

Financing Infrastructure in Central Asia: Water and Energy Nexus

By Evgeny Vinokurov



Evgeny Vinokurov

Senior Analyst, Department for Strategy and Research

Eurasian Development Bank

Contact: Vinokurov_EY@eabr.org

The utilisation of water and energy resources in Central Asia is a complex issue. Almost 85% of the water resources are concentrated in Tajikistan and Kyrgyzstan.

These countries are mostly interested in exploiting rivers for electricity production. On the contrary, Kazakhstan, Uzbekistan, and Turkmenistan are hugely dependent on water resources for intensive irrigation. Periods of usage do not coincide. The vegetation period (spring-summer) is crucial for downstream riparian countries. However, the supply of water resources is inadequate during the vegetation period because upstream countries use this time to accumulate water in reservoirs. Conversely, the non-vegetation period (fall-winter) is the time of high-volume electric power generation for upstream countries. Consequently, large volumes of water are flowing downstream when they are not needed. It leads to the flooding and water logging of large areas of Kazakhstan and Uzbekistan. For example, wasteful discharges from the Toktogul reservoir in Kyrgyzstan average about three cubic km annually and have been as high as nine cubic km in some years. This water was not only lost for downstream use but also led to ecological damage.

During Soviet times, these contradictions were conveniently – if not necessarily efficiently – reconciled within the framework of the administrative system and planned economy of a single state. As the USSR broke up, this mechanism stopped working. A new solution is badly needed. The necessity of new energy generation projects, as well as an efficient infrastructure of energy transit is reinforced by the looming energy deficit. The volume of electricity production in the countries of the Eurasian Economic Community¹ (EurAsEC) fell from 1,279 billion kWh in 1991 to 1,132 billion kWh in 2005, i.e. by 11.5%.

The energy grids of the Central Asian countries and Russia are currently working in a parallel mode. Electricity trading is growing steadily after a sharp drop in the 1990s. According to a number of agreements within the CIS, customs duties are not imposed on these trade flows, and electricity transit is realised in an unimpeded manner². This is, however, not enough in itself to resolve the intricate problems of the Central Asian water and energy nexus. An attempt to set up a new regulation system was undertaken within the Framework Agreement on the Utilisation of the Syr Darya River's Water and Energy resources signed by four Central Asian states in 1998. Practical realisation of the agreement has, however, led to frustration. We assume that there are several elements which will eventually lead to an optimal solution for the Central Asian water and energy nexus. The availability of purely financial solutions should be framed politically. Under the new conditions of political independence and market economy, an efficient utilisation of water and energy resources is only feasible on the basis of market-based regulation within an efficient political and regulatory framework.

EurAsEC is well on its way to adopting the Concept for the efficient utilisation of water and energy resources in Central Asia. The Concept foresees: (1) the participation of Kazakhstan, Kyrgyzstan, Russia, Tajikistan, and Uzbekistan, with the possible participation of Turkmenistan; (2) the synchronisation of investment activities and water and energy regulation efforts; (3) the establishment of a permanent interstate executive body functioning as an investor and a dispatcher. Along with the Central Asian states, Russia is supposed to play an important role in the process as an investor, machinery supplier, and importer of electricity.

The installed generating capacity of all power stations in the United Power System of Central Asia amounts to approximately 25,000 MW, comprising about 9,000 MW in hydropower (36 percent) and 16,000 MW in thermal power stations (64 percent). However, the actual working capacity for hydropower and thermal plants is currently below 20,000 MW³. The largest hydropower stations in the grid are Nurek in Tajikistan with a capacity of 3,000 MW and Toktogul in Kyrgyzstan at 1,200 MW.

The realisation of the Concept and the ultimate solution of the water and energy nexus problem in Central Asia are tied to a number of large-scale investment projects. We estimate their value roughly at \$15 billion. They include: Rogun HPP, Sangtudin I and II HPP, Zeravshan HPP in Tajikistan; Kambarata HPP, Naryn HPP in Kyrgyzstan; the construction

of a number of thermal power stations in Kyrgyzstan and Tajikistan to compensate for the energy deficit during non-vegetation periods; the construction of power grids in a North-South direction leading to Russia; and the construction of power grids leading to other countries.

The construction of HPPs and water reservoirs will strongly advance economic growth of these two states and, if realised in conjunction with the interests of water supplies for the downstream countries, will ensure efficient utilisation of the whole industrial and agricultural potential of the Central Asian region. Also, looking at the political situation in Central Asia, the conflict potential of the water and energy nexus is enormous. Solving it in a correct and efficient way, based on economic integration and market principles, will lay the groundwork for lasting peace and security in the region.

Table 1. Potential investments in hydro power plants (HPP) and cascade HPPs in Tajikistan and Kyrgyzstan.

HPP	Location (river)	Installed capacity, MW	Output, million kWh	Cost (million USD) and potential investor
<i>Tajikistan</i>				
Sandtudin-1	Vaksh	679		250 to complete, Russia
Sangtudin-2	Vaksh	220		220, Iran
Rogun	Vaksh	3,600	13,100	560 to complete two units (600 MW each), Russia
Shurob	Vaksh	850	987	
Cascade HPPs at Zeravshan river	Zeravshan		up to 20,000	feasibility study conducted by China
Cascade HPPs at Pyandzh river	Pyandzh	300-4,000 each	up to 86,300	
<i>including:</i> Dashtigzhum HPP		4,000	15,600	3,200
Rushan HPP		3,000	14,800	
Shirgovat HPP		1,900	9,700	feasibility study conducted by Iran
Dzhumar HPP		2,000	8,200	feasibility study conducted by Turkey
Other cascade HPPs, total		up to 5,000		
<i>Kyrgyzstan</i>				
Kambarata-1	Naryn	1,900	5,088	1,700
Kambarata-2	Naryn	360	1,148	270
Upper Naryn cascade (4 HPPs), total	Naryn	352	1,600	540

Another issue not to be overlooked is the potential replacement of coal and gas as energy sources. When the Central Asian countries are able to profit from their vast supplies of cheap hydro energy, the opportunity will open up to expand hydrocarbon exports, in particular for Kazakhstan, but also for Uzbekistan.

The most realistic short-term investment projects in Tajikistan are Rogun HPP and Sangtudin HPP I and II. As soon as they are put into operation, which is feasible within five to seven years, electricity production in Tajikistan will reach 31-33 billion kWh. Since the country's own consumption is estimated at 23-25 billion kWh, exports may reach 8 to 10 billion kWh. At the same time, in Kyrgyzstan, the short-term prospects are linked to Kambarata I and II HPP, with a total installed capacity of 2,260 MW and a yearly output of more than 6,200 million kWh.

The total installed capacity of projects in table 1 exceeds 14,000 MW with the total cost of about \$15 billion. The construction of hydro power plants should be supplemented with a number of thermal power plants in Kyrgyzstan and Tajikistan to compensate for the energy deficit during non-vegetation periods. Another vital element of this complex energy system will be power grids via Kazakhstan in the North-South direction leading to Russia, as well as the construction of power grids leading to other countries (Afghanistan, China, India, Pakistan), in particular from Tajikistan. It will allow the Central Asian upstream countries to connect their energy sources with the power grids of neighboring countries, which will represent high-capacity markets for electricity from Tajikistan and Kyrgyzstan.

The Central Asian water and energy nexus is clearly a complex issue. An acceptable compromise between the economic interests of a number of states should be found. The participation of many players is not only possible but also highly desirable. Co-financing of investment projects is necessary to cope with the sheer weight of investments. Also, co-financing can be seen as a way of risk minimisation and political reconciliation. Therefore the participation of several countries, most importantly Russia and China, is foreseen. The active engagement of multilateral development institutions such as the ADB, EBRD, World Bank, and the Eurasian Development Bank is needed in order to advance investments, analytical activities, and technical assistance for the balanced utilisation of the water and energy resources.

Russia is highly interested in developing hydro energy in the region as an importer of electricity, an investor and a supplier of machinery. Russia's policy of advancing its

interests in the Central Asian region is coupled with promoting regional economic integration within various structures, primarily EurAsEC, and aiming at an efficient solution for the whole of the water and energy nexus taking into account the interests of the water-consuming countries.

Since 2003, RAO UES imports electricity from Tajikistan and Kyrgyzstan through the territory of Kazakhstan and Uzbekistan. In 2004, a loan agreement was signed between Russia and Kyrgyzstan whereupon the latter obtained \$100 million for the modernisation of the Toktogul HPP. Bilateral agreements have already been signed with Tajikistan for completion of the construction of Sangtudin-I by the Russian energy giant RAO UES and Rogun HPP by Rusal, the leading Russian aluminum company. The plans of the latter company are coupled with its intentions to build a high capacity aluminum factory in Tajikistan, which requires abundant supplies of cheap energy. This project has, however, proved to be problematic. The project structure might be changed to allow other investors, such as RAO UES and AES to participate in the project. Also, the Kyrgyz government has called upon RAO UES of Russia to resume its partnership in completing Kambarata HPP I and II upstream of the multi-year Toktogul reservoir in the Syr Darya basin.

China is also intensifying its investment activities in the region. Massive Chinese investments are expected both to provide sufficient electricity supplies in the western regions of the country and to advance China's strategic interests in Central Asia.

The latest developments include potential Chinese investments in the modernisation of the Kayrakum HPP and the construction of the Shurob HPP as well as the North-South power line (350 km, \$140 million) in Tajikistan. In addition, various business structures (Sinohydro, RAO UES, RosUkrEnergo) have expressed interest in constructing a number of HPPs on the Zeravshan river with a total cost of \$440 million. However, in March 2007, Tajik president Emomali Rakhmonov visited China and reached an agreement on the construction of an HPP at Zeravshan by Sinohydro. In addition, another Chinese company, GNTI, plans to participate in the construction of a thermoelectric power station with 100 MW installed capacity close to large coal deposits in Tajikistan, which will be used to supply electricity in the autumn and winter period. A feasibility study for this project is currently being prepared. China is also looking into a variety of projects for small hydro power plants in Tajikistan and into larger energy generation projects in Kyrgyzstan.

The international development institutions are also becoming important players in this regard. Along with investment projects, they are instrumental in conducting research and feasibility studies on various aspects of the Central Asian water and energy nexus. Equally important are their intentions to ensure a complex solution for the regional problem, taking into consideration the development impact of investments projects on all of the involved countries.

In 2005, the World Bank approved a \$100 million loan to Kazakhstan for the construction of a 500 kV, 475 km long North-South power grid. The construction of this power grid has ensured a decrease in the energy deficit in the southern areas of the country and has expanded exports to Russia. In 2006, the Asian Development Bank secured financing in the total amount of \$56.5 million for a power grid from Tajikistan to Afghanistan. In addition, ADB together with the Islamic Development Bank approved \$11.2 million in co-financing for micro-HPPs in the mountainous areas of Tajikistan.

EBRD is also active in the field. Its project portfolio includes the modernisation of a thermal power station in Uzbekistan and the expansion of power lines in Kyrgyzstan. In addition, the EU (through TACIS), the US (through USAID), OSCE and UNDP are undertaking various information, research, and capacity building projects.

Another new important player in the region is the Eurasian Development Bank (EDB), which was created by Russia and Kazakhstan in 2006. The bank is expected to become an important investment mechanism of infrastructure financing in the EurAsEC countries, in particular of infrastructure projects with a cross-border dimension, and an engine of regional economic integration. EDB's charter capital, which is to be paid in completely by 2008, is \$1.5 billion. Additional member states are also expected to join the Bank. Within its first year, EDB has become operational and expanded its project portfolio, which in the mid-term is expected to cover areas of energy and transport, the nuclear and space industries, agro-industrial infrastructure and machine-building. In particular, the Eurasian Development Bank is keen to play an important role in financing water and energy infrastructure in Central Asia. It is reviewing various projects, which include the potential construction of new hydro power plants in Kyrgyzstan and Tajikistan, the modernisation of existing objects, water management, and financing environmental projects. In addition, EDB is planning to provide sizeable technical assistance aimed at the establishment of a proper institutional and regulatory

framework within the EurAsEC, capacity building programs, feasibility studies and research projects.

To sum up, the solution for the Central Asian water and energy nexus lies in the intertwined issues of massive investment and a viable political framework of regional cooperation. It is possible to create such a political framework within the Eurasian Economic Community. It will be an important step toward economic integration in Central Asia, which will trigger further functional integration on such issues as common electricity markets and technological standards. At the same time, given the complexity of interests involved, infrastructure development in Central Asia demands co-financing of large-scale investment projects with the participation of various states and multilateral development institutions.

1. The Eurasian Economic Community (EurAsEC) is an organisation of regional economic integration with six member states: Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, and Uzbekistan.
2. Agreement on the parallel functioning of electrical energy systems of the CIS member states, November 25, 1998; Agreement on electrical energy and power transit in the CIS member states, January 25, 2000.
3. Asian Development Bank (2002) The Study on Water and Energy Nexus in Central Asia. www.adb.org/Documents/Reports/CAREC/Water-Energy-Nexus/water-energy-nexus.pdf