

## INFORMATION TECHNOLOGIES – THE INFRASTRUCTURE OF THE “GREEN ECONOMY”

*I.K. Huzmiev*

*North-Caucasian Mining and Metallurgical Institute*

*44, Nikolaev Str., Vladikavkaz, 362027, Russia; izmailh@mail.ru*

Received: 21.09.15; accepted: 05.11.15

Future placement will be based on an economy based on a network of decentralized local low-cost technologies. The network infrastructure is largely determined by the communication between the external environment and its internal elements, which are based on information technology. Emerging network paradigm for the development of society requires the development of network monitoring systems, management and decision making for example mobile communications and the Internet. In this regard, information technology is becoming the main infrastructure of the coming new technological way of life.

Note that in the world today there is a systemic crisis of civilization. which is associated with the transition to a new “green” principles for living arrangement. According to Kondratiev it is the 6-th technological way. [1]. You must be aware that further economic growth, based on the unrestrained consumption of energy and resources may not be stable due to the limited size of the planet and population growth. Therefore, a change in the current economy of unrestrained growth to the less expensive “green economy.”According to the definition given in the reports of the United Nations Environment Programme (UNEP), the “green economy “is defined as an economy that improves the welfare of the people and ensures social justice, and thus significantly reduces the risks for the environment and the prospects for its degradation. Such an economy based on natural resources-saving technologies that reduce pollution, increasing living standards and reducing human pressure on nature. The concept of “green” economy “is the foundation of sustainable development. [2]. Sustainability means that the needs of the present generation should be met without compromising the ability of future generations to meet their own needs and has the following main objectives: the welfare of the population based on social justice and environmental protection.

In that regard, it is believed that the living arrangements will be based on the economy, for the most part based on a decentralized network of local low-cost resource and energy saving technologies of different nature with an active - adaptive systems and the control and management (smart grid), and renewable energy. This economy can be viewed as a network structure consisting of nodes of different

nature, interconnected by numerous formal and informal networks for the exchange of tangible and intangible resources. The individual components of the common system may be of a certain subsystem in a separate ad-hoc networks. For example, subsystem infrastructure, mobile network operators, active-adaptive electric networks, etc. Note that essentially each node network is generation-production, use - consumption, exchange - transport and storage of information, material resources, energy, expertise, finance, through which ensured the livelihoods of the population and the functioning of the system elements. Network architecture can be seen on one hand as a two-dimensional structure with many connections between the nodes of a horizontal or a three-dimensional multi-layer system with a peer and hierarchical structures with horizontal connections within each layer and vertical links between the layers. Such a network is a complex socio - economic system, which aims to improve the quality of life of citizens in accordance with the generally accepted criteria for the region. A complex network structure should act as a single organism, problem solver comfortable existence of individual components and their function within a given program. The network nodes are objects and subjects of the system. Units can be combined into permanent and temporary unions and associations of different nature to address temporary and strategic objectives of the system as a whole. Association can be both commercial and public, profitless. A kind of a network structure is a cellular different operators, each of them has its own network with internal contacts between subscribers and base stations and separate individual communication between the networks of other operators.

Operation nodes is largely determined by the infrastructure based on the use of information technology, for the exchange between the external environment and within the system of different resources: material, energetic and informational, which include competence, skills, capabilities and finances, regulations - standards and regulations. Decision-making procedure should be based on a development program (roadmap), condition monitoring parameters and variables and procedures for comparison of the data with the specified. A comparative analysis of the person or group of decision-makers take measures to adjust the current measured values. If the process under study is described by known algorithms, the solution can be made automatically without the participation of the staff. Management should be targeted, not the industrial. For example, the innovation zone in mountainous zone can be considered as the targeted ecosystem. When analyzing it is necessary to answer the question - how the environment - artificial and natural interface, like a person has to manage its operation, what goals are resolved and how they may change in the decision: planning (design) and ongoing (realization) arises network paradigm of society development.

It requires the development of network monitoring, management and decision-making on the example of mobile communications and the Internet. That is, we need an intelligent (smart) network infrastructure with vertical and horizontal connections for transmission - transport of resources: energy, material, information, finance (this can be considered as resources of information, as the right of access to resources), labor and competencies. Economic development and effective means of communication - interactive technologies of transportation and exchange of information without actually moving in space material carriers are now being implemented, such as the implementation of electronic payments. There is no need to move the banknotes, coins, ingots, checks - just a plastic card processing system and the link.

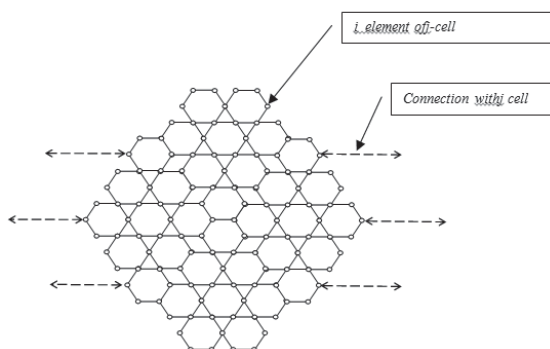
It is clear that the monitoring and decision making in the network of "green" economy should be "smart" active - adaptive control center - e-government, which is the technological foundation of information technology. The basis of this control is the concept of minimizing transaction costs (minimum of intermediaries), communicate via network communications, decentralized local systems of energy and resource supply in the form of renewable energy and the maximum use of local material resources. So that information technology has become the main infrastructure of the coming of a new technological way of living arrangement, as the basis of socio - economic development of the territory in all areas of society. This will unload the cargo and passenger traffic. The combination of globalization and regionalization, global crowdsourcing, distance education and treatment, "smart" active-adaptive

network systems of different nature, including information systems for monitoring and decision-making dramatically reduce the total cost of all the resources and the costs of mediation of different nature. In order to solve all the problems of the implementation of the objective functions of social - economic system it is necessary to develop a mathematical model to explore and develop algorithms to make decisions and software products. This will allow fully using the methods and tools of information technology, to find optimal solutions to the boundary conditions and constraints. The most effective way of solving formulated problems of the system is, in our opinion, the network system in the form of space Kantorovich solving problems by means of linear programming [3].

For example, one of the problems that arise in the network, is the task of finding and delivery of a certain resource to consumers at the lowest price taking into account the transportation costs. Thus, in the active-adaptive intelligent network (smart grid) automated system at the request of the consumer is looking for sources of a given quantity of any resource at the lowest price online in all its units and levels and determines the minimum fee for transport from the source to the consumer through the network sites using fee for one transmission resource unit per unit distance transmission. In addition to the spot exchange prices, can be used direct delivery agreement between individual consumers and suppliers at negotiated prices. The fee for each transport network level can be determined in various ways by the treaty to a regulated independent competition authority, depending on the nature of the resource and the regional characteristics of the market. The process resembles the process of pricing in networks where there are several operators competing with each other, and there is a general global roaming space. Note that the pricing problem can be solved using linear programming methods. Common (standard) linear programming problem is the problem of finding the minimum of a linear objective function (linear form) of the form: the problem which appear in the form of inequality constraints, called - the main task of linear programming. A necessary condition for setting the linear programming problem are restrictions on the availability of resources, the amount of demand, production parameters for sellers and buyers. The essence of linear programming in this case is to find the points of least value of the objective function  $F = f(x) \rightarrow \text{mine} - \text{cost of resources consumed in the defined set of constraints imposed on the arguments and form a system of limits. A mathematical model of any linear programming problem includes:$

- ✓ a maximum or minimum of the objective function (optimality criterion);
- ✓ restrictions in the form of a system of linear equations and inequalities;
- ✓ demand is not the negativity of variables.

The equivalent circuit of the system shown on Fig.



**Fig.** The equivalent circuit of a smart grid

In the general formulation linear programming problem as follows: The amount of resources consumed by different sources identified as the variables  $x = (x_1, x_2, \dots, x_n)$  and the objective function of these variables - the value of  $f(x) = f(x_1, x_2, \dots, x_n) - c$  – payment for transportation to the  $i$  site and  $i$  services of  $j$  operator of the smart grid. The task: to find a minimum of the objective function  $f(x)$ , provided that the variables  $x$  belong to some region  $G$ , including all intelligent system components involved:

$$f(x) = \sum_{j=1}^n c_j x_j = c_1 x_1 + c_2 x_2 + \dots + c_n x_n$$

Linear programming is characterized in that

- a) The function  $f(x)$  is a linear function of the variables  $x_1, x_2, \dots, x_n$ ;
- b)  $G$  is determined by a system of linear equations or inequalities.

$$\sum_{j=1}^n c_{ij} x_j \geq b_i \quad (i = 1, 2, \dots, m)$$

$$x_j \geq 0 \quad (j = 1, 2, \dots, n)$$

Globalization within the vertical control actions is faltering without regionalization. A well-functioning system is

an information network horizontally - vertical system of decision-making. For example, in apartment buildings, where the level of instinctive survival strategies are vertical, horizontal compromise negotiation procedure decisions of the majority taking into account the views of the minority. The combination of vertical Leadership (chosen leader) with the horizontal can give optimum results in a crisis. And today, it seems that moment has arrived. Globalization should be balanced regionalization. If globalization is a vertical, horizontal is the regionalization that promotes networking in all areas of human activity, and that is especially important for a variety of socio - economic systems with limited resources. It's a matter of survival, which is not realized by the majority in our consumer society.

The complicating system of living arrangement generates a at all levels, from global to regional, cumbersome system administration. Trying to solve all the problems of logistics of all resources from the material to the spiritual administratively leads to the bureaucratization of human society, the growing chaos and as Henry Ford said, "Dragging a dead weight." Intensive growth of the consumption of all resources without exception, the consumer society has exhausted itself of the finite size of the Earth. In this context, the massive use of information technology to automate the monitoring and decision making, in order to reduce resource and energy consumption of all the processes of life support as new infrastructure, "green" economy of the new century, there is no alternative.

#### REFERENCE

1. Ernst Ulrich von Weizsäcker, Karlson Hargrouz, Michael Smith, Factor 5. In: The Formula for Sustainable Growth // "Art Press" Moscow, 2013, 25 pp. (in Russian).
2. Vagin V.S., Huzmiev I.K. Concept and Indicators of Sustainable Development, // Works of VEO of Russia, 153, 2011, pp.8-15 (in Russian).
3. Venttsel ES. Operations Research: Objectives, Principles, Methodology // "Drefa", Moscow, 2004, 208 pp. (in Russian).

### ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ – ИНФРАСТРУКТУРА “ЗЕЛеноЙ ЭКОНОМИКИ”

**И.К. Хузмиев**

Будущее жизнеустройство будет опираться на экономику, основанной на сетевых децентрализованных локальных малозатратных технологиях. Инфраструктура сети во многом определяется коммуникациями между внешней средой и ее внутренними элементами, основой которых являются информационные технологии. Возникающая сетевая парадигма развития общества требует развития сетевых систем мониторинга, управления и принятия решения по примеру сотовой связи и интернета. В этой связи информационные технологии становятся главной инфраструктурой наступающего нового технологического уклада жизнеустройства.