

state investment support within the framework of a just energy transition.

The practical implementation of the methodological approach will systematize the investment decision-making process based on clear criteria for assessing RE and EE projects in households and improve the monitoring of investment results, which will allow timely identification of problems and adjustment of investment strategies in line with the national energy policy. As a result, it will contribute to a more efficient and balanced development of RE and EE in Ukrainian households, which in turn will help build a reliable, environmentally sustainable, and cost-effective energy system.

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MODELS OF COMMERCIALIZATION OF DISRUPTIVE TECHNOLOGIES

Andrii Ievsieiev, PhD student

National Technical University "Kharkiv Polytechnic Institute", Ukraine

The theoretical and methodological essence of breakthrough technologies is to understand their impact on the development of markets, economic systems and society as a whole, as well as to study the approaches and methods used for the development, implementation and commercialization of such technologies. Disruptive technologies are innovations that fundamentally change the structure of the market, replace existing products, or create new market segments, often causing economic, social, and technological transformations.

Disruptive technologies are characterized by the fact that they offer new solutions that, over time, can completely change the structure of the market or form a new one. Distinctive features of such technologies:

- provide radical innovation: fundamental changes in approaches to solving

problems or meeting needs;

- rapid spread: Due to the innovative approach and high demand, disruptive technologies are quickly penetrating the market;
- ability to change market structure: Unlike incremental innovation, disruptive technologies can displace older products and services.

Disruptive technologies significantly increase productivity, reduce costs, and often create new economic sectors. Their implementation is accompanied by the following effects: cost reduction due to new production methods or reduced resource requirements; increasing efficiency through automation, process optimization and reduction of time to complete operations; development of new markets and segments, as they create the possibility of forming new needs or segments of consumers.

Breakthrough technologies go through several stages in their life cycle: from the origin and early development to the peak of implementation and further distribution. According to the theory of innovation cycles, there are the following key phases: the nascent phase: early investment and research that leads to the formation of the underlying technology; Distribution phase: rapid market penetration due to increased demand; Stabilization phase: Once a certain level of maturity is reached, the technology becomes the standard and can be supplanted by other disruptive technologies.

For the effective implementation of breakthrough technologies, various methodological approaches are used:

- cost and risk analysis: evaluation of investments, forecasting potential profits and risks associated with the implementation of technologies;
- methods for assessing commercial potential: SWOT analysis, competitiveness analysis and modeling of market scenarios, which make it possible to determine the potential of the technology;
- innovation ecosystem models: integration of disruptive technologies into interconnected market environments where participants (startups, large corporations, research institutes) interact to maximize benefits.

Disruptive technologies have a major social impact, changing the way we work, interact, consume, and communicate. Socio-economic impacts include:

- changes in the structure of employment: automation reduces the need for some professions, but creates demand for new specialties;
- Improving the quality of life: Access to new technologies contributes to higher levels of health care, education, communication, and other aspects.
- regulatory Challenges: The need for new legislation to manage the ethical, social, and environmental impacts of technology.

To assess and forecast the effectiveness of breakthrough technologies, the following methods are used: technological forecasting: research of market trends and their impact on demand; life cycle analysis: assessment of all stages of technology from development to mass adoption and degradation; Scenario Analysis and Modeling Methods: Simulation of possible implementation scenarios to assess long-term market impact.

Commercialization of disruptive technologies is the process of transforming innovative developments into products or services that can generate profit. To achieve this, there are different models, each with its own characteristics and suitable for different types of market, technologies and resources. Let's consider the main models of commercialization of breakthrough technologies:

1. *Licensing model.* This model involves granting licenses to use the technology to

other companies. It is usually used if the technology developer does not have sufficient resources to enter the market or when he wants to earn passive income. Main advantages: quick access to the market through partners who already have infrastructure; reduction of financial risks and reduction of investment costs; the ability to focus on further development and research. However, Licensing can limit control over the use of technology and its development in the market.

2. *Joint Venture model.* This model involves creating a joint venture with a partner to commercialize disruptive technology. This allows you to combine the resources, expertise, and markets of both parties. Main advantages: co-financing reduces risks; combining knowledge and resources allows you to enter the market faster; distribution of responsibilities and costs for technology promotion. The model is suitable for projects that require significant investment and technical expertise, but requires clear coordination between partners.

3. *Model of internal development (In-House Development).* In this model, the technology developer independently finances and conducts all stages of commercialization: from production to sales. Main advantages: full control over the technology and its implementation strategy; the ability to get maximum profit without sharing with partners; high flexibility in technology modification. However, the model requires significant resources and is suitable only for companies that have sufficient financial and human potential.

4. *Technology Sale model.* In the event that the developer does not have the ability or desire to commercialize the technology, he can sell it to another company. Main advantages: receiving a one-time large income; minimization of risks and costs associated with commercialization; freeing up resources for other innovative projects. This model is suitable for startups that specialize in the development of new technologies, but are not engaged in their production or promotion.

5. *Spin-Off model.* A company can create a separate subsidiary to commercialize a particular technology. This allows you to develop the project separately from the main business and attract investors. Main advantages: attracting external investment while maintaining control over the technology; flexibility in the development of the project as a separate company; the ability to concentrate resources only on the development of breakthrough technology. This model is often used by large corporations that have a resource base for the development of spin-offs.

6. *Open Innovation Model.* In this model, the company cooperates with external partners (other companies, academic institutions, startups) to jointly develop and commercialize technologies. Main advantages: the opportunity to attract new ideas, knowledge and markets; sharing financial and operational risks with partners; quick access to new markets through partnerships. Open innovation is suitable for technologies that require the integration of different expertise and a wide market network.

7. *Startup Incubation model.* Technology incubators and accelerators help startups develop and commercialize disruptive technologies by providing them with funding, expert support, and a network of contacts. Main advantages: attracting investors and venture capital; access to experts and mentors, which contributes to faster development; risk mitigation through the support of experienced partners. The incubation model is suitable for young companies and innovative projects with limited capital.

8. *Crowdfunding model.* Crowdfunding allows you to raise funding for the commercialization of disruptive technology through contributions from a wide range of

investors and consumers. Main advantages: raising funds without attracting large investors; expansion of the market base through pre-sales; testing the market, checking the interest of consumers. Crowdfunding is suitable for projects that may be of interest to a wide range of people, including technologies with a social component.

9. *Service-Based Model*. In this model, technology is not sold as a product, but is used to provide services. For example, artificial intelligence or data processing technologies can be provided as a service (SaaS). Main advantages: constant income due to subscriptions to services; accessibility for customers without the need to purchase expensive equipment; the ability to quickly scale your business. The service model is suitable for technologies that are easily integrated into customers' business processes.

The theoretical and methodological essence of breakthrough technologies includes an understanding of their role in changing economic, social and technological systems, as well as approaches to assessing, implementing and forecasting their impact. Thanks to a comprehensive analysis and the right choice of implementation methods, breakthrough technologies can create a significant economic effect and contribute to the development of society. The choice of commercialization model depends on the type of technology, the company's resources, access to markets and the level of risks. Each model has its own advantages and limitations, and successful commercialization often involves a combination of multiple models to effectively implement disruptive technologies in the market.

METHODOLOGICAL FRAMEWORK FOR CHOOSING OPTIMAL STRATEGIES FOR SUSTAINABLE HOUSEHOLD POWER IN UKRAINE

Iryna Sotnyk, Dr. Sc. (Econ.), Professor
Sumy State University, Ukraine

Tetiana Kurbatova, Ph.D. (Econ.), Associate Professor
Sumy State University, Ukraine

Yu Yang, Master student
Sumy State University, Ukraine

The destruction of Ukraine's energy infrastructure due to the war has intensified the issue of sustainable energy supply for domestic households. Numerous outages of electricity, gas, and water supply, both planned and emergency, lead to energy grid overloads, premature wear and tear, and increasing utility costs. As a result, there is a growing need for the decentralization of energy supply for residential consumers, transforming them into prosumers who generate their own energy for personal needs. However, creating decentralized energy supply hubs within individual households requires significant investment amid the growing energy poverty of the Ukrainian population. This situation highlights the importance of developing methodological approaches to selecting cost-optimal energy strategies for homes, which would ensure the most efficient combination of energy sources for sustainable household power supply.

In general, the energy strategy of a household, as an entity not seeking to maximize economic profit, should aim to create the most comfortable living conditions for its