

CONSTRUCTION OF A SMALL HYDRO POWER PLANT AT A SITE LOCATED ON THE AK-BUURA RIVER

“CHAKAN HPP”



KYRGYZSTAN

DESCRIPTION OF THE PROJECT

The project involves the construction of a small hydro power plant (hereinafter referred to as SHPP) with a potential capacity of 20 MW, based on Papan reservoir located in the middle course of Ak-Buura river and designed to improve water supply to lands of Osh Region and water supply to Osh. The reservoir has a capacity of 260 million m³. The dam site is located in the narrow Qatar Gorge, cut by a river in a mountain group.



The main structures of the reservoir include a 120 m high blasted dam and a tunnel water passage combined with a construction tunnel and a surface flood spillway.

There are two openings at the bottom of the inlet end wall of the water passage, which then connect in a common tunnel with clear dimensions of 5*6 meters. The length of the tunnel is 501.5 meters. There is a metal siding of the tunnel threshold along the length of approximately 128 meters. The emergency repair chambers and main flat gates are located in the concrete part of the structure. The gates are maneuvered by hydraulic lifts located at the top of the inlet end wall using pressure-boosting rods.



In 2012-2013, Mercados - Energy Markets International (Spain) together with “NIIES” JSC (Russia) prepared a report “Kyrgyz Republic: Strategic planning of small and medium hydropower development. Stage I - Justification for selection of four pilot projects” containing recommendations and feasibility study for construction of new small and medium hydro power plants at the irrigation facilities (Tortgul, Papan, Kirov, Orto-Tokoi and Kugart HPPs).

The area of the allocation site is 6.5 ha.

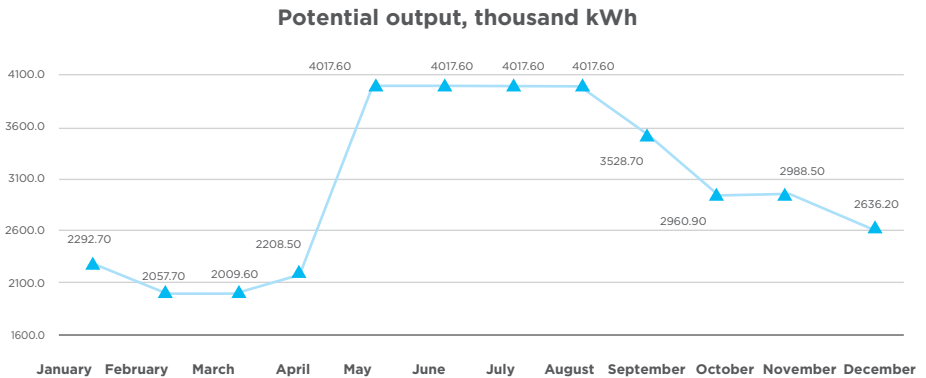
The average annual watercourse of the Papan reservoir was 21.3 m³/s.

Near the reservoir, there is a 2.5 MVA 35/6 kV Papan substation, which is connected through a 35 kV network (AC-70 mm - a wire change is required) to the 110/35/10 kV OSH-6 substation. The length of the line is approximately 30 kilometers. VL-35 also has a 4 MVA branch line to the 35/10 kV Katta-Sai substation.

Near the reservoir, at a distance of not more than 10 km from the substation, there is the settlement of Papan with no more than 4,000 inhabitants.

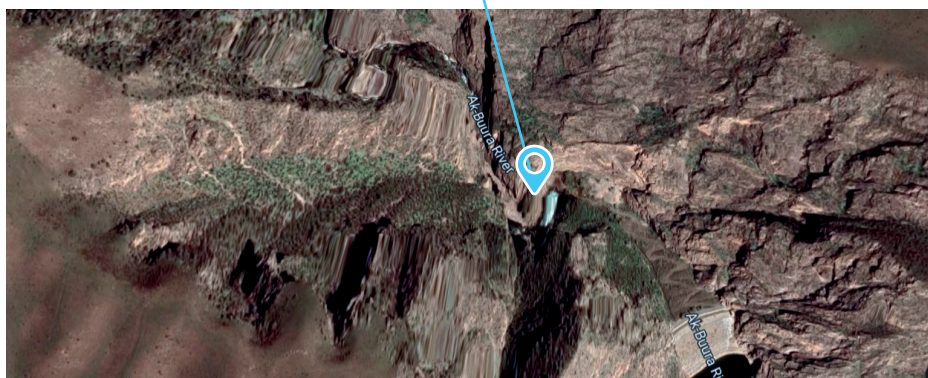
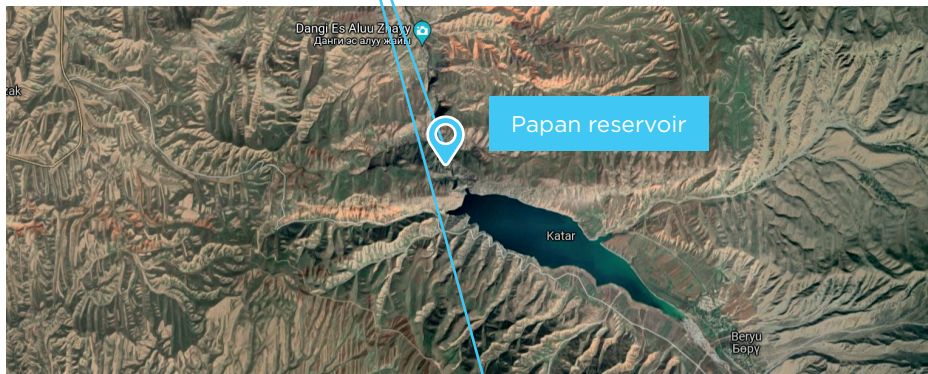
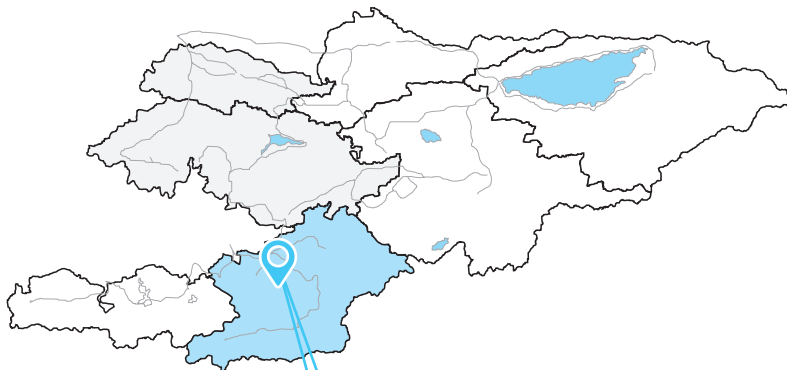
Potential annual electric energy output (thousand kWh) at Papan HPP is as follows:

January	February	March	April	May	June	July	August	September	October	November	December
2970.0	3140.0	4000.0	11900.0	19360.0	20 000.0	20 000.0	20 000.0	11300.0	8980.0	6800.0	2990.0



The potential annual average electric energy output is 93 million kWh.

GEOGRAPHICAL LOCATION OF THE PROJECT



DESCRIPTION OF THE PROJECT INITIATOR

“Chakan HPP” OJSC is a domestic company, wholly-owned by “National Energy Holding Company” OJSC. The main areas of activity are operation, design and construction of SHPPs in the Kyrgyz Republic, and generation, transmission and sale of electric energy.

“Chakan HPP” Open Joint-Stock Company was established on May 22, 2000 to ensure efficient use of SHPPs of the Kyrgyz Republic, based on the Alamedin HPP Cascade.

At present, the total installed capacity of the “Chakan HPP” OJSC is 38.5 MW and includes two production units Alamedin HPP Cascade and Bystrovskaya HPP.

- ✓ The Alamedin HPP Cascade consists of 8 small hydro power plants with a combined installed capacity of 29.78 MW, which are located in the Western Great Chüy Canal, on the outskirts of Bishkek.
- ✓ The Bystrovskaya HPP, with installed capacity of 8.7 MW, became part of “Chakan HPP” OJSC in May 2009. The plant is located in Kemin district, Nur village.

In August 2016, “Chakan HPP” OJSC became a subsidiary of “National Energy Holding Company” OJSC.

“Chakan HPP” OJSC sells electric energy in the domestic market and has 28 electricity consumers. At the same time, 80-90% of the electric energy is sold through “Severelectro” OJSC. The average annual electric energy output of “Chakan HPP” OJSC is 162.0 million kWh.



SUSTAINABLE COMPETITIVE ADVANTAGES

- ✓ **Nearby Papan substation 35/6 kV.** Near the reservoir, there is a 2.5 MVA 35/6 kV Papan substation, which is connected through a 35 kV network (AC-70 mm - a wire change is required) to the 110/35/10 kV OSH-6 substation. The length of the line is approximately 30 kilometers. VL-35 also has a 4 MVA branch line to the 35/10 kV Katta-Sai substation.
- ✓ **Advantageous location of the facility.** The location of the HPP was chosen in view of the possibility of creating the most efficient pressure and the convenience of organizing construction work.
- ✓ **High hydroelectric potential.** The hydroelectric potential of the country is 142 billion kWh. The Kyrgyz Republic ranks third in the CIS in terms of the HPP and SHPP capacity.
- ✓ **Increased tariffs for the purchase of electric energy.** According to the Renewable Energy Sources Act, energy tariffs are set at the level of the maximum tariff established for the country, applying multiplying coefficients depending on the type of RES, where the coefficient for small HPPs is 1.3.
- ✓ **Low development of the potential.** As of 2021, the utilization rate is 10% of the total hydroelectric potential of the country.
- ✓ **High capacity of HPP cascades.** According to experts, the total capacity of prospective HPP cascades is 5,600 billion kWh.
- ✓ **CASA-1000.** The Kyrgyz Republic is a member of the CASA-1000 project aimed at creating a power line linking Central and South Asia.



PROJECTED FINANCIAL INDICATORS

The preliminary amount of investments to implement this project will be USD 26,000,000. The calculations are based on the electric energy tariff set by the 2021-2025 Medium-Term Tariff Policy of the Kyrgyz Republic for Electric Energy and Heat Energy, approved by Resolution No. 192 of the Cabinet of Ministers of the Kyrgyz Republic dated September 30, 2021, and on stimulating coefficient for the generation of electric energy using water power according to Act of the Kyrgyz Republic No. 283 "On Renewable Energy Sources" dated December 31, 2008.

In this scenario, the tariff of sale of electric energy generated by the HPP will be 3.276 KGS* or 3.86 US cents* (at an exchange rate of 1 USD = 84.79 KGS).

Capacity	20 MW
Output	93 million kWh
Investments	USD 26 million

***According to the legislation of the Kyrgyz Republic, the project may be subject to a preferential tariff with application of a coefficient of 1.3 for small HPPs for a period not exceeding 10 years*

		1	2	3	4	5	6	7	8	9	10
Output	million kWh	93,0	93,0	93,0	93,0	93,0	93,0	93,0	93,0	93,0	93,0
Tariff	USD/kWh	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386
Revenue	thousand USD	3 589,8	3 589,8	3 589,8	3 589,8	3 589,8	3 589,8	3 589,8	3 589,8	3 589,8	3 589,8
EBITDA	thousand USD	3 277,8	3 277,8	3 277,8	3 277,8	3 277,8	3 277,8	3 277,8	3 277,8	3 277,8	3 277,8

- ✓ IRR at the end of Year 10 is 4.45%
- ✓ Project payback period is 7.93 years, discounted payback period is 9.78 years

SOURCES OF FINANCING AND APPLICATION OF FUNDS

Source of financing	Amount, USD
Financial investor	26 000 000
Total:	26 000 000

Application of funds	Amount, USD
Total cost estimate for the construction of the SHPP, including supply and supervised installation of electrical equipment	26 000 000
Total:	26 000 000

A BRIEF OVERVIEW OF THE ENERGETICS IN KYRGYZSTAN

Kyrgyzstan is rich in water resources. A huge amount of water-power resources are concentrated in the republic, with the total technical potential of all watercourses in the country estimated to be 16,580 MW in capacity or 142.5 billion kWh in electric energy generation. By this indicator, Kyrgyzstan ranks second place in Central Asia, second only to Tajikistan.

Hydropower and the entire energy industry in Kyrgyzstan are one of the main development areas of the country. The potential is huge, but it has not yet been fully unlocked. At the moment, only 10% of the potential is utilized.

- ✓ Each year, Kyrgyzstan generates about 15 billion kWh of electricity.
- ✓ There are seven major hydro power plants in the country: Toktogul, Kurpsay, Shamaldysay, Tash-Kumyr, Uch-Kurgan, Kambarata-2 and At-Bashy.
- ✓ There are 2 thermal power plants, in Bishkek and Osh.
- ✓ The total length of power lines in the country is 64,700 km.

98% of all electricity in Kyrgyzstan is generated by “Electric Stations” OJSC. The company owns 7 HPPs and 2 TPPs. The company’s largest facility is the Toktogul HPP, which generates 30 percent of the country’s electricity. Its reservoir holds 19 billion cubic meters of water, thus regulating the flow of the Naryn River and affecting the water distribution of the entire Syr Darya basin. The capacity of the HPP is 1,200 MW. The Toktogul Reservoir Dam is 215 m high and 292 m wide.

In the northern part of the country, the largest electricity producer is the Bishkek TPP, which supplies about 15% of the country’s needs. The capacity of the TPP is 812 MW.

Kyrgyzstan has significant potential in the small hydropower sector. This resource can be used to supply both large cities and remote areas and villages. At the same time, SHPPs, compared to standard HPPs, do not require large-scale construction, huge capital investments and flooding of areas used for reservoirs. Modern technologies make it possible to organize the supply of electric energy to the consumer in the shortest possible time.

Also, for the purpose of gradual development and effective use of renewable energy sources, improvement of the energy structure and diversification



The CASA-1000 project to lay power lines from Tajikistan and Kyrgyzstan to Pakistan and Afghanistan



of energy resources, the Kyrgyz Republic adopted the Law on Renewable Energy Sources, which stipulates that producers of electric and heat energy using renewable energy sources (hereinafter referred to as the RES) have, but are not limited to the following preferences: tax and customs preferences, guaranteed purchase of generated electric energy, application of reduced tariff for the project payback period (maximum applicable tariff for electric energy with application of the coefficient of 1.3).

Among many other positive factors inherent in hydropower, a small hydro power plant is an environmentally friendly, cheap, quick-to-build, easy-to-operate and stable source of electric energy generation. There is no environmental damage during both construction and operation of small hydro power plants.

The total gross hydroelectric potential of small rivers and watercourses is about 950-1500 MW in capacity and 5-8 billion kWh in electric energy generation, of which the Republic uses only about 2.5%.

Among the most striking examples of active development of small hydropower potential is China, which has 80,000 SHPPs. The USA has about 10,000 operating SHPPs with a total capacity of more than 7 million kW. The share of small hydropower reaches 50% of the US total hydropower. In Japan, there are 1,350 SHPPs with a total capacity of 7 million kW.

Intensive construction and commissioning of capacities is going on in Western Europe: there are 950 SHPPs in Austria, 1,200 SHPPs in Italy, 500 SHPPs in Norway, 170 SHPPs in Finland, 1,100 SHPPs in France, 800 SHPPs in Germany, and 1,200 SHPPs in Sweden. Switzerland and Austria are the leaders in efficient use of SHPPs. In these countries, SHPPs account for 8.3% and 10% of total power generation.

“Chakan HPP” OJSC, a small hydropower plants operator, generates only 1% of Kyrgyzstan’s electricity.

In addition, under the CASA-1000 project Kyrgyzstan together with Tajikistan should start exporting electric energy to Pakistan and Afghanistan as early as in 2023. Electricity is expected to be sold in summer. Kyrgyzstan plans to export more than US\$1.5 billion worth of electric energy over the 15 years of the project implementation.

OFFER FOR CREDITOR

LEGAL MECHANISM	✓ Open Joint-Stock Company
TYPE OF FINANCING	✓ BOT/BOOT/BOMT
AMOUNT	✓ USD 26,000,000
FINANCING TERM	✓ Up to 10 years
NUMBER OF TRANCHES	✓ Phased financing for the construction of a small hydro power plant
FINANCIAL SUPPORT	✓ As agreed by the parties



