MINISTRY OF ENERGY OF
THE KYRGYZ REPUBLIC

PROSPECTIVE GREEN ENERGY PROJECTS OF THE KYRGYZ REPUBLIC

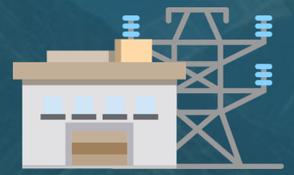
Ibrayev T.O.

ENERGY SYSTEM OF THE KYRGYZ REPUBLIC

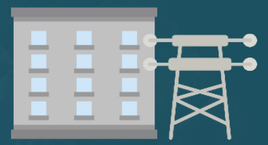
HPP
3,155 MW

TPP
862 MW

HV lines 110-500 kV
7,500 km



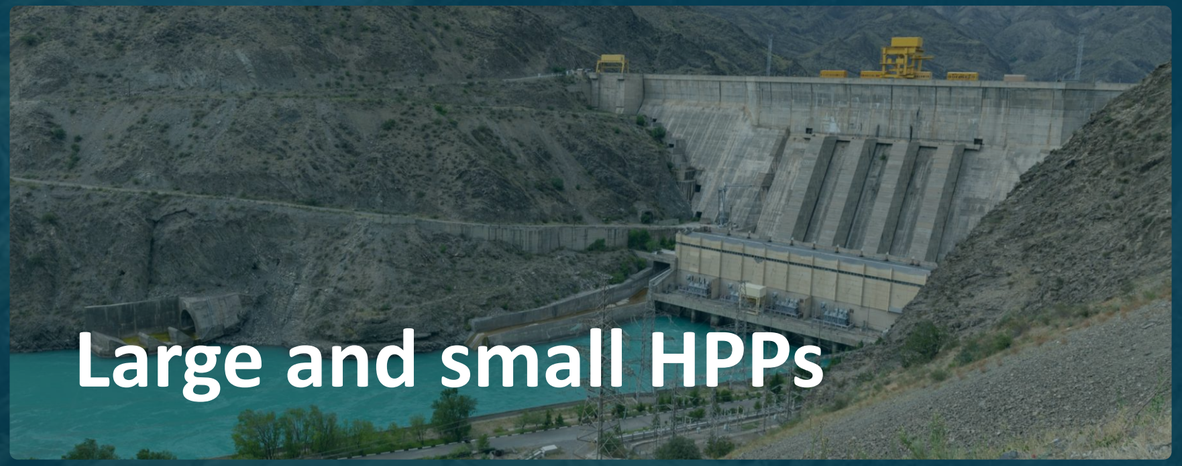
Substations 110-500 kV
200 units, 14,113 MVA

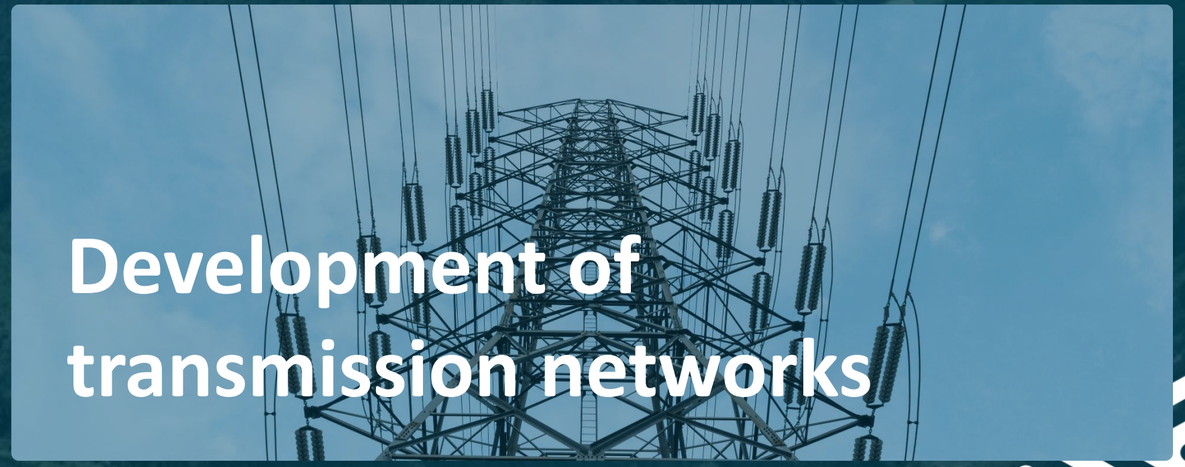


HV line 0.4-35 kV - 59,700 km
Substation & Transformers
26,649 units

- The energy system of the Kyrgyz Republic due to the geographical characteristics is clearly divided into northern and southern parts
- Both parts are connected by lines 500 kV **"Toktogul HPP – Tuleberdiyev – Frunzenskaya"** and the 500 kV **"Datka – Kemin" line** passing through the territory of the Kyrgyz Republic, as well as through the Central Asian United Energy System, covering Tajikistan, Uzbekistan and Kazakhstan
- Within the structure of electricity generation, the main share is held by hydroelectric power plants (90%), most of which are located in the south of the country
- Average annual generation: electricity - 14 billion kWh; thermal energy – 2,000 thousand Gcal

PLANNED PROJECTS





MINISTRY OF ENERGY OF THE KYRGYZ REPUBLIC

HYDROPOWER POTENTIAL

142.5
billion kWh

TOTAL HYDROPOWER POTENTIAL

LEADING POSITION IN CENTRAL ASIA IN TERMS OF HYDROPOWER POTENTIAL

13%

OF REALIZED POTENTIAL

ON THE NARYN RIVER POSSIBLE TO CONSTRUCT:

7 cascades

27 hydro power plants

6,435.4 MW
Total installed capacity

22,555 billion kWh
Average long-term annual generation

KAMBARATA HPP-1

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MAIN PROJECT PARAMETERS KAMBARATA HPP-1

Installed capacity
MW
1,860

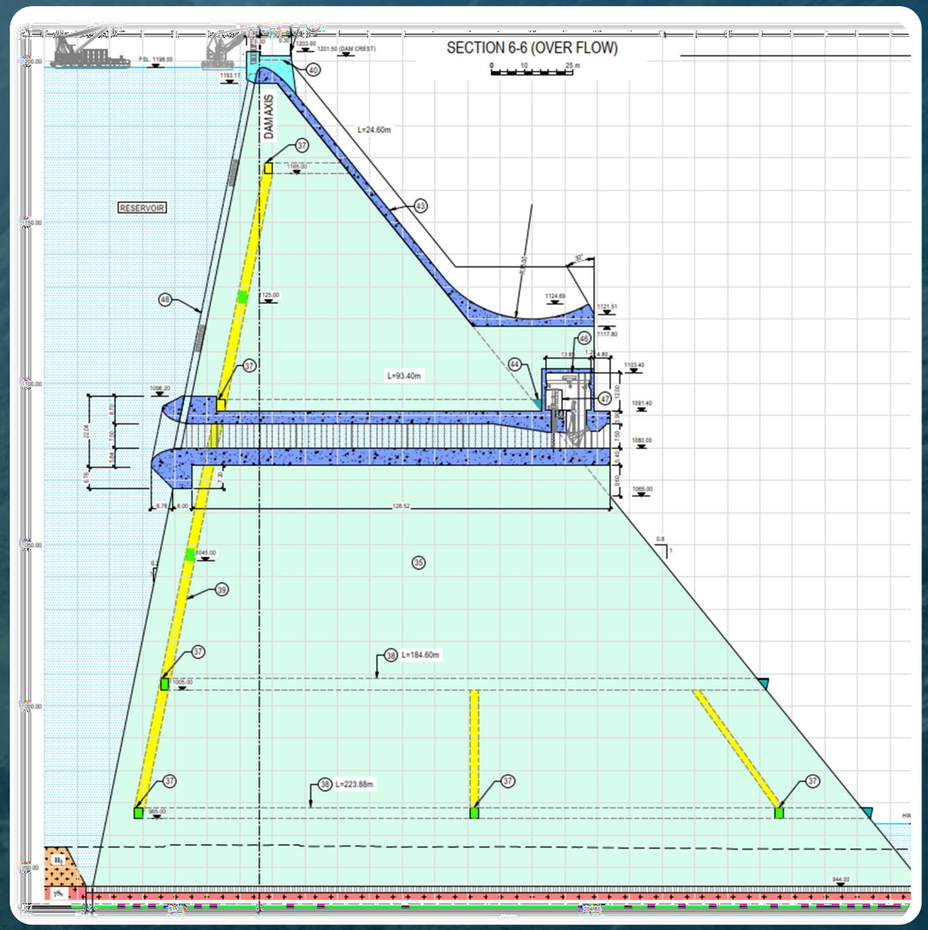
Annual generation
million kWh
6,000

Investments (according to the Feasibility Study)
million USD
3,512

Reservoir volume
million m³
5,460

Dam height
m
256

Gravity dam RCCD



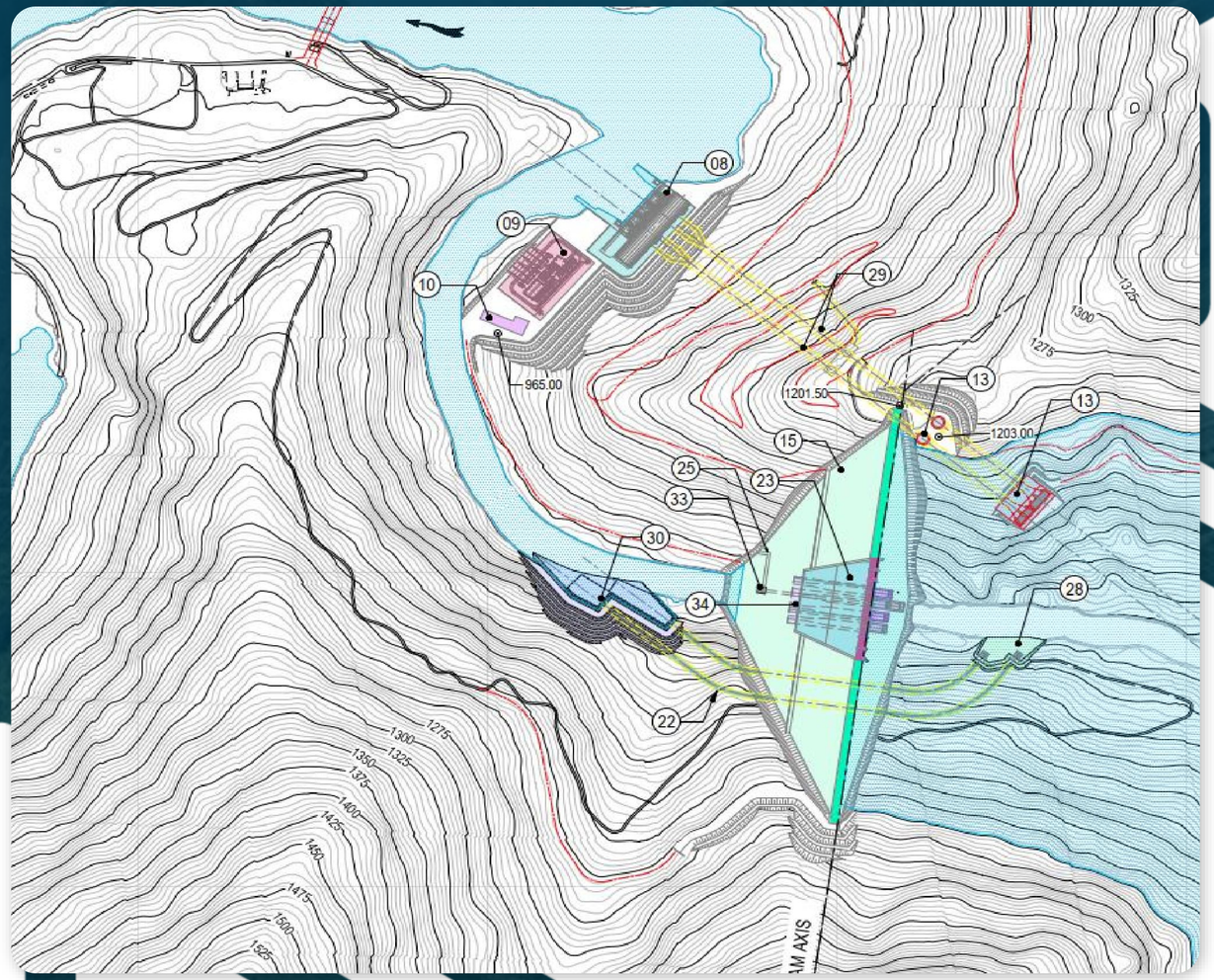
GENERAL LAYOUT

The general plan of the hydropower complex "Kambar-Ata HPP-1" includes the following:

A gravity dam constructed from roller-compacted concrete (RCC), with a maximum height of 261 m on deep foundations, featuring an uncontrolled spillway and rapid flow structures on the downstream face of the dam, as well as four medium-level outlets and one bottom outlet through the dam body. The powerhouse facility is located at the downstream toe of the dam, equipped with four turbine-generator units with a capacity of 470 MW. Water is supplied to each of the two turbine-generator installations via individual high-pressure tunnels and a shared double intake structure for the HPP

The 500 kV switchyard with gas-insulated switchgear (GIS) is located in a separate building next to the power station and connected to the 500 kV Datka-Kemin transmission line.

Two diversion tunnels are provided to divert the river chann during the construction period



ALABUGA

CASCADE OF HYDRO POWER PLANTS

MAIN INDICATORS OF THE ALABUGA HPP CASCADE

Name of HPP	Absolute Elevations of Water Levels			Reservoir capacity		Flow rates		Heads (Hydraulic Head)			Installed capacity, MW	Average Annual Electricity Generation, million kWh
	Full Supply Level (FSL), m	Dead Storage Level (DSL), m	Tailwater Level, m	Total Capacity, million m³	Active Storage, million m³	Long-Term Average Flow, m³/s	Design Flow Rate, m³/s	Max, m	Min, m	Design, m		
Arpanskaya HPP-1	2,625	2,565	2,180	310	288	18.5	40	406.5	346.5	383	**136**	556
Arpanskaya HPP-2	2,180	2,150	2,063	200	124	27.6	62.5	114.4	84.4	103.5	**58**	216.5
Makmalskaya HPP	2,063	-	1,815	27	-	27.6	55	230.8	-	230.8	**113**	464.5
Sazskaya HPP	1,815	-	1,575	19.8	-	29.1	55	223.5	-	223.5	**108**	472.9
TOTAL											**415 MW**	**1 709.9 million kWh**

CASCADE OF HPPS
ON THE AT-BASHY RIVER

MAIN INDICATORS OF THE CASCADE OF HPPs ON THE AT-BASHY RIVER

Name of HPP	Absolute Elevations of Water Levels			Reservoir capacity		Flow rates		Heads (Hydraulic Head)			Installed capacity, MW	Average Annual Electricity Generation, million kWh
	Full Supply Level (FSL), m	Dead Storage Level (DSL), m	Tailwater Level, m	Total Capacity, million m³	Active Storage, million m³	Long-Term Average Flow, m³/s	Design Flow Rate, m³/s	Max, m	Min, m	Design, m		
Taldysuyskaya HPP-1	2,720	2,700	2,575	306.5	163	16.6	20	117.2	97.2	113	20	119.5
Taldysuyskaya HPP-2	2,575	-	2,420	-	-	16.6	20	150.6	-	150.6	26.7	161
Oiterekskaya HPP-1	2,420	-	2,250	-	-	16.6	20	161.3	-	161.3	28.5	172.2
Oiterekskaya HPP-2	2,250	-	2,150	-	-	16.6	20	96	-	96	17	102.6
Akdzharskaya HPP	1,990	1,960	1,904	278.3	218	33.8	60	83	53	75.3	40	199
TOTAL											**132.2 MW**	**754.3**

KULANAK

CASCADE HPP

MAIN INDICATORS OF THE KULANAK HPP CASCADE

Name of HPP	Absolute Elevations of Water Levels			Reservoir capacity		Flow rates		Heads (Hydraulic Head)			Installed capacity, MW	Average Annual Electricity Generation, million kWh
	Full Supply Level (FSL), m	Dead Storage Level (DSL), m	Tailwater Level, m	Total Capacity, million m^3	Active Storage, million m^3	Long-Term Average Flow, m^3/s	Design Flow Rate, m^3/s	Max, m	Min, m	Design, m		
At-Bashy HPP (Naryn river discharge)	1,997		1,830.3			84.5	105	145.8		145.8	135	756.7
Aktalinskaya HPP	1,742		1,713.5	24		141.6	160	26.8		26.8	38	238.9
Zhylan-Aryk HPP-1	1,713.3		1,652			141.3	160	56.5		56.5	80	503
Zhylan Aryk HPP-2	1,651.8		1,578.1			141.1	160	69.5		69.5	98.6	503
TOTAL											351.6 MW	2,001.6 million kWh

ORUKTAM HPP CASCADE

IN THE UPPER REACHES OF THE NARYN RIVER

MAIN INDICATORS OF THE ORUKTAM HPP CASCADE ON THE NARYN RIVER

Name of HPP	Absolute Elevations of Water Levels			Reservoir capacity		Flow rates		Heads (Hydraulic Head)			Installed capacity, MW	Average Annual Electricity Generation, million kWh
	Full Supply Level (FSL), m	Dead Storage Level (DSL), m	Tailwater Level, m	Total Capacity, million m^3	Active Storage, million m^3	Long-Term Average Flow, m^3/s	Design Flow Rate, m^3/s	Max, m	Min, m	Design, m		
Oruktam HPP-1	2,600	2,550	2,480	561.3	431	35.9	70	118.5	68.5	97	60	254.3
Oruktam HPP-2	2,480			30		35.9	70				48	225.9
Dzhanikelskaya	2,500	2,440	2,315	450.2	325.2	35.9	84	180.4	120.4	141.3	100	434
TOTAL											**208 MW**	**914.2 million kWh**

CHATKAL HYDRO POWER PLANT

MINISTRY OF ENERGY OF THE KYRGYZ REPUBLIC

CHATKAL HPP PROJECT

Location :
Chatkal district, Jalal-Abad region

- Average annual flow rate: 75.6 m³/sec
- Height: 180 m
- Volume: 860 million m³
- Length: 10 km
- Area for construction: 1,600 ha
- Installed capacity: 251 MW
- Average annual generation: 1.68 billion kWh
- Construction period: 5 years
- Equity capital investments: 2,500 $/kW

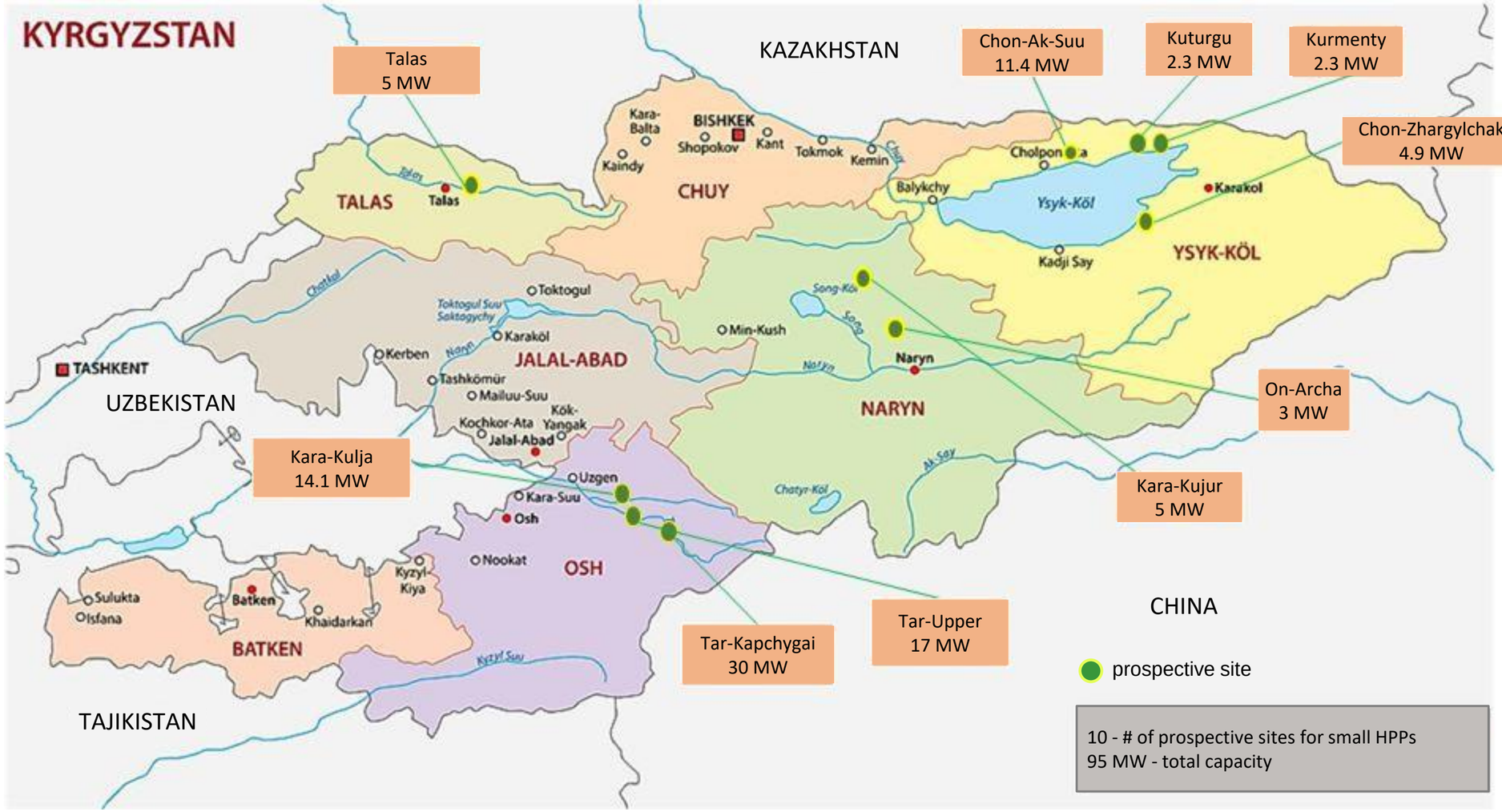
SARY-JAZ CASCADE

MINISTRY OF ENERGY OF THE KYRGYZ REPUBLIC

CONSTRUCTION OF 6 HYDRO POWER PLANTS ON THE SARY-JAZ RIVER

Total project cost	2.2–3 billion US dollars
Project construction site	Kyrgyz Republic, Issyk-Kulregion, Ak-Suu district
Installed capacity, MW	Total cascade capacity – 1,100 MW Kuylyuk HPP – 170 MW; Enilchek HPP – 60 MW Kaindy-Enilchek HPP – 20 MW; Ak-Shyirak HPP – 350 MW Kok-Shaal HPP – 250 MW; Kuyukap HPP – 250 MW
Average annual generation, million kWh	Over 4,760 million kWh
Project impact on the environment	As there are conservation areas and specially protected natural territories in the Sary-Jaz river basin, an Environmental Impact Assessment is necessary

PROSPECTIVE SITES FOR THE CONSTRUCTION OF SMALL HPPS



PROSPECTIVE SITES FOR SMALL HPPS

No.	Name of site/river	Capacity, MW	Waterflow, m^3/sec	Head, m	Annual electricity generation, million kWh	Location
1	Tar Kapchygai	30	97.0	40	121.0	Osh region, Kara-Kulja district, Tar River
2	Tar Upper	17	75.0	27	67.0	Osh region, Kara-Kulja district, Tar River
3	Kara-Kulja	14.1	20	90	85.5	Osh region, Kara-Kulja district, river Kara-Kulja
4	Chon-Ak-Suu	11.4	5	260	63.4	Issyk-Kul region, Issyk-Kul district, river Chon-Ak-Suu
5	Talas	7	18.5	43	36.7	Talas region, Talas district, river Talas
6	Chon-Zhargylchak	4.9	2.27	316	30	Issyk-Kul region, Jeti-Oguz district, river Chon-Zhargylchak
7	Kara-Kujur	5	10	37	20.5	Naryn region, Kochkor district, river Kara-Kujur
8	On-Archa	3	12.0	32	17.7	Naryn region, Naryn district, river On-Archa
9	Kuturgu	2.3	1.06	241	11.89	Issyk-Kul region, Tyup district, river Kuturgu
10	Kurmenty	2.3	1.05	281	11.9	Issyk-Kul region, Tyup district, river Kurmenty

RENEWABLE ENERGY SOURCES POTENTIAL

2,100–2,900 h

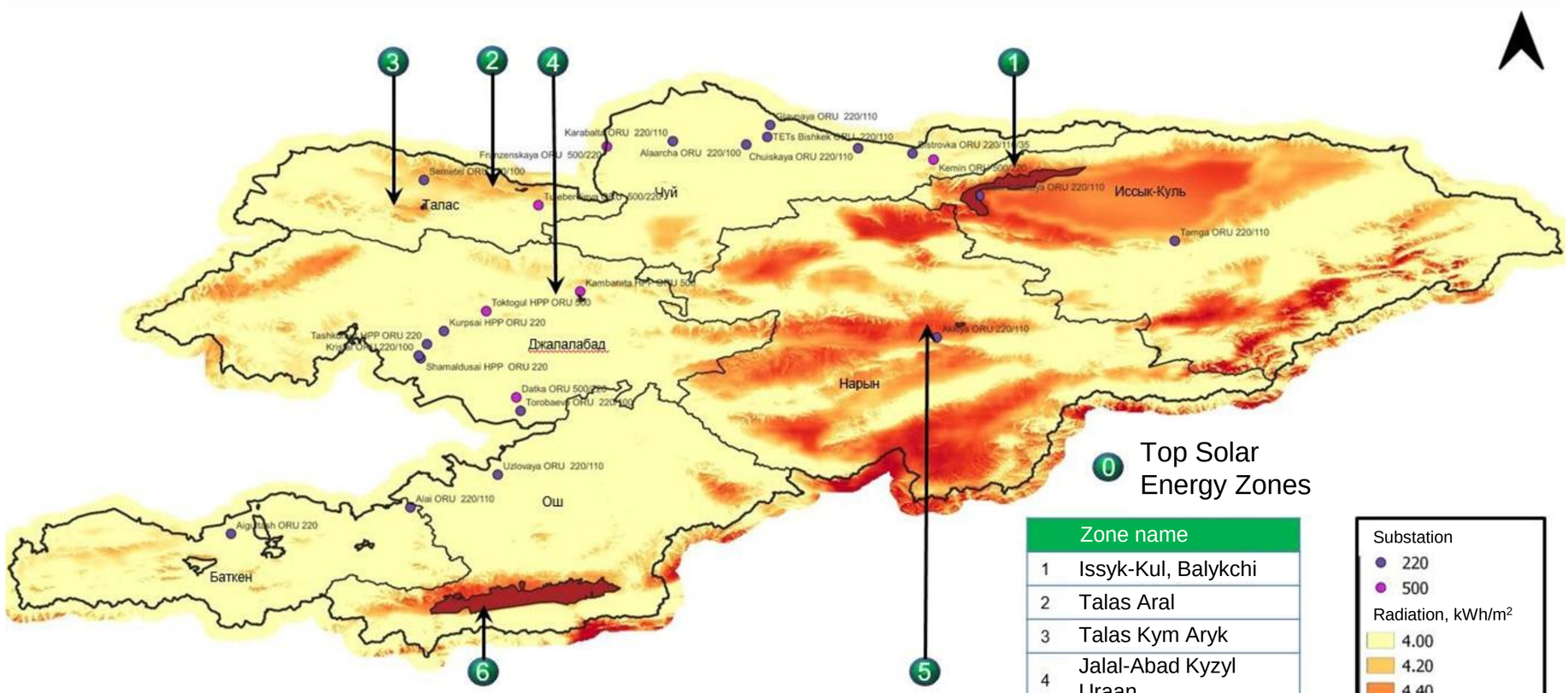
Average annual duration of sunshine

Annual irradiation on the surface **1,700 kWh/m²**

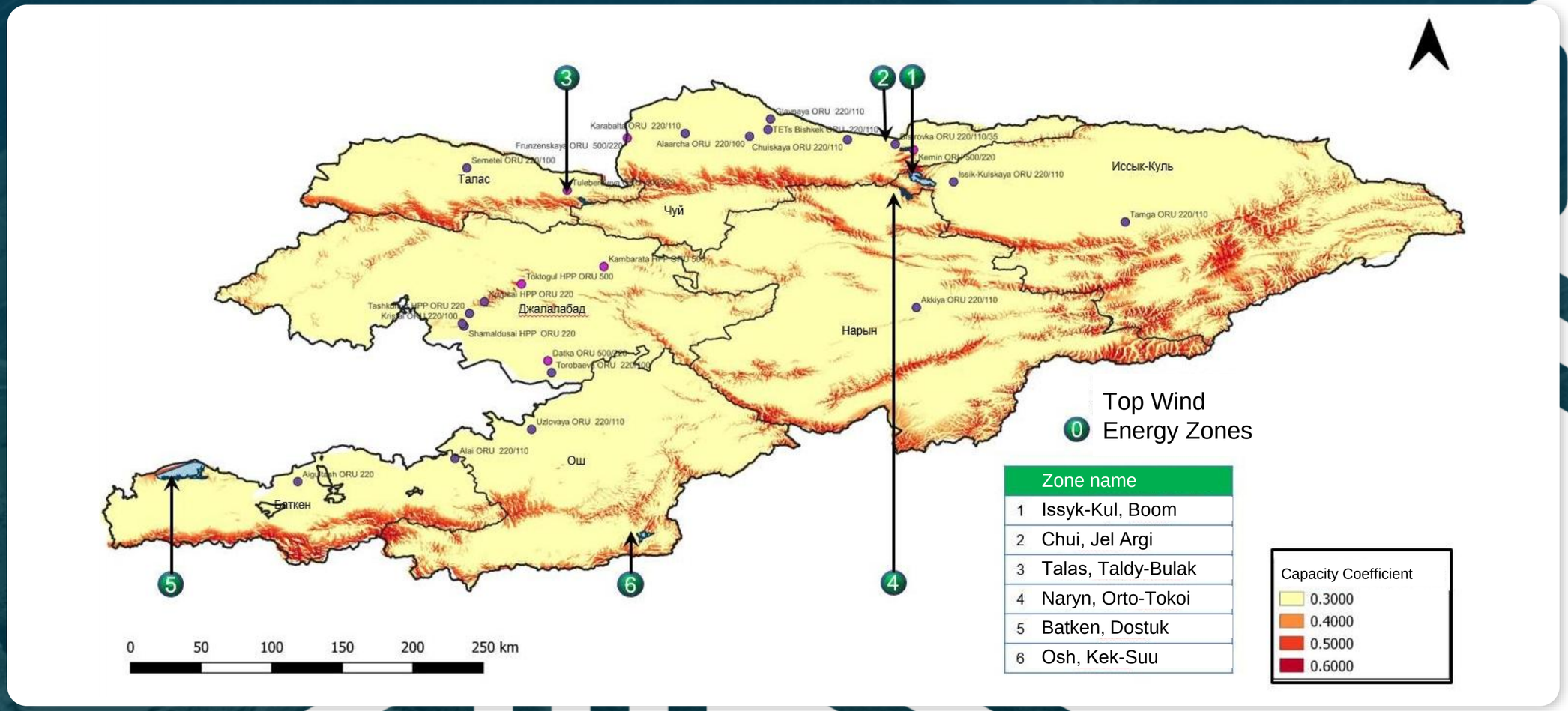
2 billion kWh

Wind energy potential

POTENTIAL ZONES FOR CONSTRUCTION OF SOLAR POWER PLANTS



POTENTIAL ZONES FOR THE CONSTRUCTION OF WIND POWER PLANTS



DEVELOPMENT OF HIGH-VOLTAGE NETWORKS FOR RECEIVING AND TRANSMITTING POWER FROM RENEWABLE ENERGY SITES

Projects for reconstruction and modernization	Project cost	Implementation period
Construction 220/110/10 kV substation in Uchkun, AT 2*125 MVA, connection to 220 kV transmission line Kemin–Ala-Archa	34.5 million $ (substation)+2.82 million $ (transmission line)	2026–2027
Construction 220 kV transmission line Tamga–Karakol and 220/110/10 kV Substation Karakol with installation of AT 2*125 MVA near Chelpek village and Karakol city	34.5 million $ (substation) + 12.69 million $ (transmission line)	2026–2028
Construction 500/220/10 kV substation Bishkek, AT 2*501 MVA, construction of 500 kV transmission line Frunzenskaya–Bishkek–Kemin	148.13 million $ (substation) + 156 million $ (transmission line)	2028–2030
Construction of 220/110/10 kV substation Isanov with two ATs of 125 MVA and 220 kV transmission line Datka–Uzlovaya-1, 2	34.5 million $ (substation) + 1.4 million $ (transmission line)	2026–2027
Construction of 500 kV substation Balykchy and 500 kV transmission line Kemin–Balykchy	193.5 million $	2028–2030
Construction of 500 kV transmission line Kemin–Torugart	218 million $	2028–2030
Conversion 110/35/10 kV substation Alamedin to 220 kV with two ATs of 125 MVA and construction of 220 kV transmission line Bishkek 500–Alamedin-1, 2	34.5 million $ (substation) + 1.9 million $ (transmission line)	2028–2030

NOTE: For the integration of renewable energy sources into the energy system, it is necessary to implement investment projects and increase the transmission capacity of substations and transmission lines

INCREASING THE TRANSMISSION CAPACITY OF SUBSTATIONS AND TRANSMISSION LINES

Facility name	Costs, million KGS	Note
Main substation construction, 3rd stage, AT 250 MVA	315	**The increase in capacity will be 745 MVA — accordingly, an increase in capacity on the part of the 110/35/10/0.4 kV side by 745 MVA is required** **Costs for the 110 kV substation: 5.8 billion KGS** **Costs for 10/0.4 kV transformer substations: 1.64 billion KGS**
Replacement of 110 kV overhead line wire Main–Kyzyl-Asker-1, 2 with a larger cross-section (240 mm²)	10.4	
Replacement of 110 kV overhead line wire CHP–Parkovaya-1, 2 with a larger cross-section (240 mm²)	8.1	
Kara-Balta substation – replacement of 3 ATs with 200 MVA units	450	
Replacement of 220 kV overhead line wire Kemin–Chui with a larger cross-section (400 mm²)	74.1	
Issyk-Kul substation – replacement of 2 ATs with 250 MVA units	300	
Replacement of 110 kV overhead line wire Issyk-Kul–Cholpon-Ata-1, 2 and 110 kV Cholpon-Ata–Ananyevo with a larger cross-section (300 mm²)	104	
Replacement of 220 kV overhead line wire Issyk-Kul–Tamga with a larger cross-section (400 mm²)	210.2	

INCREASE OF TRANSMISSION CAPACITY OF SUBSTATIONS AND TRANSMISSION LINES

Facility name	Costs, mln. KGS	Remarks
Torobaeva substation, replacement of 3 AT to 200 MVA	450	**The increase in capacity will be 600 MVA - accordingly, an increase in capacity on the part of the 110/35/10/0.4 kV side by 600 MVA is required** **Costs for the construction of 110 kV substations: 4.7 billion KGS** **Costs for the construction of 10/0.4 kV transformer substations: 1.3 billion KGS**
Construction of the second 110 kV overhead line Torobaev-Kara-Suu (185 mm2)	60.1	
Alai substation replacement of AT-2 with 125 MVA	130	
Aigul-Tash substation construction of the 2nd stage of AT	150	
Replacement of 220 kV Uzlovaya–Alai transmission line conductor with larger cross-section	96.5	

STATE SUPPORT (PREFERENCES)

01 Protection of foreign investments

02 Assistance in obtaining licenses, permits, and approvals, including allocation of land

03 Equal conditions of operation for foreign and local companies

04 Opportunities for extensive cooperation within the framework of PPP

05 Available qualified personnel

06 Exemption for import of equipment for construction of renewable energy facilities

07 Payment in foreign currency

08 Guaranteed tariff for green energy projects

MINISTRY OF ENERGY OF
THE KYRGYZ REPUBLIC

WE INVITE YOU TO INVEST IN THE ENERGY SECTOR OF THE KYRGYZ REPUBLIC!

Ibrayev T.O.