

Qurbonjon Kabutov

*S.U.Umarov Physical Technical Institute of Academy of
Sciences,*

Aini St. 299/1, Dushanbe, 734063, Tajikistan,

kurbon47@mail.ru

**Strategy and technologies of power supply on the basis of
local power sources in mountain conditions.**

16th ISTC SAC Seminar

“ENERGY SECURITY, HOW TO FURTHER THE TECHNOLOGY”

Almaty, Republic of Kazakhstan

22-23 October 2013

Tajikistan

- **Tajikistan:** The territory – 143.1 thousand sq.km. The population is 8 million (01.01.2013). Mountains occupy 93% of the territory. In rural areas are lives over 70% of the population. About 1 million people have no access to adequate power supply. Thus about 6 million people living in rural areas consume only 9% of the total electric power. Population employment in agriculture makes 70%, and the contribution of this sector to gross domestic product of the country reaches only 25%.

Basic sectors of power consumption

- **In the world** exists four basic sectors of power consumption: industrial (51 %), transport (20 %), household (18 %) and commercial (11 %).
- **Republic Tajikistan**, the basic sectors power consumption (2011, 16,1 billion кВт.ч (100 %): the industry and building - 6,45 (40 %), agriculture - 3,74 (23 %), other branches - 3,49 (21,7 %), transport - 1,61 (1 %), losses in a network - 2,27 (14 %).

Tajikistan: hydro sources potential

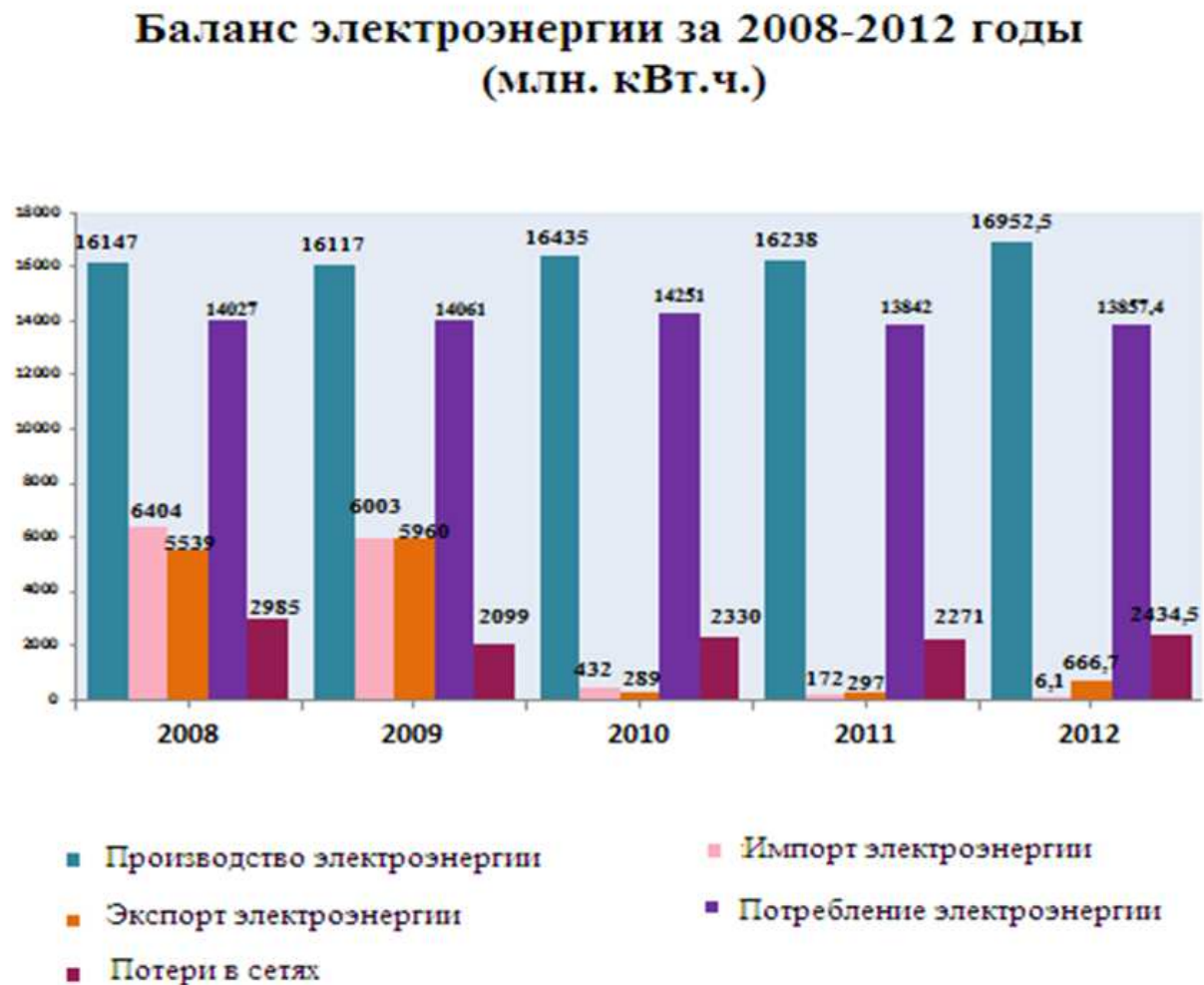
- The basic and perspective energy source in republic are the hydro sources which potential stocks are estimated 527 billion kWth in a year, including economically effective Hydroenergy potential - 317 billion kWth in a year. Now than 5 % of this potential are used less.
- Tajikistan is compelled now, to import for a year of oil products - 350-400 thousand tons, natural gas - 650-700 million m³ and the electric power - 3,5-4,0 billion кВт.час in a year

Water-power engineering

- For 1990th years the water-power engineering share in power consumption structure in Tajikistan has grown from 45 % to 75 %. However this increase is not connected with increase in manufacture of the hydroelectric power. Basically it is caused by reduction of use of fossil kinds of fuel for last twenty years. The established capacity of a power supply system - 5190 MBт.
- Available power stations of republic develop almost 16 billion kWth the electric power. However during winter time of HYDROELECTRIC POWER STATION work not on a total power (because of economy of water).

Balance of the electric power for 2008-2012 (billion kWh)

- 1. Electric power manufacture
- 2. Electric power export
- 3. Electric power losses in a network
- 4. Electric power import
- 5. Current consumption



Efficiency of use of the electric power

- The existing structure of current consumption is economically inefficient. For last 10-15 years there was a double decrease in current consumption in the industry at simultaneous more than fivefold increase in consumption by the population. In comparison with 1988 current consumption the population by 2010 has increased in 6-8 times. In Tajikistan the population has no access to the natural gas, the centralised heating and hot water.
- According to the experts United Nations SPEKA programs (UN SPECA), decrease in efficiency of use of the electric power in Tajikistan in 1990th years has made 44 % (with 1,9 US Dollar in a kWh in 1992 to 2,8 US Dollar in a kWh in 1999).

Tajikistan: energy resources

- Table 1. The forecast of requirement of Republic Tajikistan in power resources

No ite ms	The Name of energy carriers	Short-term forecasts (2006 – 2009)	Intermediate term forecasts (2010 – 2015)	Long-term forecasts (2016 – 2030)
1	The Electric power (billion kWth)	24,14	28,12	35,18
2	Natural gas (billion m3)	0,24	0,29	0,38
3	Oil (products) (million tons)	0,9	1,6	2,8
4	Coal (million tons)	0,6	0,9	1,7

Power efficiency

- Measures by power efficiency and the power savings could reduce requirement for the electric power by 30-40 %. Hydroelectric power stations develop annually about 16 billion kWh in a year. On the same capacities it was developed earlier over 18 billion kWh in a year.
- But after disintegration of the USSR the power supply system is deprived possibility to realize summer surplus of the electric power, and develops less energy because of reduction of a drain of the rivers and shortage of water in water basins in the winter.

Development of modern technologies

For creation of competitive and steady power sector which finally will provide investment of means in development of modern technologies and granting of better services to consumers carrying out of reforms in following basic directions is necessary:

- 1. To establish the prices and taxes at level which provides compensation of production costs and productivity increase.
- 2. Rehabilitation of a power infrastructure in rural areas.
- 3. Building of small HYDROELECTRIC POWER STATIONS and expansion of use of nonconventional renewed energy sources.
- 4. The maximum use of solar energy and a biomass.

Renewing energy sources.

- In republic the population most part lives in countryside (more than 70 %) and adequate maintenance with non-polluting energy is a basis of a sustainable development of rural and mountain regions and provides rational use of natural resources.
- Complex use of renewed energy sources would allow to solve successfully in the long term many problems of power supply and preservation of the environment, including, problems of reduction of emissions of greenhouse gases in atmosphere.
- Depending on volume and demand, the electricity can be made out of a network of one house or the majority of houses (connected by a local network), or in a network for delivery of the additional electric power.

Table 2. Resources of renewed energy sources of Tajikistan

- million ton of conditional fuel in a year

Resources	Total potential	Technical potential	Economic potential
Hydraulic power, the general	179,2	107,4	107,4
Including small	62,7	20,3	20,3
Solar energy	4790,6	3,92	1,49
Energy of a biomass	1,53	1,53	0,77
Wind power	185	8,84	4,42
Geothermal energy	0,05	0,05	0,05
In total (without large HYDROELECTRIC POWER STATIONS)	5218,48	34,64	27,03

There is a number of problems and barriers to development of alternative power in Tajikistan:

- - Absence of manufacture on manufacturing of devices of alternative power;
- - Absence of experience of use of installations of nonconventional power at the population;
- - There is no the legislative base promoting development of alternative power in Tajikistan;
- - Because of poverty, the population cannot get such installations from abroad.