be an alternative for long-distance AC lines (1500 km and above and the transmission power of 2,000 MW). To a lesser extent DC power is used in solving technical problems of formation of interconnected power systems which cannot be solved by using AC power (ensuring stability of parallel operation, not synchronous communications of power systems, long distance cable lines), as well as in cases where the construction of aircraft and cable lines for AC transmission line is not economically feasible, for example, crossing the sea space. In other cases it is justified to use alternating current electric power for transmission. It is worth noting quite successful practices relating to combined work of both methods.

References:

1. http://www.electricaltechnology.org/2013/05/comparison-between-ac-and-dc.html.
2. http://www.energocon.com/pages/id1320.html.
3. http://lib.rosenergoservis.ru/sovremennaya-elektroenergetika?start=78.
4. http://treugoma.ru/electric-energy/feature-issue/.

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Hydro Power Plants

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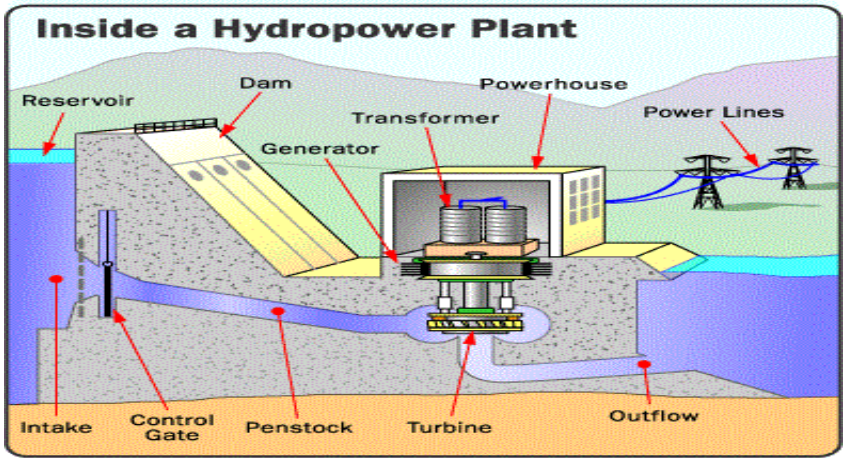
Hydroelectricity is the term referring to electricity generated by hydropower; the production of electrical power through the use of the gravitational force of falling or flowing water. It is the most widely used form of renewable energy, accounting for 16 percent of global electricity generation – 3,427 terawatt-hours of electricity production.

The main aspects of hydro power plants:

1) Design and Operation.
2) Generating methods.
3) Advantages and Disadvantages.

Design and Operation

Operation of HPP 's not much harder than where he worked first station . Thanks circuit hydraulic structures provided the necessary water pressure forces acting on that turbine blades drive a generator . Just today, for HPP does not need to use the Niagara Falls. Hydroelectric their hands can also produce the right amount of energy. Achieve the necessary force head through the construction of a series of dams. Note that in using various types of hydroelectric turbines. The main factor that affects the choice – the power head .All power equipment is located in the power house . In addition to the engine room, which houses all hydraulic units are departments that contain extra equipment, transformer station, device control and management of hydropower etc.



Generating methods

Conventional (dams) – Most hydroelectric power comes from the potential energy of dammed water driving a water turbine and generator. The power extracted from the water depends on the vol-

ume and on the difference in height between the source and the water's outflow. This height difference is called the head. The amount of potential energy in water is proportional to the head. A large pipe (the "penstock") delivers water to the turbine.

Pumped-storage – This method produces electricity to supply high peak demands by moving water between reservoirs at different elevations. At times of low electrical demand, excess generation capacity is used to pump water into the higher reservoir. When there is higher demand, water is released back into the lower reservoir through a turbine. Pumped-storage schemes currently provide the most commercially important means of large-scale grid energy storage and improve the daily capacity factor of the generation system. Pumped storage is not an energy source, and appears as a negative number in listings.

Run-of-the-river – Run-of-the-river hydroelectric stations are those with small or no reservoir capacity, so that the water coming from upstream must be used for generation at that moment, or must be allowed to bypass the dam.

Tide – A tidal power plant makes use of the daily rise and fall of ocean water due to tides; such sources are highly predictable, and if conditions permit construction of reservoirs, can also be dispatchable to generate power during high demand periods. Less common types of hydro schemes use water's kinetic energy or undammed sources such as undershot waterwheels. Tidal power is viable in a relatively small number of locations around the world.

Underground – An underground power station makes use of a large natural height difference between two waterways, such as a waterfall or mountain lake. An underground tunnel is constructed to take water from the high reservoir to the generating hall built in an underground cavern near the lowest point of the water tunnel and a horizontal tailrace taking water away to the lower outlet waterway.

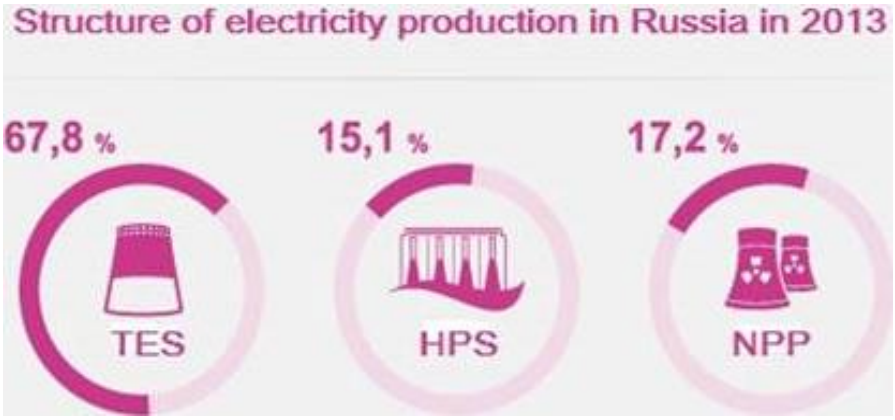
Advantages and Disadvantages of HPP's

Advantages :

- use of renewable energy;
- very cheap electricity;
- work is not accompanied by harmful emissions into the atmosphere;
- fast (relatively CHP / CHP) output to output mode after the operating power station.

Disadvantages:

- flooding of arable land;
- construction is carried out only where there are large reserves of water power;
- mountain rivers are dangerous because of high seismic areas;
- environmental problems : reduced and nonregulated water releases from reservoirs for 10-15 days (until their absence), lead to a restructuring of the unique floodplain ecosystems across the river stream, as a result, pollution of rivers, reducing the trophic chain, reducing the number of fish, aquatic invertebrates elimina-



tion animals, increased aggressiveness components midges (gnats) due to malnutrition larval stages, the disappearance of many species of nesting migratory birds, inadequate hydration floodplain soils, vegetation succession negative (depletion phytomass), reducing the flow of nutrients in the oceans.

Hydropower in Russia.

Hydropower is a good alternative for Russia, unnecessarily in our country there are many large and powerful rivers, as well as a large share of electricity generation refers to the TES, which is harmful to the country's ecology.

References:

1. Владимир Тетельмин. Плотина Саяно-Шушенской ГЭС. Состояние, процессы, прогноз. Либроком 2011 г.

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Renewable sources of energy – the solution to climate change

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Climate change is arguably one of the greatest environmental threats the world is facing. The impacts of disruptive change leading to catastrophic events such as storms, droughts, sea level rise and floods are already being felt across the world.

While the Kyoto Protocol, which aims to reduce greenhouse gas emissions, is slowly impacting on energy markets, scientists are increasingly advising policymakers that carbon emission reductions of beyond 60% are needed over the next 40-50 years [1]. How will we achieve such a dramatic reduction in carbon emissions?.

At the heart of the issue is an energy system based on fossil fuels that is mainly responsible for greenhouse gas emissions. On the contrary, renewable energy provides one of the leading solutions to the climate change issue. By providing ‘carbon-neutral’ sources of power, heat, cooling and transport fuels, renewable energy options such as wind, solar, biomass, hydro, wave and tidal offer a safe transition to a low carbon economy.

This outlines the role that renewable energy can play in reducing greenhouse gas emissions such as carbon and methane. It highlights the success to date and the activity already happening across Europe and the rest of the world. It assesses its potential, and identifies how renewable energy is central to climate change policy and delivering large carbon dioxide reductions.

According to the vast majority of climate scientists, climate change is already underway. The past decade has seen the warmest 6 years since records began. A third of global habitats are at risk, and extreme events such as floods, storms and drought are becoming more frequent. The financial consequences of climate change are also becoming apparent – with insurance claims due to weather-related damage increasing dramatically over the past few decades.

The following effects of an increase in global average temperature have been identified:

- Steady rise of the sea level.
- Flooding of coastal areas.
- Frequent extreme weather conditions.
- Frequent poor harvest.
- Water shortage.
- Devastations.
- Loss of biodiversity.
- Increase of infections.

The climate change problem is essentially a fossil fuel energy problem. While agriculture, land-use changes, cement production and the use of chemicals all contribute to green-