NEW ENERGY TECHNOLOGIES ON THE BASES OF RENEWABLE ENERGY SOURCES

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Международнаянаучно-техническая конференция
«ИНТЕГРАЦИОННЫЕ ПРОЦЕССЫ В НАУЧНО-ТЕХНИЧЕСКОМ И ОБРАЗОВАТЕЛЬНОМ ПРОСТРАНСТВЕ»

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Brief information on Kyrgyzstan

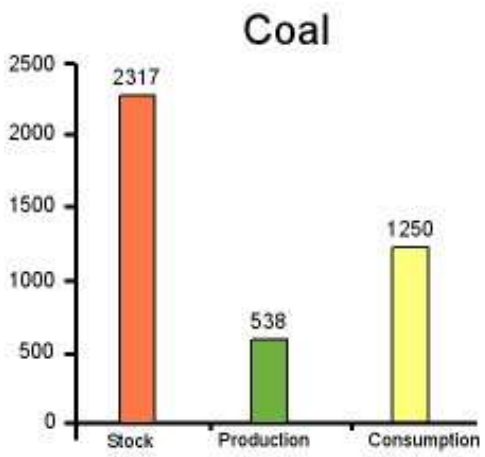
Geographical position – 39–43 d.w.
Territory – 200 thousand sq.km,
95% – mountains
Population – 6 million
Density of population 20 persons\sq.km

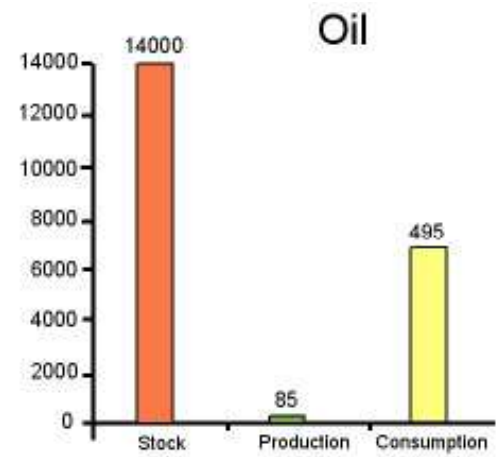
Population – urban 40%
– rural 60%

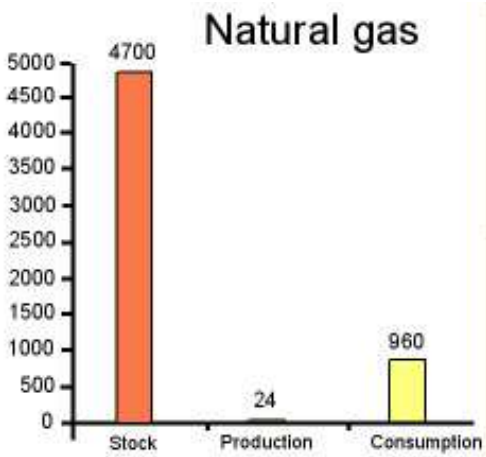
Borders with: Uzbekistan, Tajikistan, Kazakhstan, China

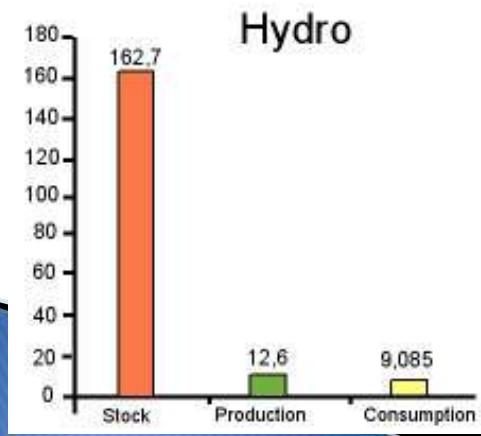
Fuel-Energy Complex of Kyrgyz Republic

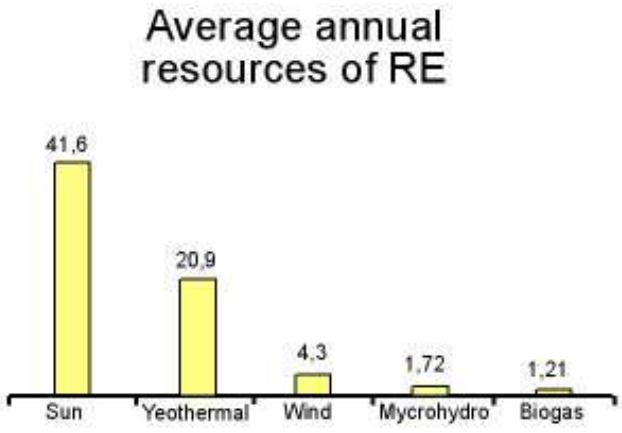
	Stocks	Production	Consumption
COAL	2317 bln.t	538 th.t	1250 th.t
OIL	4700 mln.м².	24.mln.м².	960 mln.м².
HYDRO	162,7 bln.kw.h.	12,6 bln.kw.h.	9,085 bln.kw.h.

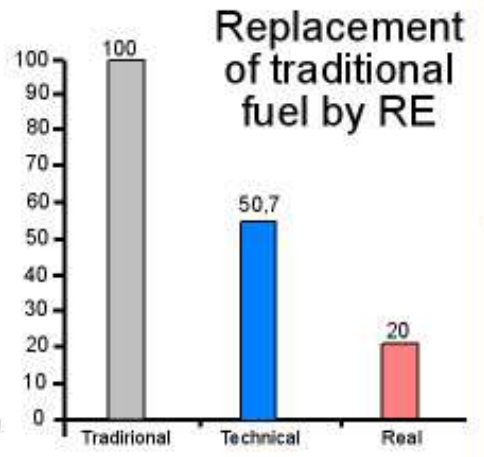




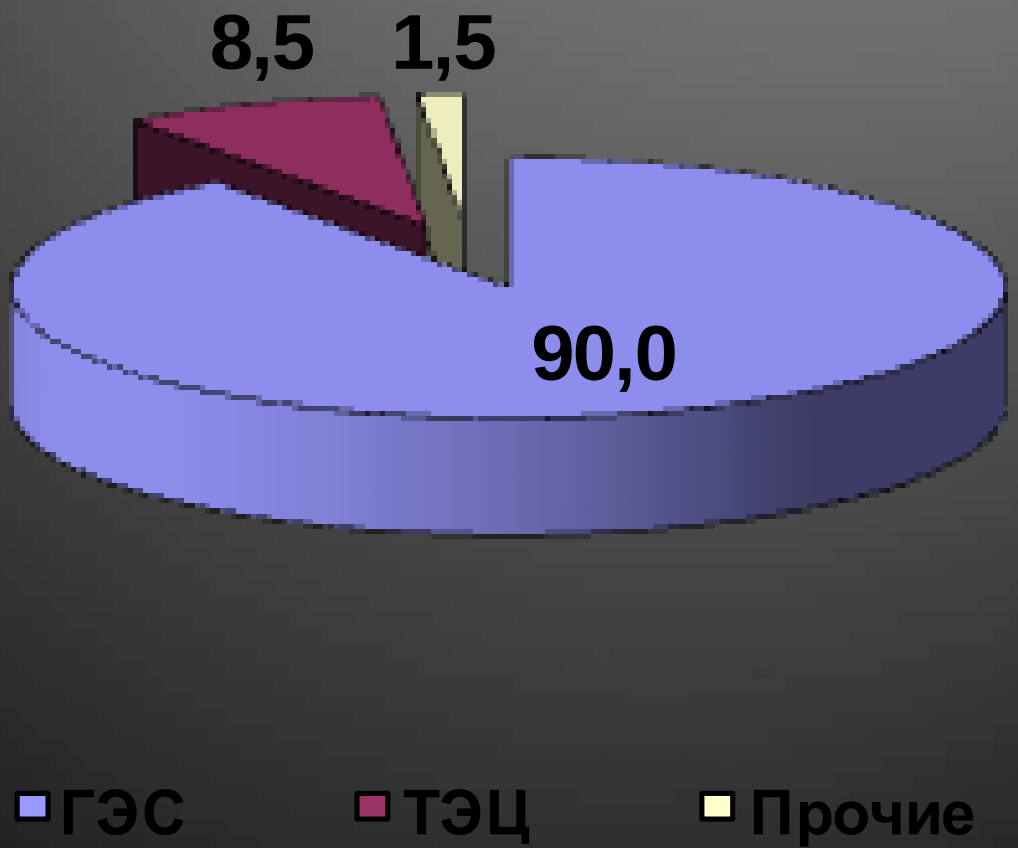








Structure of power (electricity) production in Kyrgyzstan



Generating sector of Kyrgyzstan

- 18 power stations, Σ installed capacity 3678 MW
- 16 HPSs
- 2 Heating plans

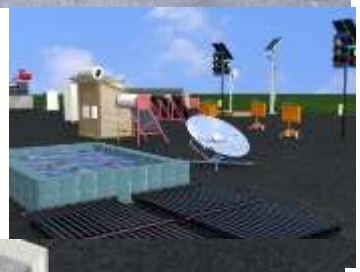
Kambarata HPS-1 and HPS-2

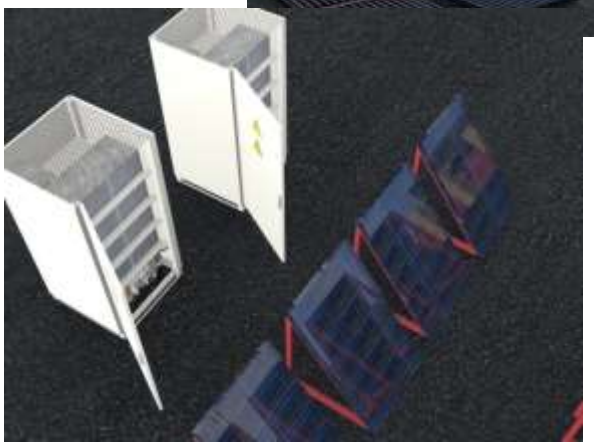
Scheme of transmission and power genaration

Renewable Energy Sources Department

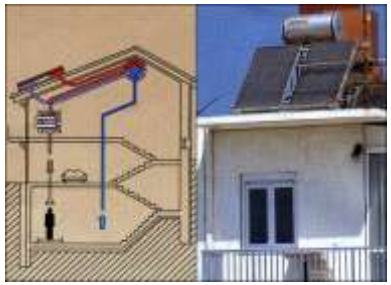
Education and scientific unit, implementing and coordinating activities in the field of usage of unconventional renewable energy sources

- Biogas plants
- PV
- Solar water heating and heating systems
- Small and microhydropower
- Wind power
- Thermal insulation materials
- Thermal pumps
- Energy saving
- Co-generation
- Energy audit
- Energy efficient buildings





The potential of renewable energy sources in Kyrgyzstan

Kyrgyzstan is among the countries with huge potential of renewable energy. The development of renewable energy can solve the major problems at the moment:

- *Improving energy security and saving of fossil fuels;*
- *Solving of problems with local energy and water supply;*
- *Improving the standard of living and employment for the local population;*
- *Sustainable development of remote areas in the desert and mountain areas;*
- *Implementation of the obligations of countries to implement international agreements on the protection of the environment.*

Kyrgyzstan has a great potential of renewables. Utilization of this potential can increase the provision with indigenous energy resources and reduce dependence on imports. Available resources of renewable energy theoretically could cover 50,7% of required energy in Kyrgyzstan. The potential resources of renewable energy actually available at the current level of techniques development total 840,2 mln TOE yearly.

The potential of small hydropower in Kyrgyzstan

One of the factors in the development of hydropower should be the rehabilitation and construction of small hydro power plants. The total hydropower potential of the surveyed 172 rivers and streams with flow rates from 1,5 to 5 m3/sec is more than 80 billion kWh per year, among them technically acceptable to the development of the hydropower potential is 5,8 billion kWh yearly. According to experts proposals now there is an opportunity to construct 92 new small hydropower plants with a total capacity of 178 MW and annual output of up to 1,0 billion kWh of electricity. In addition, the proposals on the construction of hydropower plants on 7 irrigation dams with an installed capacity of 75 MW and an annual power generation of about 220 million kWh are developed.

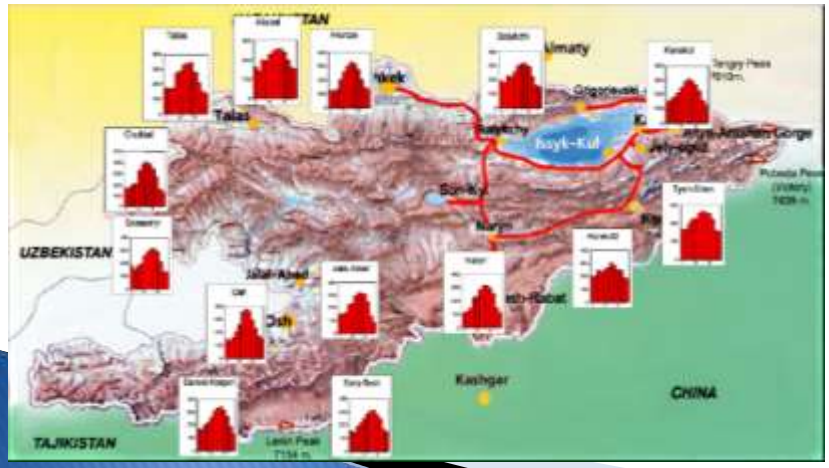
The potential of small hydropower in Kyrgyzstan

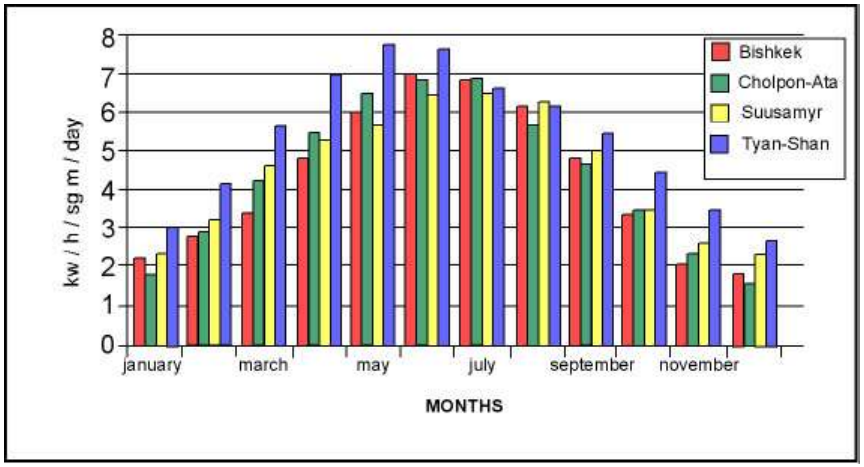
Unit costs for the construction of new small hydropower plants largely depend on the location of the station and equipment manufacturers and make up 800-1500 US$. Prime cost of electricity generation on reconstructed small hydropower plants can reach 2-8,0 cents/kWh, on newly constructed small hydropower plants - 3,5-3,6 cents/kWh, on small hydropower plants on irrigation reservoirs - 0,6-1,1 cents/kWh. It is estimated that the payback period of a small hydropower plants, which has an effective operational performance, with tariffs the ranged from 0,01 to 0,015 US$/kWh is 7-10 years.

The potential of solar energy in Kyrgyzstan

The prospections of solar radiation usage are determined by its sunshine duration and intensity level. The calculation of the average annual sunshine duration for Kyrgyzstan is 2630 hrs.

The year average amount of solar energy is about 2500 kW•h/m2. The average annual duration of solar radiance accounts for 2500-2600 hours. 1 m2 of solar thermal collector can provide 500-600 W/h in summer and 300-400 W/h in winter and can generate 1028-1278 kW•h of energy yearly.





The potential of wind energy in Kyrgyzstan

- By the nature of distribution and intensity of the wind speed the weather station are combined in districts and regions. In view of the above listed the territory of the Kyrgyz Republic is divided into five geographical zones. The basis of zoning by type of valleys is 5 values of wind speed. In foothill valleys where the highest density of the population the average annual wind speed does not exceed 1,5-3 m/s. Stock assessment of wind energy potential is made by generalized statistics weather stations and method of calculating the wind resource reserves from known annual average wind speeds. Determined that the wind potential of the Kyrgyz Republic is $49,2 \bullet 10^5$ tons of oil equivalent.

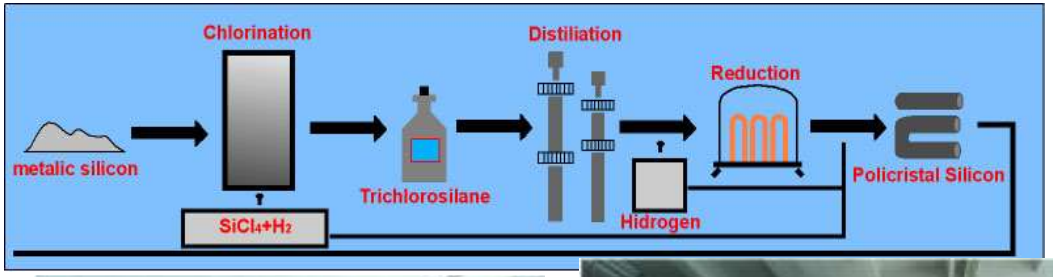
Zone	Relief type and areas	Number of stations	Altitude above sea level, km	Avergae wind speed, m/s
1	Plains and valleys:	22	0,5□1,2	2,0-3,2
	1 Fergana	9	0,6□1,1	2,3-3,1
	2 Chui	2	0,8□1,2	2,4-3,2
	3 Talas	11	0,5□1,2	2,0-2,4
2	Intermountain valleys:	14	1,9□3,6	2,3-3,7
	1 Valleys of wide spreading	7	2,0□3,5	3,0-3,7
	2 Other valleys	7	1,9□3,6	2,3-3,0
3	Hollows:	20	1,0□3,1	1,8-5,1
	1 Issyk-Kul	9	1,7□2,0	2,0-5,1
	2 Other hollows	11	1,0□3,1	1,8-2,4
4	Slopes and valleys	18	1,9□3,2	1,9-6,2
5	Mountain ridge zones	5	2,2□3,2	3,0-9,0

Developments

Various types of solar thermal collectors are developed: cellular solar collector, lamellate solar collector, plate-piped solar collector, bimetallic solar collector, solar collector with flat concentrators. Each product has its own characteristics and differs with correspondent design solutions. A series of solar water heating systems are elaborated: solar installation of individual use with combined storage tank, solar water heating installation of seasonal operation regime. Multicomponent air-water solar power installation has been developed jointly by the Kassel University (Germany) and the KSTU (Kyrgyzstan). The prototype was installed on a boiler-house "Rotor" located in Bishkek. The installation is able to convert the energy of two main sources of energy: solar radiation and ambient air enthalpy. Such solution allows the seasonal solar power installation to maintain operability in the nighttime.

Silicon production

The joint scientific-practical studies on the development of silicon technologies in Tash-Kumyr town (State JSC "Crystall" - manufacture of polycrystalline silicon, synthetic quartz crucibles) offer great interest. There is a project aimed at production of poly-and mono-silicon for the arranging of an integrated production of photovoltaic transducers. Today, operating in the Kyrgyz Republic JSC "Kyrgyz Chemical and Metallurgical Plant" (the production of mono-silicon doped with boron, antimony and phosphorus, ingot growth growing ingots up to 200 mm in diameter, wafers up to 150 mm in diameter, epitaxial structures of up to 125 mm in diameter) has a great potential for production of photovoltaic cells. This plant with an 80 large modern complex installations for growing silicon crystals is potentially one of the world's largest manufacturers of mono-crystal silicon, the raw material for the production of solar photovoltaic cells.



The potential of biomass in Kyrgyzstan

- The most unfavorable conditions for rural people have developed due to the fact that during last 10 years more than 90% of arable land is not fertilized. On the land it is needed annually up to 37,7 mln. US$, and in average annually it is spent about 4,4 mln. US$. The difference of 33,3 mln. US$ annually in foreseeable future neither the farmers nor the donors will not be able to cover. So the degradation of arable land will continue and with it the growing poverty of the majority of farmers. Formed annually 2.5 million tons of waste accumulated on livestock farms, in the courts of the peasants, in unsuitable lagoons are exposed to weathering and decayed. At the same time in the atmosphere over a hundred million m3 of gas pollutants - methane, carbon dioxide, hydrogen sulfide, creating a threat to the ozone layer, and the slurry is drained soil, contaminating mountain streams and groundwater. The radical change of the situation in agriculture is possible through the use of modern environmentally friendly technologies of agricultural processing of wastes to produce biogas (methane) and organic fertilizers.

The potential of biomass in Kyrgyzstan

- Installation of biogas plants with a capacity of up to 250 m3 of bioreactors for large dairy farms or pig farms will allow farmers to create a number of production facilities for processing of their waste - production, divided into methane gas and carbon dioxide. This setup can give 3-4 thousand tons of fertilizers per year. If one take the cost of 1 ton of fertilizer 500 soms, the revenue from such a BSU can be provided within a 2 million soms per year or more. Now one ton of manure produced by the BSU is estimated at 500 soms per 1 ton. There is every reason to believe that the price with the growth of the market will increase. The development of organic fertilizers on the BSU required for the total arable land of the republic is 1200 th. tons only for its implementation can provide income to villagers about 500-600 million soms per year. In addition to that more than one million of rural residents will be provided with gas for cooking - 100 mln.•3 som/m3=300 mln. soms.

The potential of biomass in Kyrgyzstan

BGP, Naryn

- 100 м3
- 6 t/day
- 2008

BGP, Кантг. Кант

- **200 м3**
- **14 t/day**
- **2007**

The potential of geothermal energy in Kyrgyzstan

- Low potential sources of geothermal energy can be used for hot water and heating. For example, a source at the Ak-Suu gorge can be used for heating purposes of Karakol, as it is located at a short distance of 10 km. Source temperature is stable year-round temperature of 55 ° C at a rate of 83 m3/hr. Competing methods of heating require large capital investments to meet the everyday needs of the city. It is also promising for use such fields as Issyk-Ata and Jergalan.

Production

Industrial enterprises in Kyrgyzstan can produce (with an annual growth of 10-15%):

- Solar collectors - 100-150 thousand m2 per year;
- Microhydropower - 2-2,5 MW per year;
- Wind turbines - 250-300 kWh per year;
- Photovoltaic cells based on available capacities - up to 3,2 MW per year;
- Biogas plants - 70-100 mln. m3 per year, totaling approximately 520,3-775 mln. soms.

Practical implementation of a number of projects using renewable energy sources has been made possible thanks to the fact that the Republic by now mastered the production of solar collectors, solar water heating systems of various modifications, micro-hydro, biogas plants of various capacities.


Thanks for your attention
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