Software engineering deals not only with technical issues of Software productivity (Requirements Specification, Projecting, coding,…), but also with management of software projects, including issues of planning, financing, staff management and so on. Besides that, the Software Engineering goal is developing means, methods and theories for maintenance of Software production process.

Software engineers apply systematic and organizational ways to job for achieving maximal efficiency and quality of software. Their task is adaptation of existing methods and ways to solution of concrete problem.

What is the difference with computer science?

Computer science is about the theory and methods of computer and software engineering, while software engineering deals with practical problems of software development. Computer science is the basic of software engineering and engineer in software should know the computer science. As well as engineer in electronic should know physics. In the ideal. Software engineering should be supported by some theories from computer science, but in actually it is not always so. Software engineers use receptions, which can be applied only in concrete conditions and cannot be generalized on other cases, but elegant theories of informatics cannot be always applied in real ambiguous systems.

Lastly, computer science- is not the single theoretical fundament of software engineering, because the circle of problems, staying in the front of software engineer is greatly wide then just coding. It is also management of finance, organization of works in staff, interaction with customer and so on. Solutions of these problems require the fundamental knowledge beyond the frames of computer science.

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ЭЛЕКТРИЧЕСКИЕ СТАНЦИИ И СИСТЕМЫ КЫРГЫЗСТАНА

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ELECTRIC POWER PLANTS AND SYSTEM OF KYRGYZSTAN

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The paper deals with notion of seven major hydropower stations and 2 thermal power stations of Kyrgyzstan.

Energy sector is the most promising industry sector of Kyrgyzstan, which provides a basis for economy development. Water is the main wealth of the Kyrgyz Republic.

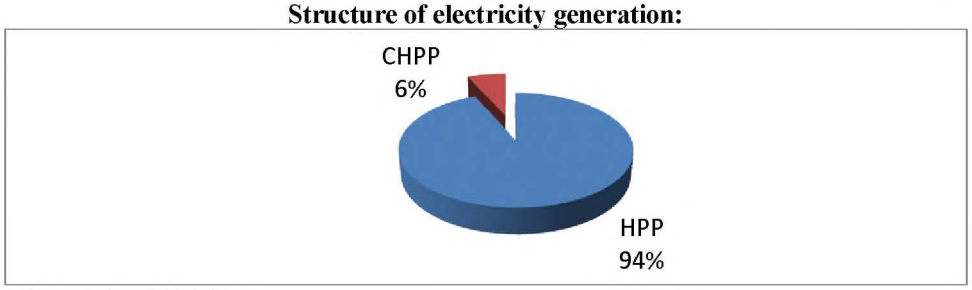
Hydropower sector, which uses continuously renewable resources for electricity generation is the main direction for the energy industry development of Kyrgyzstan.

Kyrgyzstan ranks third among the CIS countries after Russia and Tajikistan by hydro resources. Mountain Rivers possess hydropower potential of 142.5 billion kWh. The Republic Rivers have the exceptional concentration of potential capacity per 1 km of river bed.

Our Naryn River surpasses such might rivers as Volga and Angara by the specific power. Potential hydraulic energy resource of Naryn River is 56.9 billion kWh. It is possible to build 22 hydro power plants with electricity generation around 30 billion kWh on this river and its tributaries in addition to existing power plants.

	Name HPP	Commissioning year	Installed capacity, MW	Water reservoir capacity, billion m^3	Average long-term generation, million kWh per year
	Toktogul	1975	1200	19.5	4400
	Kurupsai	1981	800	0.370	2630
	Tashkumyr	1985	450	0.144	1555
	Shamaldysai	2002	240	0.040	902
	Uchkurgan	1962	180	0.021	802
	At-Bashi	1970	40	0.0096	160
	Total		2910		

Structure of electricity generation:



Toktogul cascade of HPP's

Toktogul HPP

- Integrated irrigation-energy kuot
- Commissioned in 1975
- Installed capacity 1200 MW (4x300 MW)
- Reservoir volume – 19.5 billion m^3, it is the largest water reservoir in Central Asia with long-term control of water flows
- Dam Height – 215 m
- Average long-term annual generation of electricity – 4400 million kWh/yea

Kuruspai HPP

- Commissioned in 1981
- Installed capacity 800 MW (4x200 MW)
- Reservoir volume – 370 million m^3
- Dam Height – 113 m
- Average long-term annual generation of electricity – 2630 million kWh/year

The hydro power plants under construction

Tashkumyr HPP

- In operation since 1985
- Output full capacity in 2001
- Installed capacity 450 MW (3x150 MW)
- Reservoir volume – 144 million m^3
- Dam Height – 73 m
- Average long-term annual generation of electricity – 1555 million kWh/year

Shamaldysai HPP

- Output full capacity in 2002
- Installed capacity 240 MW (3x80 MW)
- Reservoir volume 40 million m^3
- Dam Height – 37 m
- Average long-term annual generation of electricity – 902 million kWh/year

Uchkurgan HPP

- Commissioned in 1962
- Installed capacity 180 MW (4x45 MW)
- Reservoir volume – 20.9 million m^3
- Dam Height – 113 m
- Average long-term annual generation of electricity – 820 million kWh/year

At-Bashi HPP

- Commissioned in 1970
- Installed capacity 40 MW (4x10 MW)
- Reservoir volume 9.6 million m^3
- Dam Height – 79 m
- Average long-term annual generation of electricity – 160 million kWh/year

Combined Heat and Power Plants

	Name of CHPP	Commissioning year	Installed electric capacity, MW	Installed thermal Capacity, Gcal/hour	Fuel type
	Bishkek	1961	666	1443.9	Gas, fuel, oil, coal

	Osh	1964	50	350.7	Gas, fuel, oil
	Total		716		

Bishkek CHPP

- Installed electric capacity – 666 MW
- Installed thermal capacity – 1443.9 Gcal/hour
- Total: 11 turbo-generators and 24 steam boilers
- Fuel – natural gas, coal and fuel oil

Osh CHPP

- Commissioned in 1964
- Installed electric capacity – 50 MW
- Installed thermal capacity – 350.7 Gcal/hour
- Total: 2 turbo-generators and 2 hot-water boilers
- Fuel oil and gas

Future of energy in Kyrgyzstan

There are planned several main projects in energy sector:

- Kambarata HPP-1
- Normal pool level – 1190 m
- Installed capacity – 1900 MW (4x475MW)
- Electricity generation – 5088 million kWh
- Reservoir volume – 4650 million m^3
- Kambarata HPP-2
- Full capacity – 360 MW
- Reservoir volume – 70 milliom m^3
- The first unit with installed capacity of 120 MW was commissioned and connected to the network in November 2010
- Daily generation 1.4-2.0 million kWh

Due to it great energy potential Kyrgyzstan is very attractive sector for foreign investors. To support foreign investments Kyrgyzstan established a legal basis for investors such as laws “On investment”, “On energy sector”, “On electric energy sector”, etc.

In accordance with the existing laws of the Kyrgyz Republic the foreign investors may carry out the construction, operating and ownership of the new facilities, sell electricity within Kyrgyzstan and abroad. Upper-Naryn cascade of hydropower plants is the great example. Upper-Naryn cascade of hydropower plants - under construction hydropower complex, including a 4 hydroelectric power plant in the upper reaches of the Naryn River, the city of Naryn, Kyrgyzstan. Construction stage conducted in 2013 in accordance with the intergovernmental agreement between Kyrgyzstan and Russia, the launch of the first hydraulic unit is scheduled for 2016, it is planned to complete construction in 2019. The operator of the project - JSC "Upper-Naryn hydroelectric power station", which is on an equal footing speak Russian "RusHydro" and the Kyrgyz OJSC "Electric stations". Financing the construction of the cascade of stations in the amount of 24 billion rubles ($ 727 million) is made by the Russian side.

Basic technical and economic indicators of HPP of the first stage

Name	Installed electric capacity, MW	No aggregate	Gross capacity billion, m^3	Maximum operating pool elevation, m	Average long-term generation, million kWh
Naryn HPP-1	62	4	9.87	2235	227
Naryn HPP-2	60	2	1.24	2185	235
Naryn HPP-3	60	2	0.3	2141	254
Akbulun HPP	100	2	126	2315	372

According to legal basic there is a growing trend in cooperation of government with entrepreneurs. For this reason I expect a rapid growth in energy in Kyrgyzstan. In future I expect that Kyrgyzstan will become the center of hydro energy of Central Asia. To accomplish that I am intended to work hard and one day I will become a Minister of Energy and industry to lead energy in Kyrgyzstan to abundance.

Literature

1. Date from JSC”Electric Power Plants” and Ministry Energy and Industry of Kyrgyz Republic.