

**Yu. V. Yakovets**

## **Energy-Ecological Future of Civilizations**

### ***(Conclusion (Summary) for Part IV of the Global Forecast)***

1. One of the prime factors determining dynamics and life activity of civilization in retrospect and prospect is natural-ecological. It is an invariable element of genotype of civilization and society as human is the top product of evolution of nature drawing necessary sources of existence from it and energy and lives in an inseparable unity with the environment.

In a long-term forecasting it is necessary to take account of natural systems and various forms of their interaction with cyclical dynamics of social system (ecological cycles). In such case the objects of forecasting are:

- changes in natural systems, in the environment, climatic variations and long-term trends, including changes occurring under the impact of community activity and life activity of people;
- extent of the endowment of civilizations and leading countries with various natural resources – energy, mining, land, water, forest, plant and animal worlds;
- various forms of ecological interaction between nature and society, impact of ecological cyclical fluctuations on the endowment of civilizations and leading countries with natural sources of energy materials, food, impact of natural-ecological factor on the efficiency of reproduction;
- preconditions and forms society is moving to noosphere, harmonious co-evolution of society and nature by the path outlined by Russian thinkers V.I. Vernadsky and N.N. Moiseev.

2. In making a long-term forecast “Future of Civilizations” it is necessary to take account of ***regularities and tendencies of natural-ecological dynamics of civilizations***:

- as society and its technological base develops the dependence of society on natural-ecological factors decreases, a share of the primary sector, agriculture and forestry drops in the GDP structure and occupancy, especially in the vanguard civilizations. However, a full independence of society from natural resources and environment can't be reached and nature seriously warning human of it from time to time;
- cycles in natural processes and dynamics of social systems differ by nature, duration, scale, effect; they constantly interact with each other. It is necessary to foresee long-term cycles in dynamics of nature, environment and interaction of cyclical dynamics of natural and ecological systems (ecological cycles of various duration and amplitude of fluctuations). It is also necessary to take account of a regular change of energy-ecological modes of production and consumption and energy-ecological orders closely connected with the technological and economic modes of production and orders, take account of fluctuations of world and national natural rent and ecological anti rent by phases of cycles;
- the industrial world civilization was accompanied by a drastic intensification of society's impact on the environment, large-scale involvement in production of a wide range of new natural resources that established favorable conditions for technological overturns and acceleration of economic growth. However, from the last quarter of the 20<sup>th</sup> century the signs of ecological crisis, exhaustion and relative appreciation of a number of natural resources, increase in the number of ecological and technological catastrophes, unfavorable climate changes manifests themselves more and more clearly. A super long natural-economic cycle has entered its completion phase, a global energy-ecological crisis has become a reality at the beginning of the 21<sup>st</sup> century and the signs of a global agricultural-food crisis could be seen behind it.

3. Basic features of the ***global energy-ecological crisis*** which will take all space of the first quarter of the 21<sup>st</sup> century:

- a rapid growth of demand and supply of primary energy resources is continuing, especially in the developing Chinese, Indian and Moslem civilizations that leads to an overpressure on the global fuel-energy balance and strengthening of dependence of economic and social progress on the energy factor;

- a rapid exhaustion of the best, richest deposits of fossil fuel which makes over 85% of the world energy balance, will obviously lead to a reduction of world production of oil and gas in two-three decades thus impeding economic growth under the reduction of the present structure of energy sources;

- high rates of greenhouse gas emissions into atmosphere entail unfavorable climatic changes, ecological accidents and catastrophes (of local nature yet);

- a rapid increase of prices for fossil fuel and fast growth of investments in the energy sector and environment restrict the opportunity to allocate resources for economic and social development. Society is approaching the energy-economic deadlock when expense for energy supply will exceed the effect it generates;

- energy-ecological crisis is interlaced and resonates with global agro-food, water-ecological and mining crises that impose additional restrictions on civilizational progress in the first half of the 21<sup>st</sup> century.

4. A global-energy crisis affects to a various extent local civilizations. One civilizations with significant reserves of fossil fuel and exporting it on a considerable scale (Moslem, Eurasian, Latin American, and Oceanic) receives as a result of a world price growth large volumes of world fuel rent and may use it for modernization of economy, implementation of social and economic programs. Other civilizations (Japanese, western European, Chinese, Indian, Buddhist, and African) which are endowed with energy resources to a minimum extent have to import it thus making their products more expensive. Third civilizations (North American) have significant energy resources but take to their import to satisfy a significant size of consumption. Basic carriers of an ecological element of crisis are major energy consumers – Northern American and Western European, Japanese, Chinese, Indian, Eurasian, and Oceanic civilizations.

The energy-ecological crisis aggravates contradictions between civilizations, struggle for control over energy sources, becomes one of the sources of contradictions and conflicts between civilizations and states, one of factors of the unstable geopolitical situation.

5. Surmounting crisis in the second quarter of the 21<sup>st</sup> century is possible only through the **energy-ecological revolution of the 21<sup>st</sup> century** the core of which will be the establishment of a noospheric energy-ecological mode of production and consumption that will require a planetary mastering of the cluster of epochal and base innovations for the assimilation and diffusion of resource saving, ecologically clean sixth technological order – the first stage of transition to the post-industrial humanistically noospheric technological mode of production.

Basic outlines of energy-ecological revolution:

- change in the structure and relative reduction of consumption of energy resources for development and life support based on the transition to energy saving ecologically clean technologies. First of all, this relates to energy saturated vanguard civilizations but also civilizations which are considerably behind by the level of energy consumption should choose energy-ecological and economically clean paths to surmount such lagging;

- dropping in the growth rates, and then an absolute reduction in production of fossil fuel, its fuller extraction from the depths (to increase the oil recovery ratio), integrated recycling and utilization of waste. This will allow extending operation of oil deposits, preserving valuable reserves of carbons for future generations;

- development of alternative, including renewable sources of energy and among other things high-tech hydrogen energy with fuel cells. This will result in decrease of gaps between

civilizations in energy support, its relative, and in future its absolute cheapening and improving conditions for economic growth and social development;

- reduction of greenhouse gas emissions and other pollutions of the environment as a result of change in the structure of production and energy consumption and assimilation of energy-saving technologies, first of all by the vanguard civilizations – major energy consumers and sources of environmental pollution.

6. In the first quarter of the 21<sup>st</sup> century large-scale investments will be necessary in energy supplying civilizations and leading countries, in the assimilation of the cluster of epochal and base energy-ecological innovations. A significant portion of accumulations of private business and state will be necessary to direct for such purpose and first of all a base part of fuel rent and all ecological anti rent. It will have to be done under conditions of the prevailing trend to a drop in the economic growth rates. In the second quarter of the 21<sup>st</sup> century only such contributions will begin to return in full, economic growth rates will increase – energy-ecological revolution will begin to bear notable economic, social and ecological fruits.

7. The starting conditions for the implementation of energy-ecological revolution are not equal with various civilizations. Civilizations and countries with a high level of income, developed scientific-technological base and energy infrastructure with trained manpower (Northern American, Western European, Japanese, and partially Oceanic) already now concentrates resources on the implementation of long-term programs for renewable energy sources and hydrogen energy. The Eurasian, Chinese, Indian, Buddhist, Latin American (except Brasilia) civilizations have not realized yet the scale and dangers of energy-ecological crisis, and only start mapping out similar national programs. The African and basic part of Moslem civilizations are deep in the gripes of the energy-ecological crisis and have no own resource for surmounting it; the organization of partnership among civilizations will be required for assisting in solving such far-reaching tasks.

8. Development of events *according to the inertia-based* scenario will protract dangerous tendencies of global energy-ecological crisis for the second quarter of the 21<sup>st</sup> century, and it will make the effect of such crisis more drastic and possibly catastrophic for a disunited humanity.

The implementation of the *innovative-breakthrough scenario* of the planetary evolvement of the energy-ecological revolution, establishment of noospheric energy-ecological mode of production and consumption is possible only based on partnership of civilizations the basic outlines of which are taking shape as follows:

- mapping out by the UN (based on the Global Forecast “Energy-Ecological Future of Civilizations” and other options of long-term forecasts) of the Global Energy-Ecological Strategy with a horizon up to 2050, further discussions and endorsement of the strategy at the World Summit on Sustainable Development in 2012; and development of respective national and interstate (within the EU, EAEC, SCO, African Union, etc.) long-term energy-ecological strategies that will allow focusing attention, efforts and resources on all package of the implementation lines of the energy-ecological revolution;

- development and resource support of global energy-ecological projects allowing uniting efforts of civilizations and states concerned on the solution of priority tasks of assimilating energy-saving technologies, development of hydrogen energy, reduction of greenhouse gas emissions, and also partnership of civilizations for releasing from the gripes of energy-ecological crisis of African and Moslem civilizations;

- financial support of global programs and projects by expanding the Global Ecological Fund and establishment of Global Technological Fund (on deductions from the world fuel rent and removal of world ecological anti rent);

- human resources support of global energy-ecological programs and projects based on the

anticipatory education and retraining of specialists and development of distance learning in such issues;

- organizational-legal support of the implementation of global energy-ecological programs and projects by expanding authorities and responsibility of the UNO, UNDP, UNEP, establishment of competent full authorized management bodies for programs and projects, and drafting rules of the global energy-ecological law;

- a scientific convoy for mapping put global, interstate and national energy-ecological strategies, programs and projects, scientific evaluation of the referred documents and projects, establishment of independent scientific organizations for exercising such functions on a cross-civilizational basis.