

## 2002 TCDC Training Course on Small Hydro Power

### HYDRO POWER DEVELOPMENT IN TAJIKISTAN

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#### 1. Brief introduction of Tajikistan.

Tajikistan is located in Central Asia, western of China, and borders with Afghanistan, China, Kyrgyz Republic and Uzbekistan.

Tajikistan is a mountain country (about 93% of territory are mountains), filled by Tian-Shan Alay and Pamir mountain systems. The territory of Tajikistan covers 143.1 sq. kilometers and the population exceeds 6.2 mill., capital city – Dushanbe.

The republic boasts hundreds of large industries. Rapidly developing industries: including power engineering, mining and ore-dressing, chemical, nonferrous metallurgy, mechanical engineering, light, foodstuffs, etc.

Tajikistan is richly endowed with high-water and rapid rivers whose potential is widely used for power generation and irrigation of farm lands. Most of the rivers drain into the Aral Sea Basin, the largest courses being those of the Amu Darya, the Kafirnigan, the Panj, the Syr Darya, the Vakhsh and the Zarafshan rivers- all fed by the melting mountain snows and glaciers. The Panj, one of the main streams of the republic, runs for 921 kilometres along the national border. The chief water artery of Tajikistan, the Vakhsh is 525 kilometres long.

The hydropower is the main domestic (80%) source of power in Tajikistan. In terms of its potential water power resources, which amount to 32.3 million KW (output capacity) or 286 billion KWh (electricity generation), out of which 19 million KW and 144 billion KWh can be produced technically. The republic ranks second in the former Soviet Union after the Russian Federation.

The economic effectiveness 85 billion KWh. At present used only 17%

the economic effective power resources.

Besides the largest rivers Tajikistan have considerable plenty of the small rivers of its potential water power resources could produce energy 14 billion KWh.

## 2. The power industry: stages of development.

The construction (in 1936 to 1952) of the three Varzob hydroelectric station with a capacity 25 MW marked the first major step in promoting the power industry of the republic.

By the same year, the first 35 KV transmission line was built connecting the station 1 with the Glovnaya (Chief) substation in Dushanbe. The completion of the line started the beginning of the power grid of the republic.

Before the construction of cascade Varzob hydroelectric station total installed capacity electric station in Tajikistan was to 690 KW.

With the aim of accelerating electrification in the processing agriculture, government was built many projects of Small Hydro power plants of country. The finally in 1950 was built about 100 Small Hydro Power plants with the installed capacity amounted to 95000 KW.

After the year 1960, of the country started to development the large hydro power plants, the small hydro power plants stopped to run because the large power plants more economic development than the small hydro power plants.

In 1957 became operational the Kayrakkum hydroelectric station on the Syr Darya, with a 126 MW capacity. The latter, with its active storage amounting to 2.6 billion cubic meters, made an important contribution to the development of power industry and irrigated farming in the in the republic.

Three more hydroelectric stations with an installed aggregate capacity of 258 MW were built in the southern part of the republic from 1957 to 1965. The first of the three stations, the Perepadnaya hydroelectric station, with a capacity of 30 MW, became operational in 1958, marking the beginning of efforts aimed at harnessing the water power resources of the Vakhsh river.

The then largest hydroelectric station, the Golovnaya station, was commissioned on the Vakhsh in 1962- 1963. It has an installed capacity of 210 MW. In 1964 the Central hydroelectric station was built on the tail race of the Perepadnaya station, with 18 MW capacity.

The development efforts, however, were not limited to the construction and expansion of power plants; much emphasis was laid on transmission lines and substations all over Tajikistan. The first, 110 KV, transmission line was built there in 1948.

Transmission lines and substation of 220 KV and higher voltage classes have been built since 1958.

Tajikistan was one of the first to introduce cable-suspended wires on the 110 KV mountain transmission line in the Varzob valley.

The network of transmission lines in the republic is such that we can now speak about the existence of two power grids in Tajikistan which are conventionally called the southern and northern grids, the watershed being the Gissar Range.

The then largest hydroelectric station, the Nurek station, was commissioned on the Vakhsh in 1979. It has an installed capacity of 2700 MW, average annual production of 11,2 billion KWh, with its active storage amounting to 4,5 billion cubic meters.

More than forty ethnic groups participated in the construction of the power station.

This chain includes the functioning Baipaza hydroelectric station. It has an installed capacity of 600 MW.

In the 1985 Government was plan to development electrification to remote and mountains Area with the local resources. By small hydro power and another renewable energy plants.

After 10 years on small hydro power plants the country was completed with the total installed capacity of 15.400 KW., could provide.

The present, republic has 17 the small hydro power plants, with the installed capacity 31.400 KW., with annually energy supply 130 GWh.

The developing small hydro power plants in the country were very usefully and effectively for developing Social-Economic condition in

mountainous area.

The installed capacity of power generating facilities in the republic amounted to 4.412 thousand MW in 2001, producing 14.336 billion KWh of electricity, and over 98% out of that is produced by hydropower station.

The energy system of Tajikistan is a part of the Central Asia /Southern Kazakstan regional network and is designed for 500 KV and is coordinated from the dispatcher center in Tashkent.

### 3. Perspective of development.

Further development of the power industry in the republic relies heavily on its abundant water power resources.

The hydroelectric power industry of Tajikistan, which depends on the operation of the Vakhsh chain of power stations, is inseparably linked with irrigation of new farm lands in the south of the republic, Uzbekistan, and Turkmenia. Therefore, the Rogun (3600 MW) and Sangtuda (670 MW) hydroelectric stations, which are currently under construction, have tremendous importance for entire Central Asia. The Sangtuda hydroelectric station will be followed by the construction of the Shurab, and Dashtijum plants.

The Gorno-Badakhshan Autonomous Region occupies an exceptional place in the republic. Here, high in the mountains, all the main rivers of Tajikistan originate. It is feasible to construct here a hydroelectric station with a capacity up to 100.000 KW, since the geography of the region prevents their interconnection with the national grid.

In 1997 Government has appointed the small hydro power Association of country, which looks and develops :

- the small hydro power plant of country;
- the main thing of this Association works on investigation, design, construction and exploitation of the projects;
- the association supply technical support and equipment for the small hydro power plants on country.

All of problem in mountainous Area of country should solve and approve on the real constructing program with small hydro power

project for developing mountainous Area in future time.