THE CHALLENGES AND SOLUTIONS IN ENERGY PRODUCTION WITHIN THE INTERNATIONAL ENERGY SYSTEM

Baratov Xatamjon Mahmudjon ugli
Institute of Namangan Engineering and Technology
Nabiyev Shukurjon Mirmuxsin ugli
Institute of Namangan Engineering and Technology
Sultonov Dilshodbek Tursunboy ugli
Institute of Namangan Engineering and Technology

Annotation: *Geographical location and economic conditions in various countries and regions play a significant role in addressing the challenges in energy production. The natural resources and opportunities of a country are influenced by its geographical location and economic situation.*

Keywords: *G8 countries, resources, geopolitical threats, social challenges, cooperation.*

We can talk about the "energy expert triad" and the challenges it presents have a profound impact from all sides. It is closely related to human life and affects the foundations of civilization.

This triad consists of the following:

• Energy resources and electricity scarcity (journalists often refer to this challenge as "energy poverty").

• Threats to the environment and well-being, influenced by the impact of anthropogenic factors ("ecological infarction" boundary).

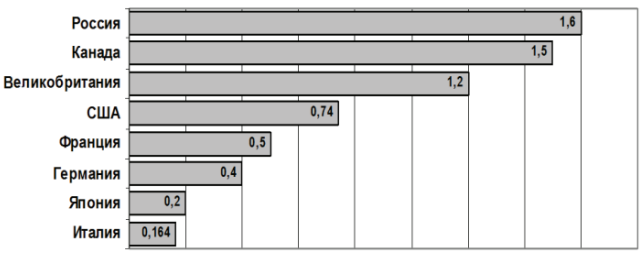
• Geopolitical and social threats.

The first challenge is primarily related to the exhaustion of fundamental energy sources, which has consequences for both the present and the distant future. The overdependence on these resources (over 80% of electricity is currently generated from them) creates an imbalance in their distribution. Even within the G8, there are concerns about energy scarcity. Energy intensity (the proportion of available energy resources relative to their demand) is changing significantly.

There are two ways to increase energy supply:

1) To search for and develop one's own energy resources (non-renewable and renewable).

2) To improve energy efficiency and increase energy productivity.



Picture 1. The energy security of G8 countries is based on the proportion of their available energy resources relative to their demand.

Countries facing energy shortages are forced to allocate a significant part of their internal production for purchasing energy. Their resources have a negative impact on the economy and society. Moreover, they are subject to various challenges. In states lacking protection against political and social cataclysms, energy suppliers find a volatile market.

This paradoxical situation is also observed in the energy sector. Even large countries are dependent on resources. We often talk about "dependence on oil and gas rents," which implies the risk of initial ease of implementation and, ultimately, vulnerability to economic fluctuations. In the global energy market, we strive for innovation development. In recent decades, Russia has joined the ranks of such countries. Shifting from an outdated model of economic development to innovations is inevitable. The national development path is declared by the state leadership and accepted by society as the most important task.

The second challenge is the increasing scale of ecological damage caused by energy production. Present-day industrial and technology applications in the energy sector lead to the emission of greenhouse gases that are responsible for more than 50% of the heat-trapping emissions contributed by humans to the atmosphere. The energy industry also intensively contaminates the lithosphere and hydrosphere. Energy systems can compete with or even exceed natural systems in terms of energy flows and transfers.

Addressing energy challenges places great hope in developing alternative energy sources that are minimally or non-environmentally impactful. Firstly, increasing the use of fast neutrons in nuclear reactors, controlled thermonuclear fusion, and the conversion of hydrogen and oxygen energy into direct electrical energy through electrochemical generators (fuel cells) are being considered. To a lesser extent, the relative energy production through magnetohydrodynamic methods is also appealing over the next 20-25 years, hampered by a range of technical challenges.

Today, the primary challenge in the global energy sector is not the scarcity of energy resources but their economic viability. In the 21st century, if successful strategies for harnessing and transitioning energy are implemented, as well as creating a global market for civilization's energy resources, the global demand for energy resources will not be a threat to humanity.

The most plausible scenario for energy development relies on utilizing the most efficient technologies for converting known energy resources, in whole or in part, into electrical and thermal energy. In the coming decades, new energy sources and novel methods for electricity and heat generation remain unforeseen.

The ongoing, real threat to the sustainable development of civilization comes from the cumulative anthropogenic impact on the environment. The new environment, primarily the energy-environment complex, has been a significant contributor. To

ensure a sustainable civilization, the reduction of environmental harm in the energy sector and the enhancement of the ecological cleanliness of energy technologies are imperative.

The challenges and solutions in energy production within the international energy system are complex and multifaceted. Here's some information about these challenges and potential solutions:

Some challenges and solutions were mentioned below.

Challenges.

1. Resource Scarcity: Many countries face challenges related to the scarcity of traditional energy resources such as fossil fuels, including oil, natural gas, and coal. This scarcity can lead to energy insecurity and economic vulnerability.

2. Environmental Impact: Energy production, particularly from fossil fuels, is a major contributor to environmental issues such as air pollution, greenhouse gas emissions, and climate change. Mitigating these environmental impacts is a significant challenge.

3. Geopolitical Tensions: The global energy system is often marked by geopolitical tensions related to the control and distribution of energy resources. This can lead to conflicts and instability in energy-producing regions.

4. Energy Access: Millions of people around the world lack access to reliable and affordable energy sources. Ensuring universal access to energy is a key challenge.

5. Energy Efficiency: Many energy systems are inefficient, leading to energy wastage and increased costs. Improving energy efficiency is crucial for sustainability.

6. Infrastructure and Grid Integration: Developing and maintaining energy infrastructure and integrating various energy sources into the grid can be challenging, particularly in regions with outdated systems.

Solutions.

1. Renewable Energy: Transitioning to renewable energy sources such as solar, wind, hydro, and geothermal power can address resource scarcity and reduce environmental impacts.

2. Energy Efficiency: Implementing energy-efficient technologies and practices in industries, transportation, and buildings can reduce energy consumption and greenhouse gas emissions.

3. Grid Modernization: Upgrading energy distribution networks and integrating smart grid technologies can enhance the reliability and flexibility of energy systems.

4. Energy Storage: Developing advanced energy storage technologies allows for better management of intermittent renewable energy sources and grid stability.

5. Diversification of Energy Sources: Reducing reliance on a single energy source or supplier can enhance energy security and minimize geopolitical tensions.

6. International Cooperation: Collaborative agreements and initiatives at the international level can promote sustainable energy development and resource-sharing among countries.

7. Investment in Research and Development: Investment in research and development of clean energy technologies is crucial for finding innovative solutions to energy challenges.

8. Energy Access Programs: Implementing programs that provide access to affordable and clean energy for underserved populations can alleviate energy poverty.

9. Carbon Pricing and Policy: Implementing policies such as carbon pricing, emissions reduction targets, and incentives for clean energy adoption can drive the transition to a more sustainable energy system.

Addressing the challenges in the international energy system requires coordinated efforts by governments, industry stakeholders, and international organizations to ensure a reliable, affordable, and sustainable energy supply while mitigating the environmental and geopolitical risks associated with energy production and consumption.

REFERENCES:

1. Закон РФ от 5 марта 1992 г. № 2446!I «О безопасности».
2. Бушуев В.В., Воропай Н.И., Мастепанов А.И. и др. Энергети! ческая безопасность России. – Новосибирск: Наука, 1998. – 302 с.
3. Ушаков В.Я. Современная и перспективная энергетика: техно! логические, социально!экономические и экологические ас! пекты. – Томск: Изд!во ТПУ, 2008. – 469 с.
4. Лукутин Б.В., Суржикова О.А., Шандарова Е.Б. Возобновля! емая энергетика в децентрализованном электроснабжении. – М.: Энергоатомиздат, 2008. – 231 с.
5. Безруких П.П. Роль возобновляемой энергетики в энергосбере! жении в мире и России // Электрика. – 2004. – № 4. – С. 3–5.
6. Энергетика окружающей среды. 2011. URL: http://crimean! center.com/?p=288 (дата обращения: 19.09.2011).
7. Ушаков В.Я. Возобновляемая и альтернативная энергетика: ресурсосбережение и защита окружающей среды. – Томск: Изд!во «СибГрафикс», 2011. – 137 с.
8. Energy Technology Perspectives: Scenaries and Strategies to 2050. (Second Edition) OECD/IEA. – Paris, 2008. – 650 p.
9. Твайделл Д., Уэйр А. Возобновляемые источники энергии. – М.: Энергоатомиздат, 1990. – 392 с.
10. Роза Р. Магнитогидродинамическое преобразование энергии. – М.: Энергоиздат, 1970. – 250 с.

11. Бойко В.И., Демянюк Д.Г., Кошелев Ф.П. Перспективные ядерные топливные циклы и реакторы нового поколения. – Томск: Изд!во ТПУ, 2005. – 490 с.

12. Мурогов В.М., Троянов М.Ф., Шмелёв А.М. Использование тория в ядерных реакторах. – М.: Энергоиздат, 1983. – 96 с.

13. Гуськов С.Ю. Прямое зажигание мишеней термоядерного син! теза потоком ионов лазерной плазмы // Квантовая электрони! ка. – 2001. – № 31 (10). – С. 885–890.