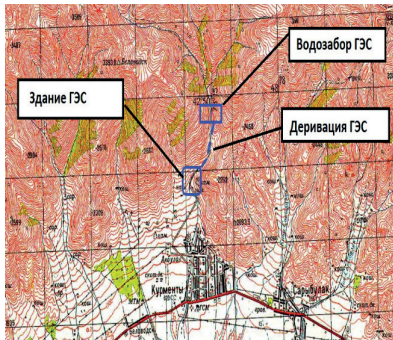


# CONSTRUCTION OF A SMALL HPP AT A SITE LOCATED ON THE KURMENTY RIVER

“CHAKAN HPP”



# KYRGYZSTAN



### Name of the company:

“Chakan HPP” OJSC

### Brief description of the Project:

The project involves the construction of a small hydro power plant (hereinafter referred to as “SHPP”) with a capacity of 2.3 MW at a potential site located on the Kurmenty River, Tup district, Issyk-Kul Region. The topography of the terrain makes it possible to build the SHPP with a pressure intake system.

There are plans to build the water inlet at the elevation of 2,193.0 m and the SHPP building at the elevation of 1,912.0 m.

The potential annual electric energy output is 11.9 million kWh.

### 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” 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.

### Project cost - \$2,259,213

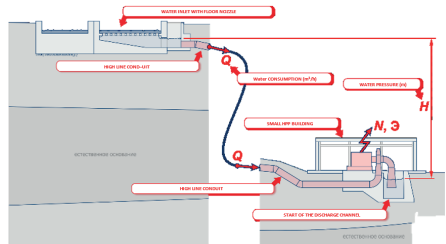
- ✓ Hydraulic structure - \$744,003
- ✓ Hydromechanical structure - \$1,172,298
- ✓ Electrical structure - \$65,465
- ✓ Unforeseen expenses - \$158,541
- ✓ Administrative expenses - \$118,906

### Amount of investments - \$2,259,213

Payback period - 5.76 years

# DESCRIPTION OF THE PROJECT

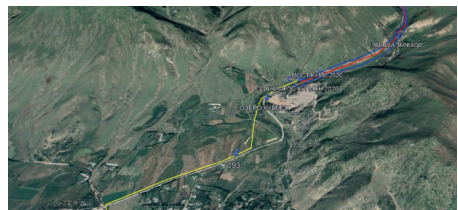
The project involves the construction of a small hydro power plant (hereinafter referred to as the SHPP) with a potential capacity of 2.3 MW, for generation of 11.9 million kWh of electric energy per year, at a potential site located on the Kurmenty river, Tüp district, Issyk-Kul Region. The topography of the terrain makes it possible to build the SHPP with a pressure intake system.



There are plans to build the water inlet at the elevation of 2,193.0 m and the SHPP building at the elevation of 1,912.0 m. The pressure intake system will be laid on the left shore with a possible crossing to the right shore in the lower part of the section. The pressure intake system will be 2,520 meters long. The total pressure will be 281 meters and the average slope of the pressure intake system will be 12%, or 111 meters per kilometer.

## General view of the Kurmenty:

- ✓ In red, the 2.6 km pressure intake system;
- ✓ In yellow, a 3 km 10 kV aerial line.
- ✓ In blue, perimeter (5.9 km) and land allocation area (16.6 ha)



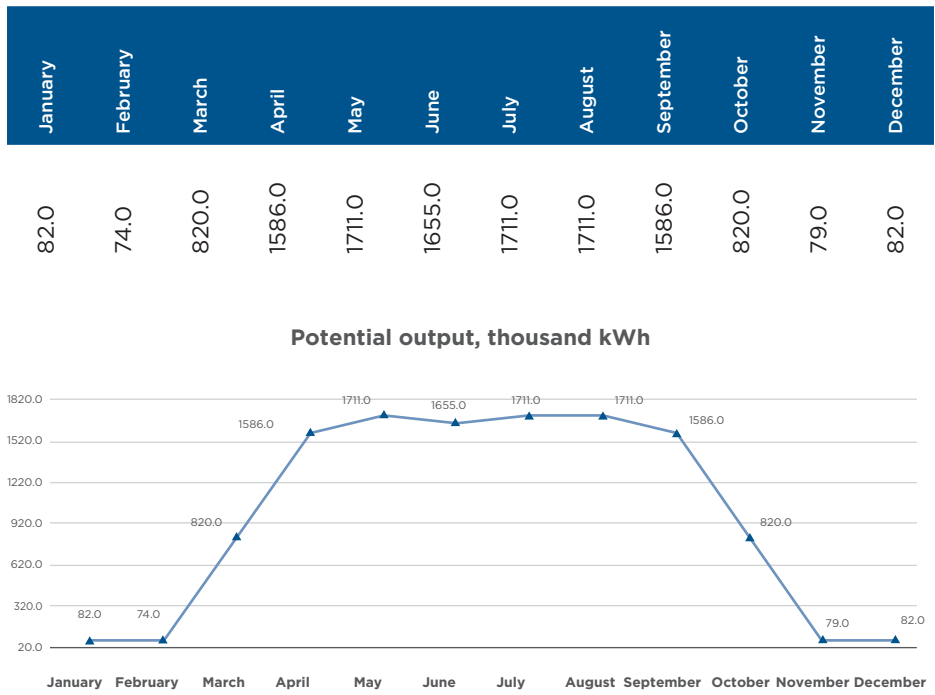
In terms of power supply, the Kurmenty River is of the glacier-snow type. For annual flow distribution of glacier-snow type rivers, longer floods from April to September and low flow period from October to March are typical. Annual flow distribution is determined by the processes of snow accumulation in the preceding autumn-winter period, climatic features of the snowmelt period, which, in turn, depends on the altitude of the catchment area, the orientation of slopes relative to moisture-bearing air masses, etc.

According to the data obtained, the following technical parameters of the SHPP cascade on the Kurmenty River are attached:

Technical parameters				
	Pressure, m	Watercourse, m <sup>3</sup> /sec	Capacity, MW	The length of the intake system, km
SHPP	281	1,05	2,3	2,6

\* The efficiency factor is taken as  $\eta=0,8$

Potential annual electric energy output (thousand kWh) on the Kurmenty River is as follows:

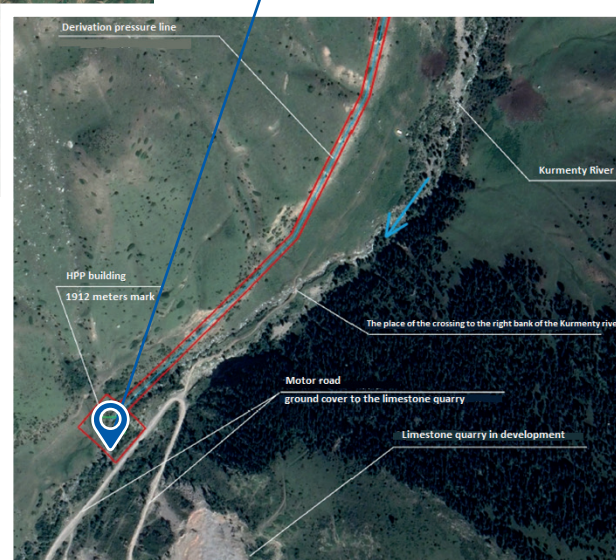
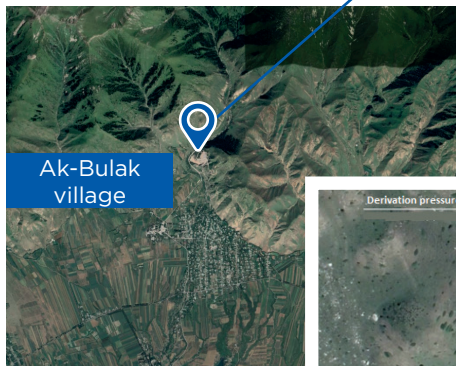
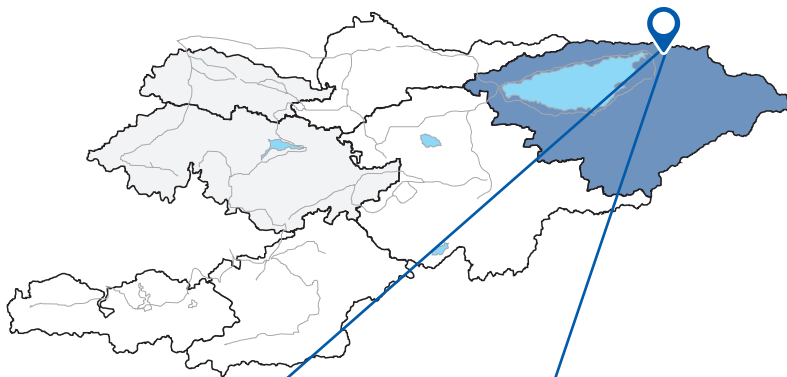


The potential annual electric energy output is 11,918,000 kWh.





# 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 Kurmenty substation 110/6-10k.** The capacity of this substation is 50,000 kVA and the load is 2,800 kVA. The number of transformers is 2×25,000 kVA. Taking into account the potential capacity of the SHPP, it is reasonable to construct a 6 kV or 10 kV cell and an aerial line. According to Google Maps, the length of the 6 kV or 10 kV aerial line connecting the Small HPP switchyard with the “Kurmenty” substation will be 2.7 km.
- ✓ **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 2,259,213. 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 for sale of electric energy generated by the SHPP will be 3.276 KGS\* or 3.86 US cents\* (at an exchange rate of 1 USD = 84.79 KGS).

Capacity	2.3 MW
Output	11.91 million kWh
Investments	USD 2.259 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	11,91	11,91	11,91	11,91	11,91	11,91	11,91	11,91	11,91	11,91
Tariff	USD/kWh	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386	0.0386
<b>Revenue</b>	<b>thousand USD</b>	<b>460,0</b>	<b>460,0</b>	<b>460,0</b>	<b>460,0</b>	<b>460,0</b>	<b>460,0</b>	<b>460,0</b>	<b>460,0</b>	<b>460,0</b>	<b>460,0</b>
<b>EBITDA</b>	<b>thousand USD</b>	<b>392,2</b>	<b>392,2</b>	<b>392,2</b>	<b>392,2</b>	<b>392,2</b>	<b>392,2</b>	<b>392,2</b>	<b>392,2</b>	<b>392,2</b>	<b>392,2</b>

- ✓ IRR at the end of Year 10 is 11.53%
- ✓ Project payback period is 5.76 years, discounted payback period is 7.10 years

## SOURCES OF FINANCING AND APPLICATION OF FUNDS

Source of financing	Amount, USD
Financial investor	2 259 213
<b>Total:</b>	<b>2 259 213</b>
Application of funds	Amount, USD
Hydraulic structure	744 003
Hydromechanical structure	1 172 298
Electrical equipment	65 465
Unforeseen expenses	158 541
Administrative expenses	118 906
<b>Total:</b>	<b>2 259 213</b>



# A BRIEF OVERVIEW OF THE ENERGY SECTOR

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 of energy resources, the Kyrgyz Republic adopted the Renewable Energy Sources Act, 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

<b>LEGAL MECHANISM</b>	✓ Open Joint-Stock Company
<b>TYPE OF FINANCING</b>	✓ BOT/BOOT
<b>AMOUNT</b>	✓ USD 2,259,213
<b>FINANCING TERM</b>	✓ Up to 10 years
<b>NUMBER OF TRANCHES</b>	✓ Phased financing for the construction of a small hydro power plant
<b>FINANCIAL SUPPORT</b>	✓ As agreed by the parties



