DOI: 10.33278/SAE-2018.eng.087-090

JEL O21, O32

SYSTEMIC STRATEGY AND SYSTEMIC POLICY IN TRANSITION TO THE NEW ENERGY TECHNOLOGIES

NIKONOVA ALLA (ORCID 0000-0002-9115-3795)[1]

[1]Central Economics and Mathematics Institute of Russian Academy of Science

Abstract. The paper reveals the immense impact of serial strategies, methods and tools for implementing strategic decisions on the quality of innovative transformation economy at the meso-economic level. The scenario for creating new energy industry in Japan is presented in the article to justify author's idea on the example of coherent approach to elaborate systemic strategy and systemic governance mechanisms, which change as energy sector and the social-economic system as a whole. The investigation in its methodological aspects combines application of fundamental base of the system economic theory with the usage of system analysis principles and methods case studies. The study focuses on the examination the New energy strategy and instruments used to convert the Japanese energy industry in the new mode of energy generation. The following are the most substantial results obtained. Systemic strategic solutions as well as systemic organizational and economic mechanisms contribute to, firstly, the positive effects concerning major of subsystems in the national economy on the base of strengthening innovation linkages and collaboration between the key actors. Secondly, they contribute to the formation of such structures (innovative clusters, innovation ecosystems), which are able to support the processes of adoption and diffusion of innovation in according with the principles of self-organization and self-improvement in changing environment. The results of author's analysis demonstrate the prospects for the further improvement the innovation system concept. Also they submit the necessity and sufficiency of a system approach to plan and innovation governance to harmonic development of socio-economic system in uncertain circumstances.

Keywords: socio-economic system, innovation, renewable energy, governance, system analysis, tools, incentives.

INTRODUCTION

Transition to a technological model is extremely relevant for the Russian economy based on the raw energy resources. A system approach is proposed for solution in the most effective way. This method can best contribute a balance of social subsystems in the socio-economic system in the time of upgrading. On the contrary, the absolute absence of systemic fundamental foundations in constructing national strategies and policy leads to empty useless cost time, wasteful efforts and money, as this can be seen in Russian practice of transformation of the national economy and the industries, in particular, in scarce results of the strategies and programmes aimed on increasing energy efficiency.

SYSTEMIC STRATEGIZING

Systemic requirements for strategic planning, governance and management were discussed in detail by G. Kleiner [1; 2]. Most of them have been realized in Japan.

Under the notion of "strategizing" we will understand iterative processes: execution of analysis, harmonization, syntheses, as well as subsequent adjustment of both strategic decisions and conceptual understanding of the examined object and the subject in long-term and irreversible changes. I.e. there should be all stages of strategizing: not only the stages of information preparation and making decisions, but also reflection, critical review for parsing the effects of incentives and practical activities. Conceptual schema to execute analysis and synthesis of a socio-

economic system was proposed in the paper [3].

Innovation concept conducted by the Japanese Government is, in fact, systemic in contrast to Russian one. New energy strategy was aimed at a shift of national energy industry from the atom exploitation to renewable energy sources (RES) in electrical generation. Without regard to acquire theoretical knowledge in the field of system planning and governance in socio-economic systems and knowledge implementation in making decisions, the Japanese Government chose exactly the system approach in switching consumption to renewable energy. In spirit of the classical fundamentals of system analysis, the Japanese Government has taken into account most of all internal and external opportunities, national competitive advantages and limitations to reform technologically electric power industry.

Indeed, **the need** for change is caused by threats from risks of nuclear energy and from deficits of natural energy resources in the country. **Opportunity** to develop renewable energy is due primarily to such distinct advantages of the Japanese economic system as a solid scientific base (high educated personnel, very high patent activity); developed system of competitive markets; financial, technological and organizational readiness to innovate [4]. This fact manifests itself as very high activity of corporations-innovative giants, as well as mutual horizontal linkages, dense networks to facilitate the interaction of business with research organizations, governmental structures and potential consumers of innovation products. For example, network of coordinated interactions between the stakeholders evolved historically in a particular model of the Japanese corporate system, Keiretsu. An important issue is a desire to develop technology that finds understanding in the consumer pole. In addition innovation is backed up by sufficient solvent demand and it relies on financial and non-financial support by the Government.

Moreover, the movement to apply clean, "green" technologies in energy generation, in particular with the RES, conforms to the global trend to ensure environmental sustainability, economic security (independence from suppliers of hydrocarbons) and technological upgrading of energy industries (as we can see this in [5]); weight of such energy in world consumption grows steadily [6, p. 44]. Thus, the Japanese strategy relied on sufficient internal reasons and external circumstances conducive to the successful development of clean energy.

SYSTEMIC POLICY: ANALYSIS

In fact, consistency of mechanisms to regulate and stimulate the new technologies is reflected in the strengthening of the integrity of the socio-economic system in transformation of its individual parts. This requirement can be achieved in systemic planning and management, taking into account the specific characteristics of the national institutional system, innovation culture, mentality, the situation inside the country, external environment. In Japan support tools have been chosen in such way as to affect all parties of creation, absorption and diffusion of renewable energy technologies. Consequently governmental policy was aimed at the growth of interest from all actors in transition to renewable energy; it was focused on the involvement all players, including households, in the process of implementation, testing, adaptation and diffusion of green technologies.

The innovation support system included the measures, agreed between each other, namely a set of tangible and intangible tools and incentives to stimulate and regulate green technology activity and the relationships between all stakeholders [7]. As we concluded, the following features distinguish systemic character of innovation policy in Japan:

1. Conformity of measures taken and the established institutions to the innovative potential of the country.
2. Policy objective, focusing on the strategic goals and corresponding subjects.
3. Varieties of instruments and incentives depending on the character of managed objects (system principle of requisite variety).
4. Adaptiveness of economic incentives, regulatory rules (e.g., freedom to choose technology, buyer or to produce any kind of energy).

5. Harmonization the various interests of the parties with the help of recruiting incentives.

6 Taking into account the feedbacks to adjust control measures.

7. Application of Quad Helix innovation model [8], involved all actors, including the population, in innovation creation and absorption in the form of so-called "social experiments", which help to increase consumer interactivity to identify reaction on innovation.

8. Synergy: obtaining additional effect in related areas and activities.

Policies cover a wide range of functional impacts [7]. Pricing cover the production costs of solar power suppliers (feed-in-tariff system). Tariff policy: for example, grace "green" tariffs for clean energy differ by type of energy sources. Tax policy: for example, supplement of 50% to the tax on the importation of fossil fuels, which goes to ecology protection. Legal measures: a) compulsory purchase surplus electricity by grid from individual farms with self-contained solar power generator; b) a freedom for producers to enter the solar power market; c) the guarantee for suppliers to access the grid; d) the right guaranteed to conclude a long-term contract to supply electricity. Governmental grants and subsidies for alternative energy equipment in the form of budget expenses and the special funds established from the payments from tradition electricity (at 2% of the rate). Special programme funding cooperation and technology transfer into the production sector, such as the A-step programme to support R&D commercialization at the different stages. Moral and organizational instruments such as public recognition of the achievements in the field of RES technologies, mode conserving resources in the vital activity.

SYNERGY: RESULTS

Results of analysis demonstrate a range of the different effects at the energy sector and at the socio-economic system as a whole: development both of the "green" energy and related industries (solar panels etc.), increasing of the energy efficiency, growth of susceptibility to innovation activity, growing understanding by all actors the needs in technological transformation. Synergy has been obtained due to a set of factors: properly constructed strategies, systemic economic and technological policy, and corresponding management tools and stimulating, balancing the interests of all players. Synergy was a result of enhancement of communication linkages in innovation activity and the deepening interactions between economic agents in the framework of Quad Helix innovation model. Feedbacks contributed to understanding signs – reaction (changes) of the object or environment as a response on the incentives. So-called "social experiments" with participation of the RES energy consumers, have contributed greatly to improvement of the new technologies and their relevance to the demand, creation public innovative consciousness; intensive transfer the successful samples among other regions of the country. As a result of synergy in the technological shifts, coevolution of subsystems has been attained as well as innovation ecosystem has been formed, which characterized by such phenomena as the unique creative atmosphere, self-organization, co-creation innovation, flexible informal linkages and structures to facilitate actor's interactivity and innovation receptivity.

DISCUSSIONS AND CONCLUSIONS

Along with this, situation in Japan is not as smooth as you would expect in the framework of a system approach to the strategic governance. Despite the adoption of system solutions and consistent implementation of systemic policy concerning RES, growth rate of renewable energy in consumption could not fill the lack of energy since nuclear sector declining after 2010 [6, pp. 41, 44]. Rate of decline in the cost of RES energy were lower than projected. Perhaps some other reasons have not been taken into consideration or some new unforeseen factors have emerged. For these and another reasons, today the Japanese Government is set to significantly less hard shift to green energy and does not abandon nuclear energy generation, which is growing since 2015 [6, p. 41] Creating a

"Society 5.0" was committed on the new resource base in accordance with the modern global trends – data, digital technology [9]. Indeed, artificial intelligence may find a new effective solution using different data.

However, significant progress in the field of mass use of RES in the Japanese economy demonstrates the critical necessity and notable impact of systemic principles both to build strategies and choose tools to support new technologies. Such effects, especially synergy, could not be retrieved without system approach. The positive results of its implementation in Japan and some other countries, but negative – in Russia, give compelling reasons for turning the system economic theory, as well as its technique applications in practice of strategic planning, governance and management, in mainstream economic thought. In this regard, it is quite important to improve the methods of system analysis, designed to obtain reliable estimates of opportunities and threats for transformation the socio-economic system, taking into account technological, structural and economic factors in dynamics.

The Japanese experience of RES development approve a significant role in the successful innovative changes first, mutual interactions of the actors, secondly, knowledge and science; thirdly, Government in implementation of a systemic approach to the planning, governance and promotion. In General, the economic practice confirms the validity of the system economic theory and its applications as a fundamental methodological basis in making strategic decisions and creation appropriate implementation models. As a base of such model we propose innovation ecosystem concept [10]: this will best facilitate productive interactions between key players and balance key public subsystems in technological transformation in socio-economic system.

ACKNOWLEDGMENTS

The research presented in the paper was supported by the Russian Foundation Basic Research, grant 18-010-01028 "Methodology and Tools for Strategizing Technological Developments in Economic Systems at the Different Hierarchy Levels, Taking into Account the Requirements of Industry 4.0 for Nonstationary Russian Economy".

REFERENCES

1. *Kleiner G.B.* System Economics as a Platform of Modern Economic Theory Development. *Voprosy Ekonomiki*. 2013;(6): 4–28. (In Russ)

2. *Kleiner G.B.* System Economic Theory and Problems of Russian Economy Stabilization. *Scientific works of the free economic society*. 2015;(195):552–579. (In Russ)

3. *Nikonova A.A.* Analysis and Synthesis of Transforming Economic System: Methodology and Practice of Innovation. *Systemic Analysis in Economy. III Int. scientific-practical conference-biennale*, November 9–11, 2016. By ed. G.B. Kleiner, S.E. Shhepetova. Vol. 1. M.: Financial University under the Government of the Russian Federation, 2016: 353–359. (In Russ)

4. The Global Innovation Index 2018. 11th ed. Ithaca, Fontainebleau, Geneva: Cornell University, INSEAD, WIPO, 2018. URL:http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2018.pdf.

5. Sustainable Energy for All, 2017. URL: http://www.se4all.org/.

6. BP Statistical Review of World Energy 2018.67thed.URL:https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/statistical-review/bp-stats-review-2018-full-report.pdf.

7. Strel`czov D.V. "Clean energy" in Japan. *Vostochnaya analitika*. 2011;(2):106–117. (In Russ)

8. *Kimatu J.N.* Evolution of strategic interactions from the triple to quad helix innovation models for sustainable development in the era of globalization. *Journal of Innovation and Entrepreneurship*. A Systems View Across Time and Space.2016;(5):16. URL: https://doi.org/10.1186/s13731-016-0044-x.

9. *Mamed`yarov Z.* Japan could not survive without new technologies. *Expert*. 2017;(50). (In Russ)

10. *Nikonova A.A.* From Green Technologies to the Innovation Ecosystem. *Crnogorski časopis za ekologiju* (*Montenegrin Journal of Ecology*). 2015;(1–2):5–22. (In Russ)