

ENVIRONMENTAL SAFETY AND ENERGY EFFICIENCY AS A PRIORITY OF JAPANESE ENERGETICS

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By the state and structure of electricity generation capacity, it can be judged which stages of formation were passed by Japanese power industry under the influence of national energy policy. The result of world's energy crisis in 1970s was the restructuring of the thermal power industry in Japan to its diversification. Since the "oil shocks" the share of oil in electricity production decreased consistently – from 73.2% in 1973 to 5.16% in 2011 [2]. At the same time capacities of thermal power plants using oil had not been taken out of operation but had not been modernized, remaining a reliable reserve for unforeseen failures in other segments of the electric power industry: Japanese power companies periodically have to resort to additional combustion of oil in case of any problems at nuclear power plants (NPP).

Despite the large amount of gross primary energy consumption, Japan's economy is one of the least energy-intensive. In 2011, the energy intensity of gross domestic product was 0.11 kg of oil equivalent (KOE) per \$1 of real purchasing power parity (PPP) compared to the world average indicator of 0.19 kg KOE/\$ PPP. The increased attention to energy efficiency is the result not only of the propensity to "lean production", but also a deep energy scarcity of Japanese economy. Domestic production of oil is in a rudimentary form, the annual production of natural gas does not exceed 4 billion m³, coal – 1.4 million tones. Japan has to import almost all of the consumed fuel resources that caused the active development of Japan's nuclear and hydro generation. Today, with the help of "peaceful atom", country provides about 26% of its total electricity production. Dependent on changes in natural conditions, the annual hydro generation varies in a wide range from 74 to 95 billion kW•h, taking up about 2.3% of world production [3].

Renewable energy sources (RES) have an active development in Japan. Already in 2008, their share reached 11.8% in the total production of primary energy sources in the country. Solar, geothermal and wind power has the greatest development. According to the "Japan Strategy of Biomass", adopted in 2002, this area of RES is among the priority. In 2011, the installed capacity of solar power plants (SPP) in Japan was 4.914 GW. According to this indicator, the country ranked third in the world, second only to Germany and Spain. The largest SPP of Japan is "Solar Ark", which produces 0.5 million kW•h/year. In 2010, the total installed capacity of wind power plants of the country was 2.5 GW. Today the installed capacity of 6 geothermal power plants (GPP) is 0.53 GW. Currently under construction there are 5 GPP [1-2]. In Japan there is a continuous search of other

unconventional sources of energy. In particular, in 2006 the municipality of Muroran mastered the production of methane from the snow. According to Japanese scientists' estimates, in the industrialized cities the content of gas in the snow is 70%, as the snow absorbs not only dust, but also harmful gases. According to the estimates, from 1 ton of snow it can be collected up to 100 liters of methane [3].

One of the priorities of national energy policy is to ensure environmental safety. Over the past decades, Japan is one of the leading countries in CO₂ emissions, produced 3.77% of global emissions in 2011. In the pre-crisis period (as of 2008) the volume of greenhouse gas emissions (GGE) in Japan reached 1.38 billion tones of CO₂-equivalent, including 1.2 billion tones in the power sector. In 1997 Japan signed the Kyoto Protocol and assumed commitments to reduce GGE by 6% from the 1990 level (1.16 billion tones of CO₂-equivalent) in 2012, but until 2003 GGE demonstrated the sustainable growth. Only since 2004, they have stabilized at 1378...1396 million tones of CO₂-equivalent, which exceeds level of 1990 by more than 18%. Addressing this issue, there was adopted "Act of rational use of energy" developed by Agency of Natural Resources and Energy of Japan [3].

In May 2007, the Japanese government adopted the initiative CoolEarth 50, according to which it is planned to reduce greenhouse gas emissions by 50% in 2050 compared to the 1990 level. To implement this initiative, in March 2008 there was designed Cool Earth – Innovative Energy Technology Plan, which determined the priority of innovative energy technologies, represented the road maps of new technologies, ways of increasing energy efficiency and cost savings, as well as a list of measures of international cooperation for improving the exchange of information and technological developments in the field.

Japan has faults with affordable electricity after decommissioning of 50 nuclear reactors as a result of the accident at NPP "Fukushima-1" in March 2011, which caused local ecological disaster after a powerful tsunami hit on Japanese coast. In this regard, the country introduced the regime of austerity of electricity. Period of lowered consumption acted from 9.00 am to 20.00. Because of rolling blackouts of electricity introduced in various country parts, the level of consumption was reduced by 5-15% compared to the summer of 2010. Restrictions are not touched upon Tokyo, Okinawa and the north-east of Honshu, where there was sufficient capacity for electricity generation. Enterprises and offices without fail disable or reduce lighting, put air conditioners at mark not less than plus 28 degrees Celsius. In May 2011, Japan passed a law requiring citizens to save energy by 15%. Thus, despite serious accidents in 2011 that rocked the country's energy system, Japan continues the consistent implementation of energy efficiency policies and environmental safety by securing them as priorities for further development.

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