



# Development of Pioneer Small Hydropower Plant on the Chirchick-Bozsuv Canal in Uzbekistan

Iskander U. Buranov <sup>1)</sup>, Shukhrat V. Khamidov <sup>2)</sup> and Olga N. Leshenko<sup>1)</sup>

1) HPPs Construction and Architecture Department, JSC Hydroproject, Tashkent 100100, Uzbekistan

2) International Investments Department, PJSC Uzbekenergo, Tashkent 100000, Uzbekistan

E-mail: [cleanenergy@consultant.com](mailto:cleanenergy@consultant.com)

## 1 ENERGY SECTOR REVIEW

Today, the installed capacity of all energy generation facilities in Uzbekistan equals to 12.3 GW. There are 40.17 TW h (86%) generated by 10 thermal power plants and the other 6.54 TW h (14%) by 30 hydropower plants.

The Public Joint Stock Company **Uzbekenergo** operates 97.4% of all generation capacities, the high voltage transmission lines are operated by the subsidiary of PJSC **Uzbekenergo** — **Uzelectroset**.

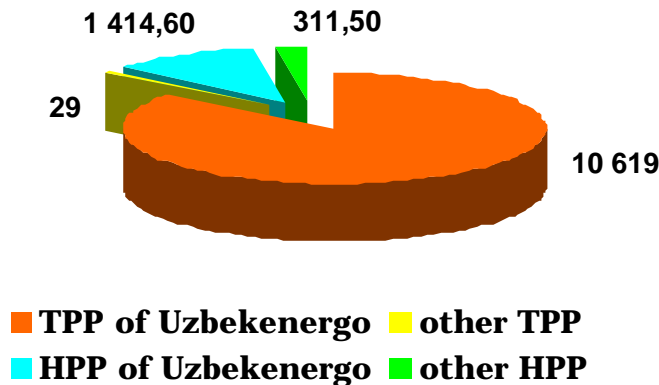


Fig. 1: Energy generation capacities of the Republic of Uzbekistan, MW

The last one built-hydropower plant of **Uzbekenergo** was put into operation in 1987; it was Gazalkent HPP (120 MW). It has been concentrated for development of the thermal power facilities, mainly based on the natural gas, till the last moments: the increasing cost of the natural gas therefore operating cost of thermal units and increased export obligations of Uzbekistan for natural gas delivery, makes **Uzbekenergo** to diversify its business opportunities and consider new alternatives to natural gas consumption, e.g. coal as a source, energy efficiency measures – installation of new modern CCPU, decrease of energy losses in the grid and hydro and wind power development. These measures reflected in the **Uzbekenergo** Development program.

## 2 FUTURE TRENDS

The “Upgrade and Development Program of the Energy Sector for 2007-2012” includes:

- 5 projects for the expansion the high voltage transmission lines network and its capacity;
- Switching the 8 natural gas burning boilers to coal;
- Construction 2 combine cycle power plants for 370 MW and 346 MW;
- Replacement the 3 turbines in Charvak HPP (620 MW) — the capacity increases for 45 MW and Construction 8 MW Small hydropower plant — Pioneer.

New alternatives mean new investments. Actually, this is a weak point of the company, due to existing tariff on electricity (the government dictates the tariff), grid losses and obligations of the company as a national electricity and heat supplier, responsible for the energy industry and its development and national economy leader — Uzbekenergo is one of the biggest taxpayers in the state budget. That is why in the framework of Pre-Feasibility Study of **Pioneer SHPP**, the client asked us to consider as many investment’s opportunities as possible.

## 3 CASE STUDY

The considering **Pioneer SHPP** is a 2<sup>nd</sup> stage of the cascade of the 3 hydropower plants on Chirchik River.

Table 1. Technical parameters of the run-of-river Pioneer SHPP.

Parameter	unit	quantity
Head	meters	8.05
Discharge	m <sup>3</sup> /sec	117.7
Output	MW	8.0
Number of units		1
Type of turbine		Kaplan
Annual generation	GW h	35.4

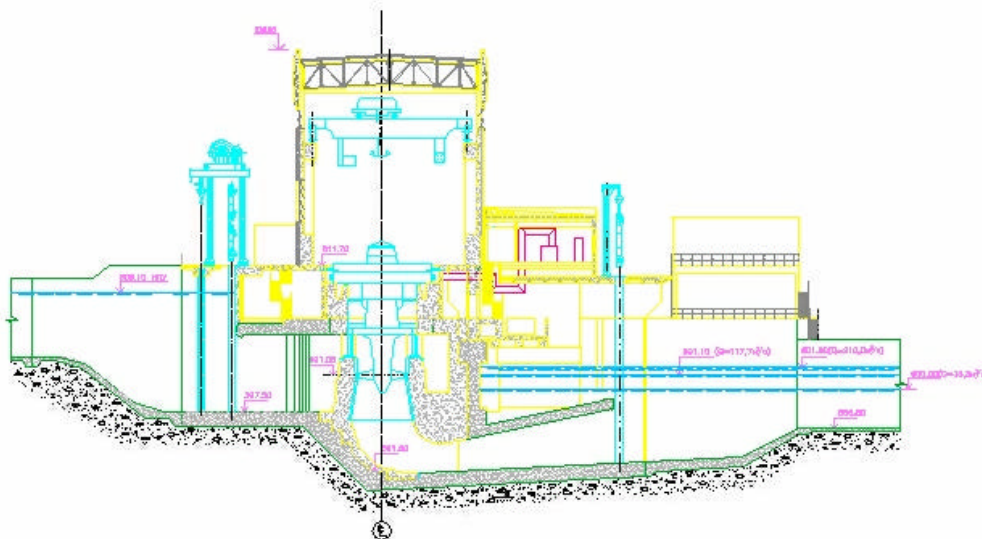


Fig. 2. Pioneer HPP cross section

Our team had been considered 7 potential ways of the investments in this project (Table 2.).

Table 2. Potential variants of the project financing.

##	Sources	Cost, US\$	%
<b>Variant: 1? – ADB Credit</b>			
1	Equity	7 154 733	64
2	Credit	4 000 000	36
	<b>Total</b>	<b>11 154 733</b>	<b>100</b>
3	Carbon revenues	0	
<b>Variant 1b – ADB Credit</b>			
1	Equity	7 154 733	64
2	Credit	4 000 000	36
	<b>Total</b>	<b>11 154 733</b>	<b>100</b>
3	Carbon revenues (3 years – crediting period)	331 791,7	
<b>Variant 1c – ADB Credit</b>			
1	Equity	7 154 733	64
2	Credit	4 000 000	36
	<b>Total</b>	<b>11 154 733</b>	<b>100</b>
3	Carbon revenues (10 years – crediting period)	1 658 958,5	
<b>Variant 2a — IDB Credit</b>			
1	Equity	7 194 047	65
2	Credit	4 000 000	35
	<b>Total</b>	<b>11 194 047</b>	<b>100</b>
3	Carbon revenues	0	
<b>Variant 2b – IDB Credit</b>			
1	Equity	7 194 047	65
2	Credit	4 000 000	35
	<b>Total</b>	<b>11 194 047</b>	<b>100</b>
3	Carbon revenues (3 years – crediting period)	331 791,7	
<b>Variant 2c – IDB Credit</b>			
1	Equity	7 194 047	65
2	Credit	4 000 000	35
	<b>Total</b>	<b>11 194 047</b>	<b>100</b>
3	Carbon revenues (10 years – crediting period)	1 658 958,5	
<b>Variant 3 – Equity</b>			
1	Equity	10 886 056	100
2	Credit	0	0
	<b>Total</b>	<b>10 886 056</b>	<b>100</b>
3	Carbon revenues	0	

The picture of project's revenue, according to existing tariff and tax policy in the country put the decision-making process, whether implement the project or not on a very narrow way (Table 3.).

Table 3. Project's financial parameters

Variants	1a	1b	1c	2a	2b	2c	3
NPV, US\$	733 397	1 093 902	1 893 066	482 441	924 952	1812909	5768878
IRR, %	3,49	3,75	4,32	3,27	3,53	4,06	6,8
Payback period, years	29	27	24,5	29	28	25	16
Expanses on loan service, US\$	3 416 701			2 440 234			

It is obvious, that having existing program on upgrade and renovation of the energy facilities with enormous investment cost, Client prefers to do not cover all the investment costs of this project; but at the same time the loan and its maintenance makes this project unprofitable. That is why our team proposed another solution.

#### 4 SOLUTION

The solution is to share the investment costs and risks.

The involvement of the strategic investor could improve project' financial figures and facilitate Uzbekenergo's burden.

**Uzbekenergo** could establishes the joint stock company (50%x50%) with the strategic investor, which after commissioning of the HPP would be the operator and maintain the HPP, selling the generated electricity to the grid or directly to the local consumers.

The joint implementation and operating of the projects with involvement of international companies would need from Uzbekenergo the application of the new organizational measures to demonstrate transparency and will of the company to be an equitable participator of the international business processes.

The commission of the new renewable energy generation utilities and upgrade and modernization of the old ones increases the value of the assets and the cost of their main shareholder — PJSC **Uzbekenergo**. Probably, the next step of the company could be IPO.

#### REFERENCES

- JSC Hydroproject (2006), Pre-feasibility Study of Pioneer SHPP, *PJSC Uzbekenergo*, Tashkent, Uzbekistan.  
 Information-analytical Report Uzbekenergo – 2005, *PJSC Uzbekenergo*, Tashkent, Uzbekistan.