Renewable energy supply in XXI century

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The Hubbert peak theory, also known as "**peak oil**", views a long-term discovery and decreasing rate of oil and some other forms of fossil fuel. Theory is named after American geophysicist M. King Hubbert, who created a unifying model for all known reserves. In a paper, presented to the meeting of the American Petroleum Institute in 1956, he made the prediction that overall petroleum production in the United States would peak between the late 1960s and the early 1970s. Oil production reached its peak in 1971 and has been decreasing since then.

In 1971 Hubbert used global oil reserve evaluation to make a prediction that global oil production would peak between 1995 and 2000. Basing on present information about proven, probable and possible oil reserves, increasing oil demand and available technologies, ASPO (Association for the Study of Peak Oil and Gas) predicts that global oil production would peak by 2010. However, peak could be delayed due to events that took place some after Hubbert's prediction, especially energy crisis in 1973. Decreased oil supply, caused by crisis, resulted in deficit and decrease of oil demand. Then, increase in price in 1990, caused by Persian Gulf War, had the same influence.

It is clear, that every global oil supply decrease will cause serious economic and social consequences. Global economic growth is based on cheap energy, so oil makes a reasonable contribution in the whole oil production. As energy resources runs low, it's growth will decline or even stop. For this reason, peak time is not as important, as the decrease rate (Hubbert curve) after it.

The more traditional energy resources come in decline, the more importance the world attach to the renewable energy sources.

Wind-power engineering

This is the fastest growing of the renewable energy technologies.

The use of wind energy is realized by application of wind turbines and wind-powered generators. The main point of wind turbines is to convert kinetic energy of the wind into potential energy of the wind.

There are two kinds of wind-powered generators: industrial and domestic (for private use). Industrial generators are built by government or grand energy corporations. They are usually combined into network to get almost a real power plant as a result. The major distinction between wind-driven power plant and traditional (atomic, thermoelectric) power stations is that it doesn't consume any fuel or produce any wastes. The only essential requirement is a high average annual windiness value. The modern wind-powered generators power reaches 6 MW.

<u>Wind-power engineering in Russia:</u>

- Russia's wind power technological strength is estimated with more than 50 000 TWph/year. One of the greatest wind-driven power plants in Russia (5.1 MW) is situated near the Kulikov's village of Zelenograd district of Kaliningrad region.

<u>Wind-power engineering prospect and plans for development:</u>

- The Canada government is planning that 10% of all electricity production will be generated by wind power by 2015.
- EU is planning to build 40 000 MW wind-power generators by 2010.
- In Spain there would be 20 000 MW generators built by 2011.
- In China a national development plan is approved. Generators are planning to produce 5 000 MW by 2010 and 30 000 MW by 2020.
- India will improve its wind-powered generators by 4 times in comparison with 2005. In 2012 there will be 12 000 MW of new generators built.
- 20% of New Zealand electricity is expected to be generated by wind power.
- 10% of UK electricity is planned to be generated by wind power by 2010.
- Egypt is going to built 850 MW of new wind-powered generators by 2010.
- International Energy Agency (IEA) forecast that wind-power engineering demand will amount 4 800 GW by 2030.

<u>Problems of wind-power engineering:</u>

- Wind-power engineering is unregulated. Energy produce depends on wind rate, and wind speed is not constant. So power system is produced with electricity irregularly. Taking into consideration that power system has unregulated heterogeneous energy rating (peaks and holes of power consumption), one can see introducing considerable proportion of wind-power engineering in power system lead to

its destabilization. It is clear, that wind-power engineering requires power reserve (e.g. gas-turbine power station) and heterogeneity smoothing mechanisms.

- Large windmills face considerable difficulties with maintenance as big part replacement on the height of 100 meters is complicated and expensive action.
- Mechanic noise (noise from working mechanic and electric features) and aerodynamic noise (noise from interaction of wind with construction blades) are also problems of no small account.
- Metallic parts of windmill, especially blades, can cause serious disturbance in television signal receiving. The larger windmill the greater disturbance it can cause. In a number of cases it is necessary to build an additional transponder to solve this problem.

Solar power engineering

Solar energy is energy directly from the Sun. It adapts rapidly in different ways. Its greatest rise solar power engineering reached in China.

It generates electricity using solar cells, semi-conducting devices that converts solar energy into electricity by the photovoltaic effect.

Solar power can be applied in many ways (generating electricity using solar cells, using concentrated solar power; heat buildings, heat water or air).

Hydro-power engineering

Types: hydroelectric dams, damless hydro systems, wave power, tide power, OTEC (ocean thermal energy conversion) etc.

Advantages:

- Renewable source, prime cost is very low, no air pollution
- Hydroelectricity generators can be quickly turned on/off according to energy consumption.

Disadvantages:

- Building of hydroelectric plant is long and expensive
- Reservoirs occupy large territories
- Dams can harm fish industry as they block the way to spawning ground

Biomass

Biomass refers to living and recently dead biological material that can be used as fuel or for industrial production. It also used to produce heat, electric power, biofuel and biogas.

Biomass can be used to produce ethanol, which is used as an engine fuel then. Corn, wheat, sugar-beet, sugar-cane, maize etc. are used as stuff.

Geothermal power engineering.

It produces electric power and heat energy due to thermal energy stored in Earth's interior, from its core. Geothermal energy usually relates to renewable sources. It is narrowly spread due to attachment for seismic active zones. It is expensive to build a power station but operating costs are low and energy is cheap.

Renewable energy sources in Russia

Composed in 2000 RES development forecast till 2020, turned out to be too much pessimistic. It was proposed that RES's part in electricity production (small hydroplants including) will be 1.0% by 2010. But this value had been reached in 2005.

Heat energy production (based on RES) rise, surpassing forecasts. In 2005 it was estimated as 95 billion kcal, yet was predicted only 70 billion kcal by 2010.