Ian Jeffries, *The Countries of the Soviet Union at the Turn of the Twenty-first Century. The Baltic and European States in Transition* (London: Routledge, 2004), 583.
223 Marat Gurt, "Turkmenistan Stifles U.S. Gas Plans," *The Moscow Times,* June 3, 2000, accessed May 15, 2014, http://www.themoscowtimes.com/news/article/turkmenistan-stifles-us-gas-plans/262464.html.
224 Imogen Bell, *Eastern Europe, Russia and Central Asia 2003* (London: Europa Publications, 2002), 454.

per 1,000 m^3 in 2006, while exported three times higher price to Europe.[225] The inability to sell its resources directly to Europe was one of the reasons Turkmenistan and other gas exporters agreed to these terms. The discriminatory pricing policy continued before and during the Russian-Ukrainian crises of 2006 and 2009.

As a result, of discriminatory pricing policies, export of Turkmen gas to Russia has been continuously declining since 2007 (from 42.6 billion m^3 in 2007 to 4.5 billion m^3 in 2015)[226], which stopped completely in 2016 and has not been resumed in 2017. And, the fact that most of the Turkmen gas is now heading toward Chinese direction implies that Russia has clearly lost its monopolist position over the transportation of gas to external markets. However, it is worth mentioning that this whole situation perfectly suits Russian interests as well. Russia may use its political and economic leverage to force/encourage Turkmen suppliers to move gas to and through Russia when sending gas toward Northern direction turns beneficial for both Russia and Turkmenistan. For instance, Russia may tempt Turkmenistan to restore its gas supply to and through Russia in large quantities by allowing them to directly sign gas contracts with the European customers, which still pay the highest price for gas in the region.

Russia–Ukraine gas crisis and economic recession have also affected the volume of Uzbek gas export to Russia (from 15.4 billion m^3 in 2009 to 1 billion m^3 in 2015).[227] The volume of Kazakh gas exports to Russia has not undergone significant changes. Differently from Uzbek and Turkmen gas, Kazakhstan exports gas to Russia to be processed and returned back to the Kazakh market. Currently, Kazakhstan, due to increasing demand for gas and lack of pipeline infrastructure, is even importing gas via Bukhara–Ural gas pipeline, which was used to transport Uzbek gas to Russia at some point and is now operated in reverse direction.[228]
Russian monopsony over the gas exports from the region was challenged by the construction of Chinese pipeline networks. The current state of gas export–import relations in the region seems to perfectly meet all actors' interests. By reducing gas exports to Russia Central Asian producers are increasing the volume of export toward Chinese direction. Ongoing dialogues between regional exporters and potential European and South Asian natural gas importers, however, show that the goal pursued by exporters is not merely to diversify their dependence on Russia, but also to obtain access to as many energy markets as possible. However, the realization of the ongoing and planned pipeline projects is likely to negatively affect availability of sufficient supply of gas in Central Asia.

The Drawbacks of Natural Gas Export Diversification

With all of the existing gas transportation projects upgraded and planned ones constructed, there is doubt that the Central Asian producers will be able to meet their supply obligations and to sensibly use the additional transport capacities. Russia remains an important customer of the regional gas via the CAC gas pipeline network, with the capacity to transport 45 billion m^3 per year and, if upgraded, 90 billion m^3 per year.[229] Russia has also been interested in the construction of the Pre-Caspian pipeline (from Turkmenistan via Kazakhstan to Russia)

225 Gawdat Bahgat, "Europe's Energy Security: Challenges and Opportunities," *International Affairs* 82, no. 5 (2006): 961, doi:10.1111/j.1468-2346.2006.00580.x.
226 Sevinj Mamadova, "Changing Market Dynamics In Central Asia: Declining Russian Interests And Emerging Chinese Presence – Analysis," *Caspian Center for Energy and Environment,* March 6, 2015, 2015, http://www.eurasiareview.com/06032015-changing-market-dynamics-in-central-asia-declining-russian-interests-and-emerging-chinese-presence-analysis/.
227 Sevinj Mamadova, "Changing Market Dynamics In Central Asia."
228 "Russian Gas Transit to China Through Kazakhstan is Less Viable — Expert," *ITAR-TASS News Agency*, March 24, 2015, accessed May 15, 2015, http://tass.ru/en/economy/784580.
229 International Energy Agency, *Optimizing Russian Natural Gas. Reform and Climate Policy*, (Paris: International Energy Agency, 2006), http://www.iea.org/publications/freepublications/publication/russiangas2006.pdf.

to significantly increase the overall capacity of the CAC.[230] While current Russia–Ukraine crisis and economic sanctions against Russia is negatively affecting Central Asia–Russia gas trade Russian government might want to restore the volume of gas import when the conflict is over. Turkmenistan has planned to increase its gas supply to Iran from 6–8 billion m^3 via Korpedzhe–Kurt–Kai pipeline[231] built in 1997 to 20 billion m^3 per year by fully operating new Dauletabad–Sarakhs–Khangiran pipeline constructed in 2010.[232] While Turkmenistan is capable of transporting 20 billion m^3 to Iran the volume of transported gas never reached its full capacity. In 2014, Turkmenistan exported only 9 billion m^3 of gas.[233] In an environment of economic blockade, Iran is also undergoing a major gas expansion program, which will make it possible to meet gas needs of Northern Iran on its own.[234] Nevertheless, the Iranian direction was the first successful attempt to diversify Turkmenistan's complete dependence on Russia. Turkmenistan exported gas to Iran when the Russian demand was decreasing. And, now by limiting the volume of gas export to Iran, which was entirely suspended in 2017, Turkmen authorities are struggling to increase gas export capacity to China.[235] The Iranian direction has always played an important role in Turkmenistan's foreign energy policy. Besides direct exports of gas, Turkmenistan might also be interested in extending the volume of swap-based gas supply arrangements with Iran to export resources to external markets.

Among the major planned pipeline projects, the TAPI pipeline, with a capacity of 33 billion m^3 per year,[236] and the Trans–Caspian project, with a capacity up to 30 billion m^3 per year,[237] stand out. President of Turkmenistan Gurbanguly Berdymukhamedov during his speech at the VI International Gas Congress on May 19, 2015 highlighted that he truly believes in the successful implementation of the TAPI project.[238] The idea to build the TAPI pipeline first emerged in the middle of 1990s. However, no progress has been achieved so far. The economic viability of the project and security challenges in Afghanistan are considered the biggest challenges along the way toward promoting the TAPI project. While the Asian Development Bank has carried out feasibility study of the project and found it economically viable and showed even the willingness to financially support the construction of the TAPI pipeline,[239] no party has taken a responsibility to cover or significantly contribute to the construction of the pipeline with the total cost of US$ 7.6–10 billion. Developing of new gas wells to boost gas production to export it to the Southern customers will increase the cost for another US$ 15 billion.[240]

230 Vladimir Socor, "Russia Resuming Gas Imports From Turkmenistan on a Small Scale," *Eurasia Daily Monitor* 7, no. 1 (January 2010), http://georgiandaily.com/index.php?option=com_content&task=view&id=16309&Itemid=132.

231 "Saparmurat Niyazov Inaugurates Gas Compressor Station at Korpeje Natural Gas Field," *Turkmenistan.ru,* September 14, 2005, accessed June 20, 2016, http://www.turkmenistan.ru/?page_id=3&lang_id=en&elem_id=7108&type=event&sort=date_desc.

232 "Turkmenistan, Iran Launch Gas Pipeline," *Pipeline and Gas Journal* 238, no. 1 (2011), accessed September 1, 2012, http://www.pipelineandgasjournal.com/turkmenistan-iran-launch-gas-pipeline.

233 Danila Bochkarev, "EU Investment in Turkmenistan's Energy Upstream: Mission Impossible?" *Elektromagazine,* April 30, 2015, accessed May 25, 2015 https://www.elektormagazine.com/news/eu-investment-in-turkmenistans-energy-upstream-mission-impossible.

234 "Turkmenistan Boosting Gas Exports to China."

235 Fuad Mukhtarli, "Turkmenistan Turns To Europe As Iran, Russia Shut Off Their Gas Markets," *CaspianNews,* August 23, 2017, accessed December 15, 2017, https://caspiannews.com/news-detail/turkmenistan-turns-to-europe-as-iran-russia-shut-off-their-gas-markets-2017-8-18-8/.

236 "Turkmenistan–Afghanistan–Pakistan–India [TAPI] Pipeline," *Ministry of Mines and Petroleum Islamic Republic of Afghanistan*, accessed July 25, 2015, http://mom.gov.af/en/page/4717.

237 Huseyn Hasanov, "Negotiations on Trans-Caspian Gas Pipeline Held Successfully in Brussels," *TREND*, March 10, 2012, accessed June 1, 2016, http://en.trend.az/capital/energy/2001834.html.

238 "Obespechenie Globalnoy Energobezopasnosti–Faktor Ustoychivogo Razvitiya (Global Energy Security is a Guarantor of Sustainable Development)," *Ministry of Oil and Gas Industry and Mineral Resources Journal,* May 28, 2015, accessed June 1, 2015, http://www.oilgas.gov.tm/publikatsii/item/435.

239 "Turkmenistan–Afghanistan–Pakistan–India [TAPI] Pipeline."

240 Danila Bochkarev, "Another Pipe Dream?" *Natural Gas Europe,* March 25, 2015, accessed May 15, 2015, http://www.naturalgaseurope.com/another-pipe-dream-22882.

The EU has always been interested in getting access to the Central Asian gas reserves avoiding the Russian territory. A 300 km long pipeline is designed to move Turkmen gas beneath the Caspian Sea and connect it to the Trans–Anatolian pipeline to supply gas through Azerbaijan and Turkey to Europe.[241] The leaders of Turkmenistan, on the one hand, and Turkey/European states, on the other, reached a framework agreement according to which Turkmenistan was to supply 16 billion m^3 to Turkey and 14 billion m^3 to Europe via the Trans–Caspian gas pipeline. However, the customers wanted to pay for gas only when it reached Turkish border, while Turkmenistan did not want to take responsibility for the transit of its gas through Azerbaijan and Georgia and refused to sign up under the detailed construction proposal in 2000. A new Turkmen President Gurbanguly Berdymukhammedov revived the interest in the Trans–Caspian pipeline. Only this time, no one had to worry about Azerbaijan, as the Deputy Foreign Minister of Azerbaijan said, "if the project is implemented, Azerbaijan will take part with great pleasure."[242]

Maros Sefcovic, EU Energy Commissioner, has visited Turkmenistan in May 2015 to give new impetus to the negotiations over the Trans–Caspian gas pipeline. Moreover, mass media reported quoting him that "Europe expects supplies of Turkmen gas to begin by 2019."[243] The Trans–Caspian pipeline is part of a bigger pipeline network to move Azeri gas to Turkey and Europe. And, the Trans–Anatolian pipeline is already under construction. Technologically, laying down the pipeline beneath the Caspian Sea is no longer a serious obstacle either. There are, however, several challenges that can further postpone the construction of the pipeline. Turkmen gas will not entirely replace Russian gas to Europe, since Europe currently imports around 150 billion m^3 of Russian gas, which accounts for about 30 percent of its total annual gas imports.[244] However, Turkmen gas will be an important source to decrease the extent of Europe's dependence on the Russia gas and cost Russia both money and political leverage. As a result, Russia could easily use undetermined legal status of the Caspian Sea not to let Turkmenistan and Azerbaijan proceed with the construction without the consent of all littoral states.[245] Turkmenistan is currently trying to keep up with Chinese demand for gas and the European customers will most likely be pulled into a competition for the region's resources.

However, even without the TAPI and the Trans–Caspian pipelines, existing gas trading arrangements may still result in a mismatch between a region's production capacity (without compromising regional consumption needs) and external demand for Central Asian gas. The reason for that is rapidly growing Chinese demand and Central Asian producers' obligation to supply over 80 billion m^3 of gas to China. Talks between Chinese and Turkmen leaders on the possibility to move Turkmen gas to China started in 2006 and already in 2009 resulted in the construction of the first line of the Central Asia–China gas pipeline. Turkmen authorities are obliged to export up to 65 billion m^3 per year.[246] Uzbek gas export has to reach 10 billion m^3 and

241 Vladimir Socor, "Aliyev, Erdogan Sign Inter-Governmental Agreement on Trans–Anatolia Gas Pipeline to Europe," *Eurasia Daily Monitor* 9, no. 122 (June 2012), accessed June 1, 2017, ahttp://www.jamestown.org/programs/edm/single/?tx_ttnews%5Btt_news%5D=39545&tx_ttnews%5BbackPid%5D=27&cHash=2e9f386b-f569ef7ea670cde5a5c3784c#.VaBs6sZViko.

242 Foreign Affairs Committee, *Global Security: Russia: Second Report of the Foreign Affairs Committee of Session 2007–08: Report, Together with Formal Minutes, Oral and Written Evidence* (The Stationery Office, 2007), 44.

243 Paolo Sorbello, "Europe and Turkmenistan Make Nice," *The Diplomat,* May 17, 2015, accessed May 25, 2015, http://thediplomat.com/2015/05/europe-and-turkmenistan-make-nice/.

244 Jason Bordoff and Trevor Houser, "American Gas to the Rescue? The Impact of US LNG Exports on European Security and Russian Foreign Policy," *Center for Global Energy Policy* (September 2014): 29, 2015, accessed May 14, 2015, http://energypolicy.columbia.edu/sites/default/files/energy/CGEP_American%20Gas%20to%20the%20Rescue%3F.pdf.

245 Barbara Janusz, "The Caspian Sea Legal Status and Regime Problems," *Chatham House* (August 2005), accessed June 1, 2017, https://www.chathamhouse.org/sites/files/chathamhouse/public/Research/Russia%20and%20Eurasia/bp0805caspian.pdf.

246 Vladimir Socor, "China to Increase Central Asian Gas Imports Through Multiple Pipelines," *Eurasia Daily Monitor* 9, no. 152 (August 2012), accessed June 15, 2017, http://www.jamestown.org/single/?no_cache=1&tx_ttnews%5Btt_news%5D=3975.1.

Kazakhstan around 5 billion m^3 of gas to China.[247] However, dropping prices for gas turned the gas export less attractive and China is not receiving expected 55 billion m^3 of gas from Central Asian suppliers.

In fact, there are already signs that it would be quite challenging for some regional gas exporters to increase their export capacity. For instance, outdated and inefficient natural gas transportation systems, growing internal demand, and the fact that no major natural gas reserves have recently been explored are indications of Uzbekistan's physical incapability to increase its exports. The fact that Uzbekistan had to cut its gas export to Russia for 40 days to meet its internal needs in 2012[248] and that it supplied less than the agreed amount of gas to Tajikistan (132 million m^3 instead of 155 million m^3 of gas)[249] in 2012 and completely stopped gas export since 2013 can be considered signs that Uzbekistan will face challenges in supplying annually approximately 15 billion m^3 of gas to Russia,[250] 10 billion m^3 to China, and 4.5 billion m^3 within the Tashkent–Shymkent–Bishkek–Almaty pipeline system.[251] The volume of Uzbek gas export to Russia declined to 1 billion m^3 in 2015.[252] Later in 2017, Russian Gazprom signed an agreement with Uzbekneftegaz for purchasing 4 billion m^3 annually for the next five years period. The supplies are expected to start in 2018.[253] Given the fact that there has been no natural gas production boom in Central Asia and the region's gas export capacity remains at approximately 65–70 billion m^3 per year, even Turkmenistan, with its massive gas reserves, may face technical, economic, and security challenges to keep up with external demand. By reducing gas exports in almost all other directions only, Turkmenistan is currently able to gradually increase the volume of its gas supply to China. It is also not clear to what extent Kazakh authorities would prioritize ensuring sufficiency on its own gas market (Southern and South-Eastern regions) over the increasing export capacity to China. Especially taking into account the fact that China having built three lines with the capacity of 55 billion m^3 of gas transporting capacity imported only around 38 billion m^3 from all three Central Asian producers.[254]

China is providing loans to the Central Asian gas exporters turning them in debt to the fastest growing customer. Not only Turkmenistan is in debt to China, but also other Central Asian countries. In 2008, China provided a US$ 13 billion loan to Kazakhstan. Export–Import Bank of China is the largest creditor to Kyrgyzstan and Tajikistan, owing 49 percent and 36 percent of the total debt respectively.[255] Turkmen authorities, like other Central Asian leaders are counting

247 "Construction of Beineu-Bozoi-Shymkent Gas Pipeline to Wrap up by Year End," *Kazinform International News Agency,* February 25, 2014, accessed May 20, 2015, http://www.inform.kz/eng/article/2634098.
248 "Uzbekistan Vozobnovil Eksport Gaza v Rossiyu Posle Mesyachnogo Pereryva (Uzbekistan Restored Export of Gas to Russia after a Monthly Disruption)," *Kazenergy*, January 29, 2013, accessed May 5, 2015, http://kazenergy.com/ru/press/2011-04-21-10-41-35/7764-2013-01-29-11-07-35.html.
249 Erkin Akhmadov, "Uzbekistan Introduces New Laws on Gas Supply," *CACI Analyst,* January 9, 2013, accessed May 5, 2014, http://www.cacianalyst.org/?q=node/5905.
250 Farkhad Sharip, "Uzbekistan's Quest for Aral Sea Oil May Weaken Kazakhstan's Position in the Caspian," *Eurasia Daily Monitor* 9, no. 23 (2012), http://www.jamestown.org/single/?no_cache=1&tx_ttnews%5Btt_news%5D=38962.
251 US EIA, *Kazakhstan—Analysis* (Washington, DC: US EIA, n.d), accessed March 20, 2014, http://www.eia.gov/countries/cab.cfm?fips=KZ.
252 Sevinj Mamadova, "Changing Market Dynamics In Central Asia: Declining Russian Interests And Emerging Chinese Presence – Analysis," *Caspian Center for Energy and Environment,* March 6, 2015, http://www.eurasiareview.com/06032015-changing-market-dynamics-in-central-asia-declining-russian-interests-and-emerging-chinese-presence-analysis/.
253 Ilham Shaban, "Gazprom Signs Five-Year Contract on Uzbekistan's Gas Purchase," *Oil & Gas News,* April 6, 2017, accessed May 15, 2018, http://caspianbarrel.org/az/2017/04/gazprom-signs-five-year-contract-on-uzbekistan-s-gas-purchase/.
254 Kamila Aliyeva, "Turkmenistan Seeks to Supply More Gas to China in 2017," *AzeriNews,* June 1, 2017, accessed January 10, 2018, https://www.azernews.az/region/114065.html.
255 Alexander Cooley, "The Emerging Political Economy of OBOR The Challenges of Promoting Connectivity in Central Asia and Beyond," *CSIS,* October 2016, https://reconasia-production.s3.amazonaws.com/media/filer_public/fc/c7/fcc79a22-e218-4a1b-8494-0220337ab2f5/cooley_the_emerging_political_economy_of_obor.pdf.

on having a piece from announced in 2013 "One Belt, One Road" that estimates around a US$ 1 trillion of investments.[256]

European Union—one of the largest customers for natural gas, which is also the highest–paying one—has reduced its natural gas production from 213.7 billion m^3 in 2005 down to 120.1 billion m^3 in 2015. The share of the European Union in the global production balance has also reduced from 7.76 percent in 2000 down to 3.39 percent in 2015.[257] In 2017, European Union natural gas production fell by 2.6 percent in comparison with 2015.[258] In this sense, European customers' interest in Turkmen gas is expected to grow. As a result, China and Europe may turn into direct competitors for the region's resources.

Competing Energy Markets

Having experienced the negative consequences of excessive dependence on the Russian pipelines, Central Asian exporters started pursuing diversification of gas export routes to obtain access to various energy markets. However, the Central Asian region is considered to be a source of gas for external customers. Thus, increasing the volume of gas exports may have a reverse effect on availability of gas for domestic and intraregional consumption.

Energy actors promote regional cooperation through six priority gas corridors. Taking into account limited gas production capacity, however, regional gas trade within one corridor may negatively affect availability of resources for trade within another. Gas export capacity of Kazakhstan, Turkmenistan and Uzbekistan to the external markets does not currently exceed 65–70 billion m^3 per year. Even though the Central Asian producers are not supplying gas in all five directions and some corridors (to South Asia and Europe avoiding Russia) due to financial, geopolitical and security reasons have low probability of near future realization, there are already signs that regional exporters may not be able to keep up with growing demand within already connected corridors (Russian and Chinese directions and intra-Central Asian cooperation):

- Central Asia–East Asia (CAGP: over 80 billion m^3 per year);
- Central Asia–South Asia (TAPI project: 33 billion m^3 per year);
- Intra-Central Asia Cooperation (up to 6 billion m^3 per year);
- Central Asia–Russian Federation (CAC: up to 50 billion m^3 per year);
- Central Asia–European Union (Trans–Caspian Pipeline: around 30 billion m^3 per year);
- Turkmenistan–Iran (up to 20 billion m^3 per year).

Simple interest in importing Central Asia gas does not turn existing and potential customers into direct competitors. Certain conditions, however, upon which gas supply relations over the Central Asian gas are being developed imply the possibility for a more active competition. Once the expensive pipelines are put in place, in the construction of which (potential) consumers cover significant share of the cost, importers will make sure that the pipeline operates in its full capacity, to first return their investments and then profit from the export/import relations. Over time, consumers' economies will turn dependent on this imported gas, which will further increase customer's interest in obtaining resources.

The current situation with the Central Asian gas export is tricky, which instigates regional producers, especially Turkmenistan, to look for alternative markets. Gas export diversification-

256 Alexander Cooley, "The Emerging Political Economy of OBOR The Challenges of Promoting Connectivity in Central Asia and Beyond," *CSIS,* October 2016, 2.
257 Sheikin Dmitriy, "Oil and Gas Sector of the Republic of Kazakhstan," *RFCA Rating Agency*, October 2016.
258 "Natural Gas Consumption Statistics," *Eurostat Statistics Explained,* July 2017, accessed May 15, 2018, http://ec.europa.eu/eurostat/statistics-explained/index.php/Natural_gas_consumption_statistics.

oriented energy policy, however, may overshadow the consequences of it for the energy security of the exporting states and security of the CAES in general. European sanctions against Russia and tensions between Central Asian upstream and downstream countries have led to the decreasing gas trade volume within the Russian and intra-Central Asian corridors. According to the gas contract signed between Turkmenistan and Russia in 2003, the former was supposed to supply up to 70–80 billion m^3 annually via CAC pipeline. However, the amount of gas export in the Russian direction decreased to 10 billion m^3 in 2014.[259] Uzbek gas supply to Kyrgyzstan accounted for around 280 million m^3 in 2013,[260] and the same amount from that time on. Tajikistan is currently completely cut off the Uzbek gas supply chain. Turkmenistan exported around 6 billion m^3 of gas to Iran in 2013 and was expected to keep the export volume in the amount of 9–10 billion m^3,[261] which is still less than targeted 20 billion m^3 after the construction of the second gas pipeline connecting these two countries. Rapidly increasing gas export to China is balancing or in some cases instigating gas supply drops in other directions.

From January 4, 2017, Turkmenistan suspended gas export to Iran due to price disputes. As usual, two sides are bringing up a set of arguments defending their claims. Thus, the case was passed to the arbitration court. Iran and Turkmenistan signed an agreement to move Turkmen gas to the Iranian consumers in the north of the country in 1997. Sides agreed on the take–or–pay type relationships, according to which Iran was supposed to purchase gas no matter whether it physically consumed it or not. Obviously, there were deviations from the terms of agreements many times, as the gas supply volume never reached the contracted terms. Apparently, Iranian authorities never paid the penalty. It was in the interest of the Turkmen government to continue export–import relations, thus limited gas supply never truly caused troubles.[262] Of course, the Iranian side has its own version and is justifying the situation. This debt was accumulated a long time ago during harsh winter of 2007–2008 when the demand for gas went up and the Iranian side was not ready to pay for it. Having acknowledging the debt, Iranian authorities believe that shutting down gas supplies to Gilan, Mazamdaram and Golestan provinces in the northern Iran was not a friendly move. Iranian side blames its Turkmen counterpart for raising the price for gas 9 fold from US$ 40 per 1000 m^3 up to US$ 360 per 1000 m^3 of gas. However, it was not just the Turkmen authorities taking advantage and playing dirty. In 2008, Russia, major importer of Turkmen gas, agreed to pay around US$ 360 per 1000 m^3 for Turkmen gas and Turkmenistan did not want to export gas for discounted price to the Iranian consumers anymore.[263]

Turkmen authorities could have brought up the debt disputes and price issue for two reasons. First, Turkmen economy is experiencing serious financial difficulties as a result of the dropping oil and gas prices. Therefore, Turkmenistan wants to improve its economic situation by claiming the debt. Second, Turkmenistan is already obliged to export around 40 billion m^3 of gas to China and does not have spare gas for that. Thus, perhaps, Turkmen authorities are trying to comply with their obligation to the Chinese counterparts. Iran is dependent on Turkmen gas to certain extent. However, this does not give Turkmen authorities much leverage, because the dependence is relatively insignificant. Iran itself is the largest producer of gas and import from Turkmenistan constitutes only 2 percent of the Iranian production level.[264]

259 Mikhail Serov, "Turkmeniya Nedovol'na 'Gazpromom' (Turkmenistan is not Happy about 'Gazprom')," *Vedomosti,* February 17, 2015, accessed May 1, 2015, http://www.vedomosti.ru/newspaper/articles/2015/02/17/turkmeniya-nedovolna-gazpromom.
260 Otorbaev, "Problems and Perspectives for the Development of Power."
261 Ilham Shaban, "Milestone Year for Turkmen Gas Export to China?" *Natural Gas Europe,* February 10, 2015, accessed May 25, 2015, http://www.naturalgaseurope.com/milestone-year-in-turkmen-gas-export-to-china.
262 Putz Catherine., "Gas Spats: Turkmenistan Tangles With Iran," *The Diplomat,* January 2017, accessed January 5, 2017, http://thediplomat.com/2017/01/gas-spats-turkmenistan-tangles-with-iran/.
263 "Iran Unyielding as Gas Dispute Widens," *Press TV Agency*, December 28, 2016, accessed March 15, 2017, http://www.presstv.ir/Detail/2016/12/28/503815/Iran-Turkey-gas-exports-p...
264 "Iran May Apply to International Arbitration over Gas Dispute with Turkmenistan," *Neftegaz*, 2017, accessed December 15, 2017, http://neftegaz.ru/en/news/view/157163-Iran-may-apply-to-international-a...

Since the European and South Asian markets are not yet physically connected to the Central Asian gas reserves, the volume of gas export and thus, dependence of the Central Asian producers on the Chinese market is increasing. To decrease such dependence, Turkmenistan is showing even greater interest in promoting the South Asian and European corridors, which are yet in the planning stage.[265] Once stability, on the Russian and European fronts, is more or less restored, under the condition that the demand for gas is expected to increase, powers interested in Central Asian resources will try to reinstate gas supply/transit relations. But again even though it is unlikely that bigger powers' competing energy interests will take the radical form of competition for resources, their influence (political, economic, security) over Central Asian producers and regional elites' desire to profit from exports may result in an increasing gas supply to external markets even at the expense of domestic consumption. Both customers and suppliers will keep the domestic energy supply at the level that does not provoke social instability or economic crisis. It is not, however, the minimum survival level, but rather the ability to enjoy sufficiency of gas supplies that constitutes the core of energy security in this context.

It is expected that gas consumption in China and India will amount to 603 billion m^3 and 202 billion m^3, respectively, by 2040.[266] Gas consumption forecast shows increasing demand for this particular type of energy source in all major energy markets, including Europe by 2040.[267] Turkmenistan positions itself as an important source to meet growing demand for gas in these directions, which claims to be capable of increasing its gas production capacity from the current level of 70 billion m^3 up to 230 billion m^3, by 2040.[268] Both Kazakhstan and Uzbekistan have also been signing gas contracts to increase the volume of export to China and showing willingness to move gas in other directions. However, due to growing domestic demands and the increasing volume of wasted gas in highly inefficient gas transporting and consumption facilities, there are serious doubts regarding Central Asian producers' ability to keep up with external demand without negatively affecting the level of energy security in their respective countries. An attempt to increase the volume of gas exports to external customers threatens security of the CAES by affecting availability of gas for domestic and intra-Central Asian consumption.

On the one hand, inability to meet growing demand may lead to a conflict of interests and a more active form of competition between customers. On the other hand, it affects sufficiency of gas for producers' internal consumption. While the Central Asian corridor due to its relatively insignificant volume of gas trade should not seriously threaten availability of natural gas to external customers, regional producers' own desire to generate higher revenues and importing states' direct interest in moving gas out results in export increase even at the expense of domestic and intra-Central Asian consumption. In this regard, the creation of broader gas markets negatively affects intra-Central Asian energy cooperation. Moreover, gas supply shortage within Central Asia forces upstream states to push forward their giant HPP projects and thus, further escalate water-energy nexus conflict.

Despite the fact that there are energy shortages for regional consumption, Central Asian gas producers will most likely continue increasing their export capacity to meet growing international demand. There are two major reasons for regional exporters' willingness to restrict domestic consumption in favour of increasing export capacity: first, regional exporters are attempting to compensate their economic losses from subsidizing gas for domestic consumption by generating higher revenues from gas exports; second, asymmetrical power relations between Central Asian

265 "Global Energy Security is a Guarantor of Sustainable Development," *Ministry of Oil and Gas Industry*.
266 "Posledovatel'niy Rost Znachimosti Turkmenistana na Mejdunarodnom Gazovom Rinke (Increasing Role of Turkmenistan in the International Gas Market)," *Ministry of Oil and Gas Industry and Mineral Resources Journal,* April 28, 2015, accessed May 5, 2015, http://www.oilgas.gov.tm/neftegazovyj-sektor/item/402.
267 David Livingston and Deborah Gordon, "EU Energy Exchange: Balancing Security, Economy, and Climate Goals," *Carnegie Energy and Climate Program,* August 27, 2014, 9, accessed May 28, 2016, http://carnegieendowment.org/files/EU_EX%20Conference%20Report-Final%20Dft-SS%20NP-CTG-WEB.pdf.
268 "Increasing Role of Turkmenistan in the International Gas Market," *Ministry of Oil and Gas Industry*.

gas producers and such external customers as Russia, China, and, potentially, Europe/US will force regional exporters to go along with the system (in which gas export to the external markets is prioritized) rather than challenge it.

Energy Subsidies, Energy Efficiency

One of the reasons for Central Asian gas exporters' policies of restricting domestic consumption through rationing is the use of subsidized gas for political purposes domestically. Low prices for gas on the domestic market result in over-consumption and lower profits for producers (both private and state-owned companies), making it unattractive to invest in upgrading domestic gas infrastructure that can significantly increase efficiency to avoid gas waste and expanding pipeline networks to supply distant regions and a larger number of people with gas.[269] Revenues from the export of gas compensate the economic loss from the subsidized energy market and thus export-oriented energy policy would remain a priority for the regional producers.

Table 3. Fossil Fuels Consumption Subsidy Uzbekistan, Kazakhstan, Turkmenistan in Million US$, 2016.

	Uzbekistan	Kazakhstan	Turkmenistan
Oil	175	1,174	2,390
Electricity	855	1,379	866.7
Gas	3,623	264	1,790
Coal	0	1,571	0

Source: IEA, "Fossil Fuel Consumption Subsidy by Country 2016," https://www.iea.org/newsroom/news/2017/december/commentary-fossil-fuel-consumption-subsidies-are-down-but-not-out.html.

Losses caused by outdated and inefficient gas production and transportation infrastructures cost Uzbekistan approximately 4-5 percent of its GDP every year.[270] Kazakhstan consumes only half of its overall gas production and exports the other half because it lacks extensive internal gas supply networks to transport resources from the resource-rich regions to distant consumption centers.[271] Increasing the volume of gas by building large production facilities seems to be a priority area for regional producers. However, according to some experts, because the level of gas loss at the consumer end is extremely high, investments in energy projects to increase efficiency would most likely cost about half as much as building new facilities with almost the same results.[272] For instance, poor transportation and distribution infrastructures accounted for losses of 20 billion m^3 of natural gas per year in the beginning of 2000s in Uzbekistan.[273] The situation has been to some extent improved over time, but the level of gas infrastructure inefficiency remains a major challenge. Inefficient energy transportation and consumption facilities still account for 60 percent of primary energy loss in the country.[274] Another example is

269 Benedict, Clements, David Coady, Stefania Fabrizio, Sanjeev Gupta, Trevor Alleyne and Carlo Sdralevich, *Energy Subsidy Reform: Lessons and Implications* (Washington: International Monetary Fund, 2013), http://www.imf.org/external/np/pp/eng/2013/012813.pdf.

270 World Bank Group, Uzbekistan: The Economics of Efficiency. Uzbekistan Pushes to Reduce Energy Consumption in Industry (Washington, DC: World Bank, 2013), accessed May 1, 2016, http://www.worldbank.org/en/results/2013/04/30/uzbekistan-the-economics-of-efficiency.

271 Naubet Bisenov, "Neighbourly Negotiations," Energy Global, 2013, accessed June 15, 2014, www.energyglobal.com/news/pipelines/articles/Neighbourly_negotiations_an_analysis_ of_central_asian_energy_pipelines.aspx.

272 Natalia Mirimanova, "Interview with Rainer Behnke," Europe-Central Asia Monitoring (2009), accessed March 5, 2015, http://www.eucentralasia.eu/fileadmin/PDF/Commentaries/Interview_INOGATE.pdf.

273 Jacob Townsend and Amy King, "Sino-Japanese Competition for Central Asian Energy: China's Game to Win," China and Eurasia Forum Quarterly 5, no. 4 (2007): 27.

274 World Bank, "Uzbekistan: The Economics of Efficiency."

the CAC pipeline network, which was designed and built in 1966–1987 with an overall capacity of about 90 billion m^3 per year. The lack of maintenance and investment over time has almost halved the operational capacity of the system to less than 50 billion m^3 per year.[275] According to the International Energy Agency, at least 30 billion m^3 of gas is annually wasted. Even the Gazprom representatives acknowledge that investments in the pipelines would save up to 10 billion m^3 of gas annually.[276] Figures significantly vary depending on different sources, but what is important is that in any case gas loses in the region are still very high. Low gas prices in the domestic markets make it unattractive for the government and private enterprises to invest in improving gas sector. In an attempt to compensate for financial losses caused by subsidized domestic gas markets, Central Asian producers are increasing their gas export capacity, which is negatively affecting sufficiency of domestic consumption.

Asymmetrical Power Relations within the Central Asian Energy System

Central Asian gas producers' attempt to reduce their gas exports dependence on Russia by establishing interdependent relations with external customers was successful, to a certain extent, especially with China. In 2009, the dominance of Russia, with its century-long cultural and political ties to the Central Asian region, but with aging pipelines in the energy sector, was challenged by China.[277] However, there is still asymmetry in the extent of vulnerability to gas supply/demand disruptions for producers within the CAES. The higher the cost of the termination or drastic alteration of gas relations for an actor, the more vulnerable this actor is.[278] Currently, most of the Central Asian gas is transported through Chinese and Russian pipelines. However, neither China nor Russia considers Central Asian gas a vital source for their economy. Russia needed Central Asian gas mainly to fulfill its supply obligations to Europe. While Central Asian gas represents approximately half of all imported gas, it yet accounts for only insignificant share of the Chinese overall energy consumption. Central Asian producers supplied in total less than 30 billion m^3 of gas, which was around 16 percent of the total gas consumption. Taking into account the fact that gas represented around 5 percent of the total primary energy consumption in, the share of the Central Asian gas does not exceed 1 percent of it.[279] Given the fact that selling natural gas accounts for approximately half of Turkmenistan's[280] budget and significantly contributes to Kazakhstan and Uzbekistan's budgets, Central Asian gas exporters are more vulnerable to gas supply disruptions than either Russia or China.[281] Central Asian producers are currently increasing gas supply to China by reducing the volume of export in other directions, thus, swapping their dependence on the Russian infrastructure into dependence on the Chinese market. The amount of gas being exported to China from Central Asia is growing fast and it is important to meet gas needs of the western regions of China. However, Central Asian gas still covers relatively insignificant share of the Chinese overall primary energy consumption. Thus, Central Asian producers will remain more vulnerable to potential gas supply disruptions to China than the Chinese economy could potentially suffer from supply cut-offs.

275 International Energy Agency, "Optimizing Russian Natural Gas."
276 Michael Fredholm, "Natural Gas: An Expensive Trickle," Transitions Online, April 10, 2008, http://www.tol.org/client/article/19509-an-expensive-trickle.html?print.
277 Garrison and Abdurahmonov, "Explaining the Central Asian Energy Game," 382.
278 Robert O. Keohane and Joseph S. Nye, Power and Interdependence: World Politics in Transition (Boston: Little, Brown, 2001).
279 Business News Europe, "Central Asia Supplies Close to Half of Chinese Gas Imports in 2013," The Uyghur American Association, June 18, 2014, accessed June 1, 2015, http://uyghuramerican.org/article/central-asia-supplies-close-half-chinese-gas-imports-2013.html.
280 Stratfor Contributor, "Difficulties Loom For A Turkmen-China Energy Deal," Forbes, August 3, 2011, accessed December 4, 2013, http://www.forbes.com/sites/energysource/2011/03/08/difficulties-loom-for-a-turkmen-china-energy-deal/.
281 Townsend, and King, "Sino-Japanese Competition for Central Asian Energy," 23.

Due to asymmetrical power relations within the CAES, some countries hold power advantages over others, in which the latter are very limited in their foreign policy choices. In this sense, more vulnerable states are likely to go along with the pattern, in which energy export to external markets is prioritized.[282] However, in an attempt to increase their bargaining power, regional exporters support various gas export diversification projects. However, regional exporters' physical inability to produce sufficient gas to meet international demand may lead to competition between external customers for the region's gas. The Shanghai Cooperation Organization is the only (and quite vague) institutional framework to regulate gas export/import relations between regional producers and major customers (China and Russia).[283] In the absence of an effective enforcement mechanism to coordinate gas supply relations, the consequences of such competition are unpredictable.

If the Central Asian gas exporters are relatively weaker players in the gas export/import relations with China and Russia, they are in a far better position to dictate terms of gas supply relations with the Central Asian consumer countries. Tajikistan and Kyrgyzstan's gas reserves are insignificant, and these countries rely on imports from Kazakhstan, but mostly unreliable Uzbekistan. For instance, gas supply disruptions from Uzbekistan and Turkmenistan to Tajikistan in 2008 caused countrywide electricity blackouts throughout the entire winter period.[284] While gas and power supplies from Uzbekistan were later restored, the volume of energy trade has been decreasing since then. Uzbekistan supplied less than the agreed amount of gas to Tajikistan (132 instead of 155 million m^3 of gas) in 2012 and completely stopped gas export to its neighbour since 2013. According to general director of "Kyrgyzgaz" Turgunbek Kulmurzaev: "Uztransgaz (state-owned energy company of Uzbekistan) stopped gas supply at night without any warning and we don't know the reason, because no one is answering the phone in Uzbekistan." Kyrgyz government acknowledged that it owned US$ 88,000 to Uzbekistan, but the sum was not critical enough to cut gas supply without warning. Even though Kyrgyzstan has developed seven oil fields and two gas fields, difficult geological conditions keep the recovery rate very low. Neither Kyrgyzstan nor Tajikistan is capable of influencing foreign policy of Uzbekistan. Besides, increasing the volume of exports to external customers is negatively effecting intra-Central Asian gas consumption.

Gas Relationships Affecting Water–Energy Nexus in Central Asia

Despite the fact that Uzbekistan, Kazakhstan and Turkmenistan possess considerable amount of energy resources, there are a number of factors affecting availability of sufficient and sustainable energy supplies for domestic, intra–Central Asian and external customers. Major energy problems that Uzbekistan is currently facing include, but are not limited to: (a) outdated energy generation, transportation and consumption facilities, which result in both commercial and technical losses; (b) subsidized energy, especially gas, sector that bears high economic cost and affects investment climate in implementing energy reforms; (c) excessive dependence on natural gas in the overall domestic consumption balance, which limits Uzbekistan's gas export capacity; (d) decreasing volume of oil production; (d) underdeveloped renewable energy sector; and (e) lack of intra–Central Asian energy trade. These factors have negatively affected the overall relationship between Central Asian upstream and downstream countries. Upstream, hydro-power rich Tajikistan and Kyrgyzstan to mitigate energy crises started releasing water interrupting the pattern of water flow along the water stream on transboundary rivers.

282 Jean A. Garrison and Ahad Abdurahmonov, "Explaining the Central Asian Energy Game: Complex Inter-dependence and How Small states Influence their Big Neighbours," Asian Perspective 35 (2011): 387.
283 Mehmet Ogutcu and Ma Xin, "Geopolitics of Energy: China and the Central Asia," Insight Turkey 9, no. 4 (n.d.), 55, accessed September 20, 2016, http://files.setav.org/uploads/Pdf/ogutcu_ma.pdf.
284 Laldjebaev, "The Water-Energy Puzzle in Central Asia," 23–36.

During the summer of 2008, the outlet of water to produce electricity increased. This significantly decreased the level of water in the reservoirs for the winter to generate electricity to meet at least the minimal internal consumption needs.[285] The price hike for Uzbek gas and reduced amount of gas imports worsened the level of energy security in Tajikistan and Kyrgyzstan. Just before the winter, Uzbekistan doubled the price of natural gas exported to Tajikistan. Although the government of Tajikistan persuaded Uzbek authorities to decrease the gas price from US$ 300 to US$ 240 per 1,000 m^3 (US $90 higher than the previous price),[286] it was still higher than the price Tajikistan was willing to pay.

Having experienced severe energy shortages in the past, Kyrgyzstan and Tajikistan want to speed up the construction of the Rogun and Kambarata HPPs. For Tajikistan and Kyrgyzstan, increasing hydro-power potential to meet their electricity needs has become a national security priority. Taking into account the huge hydro-power potential of these countries, the construction of the Kambarata I and Rogun HPPs will increase their bargaining power vis-à-vis Uzbekistan and may provide greater energy security. These projects, however, have turned into major sources of tensions for the stable and reliable supplies of electricity within the Central Asian power system.

285 Laldjebaev, "The Water-Energy Puzzle in Central Asia," 29.
286 Laldjebaev, "The Water-Energy Puzzle in Central Asia," 30.

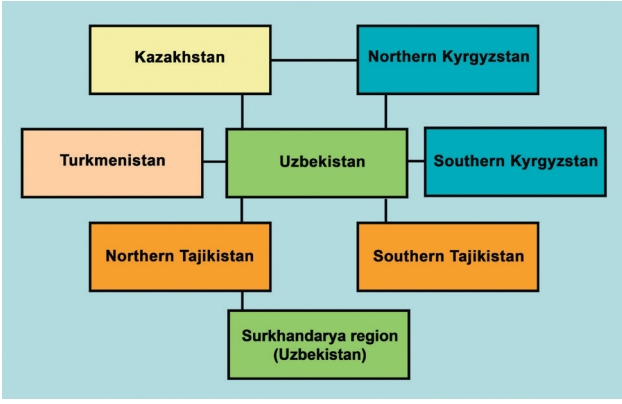
CHAPTER IV.

SECURITY OF THE CENTRAL ASIAN (ELECTRIC) POWER SYSTEM

Chapter IV. Security of the Central Asian (Electric) Power System

The CAPS was established in the 1960s and 1970s. The system consisted of mainly 30 percent HPPs of Central Asian upstream and 70 percent TPPs of downstream countries.[287] The Integrated Dispatch Center Energia, based in Tashkent (Uzbekistan), controlled the electric power supply operations of the CAPS. Even though the CAPS was part of the Unified Energy System of the USSR, physically it was isolated from the Russian electricity grids. After the collapse of the Soviet Union, the CAPS started operating on its own. Also called the Central Asian "electricity ring," CAPS connected all 83 power units (including 29 thermal and 48 hydro) of the Southern part of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan and was managed by Energia.[288] Fifty-one percent of total CAPS electricity was generated in Uzbekistan, 13.8 percent in Kyrgyzstan, 9.1 percent in Kazakhstan, 15 percent in Tajikistan, and 10 percent in Turkmenistan.[289] Therefore, Uzbekistan played a key role in electric power distribution within the region and remains extremely import to restore and sustain intra-Central Asian electricity trade.

Figure 5. The Central Asian Power System Interlinkages.



Despite the fact that intra-regional electricity trade was mutually beneficial for all actors involved, Uzbekistan decided to withdraw from the CAPS. Some experts characterize the decision as a politically motivated move. Others argue that Uzbekistan's withdrawal was provoked by Tajikistan itself. Announcement of the opening of a new 500 kV electric power transmission line South–North by Tajik authorities without proper notification of their counterparts was considered by the Uzbek side as Tajikistan's attempt to establish independent electric power system and a preparation to withdraw from the CAPS.[290] Referring to this particular announcement, Sagdulaev, head of the department at Uzbekenergo, published an article in the Pravda Vostoka newspaper saying that "from now on [2009] Central Asian electric power grid operations will jeopardize stability and safe functioning of Uzbek electric power system, and Uzbekistan raises the issue of withdrawing from the system and operating in a separate mode."[291] The message that he tried to deliver was that every Central Asian state was pursuing its own interests with no concerns

287 Khamidulla, Shamsiev, "Coordination and Dispatch Center 'Energy' Issues of Regional Cooperation Within the Central Asia Integrated Power System," 2009.
288 Asian Development Bank, "Electric energy," *Final Report RETA* 5818, 2000, 11.
289 Asian Development Bank, "Electric energy," *Final Report RETA* 5818, 2000, 19.
290 Payrav Chroshabiyev, "Uzbekistan's Decision to Withdraw from CA Power Grid Provoked by Tajikistan Itself, Says Tajik Expert," *ASIA-Plus,* November 9, 2009, accessed May 1, 2016, http://news.tj/en/news/uzbekistan-s-decision-withdraw-ca-power-grid-provoked-tajikistan-itself-says-tajik-expert.
291 Avaz Yuldoshev and Viktoriya Naumova, "Uzbekistan Plans to Pull Out of Central Asia's Power Grid Next Month," *ASIA-Plus*, November 7, 2009, accessed March 20, 2015, http://www.news.tj/en/news/uzbekistan-plans-pull-out-central-asia-s-power-grid-next-month.

for the consequences to others. This is exactly what Uzbekistan did. As a result, Uzbekistan's withdrawal from the CAPS to a different extent affected all its member states.

Intra–Central Asian electricity trade ensured security of the CAPS, in which everyone's energy interests were met simultaneously. However, regional electricity trade that accounted for 25,000 GWh per year in 1990 dropped to the level of 4,000 GWh per year in 2008 and has been further decreasing since then.[292] There are several factors indicating that Uzbekistan can significantly benefit from intra–Central Asian energy trade, which can lead to: (a) diversification of energy sources in the overall energy consumption balance, which contributes to the sustainability of energy supplies; (b) exploitation of existing energy resources in the most rational way; (c) increasing efficiency of energy production and transportation facilities; and, (d) indirect contribution to the resolution of the water–energy nexus problems in Central Asia.

Initially, the energy sectors of Central Asian countries were designed to operate within a unified energy system. Resource-sharing mechanism was based on the rational use of energy, with each state contributing different types of sources (Kyrgyzstan and Tajikistan—hydro-power, Kazakhstan—oil and coal, Turkmenistan—gas, and Uzbekistan—oil and gas) to the energy consumption balance of the Central Asian energy system. High dependence on a particular source of energy was not an issue for Uzbekistan within the system, which operated irrespective of political (administrative) and economic borders. By contributing different sources, the Central Asian energy sectors formed a complete energy system capable of meeting the energy needs of all countries simultaneously. The disintegration process of the CAES, however, affected the availability of gas and thermal electricity to upstream countries, and hydroelectricity supplies and efficiency of energy sectors to downstream countries, especially Uzbekistan. As a result, Uzbekistan consumes even more environmentally unfriendly energy sources. Eighty five percent of total coal produced in the country is used to generate electricity, which accounts for 3 percent of the overall energy consumption. Consumption of the coal in the country is expected to increase up to 10–11 percent in the near future.[293] Intra–Central Asian trade, in which Uzbekistan imports environmentally friendly hydroelectricity, contributes to the sustainability of its energy sector.

Sustainability of the Uzbek energy sector can also be considerably improved by using existing resources in the most rational way. In the winter, burning gas and coal produces thermal electricity and is used for heating purposes, while in summer TPPs only generate electricity. Within the CAPS, Tajikistan and Kyrgyzstan supplied clean electricity to downstream Uzbekistan during vegetation (spring–summer) period. In return, Uzbekistan exported electricity produced in gas-fired TPPs to upstream neighbours in the wintertime and provided heating services to its population. The majority of Uzbekistan's population receives heating services through the central heating system supplied by the coal- and gas-fired (combined heat and power plants) TPPs. Withdrawal from the CAPS forced Uzbekistan to increase thermal electricity production in summer months, with no need for heat generation. Coordinated operation of the electric power systems also contributed to Uzbekistan's ability to fully meet its electricity demand peaks in the mornings and evenings.

The energy intensity (energy efficiency measurement) of Uzbekistan exceeds other middle-level developing countries by 2–2.5 times.[294] Increasing efficiency of outdated energy producing and transporting facilities can decrease the level of energy intensity. Electric power generation facilities in Uzbekistan were constructed to operate in a base-mode and the efficiency of the

292 Asian Development Bank, "Central Asia Regional Economic Cooperation: Power Sector Regional Master Plan, 2009, 1, http://www.adb.org/sites/default/files/project-document/74195/43549-012-reg-tacr-01.pdf.
293 Government of the Republic of Uzbekistan, "Coal industry," n.d., accessed June 5, 2014, http://www.gov.uz/en/helpinfo/energy/2680.
294 Alixanov, B, "Konceptualnie Podxodi k Formirovaniyu 'Green Economy' v Uzbekistane (Conceptual Approaches to Green Economy in Uzbekistan)," *Center for Economic Research, Analytical Report*, 2011, 64.

gas-fired TPPs is reduced when operated to meet the peak load. Importing electricity form the neighbouring upstream states is not only economically beneficial as it saves at least US$ 60–70 million annually if during summer months it imports an average of 1,400 GWh from hydro-rich neighbours,[295] but also reduces the need for introducing new generation capacities working on environmentally unfriendly energy resources.

In the past, the CAPS encompassed all five Central Asian countries, but it is currently operating with only three: the Kyrgyz Republic, Kazakhstan, and Uzbekistan. The analysis of Uzbekistan's energy policy priorities shows that intra–Central Asian energy cooperation is no longer a priority for the government. Uzbekistan used to consider itself capable of entirely meeting its electricity as well as gas/fuel needs. Thus, within the framework of its National Development Programs, Uzbekistan prioritized "stability"—a status quo in energy and water consumption. Any project that brought major changes to the status quo is considered to be compromising stability and, thus, unacceptable. Inflexible position of the government of Uzbekistan regarding the construction of the Rogun and Kambarata–1 was a clear example of its static energy/water policy. These major projects are expected to bring energy independence to Tajikistan and Kyrgyzstan, while Uzbekistan is concerned about potential water release disruptions and the consequences of the giant dams' failure for downstream countries. Despite the fact that the lack of intra-regional energy cooperation has been negatively affecting the energy security of Uzbekistan, it continued to avoid an active engagement in the resolution of water–energy nexus problems in Central Asia, because the water distribution, in which Uzbekistan enjoyed over 50 percent of water withdrawal, the amount necessary to cultivate high quantities of water-intensive cotton and wheat, perfectly suited its interests.[296] Uzbekistan even warned to use actions, including force, against any serious interference with the current level of water withdrawal in the region. Despite the fact that the new leadership in Uzbekistan are claiming government's serious intentions to re-engage in Central Asian energy dynamics and restore energy trade, evidences show that controversies, which existed between states until recently are still quite relevant. Intra–Central Asian energy trade, however, can improve availability of energy supplies for upstream countries and can prevent regional state actors from using radical means in pursuit of their energy independence. Before moving into the detailed analysis of the relationships among Central Asian countries within the framework of the former CAPS, it is necessary to analyze electric power sectors of each of the Central Asian countries and determine their primary energy policy priorities.

295 Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note," *International Bank for Reconstruction and Development / The World Bank,* 2013, 37.
296 Jenniver, Sehring, "The Politics of Water Institutional Reform in Neo-Patrimonial States: a Comparative Analysis of Kyrgyzstan and Tajikistan," *Springer Science & Business Media*, 2009, 71.

Dependence and Vulnerability of the Power Sector of Kyrgyzstan

Kyrgyzstan has the potential to produce annually up to 142.5 billion kWh of hydroelectricity, which places it third after Russia and Tajikistan among post-Soviet countries.[297] That is why hydro-power is considered a priority direction in the development of Kyrgyzstan's energy sector. The share of hydroelectricity in the overall electricity production of Kyrgyzstan accounted for 60–65 percent in 1990, but reached 90 percent in 1998.[298] Currently, 90 percent of electricity in Kyrgyzstan is generated by HPPs and only 10 percent by TPPs in the Osh region. Ninety percent of hydroelectricity is generated by a set of cascades on the Naryn Trans-boundary River, which nourishes Kyrgyzstan, Tajikistan, Uzbekistan, and Kazakhstan.[299]

During the Soviet period, major hydro-power development projects were designed mainly by the Tashhydroproject Institute in Tashkent, Uzbekistan. The Upper Naryn cascade consists of eight HPPs: Oruktam–1, Oruktam–2, Ekinaryn, Dzhanikel, Akbulun, Naryn–1, Naryn–2, and Naryn–3. The process of utilizing the hydro-power potential of the Naryn River started in the 1950s. The general plan of Naryn–1 HPP was developed in the Tashhydroproject Institute in 1992. The middle Naryn cascade consists of three stations: Kambarata–1, Kambarata–2, and Kambarata–3 HPPs.[300]

Currently, the largest amount of electricity production comes to the HPP cascade in the Toktogul reservoir. Toktogul HPP has a capacity of 1200 MW and covers one-third of the total installed power capacity of 3786 MW. Toktogul was filled (19.5 billion m^3), allowing the Kyrgyz government to export a significant volume of electricity to neighbouring Kazakhstan in 2010.[301] The water level in Toktogul has been dropping. It was expected that it would drop below the electricity production level (7 billion m^3) by April 2015. The water level in the dam has indeed reached a critically low level. Taking into account the fact that it takes up to 9 billion m^3 to use its full power generation capacity, the water level in the reservoir should not decrease below 15 billion m^3.[302] Because of the rapidly melting glaciers, however, major water reservoirs in Kyrgyzstan were filled with water more than was forecasted. And, Kyrgyz authorities started exporting electricity to Kazakhstan again.

Climate change and rapidly melting glaciers secured enough water for Kyrgyzstan to produce electricity to meet domestic needs and for export. The largest Toktogul water reservoir has hit its almost full capacity of 18.78 billion m^3 in 2017.[303] These conditions will secure water and energy interests of the Central Asian upstream and downstream countries, allowing them to use water in the most rational way. In the long-run, however, climate change may impact the water availability causing another wave of tensions. Restored intra–Central Asian trade might also

297 Regional Economic Cooperation in Central Asia, "Electric Energy," *Final Report RETA 5818* (2000): 14, http://www.docstoc.com/docs/19688087/Electric-Energy#top.
298 U. Mateev and G. Anderson, "Energetika Kirgizskoy Respubliki i Puti Ee Razvitiya (Energy Sector of Kyrgyz Republic and Its Development Paths)," *REFORMA*, February 1999, accessed February 1, 2016, http://journals.manas.edu.kg/reforma/oldarchives/1999-2-2/8_1540-3762-1-PB.pdf.
299 Ernest Karibekov, "Est' li Rinok Elektroenergii v Kirgizstane, Chast 1 (Is There an Energy Market in Kyrgyzstan, Part 1)," *Analitika*, January 17, 2014, http://analitika.akipress.org/news:4952.
300 Electric Power Stations, *Elektricheskie Stancii (Electric Power Stations)*, (Bishkek, n.d), accessed January 27, 2015, http://www.energo-es.kg/?page=articles&read=18.
301 Vladimir V. Kouzmitch, "Strengthening Cooperation of Central-Asian Countries in Using Advanced Technologies in Energy Efficiency and Renewable Energy Sources," *Project of the United Nations Economic Commission for Europe*, 2013, 31, accessed May 15, 2015, http://www.unece.org/fileadmin/DAM/energy/se/pdfs/gee21/projects/AdvTech_IncreasingCooperation.pdf.
302 "Toktogulskaya GES Mojet Ostanovitsya k Vesne 2015 Goda (Toktogul HPP Can Stop Operating by Spring 2015)," October 2014, accessed January 1, 2015, http://www.stanradar.com/news/full/12811-toktogulskaja-ges-mozhet-ostanovitsja-k-vesne-2015-goda.html.
303 Ekaterina Ulitina, "Kyrtyzstan Nachal Export Elektroenergii v Uzbekistan (Kyrgyzstan Has Started Exporting Electricity to Uzbekistan)," accessed February 7, 2017, http://www.kp.kg/online/news/2799944/.

help mitigating the crisis ahead.

There is a huge potential to increase hydroelectricity production in Kyrgyzstan. Technically and economically, the most promising projects considered by the government are Kambarata–1 and –2 HPPs, which were developed by Tashhydroproject Institute back in 1980s. Construction of the Kambarata–2 project started in 1986 and stopped after the disintegration of the Soviet Union. The construction process was restarted in 2003 and the first electric power generating aggregate with a capacity of 120 MW started operating in 2010. The governments of Kyrgyzstan and Russia signed an agreement on building Kambarata–1 HPP on February 3, 2009.[304] The Kyrgyz government highlights that there is a possibility to build 7 more cascades with 33 hydro-power stations on the Naryn River. This set of HPPs will have a capacity of 6450 MW, capable of generating 22 billion kWh of electricity annually.[305]

However, Kyrgyzstan's electric power sector consists almost completely of water run-of-river type HPPs,[306] which can generate electricity mostly in the summertime. To meet its winter electricity needs, the Kyrgyz government has to either develop its own limited fossil fuel potential and build TPPs or secure stable thermal electricity import from neighbouring states. Construction of the Kara–Keche coal-fired TPP is considered to be one of the most promising projects to ensure electricity supplies to the northern parts of the country. Kara–Keche coal-fired TPP is located 50 km from Chaek, Naryn region. Kara–Keche TPP's technical and economic feasibility was studied back in 1979–1983 and, according to some estimates, has a higher electricity production coefficient than any other hydro-power generating facility.[307]

Kyrgyzstan is short on funds and is counting on foreign investors to contribute to the development of the country's hydro-power potential. Russian RusHydro is engaged in the construction of the Upper Naryn cascade and building of Kambarata–1. The Chinese company SINOHYDROLtd cooperates with the Kyrgyz government on the construction of the Susamir–Kokomeren HPP (which has a capacity of 1305 MW). The Asian Development Bank is assisting in the modernization of the Toktogul HPP (which has a capacity of 1200 MW).[308]

304 Electric Power Stations, *Elektricheskie Stancii: Kambarata-1* (Electric Power Stations: Kambarata-1) (Bishkek: Electric Power Stations, 2014), accessed February 2, 2015, http://www.energo-es.kg/?page=article&read=43.
305 Electric Power Stations, *Investicionnie Proekti (Investment Projects)* (Bishkek: Electric Power Stations, n.d), accessed December 1, 2014, http://www.energo-es.kg/?page=articles&read=6.
306 Water run-of-river type HPP does not require the use of a dam and generates electricity by channeling a portion of a river through a canal or penstock. See "Types of Hydro-power Plants," *Energy.gov,* http://energy.gov/eere/water/types-hydropower-plants.
307 Joormat Otorbaev, "Problemi i Potencial Razvitiya Elektroenergetiki v Kirgizskoy Respubliki (Problems and Perspectives for the Development of Power Sector in Kyrgyzstan)," (Government of Kyrgyz Republic, 2014), Accessed December 4, 2016, http://www.gov.kg/?p=41665&lang=ru.
308 Electric Power Stations, *Sotrudnichestvo s Zarubejnimi Partnerami (Cooperation with Foreign Partners)*, (Bishkek: Electric Power Stations, n.d), accessed December 3, 2014, http://www.energo-es.kg/?page=articles&read=7.

Table 4. Major Hydro-power and Thermal Power Plants of Kyrgyzstan.

Object	Number of aggregates	Installed capacity, MW	Average production capacity, million kWh	Investment needed, million US$	Approximate construction time
Susamir–Kokomeren HPPs cascade					
Karakol HPP	2	33	104	257,84	2015-2017
Kokomeren – 1 HPP	4	360	904	1607,8	2014-2017
Kokomeren – 2 HPP	4	912	2412	1478,1	2014-2021
Upper Naryn HPPs cascade					
Akbulun HPP	2	100	372	137	2017-2019
Naryn–1 HPP	4	62	227	85	2014-2016
Naryn–2 HPP	2	60	235	82	2015-2017
Naryn–3 HPP	2	60	254	82	2017-2019
Middle Naryn HPP cascade					
Kambarata–1 HPP	4	1600	5164	2568	2015-2021
Kambarata–2 HPP	3	360	1148	188	2013-2019
Kara–Keche TPP					
Kara–Keche TPP	4	1400	9600	2183	2014-2022

Source: Electric Power Stations, *Elektricheskie Stancii: Kambarata-1* (Electric Power Stations: Kambarata-1) (Bishkek: Electric Power Stations, 2014), accessed February 2, 2015, http://www.energo-es.kg/?page=article&read=43

Kyrgyzstan: Mitigating Energy Crisis

Unlike oil- and gas-rich Kazakhstan, Kyrgyzstan only enjoys significant hydro-power potential, which is yet to be fully developed. With seasonal electricity production variations and an underdeveloped fossil fuel sector, it is the coordinated operation of the CAPS and import of gas and oil products from Central Asian downstream countries that ensured Kyrgyzstan's energy security. Thus, Uzbekistan's withdrawal from the CAPS and decreasing gas import has negatively affected the level of energy security in the country. As a consequence, the Kyrgyz government was forced to prioritize mitigating the energy crisis by equally distributing available energy resources and reliance on Kazakhstan and Russia to meet its winter energy demands. Currently, energy production capacity does not allow Kyrgyzstan to meet its energy needs all year round on its own. Thus, ensuring stable and reliable import of natural gas and thermal electricity from the neighbouring states remains an important aspect of Kyrgyzstan's energy policy.

Energy Crisis

Hydro-power is the main source of electricity production in the country. Kyrgyzstan's electric power sector is dependent on run-of-river type HPPs constructed along the Naryn River. The largest hydroelectricity-producing facility is Toktogul. Toktogul may not have the largest HPP in terms of power production capacity (1200 MW) in Central Asia, but it is the only reservoir capable of accumulating enough water to produce electricity in both the summer and winter months. The biggest reservoirs in Central Asia are Toktogul (19.5 km³) in Kyrgyzstan, and Nurek (10.5 km³) and Kairakum (4.16 km³) in Tajikistan.[309] However, overuse of water in Toktogul to produce electricity in 2013–2014 and the reduced water flow from the mountains relative to previous years has resulted in a water level drop in the reservoir and affected near-

309 Food and Agriculture Organization of the United Nations, "Aral Sea Transboundary River Basin," *Aquastat website,* 2012, 11, accessed March 1, 2015, http://www.fao.org/nr/water/aquastat/basins/aral-sea/index.stm.

future prospects for increasing electricity production. The level of water release to downstream countries during that period remained within the range of previously agreed quotas. It is unclear though how the water drop will affect the volume of water release in the years ahead. Kyrgyzstan produced 14 billion kWh in 2014 and consumed it all. It was expected that the country would only produce 11.6 billion kWh in 2015, while the consumption needs would amount to 15.8 billion kWh in 2015.[310] Climate change and the warmest years of 2015 and 2016 in the past century has resulted, however, in rising water stream level, which is nourished from melting snow caps in the mountains and glaciers. Relative increase of water in transboundary water objects has mitigated to some extent energy crisis in the country. Yet, there is no guarantee that Kyrgyzstan will not experience water shortage to run its HPPs in the future.

The production of primary energy resources in the country has never met its consumption level, which implies that any further drop of energy production will worsen the energy crisis. The decreasing gas supply from neighbouring countries also severely affected Kyrgyzstan's energy security. Kyrgyzstan possesses less than 10 billion m^3 of proven gas reserves.[311] Having produced 30 million m^3 of gas, it imports the remaining 270 million m^3.[312] Kyrgyzstan imports 90 percent of its domestically consumed energy from Uzbekistan and Kazakhstan.[313]

Ensuring Human Energy Security

Having experienced two civil uprisings, the government of Kyrgyzstan is particularly concerned about the social and political instability that a shortage of electricity may lead to. Kyrgyzstan consumes on average 22–23 million kWh of electricity during warm summer days and 70 million kWh during cold winter days and most of it goes to household consumption. Kyrgyz households consumed 4.2 billion kWh of electricity, which accounted for 30 percent of the overall production, in 1999. The level of electricity consumption by the household sector reached 7.2 billion kWh, constituting 63 percent of the overall electricity production in the country, in 2012.[314] Due to a significant water drop in the reservoirs, the government of Kyrgyzstan was forced to limit electricity consumption by 30 percent of the total consumption volume in the previous year from October 1, 2014 to March 31, 2015.[315] This implies that an inability to produce sufficient electricity does not only hit the economy, but also affects the country's ability to meet basic human needs.

Reliance on Support from Russia and Kazakhstan

With a very strong Russian lobby and relatively good relationships with Kazakhstan, the Kyrgyz government is now counting on these two actors to secure stable and adequate supplies of energy, especially in winter. The Russian lobby forced the Kyrgyz government to repeal the law prohibiting bailing out strategic facilities of the country. As a result, Russia ratified an agreement with the Kyrgyz government, according to which the entire gas sector of Kyrgyzstan (including the national company Kyrgyzgaz, gas pipelines, gas-distributing stations, and underground gas

310 Otorbaev, "Problems and Perspectives for the Development of Power."
311 British Petroleum Company, *BP Statistical Review of World Energy June 2017*.
312 Eni, *World Oil and Gas Review for 2014*.
313 "Uzbek Gas Supplies to Southern Kyrgyzstan Resumed," *The Times of Central Asia,* December 31, 2014, accessed March 3, 2015, http://www.timesca.com/news/14814-uzbek-gas-supplies-to-southern-kyrgyzstan-resumed.
314 "Uzbek Gas Supplies to Southern Kyrgyzstan Resumed."
315 Ivan Donis, "S 1 Oktyabrya v Kirgizii Vvodyatsya Veernie Otklyucheniya Sveta (Kyrgyzstan is Introducing Rolling Blackouts Starting from October 1, 2014)," *News-Asia*, August 13, 2014, http://www.news-asia.ru/view/ks/6991.

storage facilities) was sold to Gazprom for US$ 1 in return for forgiveness of state debts.[316] Most importantly, however, Kyrgyz government was counting on Gazprom to serve as a middleman between importing Kyrgyzstan and exporting Uzbekistan to ensure stable gas supplies. Critics of the deal fear excessive political leverage over the country that selling Kyrgyzgaz gives to Russia. "Kyrgyzstan needs gas, not Kyrgyzgaz," said in one of his speeches Melis Erzhigitov, a spokesman for Prime Minister Zhantoro Satybaldiyev, as a reply to the criticism in 2013. He also added "Gazprom will provide the country with an uninterrupted supply of gas and maybe even for a cheaper price."[317] Aleksey Miller, a Gazprom chairman, describing the deal promised that the company "[now] guarantees a stable gas supply" to Kyrgyzstan.[318]

Kyrgyzstan is receiving certain preferences. Kazakhstan agreed to export 1.4 billion kWh of electricity to Kyrgyzstan generated in Zhambyl TPP in 2014. This electricity was produced from 330 million m^3 of imported Uzbek gas, which was supplied by Gazprom, the Russian gas company, in 2014.[319] In 2017, Kyrgyz government signed an agreement with its Uzbek counterparts on exporting electricity to Uzbekistan. While Uztransgaz exported gas to Kyrgyzstan for US$ 290 per 1,000 m^3 in 2013, the prices for Kazakh and Russian gas were lower, US$ 224 per 1,000 m^3 and US$ 160 per 1,000 m^3, respectively.[320] On September 20, 2012, the governments of Russia and Kyrgyzstan signed an agreement on the building and exploitation of the Upper Naryn cascade HPPs (Akblun HPP, Naryn HPP–1, Naryn HPP–2 and Naryn HPP–3). Most importantly, Kyrgyzstan is counting on Russian support to build Kambarata–1 HPP,[321] the project designed to considerably increase winter electricity production volume. However, the extent to which Russia is willing to get involved in rather big and at the same time controversial HPP projects is unclear. Moreover, the current ruble crisis and Western sanctions effectively takes this plan off the table at the moment.

Fighting Corruption and Energy Inefficiency

Decreased gas and thermal electricity supplies from abroad forced the government of Kyrgyzstan to pay greater attention to the problem of electric power sector inefficiency. Fifty-three percent of electric power generation facilities in the country are over 40 years and 37 percent are over 30 years old.[322] The total loss in the electric power system of Kyrgyzstan was almost 40 percent in 2009, out of which 25 percent (3.3 billion kWh per year) was commercial losses and thefts. Technical losses accounted for the remaining 15 percent.[323] The total loss, however, has decreased down to 30 percent in 2016 with equal distribution of technical and commercial losses.[324] The current Kyrgyz government has partially built its legacy on blaming the previous

316 "Uzbekistan Prekratil Podachu Prirodnogo Gaza na Yug Kirgizii (Uzbekistan Stopped Gas Supply to Southern Kyrgyzstan)," *Kazenergy*, July 18, 2013, accessed November 5, 2016, http://kazenergy.com/ru/press/2011-04-21-10-41-35/10102-2013-07-17-20-23-18.html.

317 Asel Kalybekova, "Kyrgyzstan: Is Gazprom Deal a Blessing or Curse for Bishkek?" *Eurasianet.org,* July 31, 2013, accessed September 1, 2016, http://www.eurasianet.org/node/67327.

318 Murat Sadykov, "After Gazprom Takeover, Southern Kyrgyzstan Marks 24th Day Without Gas," *Eurasianet.org,* May 7, 2014, accessed January 15, 2015, http://www.eurasianet.org/node/68347; Gazprom, "Gazprom Kyrgyzstan to provide reliable gas supply to Kyrgyz Republic," *Gazprom official website,* August 27, 2014, http://www.gazprom.com/press/news/2014/august/article199715/.

319 "Gazprom Videlit Dopolnitelnie 330 mln. Kubometrov Gaza Kirgizstanu (Gazprom will Supply Additional 330 mcm of Gas to Kyrgyzstan)," *TREND*, October 27, 2014, accessed December 1, 2014, http://www.trend.az/casia/kyrgyzstan/2326511.html.

320 Julia Kostenko, "Gazprom: Dreams Don't Come True?" *24.kg news agency*, September 10, 2014, accessed December 1, 2014, http://www.eng.24.kg/economics/172141-news24.html.

321 Commonwealth of Independent States, "On the Development of Cooperation of CIS."

322 Otorbaev, "Problems and Perspectives for the Development of Power Sector."

323 Nurzat Abdurasulova and Nikolay Kravtsov, "Electricity Governance in Kyrgyzstan: An Institutional Assessment," *Civic Environmental Foundation UNISON*, 2009, 14.

324 Asian Development Bank, *2014 Clean Energy Investments: Project Summaries* (Asian Development Bank, 2015).

(Kurmanbek Bakiyev) administration for the appropriation of money devoted to Kyrgyz energy sector development. The new government openly acknowledges the importance of fighting the corruption that negatively affects Kyrgyzstan's ability to address energy efficiency problems in a timely and effective manner. Even though so far the government has achieved little progress, unlike other Central Asian leaders that have been in power for decades, new Kyrgyz authorities at least elevated this problem to the state-priority policy level.[325]

Shortcomings of the National Priority Energy Project

To overcome the consequences of uneven distribution of electricity, the Kyrgyz government has recently put into force the Datka electric power station and complete the Datka–Kemin electric power transmission line connecting the southern and northern parts of the country.[326] However, the energy security of Kyrgyzstan cannot be ensured without the cooperation with its neighbours. According to Nikolai Kravcov, member of the Monitoring Council under the Ministry of Energy, Kyrgyzstan will continue to experience electricity supply shortages due to lack of production. And, even the Datka–Kemin electric power transmission line will not save Kyrgyzstan from an energy crisis. This transmission line solves the problem of transporting electricity, but does not add electric power-production capacity. Therefore, it might be a decade or two until Kambarata–1 is put into full operation.[327]

Despite the fact that Kambarata–1 can considerably increase the volume of electricity production in the country, the current administration acknowledges that all claims that a single giant HPP can solve all energy security problems in Kyrgyzstan is an illusion. The electricity production coefficient of Kamabarata–1 is low.[328] Besides, every added 1 kW of new capacity will cost US$ 2700, which Kyrgyzstan can hardly afford.[329]

The cost of electricity production in Kambarata–1 (1900 MW capacity) is estimated to be higher than in the Kara–Keche coal-fired plant (800 MW). Despite its lower electric power capacity, the coal-fired plant operates year round, while the power production capacity coefficient of Kambarata–1 accounts for only 31.5 percent. Building the Kara–Keche TPP with the capacity of 700 MW by 2017 with the possibility to increase it up to 1400 MW and then 2800 MW[330] might have a greater effect on the energy security of Kyrgyzstan.

For a limited Kyrgyz budget, building Kara–Keche is economically more efficient and thus, should be more attractive. Adding 1 kW of new power capacity costs around US$ 1,500 in TPPs and around US$ 2,000 in hydro-power plants. The government announced that the cost of Upper Naryn HPP exceeds US$ 727 million. If this sum is divided by the capacity of 237 MW, the cost of 1 kW will reach US$ 3,000, which is even US$ 1,000 higher than the average in the country. Construction of Kamabarata–1 will cost Kyrgyzstan US$ 5.2 billion. With a capacity of 1900 MW, this means 1 kW will cost US$ 2,700. Ernest Karibekov, a former head

325 Aygul Sultanbekova, Former Advisor to the Government of Kyrgyz Republic on Power Sector Development, Personal Interview, Bishkek, Kyrgyzstan, February 7, 2014.
326 Government of Kyrgyz Republic, *Premer-minister J. Otorbaev Poruchil Minenergopromu Zavershit Vse Podgotovitelnie Raboti k Otopitelnomu Period Strogo v Srok (Prime Minister Otorbaev instructed Minenergoprom to Complete All Preparatory Works for the Heating Period Strictly on Time)* (Bishkek: Gov.kg, 2014), accessed December 10, 2014, http://www.gov.kg/?p=38756.
327 Nikolay Kravcov, "V Voprosax Energobezopasnosti Nam ne Oboytis Bez Sosedey, kak I im Bez Nas (To Ensure Energy Efficiency We Need Our Neighbours as Well as They Need Us)," *Fuel Energy Sector Transparency Initiative in Kyrgyz Republic*, January 2015, accessed February 15, 2015, http://www.energoforum.kg/index.php?act=view_material&id=447
328 Otorbaev, "Problems and Perspectives for the Development of Power."
329 Karibekov, "Is There an Energy Market in Kyrgyzstan?"
330 Otorbaev, "Problems and Perspectives for the Development of Power."

of Research Institute for the Central Asian Water and Water-Energy Resources Problem Studies, believes that Kambarata–1 will not be constructed in the next 20 years. To return US$ 5.2 billion in investments, this plant will have to operate fully, selling electricity for 8 cents per kWh. Kyrgyzstan now exports electricity for around 4 cent per kWh along with the water supply.[331]

Iran to develop Kyrgyzstan's hydro-power potential?

Iran has expressed willingness to participate in the large hydro-power sector development in Kyrgyzstan. Thus, Iranian "TANA Energy Management Company" received instructions from the government to start developing project proposals. In May 2016, a Memorandum of understanding was signed between countries on the development of small hydro-power in the country. However, the statement of the Presidents Rouhani (Iran) and Atambaev (Kyrgyzstan) indicates that governments are planning to develop large hydro-power potential of Kyrgyzstan. Up until recently, it was believed that Russia would be the one building large HPPs in the country. In 2012, Russia committed to invest US$ 2.1 billion in the construction of 4 Upper Naryn cascade (200 MW) and Kambarata-1 HPPs (1.9 GW). However, in December 2015 Atambaev suggested that the parliament denounce the agreement, because Russia due to economic difficulties cannot comply with its requirements. The agreement was denounced in January 2016. China could have taken over the Russian place, as it has extensive experience in building large HPPs and has money to do this.[332] Yet, China does not take part in the conflicting projects, such as Kambarata–1. Iran, however, cannot ignore its experience with Tajik consumers and Kyrgyzstan should not be that naïve to entirely rely on Iran for the development of its large hydro-power potential.

> *"Iran and Tajikistan agreed to build Sangtuda–2 HPP with the investment package of US$ 180 million and US$ 40 million respectively. The first aggregate was introduced in 2011 and the second one commenced in 2014. According to the agreement, Iran owns the plant for 12.5 years. However, there has been several misunderstanding between the Iranian energy company and the government of Tajikistan. In 2014, Tajikistan owed around US$ 30 million to Iran. Authorities justified their inability to make on time full payments due to low payment capability of the household consumers."*[333]

For the record, Russia suspended its participation in the projects arguing that it doubts that the investments could be recouped on time. At the same time, there are too many financial, political and environmental risks associated with Kambarata–1 project. Thus, it is most likely that Iranians will be taking part in the construction of the one of the Upper Naryn cascade. Therefore, Kyrgyzstan's considerable hydro-power potential has yet to be developed. Although it suffered from gas supply cuts within the CAES, Kyrgyzstan succeeded in mitigating an energy crisis by selling its strategic gas facilities to external actors so that they can invest in modernizing the gas sector. Despite prioritizing hydro-power development in its energy policy, the Kyrgyz government decided to step away from aggressively promoting the Kambarata–1 project that is causing disagreement with Uzbekistan. Kyrgyzstan's neutral position over this project in combination with other policy initiatives has resulted in very limited, but nonetheless important, Uzbek gas and thermal electricity supply to the country.

331 Karibekov, "Is There an Energy Market in Kyrgyzstan?"
332 Anna Gussarova, Farkhod Aminjonov and Yevgeniy Khon, "The Eurasian Economic Union and the Silk Road Economic Belt: Competition or Convergence? Implication for Central Asia," *Friedrich Ebert Stiftung,* July 2017, 22, http://library.fes.de/pdf-files/bueros/kasachstan/13620.pdf.
333 Shustov Alexander, "Will Iran build HPP in Kyrgyzstan?" *Eurasia.expert,* January 9, 2017, accessed June 15, 2017, http://eurasia.expert/iran-budet-stroit-ges-v-kyrgyzstane/.

INSUFFICIENT ENERGY SYSTEM OF TAJIKISTAN

Although it possesses huge potential for hydroelectricity production (more than 527 billion kWh annually—4 percent of the worldwide hydro-power potential), Tajikistan currently generates only 16.5 billion kWh per year (4–5 percent of the potential reserves) with installed capacity of 5190 MW. More than 98 percent of electricity is generated by HPPs (4872 MW).[334] Development of this potential could significantly contribute to sustainability of energy sector not only in Tajikistan, but also other Central Asian states, by providing large quantities of relatively inexpensive and "green" electricity. Currently, there are almost 300 small HPPs producing electricity in the country. According to the Government program, adopted in 2009 for the construction of small HPPs for domestic and foreign investors for 2009–2020, Tajikistan is planning to build 189 more small HPPs to add an additional 103.6 MW.[335] While the construction of small and mini HPPs is among the priority areas in the program, it is the medium and large HPPs that can significantly contribute to electricity production in the country.

Of the more than 98 percent of electricity produced by HPPs, 97 percent of that electricity is generated by large and medium HPPs.[336] While small HPPs are mostly designed to meet the electricity demand of hundreds of people living in remote areas of the country, the planned Rogun HPP, with a capacity of 3600 MW to produce 13 billion kWh annually, may considerably increase the level of electricity production in Tajikistan. For the moment, Nurek is the largest HPP in Central Asia, with total production capacity of 3000 MW. The Nurek Dam was built between 1961 and 1980 and at 300 meters is considered the tallest in the world. Another major complex of HPPs producing electricity in the country is Sangtuda–1 HPP, constructed by Russian companies in 2009, and Sangtuda–2, built by Iranian investments and with an expected capacity of 900 MW.[337]

In addition to hydro-power resources, Tajikistan also possesses very limited fossil fuels. Its estimated coal reserves account for 4.5 billion tonnes with an approximate production around 500,000 tonnes annually.[338] The government is also planning to develop 87 small oil and gas fields.[339] Proven gas reserves of Tajikistan are estimated at the amount of 10 billion m^3, but its gas production level is extremely low.[340] Tajikistan produced less than 10 million m^3, while consumed 140 million m^3 of gas in 2012 and imported the rest from Uzbekistan.[341] Complete gas supply disruptions form Uzbekistan in 2013 had a tremendous impact on energy security of Tajikistan. Until today, Uzbekistan refrains from exporting gas to Tajik customers. The government of Tajikistan cooperates with 15 energy companies to develop its oil and gas potential and deal with energy crisis.[342] Most of all, Tajikistan is counting on newly explored Sarikamysh and West Shokhambary gas fields, which according to the preliminary estimates

334 Ministry of Foreign Affairs of the Republic of Tajikistan, *The Energy Sector of the Republic of Tajikistan*, (Dushanbe: Mfa.tj, n.d), accessed September 5, 2016, http://mfa.tj/en/energy-sector/the-energy-sector-of-rt.html.
335 Energy Charter Secretariat, *In-Depth Energy Efficiency Review Tajikistan* (Brussels: Energy Charter Secretariat, 2013), 74, accessed May 20, 2014, http://www.encharter.org/fileadmin/user_upload/Publications/Tajikistan_EE_2013_ENG.pdf.
336 United Nations Development Programme, *Sustainable Energy for All: Tajikistan: Rapid Assessment and Gap Analysis*, (UNDP, 2013), 6, accessed September 1, 2014, http://www.undp.org/content/dam/tajikistan/docs/library/UNDP_TJK_SE4ALL_Rapid_Assessment_and_gap_analysis_Eng.pdf.
337 "Tajikistan—Energy," *GlobalSecurity.org*—Reliable Security Information, http://www.globalsecurity.org/military/world/centralasia/tajik-energy.htm.
338 Ministry of Foreign Affairs of the Republic of Tajikistan, *The Energy Sector of the Republic of Tajikistan* (Dushanbe: Mfa.tj, n.d), accessed September 5, 2016, http://mfa.tj/en/energy-sector/the-energy-sector-of-rt.html.
339 President of the Republic of Tajikistan, *The Annual Message to the Majlisi Oli of the Republic of Tajikistan* (Dushanbe: President of the Republic of Tajikistan, 2011), accessed June 5, 2016, http://www.prezident.tj/en/node/2189.
340 British Petroleum Company, *BP Statistical Review.*
341 Eni, *World Oil and Gas Review for 2014.*
342 President of the Republic of Tajikistan, *The Annual Message to the Majlisi Oli of the Republic of Tajikistan*.

by the Gazprom may possess around 70 billion m^3 [not proven yet] of gas.[343] However, the fact that 94 percent of the country is mountainous area (geographic constraint) makes it extremely difficult and costly to extract and transport natural gas in Tajikistan thus turning the whole fossil fuel sector not quite attractive to foreign investors. For instance, the Shakhrinav–1P well has a planned depth of 6,300 meters, a deepest well in Central Asia and require significant upfront investments.[344]

In Pursuit of an Independent Energy System

Tajikistan's domestic energy production almost completely relies on hydro-power sector development. The hydro-power potential to produce renewable and clean electricity provides Tajikistan certain leverage. However, due to seasonal variation in hydroelectricity production and limited fossil fuel reserves Tajikistan has never been able to meet its electricity needs all year round. Like all other Central Asian republics, Tajikistan's energy sector was designed to operate within the CAES. Uzbekistan's withdrawal from the CAPS and the cut of gas and thermal electricity supply left Tajikistan in complete isolation and severely affected the level of its energy security, especially in winter months. To free itself from high dependence on neighbouring Uzbekistan, the government of Tajikistan has decided to establish countrywide (north-south) electricity transmission lines, since within the CAPS some regions of the country were only connected to the electric power grid of Uzbekistan, and increase electricity production by attracting investments to share the construction cost of the Rogun dam and HPP. While establishing an independent electric power system and a construction of Rogun HPP are the number one energy policy priority for Tajikistan, mitigating the current energy crisis by increasing efficiency of electricity producing and consuming facilities and development of the small hydro-power sector seem to be considered important as well. However, my analysis shows that there are limited opportunities for Tajikistan to ensure its energy security on its own in the short- to medium-term.

Establishing an Independent Energy System

Total primary energy production in Tajikistan has never matched the level of consumption. Within the CAES, Uzbekistan and Turkmenistan supplied insufficient thermal electricity, natural gas, and oil to Tajikistan. When the supply of these resources from its neighbour started to decrease, Tajikistan had no other choice but to rely on its own resources. The reduced level of total primary energy consumption for the last several years indicates that Tajikistan has not yet succeeded in covering the volume of previously imported energy.

Complete isolation from the CAES with no other possibility to import energy resources forced the government of Tajikistan to pursue the development of an independent national energy system. Ensuring energy independence by connecting hydro-power rich regions (southern) with those that were connected to the CAES (northern) and development of its hydro-power and limited fossil fuels potential has three objectives:

- to meet the population's electricity needs year round;
- to give a powerful impetus to the economic development of the country; and
- to increase electricity export potential.
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Tajikistan was completely cut off the electric power grids of Uzbekistan in 2011.[345] To supply

343 "Tajikistan Strategic Partnership," *Gazprom official website,* n.d, accessed May 5, 2015, http://www.gazprom.com/about/production/projects/deposits/tajikistan/.
344 "Tajikistan," *Gazprom International,* n.d, accessed June 1, 2015, http://gazprom-international.com/en/operations/country/tajikistan.
345 Michael Becker, "Regional Energy Market in Central Asia," *RESET*, May 2011.

electricity to its northern regions, the government decided to build 500 kV south–north and several 220 kV electricity transmission lines.[346] The 220 kV Lolazor–Khatlon line was finished in 2009.[347] These transmission lines, however, cannot solve the problem of winter electricity deficiency; therefore, the government of Tajikistan has prioritized the construction of the Rogun dam and HPP with the capacity to double the current electricity production volume, which would also allow hydroelectricity generation during the winter period. However, Uzbek authorities perceive this project as a threat to the water balance in the region and thus strongly oppose any progress in this direction. Hypothetically, hydro-power development in Tajikistan and meeting water needs in Uzbekistan should not necessarily be viewed as static. Tajikistan can potentially improve its energy security by fully developing huge hydro-power potential (527 billion kWh per year).[348] In terms of water withdrawal per capita, Uzbekistan is placed fourth in the world after Turkmenistan, Iraq and Guyana, and has a potential to reduce domestic consumption of water.[349] Currently, however, Tajikistan's' ability to improve its energy security by developing hydro-power potential and Uzbekistan's capability to reduce domestic water consumption, at least in the short-term perspective, face a number of obstacles associated with lack of financial resources, technological limitations and political constraints.[350]

The Soviet gas pipeline system was constructed in a way that all gas transport infrastructures to Tajikistan passed Uzbek territory. Uzbekistan was and still remains major supplier of gas to Tajikistan. Thus, the country has been experiencing severe gas shortage since 2013, when Uzbekistan completely stopped gas supplies to Tajikistan.[351] Tajik authorities may potentially count on Line–D of the CAGP, expecting that China will agree to leave a certain amount of gas for Tajikistan to meet its gas needs, especially during the winter period. According to the initial design, however, Line–D is being built to transport gas to China, using both Kyrgyzstan and Tajikistan as transit countries only. In fact, all participants of the project try to keep the question of turning Line–D into a source of gas supply to Central Asian upstream states off the table for the moment. The biggest concern still lies with Uzbekistan—a key transit country that does not refrain from using gas as a weapon to influence the foreign policies of its upstream neighbours. While Uzbekistan will no longer possess a legal right to unilaterally stop natural gas flow, because its section of pipeline is operated by Joint Venture Company, it still can physically cut supplies as all pipelines pass through its territory. Uzbekistan opposes construction of large dams, because it fears that its upstream neighbours could interfere with the water supply necessary for the downstream irrigation and particularly cotton industry, which accounts for 9 percent of total exports of the country and quite important for the livelihood of the people.[352] It has been using the dependence of Kyrgyzstan and Tajikistan on Uzbek gas as a political and economic instrument to block the construction of those dams. Gas supply to Central Asian upstream countries from the CAGP will decrease energy leverage of Uzbek authorities in relations with its upstream neighbours and may thus cause tensions between Uzbekistan and China. Therefore, China would most likely try to avoid any conflict with Uzbekistan. In this regard, until the energy-water nexus dispute between Central Asian downstream and upstream countries is resolved, counting on the

346 President of the Republic of Tajikistan, *Annual Address to the Majlisi Oli of the Republic of Tajikistan* (Dushanbe: President of the Republic of Tajikistan, 2008), accessed January 5, 2017, http://www.prezident.tj/en/node/2191.

347 Ministry of Energy and Industry of the Republic of Tajikistan, *The Construction of Line Transfer Electricity 220 kV Lolazor-Khalton* (Dushanbe: Minenergoprom.tj, n.d), accessed September 15, 2016, http://www.minenergoprom.tj/view_liniyae.php?id=3.

348 Ministry of Foreign Affairs of the Republic of Tajikistan, *The Energy Sector of the Republic of Tajikistan.*

349 Olli Varis, "Resources: Curb Vast Water Use in Central Asia," *Nature,* October 1, 2014, accessed January 25, 2015, http://www.nature.com/news/resources-curb-vast-water-use-in-central-asia-1.16017.

350 Detailed Discussion of Water Needs for Uzbekistan and Challenges for Tajikistan to Develop its Hydro-power Sector is Provided in the Following Sections.

351 "Uzbekistan Halts Gas Supply to Tajikistan from January 1," *The Times of Central Asia,* December 25, 2012, accessed May 1, 2015, http://www.timesca.com/news/10619-uzbekistan-halts-gas-supply-to-tajikistan-from-january-1.

352 Central Asia Data Gathering and Analysis Team, "Trade Policies and Major Export Items," 12.

Line–D pipeline as a source of gas supply to Tajikistan and potentially Kyrgyzstan would be problematic.

Dealing with the "High Cost" of Energy Security

Tajikistan cannot afford to bear the cost of the transition to an independent energy system on its own. The cost of energy consumption already accounts for around 60 percent of the GDP. Households in Tajikistan spend around 50 percent of their total income on energy in the winter months and still receive an amount insufficient of fully meeting their needs.[353] While the Rogun HPP can solve the problem of seasonal variation and deficiency of electricity production, disagreement between Central Asian upstream and downstream countries over this project affects the majority of investment proposals. Uzbekistan fears that the proposed highest dam would lead to: (a) unduly interruptions of water release; (b) safety of the dam can easily be jeopardized resulting in serious environmental, economic and social consequences for downstream countries. Due to tensions between Uzbekistan and Tajikistan as well as certain domestic economic constraints over this project foreign investors are not rushing to take part in the construction of the dam. Construction of Rogun started during the Soviet period, and now requires from US$ 3–6 billion in additional investments. With a public campaign to collect money for building the Rogun dam, the government of Tajikistan succeeded in collecting US$ 187 million. However, once collected, Tajik authorities had few initiatives to put the money toward.[354] The government made it compulsory for citizens to purchase almost US$ 700 worth of shares, which at the time exceeded the average annual income for most Tajik residents. It planned to collect around US$ 600 million, but managed to collect less than 30 percent of this amount.[355] This did not only fall short of the goal, but also was not enough to continue construction. Attracting foreign investments in energy projects and ensuring affordability of energy resources are among the priority policy areas for Tajikistan. Russian company was recently replaced by the Italian construction conglomerate Salini Impregilo, which won the tender for US$ 3.9 billion to build the dam. President of Tajikistan run the opening ceremony of the construction site on October 29, 2017. It is now expected that electric power in Rogun will be generated already in late 2018.[356] Yet, many experts doubt Tajikistan's capability to meet the deadline.

Development of Small Hydro-power Potential

According to the United Nations Development Programme report, more than 1 million people suffer from frequent and prolonged blackouts each winter in Tajikistan.[357] The World Bank's estimates of the number of people suffering from electricity shortage during the winter are even higher and reach 70 percent of the population.[358] People living in remote mountainous areas are the most vulnerable. Due to geographical constraints to establishing a countrywide network of electric power transmission lines, the most feasible way to bring electricity to these regions is to build small and mini HPPs at these sites. Over the last two decades, 310 small HPPs have been

353 UNDP, "Sustainable Energy for All," 10.
354 International Crisis Group, "Central Asia: Decay and Decline," 42.
355 Joao Peixe, "Tajikistan to Proceed with Rogun Hydroelectric Dam," *Oilprice,* August 28, 2011, accessed May 1, 2016, http://oilprice.com/Latest-Energy-News/World-News/Tajikistan-to-Proceed-with-Rogun-Hydroelectric-Dam.html.
356 Tohir Safarov, "Tajik President Officially Launches Construction Of Rogun Dam," *RadioFreeEurope,* October 29, 2016, http://www.rferl.org/a/tajikistan-rogun-dam-construction-launched/28082302.html.
357 World Bank Group, *Tajikistan's Winter Energy Crisis: Electricity Supply and Demand Alternatives* (Washington, DC: World Bank, 2013), accessed October 1, 2016, http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:23319658~pagePK:64257043~piPK:437376~theSitePK:4607,00.html.
358 World Bank Feature Story, *Study Shows TALCO's Potential to Save Energy*, 2013, accessed May 25, 2015, http://www.worldbank.org/en/news/feature/2013/01/28/study-shows-talco-potential-save-energy.

constructed in the country and 10 more are in the process. The government is planning to build an additional 190 small HPPs by 2020.[359] However, while 98 percent of electricity generation comes from the hydro-power sector, 97 percent of it is produced in medium and large HPPs.[360] This does not imply that building small HPPs is a failure, because they supply electricity to a number of remote areas, where connecting them to the central electric power system would be costly. It means that without the construction of large HPPs, Tajikistan will not be able to resolve its energy crisis.

Improving Energy Efficiency

Tajik authorities acknowledge that investment in increasing the efficiency of some outdated major hydroelectricity producing facilities in Tajikistan may hypothetically save some electricity. Nurek, the largest contributor to the electricity production of Tajikistan, was built in 1972. Kairakkum was constructed even earlier, in 1956.[361] Due to a variety of factors, including inefficiently functioning electricity producing facilities, Tajikistan's electric power sector is not operating to its full capacity.

Table 5. Operating Electric Power Generating Plants in Tajikistan (January 1, 2012).

	Technical capacity, megawatt		
Name	**Designed**	**Available**	**Operating**
Nurek HPP	3,000	2,385	1,625.3
Baipaza HPP	600	450	273.5
Dushanbe thermal electric plant	198	100	4.9
Yavan thermal electric plant	120	–	–
Kairakkum HPP	126	104	83.8
The Vakhsh cascade of HPPs	285	211	139.61
The Varzob cascade of HPPs	25.36	8	7.1
Pamir Energy	42	39	37
MGES	13	11	10
Sangtuda HPP–1	670	670	440
Sangtuda HPP–2	110	110	40
Total	5,190	4,088	2,661.21

Source: United Nations Development Programme, *Sustainable Energy for All: Tajikistan: Rapid Assessment and Gap Analysis*, UNDP, 2013, 6, accessed September 1, 2014, http://www.undp.org/content/dam/tajikistan/docs/library/UNDP_TJK_SE4ALL_Rapid_Assessment_and_gap_analysis_Eng.pdf.

Tajikistan is counting on multilateral institutions' support (technical, financial and expertise) to reduce electricity loss. According to some estimates, electricity production and transportation losses can be reduced by 30 percent.[362] However, unless the problem of the TALCO aluminum plant, which consumes 30 percent of the electricity produced, is resolved, the electric power sector of Tajikistan will remain inefficient. TALCO consumed 5,480 GWh in 2009 and 6,460 GWh of electricity in 2011. The World Bank recommended Energy Efficiency Action Plan for TALCO, arguing that if implemented it would cut 20 percent of electricity and 37 percent of gas consumption by the plant.[363] The government, however, remains quite sensitive to any significant reform initiatives that could affect current management system of the company. Today, TALCO, one of the 10 largest aluminum smelters in the world, provides up to 70 percent of the country's

359 President of the Republic of Tajikistan, *Annual Address of the President (2014)*."
360 UNDP, "Sustainable Energy for All," 6.
361 President of the Republic of Tajikistan, *Annual Address* (2008).
362 UNDP, "Sustainable Energy for All," 1.
363 World Bank Feature Story, *Study Shows TALCO's Potential to Save Energy*.

foreign currency earnings,[364] which is 60 percent of total export of Tajikistan and generates 20 percent of GDP.[365] TALCO is gobbling up Tajikistan's electricity in a most non-transparent manner, so that the government can immediately collect rents off exporting aluminum. TALCO legal case in the London high court revealed information on how President Rakhmon's family and their associates profit from TALCO company management. John Helmer, a Moscow based journalist, who was closely following the court proceedings, calculated the Tajik state revenue loss at US$ 1.145 billion in between 2005 and 2008 due to a particular trading scheme, which only benefited owners of the TALCO operating companies, including the family of the President.[366] In this regard, there is sometimes a trade-off between successful energy efficiency initiatives and personal gains of certain political groups in Tajikistan that prevents achieving progress in this direction.

While Tajikistan was forced to establish isolated and independent energy system, it does not enjoy self–sufficiency for energy supplies and is suffering from prolonged energy crisis. Development of hydro-power and solving the problem of energy inefficiency is a relatively long–term goal. Along the way toward establishing independent energy system Tajikistan needs to secure energy supplies from abroad. Warmed up relationships with the new leadership of Uzbekistan provides some prospects for reinstating cooperation in the energy sector and restoring energy trade between countries.

364 "Tajik Aluminum Smelter Consumes 7 Million kWh of Electricity Per Day, Says Minister of Energy," *Asia-Plus*, December 20, 2017, accessed December 25, 2017, https://www.news.tj/en/news/tajikistan/economic/20171220/tajik-aluminum-smelter-consumes-7-million-kwh-of-electricity-per-day-says-minister-of-energy.

365 John Heathershaw, "Tajikistan Amidst Globalization: State Failure or State Transformation?" *Central Asian Survey* 30, no. 1 (March 2011): 157.

366 John Helmer, "Tajik Aluminium Case Gets Nearer Judgment," *Dances with Bears*, 2 August 2008, http://johnhelmer.net/?p=479 in John Heathershaw, "Tajikistan Amidst Globalization," 160.

INDEPENDENT AND VULNERABLE POWER SYSTEM OF UZBEKISTAN

Currently, 87 percent of consumed electricity is produced in gas- and coal-fired TPPs. In addition to the discussed in the above sections gas potential, Uzbekistan possesses explored coal reserves with a volume of 1900 million tonnes, which are being extracted mainly in Angren, Shargun, and Baysun fields.[367] The Government of Uzbekistan, at least officially, acknowledges that the "brown economy" model slows down the transition to a long-term sustainable electric power sector. The sustainability of electricity supplies can be achieved through the development of a green economy and government officials often claim that Uzbekistan is steadily moving in this direction. Solar energy research and development in Uzbekistan started in the 1980s, but little progress is achieved so far. Currently, renewable energy sources are highly underdeveloped since its share does not exceed 2 percent (excluding hydro-power) of the overall electricity production. In the 1960s, more than 250 small and mini HPPs were functioning in Uzbekistan. Even though the number of small HPPs is decreasing, Uzbekistan is willing to support small HPPs, because they are considered environmentally less damaging, capable of supplying electricity to remote areas, and require less capital and investment, which can shortly be returned.[368] Uzbekistan does not prioritize hydro-power like it prioritizes gas or oil. However, hydro-power is still important for the Uzbek energy sector development, since it accounts for 20 percent of the overall electricity production and is considered to be the main source of clean electricity production in the country.[369] Uzbekistan is a party to the Non-proliferation Treaty and ratified an Additional Protocol Agreement with the IAEA in 1998. It has also ratified the Central Asia Nuclear Weapon Free Zone treaty. Thus, despite the fact that it possesses considerable uranium reserves, it does not plan to build a nuclear power station.

Electric Power Sector Overview

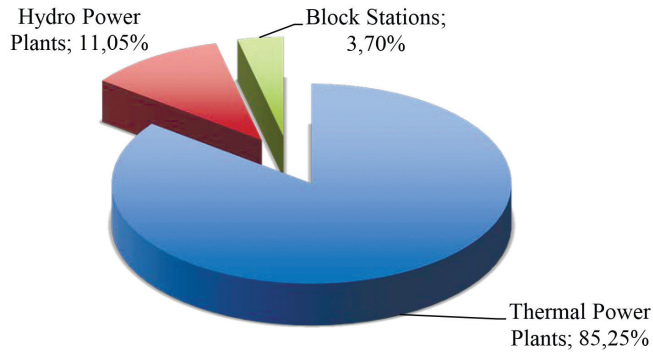
Electric power generation currently consists of TPPs and HPPs. Total installed capacity in Uzbekistan is currently about 12,500 MW generated in 25 power plants. Of this capacity, 89 percent comes from TPPs that work on gas, and the rest comes from hydro-power generators.[370] Eighty five percent of that electricity is generated on a few biggest Talimardjan, Syrdarya, Novo-Angren and Tashkent thermal power plants. Almost each and every consumer in the country is connected to the power transmission lines, the total length of which exceeds 243000 km ranging from 0.4 and 500 kV.[371]

The Uzbekenergo is a vertically integrated state monopoly consisting of 54 companies that controls electric power sector of Uzbekistan. The company operates electric power generation, transmission networks, electric power distribution and supply as well as coal sector and auxiliary service companies.[372] Currently, over 88 percent of all consumed electricity is produced in gas- and coal-fired TPPs. The Government of Uzbekistan officially acknowledges that the "brown economy" model slows down the transition to a long-term sustainable electric power sector.[373]

367 Government of the Republic of Uzbekistan, *Coal Industry* (Tashkent: Governmental Portal of the Republic of Uzbekistan, n.d), accessed June 5, 2014, http://www.gov.uz/en/helpinfo/energy/2680.
368 Alixanov B. "Konceptualnie Podxodi k Formirovaniyu Green Economy v Uzbekistan (Conceptual Approaches to Green Economy in Uzbekistan)," *Center for Economic Research, Analytical report*, 2011, 64.
369 World Bank, *Electricity Production from Hydroelectric Sources (percent of total), for 2011* (Washington, DC: World Bank), accessed June 1, 2016, http://data.worldbank.org/indicator/EG.ELC.HYRO.ZS.
370 "Uzbekistan-Utilities," *Export.gov,* July 18, 2017, accessed November 10, 2015, https://www.export.gov/article?id=Uzbekistan-Utilities-Electrical-Power.
371 "Uzbekistan: Energy 2017," *Global Legal Insights.*
372 United Nations Development Program, "Renewable Energy Snapshot," n.d. accessed May 10, 2017, http://www.eurasia.undp.org/content/dam/rbec/docs/Uzbekistan.pdf.
373 US EIA, *Uzbekistan—Overview/Data* (Washington, DC: US EIA, n.d), accessed January 7, 2018, http://www.eia.gov/beta/international/country.cfm?iso=UZB.

The sustainability of electricity supplies can be achieved through the development of a green economy and government officials often claim that Uzbekistan is steadily moving in this direction. Apparently, little progress has been made in this direction so far.

Figure 6. Power Generation Capacities by Uzbekenergo.



Source: Uzbekenergo, "Technical-Economic Indicators," 2014, October 20, 2016, http://www.uzbekenergo.uz/uz/activities/technical-and-economic-indicators/.

Electric power industry generates annually up to 48 billion kWh of electricity and around 10 million gigacalorie/hour of thermal heat. Total installed capacity of power plants in Uzbekistan exceeds 12.3 GW. TPP's total power production capacity is estimated around 10.6 GW. There are several big TPPs, including Talimardjan, Syrdarya, Novo–Angren and Tashkent TPPs that generate over 85 percent of electric power in the country.[374] Industry and household sectors account for the largest share of electric power consumption in the country.

The Uzbekenergo–owned and operated power transmission network consists of 1,850 km of 500 kilovolt (kV) lines, 6,200 km of 220 kV lines, and 15,300 km of 110 kV lines. The transmission network is interconnected with the neighbouring countries through 220 kV and 500 kV transmission lines.[375] The extension of power transmission lines is over 240,000 km long.[376]

Ensuring Sustainability of the Energy Sector

There is a lack of transparency in the energy sector, and it is difficult to provide statistical data proving the extent of deficiency of energy in the country. However, numerous complaints by the population and periodic electricity blackouts and gas supply shortages in the country indicate that there are serious energy security challenges that require attention by the Uzbek authorities.[377]

Uzbekistan consumes too much environmentally unfriendly energy sources. Eighty five percent

374 Government of the Republic of Uzbekistan, "Energy Resources of Uzbekistan," *Governmental Portal of the Republic of Uzbekistan*, n.d., accessed July 1, 2014, http://www.gov.uz/en/helpinfo/energy/10004.
375 World Bank Group, "Uzbekistan Partnership: Country Program Snapshot. Recent Economic and Sectoral Developments," April, 2015, accessed June 10, 2017, http://www.worldbank.org/content/dam/Worldbank/document/Uzbekistan-Snapshot.pdf.
376 Uzbekenergo, "Energetikaning Joriy Holati Va Rivojlanish Istiqbollari (About the Current State and Prospects of Power Development)," 2015, accessed May 10, 2015, http://www.uzbekenergo.uz/uz/activities/energy/.
377 Personal observations and interviews by the author in Bukhara and Samarkand regions of Uzbekistan, 2013-2017.

of total coal produced in the country is used to generate electricity.[378] The energy intensity (energy efficiency measurement) of Uzbekistan exceeds other middle-level developing countries by 2-2.5 times.[379] Thus, increasing the energy efficiency of outdated energy producing and transporting facilities requires urgent government attention. Most importantly, however, to have an immediate effect on sustainability of the Uzbek energy sector, existing resources have to be used in the most rational way. In the winter, burning gas and coal produces thermal electricity and is used for heating purposes, while in summer TPPs only generate electricity. Within the CAPS, Tajikistan and Kyrgyzstan supplied clean electricity to downstream Uzbekistan during vegetation (spring–summer) period. In return, Uzbekistan exported electricity produced in gas-fired TPPs to upstream neighbours in the wintertime and provided heating services to its population. The majority of Uzbekistan's population receive heating services through the central heating system run by the coal- and gas-fired (combined heat and power plants) TPPs. Withdrawal from the CAPS forced Uzbekistan to increase thermal electricity production in summer months, with no need for heat generation. Coordinated operation of the electric power systems, also contributed to Uzbekistan's ability to fully meet its electricity demand peaks in the morning and evening.[380] Yet, Uzbek authorities decided to withdraw its membership from the CAPS. To address energy security challenges Uzbek authorities are introducing new power generation capacities and promoting energy efficiency initiatives.

Energy Efficiency Challenges for Power Sector of Uzbekistan

Possessing an extensive electric power production facilities and transmission grids, energy system of Uzbekistan suffers from large electricity transmission and distribution losses, which account for almost 20 percent of the net generation. Technical losses are estimated at 13.7 percent of the total electric power generation. Most of the losses occur on the low voltage 110 kV and 0.4–35 kV transmission and distribution lines.[381] Taking into account the fact that these particular types of lines represent the largest share of all transmission and distribution networks, electric power loss on these lines has a great effect on the sufficiency of electricity supplies in Uzbekistan. The loss occurs largely due to aged electric power transmission and distribution lines.

Table 6. Transmission and Distribution Lines by Voltage, Length and Age.

Voltage Level (kV)	Length in 2010 (km)	Average Age (years)
Transmission Lines		
500	2,257	28
220	6,079	30
110	15,300	28
Distribution Lines		
35	13,593	30
6–10	93,983	33
0.4	105,834	N/A

Source: Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note," 20.

TPPs in Uzbekistan are designed to operate in the base-load mode. The peak electric power demand was met from the import of hydroelectricity from the neighbouring upstream countries.

378 Government of the Republic of Uzbekistan, *Coal Industry.*
379 Alixanov, "Conceptual Approaches to Green Economy in Uzbekistan," 64.
380 Gulnura Toralieva, "Destruction of Central Asian Electricity Grid: Causes and Implications," *EUCAM,* No. 8, January 2010.
381 Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note, 2015, *International Bank for Reconstruction and Development / The World Bank,* 20.

When Uzbekistan officially left the CAPS, it had to cover its peak demand supplies by increasing electricity production in the TPPs. The use of the TPPs, designed to operate on the base-load mode, to meet high peak power demand reduces the efficiency of the plants. As a result, TPPs, generating 88 percent of all electricity in the country, operate with efficiency rate of around one-third of its total capacity. The exact figures are presented below.

Table 7. Efficiencies of Existing Thermal Power Plants.

Plant	Available Capacity (MW)	Reported Efficiency
Talimardjan TPP	772	40%
Sirdarya TPP	2,840	34%
Novo–Angren TPP	1,960	32%
Tashkent TPP	1,758	33%
Navoi TPP	1,181	30%
Tachiatash TPP	690	30%
Angren TPP	445	31%
Fergana CHPP	289	25%
Mubarek CHPP	56	30%
Taschkent CHPP	28	23%
Other TPPs	39	N/A

Source: Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note," 64.

The useful service life of the power generating facilities in the country is rapidly decreasing. Energy sector of Uzbekistan is particularly affected by an inefficient use of water pumping technologies in the agricultural sector. Irrigation pumps use over 74 percent of electricity consumed by the agricultural sector. The problem, however, lies with 65 percent of these pumping stations exceeding their useful lifetime and overusing electric power.[382] Energy efficiency in these sectors could reduce the electricity demand by 13 percent (12,000 GWh per year) by 2030 and, thus, avoid the need for 1,900 MW of new generation capacity.[383]

Table 8. Age of Installed Generation Assets.

	Up to 10 years	11 to 20 years	21 to 30 years	Over 30 years
Uzbekistan	7%	5%	13%	75%

Source: Asian Development Bank, "Central Asia Regional Economic Cooperation: Power Sector Regional Master Plan," 2012, 22, accessed March 10, 2015, http://www.adb.org/sites/default/files/project-document/74195/43549-012-reg-tacr-01.pdf.

Installed capacity of all electric power plants in Uzbekistan exceeds 12 GW, with TPP contributing almost 11 GW, which equals 50 percent of all generating capacities of the former CAPS. The largest share of thermal electricity production comes to the gas-fired TPPs.[384]

Increasing Power Production

To meet growing demand for electricity in the country Uzbek authorities, in cooperation with international donors, are introducing additional power generation capacities. In June 2014, it was announced that the Asian Development Bank had decided to expand its portfolio in Uzbekistan

382 Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note," 26.
383 Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note," 38.
384 "Uzbekistan-Utilities," *Export.gov,* July 18, 2017.

and allocate a loan worth US$ 300 million to upgrade Uzbekistan's Takhiatash TPP. The project envisages the construction of two new energy-efficient combined-cycle gas turbines of up to 280 MW each. Uzbekneftegaz also intends to build two combined-cycle gas turbines (CCGTs) at the Syr-Darya TPP, the largest in Central Asia, with a total capacity of 900 MW. It is assumed that the new CCGTs will be built to replace retiring-from-service 3, 4 and 5 units. Their total capacity is now the same 900 MW. The second CCGT will also be constructed at the Navoi TPP with a capacity of 450 MW. The Russian company "Power Machines" was chosen for the modernisation works of three hydro-generators at Charvak hydro-power plant, which has a capacity of 155 MW, replacing the stator's winding on the hydro-generators and installing new feed systems on them. In 2017, it was reported that "Power Machines" had completed the modernisation of the Charvak HPP. Charvak HPP is the largest hydro-power plant in the Chirchik-Bozsu cascade of hydro-power plants.[385] Uzbek authorities are also planning to boost electric power production by building solar power plants.

Rent Seeking Energy Policy

Energy policy of Uzbekistan as it stands right now can be characterized as short-term oriented, state centric, and fossil fuels focused. This implies that the Uzbek elites, having retained control over energy production and transportation industries, try to take maximum benefits out of them while still remaining in power. These elites and their political clients collect rents and extract private benefits from mismanaging the energy sector. The problem of energy sector accountability and transparency affects equal distribution of oil/gas funds, prioritizing energy security concerns of the population and economies of the Central Asian countries as well as the development of non-conventional energy sectors from which elites cannot extract immediate benefits. To improve the level of energy security in the region and consequently in the country, Uzbek authorities need to reconsider Uzbekistan's energy policy.

385 "Uzbekistan: Energy 2017," *Global Legal Insights.*

ISOLATED POWER SECTOR OF TURKMENISTAN AND EXTENSIVE POTENTIAL

The history of the Turkmen energy sector dates back to 1913, when the first HPP started supplying electricity to very small population areas.[386] Gindikush HPP, with the capacity of 1.2 MW, has celebrated its 100 years anniversary five years ago and is still operational.[387] Hydroelectricity production, however, is currently almost completely absent in the total electricity production balance (0.02 percent) in Turkmenistan[388] and the electric power sector of Turkmenistan is entirely dependent on gas-fired TPPs.

Power Generation Capacities

The first gas-fired (combined heat and power) TPP in the country (Turkmenbashi) was put into operation in 1961 with initial capacity of 170 MW and has now reached a capacity of 420 MW. The process of connecting some remote areas of Turkmenistan to the central electric power grids was initiated in 1966. To establish a countrywide electric power system, it was decided to connect Ashgabat, Mary, and Charjou electric power grids in 1970. Ten years later, the formation of the centralized Turkmen electric power system was complete. Electricity generation on Mary TPP, with a capacity of 1685 MW, started operating in 1987. In 2011, it produced 9022 million kWh, accounting for 49.4 percent of total electricity production in the country. In 2014, there are nine state electric power plants with a capacity of 3984.2 MW to produce electricity in Turkmenistan. Having withdrawn from the CAPS, Turkmenistan is now increasing its electricity production capacity by building new TPPs. The first TPP constructed after gaining independence is Seydi (combined heat and power) TPP, with installed capacity of 160 MW. Three electric power stations with overall capacity of 1643 MW were introduced in 2010. Balkanabad TPP, with a capacity of 380 MW, was put into operation in 2010. Dashoguz TPP and Axal TPP, both with a capacity of 254.2 MW, started operating in 2007 and 2010 respectively. Avaz TPP was put into operation in 2010, with a capacity of 254.2 MW.[389] In September 2015, a new gas-turbine TPP was introduced in Derweze district, Ahal province, Turkmenistan. The total installed capacity of the power plant accounts for 504.4 MW. Built by the Turkish Calik Enerji Sanayi ve Ticaret A.S., this large TPP is located on the area of 32 hectares. After commissioning TTP in Derweze, the total power capacity of the country currently accounts for 5178.6 MW including 47 turbines, including 30 gas, 14 steam and three water turbines operate in 12 power plants.[390]

Reaching External Markets and Turkmenistan–Afghanistan Power Supply Relations

For the past several years, Turkmenistan has been exporting electricity to Iran, Turkey, and Afghanistan. Turkmenistan is exporting up to 2 billion kWh annually, which is 13–17 percent of total electric power production. Between 2007 and 2009, Turkmenistan exported electricity to Tajikistan in an amount of 1 billion kWh annually, but stopped due to Uzbekistan's withdrawal from the CAPS. Currently, there are four main transboundary electricity transmission lines connecting Turkmen TPPs with Uzbekistan and Iran and there is a potential to reinstate electricity

386 Ministry of Oil Industry and Mineral Resources of Turkmenistan, *Ministry* (Ashgabat: Minenergo.gov.tm, n.d), accessed June 1, 2014, http://www.minenergo.gov.tm/index.php/7-news/188-ministerstvo.
387 "Elektroenergetika Turkmenistana" (Electric Power in Turkmenistan), 182, accessed June 1, 2017, http://energo-cis.ru/wyswyg/file/Turkmenistan.pdf.
388 Yingnan Zhang, "World Small Hydro-power Development Report 2013-Turkmenistan," United Nations Industrial Development Organization (UNIDO) and International Center on Small Hydro-Power (ICSHP), 2013, accessed March 2, 2015, http://www.smallhydroworld.org/fileadmin/user_upload/pdf/Asia_Central/WSHPDR_2013_Turkmenistan.pdf.
389 Ministry of Oil Industry and Mineral Resources of Turkmenistan, *Ministry.*
390 Huseyn Hasanov, "New thermal power plant commissioned in Turkmenistan," *Trent News Agency,* September 14, 2015, https://en.trend.az/business/economy/2432921.html.

trade with other Central Asian countries. The government of Turkmenistan is also planning to construct 500 kV "Mary–Atamurad–Andxoy" transmission line connecting its largest (Mary) TPP with Afghanistan and increase the capacity of the "Mary–Seraxs" transmission lines.[391]

Differently from its Central Asian counterparts, Turkmenistan is both capable of considerably increasing power export and supplying it all year round. Turkmenistan left the CAPS back in 2003 and has been continuously increasing its gas-fired thermal power production capacity.[392] Turkmenistan exports around 15 percent (2.8 billion kWh annually) of its overall electricity production.[393] Availability of natural gas to run gas-fired TPPs and introduction of new generation capacities not only ensured self-sufficiency but also turned the country into a net exporter of electricity to Iran and Afghanistan. Counting on its rapidly growing power production capacity, Afghanistan and Turkmenistan signed a power purchase and sales agreement for the period of 2015–2028 with the initial power supply of 300 MW on November 6, 2015. [394]

Three lines (500/220/110 kV) at Atamyrat substation will be connected to the Afghan power transmission line of 500 kV. Currently, existing 110 kV line is not sufficient to extend the supply network. A 220 kV line would be able to supply currently agreed 300 MW electricity. However, it is the 500 kV line that would considerably increase the power supply up to 1000 MW.[395] At the same time, reliability of Turkmen power supplies to Afghanistan can be compromised by the lack of gas to run TPPs and to take full advantage of the rapidly increasing thermal power generation capacities. Natural gas reserves of Turkmenistan account for 17.5 trillion m^3. The country, however, is struggling to keep up with external demand for gas export. It will take several years for the government just to bring its gas export capacity to fulfill its obligations before the single Chinese customers, let alone all other existing corridors (Russian and Iranian). In this regard, Turkmenistan might face certain challenges to allocate more gas to run gas-fired TPPs aimed at boosting electricity export to Afghanistan.

Table 9. Transboundary Electricity Transmission Lines of Turkmenistan.

	Transmission lines	Voltage (kV)	Length (km)	Capacity (MW)
Uzbekistan	Serdar–Karakul	500	100	1,000
	Cherdjev–Karakul	220	67	120
Iran	Balkanabad–Gonbad	220	311	300
	Shatlyk–Seraxs	220	112	160

Source: "Elektroenergetika Turkmenistana (Electric Power of Turkmenistan)," 183.

At the same time, if Turkmen authorities succeed in reaching the level of gas production in the amount of 230 billion m^3 per year to boost electric power production in TPPs, it will be able to supply thermal power to external markets as well as to energy hungry Central Asian upstream countries via existing power transmission lines through Uzbekistan.

391 Ministry of Oil Industry and Mineral Resources of Turkmenistan, *Ministry.*
392 Ministry of Oil Industry and Mineral Resources of Turkmenistan, "Ministry," *Minenergo.gov.tm,* n.d, accessed June 1, 2014, http://www.minenergo.gov.tm/index.php/7-news/188-ministerstvo.
393 "Turkmenistan to Increase Electricity Export," *Gas and Oil Connections*, August 3, 2015, accessed June 15, 2017, http://www.gasandoil.com/oilaround/energy/04774b29a56227b616212d9d5995bff7.
394 Asian Development Bank, "Proposed Multitranche Financing Facility," 2. https://www.adb.org/sites/default/files/institutional-document/31483/omd14.pdf.
395 Asian Development Bank, "Islamic Republic of Afghanistan: Power Sector Master Plan," 6-47.

KAZAKHSTAN: TOWARDS SUSTAINABLE POWER SUPPLIES

Kazakhstan is a major electricity producer and a consumer in Central Asia. Its peak annual consumption amounted to 104.7 billion kWh in 1990. Even though annual electricity consumption decreased to 50.7 billion kWh per year in 1999, the consumption rate had been increasing for around 5 percent throughout the 2000s.[396] Due to its vast territory and lack of countrywide electric power transmission infrastructure, Kazakhstan has been securing adequate electricity supply through cooperation with neighbouring countries.

Kazakhstan's electric power grids operate in parallel with both Russian and the unified Central Asian electric power systems. It is divided into three zones: northern zone (Akmola, Aktobe, Kostanay, Pavlodar, North-Kazakhstan, East-Kazakhstan, Karaganda); southern zone (Almaty, Zhambyl, Kyzylorda, South–Kazakhstan); and western zone (Atyrau, Mangystau, and West–Kazakhstan regions). The southern zone is connected to the electric power grids of Uzbekistan and Kyrgyzstan. Northern regions are supplied with electricity from cheap Ekibastuz coal-fired TPP. While the northern zone produces 72.7 percent of the total electricity in the country, despite significant production capacity there is also a growing demand for it. The northern zone operates in parallel with Russian electric power grids connected via 220–500–1050 kV transmission lines. It is also expected that 500 kV transmission line, with the capacity of 1000 MW, will move electricity from coal-rich Ekibastuz to China.[397] The north–south 500 kV transmission line was built in 1998 to cover the peak electricity needs of the southern regions of Kazakhstan and to secure itself from unilateral supply cuts from the electric power grids of Uzbekistan.[398]

Kazakhstan has considerable power production capacity, but until recently lacked the power transmission infrastructure to move resources throughout the country. Within the CAES, southern regions have been relying on energy supplies from neighbouring Uzbekistan and Kyrgyzstan. To secure itself from unilateral energy supply cuts from these countries, Kazakhstan has decided to strengthen countrywide electric power grids (north–south).[399] While there are disagreements over payment and frequent cut-offs of power supplies from Uzbekistan that affect energy cooperation, in the case of Kyrgyzstan, it is the Kyrgyz government's technical incapability to fully manage its electric power system that caused the electricity supply cuts.

Electric Power Production and Consumption

The total installed capacity of Kazakhstan's power plants accounted for 22,055 MWh (22 billion kWh) in 2016, out of which 18,789.1 MWh (18.8 billion kWh) is available capacity. In 2016, 93.9 billion kWh of electricity was produced in Kazakhstan, which is slightly more compared to the previous year (91.073 billion kWh).[400] Thermal power share in the overall power production balance is roughly 88 percent. Around 11 percent comes from hydro-power, with remaining power production accounting for renewables. Kazakhstan's high-voltage transmission lines are owned and operated by KEGOC, while most of the regional transmission lines below 220 kV are owned by about 30 Regional Electricity Companies.[401] Kazakh authorities have done a considerable job in restoring electric power sector of the country since it was damaged after the

396 Ministry of Oil and Gas of the Republic of Kazakhstan, *Neftyanaya Promishlennost (Oil Industry)* (Astana: Mgm.gov.kz, n.d), accessed February 5, 2016, http://mgm.gov.kz/news/42.
397 Adilet legal portal, *O Programme Razvitiya Elektroenergetiki do 2030 Goda (On the Program on Electric Power Development Until 2030)* (Adilet.zan.kz, 2010), accessed February 1, 2016, http://adilet.zan.kz/rus/docs/P990000384_.
398 Adilet legal portal, "On the Program on Electric Power Development until 2030."
399 Dinara Nurusheva, Expert Bilig Brains, Almaty, Kazakhstan, April 20, 2016.
400 "Kazakhstan - Electric Power," *Kazakhstan Country Commercial Guide,* September 13, 2017, accessed December 15, 2017, https://www.export.gov/article?id=Kazakhstan-Electrical-Power-Generation
401 "The National Energy Report 2015," *Kazenergy,* 45.

disintegration of the Soviet Union. Power production capacity has been boosted and transmission lines extended. While consumption rate has also been increasing, there is a tendency for energy consumption reduction in Kazakhstan.

Table 10. Kazakhstan Power Generation 2007-2017.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 est
Kazakhstan power generation	78.9	80	78.4	82.3	86.2	90.2	91.9	94	95	93.9	102
Kazakhstan power consumption	76.9	80	77.9	83.6	88.1	91.4	89.61	91	91	91.1	96

"Kazakhstan - Electric Power," *Kazakhstan Country Commercial Guide.*

Primary energy consumption in Kazakhstan has decreased from 57.7 million tons of oil equivalent in 2014 down to 54.8 million tons of oil equivalent in 2015. It was anticipated that the tendency and electric power generation would continue to slightly drop in the future. It should be reduced due to the fact that 70 percent of power generation capacities are aged. Secondly, authorities are introducing energy efficiency initiatives, which will result in energy savings and less power demand.[402] Similar to other Central Asian countries, electricity generation facilities of Kazakhstan are highly inefficient. Sixty-five percent of those facilities has been in use for more than 20 years, and about 31 percent for more than 30 years, while 94 percent of Kazakhstan's gas turbines, 57 percent of its steam turbines, and 33 percent of its steam boilers have been in use for at least twenty years. This result in electricity loss of about 15 percent across transmission and distribution systems.[403] The statistics have shown, however, that there had been unchanging trends for power consumption over the past several years.

The northern electric power plants produce more electricity than northern territories consume. A transmission line connecting the north and the south, which was put in place in 1998, ensured the country's ability to meet peak electricity demand caused by extreme weather conditions or sudden supply cuts within the CAPS.[404] The security of electricity supplies to southern regions requires complex measures to be taken. Electric power transmission lines, connecting Southern Kazakhstan with Uzbekistan and Kyrgyzstan within the CAPS, are capable of transporting up to 8–9 billion kWh annually in both directions. The Zhambyl power plant, which can add 5–7 billion kWh per year, will not only supply domestic electricity market but also export electricity to its southern neighbours. According to the estimated figures of the (former) Ministry of Industry and New Technologies of Kazakhstan, the volume of electricity consumption will increase up to 170 billion kWh annually by 2030.[405] To meet the growing electricity demand of the south, Moynak HPP—with a capacity of 300 MW—was connected to electric power transmission lines and 2x660 MW Balkhash TPPs expected to start supplying electricity in 2017.[406]

Sixty percent of hydro-power potential is concentrated in the mountainous south-eastern region, which has the capacity to produce 8 billion kWh annually that can contribute to the sustainability

402 Dmitriy Sheykin, "Oil and Gas Sector of the Republic of Kazakhstan," *RFCA Rating Agency*, October 2016, 8.

403 "Kazakhstan - Electric Power," *Kazakhstan Country Commercial Guide.*

404 Adilet legal portal, "On the Program on Electric Power Development until 2030."

405 Adilet legal portal, "On the Program on Electric Power Development until 2030."

406 Commonwealth of Independent States, O Razvitii Sotrudnichestva Gosudarstv–Uchastnikov SNG v Sfere Elektroenergetiki. Problemi i Perspektivi (On the Development of Cooperation of CIS Member States in the Field of Energy. Problems and Perspectives), (CIS Internet Portal, 2013), accessed May 20, 2014, http://www.e-cis.info/page.php?id=23654.

of Kazakhstan's electric power sector.[407] Kazakh authorities are counting on renewables to take over coal–based electric power sector. At the moment, however, hydro-power contributes the most to the clean energy supplies. The share of the hydro-power has decreased in the overall energy consumption balance over the period of the past decade from 4.2 percent in 2005 down to 3.3 percent in 2015. To meet growing demand for electricity new hydro-power generation capacities have been constantly introduced (Uralsk HPP, Akshabulak HPP, Moynak HPP, and etc.). According to the electric power operating company KEGOC, hydro-power generation capacities in Kazakhstan accounted for 9250.3 million kWh in 2015, which is 1014.5 million kWh more than in 2014. Overall, hydro-power potential of Kazakhstan is 55 billion kWh on large rivers and 7.6 billion kWh on small rivers.[408] Authorities are planning to increase the share of power production from renewables up to 3 percent in 2020, and about 10 percent by 2030. Prior to 2010, Kazakhstan was a net exporter of electricity. Then Kazakhstan started consuming more power than it produced. In 2013, however, the trend was reversed. The Ministry of Energy aims to increase production capacity up to 150 billion kWh of electricity by 2030. Currently, Kazakhstan has 63 power plants with the total installed generating capacity of 19.9 GW.[409]

Despite considerable hydro-power potential it is still relatively underdeveloped. Kazakhstan also enjoys abundance of uranium reserves and produces 23 thousand tons of uranium annually. There is no nuclear power plant in the country at this stage. However, authorities are planning to build two nuclear power plants by 2050.[410] Until all these projects are implemented, intra-Central Asian electricity trade is the most secure way to ensure a sufficient amount of electricity supplies, both for normal and peak modes, to the southern regions of the country.

Sustainability of Electric Power Supplies

The electric power sector is highly dependent on coal–fired Thermal Power Plants. These plants account for 80 percent of Kazakhstan's total greenhouse gas (GHG) emissions. Such dependence does not allow the country to comply with its requirements in accordance with the Kyoto Protocol, which Kazakhstan signed in 2009 and voluntarily committed to reduce GHG emissions by 15 percent relative to the 1992 level by 2020 and by 25 percent of that level by 2050. Having gained full membership in the United Nations Framework Convention on Climate Change Kazakhstan had to comply with Mandatory global reduction targets, after Paris Agreement (COP 21) Kazakhstan may reaffirm its commitment to emissions reduction. Yet, Kazakhstan will have to considerably reduce GHG. It would be physically quite costly to shut down most of the coal –fired TPPs and negatively affect the level of energy security in the country. In the near-term perspective, authorities can introduce energy efficiency measures. In the longer-term perspective, the target may be achieved through larger share of the renewable energy sources yet to be introduced in accordance with the goals set within the Kazakhstan Strategy–2050.[411] Since there is, currently, electric power surplus in the country, according to the Minister of Energy, authorities are concentrating on regulating tariffs system and payment mechanism. One of the key components in the concept of energy security is to ensure stability of electric power supplies and guarantee affordability for the population and industrial sector. In the "100 tangible steps" announced by the President Nazarbaev on May 2015, there are steps dedicated to achieving the goals.[412]

407 Ministry of Industry and New Technologies of the Republic of Kazakhstan, *Malie Gidroelektrostancii (Small Hydro-power Plants)* (Astana: Mint.gov.kz, n.d), accessed March 15, 2013, http://www.mint.gov.kz/index.php?id=203&lang=ru.
408 "KEGOC Annual Report: Key Financial and Operational Indicators," *KEGOC,* 23, accessed December 15, 2016, www.kegoc.kz/sites/default/files/content-manager/ar2015-kegoc_eng_smrt.pdf.
409 "Kazakhstan - Electric Power," *Kazakhstan Country Commercial Guide.*
410 "KEGOC Annual Report: Key Financial and Operational Indicators," *KEGOC,* 23, www.kegoc.kz/sites/default/files/content-manager/ar2015-kegoc_eng_smrt.pdf.
411 "The National Energy Report 2015," *Kazenergy, n.d.,* 27.
412 "The National Energy Report 2015," *Kazenergy, n.d.,* 45.

CENTRAL ASIAN POWER SYSTEM AND RESOURCE–SHARING MECHANISM

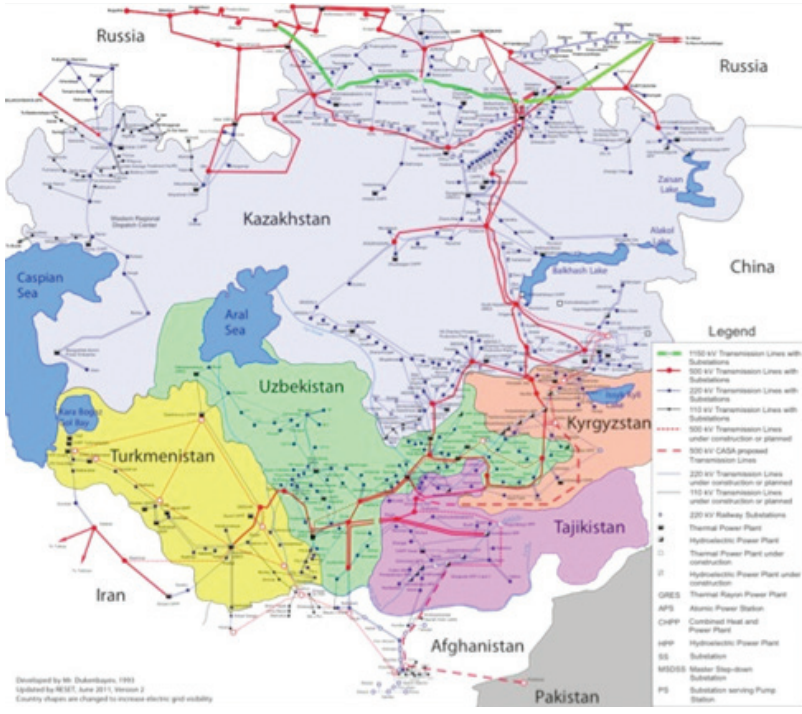
The resource-sharing mechanism ensured reliable and stable energy supplies within the CAPS for two decades after disintegration of the Soviet Union. Following the well-functioning pattern, Tajikistan and Kyrgyzstan ensured a continuous flow of water and hydroelectricity to downstream countries. Kazakhstan, Turkmenistan, and Uzbekistan in turn channelled light oil products, gas, and thermal electricity to their upstream neighbours. The CAPS not only solved the problem of uneven distribution of electricity, but also prevented electricity supply disruptions due to seasonal variations of electric power production in the region. Despite the fact that everyone benefitted from cooperation within the CAPS, formally the system collapsed under the pressure of geopolitical processes in the region in 2009. That year, Uzbekistan withdrew from the "electricity ring." Turkmenistan left the CAPS even earlier, in 2003.[413] Central Asian countries' electric power grids are no longer managed by Energia. However, regional electric power systems remain physically connected and electricity trade with sometimes-prolonged disruptions still take place. Central Asian countries are very much dependent on each other in ensuring efficiency, sustainability and sufficiency of electricity supplies. All these conditions imply the necessity to consider Central Asian countries' electric power sectors within the unified system. The system that is, perhaps, malfunctioning, but the still the system of interdependent national electric power sectors.

The CAPS, as designed during the Soviet period, incorporated electric power systems of southern Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, and Turkmenistan. The national electric power system of Kazakhstan is divided into three loosely connected internal networks: northern, western, and southern power zones. Northern and, to certain extent western regions of Kazakhstan are mostly connected to the Russian electric power grid. The southern regions of the country received electricity from the CAPS. The central role in the CAPS was devoted to Uzbekistan. Since the CAPS was designed irrespective of national borders, due to Uzbekistan's central geographical location, it was economically cost-efficient to establish the network of transmission lines connecting all other countries through the territory of Uzbekistan.

Nonetheless, Uzbekistan decided to withdraw from the CAPS. Some experts characterize the decision as a politically motivated move.[414] Others argue that Uzbekistan's withdrawal was provoked by Tajikistan itself. Announcement of the opening of a new 500 kV electric power transmission line South–North by Tajik authorities without proper notification of their counterparts was considered by the Uzbek side as Tajikistan's attempt to establish independent electric power system and a preparation to withdraw from the CAPS.[415] Perhaps referring to this particular announcement, Sagdulaev, head of the Uzbek national energy company Uzbekenergo, published an article in the *Pravda Vostoka* newspaper saying that, "[from now on (2009)] Central Asian electric power grid operations will jeopardize stability and safe functioning of Uzbek electric power system, and Uzbekistan raises the issue of withdrawing from the system and operating in a separate mode."[416] The message that he tried to deliver was that every Central Asian state was pursuing its own interests with no concerns for the consequences to others. And, that was exactly what Uzbekistan did. In any case, Uzbekistan's withdrawal from the CAPS to a different extent affected all its member states.

413 Sebastien Payrouse, "Central Asian Power Grid in Danger," *CACI Analyst*, September 2009, http://old.cacianalyst.org/?q=node/5232/print.
414 "Uzbekistan Withdraws from the Central Asian Power Grid," *BBC News,* December 1, 2009, accessed March 5, 2015, http://news.bbc.co.uk/2/hi/asia-pacific/8388406.stm.
415 Payrav Chroshabiyev, "Uzbekistan's Decision to Withdraw from CA Power Grid Provoked by Tajikistan Itself, Says Tajik Expert," *ASIA-Plus,* November 9, 2009, accessed May 1, 2016, http://news.tj/en/news/uzbekistan-s-decision-withdraw-ca-power-grid-provoked-tajikistan-itself-says-tajik-expert.
416 Avaz Yuldoshev and Victoria Naumova, "Uzbekistan Plans to Pull out of Central Asia's Power Grid Next Month," *ASIA-Plus,* November 7, 2009, accessed March 20, 2015, http://www.news.tj/en/news/uzbekistan-plans-pull-out-central-asia-s-power-grid-next-month.

Figure 7. Central Asian (Electric) Power System.



Source: "Central Asia Power System," *Exploring Kazakhstan and Post-Soviet Central Asia, One Steppe at a Time*, n.d. accessed December 20, 2016, http://onesteppeatatime.wordpress.com/2012/06/08/central-asia-power-system/.

After Uzbekistan's withdrawal from the CAPS, Tajikistan, which heavily relies on hydroelectricity export to pay for the fossil fuel imports needed to mitigate its winter supply shortages, had to redirect some of its electricity supply flow to Afghanistan and speed up the construction of Rogun, the highest HPP in the world. Kyrgyzstan was forced to largely count on Kazakhstan and Russia to meet its winter energy needs and search for investors to share the cost of the second-largest Kambarata–1 HPP to start the construction process as soon as possible. Central Asian downstream countries, however, perceive the construction of giant HPPs as a factor that can negatively affect the water withdrawal balance in the region. To prevent full-scale realization of these projects, Uzbekistan used its political, economic, and energy leverage to influence the decision making of upstream states. Conflict over the water withdrawal and electricity supply within the CAPS without establishing self-sustaining electric power systems is negatively affecting Central Asian countries' energy security. While Central Asian states have a history of cooperation in the electric power sector and have all the necessary preconditions to engage in mutually beneficial electricity trade, Central Asian states still fail to coordinate their policies to respond to energy security challenges. After the collapse of the Soviet Unified Energy System, every Central Asian state started thinking about the possibility of strengthening its national energy system, including electric power system. It is, however, Uzbekistan's withdrawal from the CAPS that forced other regional state actors to give up the policy focused on sustaining a unified electric power system in which everyone's interests are met and concentrate on establishing their own countrywide electric power systems through a painful transformation process. Going after small hares prevents them from hunting a bigger stag—the security of the CAPS.

Water and Energy Modes of the HPP

During the Soviet period, HPPs in Central Asia were designed first to ensure stable water release for irrigation purposes and then to generate electricity. Two major dams, Nurek and Toktogul, were built to regulate water flows, supply sufficient water for irrigation purposes, and prevent floods that could damage downstream countries' agricultural sector and especially cotton industry.[417] It was later decided to build two other giant dams/HPPs (Rogun and Kambarata–1) to strengthen water management in the region.

Receiving large quantities of water during the vegetation period has always been important for downstream Central Asian states. The Soviets promoted an active policy to expand irrigated lands in Central Asia, particularly Uzbekistan. As a result, Uzbekistan's irrigated land increased from 1.2 million hectares in 1913 to 4.2 million hectares in 1990. Its agricultural sector was specialized in cotton production and was accounting for two-thirds of all cotton produced in the Soviet Union.[418] Cotton production together with some other crops cultivation consumed over 90 percent of water resources from Amu Darya and Syr Darya.[419] Cotton industry remains an important part of Uzbek economy and the government obliges Uzbek farmers to cultivate about 60–70 percent of their farmland with cotton and wheat. This implied that Uzbekistan would be highly dependent on large quantities of water.[420] Moreover, currently cotton accounts for 9 percent of the total export of Uzbekistan.[421] That is why Uzbekistan is concerned about any major projects in its upstream neighbours capable of affecting existing water distribution balance.

The general schemes of Rogun and Kambarata dams were designed in Tashkent (Uzbekistan). Working in the water mode, Nurek, the largest HPP in Tajikistan, was never capable of accumulating enough water to produce significant volume of electricity in winter. While Toktogul HPP, with the capacity to potentially accumulate enough water to produce electricity any time of the year, also mostly generated electricity in the summertime.[422] In the 1990s, to keep the water mode functioning, Central Asian countries signed a number of agreements, according to which downstream states were ensured stable water supply for irrigation purposes. In exchange, Central Asian upstream countries received natural gas, oil products, and thermal electricity in wintertime to meet their energy demands.

However, when Uzbekistan withdrew from the CAPS and it was no longer possible to ensure coordinated operation of the unified electric power system, Tajikistan and Kyrgyzstan decided to turn the water mode of operating HPPs into the energy mode focused on producing as much electricity as possible whenever there was a need.[423] Both Tajikistan and Kyrgyzstan, having

417 Ernest Karibekov, "Plyus Elektrifikacii Vsey Strane. Stranam Centralnoy Azii Nujna Novaya Model Edinoy Energosistemi (Countrywide Electrification Pluses. Central Asian Countries Need New Model of the Unified Energy System)," *Centralasia.ru*, June 3, 2012, accessed August 5, 2016, http://www.centrasia.ru/newsA.php?st=1338670560.

418 David Tarr and Eskender Trushin, "Did the Desire for Cotton Self-Sufficiency Lead to the Aral Sea Environmental Disaster?" in Nariya Khasanova, "Revisiting Water Issues in Central Asia: Shifting from Regional Approach to National Solutions," *Central Asia Fellowship Papers,* no. 6 (October 2016): 7, https://app.box.com/s/fornzf5490xyou1juaw0.

419 Golubev G., *Systems View of the Water Management in Central Asia* (in Russian) (Moscow State University, Faculty of Geography, 2001) in Nariya Khasanova, "Revisiting Water Issues in Central Asia," 8.

420 Nodir, Djanibekov, Inna Rudenko, John P. A. Lamers, and Ihtiyor Bobojonov, *Pros and Cons of Cotton Production in Uzbekistan* (Case-study 7–9, Cornell University, 2010) in Nariya Khasanova, "Revisiting Water Issues in Central Asia," 10.

421 Central Asia Data Gathering and Analysis Team, "Trade Policies and Major Export Items," 12.

422 Asian Development Bank, Technical Assistance Consultant, *Central Asia Regional Economic Cooperation: Power Sector Regional Master Plan* (Metro Manila: Asian Development Bank, Report no. 43549, 2012), http://adb.org/sites/default/files/projdocs/2010/43549-01-reg-tar.pdf.

423 Karibekov, "Plus Electrification to the Whole Country."

experienced deficiency of gas and winter electricity supplies, transformed their energy sectors first to meet their needs and second to significantly increase electricity export capacity. Currently, Central Asian upstream countries continue releasing water to downstream neighbours during the vegetation period for two main reasons. First, they are bound by intergovernmental agreements (Nukus Declaration (1995), Protocol 566 (1987) and agreements on using the waters of the Syr Darya and Amu Darya rivers—Syr Darya Framework Agreement (1998) and Agreements on Hydrometeorology and Parallel Operation of Energy systems (1999)).[424] Second, and most importantly, Tajikistan and Kyrgyzstan are physically incapable of accumulating a large amount of water to produce electricity both in summer and winter. When Uzbekistan withdrew from the CAPS, Tajikistan was left in complete isolation. With no possibility to export electricity, both Tajikistan and Kyrgyzstan had to spill water. The governments of the Central Asian upstream countries are counting on the Rogun and Kambarata–1 dams to increase their ability to accumulate more water.

Filling the planned Rogun and Kambarata dams with water will take many years and may cause reallocation of water shares in Central Asia. Melted glaciers are main source of water flow in rivers in Central Asia. However, glaciers in the mountains have been rapidly receding in the region. Glacier volume changes in both Kyrgyzstan and Tajikistan accounted for around 100 km^3 (out of 500 km^3 and 600 km^3 respectively) over the last 50 years and are expected to continue in the same amount for the next half-century.[425] Calculations of the volume of water needed to fill dams were based on the water flow already under the condition of glacier melt. Thus, we cannot expect any significant increase in water flow from the receding glaciers in Tajik and Kyrgyz mountains. Besides, the fact that these dams will most likely be operated in energy mode suggests that water will be accumulated in summertime when downstream countries need it the most and released in winter. The generation capacities from Kambarata–1 HPP may allow Toktogul to return to irrigation mode with minimal effect on the current water withdrawal balance. Central Asian downstream states, however, fear that building new HPPs will take many years and new generation capacities will produce electricity for export, forcing Toktogul to continue operating in the energy mode.[426]

Main Source of Disagreements—Giant HPPs

Around 80 percent of water in Central Asia is generated in upstream Tajikistan and Kyrgyzstan. More than 85 percent of it, however, is consumed by downstream Kazakhstan, Turkmenistan, and especially Uzbekistan. While such distribution of water perfectly suits downstream countries' interests, authorities of Tajikistan and Kyrgyzstan believe it is unfair and advocate for non-interference into their energy/water policy in regard to increasing their water accumulation and electricity production capacity.[427] To increase electricity production upstream states have to accumulate more water in the summer and release it in winter as well as reduce the amount of water to be released until dams are filled up. The Government of Tajikistan argues that the construction of large HPP facilities is the sovereign right of the state, and will be in full compliance with international law.[428]

Central Asian region still has the highest rate of water withdrawal per capita in the world and

424 Eli Keene, "Solving Tajikistan's Energy Crisis," *Carnegie Endowment for International Peace*, March 25, 2013, accessed June 17, 2016, http://carnegieendowment.org/2013/03/25/solving-tajikistan-s-energy-crisis.
425 Vladimir Fedorenko, "Prospects for Water Cooperation in Central Asia," *Rethink Paper* 14 (February 2014): 14, http://www.rethinkinstitute.org/wp-content/uploads/2014/02/Fedorenko-Prospect-of-Water-Coop.pdf.
426 Karibekov, "Plus Electrification to the Whole Country."
427 Sunnatullo Jonboboev, Personal Interview, Senior Research Fellow at the University of Central Asia in Tajikistan, Astana, Kazakhstan, May 25, 2014.
428 Ekaterina Klimenko, "Central Asia as a Regional Security Complex," *Central Asia and Caucasus Press* 12, no. 4 (2011).

Uzbekistan,[429] with half the population of the region, accounts for around 50 percent of the total water withdrawal in the region. Water quotas for transboundary rivers in Central Asia are allocated as follows:

- Amu Darya
  - Uzbekistan: 48.2 percent
  - Turkmenistan: 35.8 percent
  - Kyrgyzstan: 0.6 percent
  - Tajikistan: 15.6 percent

- Syr Darya
  - Uzbekistan: 50.5 percent
  - Kazakhstan: 42 percent
  - Kyrgyzstan: 0.5 percent
  - Tajikistan: 7 percent.[430]

The high rate of water consumption in Uzbekistan is explained by the domination of the water-intensive cotton industry in its agricultural sector, which accounts for over 90 percent of water consumption, and the fact that up to 60 percent of river water does not reach irrigated land owing to deteriorated irrigation infrastructure.[431] Even though the amount of land allocated for cotton cultivation has been considerably reduced, reforms to increase the efficiency of Uzbekistan's irrigation infrastructure and introduce water saving technology are not progressing quickly enough to make a difference.

Most of the hydro-power generation facilities in Central Asia are run-of-river-type HPPs generating electricity only in summer. The only exception in the region is the Toktogul HPP, which has a storage capacity large enough to produce electricity even in winter and transmit it to the north of the country via a newly constructed 500 kV line.[432] Most of the other HPPs of the Naryn cascade are connected to the Uzbekistan's electricity grid. In return, Uzbekistan has been transmitting electricity to Kazakhstan, part of which was then sent back to Kyrgyzstan while the rest was retained for Kazakhstan's electricity needs. Northern parts of Tajikistan are also connected to Uzbekistan's electric power grid. When Uzbekistan withdrew from the CAPS, electricity exchange between Kyrgyzstan and Kazakhstan via the electricity network of Uzbekistan remained operational to some extent, while Tajikistan was left in complete isolation. Kyrgyzstan is currently importing electricity as well as oil products and gas from Kazakhstan, Uzbekistan and Russia. Kyrgyz government has recently completed the Datka–Kemin electricity transmission lines connecting the north and south, but has made no progress in building Kambarata–1. The situation is, however, more serious in the case of Uzbekistan–Tajikistan energy relations. The largest water reservoir in Tajikistan is Nurek, but it has limited storage capacity and must generate full electricity output in summer or spill water.[433] Severe energy shortages explain Tajikistan's desire to have at least one (Rogun) reservoir large enough to store water to produce electricity in wintertime. This project, however, turned out to be one of the main reasons for disagreements between Uzbekistan and Tajikistan.

The Tajik government expects the Rogun HPP to serve three major purposes: produce electricity

429 Olli Varis, "Resources: Curb Vast Water Use in Central Asia," *Nature,* October 1, 2014, accessed January 25, 2015, http://www.nature.com/news/resources-curb-vast-water-use-in-central-asia-1.16017.
430 Jenniver Sehring, *The Politics of Water Institutional Reform in Neo-Patrimonial States: A Comparative Analysis of Kyrgyzstan and Tajikistan* (Springer Science & Business Media, 2009), 71.
431 Shavkat Rakhmatullaev, Frédéric Huneau, Hélène Celle-Jeanton, Philippe Le Coustumer, Mikael Motelica-Heino, Masharif Bakiev, "Water Reservoirs, Irrigation and Sedimentation in Central Asia," *Environmental Earth Sciences* 68, no. 4 (2013) in Nariya Khasanova, "Revisiting Water Issues in Central Asia," 12.
432 Asian Development Bank, Technical Assistance Consultant, "Power Sector Regional Master Plan," 3–3.
433 Asian Development Bank, Technical Assistance Consultant, "Power Sector Regional Master Plan," 2–17.

in wintertime; increase electricity export capacity; and improve water management. Tajikistan, like any other country in the region, has a right to increase electricity exports to generate revenue. Moreover, improved water management is in the interests of both upstream and downstream countries. However, only increased electricity production in winter contributes to national energy security. While Rogun can potentially add summer electricity production capacity, which would be exported, revenues generated from increasing electricity exports do not guarantee the possibility of wintertime gas and thermal electricity imports from the neighbouring states.

There is a belief that Uzbekistan is against the Rogun HPP; in fact, it finds the proposed heights of the dam threatening to downstream countries (335 m, 3,600–2,800 MW; 300 m, 3,200–2,400 MW; and 265 m, 2,800–2000 MW).[434] Official statements by the Uzbek government emphasize the consequences of a dam failure, which according to them, may potentially cause a 245–280 meters high wave at the start-point and a 6–7 meters high wave in the Republic of Kazakhstan, endangering 5 million people, including 3 million living in Uzbekistan in a flooded area of 1.3–1.5 million hectares.[435] Most importantly, however, Uzbek authorities are concerned about the possible shortage of water that will most likely be caused by the attempt of Tajik government to fill the Rogun dam (expected time—16 years). Tajik authorities, on the other hand, emphasize a recently released World Bank report on the environmental and social impact assessment of the Rogun dam showing that the highest possible option of the dam is the most economically efficient, with acceptable environmental impact, compared to other alternatives.

Diversifying Hydro-Power Supply Routes

Intra-Central Asian electricity trade ensured security of the CAPS. However, regional electricity trade that accounted for 25 GWh per year in 1990 dropped to the level of 4 GWh per year in 2008 and has been further decreasing since then.[436] Decreasing intra-Central Asian electricity trade and frequent electricity supply disruptions forced Central Asian upstream countries to consider building alternative electricity supply routes. Tajikistan and Kyrgyzstan's excessive dependence on thermal electricity imports from neighbouring countries makes them vulnerable to electricity supply disruptions. For instance, electricity supply cuts from Uzbekistan and Turkmenistan to Tajikistan in 2008 caused countrywide electricity blackouts throughout the whole winter period. To address electricity deficiency due to such supply disruptions, Kyrgyzstan and Tajikistan started establishing independent electric power systems.

Over 90 percent of Kyrgyzstan's electricity is generated from hydro resources in the central parts of the country, while the major consumption is in the north. There is only one 500 kV transmission line connecting the Toktogul HPP with the north of the country. The other four HPPs in the Naryn cascade are connected to the 220 kV grid located in the Fergana part of the Uzbek electric power system. The electricity exchange between Kyrgyzstan, on the one hand, and Kazakhstan or Uzbekistan, on the other, in the end of the 1990s and the beginning of the 2000s was conducted approximately within the following formula:

From the Republic of Kazakhstan (annually):
- thermal electricity: 150 million kWh
- coal: 150 thousand tonnes

From the Republic of Uzbekistan (annually):

434 Barki Tojik, *Techno-Economic Assessment Study for Rogun Hydroelectric Construction Project* (World Bank, 2014), accessed October 5, 2016, http://www.worldbank.org/content/dam/Worldbank/document/eca/central-asia/TEAS_Executive%20Summary_Final_eng.pdf.
435 World Bank, *To Executive Secretary, The Inspection Panel* (Washington, DC: World Bank, 2010), accessed May 10, 2016, http://siteresources.worldbank.org/ECAEXT/Resources/258598-1297718522264/Request_for_Inspection_Eng.pdf.
436 Asian Development Bank, Technical Assistance Consultant, "Power Sector Regional Master Plan," 1.

- natural gas: 500 million m^3
- thermal electricity: 54 million kWh
- fuel oil: 15 thousand tonnes

From Kyrgyz Republic to the neighbouring states annual hydroelectricity supplies:

- to the Republic of Kazakhstan: 1100 million kWh
- to the Republic of Uzbekistan: 1100 million kWh.

During the 1999 summer period, Tajikistan provided the return of electricity to Kazakhstan and Uzbekistan in a 1:1 ratio.[437]

Until 2009, Central Asian countries' electric power systems operated in coordination with each other. That is why there were no payments for transit of electricity through the Central Asian electric power grids. The payment mechanism, first based on barter, was later applied to export/import relations. When Uzbekistan withdrew from the CAPS, the payment mechanism was introduced even for transit of electricity. However, Kyrgyzstan stopped paying transit fees for electricity transited from Toktogul HPP to the southern Batken region of the country. The construction of the Datka electric power station, 30 km from Djalal Abad, and the modernization of several transmission lines ensured some electricity supply to its southern regions.[438] Tajikistan has also constructed some south–north electricity transmission lines. When these projects connecting northern and southern parts of Tajikistan and Kyrgyzstan are completed, hypothetically they will be able to establish connections between each other and Kazakh electric power grids entirely avoiding Uzbek territory.

CASA–1000

When Uzbekistan withdrew from the CAPS, Kyrgyzstan continued electricity trading with Kazakhstan. Tajikistan, however, was completely isolated from other Central Asian states. Possessing a surplus of electricity production in the summertime with no possibility to export it to the neighbouring Uzbekistan, the Tajik government decided to redirect extra electricity to Afghanistan. Both Tajikistan and Kyrgyzstan supported the Central Asia–South Asia Regional Electricity Market (CASAREM) initiative to move surplus electricity to South Asia. As the first phase of this initiative, CASA–1000 is expected to supply electricity to Afghanistan and Pakistan from the current surplus in Tajikistan and Kyrgyzstan. Even though CASA–1000 excludes India as a potential beneficiary, hypothetically, India might benefit from the Central Asian hydro-power potential in case electricity production in upstream Central Asian countries increases (with the construction of the Rogun and Kambarata–1 HPPs) and electricity transmission lines are extended to India.[439] The initial estimates of the CASA-1000 project account for US 1$ dollars. It seems like the initiative is progressing as the opening ceremony of the construction process was announced on May 12, 2016 in Tajikistan. It is expected that the transboundary transmission line will be built by 2020. Tajik authorities highlighted that the overall capacity of the project will be around 5 billion kWh, supplying electricity from Tajikistan and Kyrgyzstan to Pakistan. They also specified that "With the launch of the first stage of the Rogun HPP, which is expected this year, the export opportunities will further expand."[440]However, concerns regarding

437 Protocol of the Workshop for the Representatives of Water and Energy Authorities of the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan and the Republic of Uzbekistan Related to Water and Energy Use Issues in the Forthcoming 1998/9 Fall-winter Season and 1999 Vegetation Period (1999), accessed May 20, 2015, http://www.ce.utexas.edu/prof/mckinney/papers/aral/agreements/Annual-Protocol-99.pdf.

438 Dmitriy Denisenko, "Kirgizstan Prekratil Platit' Uzbekistanu za Transit Elektroenergii (Kyrgyzstan Stopped Paying Uzbekistan for Power Transit)," *Vb.kg*, January 24, 2014, accessed January 25, 2014, http://www.vb.kg/doc/259320_kyrgyzstan_prekratil_platit_yzbekistany_za_tranzit_elektroenergii.html.

439 "CASA-1000," CASA-1000 official website, October 4, 2017, http://casa-1000.org/page5.html.

440 Kamila Aliyeva, "What Is Tajikistan's Electricity Export Share Within CASA-1000 Project?" *Azerinews,* January 12, 2018, accessed January 15, 2018, https://www.azernews.az/region/125397.html.

the security of electricity supply infrastructure and economic viability of the project as well as lack of electricity production in Tajikistan and Kyrgyzstan pose serious challenges for South Asian states to pursue their energy interests in the region.

Currently, installed power generation capacity within the network of the former CAPS accounts for over 25,000 MW, out of which 9,000 MW is hydro-power (36 percent) including major Nurek HPP (3,000 MW) and Toktogul HPP (1,200 MW), and 16,000 MW is thermal power (64 percent). However, real production capacity does not exceed 20,000 MW,[441] mostly because of decreasing hydro-power generation in upstream countries. In addition, South Asian countries are interested in winter electricity supplies. Uninterrupted electricity supply to South Asian countries can be achieved only with large TPPs operating to export thermal electricity and there are none in Tajikistan or Kyrgyzstan. CASA–1000 was initially counting on electricity generated on Uzbekistan's TPPs to supply electricity to South Asia 295 days/year. However, Uzbekistan did not sign up under the project and now Tajikistan and Kyrgyzstan would only be able to supply electricity for 70 days.[442] In this regard, if the CASAREM initiative is implemented, it will require significant volume of Central Asian electricity to be heading to the South Asian market, even at the expense of domestic consumption. Moving electricity out to external markets, even though it generates much-needed revenue, does not contribute to improving energy security in Central Asia.

Regional Energy Trade Versus the Rogun HPP in the Short-Term Perspective

Tajikistan, which heavily relies on hydro-power to pay for the fossil fuel imports needed to mitigate its winter supply shortages, after it was isolated from Uzbekistan had to redirect its electricity export to Afghanistan. Since Uzbekistan stopped selling gas to Tajikistan from January 2013, despite the fact that Tajikistan had been offering a good price, shows that earning money by exporting electricity to pay for Uzbek gas will not necessarily ensure gas flow from its neighbour. In an attempt to improve its energy security, Tajikistan prioritized exploitation of its hydro-power potential through the construction of the Rogun HPP.[443] The Rogun HPP will increase electricity production in general, but most importantly will make it possible to produce electricity in the wintertime. Previous Kyrgyz authorities had acknowledged that Kambarata–1 would not entirely save Kyrgyzstan from the energy crisis in the short-term. Besides, Kyrgyzstan can rely on Russia and Kazakhstan to improve its energy security and to meet wintertime electricity demands. There is also a possibility for Kyrgyzstan to build a Kara–Keche coal-fired TPP to increase availability of electricity all year round.[444] Tajikistan, on contrary, does not enjoy either of these options. Therefore, the president of Tajikistan did not give up the idea of building Rogun in the near future, which he turned into a symbol of energy security and independence of the country.

However, in the short- to medium-term perspective, the energy security of Tajikistan can be ensured only through a combination of developing its hydro-power potential with import of thermal electricity and gas from neighbouring countries. In other words, the exchange/swap/

441 Igor Tomberg, "Energy Industry in Central Asia – Challenges and Prospects," *Russian International Affairs Council* (2012), accessed March 4, 2013, http://russiancouncil.ru/en/inner/?id_4=350#top.
442 Rovshan Dovlatov, "Energeticheskiy Proekt po Postavkam Elektroenergii iz Stran Centralnoy Azii v Yujnuyu Aziyu Budet Realizovan Prejde Vsego po Politicheskim Motivam (Energy Project to Supply Electricity from Central Asia to South Asia will be Implemented Primarily for Political Reasons)," June 27, 2013, accessed September 1, 2014, http://expertonline.kz/a11231/.
443 "Uzbekistan 'Cuts Off Gas' to Tajikistan," *The Australian,* January 1, 2013, accessed May 1, 2016, http://www.theaustralian.com.au/news/latest-news/uzbekistan-cuts-off-gas-to-tajikistan/news-story/e827c626064402c4fbcc148f92b6cff8?sv=3218de401c306126f41b172d6393e5ea.
444 Ernest Karibekov, Personal Interview, Head of International Public Fund "Research Institute for the Central Asian Water and Water-Energy Resources Problem Studies", Bishkek, Kyrgyzstan, February 4, 2014.

trade of electricity to improve security of the CAPS can contribute to the energy security of Tajikistan. Until recently, intergovernmental relationships over the construction of large HPPs in Central Asia were tense. There was no guarantee that if Tajikistan and Kyrgyzstan postponed the realization of the Rogun and Kambarata–1 projects, one of the main sources of disagreements, Uzbekistan would restore functioning of the CAES or allowed them to use its energy infrastructure to transit resources from Turkmenistan and Kazakhstan. Even if Uzbekistan were to provide a 100 percent guarantee of this sort, some scholars believed that it could not be enough to placate Kyrgyzstan and Tajikistan and for symbolic and revenue-generating reasons, Kyrgyzstan and Tajikistan might still not back down.[445] Even though new leadership of Uzbekistan no longer openly blocking the construction of large HPPs, the analysis in this section shows that giant HPPs may not contribute to energy security as expected in the short-run and restoring regional trade is not only the better option, but the necessary one.

The 335 meters high Rogun HPP can almost double current production (16.5 billion kWh per year) by adding 13 billion kWh per year. However, it will take up to 16 years until the plant starts operating in its full capacity.[446] The World Bank led group of independent experts have concluded, after a series of economic, social, technical and environmental assessments, that out of three proposed heights of the dam, the highest 335 meters was found the most economically efficient one. During this period, electricity production in winter will remain limited. Taking into account the fact that Tajikistan does not possess sufficient funds to complete the project (worth US$ 3–6 billion[447]) and foreign investors are not rushing to invest in a project.

Table 11. Summary of Technical and Economic Assessment Studies for Rogun dam: Key Data.

Key Parameters	FSL1290	FSL1255	FSL 1220
Dam Height [	335	300	265
Reservoir active storage km^3]	10,300	6,450	3,930
Area at FSL [	170	114	68
Filling period [	16	13	9
Minimal operating lifetime yr]	115	75	45
Annual average cascade [	34.4, 34.3, 34.1	32.5, 32.4, 32.2	30.2, 30.1, 29.8

Table 12. Summary of Environmental and Social Impact Assessment Studies for Rogun dam: Key Data.

Key Parameters	FSL 1290	FSL 1255	FSL 1220
Summer flow Amu Darya Intended Operation [	37.4	37.4	37.4
Summer flow Amu Darya Maximizing winter energy [	30.0	30.9	33.5
Resettlement # Villages	77	36	25
Resettlement # Households	6035	2433	1825
Resettlement # Persons	42,000	18,000	13,000

Source: World Bank, Report on the 5th Riparian Information-Sharing and Consultation Process on the

445 Comment provided by Edward Schatz, an Associate Professor of Political Science at the University of Toronto, June 9, 2015.

446 World Bank, "Environment and Social Impact Assessment for Rogun Hydro-Power Plant, Analysis of Alternatives" (V Round of Dialogue on Technical and Economic/Environmental and Social Impact Assessment of the Rogun, Almaty, Kazakhstan, July 14, 2014).

447 David Trilling, "Tajikistan: Rogun Dam a Hot Topic As Tajiks Make It Through Another Winter of Shortages," *EurasiaNet.org*, March 12, 2009, http://www.eurasianet.org/departments/insightb/articles/eav031309f.shtml.

Assessment Studies of a Proposed Rogun Hydro-power Project (Washington, DC: World Bank, June 16–July 29, 2014), accessed May 1, 2016, http://www.worldbank.org/content/dam/Worldbank/document/eca/central-asia/Rogun%20Assessment%20studies%20Fifth%20Consultation%20Report_eng.pdf.

Over the past decade, high security risks have affected the investment climate, in which to further pursue construction of the dam. These risks forced Tajikistan to accept the terms not serving its best interests.[448] Tajikistan has already refused to agree on investment terms offered by Russian companies demanding a higher stake (75 percent) in benefits distribution. Almost similar investment terms were accepted by Tajikistan for the construction of Sangtuda–1 HPP and electricity produced in this plant is now being mostly exported, since the Russian side has to recover its investments. Export of electricity produced in Sangtuda affects the availability of electricity for domestic consumption. In this regard, it is preferable to look for foreign investments only after the security issues over the Rogun dam are more or less resolved. Besides, economic sanctions against Russia, which have had a profound impact on the Russian economy, negatively affect any desire or ability to participate in a large energy project such as Rogun.

Designed to ensure electricity supply to meet peak demand in winter, there is no guarantee that the Rogun HPP will not be extensively used for export purposes. There is currently a surplus of electricity production in Tajikistan and Kyrgyzstan and it is argued that CASA–1000 is supposed to transport it to southern neighbours. However, Afghanistan and Pakistan are in need of electricity import both in summer and winter and only Rogun and Kambarata–1 can provide it.[449] In this sense, Kyrgyzstan and Tajikistan may decide to increase export of electricity even at the expense of domestic consumption. The desire to export electricity in wintertime will make Rogun and Kambarata–1 economically attractive, but with a limited contribution to energy security projects. This does not mean that Tajik and Kyrgyz authorities should give up attempts to implement these projects. Given their interest in generating extra revenue, they most likely will not do so in any case. What it means, though, is that the contribution of these projects to each country's energy security might be limited.

Tajikistan does not have the financial resources to complete the construction of the Rogun HPP. The cost of the project has so far been estimated at US$ 3–6 billion. The total sum is not, of course, required all at once, since the construction will take approximately 16 years. Yet, in combination with other urgent investment-intensive energy projects, such as building small HPPs and upgrading infrastructure to improve energy efficiency, it will be difficult for Tajikistan to make significant progress. So far, Tajikistan has been counting on multilateral institutions' support, but the Asian Development Bank, a major contributor, announced that it would not finance the Rogun HPP and build CASA–1000 electric power transmission lines.[450] Tajikistan will probably seek external state contributions (Russian and Chinese, and potentially also Iranian and Indian) to complete Rogun. Negotiations with Russia have already failed due to disagreements over the control share once the HPP is completed. Chinese investors are unlikely to become involved unless regional conflict over the project is resolved or they start seriously considering importing Central Asian electricity to meet China's domestic needs. Currently, China prioritizes importing Central Asian oil and gas, and would not sacrifice friendly relationships with the transit country—a significant source of Central Asian gas—to participation in the construction of large HPPs.

448 Muzaffar Olimov, Personal Interview, Senior Scientist at the Tajik Academy of Sciences Institute of Language, Literature, and Oriental Studies, Astana, Kazakhstan, November 17, 2014.
449 President of the Republic of Tajikistan, *The Annual Message to the Majlisi Oli of the Republic of Tajikistan* (Dushanbe: President of the Republic of Tajikistan, 2011), accessed June 5, 2016, http://www.prezident.tj/en/node/2189.
450 "ABR Otkazalsya Finansirovat Stroitelstvo Rogunskoy GES I LEP v Pakistan (ADB Refused to Finance the Construction of Rogun HPP and ETL to Pakistan)," *Regnum.ru*, January 17, 2014, accessed January 20, 2017, http://www.regnum.ru/news/1755635.html.

Despite the fact that Tajik government succeeded in finding investors to share the cost of Rogun, there is a threat that most of the produced electricity would be exported with insignificant contribution to the country's energy security. While ordinary people's payment capability is limited, electricity for the major consuming facilities are subsidized by the government.[451] Foreign investors are only willing to provide money if they are sure that their investments will soon be returned. Unfortunately, the amount of money being paid by household consumers does not cover electricity production cost plus revenues. Construction of Sangtuda HPP–1 started in 2006. Iran's share in the construction accounted for US$ 180 million, while Tajikistan covered only US$ 40 million. According to the agreement, Iran would return the investment with interest from the HPP in 12.5 years of operation.[452] Because the domestic market fails to pay expected price (the cost of electricity production only varies from 3–8 cents per kWh), the Tajik government had to redirect produced electricity to external markets. If Tajikistan signs up for currently offered terms of investment, the Rogun HPP will most likely face the same fate.[453] Even though Tajik authorities have signed a contract with the Italian construction conglomerate Salini Impregilo for US$ 3.9 billion to build the Rogun dam, companies true commitment and ability to resist political and economic risks are yet to be tested. Central Asian countries' selection of projects is often dependent on money they are given. External players are taking full advantage of instability in Central Asia to force regional state actors to accept terms that they would not under other circumstances.[454]

Lack of Trust and A Chance for Greater Cooperation

In the short- to medium-term perspective, only import of natural gas, oil products, and thermal electricity in wintertime from downstream countries can ensure energy security and create favourable investment climate for business to operate all year round in Tajikistan and Kyrgyzstan. While Rogun may turn Tajikistan into a major electricity exporting-country, intra-regional trade of electricity and energy resources can significantly contribute to energy-led economic development and improve energy security. Construction of large HPPs in combination with increasing intra-Central Asian energy trade would be an ideal option to ensure security of the CAES. These two conditions are not mutually exclusive, if Central Asian governments coordinate their energy policies.

The biggest challenge, so far, has been the lack trust: Tajikistan do not trust Uzbekistan that it will not unilaterally cut energy supplies, and Uzbekistan has little confidence that Tajikistan will not keep more water than is allocated to it according to the agreements on Aral basin water withdrawal quotas. The paradox of water-energy nexus cooperation in the region is the fact that the best way to ensure uninterrupted water flow to downstream countries in the summer is to purchase electricity generated by releasing water from reservoirs in Tajikistan and Kyrgyzstan. Farkhod Tolipov, an expert on security issues in Central Asia, considered the counterfactual: what if Tajikistan had not obtained autonomy in 1929 and instead remained part of Uzbekistan? How would natural gas trading arrangements take place now and what would be the government's position on the Rogun dam? His answer was that Tajik people would probably have received gas for a subsidized price and that the government of Uzbekistan would have supported the construction of large HPPs in Tajikistan in order to both improve energy security and increase

451 "Tajik Aluminum Smelter Consumes 7 Million kWh of Electricity Per Day, Says Minister of Energy," *Asia-Plus*, December 20, 2017, accessed December 25, 2017, https://www.news.tj/en/news/tajikistan/economic/20171220/tajik-aluminum-smelter-consumes-7-million-kwh-of-electricity-per-day-says-minister-of-energy.

452 "Vse GES Vaxshskogo Kaskada Snizili Proizvodstvo Elektroenergii na 30-40 percent (All HPPs on the Vaksh Cascade Decreased Power Production to 30-40 percent)," *Regnum*, December 3, 2013, accessed March 15, 2014, http://www.regnum.ru/news/1740123.html#ixzz2vRvfDnNU.

453 Olimov, "Personal Interview."

454Maxim Ryabkov, Personal Interview, Director of the OSCE Academy, Bishkek, Kyrgyzstan, September 5, 2013.

electricity export capacity.[455] Intergovernmental agreements between Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan on using water-energy resources of the Syr Darya and Amu Darya basins require a multilateral format of negotiations on exchanging water, electricity and energy resources. However, starting from 2008, Uzbekistan only signs bilateral agreements[456] and avoids multilateral negotiations on large HPPs.

Several factors indicate that Uzbekistan might reconsider its position regarding cooperation with upstream states in the energy sector. First, the level of energy security in Uzbekistan will continue to worsen, thus leaving it no choice but to look for the most efficient way of using available energy resources. Second, Uzbekistan has almost no leverage left to force Tajikistan to give up the idea of building Rogun except to use the threat of military intervention. While the threat itself may have an impact, acknowledgement that none of the regional states want to destabilize the region decreases the potential effect of such threats. Some experts believe that there is a threat of large-scale destabilization of the region from outside, but it is less likely that the main reason would be the competition for Central Asian energy or water resources. Third, these countries are currently engaged in lose-lose relationships. Uzbekistan is pursuing a policy to promote its interests by affecting Central Asian upstream countries' foreign (energy) policies. Tajikistan is pursuing "survival" oriented energy policies to get out of the energy crisis. However, neither Uzbekistan nor Tajikistan is achieving their primary goal.[457] With the leadership change in Uzbekistan, certain prospects were opened for both countries to improve relationships. In fact, the whole region seem to benefit from the prospects for greater regional cooperation in the energy sector.

Major challenges caused by the disintegration of the CAES have forced the new leadership in Uzbekistan to pay particular attention to reinstating intra-Central Asian cooperation in the energy sector. For instance, Kyrgyzstan and Uzbekistan signed an agreement for the export of Kyrgyz electricity to Uzbekistan in the amount of 1.25 billion kWh per year.[458] President of Uzbekistan, Shavkat Mirziyoev, has also agreed to let Turkmen electricity reach Kyrgyzstan and Kazakhstan via power transmission lines of Uzbekistan.[459] The former President of Kyrgyzstan, Almazbek Atambaev visited Uzbekistan on October 6, 2017 and initiated, together with Shavkat Mirziyoyev, signing of a Memorandum of Understanding in regards to cooperation in the Kambarata-1 HPP project. Uzbekistan even expressed willingness to take part in construction.[460] Uzbekenergo signed an agreement with Barki Tojik for the import of 1.5 billion kWh of Tajik electricity to Uzbekistan starting from April 2018. Governments of the two countries highlighted that terms of electricity imports in winter-period will be discussed later this year.[461] Despite the fact that transition period in 2000s largely ignored regional energy cooperation and focused primarily on myopic national energy interests, evidences show that at least in the near and medium-term perspective restoring energy linkages within the region will help Central Asian states mitigate energy insecurity.

455 Farkhod Tolipov, Director of Bylim Karvoni Non-Governmental Research and Training Center, Personal Interview, Tashkent, Uzbekistan, June 29, 2013.
456 "Kirgiziya Virazila Sojalenie, Chto Uzbekistan ne Jelaet Sotrudnichat v Voprosax Stroitelstva GES (Kyrgyzstan Regrets that Uzbekistan is not Willing to Cooperate in Building HPP)," *Regnum*, February 5, 2013, accessed June 10, 2016, http://www.regnum.ru/news/1621466.html#ixzz2vXzxCrdn.
457 Tolipov, "Personal Interview."
458 Ekaterina Ulitina, "Kyrgyzstan Nachal Eksport Elektroenerii v Uzbekistan (Kyrgyzstan Has Started to Export Electricity to Uzbekistan)," 5, accessed February 7, 2017, http://www.kp.kg/online/news/2799944/.
459 "Uzbekistan Nachal Aktivno Sotrudnichat s Sosednimi Stranami (Uzbekistan Has Begun Active Cooperation With Neighbouring Countries)," July 10, 2017, accessed December 10, 2017, http://uznews.uz/article/6017.
460 "Uzbekistan Pristupil k Proektirovaniyu Odnoy Iz Krupneyshix GES v CA (Uzbekistan Has Started Projecting One of the Largest HPP in Central Asia)" *Sputnik,* November 13, 2017, accessed January 4, 2018, http://ru.sputnik-tj.com/asia/20171113/1023867265/uzbekistan-pristupil-proektirovaniyu-odnoy-ikrupneyshih-ges-centralnaya-aziya.html.
461 "Uzbekistan Imports 1.5 Billion kWh of Electricity from Tajikistan," *UzDaily,* March 7, 2018, https://www.uzdaily.com/articles-id-43012.htm.

CHAPTER V.

OIL SECTOR DEVELOPMENT IN CENTRAL ASIA

Chapter V. Oil Sector Development in Central Asia

Along with natural gas, Central Asian downstream countries are rich for oil. However, while oil, to a different extent, is an important source of energy for the Central Asian countries, it has never played a key role in determining the system level relationships. In the region, it is gas pipeline networks and electric power grids, but not the oil transporting infrastructure, that linked regional states and created an element of high interdependence. Despite the fact that oil has never significantly driven regional dynamics in the energy sector, ability to meet domestic needs for light oil products is an integral part of the Central Asian countries' energy security. Lack of regional cooperation in the energy sector is resulting in irrational use of oil refining capacity and extensive dependence on external suppliers of oil products. In this sense, promoting trading dynamics using existing pipeline networks to take advantage of oil refineries and use them in the most rational way is one of the possibilities to improve energy security in Central Asia.

The Soviet energy system was designed in such a way that most of the refineries were dependent on the Russian crude oil. Uzbekistan, for instance, relied on the Russian crude oil for 85 percent, Kazakhstan 74 percent, and Turkmenistan 4 percent.[462] The situation started to change when regional hydrocarbon producers gained independence. They began developing oil fields so that to supply their own crude oil to the local refineries. Over time, to a different extent, oil production and export turned into one of the sources of income for the Central Asian governments.

Table 13. Refined Oil Exporting Central Asian Countries.

Rank	Exporter	2015 Refined Oil Exports	% World Total
46.	Kazakhstan	US$ 1.3 billion	0.2
65.	Turkmenistan	US$ 463.8 million	0.1
130.	Uzbekistan	US $ 7.4 million	0.001

Source: "Refined Oil Exporting Countries for 2015," accessed January 5, 2018, http://www.worldstopexports.com/refined-oil-exports-by-country/.

While these producers are not the game changers in the global energy market (neither in terms of crude oil exports, nor for export of refined oil products), development of oil sector can bring certain benefits for the Central Asian countries. The country that stands out for its oil potential is without doubt Kazakhstan.

462 Andrei Kalyuzhnov, "Caspian Area Refineries Struggle to Overcome Soviet Legacy," Oil and Gas Journal, August 21, 2000, accessed March 12, 2017, http://www.ogj.com/articles/print/volume-98/issue-34/special-report/caspian-area-refineries-struggle-to-overcome-soviet-legacy.html.

MULTI-VECTOR/DIVERSIFICATION ORIENTED ENERGY POLICY OF KAZAKHSTAN

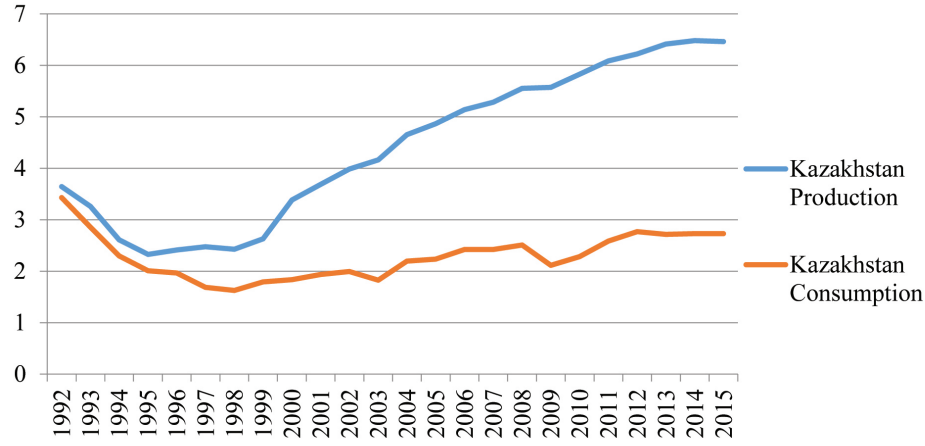
Kazakhstan's current energy policy is primarily concerned about securing the demand for its energy resources and earning revenues to fill the budget from moving energy out to external markets. Unstable energy supplies within the CAES over the past several years, however, forced Kazakhstan to strengthen its independent and self-sustaining energy system. Throughout several energy sector development programs, the government of Kazakhstan has been focusing on establishing a countrywide energy infrastructure as well as the development of renewable energy sources and increasing efficiency of energy production and transportation facilities. Current energy policy, however, does not prioritize intra-Central Asian energy cooperation.

Even though Kazakhstan's energy policy does not prioritize such cooperation, the country remains connected to the region due to its partial dependence on Uzbek resources, and the fact that it is a major transit country for Turkmen and Uzbek gas, as well as an important supplier of energy to Kyrgyzstan. Yet, the potential for cooperation is linked to the development of Kazakhstan's oil sector. Having developed its own refining capacity, Kazakhstan might turn into the largest supplier of light oil products throughout Central Asia. However, in the short to medium-term perspective Kazakhstan may take advantage of the region's oil refining capacities and supply crude oil to the neighbouring Uzbekistan the refining capacity of which is not being fully used. Up until recently, however, the primary policy priority for Kazakh authorities has been reaching external markets and increasing crude oil exports to generate high revenues to the budget.

Addressing Energy Demand Insecurity

Newly explored significant oil and gas reserves, in combination with increasing foreign investments in Kazakhstan's energy sector, ensured rapid energy production growth in the country.

Figure 8. Primary Energy Production and Consumption (quadrillion BTU) of Kazakhstan, 1992-2015.



US EIA, *International Energy Statistics: Kazakhstan* (Washington, DC: US EIA, n.d), accessed January 7, 2018, https://www.eia.gov/beta/international/data/browser/#/?c=0000000000000000000000a0000000000000000000001g008&vs=INTL.44-1-KAZ-QBTU.A&vo=0&v=H&end=2015.

In the early 1990s, to boost economic growth by developing its oil and gas potential, Kazakhstan opened up domestic reserves for international energy companies. Winners of the race for Kazakhstani resources were companies such as ChevronTexaco, ExxonMobil, Agip/Eni, Royal Dutch Shell, British Group, TotalFinaElf, and Impex. Canadian, Middle Eastern, and Russian energy companies followed them. Chinese and Indian extractive and financial corporations started playing a more active role in the mid–2000s. However, Kazakhstan does not enjoy full control over both extraction of its resources and transportation of energy to external markets. The fact that the national energy company owns only one-fifth of energy resource extraction and that the oil supply routes to Kazakhstan's major European customers (Europe imports 75 percent of Kazakh oil)[463] pass through Russia alone raise serious concerns among the general population and the government. Perceiving the PSAs signed with international oil giants in the early 1990s as unfair, Kazakh authorities have attempted to regain control over the country's natural resources by reversing those agreements and diversify their energy export route dependence.[464]

Kazakhstan's Oil Sector

Kazakhstan is not only the richest country for oil reserves in the region, but also the largest oil producer and exporter. Kazakhstan possesses 3.9 billion tons of oil reserves, which account for 1.8 percent of the world's total. The largest contribution to the budget also comes from selling oil to external markets. Kazakhstan is the 51st largest exporter in the world, with the overall export revenue accounting for US$ 40.9 billion in 2015. Energy resources are among the top export commodities contributing US$ 19.8 billion to the budget from crude oil export and US$ 2.5 billion from gas export.[465] Taxes and royalties contributed to more than half of the earnings.[466]

Figures for the oil and gas deposits in Kazakhstan are constantly changing. New fields are being discovered and oil production level is being affected by the changing dynamics in the global energy markets. In 2015, proven hydrocarbon reserves in Kazakhstan, onshore and offshore, accounted for 4.8 billion tons (267 fields); gas reserves (237 fields), non-associated gas and gas cap – 1.6 trillion m^3, dissolved gas – 1.4 trillion m^3, condensate – 441 million tons (62 fields).[467]

Oil resources in Kazakhstan are unevenly distributed. Seventy-three percent of Kazakhstan's hydrocarbon resources is concentrated in the Atyrau district, with 4 percent in Aktyubinsk, 9 percent in the west of Kazakhstan and 12 percent in Mangistau. Overall, 96 percent of oil resources in the country fall to the western regions.[468] Atyrau is the richest region for hydrocarbons, which contributes to 40 percent of oil and 60 percent of gas production in the country. Oil and gas industry has been first introduced over a century ago. Relatively large reserves of oil to commercialize the production were first discovered in 1911 in Dossor. The Nobel Company discovered the second oil field two years later in Makat. These fields delivered 200,000 tons of crude oil already in 2014. However, there was no oil transportation system at that time and camels moved oil to Khiva, along the Caspian Sea to the port of Rakushinok from which oil was

463 Nurlan Zhumagulov, "Fakti i Cifri Neftegazovoy Otrasli Kazaxstana za 2013 God (Facts and Figures of Kazakhstan's Oil and Gas Industry for 2013)," *YourVision*, 2014, http://yvision.kz/post/405781#comment2555459?utm_source=last_comments&utm_medium=main&utm_campaign=last_comments.

464 Ariel Cohen, *Kazakhstan: The Road to Independence: Energy Policy and the Birth of a Nation* (Uppsala: Silk Road Studies Program, Institute for Security and Development Policy [distributor], 2008), 119.

465 "Kazakhstan," *The Observatory of Economic Compleities,* n.d., Accessed May 15, 2017, http://atlas.media.mit.edu/en/profile/country/kaz/.

466 "Kazakhstan Energy Oil Sector," *EITI,* n.d., https://eiti.org/kazakhstan.

467 "The 11th National Report: On implementation of the Extractive Industry Transparency Initiative in the Republic of Kazakhstan for 2015," *EITI,* 2015, 39.

468 Rinat Kulmagambetov, "Energiya Kaspiyskogo Shelfa (Energy of the Caspian Shelf)," *Kazenergy*, June 28, 2013, accessed December 1, 2016, http://kazenergy.com/en/component/content/article/47-2011-04-18-15-36-46/9844-2013-06-28-04-52-45.html.

transported via 2 pipelines to small refineries called by the locals "kerosene factories".[469]

The situation has considerably changed over time. In 1991, the share of oil and gas condensate in the overall production balance accounted for 2.5 percent in Kazakhstan. The share was boosted up to 53.8 percent in 2011 and around 50 percent in 2014. The whole country turned highly dependent on extractive industry. Kazakhstan is a major oil producer in the region. Development of new fields resulted in oil production boom from 26.6 million tons in 1991 up to around 80 million tons in 2015.[470]

Over the past several years, however, oil price drop has resulted in insignificant oil production decline. While experts expect slight oil production increase in between 2017 and 2019, by developing Kashagan field as well as expanding oil production in Tengiz and Karachaganak fields, there is a serious doubt about Kazakhstan's capability to reach 100 million tons benchmark by 2020.[471] The government has been planning to increase the volume of oil condensate production up to 112 million tons by 2030.[472] In achieving this goal, or at least getting somewhere close, the role of international energy companies cannot be underestimated, since they control over four-fifth of the overall oil and gas condensate extraction in the country.[473]

Along with the development of oil sector and growing interest of international energy companies, foreign direct investment (FDI) started flowing into the economy of Kazakhstan. While the amount of the FDI accounted for US$ 1.3 billion in 1993, it has reached US$ 29 billion in 2012 with a slight drop in 2014–2015 (US$ 24 billion). Over 86 percent of the total investment package of US$ 241 billion came since 2005.[474]

Western energy companies have always been interested in the development of oil deposits in Kazakhstan. However, the latest tendency is showing a decreasing interest in the development of new fields. Excessive government regulation of the hydrocarbons sector, a lack of long–term guarantees, and delays in the launch of new large projects are major concerns for the Western investors. The Minister of Energy has highlighted that on three major oil fields Tengiz, Kashagan and Karachaganak, Western energy companies will not be sole contractors from now on. Only joint ventures with Kazakh share will be allowed to develop new wells and extract oil.[475]

The Chinese investors are quickly replacing some of the Western companies. Over 22 oil companies with Chinese share, including Sinopec Corp., CNPC, China Investment Corporation, MIE Holdings Corporation, CITIC Group, are currently participating in the energy sector development in Kazakhstan.[476] Most of these companies are granted PSA, which are, to a large extent, restricted by the legislation in the country. At the moment, there are a number of oil and

469 "Atyrau," *World Energy Cities Partnership,* n.d., accessed March 17, 2015, https://energycities.org/member-cities/atyrau-kazakhstan.

470 Dmitriy Sheykin, "Overview of Oil and Gas Extraction Industry of the Republic of Kazakhstan," RFCA Rating Agency, January 2016, 4, accessed January 5, 2017, http://www.rfcaratings.kz.

471 Dmitriy Sheykin, "Overview of Oil and Gas extraction industry of the Republic of Kazakhstan."

472 Uzakbay Karabalin, "Voloviy Obyom Dobichi Neftekondensata k 2030 Godu Sostavit Poryadka 112 mln. Ton v God" (Gross Production of the Oil Condensate Will Reach 112 mln. tonnes by 2030), (Government of the Republic of Kazakhstan, 2014), accessed October 5, 2016, http://www.government.kz/index.php/ru/novosti/16672-valovyj-ob-em-dobychi-neftekondensata-k-2030-godu-sostavit-poryadka-112-mln-tonn-v-god-u-karabalin.html.

473 Nurlan Zhumagulov, "Fakti i Cifri Neftegazovoy Otrasli Kazaxstana za 2013 God (Facts and Figures of Kazakhstan's Oil and Gas Industry for 2013)."

474 "The National Energy Report 2015," *Kazenergy, n.d.,* 86.

475 "Inostrancev Obyazhut Dobyvat Neft v RK Tolko Sovmestno s Kazakhstancam (Foreigners Will Be Obliged to Produce Oil in Kazakhstan Only Jointly with Kazakhstanis)," *Informburo,* March 2, 2017, accessed March 15, 2017, https://informburo.kz/novosti/inostrancev-obyazhut-dobyvat-neft-v-rk-tolko-sovmestno-s-kazahstancami.html?utm_source=facebook.com&utm_medium=news&utm_campaign=of.

476 Andriy Osavoliyk, "Kazakhstan: A Change of Key Players in the Oil Sector," *Open Dialog Foundation,* February 21, 2013, accessed June 15, 2016, http://en.odfoundation.eu/a/1014,kazakhstan-a-change-of-key-players-in-the-oil-sector.

gas producing sites in which foreign shareholders enjoy PSA. However, those agreements were signed in the 1990s. Based on the data of the Ministry of National Economy, the following PSAs have been signed in Kazakhstan:

1. Karachaganak Petroleum Operating B.V. Kazakhstan branch (KPO) Agip Karachaganak B.V. (Netherlands) BG Exploration and Production Limited (United Kingdom) Chevron International Petroleum Company (United States) Lukoil Oil Company (Russia) KMG Karachaganak (Kazakhstan)
2. North Caspian Operating Company N.V. Branch KMG Kashagan B.V. (Netherlands)/ Kazakhstan Agip Caspian C B.V. Branch (Netherlands) ExonMobil Kazakhstan Inc (United States) Shell Kazakhstan Development B.V. (Netherlands) Total E&P Kazakhstan (France) KNNK Kazakhstan B.V. Branch Inpex North Caspian Si Ltd (Japan)
3. Zhaikmunai JV LLP
4. Maersk Oil Kazakhstan GmbH Branch
5. Saigak Kazakhstan B.V. Branch
6. Sagiz Petroleum Company LLP
7. Potential Oil LLP
8. Pricaspian Petroleum Company LLP
9. Kolzhan-Oil LLP
10. Caspi Meruerty Operating Company B.V. Branch
11. Kurmangazy Petroleum LLP
12. Tengizchevroil LLP.[477]

Currently, only Chinese companies are being granted such terms and Kazakhstan is turning extensively dependent on the Chinese companies operating oil and gas extraction sites in some regions. According to various sources, Chinese investors produce almost 100 percent of oil and gas in Aktobe, 60 percent in Kyzylorda, 30 percent in Mangystau and around 10 percent in Atyrau regions.[478] CNPC first acquired 60 percent of the stake in AktobeMunayGaz and now owns over 85 percent of the company to develop Zhanazhol, Kenkiyak Oversalt and Kenkiyak Subsalt oil fields. Kazakhstan – China oil pipeline delivers oil to China from these fields.[479] Yet, the largest volume of oil is still heading to the European consumers.

Oil Export Dynamics in Kazakhstan

The statistics have shown an overall increasing trend in the production of oil for the past two decades. Having boosted oil production, Kazakhstan has turned highly dependent on export of oil and related products, which currently account for 73 percent of the total export. These are the main export partners of Kazakhstan: Italy–18 percent; China–12 percent; Netherlands–11 percent; Russia–10 percent; France–6 percent.[480]

Increasing oil production capacity over the past decade turned Kazakhstan into a major exporter in the region. In 2015, Kazakhstan exported 72,077 million tonnes of oil and gas condensate through the Atyrau–Samara pipeline (15.7 million tons), Caspian Pipeline Consortium (42.7 million tons, including 38 million tons of Kazakhstani oil), Atasu–Alashankou pipeline (11.8

477 "The 11th National Report: On implementation of the Extractive Industry Transparency Initiative in the Republic of Kazakhstan for 2015," *EITI,* 2015, 31.
478 Andriy Osavoliyk, "Kazakhstan: A Change of Key Players in the Oil Sector."
479 "CNPC Kazakhstan," *CNPC website,* accessed December 15, 2017, http://www.cnpc.com.cn/en/Kazakhstan/country_index.shtml.
480 "Kazakhstan Exports," *Trading Economics,* n.d., accessed March 15, 2017, http://www.tradingeconomics.com/kazakhstan/exports.

million tons).[481] The largest volume of oil export is heading towards the European market. However, there is no oil transport infrastructure directly connecting Kazakhstan with Europe. Existing pipelines pass through and are controlled by Russia, making Kazakhstan vulnerable to export demand insecurity—threat of the unilateral import disruption by a single country that may significantly affect producing state.

The most dramatic decrease in oil transportation was recorded on the Atasu–Alashankou pipeline route. The total amount of oil shipped via Atasu–Alashankou pipeline was reduced by 1.726 million tons (from 11.794 million tons in 2015 to 10.068 million tons in 2016). Furthermore, the volume of oil transportation via Atyrau–Samara pipeline declined from 15.702 million tons in 2015 to 15.024 million tons in 2016. The Aktau and Batumi seaports experienced further decrease in the oil transshipment by tankers. The total amount of oil shipped by tankers in the Caspian Sea declined to 2.196 million tons in 2016 compared to 2.881 million tons in 2015.[482]

Cooperation with leading energy companies and increasing energy export capacity to Europe, Russia, and China constitute the priority in Kazakhstan's foreign energy policy. However, energy cooperation with Central Asian countries, which was once critical for stable and reliable supplies of energy, is not a priority anymore. Kazakhstan's dependence on the neighbouring Uzbekistan and, to a limited extent, Kyrgyzstan is expected to decline in the future. At the same time, dependence of both Kyrgyzstan and Uzbekistan on the energy supplies from Kazakhstan is forecasted to increase. Kazakh authorities are not only interested in foreign investments in developing country's energy sectors, but also in the revenues to the budget coming from moving resources out to external markets.

Source of Income for Kazakhstan

According to the Ministry of National Economy, oil and gas sectors contributed 17.6 percent to the GDP, or US$ 7,210.7 billion in 2015. In value terms, the export of oil and oil condensate as well as natural gas accounted for US$ 27.6 billion, which constitutes around 60 percent of Kazakhstan's export. [483] In total, having exported over half of its energy resources the earnings account for 22 percent of the GDP, almost 70 percent of the export revenues, and around half of the budget earnings. The Tax Code introduced in Kazakhstan in 2009 implies multiple taxation instruments, which give certain leverage for the government to balance the interests of external energy producing companies.[484]

Excessive dependence on hydrocarbons in the export balance implies that any turbulence on the global oil market will considerably affect the flow of economic revenues to the budget of Kazakhstan.[485] In between 2010 and 2015, Kazakhstan earned approximately US$ 160 billion from its oil, gas and mining sector. With just US$ 12 billion in 2015, the country suffered a significant decrease in revenue, compared to the consistent years of 2011–2014, during which revenue hovered around US$ 30 billion per year.[486] Yet the country is still highly dependent on oil export revenues. The largest revenue is coming from the export of crude oil. Kazakhstan,

481 "The 11th National Report: On implementation of the Extractive Industry Transparency Initiative in the Republic of Kazakhstan for 2015," *EITI,* 2015, 56.

482 KazTransOil, "KazTransOil JSC Informs About Operational Results for 12 Months of 2016," *KazTransOil website,* 2017, accessed December 15, 2017, http://www.kaztransoil.kz/en/press_centre/press-releases/press-releases/...

483 "The 11th National Report: On implementation of the Extractive Industry Transparency Initiative in the Republic of Kazakhstan for 2015," *EITI,* 2015, 71.

484 "The National Energy Report 2015," *Kazenergy, n.d.,* 22.

485 Dmitriy Sheykin , "Overview of Oil and Gas extraction industry of the Republic of Kazakhstan," 2.

486 Artemyev Anton, "Drowning in Data – EITI in Kazakhstan Must Mean More," *Eurasianet*, February 20, 2017, accessed January 01, 2018, http://www.eurasianet.org/node/82486.

however, can produce and export value added products by extending oil refinery capacity of the country.

Oil Refinery Capacity

Kazakhstan possesses extensive oil reserves, but paradoxically, its oil refining capacity in stil underdeveloped. Total refinery capacity of the country currently accounts for 78 percent of the consumption level. The rest of oil products is imported from outside, mostly Russia. Realizing country's vulnerability to external supplies of oil products, Kazakh authorities have initiated an oil refinery modernization program.[487] According to the Deputy Director of the KazMunayGas state-owned energy company, Daniyar Satybaldin, Kazakhstan is expected to be self–sufficient for fuel supplies already by 2018. Currently, 30 percent of petroleum is being imported from Russia. However, when the modernization initiatives are implemented, Kazakhstan will be able to entirely meet its energy needs for petroleum, diesel fuel and aerokerosin. Daniyar Satybaldin also highlighted that oil refinery capacity will be increased from 14.5 million tons up to 16.5 million tons.[488] Yet, Kazakhstan has recently experienced a shortage of light oil products for local consumption.[489] This was a a short-term supply disruption. Should the Central Asian countries maintained cooperative dynamics in the oil sector, such short-term supply disruption incidents could have been avoided.

There are three refineries in Kazakhstan: Atyrau, Shymkent and Pavlodar. In the initial design, out of three refineries only Atyrau was built to operate on local oil supplies. The Pavlodar and Shymkent refineries were designed to refine oil delivered from Russia (Western Siberia) via Omsk–Pavlodar–Shymkent–Chardzhou oil pipeline. Oil was delivered to Pavlodar and Shymkent refineries in Kazakhstan and Chardzhou refinery in northeast Turkmenistan.[490] Authorities are planning to modernize all of these refineries. The modernization is expected to increase oil–refining capacity of all three facilities up to 17.5 million tons per year. High quality oil products will also respond to the K4 and K5 classes of environmental requirements of the Technical Regulations of the Customs Union/ Eurasian Economic Union.[491]

Kazakhstan has been planning to introduce 4th refinery to meet domestic needs for oil products. Currently, Kazakhstan imports refined oil products from China and Russia. However, according to Ivan Khomutov, Director for Research Projects at the Petromarket Research Group: "If the Kazakhstan's economy growth does not outstrip the forecast and modernisation of oil refineries is successfully completed than over the next 15 years there will be no need for Kazakhstan to build the 4th refinery to supply domestic market with petroleum products." This is an important part of the energy security policy of the country, since the overall demand for light oil products according Ivan Khomutov will be growing and increase for 25 percent, from 4.8 million tons in 2015 up to 6 million tons in 2030. Not to compete for limited oil products, Kazakhstan has to complete modernization of the refineries. At the same time, if Kazakhstan succeeds to build the

487 "The National Energy Report 2015," *Kazenergy, n.d.,* 24.
488 Elemesov Marat, "K 2018 Godu Kazakhstan Gotovitsya Obespechit Sebya Benzinom na 100 percent (Kazakhstan Will Meet Domestic Oil Needs From Its Own Resources by 2018)," *Liter,* February 17, 2017, accessed December 1, 2017, https://liter.kz/mobile/ru/articles/show/29284-k_2018_godu_kazahstan_gotovitsya_obespechit_sebya_benzinom_na_100_.
489 Paolo Sorbello, "Fuel Crisis Exposes Kazakhstan's Energy Contradictions," *The Diplomat,* October 23, 2017, accessed January 5, 2018, https://thediplomat.com/2017/10/fuel-crisis-exposes-kazakhstans-energy-contradictions/.
490 Andrei Kalyuzhnov and Julia Nanay, "Caspian Area Refineries Struggle to Overcome Soviet Legacy*," Oil and Gas Journal*, August 21, 2000, http://www.ogj.com/articles/print/volume-98/issue-34/special-report/caspian-area-refineries-struggle-to-overcome-soviet-legacy.html.
491 "Downstream Caspian and Central Asia," 4th International Annual Conference, Post–Conference Report 2016.

fourth refinery then it will not only meet its own needs, but will also be able to export refined oil products to the neighbouring Kyrgyzstan, Tajikistan, Uzbekistan and Afghanistan.[492]

Having possessed huge energy resources, Kazakh authorities want to produce value–added products. Therefore, the 4th refinery is one of the most promising initiatives with the total cost of US$ 6 billion. The government also plans to build a US$ 6.3 billion worth petrochemical complex in Atyrau with the capacity to produce 500,000 tons of propylene and 800,000 tons of polyethylene.[493] Meanwhile, however, Kazakhstan is still dependent on imported oil products.

False Expectations from Reducing Dependence on Imported Oil Products

It is worth mentioning, however, that reducing 30 percent dependence on the imported refined products will not solve the problem of affordability of energy supplies for domestic consumers in Kazakhstan. Self–sufficiency in refined oil products is certainly an advantage. However, such self–sufficiency will not affect the price, over which local consumers are so highly concerned about. Petroleum prices in Kazakhstan are dependent on the prices in Russia, because around one–third of the products are imported. The only difference is the taxation in Kazakhstan and delivery cost to the final destination, which is added to the actual price for the refined light oil products.

The Minister of Energy highlighted saying that: "It is better when the prices are high, but petroleum is available in suffice compared to when it is cheaper and insufficient." The Minister has also mentioned that, even though Kazakhstan is expected to achieve self–sufficiency for oil products already in 2018, it does not mean that oil products will be a lot cheaper than in the neighbouring Russia. Membership in the Eurasian Economic Union implies custom tariffs free relationships. Once energy markets are established, price differences in these two countries will automatically be synchronized. If petroleum is cheaper in Kazakhstan, then sellers will move products to Russia, thus resulting in fuel shortages for Kazakh consumers. This implies that fuel prices will always be linked to the prices within the Eurasian Economic Union.[494] If unified, and oil and gas markets of the Eurasian Economic Union are established as planned by 2025, all prices will be automatically synchronized with the Russian prices, which are higher than in Kazakhstan.

Future Oil Sector Development Prospects

According to the estimates for 2015 the "reserves–to–production ratio" (R/P) for oil accounts for around 50 years in Kazakhstan.[495] This implies that with the existing oil production capacity Kazakhstan, will only have sufficient oil for 50 years. Taking into account authorities' willingness to considerably increase oil production capacity for both domestic and export needs, the ratio is expected to be even lower. [496] Nevertheless, the government of Kazakhstan is quite optimistic and is largely counting on taking full advantage of major oil fields in the country.

So far, the largest oil field operating in the country is Tengiz, which was discovered in 1979.

492 "Does Kazakhstan Need 4th Refinery?" 4th International Annual Conference, Post–Conference Report 2016.
493 "Unlocking Region's Enormaous Potential in Today's Economic Realities Kazakhstan," 4th International Annual Conference, Post–Conference Report 2016.
494 Bolat Abylkasymov, "Svoy Benzin Deshevle Ne Budet (Local Petroleum Will Not Be Cheaper)," *Ratel,* March 2, accessed May 5, 2017, 2017, HTTP://WWW.RATEL.KZ/RAW/SVOJ_BENZIN_DESHEVLE_NE_BUDET.
495 "The 11th National Report: On implementation of the Extractive Industry Transparency Initiative in the Republic of Kazakhstan for 2015," *EITI,* 2015, 40.
496 "The 11th National Report: On implementation of the Extractive Industry Transparency Initiative in the Republic of Kazakhstan for 2015," *EITI,* 2015, 40.

This field is the deepest in the world, the upper oil–bearing reservoir, which is at about 4000 meters deep. An agreement between the government of Kazakhstan and Chevron was signed in 1993 for the period of 40 years. The Tengizchevroil members are KazMunayGas–20 percent, Chevron–50 percent, ExxonMobil–25 percent, and LukArco–5 percent. Tengiz is not an easy field to develop, yet oil in the field is very "light" and is highly demanded due to its quality. Tengizchevroil also started producing and exporting natural gas since 2000.[497]

Oil and gas condensate field Karachaganak, which is located in the West–Kazakhstan Region is also one of the major sources of hydrocarbon production for Kazakhstan. Karachaganak contains over 1.2 billion tons of oil and 1.3 trillion m^3 of gas. The field was discovered in 1979 and was put into operation in 1984. Final PSA was signed with foreign companies for the time period of 40 years in 1997 and the field is currently being operated by Karachaganak Petroleum Operation.[498]

Kashagan—Fainted Future

Kazakhstan has taken place among the richest oil countries in the world after oil production boom of 2000s and discovery of Kashagan oil field. Kazakhstan has placed much hope for the development of Kashagan oil field hoping that it will turn the country into one of the largest producers of oil not only in the region, but also globally. According to the initial estimates, when the field starts fully operating, it should produce up to 1.5 million barrels of oil per day in the 11 billion barrels oil field, which is equal to oil production in the Big Burgan oil fields in Kuwait or twice as much as in the largest oil field in Russian Samotlorskoe. Kashagan oil field is part of the North Caspian Sea Project and was discovered in 2000. The agreement of the North Caspian Sea PSA was signed in 1997 and the exploration work started a year after. Among other major fields within the North Caspian Sea Project are the followings: Kalamkas offshore–in 2002, Aktoty–in 2003, Kairan–in 2003 and Kashagan South-West–in 2003. Yet, Kashagan only started producing oil in October 2017. Prior to this, consortium participants kept extending oil production many times: 2005, 2008, 2011, and 2013.[499] Oil extraction at Kashagan started on September 11, 2013, but was suspended due to gas leak in the pipeline. Transportation was restored a month later. However, after the second gas leak accident, oil extraction was suspended for 4 years.[500]

Kashagan is extremely difficult project to realize in the harsh offshore environment of the northern part of the Caspian Sea. Because of the size of the field, the technical and environmental complexities, Kashagan will be developed in phases. The Phase 1–the Experimental Program is currently under development. Other phases are in the planning stages. The following oil and gas companies have shares in the North Caspian Operating Company:

- JSC NC "KazMunayGas" (KMG Kashagan)–16.88 percent;
- ENI (Agip Caspian Sea)–16.81 percent;
- Exxon Mobil Corporation (ExxonMobil Kazakhstan Inc.)–16.81 percent;
- Royal Dutch Shell plc. (Shell Kazakhstan Development)–16.81 percent;
- Total S.A. (Total E&P Kazakhstan)–16.81 percent;
- CNPC (CNPC Kazakhstan)–8.33 percent;
- INPEX Corporation (INPEX North Caspian Sea)–7.56 percent.[501]

497 "Tengizchevroil," *KMG website,* n.d., accessed January 5, 2017, http://www.kmg.kz/en/manufacturing/upstream/tengiz/.
498 "Karachaganak," *KMG website,* n.d., accessed December 15, 2017, http://www.kmg.kz/en/manufacturing/upstream/karashaganak/
499 Blogov Petr, "Kashagan: Ostrova Nevezeniya (Kashagan: Islands of Unluckyness)," December 16, 2016, accessed June 10, 2017,
http://intersectionproject.eu/ru/article/russia-world/kashagan-ostrova-nevezeniya.
500 "Severo–Kaspiyskiy Proekt (North–Caspian Project)," *PSA,* n.d., accessed January 5, 2017, http://www.psa.kz/proekty/?ELEMENT_ID=54
501 "Kashagan," *KMG website,* n.d., accessed May 15, 2017, http://www.kmg.kz/en/manufacturing/upstream/kashagan/.

There are many concerns in regards to the field operation. If in 2013 stakeholders were worried about the capability to reach expected production level, in 2017, taking into account dropped oil prices, many doubt the profitability of the whole project. The initial estimates of about US$ 57 billion has risen to over US$ 180 billion over the past 20 years, turning Kashagan almost into the most expensive oil project on earth. Still, according to the Minister of Energy, Kanat Bozumbaev, reducing oil production in the field is not an option. He highlighted that the field will be developed and oil produced no matter what. When the American company ConocoPhillips was replaced by the Chinese CNPC, experts started talking about possible redirection of the oil towards Chinese direction. However, European consumers are still quite attractive and as was expected the first oil is heading towards European direction. Perhaps, when the oil production increases in the field, it will also be heading towards Chinese direction.[502]

Oil Sector Disputes with External Companies

Having a closer look into the relationships between Kazakh authorities and external actors, the behaviour of the former reflect governments' dissatisfaction with previous PSAs, which were signed during difficult times for the economy in the 1990s when oil prices were low and foreign companies had the advantage. At that time, the Kazakh government was ready to sacrifice the right to fully control its natural resources for potential economic gains.[503] Simple dissatisfaction turned, over time, to governments' policies to change the terms of contracts. Kazakhstan's parliament, for instance, adopted new laws in 2007 that allow the Kazakh government to break natural resource contracts and force negotiations.[504] Kazakhstan used environmental claims to renegotiate existing contracts with a number of major oil companies in 2003. In 2007, disputes over environmental issues helped Kazakhstan to change the framework of Eni's operation of the Kashagan field.[505] In addition, "some analysts believe that Kazakh elites are using China to increase country's leverage in negotiations with Russia."[506]

Foreign energy companies often complain that the government of Kazakhstan use selective enforcement of labor and variety of other laws against them. One of the clear example is the case of Kazakh authorities using employment practices against Tengiz–Chevron, a consortium of a number of international oil corporations. The consortium used several firing over small infractions, which resulted in discrimination against Kazakh staff. While authorities claimed that accusations were legal in nature, some believed that they were politically motivated.[507]

In 2012 alone, several Western companies refused to develop projects in the Caspian Sea section of Kazakhstan, including:

a) The French company "Total" refused to develop the "Zhenis" field;
b) The Italian company "Eni" refused to develop "Shagala" field;
c) The Exxon Mobil and Royal Dutch Shell warned that they may not extend the terms of the Production Sharing Agreement for another 20 years;
d) American oil company "ConocoPhillips" sold its 8.4 percent share in the Kashagan deposit development. One of the reasons for withdrawal was the fact that the cost of

502 Blogov Petr, "Kashagan: Ostrova Nevezeniya (Kashagan: Islands of Unluckyness)."
503 Bela Rashidova, Head of Economic Studies Department, at Kazakhstan Institute for Strategic Studies under the President of the Republic of Kazakhstan, Personal Interview, Almaty, Kazakhstan, August 8, 2013.
504 Jean A. Garrison and Ahad Abdurahmonov, "Explaining the Central Asian Energy Game: Complex Interdependence and How Small states Influence their Big Neighbours," *Asian Perspective* 35 (2011): 394.
505 Brenda Shaffer, *Energy Politics* (Philadelphia: University of Pennsylvania Press, 2009), 32.
506 Mehmet Ogutcu and Ma Xin, "Geopolitics of Energy: China and the Central Asia," *Insight Turkey* 9, no. 4 (n.d.): 54, accessed September 20, 2016, http://files.setav.org/uploads/Pdf/ogutcu_ma.pdf.
507 Rachael Willis, "How to Fix Kazakhstan's Reliance on Fossil Fuels," *Huffpost,* January 8, 2018, https://www.huffingtonpost.com/entry/how-to-fix-kazakhstans-reliance-on-fossil-fuels_us_5a54af3ee4b0f9b24bf31a8f.

the field development has considerably increased up to US$ 46 billion and has been delayed for eight years;[508]

e) In 2013, Norwegian oil company "Statoil" declared its withdrawal from the development of "Abai" field. Norwegian oil company Statoil and KazMunayGas have been negotiating over the development of the Abay section on the Caspian Sea since the 1990s. It took over seven years for the Norwegian company to come up with a final plan for the development of the project. However, seven more years after KazMunayGas and Statoil still could not come to an agreement. As a result, Statoil decided to leave Kazakhstan and close its office in Astana.[509]

There is an ongoing dispute over taxes between the Ministry of Energy with foreign energy giants operating in Karachaganak consortium (Shell and Eni). For instance, Kazakhstan, represented by the state–owned KazMunayGas energy company with 10 percent share in the Karachaganak field had filed a US$ 1.6 billion claim against consortium's major stakeholders.[510]

Kazakhstan's policy to pressure external energy companies on the environmental concerns and dropping oil prices have significantly reduced investment flow into the energy sector of the country and the production volume. The only exception over the past several years was tremendous deal offer by the oil companies led by Chevron in an amount of US$ 36.8 billion in the development of the Tengiz oil field. This is a great opportunity for the authorities to reach a targeted goal of 130 million tons by 2020. Even though there are doubts regarding feasibility of the energy policy goals, this investment package, even if partially provided, might considerably contribute to boosting oil production and export capacities. An average oil production output accounts for around 80 million tons annually and only a large-scale production increase in the Tengiz field and introduction of larger production volumes in Kashagan field will boost the oil production output.[511]

In general, however, the Chinese money is replacing the diminished Western investments and not allowing other external actors to enter Kazakhstan's oil sector. The total Chinese investment in Kazakhstan accounts for over US$ 30 billion already. However, Kazakhstan is turning highly dependent on China as a largest loans provider. Kazakh authorities had a chance to diversify their dependence by counterbalancing India to China in the deal for selling the share of the ConocoPhilips Company. Yet, the preference was given to Chinese investors once again. American ConocoPhilips Company had a share of 8.4 percent in the North Caspian Consortium. Taking full advantage of its privilege for priority purchase right in accordance with the "Law on subsoil and subsoil use" KazMunayGas purchased the share for around US$ 5 billion. To return its investments, KazMunayGas decided to sell its share of 8.33 percent in the project to the Chinese CNPC. There were two foreign energy companies competing for the share: Chinese CNPC and Indian ONGC Videsh Limited. Yet, the Chinese company won the race. On September 7, 2012, Xi Jinping confirmed that Chinese CNPC is getting a share in the development of the Kashagan project.[512]

508 Andriy Osavoliyk, "Kazakhstan: A Change of Key Players in the Oil Sector."
509 Chervinskiy Oleg, "Kak Astana Planirovala Iskat Vtoroy Kashagan Na Sushe (How Astana Was Planning to Search for Kashagan Onshore)," Ratel, February 20, 2017, accessed December 15, 2017, http://www.ratel.kz/outlook/kak_astana_planirovala_iskat_vtoroj_kashagan_na_sushe#comments.
510 "Kazakhstan: Shell-Eni Group Continue Talks Over Tax Dispute," Reuters, January 26, 2017, accessed March 15, 2017, http://finance.yahoo.com/news/kazakhstan-shell-eni-group-continue-101320121.html.
511 Jonathan Hoogendoorn, "Kazakhstan and the Oil Investment Deal: Implications for Trans-Asiatic Trade," *Global Risk Insights,* July 19, 2016, accessed May 15, 2017, http://globalriskinsights.com/2016/07/kazakhstan-oil-investment-trade/.
512 Chervinskiy Oleg, "Kak Astana Planirovala Iskat Vtoroy Kashagan Na Sushe (How Astana Was Planning to Search for Kashagan Onshore)."

Short–Term Prospects for Oil Sector Development

Counting on the development of Kashagan, Kazakh authorities aim to increase oil production by 3 million tons from roughly 78 up to 81 million tons in 2017. The Minister of National Economy, Timur Suleymenov highlighted that Kazakh energy sector produced 86.2 million tons of oil in 2017, which is record high volume since independence of Kazakhstan.[513] Kazakhstan's participation in an OPEC–led production cut to keep the oil prices rising will expire at the end of June, 2017. After this, Kazakhstan will be allowed to boost oil production.[514] However, dropping oil prices should still be a major concern for Kazakhstan. Oil price collapse from around US$ 120 a barrel to under US$ 50 may not be the worst–case scenario. According to Moore Stephens: "even if oil demand continues to climb until 2025, its price could drop down to US$ 10, if markets anticipate a significant fall in demand."[515] Transition to a low carbon fuels is a matter of environmental security for the country, since Kazakhstan is ranked one of the 10 most toxic countries in the world.[516]

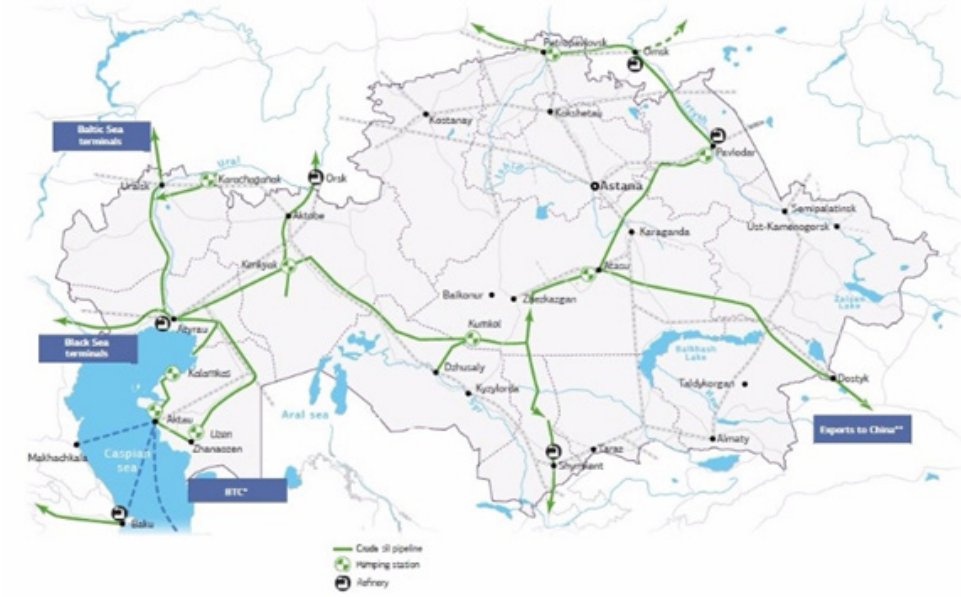
Because Kashagan is not really progressing and so far did not turn into an "El–Dorado" for Kazakhstan, authorities have come up with a new flagman project. Former Prime Minister, Serik Akhmetov, highlighted that authorities are planning to establish a new consortium for exploring and developing deep-water Caspian basin. The project was called "Eurasia", because the territory beneath the Caspian Sea that Kazakhstan wants to explore lies on the border of Europe and Asia. This, however, is not going to be an easy project either. During the first stage, relevant agencies will be studying existing data on the field. The second stage implies extensive explorative activity. During the third stage "Kaspiy–1" well will be developed. Drilling is expected to take place 14–15 km deep and the primarily cost will amount to US$ 500 million. The experience of oil and gas sector development in Kazakhstan shows that this sum may triple along the way of project implementation.[517] To move resources to external markets, Kazakh authorities are planning to extend transportation networks.

Oil Pipeline Infrastructure

Kazakhstan also enjoys extensive oil transporting infrastructure with the length of 8,301 km long oil pipelines.[518] Energy resources are transported by the subsidiaries of the National Company KazMunayGas—KazTansOil controlling 5,400 km long pipeline network and Kazmortransflot with 6 carriers on the Caspian Sea and total deadweight of 12,000 –13,000 tons. Currently, major oil transporting facilities in Kazakhstan are Caspian Pipeline Consortium, Atyrau–Samara pipeline, Atasu–Alashankou pipeline, Aktau sea terminal. Kazakh oil transported through these facilities in 2015 accounted for almost 70 million tons out of less than 80 million tons.[519]

513 Inga Selezneva, "Kazakhstan produced record amount of oil in 2017," *Kazpravda,* January 11, 2018, http://www.kazpravda.kz/en/news/economics/kazakhstan-produced-record-amount-of-oil-in-2017/.
514 Nick Coleman, "Kazakhstan Adds Kashagan Crude Oil to Surging Siberian Light Exports," *S&P Global Platts Webinar,* March 3, 2017, accessed December 1, 2017, http://www.platts.com/latest-news/oil/london/kazakhstan-adds-kashagan-crude-oil-to-surging-26677362.
515 Ian Johnston, "Record Number of Oil And Gas Firms Go Bust As Renewable Energy Revolution Begins to Bite," Independent, January 3, 2017, accessed December 15, 2017, http://www.independent.co.uk/environment/oil-gas-firms-industry-bust-renewable-energy-revolution-biofuel-solar-panel-wind-power-opec-saudi-a7507016.html?cmpid=facebook-post.
516 Clark Charles, "Countries with the Most Toxic Environments on Earth," Business Insider, February 9, 2017, accessed May 15, 2017, http://www.businessinsider.com/map-of-the-most-polluted-and-toxic-countries-2017-2?utm_content=buffer0192f&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer.
517 Chervinskiy Oleg, "Kak Astana Planirovala Iskat Vtoroy Kashagan Na Sushe (How Astana Was Planning to Search for Kashagan Onshore)."
518 Dmitriy Sheykin, "Overview of Oil and Gas extraction industry of the Republic of Kazakhstan," 4.
519 "Oil Transportation," KazMunayGas website, n.d., http://www.kmg.kz/en/manufacturing/oil/.

Figure 9. Oil Export Routes from Kazakhstan.



Source: IHS Energy, EOEO.

- Atyrau–Samara pipeline: Oil transporting capacity of this pipeline accounts for 17.5 million tons.[520] The total length of 1,232 km through the territory of Kazakhstan. While the total oil transport capacity of the pipeline is around 30 million tons, only slightly over 15 million tons of oil is being carried out at the moment.[521]

- Caspian Pipeline Consortium: Oil transporting capacity of this pipeline accounts for 38 million tons. Caspian Pipeline Consortium operators are currently working on extending the transportation capacity of the pipeline up to 67 million tons per year.[522] The largest oil exporting pipeline network is the Caspian Pipeline Consortium with total length of 1,510 km. Currently, the network has the capacity to export 35.2 million tons of oil and transit capacity of 40 million tons of oil. The resources are being delivered from Tengiz, Karachaganak and Kashagan fields. In 2010, it was decided to increase export capacity of the network up to 52.5 million tons. The work on extending the pipeline's export capacity is currently being carried out.[523]

- Sea ports: Aktau–Baku (the Caspian Sea); Aktau- Makhachkala (the Caspian Sea); Routes from the ports of the Black Sea. In 2015, the amount of oil transportation by Kazmortransflot comprised of 7 million tons, among them 2.7 million tons on the Caspian Sea and 4.3 million tons on the Black Sea.[524]

- Atassu–Alashankou pipeline: 11.8 million tons. The pipeline was put into operation in 2006 with the capacity to transport 10 million tons of oil. In December 2013,

520 "Atyrau-Samara Pipeline," KazMunayGas website, n.d., accessed May 10, 2016, http://www.kmg.kz/en/manufacturing/oil/atyrau_samara/.
521 Dmitriy Sheykin, "Overview of Oil and Gas extraction industry of the Republic of Kazakhstan," 6.
522 "Caspian Pipeline Consortium," KazMunayGas website, n.d., accessed March 10, 2016, http://www.kmg.kz/en/manufacturing/oil/ktk/.
523 Dmitriy Sheykin, "Overview of Oil and Gas Extraction Industry of the Republic of Kazakhstan."
524 "Oil Transportation," KazMunayGas website, n.d. "Kazakhstan-China Oil Pipeline."

> its capacity was extended up to 20 million tons. Network operating companies are planning to extend transportation capacities at Kenkiyak–Atyrau pipeline up to 12 million tons per year; Kenkiyak–Kumkol pipeline up to 20 million tons per year; and Kumkol–Atasu pipeline section.[525]

The overall length of the Kazakhstan–China oil pipeline is 2200 km and it consists of three distinct sections: Atyrau–Kenkiyak; Kenkiyak–Atasu; and, Atasu–Alashankou). Three pipelines over the period of over 10 years were connected to transport Kazakh oil from resource rich Western parts of the country to China. The first section/pipeline was commenced in December 2005 to carry 10 million tons of oil via 962 km long Atasu–Alashankou pipeline. A US$ 700 million worth pipeline was built as a joint venture with 50/50 percent share of the KazMunayGas subsidiary KazTransOil and CNPC subsidiary China National Corporation for Exploration of Oil and Gas. The second section of the project was completed in 2009, connecting Kenkiyak and Kumkol with the length of 794 km. The third 450 km long section of the pipeline was put into operation in Atyrau–Kenkiyak in 2004. It used to run in reverse direction, changing the direction from West to East and turning into integrated section of the Kazakhstan–China pipeline transporting oil from oil rich Atyrau and Mangystau regions to transport 20 million tons. Parties are planning to increase the transport capacity of up to 40 million tons of oil from the Caspian Sea to the Western parts of China.[526]

Kazakhstan and China agreed to double transport capacity in 2014. However, there are certain challenges towards achieving this goal. First, oil production in Aktobe and Kyzylorda regions, which aims to contribute to the oil export, is declining. Second, Kazakh oil companies are planning to increase the supply of oil to Shymkent and Pavlodar refineries. Because of insufficient export capacity, parties have been transporting Russian oil through swap deals. In fact, Russian oil accounts for almost 60 percent of the total transported oil. Kazakh authorities are counting on the development of Kashagan oil field to increase export capacity up to projected 40 million tons per year. [527] However, taking into account the fact that Kashagan oil extraction is not progressing very fast, there might be certain delays in achieving the goals. It is also worth mentioning that all the projects designed to increase oil and refined oil production and export largely excludes Central Asian countries. Central Asian market is not large enough for Kazakhstan to meet its national interests. Yet, not to fall into excessive dependence on a few external customers, Kazakh authorities may want to seriously consider promoting intra–Central Asian oil trade. Kazakh oil, for instance, is a very good source of energy supplies to run Uzbek refineries in full capacity.

525 KazMunayGas website, n.d. October 8, 2016, http://www.kmg.kz/en/manufacturing/oil/kazakhstan_china/.
526 "The National Energy Report 2015," *Kazenergy, n.d.,* 101.
527 "The National Energy Report 2015," *Kazenergy, n.d.,* 102.

TURKMENISTAN'S OIL SECTOR

Turkmenistan is another oil rich Central Asian country. Oil production in Turkmenistan dates back to 1909 with the exploration of the resources in Chekelen field. It was later extended with an introduction of such fields as Nebitdag in the 1930s, Kumdag in 1948 and Koturdepe in 1959. Currently, oil reserves of Turkmenistan accounts for 700 million tons.[528] According to official figures, Turkmenistan's resource base is approximately 71.64 billion tons of oil equivalent, including 53 billion tons located in onshore fields and 18.21 billion tons in the Caspian Sea.[529] While natural gas accounts for primary energy production and export, Turkmenistan also has the oil production and refining capacities. Oil production in Turkmenistan has been slowly increasing over the past two decades.

"Turkmen Oil" State Concern is the largest oil production complex in the country, which is responsible for exploration and development of oil fields. While Turkmen authorities passed a law prohibiting PSAs, there are already singed several PSAs for the development of oil fields by external companies:

Onshore:

- Eni (Italy) operating under a 25-year PSA contract signed in 2007 at the Nebit Dag field in western Turkmenistan. Turkmenneft holds 10 percent stake in the project.
- Mitro International (Austria) together with Turkmenneft develops Hazar oil field in the western Turkmenistan in accordance with PSA for 25 years signed in 2000.
- China National Petroleum Corporation (China) operates Bagtyýarlyk in Turkmenistan's major southeastern fields under a 32-year PSA contract signed in 2007.

Offshore:

- Petronas Carigali (Malaysia) operates Block 1 under a 25-year PSA to be expired in 2021;
- Dragon Oil, fully owned by Emirates National Oil Company (UAE) operates Block 2 under a 25-year PSA to be expired in 2024;
- Buried Hill (Cyprus) operates Block 3 under a 25-year PSA to be expired in 2032;
- Itera (Russia) operates Block 21 under a 25-year PSA to be expired in 2024.[530]

Turkmenistan exported products worth a bit less than US$ 9 billion in 2015, which made it world's 90th largest exporter. Natural gas accounts for over 80 percent of the total exports of Turkmenistan and around 5 percent is the refined oil products. Therefore, the largest contribution to the budget in 2015 came from natural gas (US$ 7.17 billion), refined oil products (US$ 447 million) and crude oil (US$ 243 million). Turkmenistan is almost entirely dependent on the Chinese market with US$ 7 billion trade turnover with natural gas constituting for most of the trading balance.[531] Oil exported via tankers through the Caspian Sea to the European and other markets. Central Asian countries, however, are not even part of the energy export–import relations.

Similar to Kazakhstan, it has been largely exporting raw materials. New energy policy is to transform the country from an exporter of raw materials into a supplier of processed products.

528 "Turkmenistan Oil and Gas," n.d., accessed May 5, 2017, http://turkmenistanoil.tripod.com/id4.html.
529 "Turkmenistan – Oil and Gas," Export.gov, August 15, 2016, accessed May 5, 2017, https://www.export.gov/article?id=Turkmenistan-oil-and-gas-production.
530 Annette Bohr, "Turkmenistan: Power, Politics and Petro-Authoritarianism," *Russia and Eurasia Programme,* March 2016, 74, accessed May 1, 2018, https://www.chathamhouse.org/sites/files/chathamhouse/publications/research/2016-03-08-turkmenistan-bohr.pdf.
531 "Unlocking Region's Enormaous Potential in Today's Economic Realities Kazakhstan," 4th International Annual Conference, Post–Conference Report 2016.

Authorities invested over US$ 9 billion in the construction of 428 large projects. Currently, most of the oil produced in Turkmenistan is being refined in Turkmenbashi and Seidi refineries. Turkmenistan is also planning to build large Kiyanly petrochemical complex. One of the priority energy policies is to implement a modernization program of the Turkmenbashi complex of oil refineries to boost refining capacity up to 20 million tons of oil per year by 2020. About US$ 1 billion are being invested in phased modernisation of the Turkmenbashi complex of oil refineries.[532]

Dropping oil prices also affected Turkmenistan's production and export of oil and oil products. Turkmenistan's oil product exports decreased by 35 percent in 2015, to around 2.5 million tons. The fact that sales level of the Turkmen oil products remained the same implies that most of the refined oil is being sold domestically.[533] Turkmenistan exports limited oil products, but not within the Central Asian region. Turkmen authorities are expecting to increase oil–refining capacity up to 20 million tons by 2020, up to 22 million tons by 2025 and up to 30 million tons by 2030.[534] Perhaps, when oil–refining capacity reaches higher level, Turkmen authorities will consider supplying oil products to the neighbouring Central Asian countries. An alternative would be to use Uzbekistan's extensive oil–refining capacity and supply light oil products within the Central Asian region.

532 "Unlocking Region's Enormaous Potential in Today's Economic Realities Kazakhstan."
533 Yury Burenko, "Turkmenistan Oil Product Exports Dropped by 35 percent in 2015," May 4, 2016, accessed March 25, 2017, http://dymresources.com/2016/05/04/turkmenistan-oil-product-export-loading-dropped-2015/.
534 "Turkmenistan Eyes to Increase Oil Export," Freight News, November 22, 2016, accessed May 5, 2017, http://www.hellenicshippingnews.com/turkmenistan-eyes-to-increase-oil-export/.

UZBEKISTAN: FROM OIL EXPORTER INTO OIL IMPORTING COUNTRY

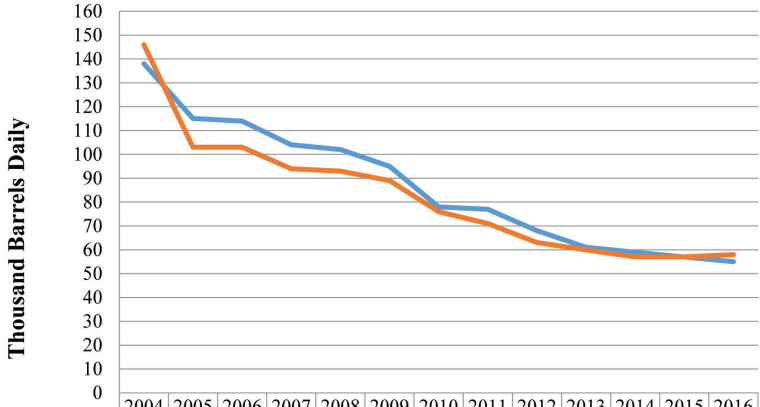
Having enjoyed extensive oil refining capacity, Uzbekistan simply lacks sufficient oil production to take full advantage of that capacity. Uzbekistan has turned from oil exporting into oil importing country. To meet its demands for light oil products, Uzbekistan has to either import crude oil from the neighbouring Kazakhstan and Turkmenistan or boost oil production by introducing new technologies to enhance efficiency in the domestic oil fields.

The first oil production in Uzbekistan dates back to 1885 in the Fergana valley. A larger scale oil exploration activity in Uzbekistan began in 1900 and starting from 1904, oil was extracted from blowout wells.[535] Currently, conventional oil reserves of Uzbekistan are estimated at the amount of 600 million barrels.[536] Over 60 percent of proven oil fields are located in the Bukhara–Kiva region (southern and south–Western parts of the country), including the Kokdumalak field, which accounts for about 70 percent of the country's oil production.[537] Oil production level in Uzbekistan has considerably dropped over the past two decades. This is largely due to the fact that old oil fields are being slowly depleted while no major new oil reserves have been discovered. Yet, oil–refining capacity in Uzbekistan remains large enough to meet the demand of both local and external consumers. Due to lack of intra–regional cooperation, this capacity has not been fully exploited so far.

Oil Refining Capacity

While in the 1990s Uzbekistan was net exporter of oil, since 2000s downward trends in oil production turned the country into a net importer, which in return is negatively affecting availability of light oil products for population needs and export to the neighbouring countries.

Figure 10. Oil Production and Consumption in Uzbekistan 2004–2016.



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Production	138	115	114	104	102	95	78	77	68	61	59	57	55
Consumption	146	103	103	94	93	89	76	71	63	60	57	57	58

Source: BP Statistical Review of World Energy June 2017.

The country has a century long experience in refining oil. The first oil refinery plant in the country was built back in 1906 in Fergana. The plant was extended and reached the annual

535 Uzbekneftegaz, "History of Oil and Gas Sector of Uzbekistan," 2015, accessed June 19, 2016, http://www.ung.uz/ru/about/history.

536 BP Statistical Review of World Energy June 2017.

537 Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note," *International Bank for Reconstruction and Development / The World Bank,* 9.

processing capacity of 176,000 tonnes in 1940.[538] Uzbekistan used to export oil products by trains to China and Afghanistan from this plant. Fergana oil refinery (second complex) was put into operation in 1959. Bukhara oil refinery plant was built in 1997.[539] The total refinery capacity of these plants in Uzbekistan makes it possible both to fully meet domestic needs and export oil products to external markets (to the neighbouring Central Asian states and via train to China and Afghanistan).

During the Soviet time, Uzbekistan relied on Russian crude for its three operating refineries. However, Uzbekistan stopped importing crude oil from Russia in 1995. To meet domestic needs for refined oil products it continued importing light oil products from Russia until 1998. Yet, to achieve self-sufficiency Uzbekistan introduced new refinery capable of refining up to 2.5 million tons of oil products in Bukhara region in 1997. This refinery also granted Uzbekistan independence and self-sufficiency for refined oil products.[540]

Fergana Refinery is among the largest refineries currently operating in Uzbekistan and, as a matter of fact, Central Asia. It produces up to 5.5 million tons of oil products and lubes annually. Consisting of 44 processing plants, Fergana refinery produces over 75 types of oil products, 20 of which are being exporter to external markets.[541] Fergana refinery has a capacity of 114,288 barrels per day. It produces gasoline, fuel oil (including aviation fuel), sulphur and solvents. Bukhara refinery, in its turn, is capable of processing 50,000 barrels per day with the possibility to expand the capacity up to 110,495 barrels per day. Main products of the plant are gasoline, diesel, and fuel oil. However, oil production decline in the last years has resulted in only 60 percent operation of its full refining capacity. Besides, oil production in the country is forecasted to further decline. Uzbekistan has turned from a net exporter into a net import of crude oil to process it in its refineries.[542] While oil-processing capacity of Uzbekistan will remain within the same range of 225,000 and 230,000 barrels per day up until 2024, the volume of the refined oil products is expected to decline from 75,640 barrels per day to 69,050 barrels per day in 2024.[543] Uzbekistan is currently receiving a limited volume of crude oil imports from Russia and Kazakhstan to meet peak demands. In fact, there is an energy–transporting infrastructure capable of moving crude oil to keep Uzbek refineries operating in full capacities. This provides some prospects for extending oil-trading dynamics within the region.

Oil Pipeline Infrastructure

There are two major oil pipelines to transport oil and oil products from Russia and Kazakhstan to Uzbekistan: Omsk–Shymkent–Bukhara oil pipeline and Shymkent–Tashkent oil pipeline. The Omsk–Shymkent–Bukhara oil pipeline is used to transport oil from the Siberian city of Omsk through Pavlodar, Karaganda and Shymkent to Uzbekistan. Inside Uzbekistan, the pipeline runs through Nurata and Navoi to the Bukhara refinery, before transporting oil onwards to the Chardzhou refinery in Turkmenistan. The Shymkent–Tashkent pipeline links the refinery in Kazakh city of Shymkent with Tashkent city. It is used for a small-scale gasoline and oil imports.[544] While Uzbek oil is processed in Bukhara (south–west) and Fergana (east) refineries, it is still cost efficient to import refined products from Shymkent to supply the capital city of Tashkent. Russia and Kazakhstan are two major suppliers of refined fuels to Uzbekistan.

538 Uzbekneftegaz, "History of Oil and Gas Sector of Uzbekistan."
539 Uzbekneftegaz, "Pokazateli (Osnovnie Key indicators)," March 17, 2015, accessed June 1, 2016, http://www.ung.uz/ru/business/indicators.
540 Andrei Kalyuzhnov, "Caspian Area Refineries Struggle to Overcome Soviet Legacy," Oil and Gas Journal, August 21, 2000.
541 "Development Priorities for the Oil and Gas Industry of Uzbekistan," 4th International Annual Conference, Post–Conference Report 2016.
542 Uzbekneftegaz, "Osnovnie Pokazateli (Key indicators)," March 17, 2015, 11.
543 Business Monitor International, "Uzbekistan Oil and Gas Report," *BMI,* 2015, 22.
544 Kochnakyan et. al., "Uzbekistan energy/power sector issues note," no. 11. *International Bank for Reconstruction and Development / The World Bank.* 2013.

Uzbekistan, however, having perceived itself self-sufficient, has been quite reluctant for a long time to importing oil from abroad, which leads to shortages of oil products in the domestic market.

Increasing Oil Recovery Rate and Shale Oil Potential

Since no major oil fields have recently been discovered in the country, Uzbekistan is planning to boost oil production by increasing the recovery rate in existing oil fields. The oil recovery rates in Uzbekistan are extremely low and account for only 28 percent average. By introducing new technologies, Uzbekistan can increase the recovery rate at oil fields up to 56 percent. Uzbekistan, in an attempt to attract more foreign investments, created favourable taxation system: international oil companies are exempt from taxes during exploration. They are also exempt from tax on profits for the first seven years of their production and from property and profit taxes on their shares in the joint ventures.[545] These are a few policy measures used by the authorities to attract foreign investments to its energy sector.

In addition to increasing crude oil production, Uzbekneftegaz is interested in the development of country's non-conventional oil potential. According to the preliminary estimates, Uzbekistan possesses around 340 billion barrels of shale oil reserves. Uzbekneftegaz in cooperation with Japan Oil, Gas & Metals National Corporation, Russia's Atomenergoproekt Institute and several Korean companies are planning to establish a joint venture and invest US$ 600 million in the development of shale oil in the country. Uzbekistan has already begun drilling for shale oil in 2013 at the Sangruntau field.[546]

Projections for Oil Production in Uzbekistan

Crude oil, natural gas liquids and other liquids production decreased from 164,750 barrels per day in 1996 to 93,630 barrels per day in 2014. While development of unconventional oil reserves, increasing recovery rate and/or development of new fields can increase oil production in Uzbekistan, Business Monitor International forecasts that Uzbekistan's own production of oil, gas and other liquids will further decrease to 91,600 barrels per day by 2019 and 85,800 barrels per day by 2024.[547] After a slight increase of the export of crude oil and other liquids, from 18,000 barrels per day in 2014 to 21,000 barrels per day in 2015, is also forecasted to decrease to 16,700 barrels per day in 2024.[548]

Oil sector development in Uzbekistan is no longer an issue of making profit. It is now a matter of energy security. Domestic consumers are experiencing significant shortages of oil products in Uzbekistan. Thus, oil sector development requires an innovative and reforms-based energy policy to address existing and emerging energy security challenges in the country. Uzbekistan succeeded to attract around US$ 10 billion of foreign direct investment in 2014. Over 63 percent of this funding was spent on the development of fuel and energy sectors.[549] Energy sector continues to attract the largest amount of foreign investments even today. Once the problem of insufficient oil supplies to the refineries in Uzbekistan is resolved, authorities will be able to increase export of refined products to the neighbouring markets, thus facilitating intra–Central Asian trade and improving energy security of the Central Asian countries. Neighbouring Kyrgyzstan, which is currently highly dependent on light oil products import from Russia and China, will also benefit by diversifying its dependence.

545 Business Monitor International, "Uzbekistan Oil and Gas Report," *BMI,* 2015, 47–48.
546 Business Monitor International, "Uzbekistan Oil and Gas Report," *BMI,* 2015, 14.
547 Business Monitor International, "Uzbekistan Oil and Gas Report," *BMI,* 2015, 16–17.
548 Business Monitor International, "Uzbekistan Oil and Gas Report," *BMI,* 2015, 28.
549 "Three Reasons to Work With Uzbekistan's Oil and Gas Industry," *ITE Oil and Gas,* March 30, 2015, accessed January 5, 2017, http://www.oilgas-events.com/market-insights/insights-uzbekistan/3-reasons-to-work-with-uzbekistan-s-oil-and-gas-industry/801781717.

POTENTIAL FOR BROADER COOPERATION IN THE OIL SECTOR

During his official visit to Kazakhstan, newly elected President of Uzbekistan Shavkat Mirziyoyev highlighted that any large-scale regional transportation or energy projects will not be implemented without active involvement of the Central Asian state actors and regional integration.[550] If this statement is followed by practical measures, regional actors will pull their resources together to address energy insecurity through greater cooperation in the oil sector in Central Asia. For instance, Uzbek authorities have already reached an agreement with Kazakhstan to import oil via Omsk–Pavlodar–Shymkent oil pipeline to refine it. As mentioned earlier, hydrocarbons extraction in Uzbekistan has been declining and oil-refining capacities in the country—Bukhara, Fergana and Altynaryk refineries–operated for 60 percent.[551] This agreement is one of the first attempts to reinstate intra-Central Asian energy cooperation.

Most importantly, without such cooperation, Central Asian upstream states, which do not enjoy considerable oil reserves and refining capacity, are particularly vulnerable. According to some estimates oil reserves in Kyrgyzstan may account for around 500 million to 1 billion tons. There are 10 spots in the country, which can be rich for oil: Fergana–100 million tons, Alay–70 million tons, Aksay–50 million tons, Toktogul–30 million tons, etc. Unfortunately, these are only preliminary estimates. Because of the high recovery costs, the government is not capable of conducting exploratory work. Kochkor–Ata field delivers around 70 thousand tons of crude oil annually. This is still extremely low level of production. Kochkorata Oil Refinery is capable of processing 500 thousand tons of crude oil, but is operated for only 15 percent of its overall capacity.[552] Five refineries in Kyrgyzstan require modernization to meet new standards of Euro 4 and 5 by 2019. Because, Kyrgyzstan does not have sufficient oil production to run its refineries, it is highly dependent on imported oil products. Tajikistan has also been attracting foreign investments in the construction of several oil refineries with the capacity of up to 500 thousand tons a year. So far, the initiative is not progressing well.[553] However, Chinese investors are showing interest and actively engaging in the Central Asian upstream countries' energy sector development.

In fact, China is taking over Russia's position as major supplier of refined fuel to Central Asian countries. Having possessed limited refining capacity Kazakhstan, Kyrgyzstan and Tajikistan have been relying on the Russian products. However, over the past several years, stability of light oil products supply from Russia has been compromised. Therefore, China is engaging in the energy sector development in those countries by introducing new refining capacities. China has already built a refinery with 800,000 tons capacity in Kyrgyzstan. Chinese companies are also building a plant capable of refining 1.1 million tons of oil in Kyrgyzstan by 2017. China is planning to upgrade 8 million tons capacity refinery with the total cost of US$ 1 billion in Shymkent, Kazakhstan.[554]

President Vladimir Putin has ratified an agreement between Russia and Kyrgyzstan regarding the

550 "Prezident Uzbekistana o Vizite v Kazaxstan (President of the Republic of Uzbekistan About His Visit to Kazakhstan)," March 20, 2017, accessed January 5, 2017, http://www.inform.kz/ru/prezident-uzbekistana-o-vizite-v-kazahstan-narody-nashih-gosudarstv-mnogogo-zhdut-ot-etoy-vstrechi_a3009595.
551 "Nefteprovod Kazaxstana Pomojet Uzbekistanu Uvelichit Vypusk Benzina (Kazakh Oil Pipeline Will Help Uzbekistan Increase Fuel Production Output)," March 27, 2017, accessed December 12, 2017, http://anhor.uz/society/10481.
552 "Zapasi Nefti v Kyrgyztane Sostavlyayut Milliard Tonn (Oil Reserves in Kyrgyzstan Account for a Billion Tons)," March 29, 2012, accessed October 24, 2017, https://tengrinews.kz/markets/zapasyi-nefti-v-kyirgyizstane-sostavlyayut-milliard-tonn-211115/.
553 "Unlocking Region's Enormaous Potential in Today's Economic Realities Kazakhstan," 4th International Annual Conference, Post–Conference Report 2016.
554 Chris Rickleton, "Central Asia Rues Dependency On Russian Fuel," *Eurasianet,* October 6, 2014, http://oilprice.com/Energy/Natural-Gas/Central-Asia-Rues-Dependency-On-Russian-Fuel.html.

supplies of tariff–free oil and oil products to the Kyrgyz market in 2017. Parties are negotiating the volume and types of Russian oil products to be exported to Kyrgyzstan.[555] Because the supply relationships are not entirely clear between Russia and Kyrgyzstan, China is replacing Russian light oil products. There are, however, some tensions between local authorities and Chinese investors. Oil refining facility built by the Chinese is only half loaded and the end–consumers receive even less products. While Kyrgyz officials are blaming Chinese counterparts, in one of the interviews the refinery's director Andrei Yu Shan Lin claimed that: "We have an agreement to supply local [Kyrgyz] companies. How they distribute what we sell is not something we have knowledge of."[556]

Russia is supplying Kyrgyzstan and Tajikistan with discounted oil products to keep them largely under its sphere of influence. Shortcoming of such relationships is the lack of reliability and sustainability of the energy supplies. Russia is exporting oil products to Central Asian upstream countries based on the annually renewed contracts. At some point, however, Russia can simply suspend the relationships and refrain from renewing the contract. In this case, Tajikistan and Kyrgyzstan might end up in a vulnerable position. At the same time, excessive dependence on Chinese investments to develop oil and gas sector in Central Asian upstream countries also bears political and economic risks for the latter. Tajikistan and Kyrgyzstan could have been a lot safer in terms of energy security (ability to meet domestic needs for oil products), if energy initiatives to develop indigenous resources are combined with intra–Central Asian energy trade.

555 "Putin Podpisal Ratifikaciyu Dogovora o Besposhlinnix Postavkax Nefteproduktov v RK (Putin Ratified An Agreement on Customs Free Supplies of Oil Products to RK)," *Azattyk,* December 29, 2016, accessed May 5, 2017, http://rus.azattyk.org/a/28203717.html.
556 Chris Rickleton, "Central Asia Rues Dependency On Russian Fuel."

Concluding Remarks for the Discussions of the Central Asian Energy Systems

Summing up the analysis in the above discussed chapters, there are several factors affecting the stability and reliability of energy supplies within the CAES, such as: a) natural gas and oil trade deals, which are usually signed on a long-term basis with long-term obligations; b) pipelines, the only cost-efficient way to transport natural gas and oil, which require significant investments from both producers and external customers; and, c) the fact that Central Asia is surrounded by greater powers that often compete for energy resources.

Due to asymmetrical power relations within the CAES, greater powers attempt to maintain their influence over energy policy choices, and weaker powers are constantly searching for ways to increase their leverage. Central Asian exporters' dependence on the Russian pipeline network to export their natural gas put them in a vulnerable position vis-à-vis Russia. Russia effectively used this dependence to promote its economic and political interests. However, the Russian monopsony was challenged by the Chinese energy pipeline network. While it constitutes partially successful efforts to diversify away from Russia, diversification of export routes has limited direct contribution to the level of energy security of the Central Asian states.

Taking into account the fact that there has been no natural gas and oil production boom as expected in Central Asia; there is a doubt regarding regional producers' ability to produce required amount of gas and oil to keep up with international energy demand. An attempt to fulfill obligations to supply an agreed volume of natural gas and oil to external customers may worsen unstable regional energy market in which less hydrocarbons are available for intra-Central Asian trade. Having experienced a shortage of gas and electricity, especially during the winter period, Tajikistan and Kyrgyzstan are trying to develop their hydro-power potential, which is further escalating tensions between Central Asian countries over the energy-water balance. Uzbekistan has been using the dependence of Tajikistan and Kyrgyzstan on Uzbek gas as a leverage to block the construction of giant HPPs. The asymmetry in the dependence has been changing, however, and upstream countries continue to pursue independent energy policies.

To address the problem of energy deficiency in Central Asian upstream countries, as a consequence of the CAES disintegration, these countries switched a water mode of the HPPs into an energy mode. However, without proper coordination, the energy-operating mode of the large HPPs may affect water distribution quotas in the region. Increasing the level of electricity production is expected to solve the problem of insufficiency. Thus, the governments of these countries have prioritized construction of another set of large and medium HPPs. Nonetheless, the analysis shows that projects, over which Central Asian upstream and downstream countries have serious disagreements, such as Rogun and Kambarata–1, have a number of limitations that will most likely affect the extent of their contribution to the security of the CAES. And, it is the cooperation in the energy sector and the reinstated gas and electricity trade within the region that can considerably improve security of the CAES.

CHAPTER VI.

SECURITY OF THE CENTRAL ASIAN ENERGY SYSTEM THROUGH ENERGY TRADE

Chapter VI. Security of the Central Asian Energy System through Energy Trade

Establishing and operating independent energy systems, within the inherited interconnected network, that Central Asian states are currently, prioritizing bears high cost and negatively affects security of the CAES. In contrast, re-integration of the CAES will not only restore the energy trade, but also provide a favourable investment climate for the modernization of existing facilities and construction of new infrastructures (HPPs, TPP, pipelines and electricity transmission lines). The energy security interests of all Central Asian countries are supposed to be met simultaneously within the integrated CAES. However, Central Asian oil and gas producers believe the interdependence that the CAES entails threatens their sovereignty and national security. Moreover, the revenues from exporting energy to external markets are so great that the elites who control the energy flow would refrain from full-scale reintegration of energy sectors since it will limit governments' control over their energy resources.

But the analysis shows that re-instating the energy trade to meet current demand, while the state retains full control over its energy sector, is not only possible, but also is a necessary condition in the short-term perspective. In the short-term, the intra-regional energy trade implies that Central Asian countries would only assist each other to meet insufficient energy resources, which would otherwise be impossible to obtain or at least cost inefficient, especially during energy demand peaks. While such trading arrangements contribute to the level of energy security in the short-run and do not guarantee sustainability of supplies in the long-term perspective, restoring the energy trade is nonetheless an important first step toward breaking the status quo and achieving a maximally secure CAES. Increasing the intra–Central Asian energy trade, however, will be possible only under the condition that state actors, to some extent, reconsider their policy priorities. Considering political changes in Uzbekistan, new prospects emerged for strengthening regional energy cooperation in Central Asia.

Table 14. Attributes of a Maximally Secure CAES: Development Scenarios.[557]

Criteria	*Energy sector development scenarios*		
	1	*2*	*3*
	Status Quo (Energy Insecurity)	**Energy trade to meet current demand** (Short-term Security of Energy Supplies)	**Integrated Central Asian Energy System** (Sustainable and Long-term Energy Security)
Security of Energy Supplies (Diversification of energy by source, fuel type, transport routes and electricity production by fuel type; Strategic reserves and refining capacity; market mechanisms)	**Prospects:** -Independent energy systems are less vulnerable to unilateral energy supply cuts **Challenges:** -National energy systems are not designed to operate independently (very limited storage and processing capacity); -Excessive dependence on fossil fuels in downstream countries and lack of these resources in upstream countries; -Reliance on non-market mechanisms.	**Prospects:** -Diversification of electricity generation by fuel type and energy sources in the overall balance; -Prevents water spills from existing infrastructure without producing electricity; -Secures necessary amount of energy for the regional use; **Challenges:** -Energy transportation loss—due to inability to agree who is responsible for the maintenance of transport infrastructure; -Continue to pursue establishing independent energy systems.	**Prospects:** -Stable and reliable supplies of diversified energy sources; -Share the cost of energy projects (money, personnel, available technology); -Does not require huge investments in new infrastructures (only in upgrading existing ones); -States are encouraged to use market mechanisms; -Enhanced reliability, flexibility and quality of energy supply.
Energy demand management Expose to demand side risks (fossil fuel demand reduction; expose to demand surges; balanced distribution of resources)	**Challenges:** -Policy initiatives encourage increasing fossil fuel consumption; -Unable to meet peak demands in response to extreme weather conditions; -Increasing export at the expense of domestic consumption.	**Prospects:** -Fossil fuel demand reduction (for Uzbekistan and Kazakhstan) due to exchange of energy resources; -With proper coordination—ability to meet energy demand peaks; **Challenges:** -Energy export still prevails over domestic consumption needs.	**Prospects:** -Fossil fuel demand reduction as a result of policy initiative; -Ability to meet energy needs for the periods of demand peak; -No export at the expense of domestic consumption; -Balanced amount of export and import.
Energy Efficiency Energy consumption growth/economic growth (Burning fossil fuels produce electricity and is used for heating in winter; avoiding HPP water spills	**Challenges:** -Shortage of energy production in winter in Upstream states; -Water spills in summer; -Inefficient use of fossil fuels.	**Prospects:** -Availability of energy for Upstream states in winter -Businesses operate all year round; **Challenges:** -Subsidizing inefficient energy sector remains; -No mechanism to ensure reliability and stability of energy supplies.	**Prospects:** -Guaranteed and long-term availability of energy for both Upstream and Downstream countries to work all year round by using hydro-power and fossil fuels in the most efficient way.

557 Energy sectors development scenarios are based on the analysis of the Central Asian countries' energy sectors and the Central Asian Energy System.

Criteria	*Energy sector development scenarios*		
	1	*2*	*3*
	Status Quo (Energy Insecurity)	**Energy trade to meet current demand** (Short-term Security of Energy Supplies)	**Integrated Central Asian Energy System** (Sustainable and Long-term Energy Security)
Economic aspect (Total fuel costs/GDP; Import fuel cost/GDP; Fuel import—% of GDP)	**Challenges:** -Increasing total fuel production cost leads to higher subsidies in energy sector to avoid social tensions and political instability; -Increasing import of oil and gas products from outside the region for higher cost; -Building independent energy systems (electric power transmission lines and pipelines) increases the cost of energy.	**Prospects:** -Decreasing the total fuel price; - Increasing import from the regional producers for lower prices; -Producing energy in a more cost efficient way (hydro-power in the summer; thermal power in winter); **Challenges:** -Energy sector remains highly subsidized.	**Prospects:** -Sustainability of the most economically efficient production of energy resources; -Stable pricing policies; -Limited exposure to energy related economic risks; -Savings in operating and investment costs.
Environmental aspect (Greenhouse gas emissions)	**Prospects:** -Slowly developing RES; **Challenges:** -For Downstream states, increasing fossil fuels consumption to cover the loss of electricity previously imported form Upstream states; -For Upstream states investment in the development of its fossil fuel deposits.	**Prospects:** -More balanced consumption of fossil fuels due to periodical exchange of cleaner energy sources; -Sharing the knowledge of renewable energy sources development; **Challenges:** -For Upstream countries limited increase of their own consumption of fossil fuels; -For Downstream countries slowly raising the stake of fossil fuels in the overall energy balance.	**Prospects:** -Efficient use of natural gas (cleaner than oil and coal) and hydro-power due to exchange of energy resources, contributes to long-term sustainability of the regional ecosystem.
Human Dimension (Increase the fraction of population with access to basic energy services)	**Challenges:** -Supply of energy to population spots that are already connected to energy system is limited due to state's inability to meet domestic needs; -Energy supply shortage due to isolation from the CAES; -Increasing export at the expense of domestic consumption.	**Prospects:** -Availability of additional energy to meet peak demands; -Incentive to wider introduce renewable energy sources technology in remote areas; **Challenges:** -Availability of energy is too dependent on ups and downs of negotiation processes; -Increasing export at the expense of domestic consumption remains.	**Prospects:** -Maintenance of the interconnected energy transporting system allows providing sufficient and clean energy to the people that now lack energy due to withdrawal of some of the members of the CAES; -Ensures slow but gradual transition to a more sustainable energy sector.

Criteria	*Energy sector development scenarios*		
	1	*2*	*3*
	Status Quo (Energy Insecurity)	**Energy trade to meet current demand** (Short-term Security of Energy Supplies)	**Integrated Central Asian Energy System** (Sustainable and Long-term Energy Security)
Military/Security Dimension (Non-traditional threats; conflict over resources)	**Challenges:** -Exposure to military conflict over Rogun and Kambarata–1 HPPs; -Inability to take coordinated actions against non-traditional threats (terroristic attacks); -Using energy weapon (influence the decision making of other countries).	**Prospects:** -Provide security of energy supply and transit within the region; -Governments' can secure necessary amount of energy to meet basic needs in the period of energy crisis to avoid social uprising and political confrontation; **Challenges:** -Risk of military confrontation remains; -Inability to respond to non-traditional security threats; -States are not secure from energy weapon.	**Prospects:** -Low risk of conflict over resources among Central Asian countries; -Interconnected states are interested in fighting back security/military groups threatening security of energy supplies within the region; **Challenges:** -Some external state actors may perceive such union as a threat.
Regional Cooperation (Commitment to regional cooperation on energy related issues)	**Prospects:** -Multilateral Inst. provide support (grants) to Tajikistan and Kyrgyzstan to improve energy security; **Challenges:** -Frequent energy supply cuts due to lack of an effective enforcement mechanism; -Image of an unreliable partner.	**Prospects:** -Short-term and bilateral contracts for the functioning of the CAES is better than the disintegrated system; **Challenges:** -No effective and trustworthy mechanism regulating regional cooperation.	**Prospects:** -Long-term and multilateral agreements in energy sector; -Effective mechanism (The Energy Security Center for Regional Cooperation) to timely and efficiently respond to energy security threats.

Along the Way Toward Independent Energy Systems (Status Quo)

The status quo is characterized by the recently emerged energy insecurities due to Central Asian countries' desire and in some cases necessity to establish independent energy systems. Currently, each Central Asian government pursues policies designed to establish and strengthen their national energy systems. While decreasing dependence on imported oil, gas and electricity may potentially improve a country's ability to resist unilateral sudden energy supply disruptions, disintegration process of the CAES has negatively affected the level of the energy trade. It became obvious that energy trade disruptions without establishing self-sustaining independent energy systems affect energy security, to different extents, of all Central Asian states.

Guided partially by the belief of self-sufficiency, Uzbekistan decided to withdraw from the CAPS and redirect gas and electricity exports to external markets. Due to its strategic location on the crossroad of energy-transporting corridors within the region, this decision affected the overall security of the CAES. Energy supply cuts, in combination with highly subsidized and inefficient energy sectors, underdevelopment of renewable energy sources, lack of countrywide electricity transmission and gas supply networks, as well as disagreements over the water withdrawal balance have severely affected availability and affordability of energy supplies to Central Asian upstream countries and sustainability and efficiency to downstream states.

Independent energy systems do provide higher security from sudden unilateral supply cuts, but also bear additional costs and can only be realized in the long-term. Establishing and sustaining independent energy systems in Central Asia would require at least:

(a) Construction of new gas-fired TPPs in Turkmenistan and an extension the gas and electric power supply networks;
(b) In Kazakhstan, an enlargement of the 500 kV transmission lines connecting north with south, and using the Beineu–Bozoy–Shymkent pipeline to transport natural gas from the gas-rich regions to southern parts of Kazakhstan and Tobol–Kokshetau–Astana pipeline; increasing oil refinery capacity;
(c) In Uzbekistan, the construction of new small HPPs and coal/gas-fired TPPs as well as modernization of existing ones; increasing oil production capacity.
(d) In Tajikistan, extending countrywide electric power transmission lines, including "North–South" and construction of the Rogun HPP; enhancing hydrocarbons production and processing capacities;
(e) In Kyrgyzstan, completing a 500 kV "Datka–Kemin" north-south and other smaller transmission lines as well as building Kambarata–1 HPP and Kara–Keche TPP; increasing oil and gas production and refining capacities;
(f) Most importantly, introduce energy efficiency technologies in outdated energy producing, transporting and consuming facilities.[558]

Central Asian countries may strengthen their national energy systems at some point, but the transition is accompanied by a decrease in energy security in some countries, an unfavourable investment climate to promote energy-led economic growth and underdevelopment of some energy sectors in others.

Integrated Central Asian Energy System

As highlighted in the previous section, establishing and operating independent energy systems within still interconnected networks bears high cost and negatively affects the level of energy security in Central Asia in the transition period. From the energy security perspective, re-integration of the CAES would be the most promising way to address energy security challenges in the region. Coordinated operation of the CAES and rationally exploiting energy potential of the region would ensure stability and reliability of supplies prioritizing energy trade/resource exchange within the region. It will also ensure the sustainability of energy sectors providing sufficient and clean energy for population and economic needs for the foreseeable future. Most importantly, the CAES will serve as an effective mechanism capable of ensuring energy security in the long-term perspective. Long-term stability and reliability of energy supplies as well as the resolution of disagreements over the construction of large HPPs in Central Asia will improve investment climate for the private sector to participate in energy projects and accelerate energy-led economic growth. Market mechanisms prevailing within the CAES may contribute to solving the problem of highly inefficient and subsidized energy sectors and promote alternative energy sources in the region.

While energy interests of all countries are met simultaneously within the integrated CAES, Central Asian states perceive interdependence as a factor threatening national security and would refrain from full-scale reintegration of their energy sectors. Lack of political will is considered a major obstacle toward restoring CAES.[559] Central Asian countries' energy security policies are currently state-centric, export-focused and short-term oriented. Having perceived energy resources as

558 The list of these attributes is based on the analysis in the previous chapters.
559 Tolganai Umbetalieva, Personal Interview, Director of the Central Asian Foundation for the Development of Democracy, Almaty, Kazakhstan, April 1, 2016.

a strategic commodity, state actors try to maintain full control over production, distribution, and transportation of these resources. Large revenues that Central Asian governments stand to earn from selling their resources encourage these governments to increase export capacity to external markets even at the expense of domestic and intra-regional energy consumption. Short-term oriented energy policies also affect the sustainability of the Central Asian energy sectors. Asymmetrical interdependence between regional producers and external customers who are eager to acquire Central Asian resources but who also prefer a bilateral format of cooperation remains a challenge to establishing a strong unified energy system.

Reintegration of the CAES differs from simply maintaining coordinated operation of energy networks to large-scale joint investments in the development of hydrocarbon and hydro-power sectors. Due to different levels of economic development, Central Asian countries will not be able to equally contribute to sustaining the system and share the cost. Kazakhstan's GDP is higher than that of other Central Asian states, while economies of Tajikistan and Kyrgyzstan are the least developed.[560] Unwillingness of some regional state actors to take over the cost of others while equally sharing the benefits is another challenge indicating that full-scale re-integration of the CAES at this stage is highly unlikely.

560 World Bank, *GDP (Current US$) for 2016* (Washington, DC: World Bank, 2017), accessed October 20, 2017, http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries/XD-XM?display=default.

SUSTAINABILITY OF ENERGY SUPPLIES WITHIN THE CENTRAL ASIAN REGION

One of the policy options to deal with energy insecurity is to develop renewable energy sources in the region. Overemphasizing the importance of fossil fuels explains the lack of attention by governmental agencies toward the development of renewable energy sources to ensure sustainability of energy supplies. Despite the fact that Central Asian countries enjoy an abundance of clean energy resources (5.5 percent of the world's economically efficient hydro-power potential is found in Tajikistan and Kyrgyzstan and solar energy in mainly downstream states is available on average of 8–10 hours of sunshine per day),[561] they represent only a tiny proportion of the resources used to produce electricity. Renewables, mainly hydro-power, accounted for only 1 percent of Kazakhstan's, 2 percent of Uzbekistan's, and 0.001 percent of Turkmenistan's primary energy production.[562] When Uzbekistan withdrew from the CAPS it succeeded to cover electricity loss that was previously imported from upstream countries by burning more coal and gas in TPPs. Turkmenistan increased the number of gas-fired TPPs to meet its electricity needs. Kazakhstan connected its southern regions with electricity produced in coal-fired TPPs located in the north. Apart from environmental considerations, producing electricity in TPPs during summer period is cost inefficient. In winter, TPPs produce electricity and provide a heating opportunity, while in summer only electricity is produced.

Burning fossil fuels is the main source of CO_2 emissions. Figures for carbon dioxide emissions from the consumption of energy for Central Asian countries in tonnes per capita suggest that the level of CO_2 in Central Asian downstream countries is quite high. While energy efficiency initiatives to improve energy-producing facilities can save some energy, it is not a solution per se. It can only buy time to develop a sustainable energy sector.[563] Importing electricity from upstream Central Asian states, which have a surplus of clean and sustainable electricity production during the summer, would benefit downstream countries by providing the possibility to use their fossil fuels more efficiently with limited CO_2 emissions.

Inefficient Energy Sectors

The landlocked geographical status of the region limits state actors' ability to diversify their export/import dependence. The interdependence that the CAES entails put regional importers in a position where they are vulnerable to frequent energy supply disruptions caused by the process of the disintegration of the system, which is highly energy intensive. Fossil fuel-based regional energy sectors are environmentally damaging. So far, no policy initiative has succeeded in reducing fossil fuel demand in Central Asian countries. Only Tajikistan and Kyrgyzstan have, to some extent, decreased fossil fuel consumption during the years of independence.[564] However, it was not the result of an effective policy initiative, but rather fossil fuel supply cuts from neighbouring states, which caused severe energy shortages in these countries.

561 Romen Zakhidov, "Central Asian Countries Energy System and Role of Renewable Energy Sources," *Applied Solar Energy* 44, no. 3 (2008): 218–223.

562 International Renewable Energy Agency, *Renewable Energy Country Profile—Kazakhstan* (Abu Dhabi: IRENA, n.d), accessed December 1, 2016, http://www.irena.org/REmaps/countryprofiles/asia/Kazakhstan.pdf; International Renewable Energy Agency, *Renewable Energy Country Profile—Turkmenistan* (Abu Dhabi: IRENA, n.d), http://www.irena.org/REmaps/countryprofiles/asia/Turkmenistan.pdf; International Renewable Energy Agency, *Renewable Energy Country Profile—Uzbekistan* (Abu Dhabi: IRENA, n.d), http://www.irena.org/REmaps/countryprofiles/asia/Uzbekistan.pdf.

563 José Goldemberg, "Energy Choices toward a Sustainable Future," *Environment: Science and Policy for Sustainable Development*, December 2007, accessed September 15, 2015, http://www.environmentmagazine.org/Archives/Back%20Issues/December%202007/Goldemberg-full.html.

564 International Energy Agency, *Total Primary Energy Consumption* (Paris: International Energy Agency, n.d.), accessed January 15, 2017, https://www.iea.org/stats/WebGraphs/TAJIKISTAN5.pdf

The energy sectors of Central Asian countries are also highly subsidized. Subsidizing keeps prices for energy low enough to make it affordable to the population and industries. Low energy prices and a long legacy of the Soviet period (during which saving energy was not a priority), however, turned out to be discouraging factors for using energy efficiently. Moreover, outdated energy production facilities and lack of investment in maintaining energy infrastructure cause considerable energy losses and negatively affect the availability of energy resources in Central Asia.[565]

Table 15. Age of Installed Generation Assets.

	Up to 10 years	11 to 20 years	21 to 30 years	Over 30 years
Kazakhstan	11%	11%	33%	44%
Kyrgyzstan	4%	9%	23%	64%
Tajikistan	14%	0%	12%	74%
Uzbekistan	7%	5%	13%	75%

Source: Asian Development Bank, Technical Assistance Consultant, *Central Asia Regional Economic Cooperation: Power Sector Regional Master Plan* (Metro Manila: Asian Development Bank, Report no. 43549, 2012), http://adb.org/sites/default/files/projdocs/2010/43549-01-reg-tar.pdf.

The above figures highlight that Uzbekistan and Kazakhstan suffer the most from the inefficient energy sectors. Highly inefficient energy sectors raise energy security and environmental concerns for these countries. Authorities are prioritizing development of alternative energy sources to address the problem of energy inefficiency.

Energy Efficiency Policy Priority of Uzbekistan

The efficiency of electricity transmission and distribution is one of the government's priorities due to significant losses, estimated to represent 20 percent of net generation, with the cost of excess losses estimated at US$ 340 million. The issue of energy efficiency is one of the top priority policies for the government not only in the power transmission sector. Gas–fired TPPs' efficiency in Uzbekistan is 40 percent lower than that of the modern TPPs, costing the budget around US$ 1.2 billion. The government is planning to retool the outdated energy infrastructure. Most importantly, however, Uzbek authorities are aiming at generating approximately 21 percent of all its energy needs from renewable sources, including solar, by 2031.[566]

Along with the development of alternative energy sources, Uzbek authorities are also planning to increase coal consumption. Having possessed 1,900 million tonnes of coal reserves, the share of this particular type of energy source in Uzbekistan is relatively limited. Coal in Uzbekistan is being extracted mainly in Angren, Shargun, and Baysun fields.[567] Energy sector, residential sector and construction industry are currently the largest consumers of coal. Eighty five percent of which is consumed by electric power sector. One of the energy priorities of Uzbekistan is to increase the number of coal-fired TPPs, which could save some gas for export. To solve the problem of energy insecurity, in accordance with the Modernization and Retooling Program for the Coal Industry in 2013, the coal mining is expected to gradually increase. This will be an energy security measure to replace declining natural gas and oil production for electricity production and household consumption. According to the energy sector development program for 2011–2015, Uzbekugol has introduced initiatives to increase the share of coal up to 10–

565 Head of Sales Department of "Buxorogaz," Personal Interview, Bukhara, Uzbekistan, June 23, 2013.
566 Kochnakyan et. al., "Uzbekistan Energy/Power Sector Issues Note," 2015, *International Bank for Reconstruction and Development / The World Bank,* vi.
567 Government of the Republic of Uzbekistan, "Coal industry," n.d., accessed June 5, 2014, http://www.gov.uz/en/helpinfo/energy/2680.

11 percent in the overall electric power production balance. For comparison, the share of coal constituted around 3.6 percent in 2010.[568]

Addressing Energy Inefficiency in Kazakhstan

Differently from Uzbekistan, excessive dependence on coal poses serious energy security concerns for Kazakh authorities. Currently, 50 enterprises consume 40 percent of all energy. Since there is a potential to decrease energy consumption by these enterprises by 30–40 percent,[569] the government has decided to promote energy efficiency initiatives. The subsidized energy sector does not provide incentive for industry and the population to efficiently use energy resources. President Nursultan Nazarbayev has remarked, "in Kazakhstan nobody saves anything, because electricity, heat and gas flow cheaply."[570] Energy efficiency reforms, especially in the industrial sector, require considerable investments that can hardly be pulled out of the budget in the short-term.

There are several reasons for high intensity of the energy sector in Kazakhstan:

1. Structure of the economy, which is dominated by heavy industry;
2. Distinctly continental climate, which results in high heating costs;
3. Extensive geographical area and low population density that increases transportation and distribution costs of energy resources;
4. Dominance of coal, which has low conversion efficiency, in the overall energy consumption;
5. Extremely high level of energy waste in the production, transportation and consumption objects.

Kazakhstan is very rich for cheap, but quite environmentally damaging fossil fuel — coal with the amount of 33.6 billion tons or 3.8 percent of the world's coal reserves.[571] With the current level of consumption, the amount of coal will be sufficient for over 250 years. Taking into account the fact that authorities aim to reduce the share of coal in the overall energy consumption balance these reserves may be sufficient for even longer period. Yet, whether Kazakhstan will still be in need of environmentally damaging fossil fuels when the whole world is shifting to renewable and clean energy is an open question. The transition to better energy resources will take place as soon as the opportunity presents itself, because most coal deposits contain low heating value as well as high moisture, high and sulfur content. Due to its quite low extraction cost in the Ekibastuz deposits coal is an attractive source of energy for Kazakhstan. However, because there is a high level of methane in the deposits coal development has extremely high environmental cost. Moreover, coal currently accounts for 60 percent of the primary energy consumption in Kazakhstan.[572] To address the problem of inefficient energy sectors both Kazakh and Uzbek authorities are promoting alternative energy sources.

Alternative Energy Sources

The renewable energy sources, being labelled as "energy of the future", are already turning

568 Uzbeknazorat Inspection, "Current State and Development Prospects for the Energy Sector of Uzbekistan," n.d., accessed June 10, 2015, http://www.energonazorat.uz/en/energy-saving/ozbekiston-energetikasining-zamonaviy-ahvoli-va-taraqqiyotining-istiqbollari.html.
569 Government of the Republic of Kazakhstan, *50 Enterprises Consume 40 Percent of All Energy in Kazakhstan* (Astana: Government.kz, 2014), accessed October 1, 2014, http://ru.government.kz/index.php/en/novosti/17316-50-enterprises-consume-40-percent-of-all-energy-in-kazakhstan.html.
570 International Crisis Group, *Central Asia: Decay and Decline* (Asia Report 201, 2011), 34.
571 "Kazakhstan Energy Oil Sector," *EITI, n.d.,* https://eiti.org/kazakhstan.
572 "The National Energy Report 2015," *Kazenergy, n.d*.

into "energy of the present". A year of 2016 was a turning point, in which the cost of energy generation from renewable energy sources turned equal to the energy production from the fossil fuels. In 2015, 90 percent of all newly introduced electric power generation capacities came from renewable energy sources. Solar power generation cost decreased from US$ 600 per MWh down to US$ 100 per MWh in less than a decade. It is expected that within the next 7 years the whole global energy system will be transformed in which alternative energy generation will be replacing fossil fuels rapidly. This will happen because of the reduced energy generation cost for solar energy up to 43 percent, wind energy 26 percent and ocean waves energy 35 percent. Central Asian countries are not exceptions.[573] Yet, in the short- to medium-term perspective political and economic conditions in the region imply no major boost of renewable energy sources in the overall consumption balance, except for two countries: a) Uzbekistan aiming to address energy security challenges; and, b) Kazakhstan attempting to mitigate environmental impact of excessively burning coal.

Not all Central Asian states are equally exposed to vulnerability of unsustainable (clean and long–term) energy supplies. Energy sectors of Tajikistan and Kyrgyzstan almost completely rely on clean hydro-power supplies. New power production capacities also expect to come from hydro-power. For instance, the Tajik government with the support of international donors achieved almost 90 percent of the 2012–2016 target for the small hydro-power projects implementation. Renewable energy sources are expected to address some of the energy security challenges on the country–level. Authorities hope that small hydro-power plants as well as solar panels will considerably improve the livelihood of the people residing in the distant mountainous areas. Yet, it is expected that only 63 MW hydro-power and 4.3 MW solar power additional capacities will be introduced until 2020.[574] Turkmenistan's energy sector, in its turn, is entirely dependent on TPP working on gas, which is cleaner than oil and coal. And, Turkmenistan enjoys abundance of gas production to meet domestic needs and is able to provide very cheap electricity supplies. Thus, there is no urgency in developing renewable energy sources in these countries.

Uzbekistan and Kazakhstan, on the other hand, are highly concerned about sustainability of energy supplies. Inefficient energy sector, large consumption balance and lack of new production capacities resulted in energy insecurity in Uzbekistan. To solve the problem of insufficient energy supplies Uzbek authorities are introducing renewable energy sources in the overall consumption. Kazakhstan does not suffer from energy shortages. Yet, electric power sector of Kazakhstan is highly dependent on environmentally damaging coal–fired TPPs. Addressing environmental concerns are highlighted in the official documents as one of the policy priorities. As a result, these two countries are showing certain progress in introducing renewables in the overall power production balance.

Alternative Energy Sources of Uzbekistan to Address Energy Insecurity

Having experienced growing energy insecurity over the past decade, the government is developing alternative energy sources more actively than others in the region are. On 5 May 2015, a Program of Measures was adopted by the Presidential Decree to reduce energy intensity, implement energy-saving technologies for the period of 2015–2019. There is not only a huge potential, but also a tremendous need for the development of renewable energy sources in Uzbekistan. While the World Bank statistics mention 100 percent access of the population to the electricity,[575] according to some estimates for about 1500 rural settlements of 1,5 million people are not properly connected to the central power grids due to remoteness and inefficiency

573 Andrew Griffin, "Solar and Wind Power Cheaper than Fossil Fuels for the First Time," *The Independent,* January 7, 2017, accessed January 15, 2017, http://www.independent.co.uk/environment/solar-and-wind-power-cheaper-than-fossil-fuels-for-the-first-time-a7509251.html.
574 Climatescope, "Country: Tajikistan," *Climatescope 2017,* accessed January 15, 2018, http://global-climatescope.org/en/country/tajikistan/#/enabling-framework.
575 World Bank Group, "Access to Electricity (percent of population)," n.d., October 5, 2016, accessed May 1. 2017, http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS.

of outdated electric power transmission and distribution lines. Lack of connection to the electric power supply grids and reduced electricity supplies as a result of an excessive electric power loss on the transmission and distribution lines create a demand and an incentive for the development of renewable energy sources in those areas. Over 65 percent of the population in Uzbekistan lives in rural areas. Therefore, the biomass energy, small photovoltaic panels and small wind turbines can also ensure sufficiency and stability of energy supplies for these people.[576] Renewable energy potential in Uzbekistan is estimated to be significant, but with the exception of hydro-power is not yet exploited on a larger scale.

While technical potential for the renewable electricity capacity is significant (Biomass 800 MW; Solar PV 593,000 MW; Wind over 1,600 MW; Small Hydro 1,800 MW) it is currently extremely underdeveloped, since the share of the renewables does not exceed 2 percent (excluding hydro-power) of the overall energy consumption.[577] The government of Uzbekistan aims to reach 21 percent of renewable energy sources in the overall energy consumption by 2030.[578] To achieve this goal, Uzbek authorities have adopted a normative base promoting and regulating the development of renewable energy sources in the country, including: a) Bill "On Alternative Energy Sources"; b) State Program for the "Development Prospects of Alternative Energy Sources and Fuels for 2013–2020"; c) "Long-term conceptual provisions and development directions for the use of renewable energy sources for the production of electric and heat energy in Uzbekistan"; and, d) Draft Concept of the Republic of Uzbekistan for development of alternative fuels and energy for 2012–2020.[579]

Solar energy takes up to 99 percent of the total renewable energy potential in Uzbekistan, which enjoys on average 270–300 sunny days a year. Karakalpakstan has the greatest potential for the production of solar energy of over 19 billion tons of oil equivalent.[580] Solar energy research and development in Uzbekistan started in the 1980s, but little progress has been achieved so far. Solar energy rich regions of Uzbekistan—Karakalpakstan, Navoi, Bukhara and Surkhandarya—are also mostly desert areas with relatively sparsely located population centers and, thus, have prospects for the development of alternative energy. The first largest solar station is expected to be built in Samarkand with the capacity of 100 MW during this period. It was reported that the German consortium of GOPA International Energy Consultant, Suntrace GmbH and the Renewables Academy AG signed a contract with Uzbekenergo to provide consultancy services for the construction of this plant. Uzbekenergo and Chinese company Suntech Power have signed an agreement on the establishment of a joint venture for the production of photovoltaic panels for 100 MW power capacity.[581] Uzbekenergo, with a loan of US$ 110 million from the Asian Development Bank, is building a 100 MW capacity photovoltaic power plant in Samarkand region. The plant is to be constructed by 2019.[582] Uzbekenergo is also planning to build 100 MW

576 Bahtiyor, Eshchanov, Stultjes Mona, Eshchanov Ruzumboy, and Salaev Sanaatbek, "Potential of Renewable Energy Sources in Uzbekistan," *Journal of Knowledge Management, Economics and Information Technology 7,* December 2011, 2.

577 United Nations Development Program, "Renewable Energy Snapshot," n.d., accessed May 10, 2017, http://www.eurasia.undp.org/content/dam/rbec/docs/Uzbekistan.pdf.

578 Umid Aripdjanov, "Uzbekistan – Energy," *Global Legal Insights*, 2014, accessed May 10, 2017, http://www.globallegalinsights.com/practice-areas/energy/energy-3rd-edition/uzbekistan.

579 Vladimir Kouzmitch, "Strengthening Cooperation of Central-Asian Countries in Using Advanced Technologies in Energy Efficiency and Renewable Energy Sources," *Project of the United Nations Economic Commission for Europe (UNECE),* n.d., 21.

580 Vladimir Kouzmitch, "Strengthening Cooperation of Central-Asian Countries in Using Advanced Technologies in Energy Efficiency and Renewable Energy Sources," *Project of the United Nations Economic Commission for Europe (UNECE),* n.d., 18.

581 Islam Karimov, "Muqobil energiya mangalarini yanada rivojlantirish chora-tadbirlari to'g'risida (About plans for the development of the renewable energy sources)," *Press Service Uzbekistan,* March 1, 2013, accessed December 15, 2016, http://www.press-service.uz/uz/document/4638/.

582 "Uzbekistan Launches First Solar Power Plant," *Times Central Asia,* December 31, 2014, accessed May 10, 2015, http://www.timesca.com/news/14815-uzbekistan-launches-first-solar-power-plant.

each solar power plants in Namangan and Surkhandarya regions by 2020. Yet, because the total cost of solar power sector development is expected to amount as high as US$ 450 million[583] and authorities experience financial difficulties they are actively looking for foreign investors.

Along with solar energy, authorities are developing small hydro-power potential. Almost 650 rivers, a number of irrigation canals and reservoirs provide huge potential for the development of small and mini hydro-power plants in the country. In the 1960s, around 250 small and mini HPPs were functioning in Uzbekistan.[584] While the estimated technical hydro-power potential of the country accounts for 27.4 billion kWh per year, only 6.28 billion kWh (23 percent) is currently being generated.[585] Hydroelectricity in Uzbekistan is mainly produced in 29 HPPs in 5 cascades operated by Uzbekenergo and 6 HPPs run by Uzsuvenergo. Chorbog HPP with the capacity of 600 MW and Xojakent HPP with total capacity of 165 MW are the largest HPPs in Uzbekistan.[586] Only these HPPs have water reservoirs to regulate operation of the plants. The third largest HPP in the country is Farkhod HPP, which has the capacity of 126 MW. This HPP is also constructed on a large reservoir.[587] However, while the plant belongs to Uzbekistan, the water reservoir is located on the territory of Tajikistan and water–energy nexus tensions between these two countries affect the reliability and stability of the HPP operation. Others operate on the water run-off basis with inflexible control of electricity generation. Even though hydro-power sector development has been to some extent neglected over two decade, Uzbekenergo is willing to support the construction of mini HPPs, because these plants are considered environmentally less damaging, capable of supplying electricity in remote areas, and require less capital and investment, which can be also shortly returned.

Geographical conditions are not favourable for the large-scale development of wind power in Uzbekistan. The country is completely land-locked and consists of 25 percent mountainous and 75 percent desert areas with an average wind speed not exceeding 2–2.5 meters per second. These conditions are not suitable for installing middle and high power turbines.[588] The most favourable areas for building wind turbines are Bukhara, Navoi, Kashkadarya, Tashkent regions and Karakalpakstan. Uzbekenergo and the Chinese company Xian Electric Engineering Co. Ltd. have signed a memorandum of understanding on the development of wind energy in the country.[589] While hypothetically wind energy potential of Uzbekistan reaches 520,000 MW, technically justifiable wind energy development accounts only for 1000 MW (areas with good wind conditions) and 765 MW (areas with perfect wind conditions).[590]

At the same time, Uzbekistan's large agricultural sector provides considerable potential for the development of biomass energy. For 65 percent of the country's rural population the main source for biomass energy is cotton-plant stalks, production of which accounts for 2–3 million tonnes

583 "Uzbekistan: Energy 2017," *Global Legal Insights,* 10.

584 Alixanov B., "Konceptualnie Podxodi k Formirovaniyu Green Economy v Uzbekistan (Conceptual Approaches to Green Economy in Uzbekistan)," *Center for Economic Research, Analytical report*, 2011, 64.

585 Vladimir Kouzmitch, "Strengthening Cooperation of Central-Asian Countries in Using Advanced Technologies in Energy Efficiency and Renewable Energy Sources," *Project of the United Nations Economic Commission for Europe (UNECE),* n.d., 18.

586 Uzbeknazorat Inspection, "Current State and Development Prospects for the Energy Sector of Uzbekistan."

587 Khayrullo Tojiboev, "Farhod GES – kecha, -bugun, -ertaga (Farkhod HPP – yesterday, -today, -tomorrow)," n.d., accessed January 26, 2017, Retrieved from http://www.energonazorat.uz/en/energy-saving/farhod-ges-kecha,-bugun,-ertaga.html.

588 Eshchanov et. al.,"Potential of Renewable Energy Sources in Uzbekistan, *Journal of Knowledge Management, Economics and Information Technology 7,* December, 2011, 12.

589 Vladimir Kouzmitch, "Strengthening Cooperation of Central-Asian Countries in Using Advanced Technologies in Energy Efficiency and Renewable Energy Sources," *Project of the United Nations Economic Commission for Europe (UNECE),* n.d., 34.

590 Jegelevicius Linas, "Uzbekistan's Ambitious Wind Power Target Signals New Energy Politics," *Renewable Energy World,* June 11, 2015, accessed May 1, 2017, http://www.renewableenergyworld.com/articles/2015/06/uzbekistan-s-ambitious-wind-power-target-signals-new-energy-politics.html.

per year. Uzbekistan is one of the largest cotton producers in the world. Uzbek farmers are currently obliged by the government to cultivate 60–70 percent of their land with cotton. Cotton stalks are mostly used for cooking and space heating. Other sources that are used for bioenergy in the country include bulrush in the amount of 10–15 million tonnes, solid communal wastes of 30 million m^3 and agricultural waste of 100 million m^3 annually.[591]

Uzbekistan is also a uranium producer. The proven uranium reserves of Uzbekistan are estimated at the amount of 185,800 tonnes according to the Uzbek State Committee on Geology and Mineral Resources.[592] Navoi Mining and Metallurgical Plant with three mining units and Hydrometallurgical Plant–1 is responsible for the extraction and export of uranium. Proven uranium reserves are enough for the company to operate at least within the next 40 years.[593] However, there are no nuclear power plants in the country and Uzbekistan is a net exporter of uranium. The plant produces 2,400 tonnes of uranium annually and exports it to: the US, South Korea, Japan, and China.[594] The government of Uzbekistan is not currently planning to develop nuclear energy for domestic consumption. In terms of alternative energy sector development, only Kazakhstan has set ambitious goals that would take the country to leading positions in this area.

Kazakhstan: An Image of "Green Energy" Advocate or an Example to Follow?

Kazakhstan is the only country in the region that has adopted a long-term strategy—"Kazakhstan–2050", which has a particular focus on diversification of energy sources in the overall energy consumption. Among 10 global challenges of the twenty-first century, Kazakhstan highlighted three related to resources: deficit of water (fourth challenge); global energy security (fifth challenge); and decreasing amount of fossil fuels (sixth challenge).[595] However, very few experts dare to predict how Kazakhstan's energy sector will look 35 years from now and most of them are sceptical about its ability to achieve set goals such as increasing renewable energy sources up to 50 percent of the total energy consumption by 2050.[596] Currently, 80 percent of electricity is generated by coal-fired TPPs, while the share of renewable energy sources is around 1 percent.[597]

According to the Ministry of Energy, Kazakh authorities aim to introduce 1040 MW renewable energy capacity by 2020, including 13 wind mills with the capacity of 793 MW; 14 HPPs with the capacity of 170 MW; 4 Solar Plants with the capacity of 77 MW. The goal is to achieve 30 percent share of the renewables in the overall consumption balance by 2030: 11 percent wind and solar energy; 8 percent nuclear power plant; 10 percent hydro-power; 21 percent gas–fired TPPs; and, 49 percent coal–fired TPPs. According to Kazakhstan's Strategy–2050, authorities

591 Vladimir Kouzmitch, "Strengthening Cooperation of Central-Asian Countries in Using Advanced Technologies in Energy Efficiency and Renewable Energy Sources," *Project of the United Nations Economic Commission for Europe (UNECE),* n.d., 37.
592 Azizov, D., "Uzbekistan Does Not Plan to Construct Nuclear Power Plant," *Trend.az,* August 5, 2014, accessed June 10, 2017, http://en.trend.az/business/energy/2299896.html.
593 Elena Safirova, "2012 Minerals Yearbook: The Mineral Industry of Uzbekistan," *US Geological Survey,* October, 2014, 49.
594 Umid Aripdjanov, "Uzbekistan – Energy," *Global Legal Insights*, 2014, accessed May 10, 2017, http://www.globallegalinsights.com/practice-areas/energy/energy-3rd-edition/uzbekistan.
595 Ministry of Defense of the Republic of Kazakhstan, *Strategy "Kazakhstan–2050": New Political Course of the Established State* (Astana: address by the President of the Republic of Kazakhstan, Nursultan Nazarbaev, 2012), accessed July 1, 2016, http://www.mod.gov.kz/mod- en/index.php/address-by-the-president-of-the-republic-of-kazakhstan-leader-of-the-nation-nnazarbayev-strategy- kazakhstan-2050-new-political-course-of-the-established-state.
596 Rashidova, Personal Interview.
597 International Renewable Energy Agency, *Renewable Energy Country Profile—Kazakhstan* (Abu Dhabi: IRENA, n.d), accessed December 1, 2016, http://www.irena.org/REmaps/countryprofiles/asia/Kazakhstan.pdf.

aim to increase the share up to 50 percent with the following breakdown: 39 percent from solar and wind energy; up to 14 percent from nuclear and hydro-power; 16 percent from gas–fired TPPs; and, 31 percent from coal–fired TPPs. At the same time, coal–fired TPPs will undergo modernization to which efficient innovative technologies will be introduced. In order to achieve these goals the government will have to invest at least 1 percent of the GDP, which accounts for US$ 3–4 billion per year.[598] Financial difficulties that the country is currently facing slow down the transition.

Having prioritized clean energy in its energy policy priorities, Kazakh authorities are looking forward to attracting private investment in the amount of 480 million Euros. Moreover, "On June 21, in the presence of the Prime Minister of the country, a memorandum of understanding on cooperation and support for the development of renewable energy in Kazakhstan between the Ministry of Energy and the European Bank for Reconstruction and Development was signed. The [European Bank for Reconstruction and Development] plans to invest up to 200 million Euros in renewables projects in the coming year, with the possibility of attracting private investments and financial injections of other international financial institutions for a total of up to 480 million Euros" highlighted Kazakh Energy Minister Kanat Bozumbayev during a round table titled "Heritage of EXPO-2017".[599]

Yet, the government's goals are quite ambitious taking into account relatively slow level of renewable energy sources development in Kazakhstan. The first relatively large Solar Power Plant—"Burnoe Solar–1" in Zhambyl region was put into operation in July 2015. A 50 MW capacity power plant is already producing over 40 million KWh of electricity. The second stage of the project is expected to double power production capacity of the plant. This project not only considerably extended the coverage area of clean energy supplies, but also provided new job opportunities for around 300 people. There are, of course, other projects helping the people both in terms of stable power supplies and local industrial production such as Korday Solar Power Plant, Otar Solar Power Plant or a number of wind turbines in the Korday passage.[600] Yet, on the country-level, these achievements are still insignificant. Nuclear power sector development can boost the renewable energy production, but the plans to build nuclear power plant was postponed.

The Minister of Energy, Kanat Bozumbayev, has highlighted that despite enjoying the largest production capacity in the world, Kazakhstan is not planning to build nuclear power plant within the next 7 years, due to overproduction of electricity in the country. There is an electricity surplus of around 5,000 MW during summer and 3,500 MW in winter. The only nuclear power generator–the older Aktau reactor was shut down in 1999.[601] Kazakh authorities have been talking about building a nuclear plant for almost ten years and have been negotiating with the Russian Rosatom and Japanese Toshiba. Kazakhstan produced a bit less than 24 thousand tons of uranium in 2015, covering up to 40 percent of the world's market, which was all exported.[602] While the Minister was referring to the construction of nuclear plants, this same line of logic can be applied to all projects in the renewables sector.

598 Elena Butirina, "Bestoplivnaya Energetika. Razumnaya Alternativa 'Energeticheskim Tradiciyam' (Energy Without Fuels. Alternative to 'Energy Traditions')," *Kazenergy,* accessed September 10, 2017, http://www.kazenergy.com/en/analytics/alternative-energy-sources/12558--l-r.html.

599 Kamila Aliyeva, "Kazakhstan May Attract Up to 480M Euros for Renewable Energy Projects," *Azerinews,* November 15, 2017, accessed January 10, 2018, https://www.azernews.az/region/122280.html.

600 Galina Skripnik, "Zhambyl SPP 'Burnoe Solar' Expanding Capacities," *Kazinform,* July 31, 2017, http://www.inform.kz/ru/zhambylskaya-ses-burnoe-solar-rasshiryaet-ob-emy_a3050148.

601 "The National Energy Report 2015," *Kazenergy, n.d.,* 26.

602 Raushan Nurshaeva, "Kazakhstan Otkazalsya Ot Planov Stroitelstva Atamnoy Stancii (Kazakhstan Refrains from the Plans to Build Nuclear Plant)," *Forbes.kz,* November 12, 2016, accessed October 15, 2016, https://forbes.kz/news/2016/11/02/newsid_125893.

Despite having huge renewable energy potential, renewables remain highly underdeveloped. Kazakhstan has declared its plans to invest 2 percent of the GDP in "green modernization" and development of renewable sources. One of the most promising areas is wind energy. The wind potential of the mountain pass to China—the Jungar Gates—can potentially provide around 1.3 trillion kWh annually. [603] Thus, differently from their Uzbek counterparts, Kazakh authorities heavily rely on wind energy. In 2018, six new wind power plants with the capacity from 35 to 100 MW are scheduled to commence in the North-Kazakhstan Region. In between 2017 and 2020, another six renewable energy projects totaling 247 MW will be put into operation in the Zhambyl region.[604] Unfortunately, little practical progress has been achieved so far. The overall estimates of the renewable energy resources for electric power generation and geothermal heating potential account for 1885 billion kWh and 4.3 GW respectively. Solar energy potential in the country is around 2.5 billion kWh. Wind energy is estimated to be around 1820 billion kWh annually. With this huge potential for developing alternative energy sources, renewables account for only 0.02 percent in the total production balance.[605]

Nursultan Nazarbaev, the President of Kazakhstan, often presents himself as the main advocate for green energy development in Central Asia.[606] However, his latest statement left everyone quite confused. During the XI Forum of Interregional Cooperation, Nazarbaev claimed: "Personally, I do not believe in alternative energy, including wind and solar energy. Oil and gas are our biggest advantage and there should not be a fear of us being a resource-country. It is good that we have these resources, which we will be exporting and generating revenues."[607] It became obvious that the government does not see any urgency in developing renewable energy sources in Kazakhstan, except for improving its image.[608] In this sense, the question of whether Kazakhstan is an example for other Central Asian states to follow in terms of renewable energy sources development remains open. On the other hand, from the environmental security point of view development of renewables is still a necessity.

One of the major challenges along the way towards developing renewable energy sources in Kazakhstan is the tactic that energy-purchasing companies use. These companies are forced by the government to purchase electricity produced using new technologies at a higher price to keep the incentive to develop renewable energy sources. Having contradicted those companies' economic interests, most of the renewable energy projects are being compromised by these companies. Thus, achieving the goal of 50 percent renewables in the overall energy balance by 2050 seems problematic, argues Almaz Akhmetov.[609]

President of Kazakhstan signed a decree on May 30, 2013 on boosting the renewable energy resources consumption up to 50 percent by 2050. According to the new energy policy set at the Concept of Fuel and Energy Sector Development to 2030, up to 8 GW (from 2.7 GW) is expected to be generated from renewables already by 2030. While currently, hydro-power

603 "Sound Logic Behind Renewable Expansion" Invest in Kazakhstan 2013, 82, accessed June 1, 2015, http://kazakhstan.newsdeskmedia.com/Images/Upload/invest_in_kazakhstan/PDFs/Investment-Opportunities-Power-Energy.pdf.
604 "Kazakhstan - Electric Power," Kazakhstan Country Commercial Guide, September 13, 2017, accessed December 15, 2017, https://www.export.gov/article?id=Kazakhstan-Electrical-Power-Generation
605 Dmitriy Sheykin, "Energy of Kazakhstan," RFCA Rating Agency, October 5, 2016.
606 "Kazaxstanu Nujen Institute po Voprosam 'Zelenoy' Energetiki (Kazakhstan Needs an Institute on 'Green' Energy Issues)," *Kazenergy*, October 11, 2013, accessed March 5, 2016, http://kazenergy.com/ru/press/2011-04-21-10-24-20/11309------qq--.html.
607 Sofiya Pashkova, "Prezident Kazaxstana Priznalsya, Chto Ne Verit v Alternativnuyu Energetiku (President of Kazakhstan Admitted that He Does not Believe in Alternative Energy)," *Vlast.kz*, September 2014, accessed December 1, 2016, http://vlast.kz/article/prezident_kazahstana_priznalsja_chto_ne_verit_v_alternativnuju_jenergetiku-7678.html#gsc.tab=0&gsc.q=%D1%84%D0%B0%D1%80%D1%85%D0%BE%D0%B4&gsc.sort=.
608 Daniyar Kosnazarov, Head of the Strategic Planning Department, Narxoz University, Personal Interview, Almaty, Kazakhstan, March 18, 2017.
609 Almaz Akhmetov, Expert at Regional Environmental Center of Central Asia, Skype Interview, July 26, 2013

comprises most of the clean energy production, in the next stage the emphasis will be made on wind and solar energy.[610] Kazakhstan is probably the only country, which enjoys relative energy security, including in the power supply sector. Thus, Kazakhstan is heading towards that direction, yet real incentive to develop renewable energy sources on the large scale in the country is still absent.

610 "The National Energy Report 2015," *Kazenergy, n.d.,* 315.

INTRA-CENTRAL ASIAN ENERGY TRADE TO MEET CURRENT DEMAND

Restoring energy trade may either lead to an integrated energy system or provide conditions for a smooth transition to independent energy systems depending on which policy priority is chosen by the Central Asian governments. Intra-Central Asian energy trade ensures sufficient energy supplies to meet energy demand peaks for Central Asian upstream countries and allows downstream neighbours to use their resources more efficiently. It might only contribute to energy security level of the Central Asian region in the short-run, but it may nonetheless be an important first step toward achieving a maximally secure CAES in the future. Breaking the status quo through intra-regional energy trade, which is beneficial for both sides, should be an important policy direction for the Central Asian countries if they want to improve their energy security. In fact, Central Asian countries would achieve similar benefits from intra-regional energy trade as from operating within the re-integrated CAES. Short-term bilateral agreements-based energy trade within the region, however, is not sustainable. Unless there is a well-functioning regional energy governance mechanism designed to ensure cooperation in energy sector to improve energy security in emergency as well in normal situations the CAES will remain vulnerable. At the same time, while increasing intra-Central Asian energy trade requires to some extent reconsideration of the state actors' energy policy priorities, issues of sovereignty, strategic interests and distribution of gains are not as acute as in case of the CAES re-integration and thus, more acceptable to Central Asian governments.

The analysis of the vulnerability of the CAES shows that there are several advantages of intra-Central Asian energy cooperation with direct effect on the level of energy security in the region. Regional state actors have inherited gas pipeline and electric power grid networks so that there is no need to invest in expensive infrastructure to connect Central Asian energy sectors. Comparative advantage in complementary energy sources provides the conditions for using energy in the most rational way by exchanging or trading resources. Since the volume of electricity and natural gas export/import in the region is insignificant, such trading arrangements do not threaten the availability of energy to external customers and thus do not cause confrontation from their side.[611] The Central Asian energy trade does not only address the problem of an uneven distribution of resources, but also resolves the shortage of energy due to seasonal variations. The most cost-efficient way to produce energy and transport it within the region will decrease the price of energy. While re-integration of the CAES in the current geopolitical realities would be a difficult task to accomplish, coordinated management of energy supply flows and increasing energy trade among regional state actors are quite realizable. Trading of energy resources may go beyond formal trading agreements and take the form of swaps, barters and other types of exchange arrangements. It is important, however, that such arrangements are concluded mainly among Central Asian countries because all external actors are only interested in moving resources out of the region with no contribution to Central Asian energy security.

611 See discussions in the Chapter III-V.

Table 16. Direct Energy Interests with the CAES and over Central Asian Energy Resources.[612]

	From Kazakhstan	From Kyrgyzstan	From Tajikistan	From Turkmenistan	From Uzbekistan
Kazakhstan	=/=	-Imports electricity; -EEU membership – free movement of energy resources	-Potential to import electricity in summer	-Shares energy interests of major exporting countries in Central Asia; -Common position regarding the Caspian Sea oil and gas exploration	-Imports natural gas (4 billion m^3 per year) for the needs of its southern and south-eastern regions; -Imports electricity to supply its southern regions
Kyrgyzstan	-Imports electricity (1,5 billion kWh per year); -Imports natural gas, light oil products, coal; -Potential investor in energy projects	=/=	-Partners within the CASA–1000; -Transit states for the CAGP Line–D	-Potential importer of natural gas and electricity	-Imports natural gas–280 million m^3 per year; -Imports electricity in winter; -Imports coal; -Potential light oil products import
Tajikistan	-Imports light oil products in insignificant volumes	-Imports light oil products; -Shares common position in relations with downstream Uzbekistan over the water-energy nexus	=/=	-Potential importer of natural gas; -Potential to import electricity in winter	-Imports natural gas (currently stopped); -Imports electricity in winter (currently stopped); -Imports oil products (currently stopped); -Conflicts over Rogun dam/HPP
Turkmen-istan	-Major transit country for Turkmen gas on both Russian and Chinese directions	- Transit (potentially importing) country for Turkmen gas via CAGP Line–D	-Transit (potentially importing) country for Turkmen gas via CAGP Line–D	=/=	-Major transit country for Turkmen gas to Russia and China; -Transit country for Turkmen gas and electricity to Tajikistan
Uzbekistan	-Shared interests in dispute against the construction of giant HPPs and redistribution of water withdrawal; -Imports crude oil for its refineries	-Imports hydroelectricity (currently stopped) along with stable water release	-Imports hydroelectricity (currently stopped) along with stable water release	-Potentially importing electricity and natural gas	=/=

612 The information in the table is derived from the analysis in the previous chapters.

	From Kazakhstan	From Kyrgyzstan	From Tajikistan	From Turkmenistan	From Uzbekistan
Russia	-Imports/ exports of electricity; -Exports light oil products to Kazakhstan; -Imports and transits of oil; -Imports Kazakh uranium	-Modernization and development of gas and hydro-power sector (Kyrgyzgaz; Bishkek TPP; Kambarata–1) -Mediator to assure Uzbek gas and thermal power supply	-Hydro-power sector development; -Operation of HPPs, including Sangtuda–1 HPP; -Potential contributor to the construction of Rogun HPP	-Imports and a transit country for Turkmen natural gas	-Imports Uzbek gas; -Imports Uzbek Uranium; -Potentially supply crude oil
China	-Imports oil and natural gas; -Imports uranium	-Transit country for the CAGP; -Interested in importing electricity	-Transit country for the CAGP; -Interested in importing electricity	-Main importer of Turkmen gas (up to 65 billion m^3 per year)	-Imports natural gas (10 billion m^3 per year)
European Union	-Major importer of Kazakh oil;	=/=	=/=	-Interested in importing Turkmen gas;	=/=
Afghanistan	=/=	-Interested in importing electricity via CASA-1000	-Imports electricity	-Interested in importing gas; -Imports electricity	-Imports electricity
Iran	-Swap oil deals with Kazakhstan	=/=	=/=	-Imports Turkmen gas; -Swap oil deals	=/=

Complementarity of Energy Resources

Central Asian countries do not only possess a significant amount of resources, but also enjoy a comparative advantage in developing different types of energy, which provides incentive for intra-regional trade (Tajikistan and Kyrgyzstan enjoy 5.5 percent of the world's economically-efficient hydro-power potential; Kazakhstan possesses a considerable amount of oil and is among the top ten countries with explored coal reserves in the world; Uzbekistan is a major natural gas producer in the region; Turkmenistan is the largest natural gas exporter in Central Asia and ranks fourth in terms of gas deposits in the world). [613] While diversification of sources in the energy consumption balance is often tied to renewable energy source, in the context of the Central Asian region it is the exchange of fossil fuels and hydro-power, which can provide sustainability of supplies in the short- to medium-run. Having benefitted from exchanging different types of resources, Central Asian states enjoyed stability and reliability of energy supplies for many decades. However, the disintegration process of the CAES has forced state actors to develop and depend on a particular type of energy source and thus, have become vulnerable. Intra-Central Asian energy trade can work to solve these problems by contributing to the diversification of energy sources in the overall balance of energy consumption.

Overall, the Central Asian region does not entirely enjoy energy security. Initially, the energy sectors of the Central Asian countries were designed to operate within a unified energy system. Resource-sharing mechanism was based on rational use of energy, with each state contributing

613 Romen Zakhidov, "Central Asian Countries Energy System and Role of Renewable Energy Sources," Applied Solar Energy 44, no. 3 (2008): 218–223.

different types of sources to the energy consumption balance of the CAES. High dependence on a particular source of energy was not an issue within the CAES, which operated irrespective of political (administrative) and economic borders. Central Asian energy sectors contributed different sources and formed a complete energy system capable of meeting the energy needs of all countries simultaneously. The disintegration process of the CAES, however, affected the short- and medium-term availability of gas and thermal electricity to upstream countries.

Sufficiency of the Supplies

Kyrgyzstan and Tajikistan import a high volume of primary energy resources and have limited opportunities to diversify their dependence on existing light oil products supplies, electricity transmission lines and gas supply networks coming from and through Uzbekistan. While Central Asian downstream countries' oil and natural gas are important for external players, they are also extremely important for Tajikistan and Kyrgyzstan. [614]

Hydro-power is the main source of energy for these countries. However, water run-of-river type HPPs produce electricity only in the summer period, leaving countries in an energy crisis in the winter. Having quite a few diversification options, Tajikistan and Kyrgyzstan may hope to receive Kazakhstani fossil fuels and thermal electricity. Another possibility is to use transited Turkmen gas through Tajikistan and Kyrgyzstan when CAGP's Line–D is constructed and thermal electricity from Turkmenistan.[615] In any case, Central Asian producers themselves can supply an additional volume of energy to upstream states. In addition, using existing infrastructure remains the most cost efficient way to improve energy security in upstream Central Asian states.

Inherited Energy Transport Infrastructure

Building infrastructure to connect energy-producing and consuming sites is probably the most time-, energy- and finance-intensive part of establishing an energy system. Central Asian countries have inherited energy infrastructure (for example, Bukhara–Tashkent–Shymkent–Almaty–Bishkek, Uzbekistan–Tajikistan, Uzbekistan–southern Kyrgyzstan gas pipelines and the Central Asian electric power grids) capable of transporting enough resources to meet current energy needs of the whole region. Increasing energy supplies through upgrading existing infrastructure is cheaper and faster than building independent energy systems. [616]In this sense, interconnected energy systems entail two key economic benefits: savings in operating costs of the interconnected electric power and pipeline systems; and savings in investment costs of upgrading interconnected energy infrastructure networks.

Alternative Electric Power Transmission Lines

An attempt to establish an independent electric power system while avoiding the electricity transmission lines of Uzbekistan is still in the planning stage. Once Kazakhstan, Kyrgyzstan and Tajikistan complete the extension plans of their independent electric power grids connecting north with south, there will be a possibility to connect south-eastern Kazakhstan with northern Kyrgyzstan via the Kemin–Alma 500 kV transmission line and southern Kyrgyzstan with northern Tajikistan via the Datka–Hodzent 500 kV transmission line.[617] Alternative electric

614 Maxim Ryabkov, Personal Interview, Director of the OSCE Academy, Bishkek, Kyrgyzstan, September 5, 2013
615Chinese National Petroleum Corporation, "Flow of Natural Gas from Central Asia," CNPC website, n.d, accessed December 15, 2017, http://www.cnpc.com.cn/en/FlowofnaturalgasfromCentralAsia/FlowofnaturalgasfromCentralAsia2.shtml
616 See Chapter III: Pipeline Politics of the Central Asian Gas System.
617 Asian Development Bank, Technical Assistance Consultant, Central Asia Regional Economic Cooperation: Power Sector Regional Master Plan (Metro Manila: Asian Development Bank, Report no. 43549, 2012), 2–34, http://adb.org/sites/default/files/projdocs/2010/43549-01-reg-tar.pdf.

power systems would then allow these three countries to exchange electricity to meet seasonal production deficiencies. Establishing a well-functioning countrywide electric power transmission networks and connecting all three countries by building trans-boundary transmission lines are both time- and finance-intensive projects. This may seem to be a good option in the long-term, but in the short-term, the increasing electricity trade within the existing Central Asian electric power grids that will make it possible to address more acute energy security challenges.

On June 12, 2017 during the opening ceremony of EXPO–2017, the Minister of Energy and Water Resources of Tajikistan, Usmonali Usmozoda suggested Kazakh authorities to become an energy hub in the region within the Russia–Kazakhstan–Central Asia triangle. [618] Tajik authorities propose their Kazakh counterparts to to import hydroelectricity from upstream Central Asian states, including Tajikistan, in summer and channel them thermal electricity in winter. Basically, the new proposal is to extend the power transmission networks beyond northern Kyrgyzstan and also focus on southern parts of the country and Tajikistan. The idea is to restore Central Asian energy system, but having Kazakhstan in its center this time. Yet, for the moment, it is just a political statement without any financial, technical and economic grounds. Fifty-one percent of total CAPS electricity has been generated in Uzbekistan, 13.8 percent in Kyrgyzstan, 9.1 percent in Kazakhstan, 15 percent in Tajikistan, and 10 percent in Turkmenistan.[619] So, neither energy transporting infrastructure not production capacity of Kazakhstan can physically turn it into an energy hub in Central Asia.

Decreasing the Price of Energy

In one of his speeches, President of Kazakhstan Nursultan Nazarbaev highlighted, "the price of electricity will continue to increase, whether you want it or not; the price of gas will be getting close to world prices as well; [so he recommends that industries and people] employ energy efficient technologies."[620] Turkmenistan has introduced pricing for natural gas that was previously provided free of charge. It has also become difficult for Uzbekistan to sustain low prices of gas, electricity and oil products in its highly subsidized energy sector. Total subsidy as shares of GDP in Uzbekistan accounts for over 20 percent, followed by Turkmenistan with 20 percent and Kazakhstan with approximately 2-3 percent. Tajikistan and Kyrgyzstan suffer from high prices for energy. These countries are in need of cheaper energy, which can be provided by choosing the most cost efficient way to secure supply of energy resources. Even though quick transition to equating domestic and foreign prices is difficult, this process in the end is inevitable. Taking into account economic, environmental and energy security concerns of using independent energy systems, regional energy trade will decrease the cost of energy, thus accelerate the transition process.

Preventing Conflict over the Region's Resources

Guided by the belief of self-sufficiency, Uzbekistan has cut gas and electricity supply to upstream Central Asian states, and in response Tajikistan and Kyrgyzstan are trying to speed up the process of Rogun and Kambarata–1 HPPs construction. Projects capable of affecting the existing water distribution level in the region have led to confrontation from downstream Central Asian countries. During an official visit of the President of Uzbekistan to Kazakhstan, he warned that construction of large HPPs in the region may "lead not only to confrontations,

618 "Rol' Uzbekistana v Energetike Tsentralnoy Azii Mojet Pereyti k Kazaxstanu (The Role of Uzbekistan in Central Asia May Pass to Kazakhstan)," July 27, 2017, accessed January 5, 2018, http://anhor.uz/events/roly-uzbekistana-v-energetike-centralynoy-azii-mozhet-pereyti-k-kazahstanu.
619 Asian Development Bank, "Electric energy," Final Report RETA 5818, 2000, 19.
620 Murat Jakeev, "Tarifi Na Elektroenergiyu i Gaz Budut Rasti—Prezident RK (Tariffs for Electricity and Gas will Continue to Increase—President of RK)," Kazinform, July 2, 2014, accessed August 1, 2016, http://inform.kz/rus/article/2674096.

but also to war."[621]

The new president of the Republic of Uzbekistan, Shavkat Mirziyoyev has chosen a different approach to large hydro-power sector development in the region. Now the official position of the Minister of Foreign Affairs Abdulaziz Komilov in regards to Rogun dam construction consists of several statements highlighting the necessity for greater cooperation, but no concrete details on how to achieve it.[622] Restoring and sustaining regional energy trade would be a gesture of good will from the Uzbekistani side and encourage upstream states to sustain previous water-energy supply balance until Central Asian countries can reach solutions amenable to all.

Prospects for Regional Energy Cooperation

Despite extensive potential for the development of renewable energy sources in Uzbekistan and Kazakhstan, in the near to medium term perspectives, this particular energy sector will not boost power production to either solve energy security problems or address environmental challenges. There are some prospects, however, to enhance sustainability of the Central Asian energy supplies through joint development of large hydro-power project and restoring intra–Central Asian energy trade. The water-energy nexus dispute between Uzbekistan and Central Asian consumer countries poses a serious challenge to the realization of the region's full hydro-power potential. While approximately 98 percent of Tajikistan's electricity is produced using hydro-power, only 10 percent of its total hydro-power potential is currently being tapped.[623] Further development of the region's hydro-power potential (i.e., the construction of the Kambarata–1 and Rogun HPPs) will enable a surplus of electricity for internal consumption, which will most likely result in increasing the volume of clean electricity exports to neighbouring downstream countries as well as external customers.[624] A surplus of electricity will not entirely replace gas and fuel imports, but it will allow Tajikistan and Kyrgyzstan to engage in energy trade negotiations with Uzbekistan on a more equal footing. To achieve these goals, however, Central Asian leaders have to reconsider their policies towards regional cooperation and promote trust among each other by making energy management more transparent and accountable.

Lack of Energy Sector Accountability and Transparency

The analysis in this book highlights particular areas of activity that Central Asian governments prioritize in their national energy policies. With the exception of Kyrgyzstan, which has recently undergone a regime change, and to some extent Uzbekistan, Central Asian elites have remained in power for decades, and it is not surprising that they refrain from elevating the problem of lack of accountability as well as corruption in the energy sector and rent-seeking to the policy priority level. Central Asian energy policies as they stand right now can be characterized as short-term oriented, state centric, and hydrocarbons/hydro-power focused.[625] This implies that the Central Asian elites, having retained control over energy production and transportation industries, try to

621 Fuel Energy Sector Transparency Initiative in Kyrgyz Republic, "Kambaratinskie Strasti (Kambarata Passion)," *Energoforum*, December 10, 2012, accessed June 5, 2014, http://www.energoforum.kg/index.php?act=view_material&id=374.
622 Catherine Putz, "Uzbekistan's Changing Rogun Tone," July 10, 2017, accessed January 5, 2017, http://thediplomat.com/2017/07/uzbekistans-changing-rogun-tone/.
623 Robert L. Wilby, Michael Friedhoff, Richenda Connell, Ben Rabb, Nasridin Minikulov, Anvar Homidov, Muzaffar Shodmanov, Nadezhda Leonidova, PPCR Phase I Project A4: Improving the Climate Resilience of Tajikistan's Hydro-power Sector (Pilot Program of Climate Resilience, 2011), http://www.ppcr.tj/IP/Phase1/Component4/ppcr_a4_-draft_final_report_13oct11%20 (Final%20REport).pdf.
624 Igor Tomberg, "Energy Industry in Central Asia—Challenges and Prospects," Russian International Affairs Council, 2012, accessed March 4, 2013, http://russiancouncil.ru/en/inner/?id_4=350#top.
625 Alexander Cooley, Great Games, Local Rules: The New Great Power Contest in Central Asia (Oxford University Press, 2012).

take maximum benefits out of them while remaining in power. The Central Asian elites and their political clients collect rents and extract private benefits from mismanaging the energy sector. The problem of energy sector accountability and transparency affects equal distribution of oil/gas funds, prioritizing energy security concerns of the population and economies of the Central Asian countries as well as the development of non-conventional energy sectors from which elites cannot extract immediate benefits.

There are, in fact, many examples of rent-seeking that plague the Central Asian energy sectors, including: the "Kazakhgate" scandal over the secret account in a Swiss bank on payment made for oil contract;[626] Bakiyev's energy sector reform as a result of which the electric power sector of Kyrgyzstan was partially privatized and exported, pocketed by the ruling regime even at the expense of creating serious domestic blackouts;[627] nationwide obligatory collection of money to build the Rogun dam in Tajikistan with insignificant final result;[628] the scandal around the Zeromax conglomerate in Uzbekistan for the control of resources by the government against certain elite groups;[629] and the problem of lack of transparency in regards to the "stabilization fund" of Turkmenistan.[630]

Even though there are many signs indicating that short-term sufficiency of resources and long-term sustainability of energy supplies are highly dependent on reforming the energy governing system, Central Asian elites profit from the current energy sector management schemes established in their respective countries and thus, refrain from raising the issue of energy sector accountability and transparency to the state policy level. Without doubt, elites benefit from natural endowment rents and perhaps only care about maximizing short-term profits. Since the subsidized domestic energy markets are rather burdens for the Central Asian governments than a source of income, it is not surprising that they are actively looking for the possibilities to earn hard currency by increasing energy exports to as many external markets as possible. Intra-Central Asian energy trade, which can contribute to the sufficiency and sustainability of energy supplies, however, does not conflict with either availability of energy for domestic consumption or to meet external demand. First, the volume of energy traded within the Central Asian region is insignificant compared to the level of domestic consumption and external demand. So, the intra-regional energy trade does not affect revenues from selling energy to external customers or availability of energy for local consumers. Second, intra-Central Asian gas and electricity trade is no longer subsidized and may be considered as a source of income for the regional producers. Initiatives to establish economic regionalism, argues Kathleen Collins, fail because it implies liberalization of Central Asian countries' economies, which can directly affect personalities rule and patronage systems, and Central Asian leaders try to block such initiatives.[631] Energy trade within the region, however, does not necessarily imply liberalization of the Central Asian energy sectors, but the release of information required to ensure coordinated operation of gas pipeline networks and electric power grids. Thus, I tend to believe that the lack of energy trade within the CAES is not just a mindset problem of elites coupled with a series of internal governance problems, but also a coordination problem, which sometimes downplays domestic obstacles.

626 "Kazakhstan–an End to 'Kazakhgate'," OSW Center for Eastern Studies, August 18, 2010, accessed April 15, 2015, http://www.osw.waw.pl/en/publikacje/analyses/2010-08-18/kazakhstan-end-to-kazakhgate.
627 Erica Marat, "Criminalization of the Kyrgyz State Before and After the Tulip Revolution," China and Eurasia Forum Quarterly 6, No. 2, (2008), 18.
628 International Crisis Group, Central Asia: Decay and Decline (Asia Report 201, 2011), 14.
629 Simon Pirani, "Central Asian and Caspian Gas Production and the Constraints on Export," Oxford Institute for Energy Studies, 2012, 33, http://www.oxfordenergy.org/wpcms/wp-content/uploads/2012/12/NG_69.pdf.
630 International Institute for Political, "Investment Opportunities in Turkmenistan: Political Risks Analysis," 2011, 19, http://www.minchenko.ru/netcat_files/File/Print_eng_Preview.pdf.
631 Kathleen Collins, "Economic and Security Regionalism among Patrimonial Authoritarian Regimes: The Case of Central Asia," Europe-Asia Studies (61), no. 2, (March 2009): 251.

Governments' Position toward Regional Energy Cooperation

The analysis of the Central Asian states' energy policy priorities illustrates that intra-Central Asian energy cooperation is no longer a priority. Uzbekistan considers itself capable of entirely meeting its electricity as well as gas/fuel needs. Within the framework of its National Development Programs, Uzbekistan prioritizes "stability"—a status quo in energy and water consumption.[632] Any project that brings major changes to the status quo is considered to be compromising stability and, thus, unacceptable. The Uzbek government's inflexible position regarding construction of the Rogun and Kambarata–1 is a clear example of its static energy/water policy. Despite the fact that the lack of intra-regional energy cooperation is to some extent negatively affecting the energy security of Uzbekistan, it continues to avoid the resolution of water-energy nexus problems in Central Asia, because the current water distribution, in which Uzbekistan enjoys over 50 percent of water withdrawal, the amount necessary to cultivate high quantities of water-intensive cotton and wheat, perfectly suits its interests.[633] Uzbekistan warns to use actions, including force, against any serious interference with the current level of water withdrawal in the region.[634] Geographical location and inherited energy infrastructure turned Uzbekistan into an extremely important actor, without which any initiative to improve Central Asian energy cooperation will most likely fail. Over the last years, however, Uzbekistan has been using its infrastructural as well as geographical advantage for purposes other than to improve the energy security of the country and the region as a whole.

There are still some prospects for the security of the CAES through increasing intra-Central Asian energy cooperation. Prolonged energy supply cuts forced Kyrgyzstan and Tajikistan to accelerate the process of establishing independent energy systems and, thus, decrease Uzbekistan's energy leverage over them.[635] So keeping a certain level of energy exchange serves Uzbekistan's strategic interests. Kazakhstan is also in the process of establishing independent energy system, but it can still benefit from exchanging energy resources with Kyrgyzstan and Uzbekistan as well as from its important gas transit status. Hundred percent of Turkmen gas has to pass through the territory of the Central Asian countries; therefore, the stability and security of the region is in Turkmenistan's direct interest. Overall, cheap and clean electricity imported from upstream countries would allow Central Asian downstream countries to efficiently use coal- and gas-fired TPP as well as contribute to the sustainability of their energy sectors.

Small HPPs and a countrywide electric power transmission network will not solve the problem of electricity shortages in wintertime in Tajikistan and Kyrgyzstan. Development of oil and gas fields in these countries is too costly due to difficulty of extraction and transportation of these resources. Unlike Kyrgyzstan, which may rely on Kazakhstan to ensure limited winter electricity supplies and Russia to import Uzbek gas, Tajikistan has no state actor in the region to entrust in assisting in energy crisis mitigation. President of Tajikistan, Imomali Rahmon, often highlights the Tajik position in regards to regional cooperation, arguing that "it [Tajikistan] will always adhere to the principles of friendship, mutual respect and trust, good will and beneficial and constructive collaboration."[636] In fact, leaders of the Central Asian states often talk about historical friendship, but such claims rarely result in regional projects especially in the strategically important energy sector. Tajikistan can clearly benefit from the intra-Central Asian cooperation in the energy sector, but the Tajik government does not possess the power

632 Government of the Republic of Uzbekistan, *Investments* (Tashkent: Governmental Portal of the Republic of Uzbekistan, n.d), accessed October 1, 2016, http://www.gov.uz/en/business/invest/1175.
633 Jenniver Sehring, *The Politics of Water Institutional Reform in Neo-Patrimonial States: A Comparative Analysis of Kyrgyzstan and Tajikistan* (Springer Science & Business Media, 2009), 71.
634 Fuel Energy Sector Transparency Initiative in Kyrgyz Republic, "Kambaratinskie Strasti (Kambarata Passion)."
635 Farkhod Tolipov, Personal Interview, Director of Bylim Karvoni Non-governmental Research and Training Center, Tashkent, Uzbekistan, June 29, 2013.
636 President of the Republic of Tajikistan, *Annual address of the President of the Republic of Tajikistan Emomali Rahmon to the Majlisi Oli of the Republic of Tajikistan* (Dushanbe: President of the Republic of Tajikistan, 2014), accessed December 1, 2016, http://www.prezident.tj/en/node/6600.

to either force or encourage neighbouring Uzbekistan to reinstate gas and electricity trade and cooperation. Surplus of electricity generation in summer (3–5 billion kWh annually) and electricity shortage in winter (2.5 billion kWh annually) provides some prospects for mutually beneficial electricity trade in the region.[637] Unable to export extra produced electricity in summer to neighbouring Uzbekistan, Tajik authorities, with the support of some international actors such as the Asian Development Bank and the World Bank, wish to redirect this electricity to South Asian countries. However, the Central Asia–South Asia Regional Electricity Trade Project (CASA–1000), a project designed to move electricity from Central Asia to South Asia, will not solve the energy security problems of the Central Asian upstream states because it is designed to move electricity out of the region. The following chapter identifies the main challenges preventing Central Asian states from engaging in a greater level of energy sector cooperation to ensure security of the CAES.

637 President of the Republic of Tajikistan, *Annual address of the President of the Republic of Tajikistan Emomali Rahmon to the Majlisi Oli of the Republic of Tajikistan.*

CONCLUSION

Energy sectors of the Central Asian countries were designed to operate within the CAES irrespective of national borders. Coordinated operation of the Central Asian electric power grids, gas pipeline networks and oil supplies within the framework of the resource-sharing mechanism not only ensured stability and reliability of energy supplies, but also provided conditions for using energy resources in the most rational way. However, recent transformation of the CAES, in which intra-Central Asian energy cooperation is no longer a priority, has negatively affected the level of energy security in the region. In the trade-off between pursuing establishing independent energy systems and strengthening regional cooperation in the energy sector, regional state actors decided to give preference to the former. While there are a number of domestic as well as foreign factors affecting the decision-making process, the analysis shows that a transition to a completely independent energy system requires sustaining regional energy trade for at least the short- to medium-term.

A long history of cooperation, inherited energy infrastructure, interdependence, and complementarity of energy sectors suggest that strengthening intra-regional energy cooperation will improve security of the CAES, and even more important in this context, is that it will do so in the most cost-efficient way. There are, however, several external as well as domestic obstacles preventing regional state actors from engaging in a more dynamic and cooperative energy trade. Energy-thirsty regional and global customers perceive Central Asia as a source of energy and promote projects to move energy out of the region, thus threatening availability of sufficient resources for domestic and intra-regional consumption. While these actors support stability in the region, they may not be interested in an integrated Central Asia that is capable of dictating its own terms. Power asymmetry in favour of external customers may force regional energy producers to act in a way that may sometimes affect availability of sufficient energy supplies for both the population and economic needs of the Central Asian republics. And, asymmetrical interdependence between Central Asian downstream hydrocarbon producers and upstream consuming states is affecting the availability of sufficient energy supplies for intra-Central Asian needs.

Central Asian policy makers who started prioritizing the strengthening of national energy systems within their respective countries resulted in the irrational use of energy resources, investment in costly energy projects and eventually difficulties to sustain affordable energy prices. Most importantly, despite the fact that Central Asian countries acknowledge the importance of regional energy cooperation and the necessity to establish well-functioning mechanisms to address energy insecurities, there is no effective intra-Central Asian initiative promoting such cooperation.

Maximally secure CAES requires the establishment of the regional energy governance mechanism, which ensures reliability of energy supplies, encourages coordinated actions among actors to respond to energy insecurities, and engages all actors (state and non-state) in strengthening national energy sectors by providing conditions to improve regional energy cooperation. However, currently none of the regional-level energy governance mechanisms successfully draw enough resources to encourage energy actors to use energy resources in the most rational way and ensure sustainability of energy supplies for both the population and economic needs. In this work, energy security is defined as a condition that states enjoy when they can be confident they will have adequate and sustainable energy supplies for the population and economic needs for the foreseeable future. Even though the CAES is in the process of disintegration, until Central Asian countries establish independent national energy systems, which are for some of them a long-term goal, regional cooperation in the energy sector remains an important component to ensure security of the CAES. The analysis also shows that energy security for Central Asian countries in the short-run can be ensured through intra-Central Asian energy trade and coordinated operation of interdependent energy sectors.

COMPETING ASPECTS OF ENERGY COOPERATION WITHIN THE CAES

Scholars and Central Asian policy makers have failed to arrive at a shared definition of energy security or at least agree upon key elements of it, because there is often a conflict of interests as a consequence of which one's energy security is promoted at the expense of others or energy security interests are sacrificed for the sake of financial gains, political or economic leverage. Central Asian energy cooperation has three components that are closely interlinked and, due to inappropriate management, sometimes become mutually exclusive.

(α) *Energy supply security* prioritizes Central Asian countries' availability and affordability of sufficient supplies of energy now and for the foreseeable future.
(β) *Energy export security* aims at ensuring energy demand (through either long-term contracts or diversification of energy export routes) to generate revenues from selling energy to external markets.
(χ) *Water-energy nexus*, a legacy of the Soviet Unified Energy System of Central Asia, based on resource-sharing mechanism that ensures a stable supply of water for irrigation purposes in exchange for energy resources.

Regional and global powers' interest in Central Asian resources has been growing over the past decade. Unfortunately, energy export capacity does not match the volume of gas that the regional producers are taking obligations to supply. Tempted by financial revenues from exporting energy resources, Central Asian producers continue to increase the volume of exported energy even at the expense of domestic consumption needs, as is clearly illustrated in the example of Uzbekistan.

Governments, as key energy policy decision makers, have to balance prioritizing different aspects of energy sector cooperation such as energy security, environmental concerns, economic growth and development. In this sense, while making a decision to improve other aspects of energy sector development, state and non-state actors should keep in mind the importance of energy security concerns.

HPPs' primary goal has shifted from the water mode of operating, which established a well-functioning water management system, into an energy mode, which prioritizes increasing electricity production capacity, thus might affect the water withdrawal and energy supply balance in Central Asia. This has led to serious disagreements between regional state actors resulting in frequent energy supply disruptions and energy trading mechanisms' failures.

While all these aspects of energy cooperation should not necessarily be mutually exclusive, the analysis shows that conflict over water distribution and construction of giant HPPs along with increasing the volume of energy export are negatively affecting availability of energy resources for domestic and intra-regional needs.

CHANGING DYNAMICS OF THE CENTRAL ASIAN POWER BALANCE

Central Asia is not the only region where non-cooperative dynamics between states in the energy sector affect availability of sufficient and stable energy supplies. What distinguishes this region, however, is the fact that initially Central Asian countries' energy sectors were designed to operate within a unified energy system. However, intra-regional energy trade within the framework of the resource-sharing mechanism, which ensured stability of energy supplies in Central Asia, is currently being compromised.

Almost complete dependence on the Russian pipeline network to export oil and natural gas has put Central Asian states in a very vulnerable position (low prices for oil and gas, economic

dependence, political pressure, etc.). Thus, diversification of energy export routes by building alternative pipeline networks promoted by regional and global energy consumers was supported by Central Asian energy exporters. However, limited energy export capacities along with other economic, geopolitical and security factors have forced Central Asian producers to increase energy exports even at the expense of domestic and intra-Central Asian consumption.

Ups and downs in energy production and consumption, certain progress in the construction of new facilities and the maintenance of existing ones did not significantly affect the power balance among Central Asian states and with Russia throughout 1990s. Yet, it was clear that the CAES has undergone transformation from the condition in which political and economic borders were disregarded into intra-regional energy relationships in which states are highly concerned about their sovereignty. In the late 1990s, Turkmenistan started considering development of an independent energy system. Uzbekistan has also been working on strengthening its own national energy system. At that time, however, their energy policies did not imply complete breakdown of the unified CAES.

Having benefitted from re-selling Central Asian resources, Russia had been mostly blocking all energy projects designed to diversify Central Asian countries' energy export dependence on Russia. While Russia was also interested in importing Central Asian energy, it needed these resources only to fulfill its obligations to supply natural gas to the European customers. In such asymmetrical interdependence, Central Asian exporters were forced to comply with game rules set by the Russian government that were rarely in favour of the former. Since the higher the cost of the termination or drastic alteration of energy relations for an actor, the more vulnerable this actor is and Central Asian states left in this more vulnerable position. Currently, the majority of Central Asian energy resources are transported through Russian and Chinese pipelines. However, neither China nor Russia considers Central Asian energy as a vital source for their economy.

So, despite the fact that there are a number of proposed energy projects capable of changing the power distribution in the region, only China has succeeded to significantly challenge the established balance. In 2012, gas export to China and Iran exceeded the volume transported to Russia for the first time. Currently, China is the major importer of gas. Since 2016 and 2017 Turkmenistan, major exporter of gas, suspended gas supplies to Russia and Iran respectively. And, taking into account the projected increase of gas exports in this direction, it will remain the major importer in the future. China is also quite interested in importing electricity from Central Asian upstream countries. In this sense, Central Asian countries in an attempt to escape from extreme dependence on the Russian pipeline network are falling into the same trap of high dependence on China. Further diversification of energy export routes is important for Central Asian states since it can minimize the cost of drastic alteration of energy relations with either China or Russia, but does not necessarily contribute to the level of energy security of the latter.

While in energy export/import relations with external customers Central Asian exporters represent weaker players, in energy supply relations within the region oil and gas producers retain the upper hand. During the Soviet Union and right after its collapse, mutually beneficial resource-sharing mechanisms ensured energy security and contributed to economic stability to some extent. However, the current state of natural resource management in Central Asia can easily be characterized as prone to conflict. Higher prices for energy paid by external consumers have tempted downstream countries to redirect resources to the outside world and then equate the price for upstream Central Asian countries. Having experienced severe energy shortages to meet the economic and population needs of the country, Tajikistan and Kyrgyzstan have shifted from water to energy mode in operating their HPPs, which is capable of affecting current water withdrawal level in the region. Tajikistan and Kyrgyzstan are now planning to speed up the construction of two giant HPPs to generate more electricity and develop their own fossil fuels to improve the level of energy security by decreasing their dependence on oil and gas as well as

thermal electricity coming from downstream neighbours. Nevertheless, the construction of the Rogun and Kambarata dams, perhaps predictably, was critically and sometimes aggressively accepted by Uzbekistan.

HUNTING A BIGGER STAG

Having a history of long-term cooperation in the energy sector with the preconditions to establish and sustain cooperative dynamics, the "SH" is a good model by which to map Central Asian countries' energy security dilemma. There are prospects to hunt a stag (the security of the CAES) through cooperation in the energy sector and to reinstate intra-Central Asian energy trade. Existing energy infrastructure, history of the parallel operation of the national energy systems, complementarity of energy sources, among many other factors, may incentivize and encourage actors to pursue strengthening the security of the CAES. Central Asian actors can achieve the highest pay off through cooperation in the energy sector. Since there should be no incentives between actors to cheat on each other in pursuit of rewards higher than what they can achieve through cooperation, current regional-level energy security problems lie with actors' failure to take coordinated actions to respond to those challenges and not the cooperation itself. The main challenge as it seems now is the choice between short- and long-term benefits. While all Central Asian countries will most likely benefit from cooperation in the energy sector, current geopolitical realities tempt some actors to defect on others and pursue short-term rewards (not necessarily in terms of energy security) and force others do the same, thus leaving them absolutely no chance to hunt the stag.

THE PROBLEM OF HUNTING A STAG (MAXIMALLY SECURE CENTRAL ASIAN ENERGY SYSTEM)

Central Asian energy sectors were initially designed to operate within a unified energy system turning regional state actors interdependent on each other. Having mutually benefited from cooperation in the energy sector, Central Asian states were supposed to keep bartering/trading energy and sharing resources. During the Soviet Union, instructions coming from a supra-national political centre (Moscow) ensured the stability of energy supplies and coordinated operation of the CAES. Throughout the 1990s, regional state actors continued cooperating in the energy sector by inertia, because there were neither domestic nor external major factors threatening intra-regional energy trade in Central Asia. The CAES, however, had later undergone certain internal as well as external transformations, which affected the level of intra-regional cooperation in the energy sector consequently leading to energy insecurity.

The SH theory implies that if a stag appears in the beginning of hunting, hunters would most likely go for a stag. If the hunting takes more time, there emerges a risk that someone would defect by being tempted by a hare running through bush. In the Central Asian case, there was no need for hunters to test their true commitment to the common cause in the prolonged hunting because they have already been benefitting from cooperation and know that they have all preconditions to trust each other.

While security of the CAES is a stag that actors can achieve in case they choose to pursue intra-Central Asian energy cooperation, regional state actors nonetheless started prioritizing establishing independent national energy systems. Turkmenistan had officially withdrawn from the CAPS did not completely suspend energy export/import relations with other Central Asian states until Uzbekistan cut off the unified system. Now Turkmenistan is retaining the status of neutrality by refraining from becoming involved in conflicting water/energy nexus relationships. As a hub of the CAES, Uzbekistan's decision to withdraw from the CAPS and alter the stable gas

supply to neighbouring countries seriously affected the level of cooperation, which have led to a different extent to a decreased level of energy security in all five Central Asian states. Guided by the belief of self-sufficiency, Uzbekistan until recently refrained from full-scale reintegration of the CAES, even despite the fact that isolationist energy policy toward neighbouring states negatively affected its own energy security. Uzbekistan's decision to withdraw from the common energy system was partly justified by the fact that Central Asian upstream states started expressing a willingness to develop their hydro-power potential through the construction of the giant HPP. The Uzbek government then used its energy leverage as a "weapon" to influence the decision making of its counterparts. Kazakhstan, relying on its financial capabilities, also decided to secure itself from any sort of dependence on unreliable southern partners.

High incentive to hunt a stag and all preconditions for sustaining cooperative dynamics was supposed to prevent state actors from defecting. In the SH game it is always preferable to hunt a stag under the condition that others hunt it too. And it is better to hunt a hare if other players hunt hares. While each player always had in mind strengthening their energy systems, in fact most of the actors were forced to hunt hares because Uzbekistan preferred a hare to a stag. Decreasing levels of energy security proves the fact that the consequences of the CAES disintegration are more severe than was probably assessed by the Uzbek government and go beyond the scope of the Central Asian upstream countries alone. So what was perceived as a mild dilemma (an insignificant difference in terms of payoffs between cooperation and defection), in fact turned to be a severe issue.

Within the water-energy nexus, in which water and energy were considered closely tied to each other, all Central Asian states enjoyed fair distribution of resources and benefits. Energy supply networks were largely operated within a closed circle with no possibility to export energy other than in the Russian direction, so the regional energy producers were not tempted by hard currency paid by external customers. Currently, however, there is no longer a supra-national body dictating the terms of cooperation. Water and energy sectors are still closely interlinked, but while some actors operate HPPs within an energy mode, others insist on keeping the water mode. On top of that, rapidly increasing external demand for Central Asian energy resources and physical capability to move that energy is a very tempting hare, which regional state actors cannot resist to pursue.

High external market prices for oil and gas in combination with slowly increasing energy production capacity, in addition to the fact that Central Asian countries have succeeded to diversify their dependence on Russia by obtaining access to China, Europe, Iran, and in limited quantities to other markets transformed the CAES in which hydrocarbon producers are incentivized to cheat on Central Asian upstream countries and redirect their export to newly opened energy markets even at the expense of intra-regional consumption. Decreased oil and gas prices, in turn, are now forcing Central Asian states to extend energy cooperation among themselves.

Having justified its defection on regional energy cooperation by low regional prices compared to what was offered by external customers, Uzbekistan succeeded to achieve more favourable terms in the electricity and gas trade. Central Asian upstream countries are now willing to pay a good price for the oil and gas supplied by their downstream neighbours. However, there was another reason, which was perhaps more important, for Uzbekistan to choose non-cooperative dynamics. Uzbekistan also decided to defect to make Central Asian upstream states give up the idea to pursue the construction of giant HPPs capable of affecting the status quo water withdrawal balance, which perfectly suits its interests. Even though the new leadership in Uzbekistan has declared that controversies regarding large HPPs with Central Asian upstream states are now resolved. No practical measures had been taken so far.

In an environment of uncertainty, where Central Asian governments are no longer sure

about the intentions of their neighbours, the best way to encourage actors to cooperate is to improve communication channels. Communication in this sense is a good tool to alleviate the fear of uncertainty and being cheated by others. For the moment, however, communication among Central Asian countries is limited to cheap talks. To encourage regional state actors to communicate more actively and not only with their counterparts, but also with other actors engaged in the Central Asian energy sectors to promote and sustain cooperation within the CAES, several regional-level governance mechanisms were put in place. Unfortunately, the extent of cooperation and, consequently, security of the CAES remains limited suggesting that regional energy governance innovations face serious challenges preventing them from achieving the goal for which they were designed.

The SH game is about the trade-off between low-risk short- and high-risk long-term rewards. The main line of argument in the case of the CAES is that non-cooperative dynamics in the region's energy sector is the result of state actors' desire to pursue immediate gains due to inability to coordinate their actions to achieve greater long-term benefits. This, however, does not undermine the extent of domestic energy sector governance drawbacks and the problem of corruption. Central Asian governments and elites in general, who benefit from natural endowment rents perhaps only care about maximizing short-term profits. Lack of transparency of the region's energy sectors and unaccountability of ruling elites make it possible for elites to fill their pockets from exploiting resources without caring about long-term energy security. Central Asian countries are, to a different extent, authoritarian states in which powerful actors can extract rents without penalty and without concern for the long-term public good. Domestic energy sector mismanagement may overshadow the problem of regional-level cooperation and coordination. Internal governance problems in the region indeed affect the regional-level cooperation in Central Asia. Presumably, if these countries were genuine democracies, and if their energy infrastructures were owned and operated by public agencies for the public benefit, they would be more attuned to long-term energy security concerns. The book has shown that the Central Asian energy sectors are controlled by the ruling elites who have a low level of accountability to the public.

ATTRIBUTES OF A MAXIMALLY SECURE CENTRAL ASIAN ENERGY SYSTEM

This book shows that there are several key attributes of a maximally secure CAES that should be prioritized in addressing energy security challenges in the region. Central Asian countries cannot ensure their energy security, at least in the short- and medium-term, without restoring and sustaining energy trade among each other, since all external actors are interested and have successfully implemented projects designed to move energy resources out of the region. Using energy resources rationally would be possible only through intra-regional energy trade (monetary exchange of energy resources), in which Central Asian upstream countries supply hydroelectricity in summer time in exchange for downstream neighbours' thermal electric power and hydrocarbons in the winter period. Having made first attempts to restore energy trade in the region, Central Asian states must pull their efforts to strengthen energy governance mechanism. To be considered effective, regional energy governance mechanisms must be capable of ensuring the following attributes of a maximally secure CAES:

- Reliability and stability of sufficient energy supplies both in normal and emergency situations;
- Possibility to take coordinated actions for a timely and effective response to sudden energy supply cuts;
- Transit security of energy resources through Central Asian states;
- Effective enforcement mechanisms to encourage Central Asian states to fulfill their obligations, in which sacrificing some of their interests would still be better than non-

compliance with terms of intergovernmental agreements;
- Joint investments in maintenance and modernization of trans-boundary electricity transmission lines and pipeline infrastructures as well as the development of the Central Asian (hydro) power sector by bringing financial resources and qualified expertise together from multilateral-institutions, civil society, and national governments. Joint ownership can align commercial interests of all Central Asian countries and as a result, encourage them to cooperate;
- Transparency and accountability of energy sectors;
- On the country level, developing the renewable energy sources and increasing energy efficiency of energy producing, consuming, and transportation facilities through the exchange of technology, expertise, and financial resources; and,
- Development of the Central Asian (mainly focusing on five Central Asian states) Regional Energy Cooperation Strategy and Action Plan, because achieving the above-mentioned goals also depends on whether Central Asian energy governors share common understanding regarding what constitutes the core of energy insecurity, the seriousness of energy security challenges, and policy options to overcome those obstacles.

The CAES has experienced both a highly authoritative vertical management by a supra-national body and a cooperative dynamic within the resource-sharing mechanism without any regulatory institution after the disintegration of the Soviet Union. Most of the above-mentioned conditions that are now expected of the regional-energy governance mechanisms were provided by a single political centre (Moscow). Currently, however, the ongoing disintegration of the system proves that Central Asian countries are no longer capable of sustaining a maximally secure CAES. It has also become clear that ongoing disagreements between Central Asian countries cannot be resolved and more importantly future large-scale tensions prevented without an effective regional energy governance mechanism in the region.

RECOMMENDATIONS

The analysis in this book highlights that intra-Central Asian energy trade has several direct positive effects on the level of energy security in the region. Regional state actors inherited pipeline and electric power networks saving them from considerable upfront investments in infrastructure, which most of Central Asian states would fail to afford. Comparative advantage in developing complementary energy sources provides conditions for using energy in the most rational way. Since the volume of electricity and natural gas export/import in the region is relatively insignificant, such trading arrangements do not threaten the availability of energy to external customers and thus, do not provoke immediate confrontation from their side. Central Asian energy trade does not only solve the problem of uneven distribution of resources, but also ensures sufficiency of affordable energy supplies. In this sense, there is an urgent need to restore intra-Central Asian energy trade, at least in the average amount traded within the last decade, while temporarily refraining from the further development of projects capable of affecting water distribution and energy supply balance. Promote dialogue among those experts who directly advise decision makers so that they can reach united position regarding key attributes of the Central Asian energy security is also recommended. Central Asian governments should also take full advantage of the assistance offered by multilateral programs. Although intra-Central Asian energy trade, based on annually renewed agreements signed just to meet energy demand peaks, does not necessarily require regional-level energy governance mechanism, long-term sustainability of energy supplies is directly linked to well-functioning governance mechanism.

This analysis shows that reinstating intra-Central Asian energy trade is currently the most optimal policy option to ensure availability of energy resources at lower prices, provide stability

of supplies to meet energy demand peaks, and diversify sources of energy in the consumption balance in the short- to medium-term perspectives. To achieve these goals the book provides several recommendations.

First, it is recommended that Central Asian countries reinstate energy trade in the average amount of resources being exchanged over the past decade on the basis of annually renewed bilateral agreements:

- export of 500 million m^3 of gas per year to Kyrgyzstan and 300 million m^3 per year to Tajikistan from Uzbekistan under the condition that trading partners set a justified price;
- electricity supply of 800–1,800 GWh annually (depending on wet and drought years) from Tajikistan and Kyrgyzstan in exchange for the same amount of electricity supply from Uzbekistan;
- 1000 GWh electricity supply annually from Turkmenistan to Tajikistan and the same amount in reverse direction via swap deals with Uzbekistan;
- 3.5 billion m^3 per year gas supply to southern regions of Kazakhstan either directly from Uzbekistan or via swap deals from Turkmenistan.

Second, to reinstate and sustain intra-Central Asian energy trade, it is advisable for decision makers and the experts counselling them to reach shared position over key attributes of the CAES and develop a Central Asian energy security strategy.

Central Asian decision makers often fail to reach consensus over water-energy balance and take coordinated actions to respond to energy security challenges, because they prioritize different aspects of cooperation (energy supply security, increasing export capacity, water, and energy modes of HPPs) in their energy policies.

It is recommended to use existing governance platforms for a more active dialogue among experts directly advising decision makers from such institutions as:

- Kazakhstan Institute for Strategic Studies under the president of Kazakhstan, and the Library of the First President of the Republic of Kazakhstan;
- Center for Economic Research, Institute for Strategic and Regional Studies under the President of Uzbekistan;
- National Institute for Strategic Studies of Kyrgyzstan;
- Center for Strategic Studies under the President of Tajikistan; and
- National Institute for Strategic Planning and Economic Development of Turkmenistan.

Third, if there is a need for a trade-off between energy cooperation and construction of large HPPs in the region, until Central Asian republics reach a solution amenable to all, it is recommended that:

- Tajikistan having completed 70m of the Rogun dam, starts operating two blocks of the HPP; further construction continues under the coordinated monitoring of all parties involved;
- Uzbekistan reinstates supplies of gas and thermal electricity to Tajikistan to cover the country's winter energy needs;
- parties provide guarantees that no further construction of the dam will be pursued, unless agreed by both downstream and upstream countries, and no sudden unilateral energy supply cuts will take place.

Fourth, one of the main counter-arguments from the Uzbek side regarding the construction of the 335m high Rogun dam was the fact that studies conducted by the World Bank assessed environmental and social impact for only the Vaksh River basin around the dam. Uzbek authorities conclude from this that the dam can potentially be destroyed by the earthquake and the consequences for the downstream countries will be devastating. It could be recommended that regional state actors seek a second round of independent expertise on environmental, social, and economic impact assessment of large HPPs on downstream Central Asian states, under the condition that these states grant full access to facilities and data necessary to conduct the assessment. The main focus of the assessment would not be the extent of damage in case of failure of the dam, but rather possible measures that could be taken capable of reducing the extent of devastation if it happens. Since Tajik and Uzbek authorities have recently agreed that the latter will not object construction of the dam, there was no official statement made highlighting that previous controversies are no longer relevant. The assessment period will serve as a period for finishing the first stage of the dam and postponing further construction of Rogun.

Fifth, it is also recommended that Central Asian governments seek financial and technical assistance in implementing regional-level energy projects from multilateral programs and NGOs within the Central Asian Regional Economic Cooperation program. Having limited financial capabilities, Uzbekistan, Kyrgyzstan, and Tajikistan may resist getting involved in projects that require relatively large investments to upgrade or build new energy infrastructure, train personnel, or introduce new technologies on their own. Support from multilateral institutions will be a good incentive to pursue regional-level energy projects. Attracting foreign investors through public-private partnership initiatives within the program might be a good alternative to reduce dependence on external state actors such as China or Russia.

Sixth, throughout the analysis it became obvious that only intra-Central Asian energy trade and cooperation can contribute to the security of the CAES. And, hypothetically, promotion of the Central Asian energy security would depend on energy governance innovations with the membership of all five regional state actors specifically designed to ensure security of the CAES. Since regional state actors are financially incapable and often unwilling to equally contribute to the formation of such mechanisms and the relevant institutional apparatus, Central Asian states themselves would refrain from making moves in this direction. External players have their own interests over the region's resources, which do not include strengthening the CAES through integration of region's energy sectors. In this sense, the most optimal strategy would be to take advantage of all existing regional governance mechanisms by promoting communication among them. Energy trade within the Central Asian region can restore trust and promote energy resources exchanging mechanisms. As the first step toward establishing a maximally secure CAES, reinstating energy trade does not necessarily require complex regional energy governance mechanisms. As the analysis shows, energy-trading arrangements within current geopolitical realities have a greater chance of implementation through bilateral format of negotiations and agreements. Regional-level energy governance mechanisms in the short-term perspective must provide a platform for negotiations to conclude either bilateral or multilateral agreements, contribute to the transparency of the process and ensure implementation of those agreements. Ensuring sustainability and reliability of energy supplies within the CAES, however, has to be backed by well-functioning regional-level energy governance mechanism. Once Central Asian countries restore cooperation in their energy sectors, there will be ground for either establishing a new energy governance mechanism specifically designed to improve energy cooperation and ensure energy trade-led economic growth as well as the security of energy supplies within the Central Asian region or concentrate on transforming one of the existing mechanisms into an instrument that pulls Central Asian states together.

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Notes: