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DILEMMAS OF COMPATIBILITY AND ENERGY SECURITY THROUGH REGIONAL COOPERATION: CENTRAL ASIAN COUNTRIES' ENERGY POLICIES

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EXECUTIVE SUMMARY

Exchange of energy resources ensured stability and reliability of energy supplies within the Central Asian Energy System (CAES) for many decades. While the CAES provided conditions for all Central Asian states to enjoy energy security simultaneously, it could not withstand recently emerged geopolitical and economic challenges. This policy paper studies competing energy policies that have led to fundamental disagreements over the water-energy nexus along with disputes over the price for fossil fuels, which in its turn to a different extent affected sufficiency of energy supplies and sustainability of the Central Asian energy sectors. The analysis shows that energy policies of the Central Asian countries focus on various initiatives to address energy security challenges, but do not prioritize intra-regional cooperation and energy trade anymore. The paper follows the argument that disintegration of the CAES, without yet establishing national energy systems is accompanied by decreasing level of energy security in all five Central Asian states. While full-scale re-integration of the CAES in the current geopolitical realities seems to be a difficult task to accomplish, the study shows that improving intra-Central Asian energy trade is quite possible and under recently emerged circumstances needs to be urgently prioritized in energy policies of the Central Asian states.

The policy paper finds 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 power networks saving them from considerable upfront investments, 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 power and natural gas export/import in the region is relatively insignificant such trading arrangements do not threaten availability of energy to external customers. Central Asian energy trade does not only solve the problem of uneven distribution of resources, but also contributes to sufficiency and affordability of energy supplies. Policy recommendations highlight urgent need for restoring intra-Central Asian energy trade in the average amount traded within the past decade, while temporarily refraining from further development of projects capable to affect water-energy balance. It is recommended to promote dialogue among experts directly advising decision makers so that they can reach shared position regarding key attributes of the Central Asian energy security. Central Asian governments should also take full advantage of assistance offered by multilateral programs.

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RATIONALE

Central Asian countries' energy sectors were initially designed to operate within a unified energy system managed from Tashkent. After gaining independence Central Asian leaders reached common understanding regarding benefits of closer regional energy cooperation. Interestingly though these same leaders later started pursuing policies that distance countries from each other leading to disintegration of the Central Asian Energy System (both natural gas pipeline and electric power grid networks). Breakdown of an interdependent system into separate entities (national energy systems) to a different extent has affected the level of energy security in all five countries. In this regard, recently emerged energy security challenges can only be addressed through increasing intra-Central Asian energy trade.

Based on the analysis of primary and secondary data along with extended expert interviews, this paper aims to analyze the level of energy insecurity as well as compatibility of competing energy policies of the Central Asian countries to identify the most feasible policy option to address current energy security challenges. The primary audience that this study aims to communicate its findings to is government officials, who seem to have lack of knowledge regarding energy policy priorities of their neighboring counterparts and limitations of their own energy policies to ensure countries' energy security especially in the short run. The results of the study could also be useful for multilateral institutions promoting regional energy cooperation in designing action plans to improve energy security in Central Asia.

A modified set of criteria that include policy dimensions developed by Dr. Vlado Vivoda was chosen for this particular policy study to assess Central Asian countries' level of energy security. Empirical data for the assessment was mainly collected from such databases as International Energy Agency, U.S. Energy Information Administration, the World Bank, because they provide information for all countries simultaneously. Since Central Asian countries have not adopted energy security strategies highlighting energy security policy priorities, in an attempt to determine state actors' priority areas in energy sector I have analyzed information provided in governmental portals (Kazakhstan – (former) Ministry of oil and gas website (www.mgm.kz); (former) Ministry of Industry and New Technologies (www.mint.kz), Government of Kazakhstan website (www.government.kz); Kyrgyzstan – Government of Kyrgyz Republic website (www.gov.kg); Tajikistan – President of Republic of Tajikistan website (www.prezident.tj); Turkmenistan – Government of Turkmenistan website (www.turkmenistan.gov.tm); Turkmen state information agency (www.tdh.gov.tm); Uzbekistan – Government of Uzbekistan website (www.gov.uz); CIS database - www.e-cis.info). Semi-structured expert interviews with state officials and experts were also used for the analysis of cooperative/conflicting dynamics among Central Asian countries in energy sector.

There are several factors indicating that exploring compatibility of the Central Asian states' energy security policies is both timely and important. The World Bank has released

the assessment results for the Rogun hydropower plant, according to which 335 meters 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 approved by the WB expert panel yet objected 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. Inability of Tajikistan and Kyrgyzstan to fill reservoirs due to overusing water resources has reduced the level of electricity production consequently leading to deficiency of energy to meet basic human needs. With relatively limited oil and gas extraction capacities Central Asian downstream countries' attempt to increase the volume of exported energy affects sufficiency of hydrocarbon supplies for domestic and intra-regional consumption. Transition from subsidized to market prices while ensuring affordability of energy resources through policy initiatives turned to be a difficult, but a necessary task. Addressing these and some other energy security problems requires greater regional cooperation promoted by prioritized energy policies.

Regional producers' perception of energy resources as a strategic commodity and overemphasized sovereignty issue prevent them from a full-scale re-integration of their energy sectors. Transition to independent national energy systems, however, along with developing countrywide infrastructure and increasing energy production capacity also requires sustaining intra-Central Asian energy trade. Trading of energy resources may go beyond formal agreements and take the form of swaps, barters and other types of exchange arrangements. It is imperative, 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. Short-term trading arrangements will not solve all energy security problems, but they can contribute to enduring affordable prices by using resources rationally, enhancing countries' ability to meet energy peak demands and creating preconditions to establish sustainable energy sectors. Since energy sectors are highly controlled by the governments, improving intra-regional trade requires particular policies that prioritize intra-Central Asian energy cooperation and trade.

Defining security of the Central Asian Energy System

Taking into account main characteristics of the Central Asian region, in this particular project, I define energy security 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.

The Central Asian Energy System is a framework/complex system within which various energy actors interact and affect each other's security. Given the above-mentioned definition of energy security, the security of the Central Asian Energy System is the condition in which all Central Asian states enjoy energy security (for both population and economy needs) simultaneously. The system entails balancing among energy interests of all. Reaching consensus is difficult, but necessary if the end goal is to make sure that everyone is enjoying energy security.

Conflicting dynamics of energy cooperation in Central Asia

Scholars and Central Asian policy makers fail to come up with 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 and/or economic leverage. Central Asian energy cooperation has three components that are closely interlinked and due to inappropriate management sometimes become mutually exclusive.

a) Energy supply security prioritizes Central Asian countries' availability and affordability of sufficient supplies of energy for the foreseeable future.

b) 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 out to external markets.

c) Water-energy nexus, as a legacy of the Soviet Unified Energy System of Central Asia, is based on resource sharing mechanism to ensure stable supply of water for irrigation purposes in exchange for energy resources.

Regional and global powers' interest over the Central Asian resources has been growing over the last decade. Unfortunately, energy export capacity does not match growing external demand and more importantly the volume of gas that the regional producers are now obliged to supply. Being tempted by financial revenues from exporting energy resources, Central Asian producers continue increasing the volume of exported energy even at the expense of domestic consumption needs, as is clearly illustrated in the example of Uzbekistan.

The shift from water mode of hydropower plants, primary goal of which is to establish a well functioning water management, into energy mode that prioritizes increasing power production capacity has affected the water-energy balance in Central Asia. This, in its turn, has led to disagreements between state actors resulting in frequent energy supply disruptions and energy trading mechanism failure.

While these aspects of energy cooperation should not necessarily be mutually exclusive, the analysis shows that conflict over water-energy nexus along with increasing the volume of energy export are negatively impacting availability of energy resources for domestic and intra-regional needs.

Security of the Central Asian Energy System

Central Asia is not the only region where non-cooperative dynamics between states in energy sector impact 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 that ensured stability of energy supplies in Central Asia is currently being compromised.

Almost complete dependence on Russian pipeline network in exporting oil and 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 energy export routes

by building alternative pipeline networks promoted by regional and global energy consumers was highly supported by Central Asian energy exporters. Limited energy export capacities, however, force Central Asian producers to increase energy export even at the expense of domestic and intra-Central Asian consumption.

The resource sharing mechanism ensured reliable and stable energy supplies during Soviet era and right after the disintegration of the Soviet Union. The mechanism was quite simple: upstream countries of Kyrgyzstan and Tajikistan ensured a continuous flow of water and a certain amount of electricity during the summer to downstream countries, while Kazakhstan, Turkmenistan, and Uzbekistan channeled fuel, gas and thermal power to them in return (Laldjebaev, 2010, p. 24). Central Asian energy system did not only solve the problem of uneven distribution of energy resources, but also prevented power supply disruptions due to seasonal variations of energy production in the region. However, current geopolitical and economic realities started challenging the effectiveness of the mechanism. The Almaty Agreement of 1992 was supposed to keep the mechanism functioning "until the states could reach a solution amenable to all parties" (Dinar, Dinar, McCaffrey, & Mckinney, 2007, p. 294). Fundamental disagreement between region's water demand for irrigation and the use of water to generate electricity along with disputes over the price for fossil fuels have led to a conflict between upstream and downstream countries.

Central Asian countries do not enjoy energy security

ENERGY SECURITY MEASUREMENT CRITERIA (Vivoda, 2010)[1]							
Energy Security Dimension	**Attribute**	**Interpretation (Preferred)- Low/Medium /High**	**Kazakhstan**	**Kyrgyzstan**	**Tajikistan**	**Turkmenistan**	**Uzbekistan**
Energy supply	a) Fraction of primary energy as imports	Low	Low	High	High	Low	Low
	b) Diversification (by source)	High	MD	Low	Low	Low	MD
	c) Diversification (by transport routes)	High	MD	Low	Low	Low	MD
	d) Diversification of electricity generation (by fuel type)	High	Low	Low	Low	Low	MD
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	MD	MD	Low	MD
	Increasing export at the expense of domestic consumption	No	No	No	No	No	Yes
Efficiency	a) Energy efficiency	High	Low	Low	Low	Low	Low
Economic	a) Total fuel costs/GDP*	Low	MD	High	High	Low	MD
	b) Fuel imports (% of GDP)	Low	Low	High	High	Low	Low
	c) Fuel exports (% of GDP)	High	High	Low	MD	High	MD
Environmental	a) Reliance on fossil fuels as a fraction of primary energy consumption	Low	High	High	MD	High	High
	b) Greenhouse gas emissions (metric tons per capita)	Low	High	Low	Low	High	MD
Human security	a) Fraction of population with access to basic energy services (i.e. electricity)	High	High	High	High	High	High
Military-Security	a) Exposure of critical energy infrastructure to energy related military/security risks	Low	Low	Low	Low	Low	MD
Domestic socio - cultural-political	a) Exposure to social or cultural energy-related risks (i.e. NIMBYism, energy sector labor unrest)	Low	MD	MD	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	MD	Low	High	Low	High
Technological	a) Diversification for key energy - related industries (i.e. power generation) by technology type	High	Low	Low	Low	MD	Low
International	a) Commitment to regional and other	High	High	MD	MD	High	Low

1 Energy security measurement criteria are modified to capture main attributes of the Central Asian Energy System.

a) Diversification for key energy -related industries (i.e. power generation) by technology type	High	Low	Low	Low	MD	Low
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	MD	MD	High	Low
a) Existence of energy security strategy	Yes	No	No	No	No	No
b) Transparency of energy security policy	MD	MD	Low	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 prioritized in policy	Yes	No	Yes	Yes	No	Yes
f) Efficiency issues prioritized in policy	Yes	Yes	Yes	Yes	Yes	Yes
g) Economic issues prioritized in policy	Yes	Yes	Yes	Yes	Yes	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 prioritized in policy	Yes	No	No	No	No	Yes
k) Socio-cultural and political issues p rioritized in policy	Yes	Yes	Yes	No	No	No
l) Technological issues prioritized in policy	Yes	Yes	No	No	Yes	No
m) International cooperation issues prioritized in policy:						
Within Central Asia:	High	Low	MD	MD	Low	Low
With external actors:	High	High	MD	MD	High	High

Overall, Central Asian region does not enjoy energy security. Initially 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 different types of sources (Kyrgyzstan and Tajikistan – hydropower, Kazakhstan – oil and coal, Turkmenistan – gas, and Uzbekistan – oil and gas) to the energy balance of the CAES (Appendix 1). High dependence on a particular source of energy was not an issue within the CAES, which operated irrespective of political (administrative) and economic borders. Having contributed different sources Central Asian energy sectors all together formed a complete energy system capable to meet energy needs of all countries simultaneously. Disintegration of the CAES, however, affected short- and medium- term availability of energy resources to upstream countries and sustainability of power supplies (Appendix 2) for downstream fossil fuel producing states.

Having possessed considerable hydrocarbon production capacity, Central Asian producers still fail to meet their own demand for fuel/refined oil and gas products (Appendix 3). Dependence on importing fuel products makes Central Asian region vulnerable to supply disruptions from Russian, Chinese and European producers.

Land-locked geographical status of the region limits state actors ability to diversify their export/import dependence. Interdependence that the CAES entails put regional importers in a vulnerable position to frequent energy supply disruptions caused by the process of disintegration of the system.

Central Asian energy sectors are highly energy intensive. Fossil fuel based regional energy sectors are environmentally damaging (Appendix 4). So far no policy initiative succeeded to reduce fossil fuel demand in Central Asian countries.

Only Tajikistan and Kyrgyzstan to some extent decreased fossil fuel consumption for the last several years. However, it was not the result of an effective policy initiative, but rather fossil fuels supply cuts from neighboring states, which caused severe energy shortages in these countries (Appendix 5).

Central Asian countries' energy sectors are also highly subsidized (Appendix 6). Subsidizing keeps prices for energy low enough to make it affordable to population and industries (Appendix 7). Low energy prices and a long legacy of the Soviet period in which saving energy was not a priority, however, turned to be discouraging factors for using energy efficiently. Moreover, outdated energy production facilities (Appendix 8) and lack of investment in maintaining energy infrastructure cause considerable energy losses (Appendix 9) and negatively impact availability of energy resources in Central Asia.

Parallel operation of power systems and exchange of energy resources ensured 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 gradual transition from current interdependence into independently operated self-sufficient energy systems. In other words, the pace of decreasing intra-regional energy trade should be symmetrical to increasing power 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 intra-regional energy trade to ensure energy security along the above-mentioned transition.

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 interviewing experts I have highlighted areas of energy sector that are currently being prioritized in Central Asian countries' energy policies. Having highlighted state energy policy priorities the following sections of the policy study point out to major flaws of these policies to ensure Central Asian energy security in the short to medium term perspective.

ENERGY POLICY PRIORITIES OF THE CENTRAL ASIAN STATES

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 (RES). The policy study emphasize 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. But the analysis of competing energy policies of the Central Asian states shows that intra-regional cooperation is currently not prioritized. This section of the study points out to energy policies that the Central Asian governments currently prioritize and highlight their limited contribution to improve the level of energy security in the region.

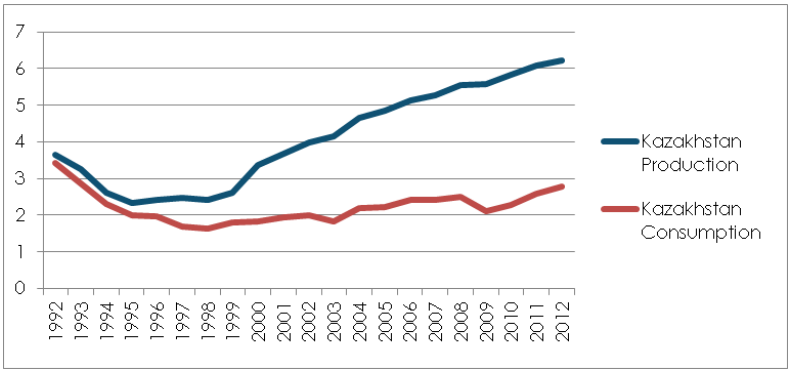
KAZAKHSTAN: Multi-vector/Diversification Oriented Energy Policy

Kazakhstan's current energy policy is primarily concerned about securing demand for its energy and revenues to fill the budget from moving energy out to external markets. Unstable energy supplies within the CAES over the last several years, however, also forced Kazakhstan to strengthen its independent and self-sustaining energy system. Within numerous energy sector development programs the government of Kazakhstan seem to have been focusing on establishing countrywide energy infrastructure as well as the development of renewable energy sources and increasing energy efficiency, but not on the intra-Central Asian energy cooperation.

Primary policy priority – Solving energy demand insecurity

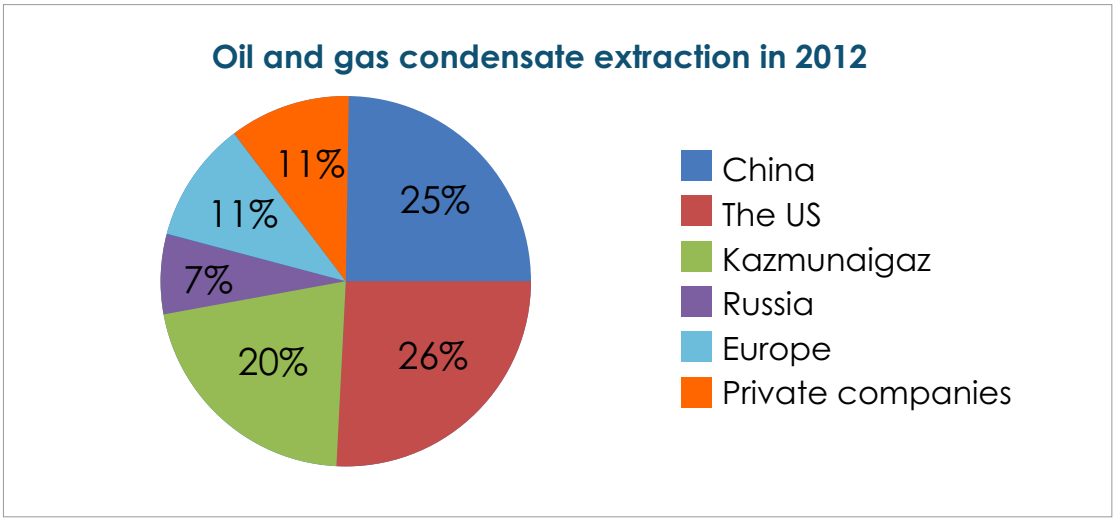
Explored coal, oil and gas reserves in combination with increasing foreign investments into Kazakhstan's energy sector ensured rapid energy production growth in the country.

Figure 1 – Primary energy production and consumption (quadrillion Btu) of Kazakhstan (U.S. Energy Information Administration EIA, International Energy Statistics: Kazakhstan)



However, Kazakhstan does not enjoy full control over both production of its resources and transportation of energy to external markets. The fact that national energy company owns only one fifth of energy resource extraction (See: Figure 2) and that the oil supply routes to its major European customers (Europe imports 75% of Kazakh oil (Zhumagulov, 2014)) lie through the territory of Russia alone raise serious concerns among population and the elite. Having perceived product sharing agreements unfair Kazakh authorities attempt to regain control over its natural resources by reversing those agreements signed with international oil giants in the early 1990s and diversify their energy export route dependence (Cohen, 2008, p. 119).

Figure-2 Oil and gas condensate extraction (Zhumagulov, 2014)



Second policy priority – Securing energy supplies to Southern Kazakhstan

Having considerable energy production capacity the country is still lack energy transport infrastructure to move resources throughout Kazakhstan. Within the CAES, Southern regions have been relying on energy supplies from neighboring Uzbekistan and Kyrgyzstan. To secure itself from unilateral energy supply cuts (either due to disagreements over the price or due to technical incapability to timely respond to accidents) from these countries, Kazakhstan has decided to strengthen countrywide pipeline networks and power grids (North-South).

The Northern power system's production capacity is higher than the amount of electricity Northern territories consume. First transmission line connecting North with South, which was put in place in 1998, ensured country's ability to meet power demand peaks due to extreme weather conditions or sudden supply cuts within the Central Asian (Electric) Power System (CAPS) (Adilet legal portal, 2010). To meet growing power demand of the South Moynak HPP with the capacity of 300 MWt was connected to power transmission lines and 2x660 MWt Balkhash TPPs are expected start supplying electricity in 2017 (Commonwealth of Independent States CIS, 2013).

Kazakhstan's gas production capacity is unevenly distributed. It consumes only half of its produced gas and exports the other half, because it lacks extensive internal gas supply networks to transport energy within the country. Gas shortages in some are compensated by swap deals. Kazakhstan supplies 4.5 bcm/y to Russia in the West, while imports approximately 3.5 bcm/y from Uzbekistan in the South and 1 bcm/y in the North. Frequent unilateral gas supply disruptions and disputes over the price with Uzbekistan, however, forced Kazakhstan to look for alternatives to reduce its dependence.

The most optimal alternative was to build a pipeline connecting gas-producing Kyzylorda with major energy consuming Shymkent and Almaty regions of Kazakhstan - Beineu-Bozoi-Shymkent gas pipeline. The government believes that once implemented this project may ensure full gasification of 13 regions out of 16 by 2030 and increase the volume of household consumption from 10.9 to 18 bcm (Government of the Republic of Kazakhstan GoK, 2014). The main problem with this project, however, is that if all goes according to the plan it will take another 15 years to significantly increase household energy consumption in the Southern Kazakhstan. Besides, Beineu-Bozoi-Shymkent gas pipeline is also expected to fill 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 energy out of the region may overshadow Kazakhstan's desire to supply sufficient amount of gas to its Southern regions.

Third policy priority – Addressing energy inefficiency

Kazakhstan's economy is energy intensive. Subsidized energy sector does not provide incentive for the industry and population to efficiently use energy resources. President Nursultan Nazarbayev often remarks that: "in Kazakhstan nobody saves anything, because electricity, heat and gas flow cheaply" (International Crisis Group ICG, 2011, 34). Currently, 50 enterprises consume 40 percent of all energy (GoK, 50 enterprises, 2014). Overall, industry consumes 70% of produced power in the country (GoK, 2011). Since there is a potential to decrease energy consumption by these enterprises to 30-40% (GoK, 50 enterprises, 2014) the government has decided to prioritize it. Energy efficiency reforms especially in the industry sector require considerable investments that can hardly be pulled out of the budget in the short term.

Fourth policy priority - An image of "Green Energy" advocate

Kazakhstan is the only country in the region that has adopted a long-term Strategy "Kazakhstan - 2050" with particular focus on diversification of energy sources in the overall energy balance. However, a very few experts dare to predict how Kazakhstan's energy sector will look in 35 years from now and most of them are skeptical about its ability to achieve set up goals such as to increase RES up to 50% in the energy balance by 2050 (B. Rashidova, personal communication, 2014). Currently, 80 percent of electricity is still generated by coal-fired TPPs, while the share of RES is less than 1%.

Wind power potential of the mountain pass to China, the Jungar Gates, alone can provide more than 1 trillion kWh per year (Ministry of Industry and New Technologies MINT, n.d.). Acknowledging this potential, President of Kazakhstan has become the main advocate for Green Energy development in Central Asia ("Kazaxstanu nujen institute po voprosam 'zelenoy' energetiki (Kazakhstan needs an institute on 'green' energy issues)," 2013). However, the latest statement of the main supporter of green energy in the region left everyone quite confused. Nursultan Nazarbaev during the XI Forum of Inter-regional cooperation claimed that: "Personally, I do not believe in alternative energy, including wind and solar energy. Oil and gas is 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" (Pashkova, 2014). In this sense, the question of whether Kazakhstan will turn into an example for other Central Asian states to follow in term of renewable energy sector development remains open.

KYRGYZSTAN: Mitigating Energy Crisis

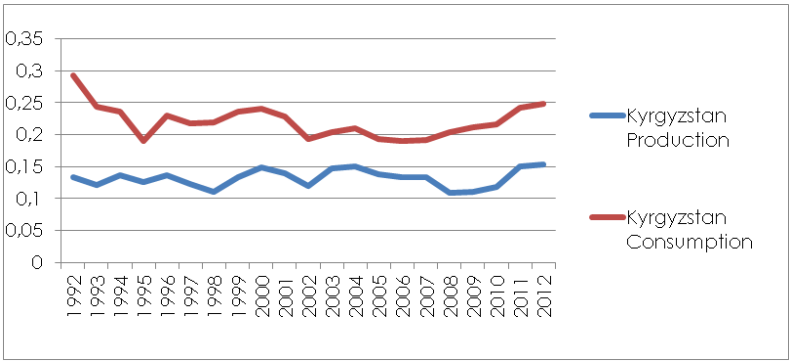
Unlike hydrocarbon rich Kazakhstan, Kyrgyzstan only enjoys significant hydropower potential, which is yet to be fully developed. Having seasonal power production variations and underdeveloped fossil fuel sector, it is the parallel operation of the CAPS and import of gas and oil products from Central 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, Kyrgyz government was forced to prioritize mitigating energy crisis by equally distributing available energy resources and reliance on Kazakhstan and Russia to meet its winter energy demands.

Energy Crisis

Hydropower is the main source of energy production in the country. Energy sector of Kyrgyzstan is dependent on run-of-river type HPPs constructed along the Naryn River. The largest hydropower producing facility is Toktogul. Toktogul is not the largest HPP in terms of power production capacity (1200 MW) in Central Asia, but it is the only one capable to accumulate enough water to produce electricity both in summer and winter months. However, overuse of water in Toktogul to produce electricity in 2013-2014 has resulted in water level drop and affected near future prospects for power generation. Kyrgyzstan produced 14 billion kWh in 2014 and it is expected that the country will only produce 11.6 billion kWh in 2015, while the consumption needs will amount 15.8 billion kWh (Otorbaev, 2014).

Production of primary energy resources in the country has never met its consumption level, which implies that any further drop of energy production worsens energy crisis. On top of that, decreasing gas supply from neighboring countries severely affected Kyrgyzstan's energy security. Uzbekistan supplied 800 million cm of gas to Kyrgyzstan in 2000 and decreased the amount threefold in 2013 (280 million cm per year) (Otorbaev, 2014). By the end of 2013 it completely stopped supplying gas to Kyrgyzstan.

Figure 3 – Primary energy production and consumption (quadrillion Btu) of Kyrgyzstan (EIA, International Energy Statistics: Kyrgyzstan).



Primary policy priority – Ensuring human energy security

Having experienced two revolutions, the government of Kyrgyzstan is particularly concerned about social and political instability that energy crisis may lead to. Kyrgyzstan consumes 22-23 million kWh per day during warm days and 70 million kWh per day during cold winter days and most of it comes to household consumption. Kyrgyz households consumed 4.2 billion kWh, which accounted for 30% of the overall production in 1999. By 2012 the level of power consumption by household sector increased up to 7.2 billion kWh annually constituting 63% of the overall production in the country (Otorbaev, 2014). Due to significant water drop in the reservoirs the government of Kyrgyzstan was forced to limit electricity consumption by 30% of

the total consumption volume in the previous year from October 1, 2014 to March 31, 2015 (Donis, 2014). This basically implies that energy crisis does not only hit the economy, but also affect country's ability to meet basic human needs.

Second policy priority – Reliance on support from Russia and Kazakhstan

Having a very strong Russian lobby and relatively good relationships with Kazakhstan Kyrgyz government is now counting on these two actors to secure stable and adequate supplies of energy, especially in winter. The Russian lobby forced Kyrgyz government to repeal the law prohibiting bailing strategic facilities of the country. As a result, Russia ratified agreement with Kyrgyz government according to which the whole gas sector of Kyrgyzstan (including national company "Kyrgyzgaz", gas pipelines, gas distributing stations, underground gas storage facilities) was sold to "Gazprom" for $1 in return for forgiving of state debts ("Uzbekistan prekratil podachu prirodnogo gaza na yug Kirgizii (Uzbekistan stopped gas supply to Southern Kyrgyzstan)," 2013). Kyrgyzstan is already receiving certain preferences. Kazakhstan agreed to export 1,4 billion kWh of electricity to Kyrgyzstan generated in Dzhambil TPP using 330 million cubic meters of Uzbek gas provided by Russian company in 2014 ("Gazprom videlit dopolnitelnie 330 mln. kubometrov gaza Kirgizstanu (Gazprom will supply additional 330 mcm of gas to Kyrgyzstan)," 2014). On September 20, 2012 governments of Russia and Kyrgyzstan signed an agreement on 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 (CIS, 2013), the project designed to considerably increase winter power production. However, the extent to which Russia is willing to get involved in rather big and at the same time controversial energy projects is unclear. Moreover, the current Ruble crisis and Western sanctions effectively takes this plan off the table for the moment.

Kyrgyz authorities may hypothetically count on Line D of the Central Asia-China Gas Pipeline expecting that China would agree to leave certain amount of gas for Kyrgyzstan to meet its energy needs, especially during winter period. According to the initial design, however, Line D is being built to transport gas to China while using both Kyrgyzstan and Tajikistan as a transit country only. In fact, participants of the project mostly try to keep the question of turning Line D to a source of gas supply to Central Asian upstream states off the table. The biggest concern still lies with Uzbekistan a key transit country that does not refrain from using energy weapon to influence foreign policies of its upstream neighbors. While Uzbekistan does no longer possess a legal right to unilaterally stop natural gas flow, because its section of pipeline is operated by JV Company, it still can physically cut supplies as all pipelines lie through its territory. Uzbekistan opposes construction of large dams, because it fears that its upstream neighbors could interfere with the water supply necessary for the downstream irrigation and particularly cotton industry and is using its energy leverage to prevent it. In this sense, until energy-water nexus dispute between Central Asian downstream and upstream countries is resolved counting on Line D pipeline as a source of energy supply to Kyrgyzstan and Tajikistan would be problematic.

Third policy priority – Fighting corruption and energy inefficiency

Decreased energy supplies from abroad forced the government of Kyrgyzstan to pay greater attention to the problem of energy sector inefficiency. 53% of power generation facilities in the country is 40 years and 37% is 30 years old (Otorbaev, 2014). Current total losses in power system of Kyrgyzstan account for almost 40% out of which 25% (3.3 billion kWh) is commercial losses and thefts. Remaining 15 percent accounts for technical losses (Abdyrasulova & Kravsov, 2009, p.14). Current Kyrgyz government has built its legacy on

blaming previous (Kurmanbek Bakiyev) administration for the appropriation of money devoted to Kyrgyz energy sector development. So the new government openly acknowledges the importance of fighting corruption that negatively affects Kyrgyzstan's ability to timely and effectively address energy efficiency problems. Even though so far the government has achieved little progress, at least differently from other Central Asian elites that have been in power for decades Kyrgyz authorities elevated this problem to the state priority policy level.

Shortcomings of the national priority energy project

To overcome the consequence of uneven distribution of electricity Kyrgyz government will soon put into force Datka electric station and complete Datka-Kemin transmission line connecting Southern and Northern parts of the country (Government of Kyrgyz Republic, 2014). However, energy security of Kyrgyzstan cannot be ensured without neighbors. According to Nikolai Kravcov, member of the Monitoring Council under the Ministry of Energy, Kyrgyzstan will continue experiencing energy insecurity due to lack of power production. And even Datka-Kemin transmission line will not save Kyrgyzstan from energy crisis. This transmission line solves the problem of transporting electricity, but does not add power capacity. And it will take decades till Kambarata-1 is put into full operation (Kravcov, 2015).

Despite the fact that Kambarata-1 can considerably increase power production in the country, current administration acknowledges that all claims concerning the fact that single giant HPP can solve all energy security problems is an illusion. Power production coefficient of Kamabarata-1 accounts only for 31.5% (Otorbaev, 2014). Besides, every added 1 kW new capacity will cost $2700, which Kyrgyzstan can hardly afford (Karibekov, 2014).

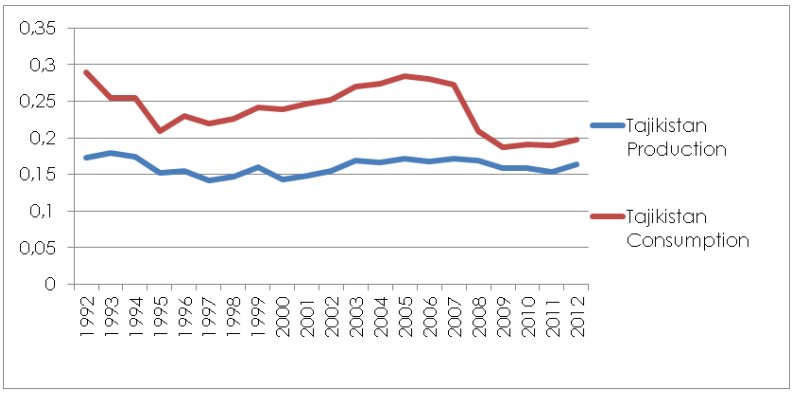
TAJIKISTAN: In Pursuit of Independent Energy System

Tajikistan's energy security almost completely relies on hydropower sector development. Hydropower potential to supply renewable and clean energy source provides Tajikistan certain leverage. However, the lack of production capacity and high dependence on imported energy put the country in a very vulnerable situation. Like all other Central Asian republics, Tajikistan's energy sector was designed to operate within the CAES. Uzbekistan's withdrawal from the CAPS left Tajikistan in complete isolation and severely affected the level of its energy security. To immune itself from high dependence on neighboring Uzbekistan, the government of Tajikistan is increasing the capacity of North-South transmission lines and attracting investments to share the construction cost of Rogun HPP. While establishing an independent energy system is energy policy priority number one for Tajikistan, mitigating current energy crisis by increasing energy efficiency and development of small hydropower sector seem to be considered important as well. However, the analysis shows that there are limited opportunities for Tajikistan to ensure its energy security on its own in the short to medium term perspectives.

Primary policy priority - Establishing independent energy system

Energy production capacity in Tajikistan has never matched the level of consumption. Within the CAES Uzbekistan supplied electricity, natural gas and oil products to Tajikistan. That is why, when energy supplies from its neighbor started decreasing Tajikistan had no choice but to rely on its own resources. Reduced level of energy consumption for the last several years indicates that Tajikistan has not yet succeeded to cover the volume of previously imported energy.

Figure 4 – Primary energy production and consumption (quadrillion Btu) of Tajikistan (EIA, International Energy Statistics: Tajikistan)



Complete isolation from the CAES with no other possibility to import energy resources forced the government of Tajikistan to pursue development of an independent national energy system. Ensuring energy independence by connecting electricity-producing regions (Southern) with those that were connected to the CAES (Northern) and development of its hydropower potential has three entailing objectives:

a) to meet the need of population in electricity all the year round;

b) to give a powerful impetus to the economic development of the country;

c) to increase electricity export potential.

Tajikistan was completely cut off the parallel power system in 2011 (Becker, 2011). To supply electricity to its Northern regions the government decided to build 500 kV "South - North" and several 220 kV electricity transmission lines (President of the Republic of Tajikistan PoT, 2008). Building 220 kV "Lolazor-Khatlon" line was finished in 2009 (Ministry of Energy and Industry of the Republic of Tajikistan, n.d.). These transmission lines, however, could not solve the problem of winter electricity deficiency. So the government of Tajikistan has prioritized the construction of Rogun dam/HPP with the capacity to double current power production volume, which would also allow winter period power generation. The WB independent expert panel found the highest option of the dam the most economically efficient with acceptable environmental and social impacts. However, Uzbek authorities perceive this project as a threat to the water withdrawal balance in the region and thus, strongly oppose any progress in this direction.

Second policy priority – Dealing with "high cost" of energy security

Transition to an independent energy system bears the cost that is higher than Tajikistan can afford on its own. Energy already costs Tajik budget around 60% of the GDP. Households in Tajikistan spend around 50% of their total income on energy in winter months and still receive the amount insufficient to fully meet their needs (United Nations Development Program UNDP, 2013, 10). While the Rogun HPP can solve the problem of seasonal variations and electricity deficiency, disagreement between Central Asian upstream and downstream countries over this project affect majority of investment proposals. Construction of Rogun started during the Soviet period and now requires from $3-6 billion additional investments. With public campaign to collect money for building Rogun Dam, the government of Tajikistan succeeded to collect $187 million. However, once collected Tajik authorities had a few initiatives to put the money to (ICG, 2011). The government made it compulsory for citizens to

purchase almost $700 worth of share, which at that time exceeded the average income for most of the Tajik residents. It planned to collect around $600 million, but managed to collect less than 30% percent of it, which was short enough to continue construction.

Third policy priority - Development of small hydropower potential

According to the UNDP report more than 1 million people suffer from frequent and prolonged blackouts each winter (World Bank Group, "Tajikistan's Winter Energy Crisis", 2013). People living in remote mountainous areas are the most vulnerable ones. Due to geographical constraints to establish a countrywide network of transmission lines, the most feasible way to bring them energy is to build small and mini HPPs at their own sites. For the last two decades 310 small HPP had been constructed in the country and 10 more are in the process. The government is planning to build additional 190 small HPP more by 2020 (PoT, 2014). However, while 98% of power generation comes to hydropower sector, 97% of it is produced in medium and large HPPs. It does not imply that building small HPPs is a failure, because they supply electricity to a number of remote areas connecting of which to the central power system is costly. But it means that without construction of large HPPs Tajikistan will not be able to resolve its energy crisis.

Fourth policy priority – Improving energy efficiency

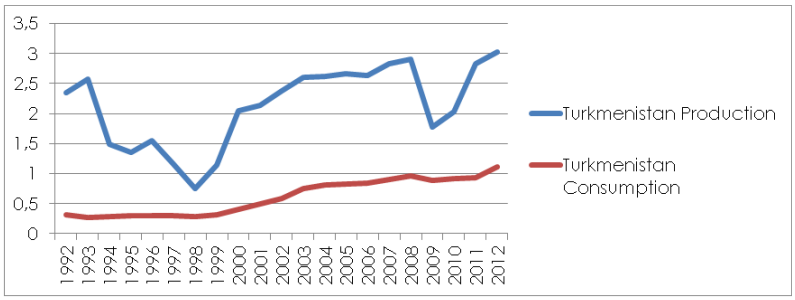
The government of Tajikistan acknowledges that investment in increasing the efficiency of some outdated major hydropower producing facilities in Tajikistan. Nurek, the largest contributor to the power production of Tajikistan, was built in 1972. Kairakkum was constructed even earlier in 1956 (PoT, 2008). Tajikistan is trusting multilateral institutions' support (technical, human resources and finance) to reduce electricity loss. According to some estimates electricity production and transportation losses can be reduced by 30% (UNDP, 2013, p.1).

However, unless the problem of TALCO aluminum plant, which consumes 40% of power produced (World Bank, 2012), is resolved energy sector of Tajikistan will remain inefficient. The problem of TALCO, which is gobbling up of Tajikistan's electricity in a most non-transparent manner so that the government could immediately collect rents off exporting aluminum. TALCO provides up to 70% of the country's foreign currency earnings. So the government remains quite sensitive to any significant reform initiative of this enterprise.

TURKMENISTAN: Neutrality and Integration into Global Energy System

Turkmenistan is the country in the region domestic energy policy of which is almost completely linked with its international energy interests. Energy production and consumption balance shows that, due to a large-scale exploitation of natural gas fields and rising gas production rate, Turkmenistan has sufficient energy supplies to meet its energy needs. However, Turkmenistan has always been considered as a source of energy and the largest share of production has been exported. After the collapse of the Soviet Union due to lack of investment in maintaining Turkmen gas sector and decreasing demand for energy all over the Soviet space the level of energy production has been decreasing up until the end of the 1990s.

Figure 5 – Primary energy production and consumption (quadrillion Btu) of Turkmenistan (EIA, International Energy Statistics: Turkmenistan)



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

Primary policy priority – Integration into global energy system

Having one of the richest natural gas reserves in the world the government of Turkmenistan prioritizes integration into global energy system and for the moment refrains from active cooperation with other Central Asian states (Government of the Republic of Turkmenistan, 2011). "The Program for the Oil and Gas Industry Development of Turkmenistan till 2030" is an important document determining energy security strategy of the country (State News Agency of Turkmenistan SNA, 2014). Having experienced negative consequences of almost complete dependence on Russian pipelines to move energy out of the country, Turkmenistan wants to diversify export portfolio to all possible directions (China, South Asia, Europe and Iran) with long-term commitments including swap deals. While the government in its foreign energy policy prioritizes integration into global energy system, which basically implies connecting its energy reserves with external energy markets, so far it has largely succeeded only to swap Russian patronage for Chinese. China expects to import up to 80 bcm/y of gas from Central Asia by 2020. Being least connected and dependent on other Central Asian countries' energy resources it is not surprising that the Turkmen government decided to isolate itself from tensions over the shared management of water and energy resources in the region.

Second policy priority – Implementing major energy projects

To meet external energy demand Turkmenistan has to develop giant gas deposit "Galkynysh" (SNA, 2014) (in the east) and connect it to the major gas pipelines located in the Western parts of the country via "East-West" trans – Turkmen gas pipeline (Chernayev, 2012). By developing this field only Turkmenistan will be able to fulfill its obligations to external customers but it is happening very slowly.

Exporting energy to external customers, however, does not contribute to energy security of the country. Only the export of gas to the neighboring Uzbekistan in case of

emergency and potentially to Tajikistan and Kyrgyzstan via Central Asia – China Gas Pipeline's Line-D and in exchange receive (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 export of upstream countries' electricity to Turkmenistan again through swap agreements with Uzbekistan have a potential to contribute to the sustainability of the Turkmen energy sector. The fact that Central Asian energy is currently transported through Kazakh territory only adds strategic importance to the Line D pipeline with the capacity of 30bcm/y, which is designed to move natural gas avoiding Kazakhstan, and thus, has a very high chance of near future completion. However, as it was discussed earlier it is less likely that any of such trading arrangements, between Turkmenistan and other Central Asian countries, would take place unless conflict between Uzbekistan and upstream countries is resolved.

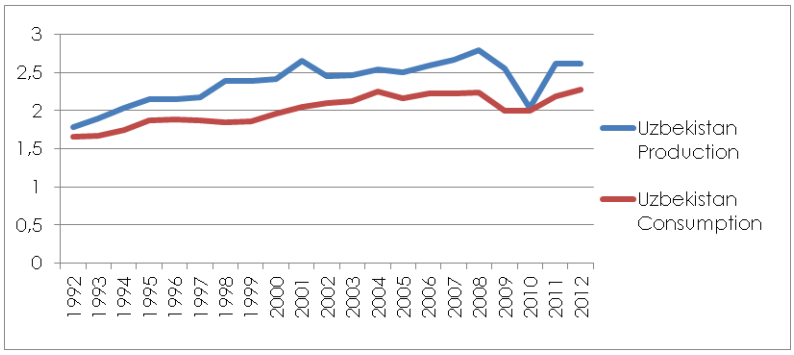
UZBEKISTAN: Prioritizing Stability in Energy Policy

Uzbek authorities believe that Uzbekistan is among few countries in the world that are sufficient in energy supplies to meet their energy demands. Being guided by the belief of self-sufficiency it withdrew from the CAPS and signed a number of agreements on exporting energy to external markets. To keep prices affordable the government of Uzbekistan is subsidizing its energy sector. Sustainability of Uzbek energy sector is another energy policy area that authorities often highlight in their speeches. The evidence, however, shows that Uzbekistan neither enjoys energy security, nor is capable to keep subsidizing its energy sector without negatively affecting overall economic development of the county.

Energy production capacity

Uzbekistan is a major producer of primary energy resources in the region. Its natural gas production capacity exceeds 60 bcm/y. Uzbekistan produces over 100 thousand barrels of oil per day. It is also a coal producer in the region, overall production of which accounts for approximately 4.2 million short tons (U.S. Energy Information Administration, Uzbekistan). Due to considerable primary energy production capacity Uzbekistan was able to cover the volume of power that was previously imported from neighboring upstream Central Asian states. However, the analysis shows that Uzbekistan is far from achieving the status of a country that is fully sufficient in energy supply. Installed capacity of Power Plants in Uzbekistan exceeds 12,3 GW (capable to generate annually up to 48 billion kWh of electric power and more than 10 mln. Gcal of thermal power) equals 50% of all generating capacities of the Interconnected Power System of Central Asia (Government of the Republic of Uzbekistan GoU, Energy resources of Uzbekistan, n.d.). It, however, consumes almost as much energy as produces (Chart 6), and yet the level of consumption does not fully meet energy needs of the country. Moreover, increasing volume of energy export will further affect availability of energy supplies to domestic market.

Figure 6 – Primary energy production and consumption (quadrillion Btu) of Uzbekistan (EIA, International Energy Statistics: Uzbekistan)



Energy insecurity

High level of consumption is justified by the fact that Uzbekistan's economy is energy intensive. Population of 29 million people (almost half that of the region's) is another factor that can explain high rate of energy consumption. Being guided by the belief that Tajikistan and Kyrgyzstan needs Uzbek energy more than it needs electricity generated in upstream countries, Uzbekistan decided to withdraw from the CAPS. Uzbekistan's electricity production capacity saved it from experiencing serious electricity shortages. An attempt to meet its own electricity demand, however, turned to be both economically inefficient and environmentally damaging. Uzbekistan may not be in crucial need of electricity import to survive. But energy security is not only an issue of survival. It is the sufficiency of electricity supplies to meet economic and population needs for the foreseeable future that Uzbekistan does not enjoy.

Primary policy priority – Securing affordable energy prices

Energy sector of Uzbekistan is highly subsidized. Uzbek household consumers pay $50 per thousand cm of gas, while Uzbekistan exported gas for the last several years at round the price of $300 per thousand cubic meters. Currently, the government subsidizes around $10 billion in its gas sector alone (IEA, Fossil fuel consumption subsidy rates, n.d.). Due to financial difficulties, however, Uzbekistan cannot afford to continue subsidizing energy sector and keeping prices low without negatively affecting economy. Since private energy companies refrain from engaging in the distribution and sale of gas in the domestic market, which is highly subsidized, the national energy provider "Uzbekenergo" fully controlled by the government is responsible for ensuring affordability of energy at high economic cost.

Second policy priority – Increasing energy export capacity

Uzbekistan had been supplying approximately 15bcm of gas to Russia, 10bcm to China, and 4.5bcm within Central Asian region. Leaders of Uzbekistan and China also agreed to increase the volume of gas supply up to 25bcm by 2016. However, outdated and inefficient natural gas transportation systems, growing internal energy 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.

Third policy priority – Ensuring sustainability and rational use of resources

Burning fossil fuels in winter produces 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 period. In return Uzbekistan exported power produced in gas-fired TPP to upstream neighbors in wintertime and provided heating services to its population. Majority of Uzbekistan's population receive heat 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 power production in summer months with no need for heat generation.

Lack of energy management accountability and transparency

The analysis above highlights particular areas of activity that the Central Asian governments prioritize in their national energy policies. Having remained in power for decades it is not surprising that except for Kyrgyzstan that has recently undergone regime change Central Asian elites refrain from elevating the problem of lack of accountability as well as corruption in energy sector and rent-seeking to the state policy priority level. Central Asian energy policies can be characterized as short-term oriented, state centric and hydrocarbons/hydropower focused. This basically implies that Central Asian elites having retained control over energy resources' extraction and production industries try to take maximum benefits out of them while remaining in power.

There are in fact many examples of rent seeking that plague the Central Asian energy sectors including: the "Kazakhgate" scandal over the secrete account in Swiss bank on payment made for oil contract; Bakiev's energy sector reform as a result of which power sector of Kyrgyzstan was partially privatized and exported, pocketed by the ruling regime even at the expense of creating serious domestic blackouts; nationwide obligatory collection of money to build the Rogun dam in Tajikistan; the scandal around Zeromax conglomerate in Uzbekistan that was believed to be controlled by the daughter of the President; and the problem of lack of transparency in regards to "stabilization fund" of Turkmenistan. So the Central Asian elites and their political clients collect rents and extract private benefits from mismanaging their energy sectors and thus quite carefully approach energy sector management accountability and transparency. That is the reason for not raising this issue to the state policy level even though ensuring both short-term availability of resources and long-term sustainability of energy sectors are highly dependent on reforming energy governing system.

INSECURITY OF THE CENTRAL ASIAN ENERGY SYSTEM

The CAES over the last decade has undergone transformation, in which due to political and economic constraints regional energy producers decided to redirected export of their resources to external markets. However, it is now more evident that opening up new markets does not necessarily contribute to the level of energy security in the region. Unaccountable and non-transparent management of energy sectors does not guarantee that revenues from exporting resources would be directed to improving capital-intensive energy efficiency and RES development sectors. Despite clear advantages of intra-regional cooperation in energy sector lack of trust overshadows energy security interests and Central Asian countries to a different extent keep pursuing isolationist energy policies.

The problems and prospects of regional energy cooperation

As the analysis clearly illustrates that intra-Central Asian energy cooperation is no longer a priority energy policy for the regional state actors. Uzbekistan considers itself capable of entirely meeting electricity as well as gas/fuel needs of the country. Within the framework of its National Development Programs Uzbekistan prioritizes "stability"— a status quo in energy and water consumption. Uzbekistan enjoys over 50 percent of water withdrawal in Central Asia— the amount necessary to cultivate high quantities of water-intensive cotton (GoU, Investments, n.d.). Any project that brings major changes to the status quo are considered to be compromising stability and thus, unacceptable. Uzbek government's inflexible position regarding construction of Rogun and Kambarata-1 is a clear example of its static energy policy. Despite the fact that lack of intra-regional energy cooperation is negatively affecting energy security of Uzbekistan it continues to avoid resolution of water-energy nexus problems in Central Asia, because current water distribution perfectly suits its interests. Moreover, Uzbekistan warns to use actions, including force, against any serious interference with the current level of water withdrawal in the region (Fuel Energy Sector Transparency Initiative in Kyrgyz Republic FESTI, 2012). 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. Uzbekistan has been using this advantage for purposes other than that to improve energy security of the country.

But there are some prospects for increasing intra-Central Asian energy cooperation. Prolonged energy supply cuts force other Central Asian countries to accelerate the process of establishing independent energy systems and thus, decrease Uzbekistan's energy leverage over them (F. Tolipov, personal communication, 2013). So keeping the minimum level of energy exchange serves its strategic interests. The fact that Kazakhstan can still benefit from exchanging energy resources with Kyrgyzstan and Uzbekistan as well as an important energy transit status of the country will keep it engaged with intra-regional energy trade. More than 90% of Turkmen gas has to pass the territory of the Central Asian countries. So the stability and security of the region is in its direct interest. Cheap and clean electricity

import from upstream countries would allow Central Asian downstream countries to efficiently use natural gas by saving it for export.

Small HPPs and a countrywide power transmission networks will not solve the problem of energy shortage in wintertime. Development of oil and gas fields due to difficulty of extraction and transportation of these resources is too costly. Unlike Kyrgyzstan that may rely on Kazakhstan and Russia to ensure limited winter energy supplies, Tajikistan has no state actor in the region to entrust assisting in energy crisis mitigation. Tajik authorities realizes the importance of intra-Central Asian cooperation in energy sector, but does not possesses power either to force or encourage neighboring Uzbekistan to reinstate energy trade and cooperation. Surplus of power generation in summer (3-5 billion kWh per year) and electricity shortage in winter (2.5 billion kWh per year) provides some prospects for mutually beneficial energy trade in the region (PoT, 2014). Being unable to export extra-produced electricity in summer to neighboring Uzbekistan, Tajik authorities with the support of some international actors such as the Asian Development Bank and the World Bank wish to redirect this power to energy hungry South Asian countries. However, CASA-1000 will not solve energy security problems of the Central Asian upstream states because it is designed to move energy out of the region.

Competing energy markets

Having experienced negative consequences of excessive dependence on the Russian pipelines, Central Asian exporters started pursuing diversification of energy export routes to obtain access to various energy markets. However, the Central Asian region is considered to be a source of energy for external customers and increasing the volume of energy export is having a reverse affect on availability of energy for domestic and intra-regional consumption.

Multilateral institutions as well as state actors promote regional cooperation through five priority energy corridors. Taking into account limited energy production capacity, regional energy trade within one corridor may negatively impact availability of energy resources for trade within another corridor and the relationships in the gas sector clearly illustrate that. Current level of gas export capacity of Kazakhstan, Turkmenistan and Uzbekistan to external markets does not exceed 65-70bcm per year. Even though Central Asian producers are not supplying gas in all five directions and some corridors (to South Asia and to 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 keep up with growing demand within already connected corridors (towards Russian, Chinese directions and intra-Central Asian cooperation):

- Central Asia-East Asia (CAGP – over 80bcm per year)
- Central Asia-South Asia (TAPI project – 33bcm per year)
- Intra-Central Asia Cooperation (up to 6bcm per year)
- Central Asia-Russian Federation (CAC - up to 50bcm per year)
- Central Asia-European Union (Trans Caspian Pipeline – around 30bcm per year)

The European sanctions against Russia and tensions between Central Asian upstream and downstream countries led to the decreasing of the gas trade volume within the Russian and intra-Central Asian corridors. As a result, the volume of gas export and thus, dependence of the Central Asian producers on the Chinese market is increasing. To decrease such

dependence regional producers are showing even greater desire to promote the South Asian and European corridors, which are still in the planning stage. Taking into account the fact that the demand for natural gas, including Central Asian gas, in the world is expected to increase, regional gas flow will most likely be restored/initiated in all directions. On the one hand, inability to meet growing demand may lead to a conflict of interests and competition between customers. On the other hand, it may affect sufficiency of energy resources for producers' internal consumption. While the Central Asian corridor due to its relatively insignificant volume of energy trade should not seriously threaten availability of energy resources to external customers, regional producers' own desire to generate high revenues and importing states' direct interest in moving energy out will result in energy export increase even at the expense of domestic and intra-Central Asian consumption. In this regard, the creation of broader energy 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 escalating the conflict.

Major source of disagreements

Around 80% of water in Central Asia is generated in upstream Tajikistan and Kyrgyzstan. More than 80% of it, however, is consumed by downstream Kazakhstan, Turkmenistan and Uzbekistan. While such distribution of water perfectly suits downstream countries' interests, Tajikistan and Kyrgyzstan believe it is unfair. With the exception of Toktogul HPP in Kyrgyzstan, hydropower generation facilities in upstream Central Asian states is a run-of-river type HPPs generating electricity only in summer. So the majority of the HPPs have to generate full electricity output in summer or spill water (Asia Development Bank ADB, 2012). Experiencing severe electricity shortage justifies Tajikistan's desire to have at least one (Rogun) reservoir to store enough water to produce electricity in wintertime. This project, however, turned to be one of the main reasons for disagreements between Uzbekistan and Tajikistan.

The analysis shows that giant HPPs may not significantly contribute to energy security of the Central Asian upstream states in the short run. And if the temporary suspension of the construction of Rogun and Kambarata-1 can lead to restoring regional trade state actors should seriously consider this option.

335 meters high Rogun HPP may almost double current production capacity (16,5 billion kWh per year) by adding 13 billion kWh per year. It, however, will take up to 16 years till the plant starts operating in its full capacity. And for this period electricity production in winter will remain mostly limited.

Taking into account the fact that Tajikistan does not possess sufficient funds to complete the project worth $3-6 billion (Trilling, 2009) and foreign investors are not rushing to invest in it due to high security risks Rogun's large-scale contribution to energy security will most likely be further postponed.

Current high security risks affect investment climate, in which to further pursue construction of the dam Tajikistan will be forced to accept terms not serving its best interests (M. Olimov, personal communication, 2014). Tajikistan has already refused to agree on investment conditions proposed by Russian companies demanding higher stake (75%) in benefits distribution. Same terms was accepted in the construction of Sangtuda-1 HPP and power produced in this plant is now being mostly exported since Russian side has to recover its investments, which affect availability of power for domestic consumption. In this regard, it is preferable to look for foreign investments once the security issues over the Rogun are more or less resolved.

Tajikistan expects to increase power export capacity through the Rogun HPP. However, potential customers (South Asian states) are mostly in need of electricity import in winter. Thus, following policies of the Central Asian hydrocarbon producers, Tajikistan may also pursue increasing export of electricity even at the expense of domestic consumption. Desire to export electricity in wintertime will turn Rogun and Kambarata-1 into economically attractive, but with limited contribution to energy security project.

Lack of trust

Construction of large HPPs in combination with increasing intra-Central Asian energy trade would of course 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 as it seems right now is the trusting issue: Tajikistan does 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 rightfully allocated to it. 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 is to purchase electricity from Tajikistan and Kyrgyzstan, which is generated by releasing water from reservoirs. Intergovernmental agreements between Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan on using water-energy resources of Syrdarya and Amudarya basins imply multilateral format of negotiations on exchanging water and power. However, starting from 2008 Uzbekistan only signs bilateral agreements ("Kirgiziya virazila sojalenie, chto Uzbekistan ne jelaet sotrudnichat v voprosax stroitelstva GES (Kyrgyzstan regrets that Uzbekistan is not willing to cooperate in building HPP)," 2013) and avoids multilateral negotiations on large HPPs.

At the same time, there are several factors indicating that Uzbekistan may want to reconsider its position in the near future. First, the level of energy security in Uzbekistan will continue to decrease leaving it no choice but to look for the most rational way of using available energy resources. Second, the only leverage left in the hands of Uzbek authorities to force Tajikistan to give up the idea of 335 meters Rogun HPP construction is the threat to use military intervention. While the threat itself may have an impact, acknowledgement that none of the regional states want to destabilize the region decrease the potential effect of such threats.

POLICY CHOICES MATRIX

	1	*2*	*3*
Goals/criteria▼	**Status Quo** (Energy policies to establish independent energy systems)	**Integrated Central Asian Energy System** (Energy policies to ensure sustainable and long-term energy security)	**Energy trade to meet current demand** (Energy policies prioritizing short-term security of energy supplies)
Security of Energy Supplies (Diversification of energy by source and transport routes; Stability and reliability of supplies)	**Prospects:** -Independent energy systems are less vulnerable to unilateral energy supply cuts. **Challenges:** -National energy systems are not designed to operate independently: a) High dependence on fossil fuels; b) Insufficient energy supplies; -Increasing export at the expense of domestic consumption.	**Prospects:** -Stable and reliable supplies of diversified energy sources; - Joint investments in energy projects; - Savings in infrastructure cost – upgrading existing; - Regional energy governance mechanism.	**Prospects:** -Diversification of energy sources; - Rational use of water and energy; -Sufficient energy supplies to meet peak demands. **Challenges:** -Energy transportation loss – lack of joint investments in maintenance.
Energy demand management: (Fossil fuel demand reduction; balanced distribution of resources)	**Challenges:** -Increasing fossil fuel consumption; - Inability to meet peak energy demands.	**Prospects:** -Fossil fuel demand reduction as a result of policy initiative; -Ability to meet energy demand peaks; -No export at the expense of domestic consumption.	**Prospects:** -Fossil fuel demand reduction (for Uzbekistan and Kazakhstan) due to exchange of energy resources; -Ability to meet energy demand peaks. **Challenges:** **-**Energy export still prevails over domestic consumption needs.
Energy Efficiency Energy consumption growth	**Prospects:** -Forced to increase energy efficiency. **Challenges:** -Water spills in summer; -Inefficient use of fossil fuels.	**Prospects:** -Guaranteed and long-term availability of energy for both Upstream and Downstream countries all year round.	**Prospects:** - Winter energy supplies – business operates all year round; **Challenges:** -No mechanism to ensure reliability and stability of energy supplies

Economic aspect (Total fuel costs/GDP; Fuel import - % of GDP)	**Challenges:** - Subsidized energy sectors – Downstream CA; - Increased energy price – Upstream CA; - Cost of independent energy systems increases energy price.	**Prospects:** -Rational use of energy; -Stable and predictable pricing policies; -Savings in energy sector operating and investment costs.	**Prospects:** -Sustaining affordable prices; -Decreasing the total fuel price. **Challenges:** -Vulnerability to imported energy hikes.
Environmental aspect (Green house gas emissions)	**Prospects:** -Slowly developing RES. **Challenges:** -Development of fossil fuel deposits – Upstream CA. - Increasing fossil fuel consumption – Downstream CA.	**Prospects:** -Rationally use energy resources; -Sharing the knowledge of RES development.	**Prospects:** - Balanced consumption of fossil fuels. **Challenges:** -Increasing import of fossil fuels – Upstream CA; - Increasing fossil fuel consumption – Downstream CA.
Human Dimension (Increase the fraction of population with access to basic energy services)	**Challenges:** -Energy insecurity due to seasonal variations; -Isolation of some regions from Central supply chain; -Increasing export at the expense of domestic household consumption.	**Prospects:** -Stable and reliable supplies within the whole CAES; -Governance instruments to gradual transition to a more sustainable energy system.	**Prospects:** -Winter energy supplies – Upstream CA; -Smooth transition to RES technology in remote areas. **Challenges:** -Unstable energy supplies; -Increasing export at the expense of domestic household consumption.
Military/Security Dimension (Conflict over resources)	**Challenges:** -Exposure to military conflict over Rogun and Kambarata-1 HPPs; -Using "energy weapon".	**Prospects:** -Low risk of conflict over resources among Central Asian countries; - Coordinated response to security/military threats. **Challenges:** -Some external security state actors may perceive such union as a threat.	**Prospects:** -Security of supply and transit of energy in the period of crisis to avoid social uprising and political confrontation. **Challenges:** -Risk of military confrontation; -States are not secure from "energy weapon".
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:** -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.	**Prospects:** -Short-term and bilateral contracts for the functioning of the CAES are better than disintegrated system. **Challenges:** -No effective and trustworthy mechanism regulating regional cooperation.

Policy option 1: Along the way towards independent energy systems (Status Quo)

The status quo is characterized by 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 energy resources may potentially improve country's ability to resist unilateral sudden energy supply disruptions, disintegration of the CAES negatively impacted the level of energy trade. It became obvious that energy trade disruption without yet establishing self-sustaining independent energy systems affects to a different extent energy security of all Central Asian states.

Being guided by the belief of self-sufficiency Uzbekistan decided to withdraw from the CAES and redirect energy export to external markets. Due to its strategic location on the crossroad of all energy-transporting roads that decision affected the level of energy security in the region. Energy supply cuts in combination with highly subsidized and inefficient energy sectors, underdevelopment of RES, lack of countrywide power and gas transmission networks as well as disagreements over the water-energy balance have severely affected availability and affordability of energy supplies to Central Asian upstream countries and sustainability of downstream states' energy sectors.

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

a) Construction of new gas-fired TPPs in Turkmenistan;

b) In Kazakhstan, an enlargement of the 500 kV transmission lines connecting north with south, and construction of the Beineu-Bozoy-Shymkent pipeline to transport natural gas from the gas-rich regions to southern parts of Kazakhstan and Tobol-Kokshetau-Astana pipeline;

c) For Uzbekistan building new small HPPs and coal/gas-fired TPPs;

d) For Tajikistan establishing countrywide power transmission lines and construction of Rogun HPP;

e) For Kyrgyzstan completing 500 kV North-South transmission lines and building Kambarata-1 as well as Kara-Keche TPP.

So the Central Asian countries may strengthen their national energy systems at some point, but the transition will be accompanied by worsening the level of energy security in some countries, unfavorable investment climate to promote energy led economic growth in others (Central Asian countries' energy insecurities are discussed in detail in the previous sections).

Policy option 2: Integrated CAES

Establishing and operating independent energy systems within still interconnected networks bears high cost and negatively impacts the level of energy security in Central Asia. From solely energy security perspective, re-integration of the CAES would be the most promising policy option to address energy security challenges in the region. Joint operation of the Central Asian energy system 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 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 to ensure energy security in the long-term perspective. Long-term 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 private sector to participate in energy projects and the economy as a whole. Market mechanisms prevailing within the CAES may contribute 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, having perceived interdependence within the system as a factor threatening national security Central Asian states would refrain from full-scale reintegration of their energy sectors. Lack of political will is considered to be a major obstacle towards establishing CAES. Central Asian countries' current energy security policies are state centric, export focused and short-term oriented. Having perceived energy as strategic commodity state actors would try to maintain full control over production, distribution and transportation of these resources. Being tempted by revenues to fill up the budget from selling resources Central Asian governments pursue policies to increase export capacity even at the expense of domestic and intra-regional energy consumption. Short-term oriented energy policies also impact sustainability of the Central Asian energy sectors.

Policy option 3: Intra-Central Asian energy trade to meet current demand

While the CAES implies further integration of the Central Asian energy sectors, restoring energy trade may either lead to integrated energy system or provide conditions for smooth transition to independent energy systems depending on which policy priority Central Asian governments will choose. This policy option implies that Central Asian countries would only assist each other to meet insufficient energy resources obtaining of which would otherwise be impossible or cost inefficient, especially during (winter) energy demand peaks. It may only contribute to energy security level of the Central Asian region in the short run, but it may nonetheless be an important first step towards achieving a maximally secure CAES in the future. While increasing Intra-Central Asian energy trade requires to some extent reconsideration of the state actors' energy policy priorities, questions of sovereignty, strategic interests and distribution of gains are not as acute as in case of the CAES reintegration and thus, more acceptable to Central Asian governments.

Complementarity of energy resources

Central Asian countries do not only possess significant amount of resources, but also enjoy comparative advantage in developing different types of energy sources, which provides incentive for intra-regional trade (Tajikistan and Kyrgyzstan enjoy 5.5 percent of the world's economically efficient hydropower potential; Kazakhstan possesses considerable amount of oil and is among first ten in explored coal reserves; Uzbekistan is the major natural gas producer in the region; Turkmenistan is the largest natural gas exporter in Central Asia and enjoys fourth place in terms of gas reserves in the world). While diversification of sources in the overall energy balance is often tied to RES, in the context of the Central Asian region it is the exchange of hydrocarbons and hydropower, which can provide sustainability of supplies in the medium run. Having benefitted from exchanging different types of resources Central Asian states enjoyed stability and reliability of energy supplies for many decades.

However, disintegration of the CAES now forces state actors to develop a particular type of energy source and thus, become vulnerable. Intra-Central Asian energy trade can contribute to the diversification of energy sources in the balance of energy consumption.

Sufficiency of energy supplies

Kyrgyzstan and Tajikistan suffer from high-level import of primary energy resources with a very limited possibility to diversity their dependence on existing electricity transmission lines and energy transportation networks from and through Uzbekistan. Hydropower is the main source of energy for these countries. However, run-of-river type HPPs produce electricity only in summer period, leaving countries in energy crisis in winter. Having quite a few diversification options Tajikistan and Kyrgyzstan may hope to receive Kazakhstani fossil fuels and thermal power. Another possibility is to potentially use transited Turkmen gas to China by Tajikistan and Kyrgyzstan when Central Asian Gas Pipeline's D-line is constructed. In any case, it is the Central Asian producers themselves that can supply additional volume of energy to upstream states. And using existing infrastructure remains the most cost efficient way to improve energy security in upstream Central Asian states.

Sustainability and efficiency of energy supplies

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[2]. Apart from environmental considerations (burning fossil fuels is the source of green house gas emission[3]) producing electricity in TPPs during summer period is cost inefficient. In winter, TPPs produce electricity and provide heating opportunity, while in summer only electricity. Importing electricity from upstream Central Asian states, which have a surplus of clean and sustainable power production during the summer, would benefit downstream countries by providing possibility to use their fossil fuels more efficiently with limited green house gas emissions.

Inherited energy transport infrastructure

Building infrastructure connecting energy producing and consuming sites is probably the most time, energy and finance consuming part of establishing energy system. Central Asian countries inherited energy infrastructure (Central Asia – Center, Bukhara-Tashkent-Shymkent-Almaty-Bishkek and Uzbekistan - Tajikistan gas pipelines and the Central Asian Power Grid) capable to transport 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. In this sense, interconnected energy systems entail two key economic benefits: savings in operating costs of the interconnected power and pipeline systems; and savings in investment costs of upgrading interconnected power systems.

Alternative Power Transmission lines

Once Kazakhstan, Kyrgyzstan and Tajikistan complete establishing their independent power networks connecting North with South, there will be a possibility to connect Southern Kazakhstan with Northern Kyrgyzstan via Kemin - Alma 500 kV transmission line and Southern Kyrgyzstan with Northern Tajikistan via Datka – Hodzent 500 kV transmission line (ADB, 2012). Alternative power system would then allow these three countries exchange electricity to

2 Reliance on fossil fuels as fraction of primary energy consumption: Kazakhstan – 98.9%, Kyrgyzstan – 68.4%, Tajikistan – 42.0%, Uzbekistan – 98.2%. (Appendix 5)
3 CO2 Emissions – metric tons per capita: Kazakhstan-11.3, Kyrgyzstan-1.4, Tajikistan-0.34, Turkmenistan-10.4, Uzbekistan-4.1 (Appendix 4)

meet seasonal power production deficiency. Establishing a well functioning alternative power system would require completion of independent national power systems, increasing electricity production capacities and connecting three countries by building trans-border transmission lines, which are quite a time and finance consuming projects. In the long run this might seem to be a good option. However, it is the increasing electricity trade within the existing Central Asian electric power grids that will make it possible to address short-term energy security challenges.

Decreasing the price of energy

In one of his speeches, President Nazarbaev highlighted that: "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" (Jakeev, 2014). 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.

Tajikistan and Kyrgyzstan already suffer from high prices for energy. In this regard, Central Asian states are in need of cheap 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 regional conflict over resources

Being guided by the belief of self-sufficiency Uzbekistan cut gas and power supply to upstream Central Asian states and in response Tajikistan and Kyrgyzstan are speeding up the process of Rogun and Kambarata-1 HPPs construction. Projects capable to affect water withdrawal balance 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, but also to war" (FESTI, 2012). Restoring and sustaining regional energy trade would be a gesture of good will from Uzbekistani side and encourage upstream states to sustain previous water-energy supply balance until Central Asian countries reach solutions amenable to them all.

CONCLUSIONS AND RECOMMENDATIONS

This policy study shows that reinstating intra-Central Asian trade is 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 overall consumption balance in the short to medium term perspectives. To achieve these goals policy study 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:

- Export of 500 mcm/y to Kyrgyzstan and 300 mcm/y of gas to Tajikistan from Uzbekistan and/or Turkmenistan under the condition that trading partners set a justified price;
- Power supply of 800 – 1,800 Gwh per year (depending on wet and draught years) from Tajikistan and Kyrgyzstan in exchange for the same amount of power thermal supply from Uzbekistan;
- 3,5 bcm/y gas supply to Southern regions of Kazakhstan either directly from Uzbekistan or via swap deals from Turkmenistan;
- 1000 GWh per year electric power supply from Turkmenistan to Tajikistan;
- Joint operation of the CAPS and coordinated electric power export/import among Central Asian states on the basis of annually renewed bilateral agreements.

Second, to reinstate and sustain intra-Central Asian energy trade it is advisable for decision makers and experts counseling them to reach united position over key attributes of the Central Asian energy security and develop 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 establish a platform for regular dialogue among experts directly advising decision makers, which can contribute to solving the problem of trust, from such institutions as:

Kazakhstan Institute for Strategic Studies under the President of Kazakhstan, The Library of the First President of 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;

National Institute for Strategic Planning and Economic Development of Turkmenistan.

Third, if there is a need for trade-off between energy trade and construction of large HPPs in the region, until Central Asian republics reach solution amenable to all, then it is recommended that:

- Tajikistan having completed 70 meters of Rogun dam starts operating two blocks of the HPP;
- Uzbekistan reinstates supplies of gas and electric power to Tajikistan especially to cover winter energy needs;
- -Parties provide guarantees that no further construction of the dam will be pursued and no sudden energy supply will take place.

Fourth, one of the main counter-arguments from Uzbek side regarding the construction of 335 meter high Rogun was the fact that studies conducted by the WB assessed environmental and social impact for only Vaksh river basin around the dam. In this regard, it is recommended that regional state actors seek 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 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 capable to reduce the extent of devastation. The assessment period will serve as a time frame for 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 non-state organizations within the CAREC program. Having limited financial capabilities Uzbekistan, Kyrgyzstan and Tajikistan may resist getting involved into projects requiring relatively large investments in building new and upgrading existing energy infrastructure, training personnel, and introducing new technologies on their own. Support from multilateral institutions will be a good incentive for them to pursue regional level energy projects. Attracting foreign investors through Public-Private Partnership initiative within the program might be a good alternative to reduce dependence on external state actors such as China or Russia.

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APPENDIX

Appendix 1 – Diversification by source (Balances for 2012 in thousand tonnes of oil equivalent (ktoe) on a net calorific value basis)

Production	Coal and Peat	Crude oil	Natural gas	Hydro	Biofuels and waste	Total
Kazakhstan	52763	82608	28550	657	59	164638
Kyrgyzstan	422	79	24	1219	4	1749
Tajikistan	180	30	9	1453	0	1672
Turkmenistan	0	11805	56223	0	0	68028
Uzbekistan	1354	3338	51088	964	4	56748

Source: International Energy Agency. Balances for 2012 in thousand tons of oil equivalent (ktoe) on a net calorific value basis. Retrieved from http://www.iea.org/statistics/statisticssearch/report/?country=KAZAKHSTAN&product=balances&year=2012

Appendix 2 –Diversification of electricity and heat generation (by fuel type) for 2012

Electricity GWh	Coal and Peat	Oil	Gas	Biofuels	Waste	Nuclear	Hydro	Geoth.	Solar	Wind
Kazakhstan	69421	735	13411	0	0	0	7637	0	0	0
Kyrgyzstan	728	180	81	0	0	0	14179	0	0	0
Tajikistan	0	0	74	0	0	0	16900	0	0	0
Turkmenistan	0	0	17750	0	0	0	0	0	0	0
Uzbekistan	2145	383	38762	0	0	0	11210	0	0	0

Source: International Energy Agency. Electricity and Heat for 2012. Retrieved from http://www.iea.org/statistics/statisticssearch/report/?year=2012&country=KAZAKHSTAN&product=ElectricityandHeat

Appendix 3 - Refining/fuel processing capacity (for 2012) as a fraction of primary energy consumption

	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Oil refinery 1000 tons	14458	84	25	7842	3071
Total Primary Consumption 1000 tons of oil equivalent	65065	6052	4791	22691	55481

Source: International Energy Agency. Kazakhstan: Oil for 2012. Retrieved from http://www.iea.org/statistics/statisticssearch/report/?country=KAZAKHSTAN&product=oil&year=2012

Appendix 4 – Greenhouse gas emissions

	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Total Carbon Dioxide Emissions from the Consumption of Energy (Million Metric Tons) for 2012	224.220	9.278	2.973	64.979	123.170
CO2 Emissions (metric tons per capita)	11.289	1.430	0.343	10.376	4.120

Source: U.S. Energy Information Administration. International Energy Statistics: Total Carbon Dioxide Emissions from the Consumption of Energy (Million Metric Tons). Retrieved from http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=90&pid=44&aid=8&cid=KZ,KG,TI,TX,UZ,&syid=2012&eyid=2012&unit=MMTCD

Source: U.S. Energy Information Administration. International Energy Statistics: Per Capita Carbon Dioxide Emissions from the Consumption of Energy (Metric Tons of Carbon Dioxide per Person). Retrieved from http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=90&pid=45&aid=8&cid=KZ,KG,TI,TX,UZ,&syid=2007&eyid=2011&unit=MMTCD

Appendix 5 – Reliance on fossil fuels as a fraction of primary energy consumption

	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Percent	98.9	68.4	42.9	n/a	98.2

Source: World Bank. Fossil fuel energy consumption (% of total). The World Bank Data. Retrieved from http://data.worldbank.org/indicator/EG.USE.COMM.FO.ZS/countries

Appendix 6 – Natural gas subsidies in billion dollars and percentage of GDP

	Natral gas subsidy in billion dollars			Percent of GDP
	2009	2010	2011	2011
Kazakhstan	0.21	0.22	0.33	0.15
Turkmenistan	2.17	3,55	4,36	14.80
Uzbekistan	9.29	9.28	9.09	18.88

Source: International Energy Agency. (n.d.). Fossil fuel consumption subsidy rates as a proportion of the full cost of supply 2013. Retrieved from International Energy Agency website: http://www.iea.org/subsidy/index.html

Source: Clements et al. (2013) Energy Subsidy Reform: Lessons and Implications. International Monetary Fund. p. 68. Retrieved from http://www.imf.org/external/np/pp/eng/2013/012813.pdf

Appendix 7 – Pump price for gasoline (US$ per liter)

	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
2012	1.01	0.89	1.45	0.22	1.02

Source: World Bank. Pump price for gasoline (US$ per liter). The World Bank Data. Retrieved from http://data.worldbank.org/indicator/EP.PMP.SGAS.CD?display=default

Appendix 8 - 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: Asia Development Bank. (2012). Central Asia Regional Economic Cooperation: Power Sector Regional Master Plan. Technical Assistance Consultant's Report, 2-1/2-2. Retrieved from http://www.adb.org/projects/documents/central-asia-regional-economic-cooperation-power-sector-regional-master-plan-tacr

Appendix 9 - Electricity distribution losses (Billion Kilowatthours)

	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
2011	7.4	21.8	16.7	12.7	8.8

Source: World Bank. Electric power transmission and distribution losses (% of output). The World Bank Data. Retrieved from http://search.worldbank.org/all?qterm=Electricity+distribution+losses+%28Billion+Kilowatthours%29&language=EN&op=