

ON SOME ASPECTS OF CHINA'S POLICIES IN THE FIELD OF «GREEN» ENERGY

Kharchenko, Maxim P., Moscow State University of Railway Engineering (MIIT), Moscow, Russia.

ABSTRACT

The article is devoted to the study of the evolutionary development experience of alternative energy in China. The author analyzes the country's methods for

producing «green» energy and options for its use in various sectors of the Chinese economy and the transport sector. The cars and trams with hybrid and electric motors are of particular interest.

Keywords: China, safety strategy, alternative energy, «green» energy, alternative transport, electric car, hybrid tram.

Background. The Chinese leadership has put forward a very bold, which seemed for somebody even fantastic, idea that by 2020 in the country 30% of the energy will be produced through alternative sources. Realizing the urgent need to get exactly this type of energy, which would help China to become an independent player on the world energy market and not to depend on hydrocarbon supplies, the country's leaders have invested a lot of money in projects related to renewable energy.

China is ready to allocate \$70 billion investment annually for development of «green sector» under the condition that the energy strategy adopted will be successfully implemented. «Program 2011–2030», which has two intermediate «stops»: 2015 and 2020 (See Table 1), should help China to hold the first place in the world in terms of investment in alternative energy, continuing to outpace Australia, Germany and the United States.

Table 1

Year	Wind	Sun	Water
2015	50 mln kW	30 GW	150 GW
2020	200 GW	50 GW	260 GW
2030	400 GW	100 GW	350 GW

Objective. The objective of the author is to consider some aspects of development of «green» energy strategy in China.

Methods. The author uses general scientific methods, economic approach, comparative analysis, analytical method.

Results. Despite the fact that China currently lags behind its program plans, the rate of growth for a number of types of renewable energy is very impressive. Xinhua information agency published, for example, the following data on the first quarter of 2016: «In January–March this year, China has put into operation new wind installations with a total capacity of 5,33 GW, which is 13 per cent more against the same period last year ... By the end of March, China's total wind power capacity reached 134 GW, with an increase of 33 per cent compared to last year's figure for the same period.

During this period of time the amount of electricity generated by WES reached 55,2 billion kilowatt hours, an increase by 21 per cent compared with the same period of last year» [1].

With all the failures that periodically overtake the creators of «green energy miracle», the general director of China National Centre for the change in climate strategies and international support Lee Tszunfan is sure that by 2050 85% of the total China energy will be produced by alternative sources [2].

It must be assumed that this belief is shared by other Chinese officials and entrepreneurs. Announced in 2011 the Twelfth Five Year Plan was held under the motto of the first step from «black energy» to «green». It is not surprising that China today is a major manufacturer of solar panels: its share in the world market is more than two thirds. The main manufacturing companies are also Chinese: «Yingli Green Energy», «Trina Solar», «JinkoSolar». Although these companies are very unstable, and their creators, in one day became billionaires, then in one day they can loose everything, precisely because they are the future of solar energy.

In 2011, oil consumption in China amounted to 461,8 million tons, of which more than 160 million tons [3] were spent on maintenance of the car fleet. This rate of consumption created a threat not only to environmental, but also economic

security of the country, which could lead to catastrophic dependence of China on oil import. Realizing the complexity of the situation, the Chinese government tried to modernize the automotive industry and to transfer drivers of the largest metropolises to natural gas. Certain result of the start of the program was that today more than 3 million vehicles in China use this type of fuel [4]. However, the program cannot be considered totally successful, as substitution of petrol with gas did not allow the country to get rid of carbon dependency and the positive effect exerted on the environment, is extremely small.

After analyzing the results of the first attempts of reform, the State Council of China in 2011 approved the «Program of development of the automotive industry on the basis of energy-saving and new energy (2011–2020)» [5]. Under the new program, the government has decided to invest more than 100 billion Yuan into the development of car production, using new forms of energy. As a separate line expenses at the amount of 15 billion Yuan were prescribed to build the appropriate infrastructure of electric charging stations [6].

It should be emphasized that the «Program 2011–2020» is a very important stage in the development of the Chinese alternative automobile industry. Companies that operate in the framework of this program, develop and implement a complete production line of the new generation of cars that is by due to various tax benefits and state support for alternative energy will soon become much cheaper and more attractive than conventional cars.

It is extremely important that the result of the «Program 2011–2020» is clearly visible now. As reported by Xinhua: «In January–April [2016], China produced 94 thousand and sold 90 thousand cars running on clean energy sources that is by respectively 126,8 and 131,1 per cent more than in the same period last year ... In particular, during this period of time the production and sales of electric vehicles was 70552 and 66444 units (increase by 165,3 and 171,2 per cent respectively). And the production and sale of «hybrid cars», combining an electric motor with an internal combustion engine, totaled 23890 and 24085 units (58,8 and 64,1 per cent growth respectively). Electric cars make up 73 per cent of all vehicles produced in the country on environmentally friendly sources of energy» [7].

Given the amount of funds that the Chinese government invests in alternative energy sources in general and in car production in particular, a grand contribution to the development of electric charge stations should be noted. The pace of development of a network of such stations is very inspiring – Beijing authorities, for example, expect to launch the 300th charging station by the end of 2016. And this, in turn, means that soon the Chinese capital will be literally crammed with 50 thousand electric charging units, each of which will be located at a distance of 5 km from each other within the 5th transport ring of the capital [8].

But do not believe that only the capital and metropolitan areas are included and actively participate in the activities and projects of the «Program 2011–2020». For example in the city of Taiyuan, Shanxi Province according to the plans of local authorities all taxi cars soon will be replaced by electric vehicles, which will not only improve the environment of the city, but also save a portion of the budget allocated annually by the authorities for modernization of equipment and automotive vehicles themselves. Xinhua reported: «8292 taxi cars registered in the city began to be written off from the end of last year (2015 – author's note.). To date, more than 4 100 taxis have been replaced by electric vehicles. It is planned that by the end of July, electric vehicles will have replaced the left taxis, which run on petrol or gas fuel» [9].

R & D development, very richly funded under all the same «Program 2011–2020», bears its fruits. So, China's minister of science and technology Wan Gang, speaking at the China Automotive Forum 2016 said that China intended over the next five years to create batteries for electric vehicles with twice the energy density and to reduce by half the cost of their production. The minister said the following: «The new power source will have an improved measure of density, which reaches 300 watt-hour / kg, and the cost of production will be less than 1 Yuan per watt-hour. The focus is on the expansion of production scale and enhancement of research activities in this area». On the basis of energy saving, environmental protection and features of the automotive industry, the future of the industry depends on the cars on new sources of energy. In addition, the energy structure settlement in the country will provide electric cars with energy, stricter requirements for automotive companies to reduce energy consumption will facilitate the transition to mass production of electric vehicles [10].

The use by Chinese experts of hybrid and alternative energy sources for public transport is of particular interest. So, in April 2016 after four years of painstaking joint work of engineers and workers of Tangshan locomotive-car-building company at the Chinese locomotive building Corporation CRRC (Zhongguo Chzhunche), located in Hebei province, and scientists from the Southwest Jiaotong university a new tram on hybrid energy sources – hydrogen batteries and supercapacitors was created. As the Tangshan locomotive-car-building company announced, a new tram can run longer than currently available, and does not need the overhead contact line. Moreover, it does not produce emissions. The tram can carry up to 336 passengers, and 15-minute charging allows it to cover more than 40 km at a maximum speed of movement of 70 km / h. Special pride of Chinese experts is that it is the world's first tram, using a hybrid power supply system of the hydrogen batteries and supercapacitors [10].

In fairness it should be noted that hydrogen fuel cells are also widely used in the automotive industry.

Strategic security priority, of course, is the key choice in China. China's strategy in this area is concentrated around a few basic ideas that cooperate in themselves external and internal resources.

Firstly, it is the principle of «thrift». In his speech at the XVIII Congress of the CPC General Secretary of the Central Committee of the Communist Party of China Hu Jintao said: «Resource saving is a basic ecological environment protection measure. It is necessary to ensure the economical and intensive use of resources by promoting the radical transformation of the forms of their use and strengthening of control of the entire process for saving purpose to be able to significantly reduce the intensity of energy resource consumption, water and land, to increase at the same time the coefficient and efficiency of their use. It is necessary to promote revolutionary forms of energy production and consumption, to control the total amount of their costs, to support the development of energy-saving and low-carbon industry, the development of sources of new and renewable energy sources, ensuring energy security of the country» [11].

Secondly, the principle of diversification of sources of energy generation through the use of alternative energy of wind, sun and water.

Thirdly, technological innovation and development of nuclear energy. A special place in ensuring the energy security of China is given today to the development of nuclear energy. If oil and gas supplies by sea is subject to various constraints – from the international situation to the banal piracy and land oil and gas pipelines are under construction and testing, the development of nuclear energy can be provided on its territory and it does not depend on the countries-exporters of energy resources or transit countries.

It is safe to assume that after the planned construction of a number of nuclear reactors in their compliance with all

regulations and safety requirements, if they do not manage to completely cover the deficit in China's energy resources, then at least the energy security of China will be significantly strengthened.

Conclusion. The tasks for the actual transfer of the country on the rails of alternative «green» energy – it is clear, are very difficult to be implemented. However, the success of Chinese companies, research institutes, factories give us a hope that our eastern partner will still be able to implement the planned tasks and will be able to hold the leading position among countries that use alternative energy.

REFERENCES

1. In the first quarter of 2016 in China wind power capacity grew by 13 percent. Information agency «Xinhua». [V pervom kvartale 2016 goda moshhnost' vetroelektrostancij v Kitae vyroslo na 13 procentov. IA «Sin'hua»]. [Electronic resource]: http://russian.news.cn/2016-04/27/c_135315933.htm. Last accessed 28.04.2016.
2. Freiderson, T. China aims to become a leader in the production of «alternative» energy [Kitaj stremitsja stat' liderom v proizvodstve «al'ternativnoj energii». Moskva–Pekin, 2015, № 4 (September), pp. 38–41.
3. In 2012, the volume of CNPC crude oil in China reached 110 million tons [V 2012 g. ob'em syroy nefi CNPC v Kitae dostig 110 mln ton]. [Electronic resource]: <http://russian.people.com.cn/31518/8087668.html>. Last accessed 11.04.2015.
4. Pravosudov, S. As Russian weaned Chinese from coal [Kak russkie kitajcev ot uglja otuchali]. Moskva–Pekin, 2015, № 1 (May-June), p. 19.
5. Lan Xinzhen. Keeping It Green. China gives more generous incentives to energy-saving and new-energy vehicles. *Beijing Review*, May 3, 2012, Vol. 55, № 18, pp. 28–29.
6. China's National English News Weekly. [Electronic resource]: http://www.bjreview.com.cn/quotes/txt/2011-02/14/content_331522.htm. Last accessed 15.04.2016.
7. In January-April, China's production of environmentally friendly cars increased by 126,8 percent, sales – by 131,1 percent. Information agency «Xinhua». [V janvare-aprele v Kitae vypusk ekologicheski chistyh avtomobilej vyros na 126,8 proc, sbyt – na 131,1 proc. IA «Sin'hua»]. [Electronic resource]: http://russian.news.cn/2016-05/11/c_135351303.htm. Last accessed 12.05.2016.
8. Petrunko, K. The transport complex of China: course – innovation [Transportnyj kompleks KNR: kurs – innovacii]. *Proceedings of the II International Conference of Young Orientalists in the RAS IFES*, 2015, pp. 89–90.
9. Taiyuan will be the first city in China with a 100 percent taxi fleet of electric cars. Information agency «Xinhua». [Tajuan' stanet pervym v Kitae gorodom so 100-procentnym avtoparkom taksi iz elektromobilej. IA «Sin'hua»]. [Electronic resource]: http://russian.news.cn/2016-05/10/c_135348329.htm. Last accessed 11.05.2016.
10. China plans to double the power density of batteries. Information agency «Xinhua». [Kitaj planiruet udvoit' energeticheskiju ploinnost' akkumuljatorov. IA «Sin'hua»]. [Electronic resource]: http://russian.news.cn/2016-04/27/c_135316434.htm. Last accessed 01.05.2016.
15. Hu Jintao. The full text of the report at the 18th CPC National Congress [Polnyj tekst doklada Hu Czin'tao na 18 s'ezde KPK]. [Electronic resource]: <http://www.cntv.ru/2012/11/19/ARTI1353293400614968.shtml>. Last accessed 06.05.2015.

Information about the author:

Kharchenko, Maxim P. – Ph.D. (History), senior lecturer at the department of International relations and geopolitics of transport of Moscow State University of Railway Engineering (MIIT), Moscow, Russia, harcenco@yandex.ru.

Article received 16.06.2016, accepted 24.08.2016.

