

## RENEWABLE ENERGY SOURCES

## 8.6. Analytics

## 8.6.1. Actual Status and Perspective of Development of Renewables in Russia. National Policy and Possibilities of Regions and Business

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## ABSTRACT

This survey opens a series of articles on the certain technologies on renewables in Russia placed in the Information Electronic Constantly Updated Open System “The Best Available and Perspective Nature Protection Technologies in the Russian Power Industry” of the Moscow Power Engineering Institute (<http://osi.ecopower.ru>). It presents information on actual status and perspective of renewables development. The particular focus was made on the necessity of a system analysis and system decisions to provide development of renewables. Main components of a system approach are indicated. National policy towards renewables is analyzed, conclusions relating to possibilities of renewables development at the administrative regulation level in regions and at the business level.

There is a boom of renewables development in the world. According to [1 and 2]: in 2013 investments in renewables constituted USD 214.4 bln.; capacities of renewables (without hydro plants) in 2013 achieved 560 GW<sub>e</sub> having increased by 80 GW<sub>e</sub> per year (or by 16,7 %), incl.:

- biofuel energy facilities – 88 GW<sub>e</sub>;
- geothermal – 12 GW<sub>e</sub>;
- photovoltaic converters – 139 GW<sub>e</sub>;
- solar concentrators – 2,5 GW<sub>e</sub>;
- wind plants – 318 GW<sub>e</sub> (in 2012 it was 283 GW<sub>e</sub>, i.e. the increase made 12 %);

In 2013 hot water production with solar panels constituted 326 GW<sub>th</sub> (in 2012 it was 282 GW<sub>th</sub>, i.e. the increase made 16 %).

The installed capacities of power generating facilities with renewables (without big hydro plants) in 2010 were higher than the capacities of all of the nuclear power plants — 340 GW<sub>e</sub>. Heating and hot water supply systems serve more than 60 mln houses all over the world, annual increase rate constitutes more than 15 %. In 2013 144 countries approved national programs on renewable introduction with certain indicators for a medium and long-term perspective. Many countries set a goal to achieve the share of renewables in the energy balance of the country at the level not lower than 15...20 % by 2020, and in EU — up to 40 % by 2040. Priority development of renewables, providing rates of growth of tens percent a year, is conducted with powerful state support of related laws acceptance, financing and policy.

Success of mass renewables introduction is often demonstrated via the experience of European countries. But with that all of the driving forces for development of renewables are never mentioned. In addition to the well-known forces such as mitigation of environmental impacts, diversification on energy sources, increase in energy security, decrease in dependence on fuel import, economic issues and image aspects, there are two more reasons: refusal from nuclear power plants and severe commitments of GHG

emissions under the Kyoto protocol. So, there is quite a lot of reasons for special concern towards renewables development in these countries.

In Russia renewables without large-scale hydro plants with capacities of 30 MW<sub>e</sub> and higher produce totally about 1 % of electricity, and the share of heat production by renewable facilities constitutes about 3 % (~ 2 bln GCal) [3]. Nevertheless, by Energy Strategy of Russia by 2030 [4] renewables are treated as sources that are to be developed with increased rate (with the remark that large-scale hydro plants are also referred to renewables).

Criticism towards low rates of renewables development in RF mainly addresses the activities of the government (no special law, lack of programs, not enough financing of R&D and implementation of projects, etc.). However, comparing driving forces for renewables development in EU and in Russia it is easy to see that in our country they are substantially weaker. In particular, in RF construction of a number of nuclear and thermal power plants is envisaged, commitments on GHG emissions in the framework of Kyoto protocol (KP) are met with a great reserve and no new commitments were taken by Russia for the prolonged period of KP; there is no dependence on fuel import, etc. To our understanding these very reasons are the decisive ones when speaking of some recess in renewables development. There was no mass introduction of renewables in Russia because of lack of motivate necessity which is also a substantial reason of slowing the realization of even accepted administrative decisions. To demonstrate state priorities a simple example can be presented (it can't be treated as an alternative project for nuclear power plant): nuclear unit of 1000 MW<sub>e</sub> with utilization hours of the installed capacity of 6000 hours/y, operating in a base-load mode and a wind power plant with an equal power production. About 500 wind plants of 3 MW<sub>e</sub> each will be needed with optimistic 4000 hours/y of the installed capacity use. It should be noted that such high capacity plants are not manufactured in Russia and wind plants are working in an impulse mode, depending on the wind force. Or another example: it is easy to imagine what will be the priority of a regional government when a comparison is made whether to construct one medium-scale hydro plant or a series of mini- and micro hydro facilities. In such a way high capacity traditional power concept, cultivated from the State Electrification Plan, accepted in 1920's in a natural manner takes over the renewables. At the same time it should be noted that by the middle of the XX century in the former USSR some 6600 small-scale hydro were in operation, being all later dismantled as a result of construction of big thermal, hydro and nuclear power plants and introduction of the Unified Power System of USSR [5].

Nevertheless, the mentioned before is not the reason for referring the renewables to the category of the secondary sort

of energy sources. As mentioned in [3] technical availability of renewable resources in Russia constitutes not lower than 24 bln t.c.e., there are a lot of remote small settlements where renewables can normally compete with traditional sources, there is a mere niche for renewables even in the regions with abundance of primary renewable resources. For instance, this is true for geothermal energy on Kamchatka peninsula, in Krasnodar region, for wind power at places where the wind potential is stable and strong. Design works of some off-shore wind mills with capacities up to 75 MW<sub>e</sub> are under way. At Altay and Astrakhan regions technical reasonability of using large-scale solar power was proved and construction of two high-capacity power plant started.

We think that targeted indicators of renewables development can not be kind of self-targeted or based on not fully substantiated intentions or defined only administratively, they should be based on a strict concept of reasonability.

RF's targeted indicators up to 2020 are stated by the order of the Government dated 08.01.2009 No.1-p [6]. They demand the increase in the share of renewables (except big hydro plants):

- from 0,9 % in 2008 to 1,5 % by 2010;
- to 2,5 % by 2015;
- to 4,5 % by 2020 which constitutes about 80 bln kWh of electricity production with renewables as compared with 8.5 bln kWh at the time being.

Unfortunately, a methodology of forecasting those targeted indicators is not clear. For the present the indicators are not met. There are some more conservative scenarios which gives the share of renewables by 2020 at the level of not higher than 1,5...2,0 % of electricity production [7]. Nevertheless, trends are clear and the targeted indicators are fixed though being a bit doubtful. The question is still on the agenda: how to provide even a moderate growth of renewables? Much is proposed to do with the help of international experience. Measures worked out by the RF Ministry of Energy [3], which seem to be quite serious, include the following:

- to improve the system of targeted indicators and to provide the improvement of national statistic reporting network;
- to work out and regularly update the scheme of placing of generating capacities with renewables;
- to provide the development and realization of measures for attracting non-budget investments for constructing of new and refurbishment of existing facilities with renewables, including the following legal measure (under Federal Law dated 26.03.2006 No.35-FZ "On the power sector") – providing subsidiary financing as a compensation of the cost of technological connection to electrical grids of sources classified as renewables;
- to work out a complex of measures that would help the development of small enterprises that are functioning at the market of services in the field of renewables in the power sector.

In order to smooth competition conditions for energy producers with renewables and those producers using organic fuel it is envisaged:

- to establish and regularly update discount rates and periods when the discounts are valid, this discount being added to weighted price of electricity at the wholesale market in order to get the final price of electricity produced with renewables;
- to establish the duty of wholesale buyers to purchase electricity produced with renewables;

- to realize measures to improve legislative regime of natural resources use for construction and operation of facilities with renewables;
- to use mechanisms of additional support of renewables development;
- to work out a complex of normative and regulation measures to introduce a support to renewables, primarily additions to the power prices, those measures are to be incorporated into the mechanisms of functioning of wholesale and end markets of electricity (incl. regions that are not united with price zones of the wholesale market), and also to implement them in the isolated power systems.

In the field of improving of infrastructural provisions of development of power production with renewables it is envisaged:

- to improve the efficiency of scientific provisions and technological support of development of renewables;
- to rationally use the potential of domestic industry;
- to create and develop informational environment for population;
- to organize education and training of specialist as well as preparation of normative and technical documentation for designing, construction and operation of generation facilities with renewables;
- to provide assistance in creation the system of stimulating the production and sales of electricity produced with renewables.

All of the above measures do not cause any objections, though they can be added. First of all, this refers to creation of stimulus for manufactures of equipment and organization of business at all levels from big industrial projects to small projects for consumers. In case some profits are foreseen from the renewables projects an optimistic result can be achieved. It's just an interest from business that can speed up implementation of renewables. It is important to underline the system of planning and realization of regional programs. A good assistance can be expected from pressing on the governmental and regional administrations produced by business institutions. It is very important to set a system realization of all of the above measures in one complex in such a way that not a single component can work alone or can contradict with the others when interacted measures are in work, as well as there is a refuse from realization of a necessary measure for some time or forever under some reason.

In articles dedicated to technological aspects the following renewables are considered:

- wind power stations;
- solar power plants and heat supply systems;
- small hydro;
- tidal power plants;
- geothermal power plants;
- biofuel facilities.

Taking into account that the Information Electronic Constantly Updated Open System "The Best Available and Perspective Nature Protection Technologies in the Russian Power Industry" of the Moscow Power Engineering Institute includes information on the available technologies being already developed, but not under R&D stage, they are not described here. It should be pointed out that the described technologies and related equipment are at different stage of manufacturing availability; some are model type with available serial equipment (wind engines, mini and micro hydro, some biofuel facilities), some are at the stage of

designing or trial operation of demonstrational facilities. Some facilities are the objects of individual design and the related equipment is manufactured under individual orders. Some imported equipment can be considered as available (for instance, wind engines). Correspondingly, the description of all of the technologies and equipment is presented with different completeness. In every case the authors had in mind the definition of the best available technology according to standard GOST R 54097-2010: it is a “technological process, technical method based on modern achievements of science and techniques aimed at mitigation

of environmental impacts and which has an installed term of practical implementation taking into account economic, technical, ecological and social factors”.

In this survey and in the “technological” articles terms, definitions, classifications, technical conditions are used according to standards GOST R 54531-2011, GOST R 54100-2010, GOST R 51237-98, GOST R 51238-98, GOST R 51594-2000, GOST R 51990-2002, GOST R 51991-2002, GOST R 52808-2007, GOST R 51595-2000, GOST R 54097-2010, GOST R 54097-2010.

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