

# Challenges of the Energy Transition



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Roadmap for a climate-neutral,  
sustainable Ukrainian energy sector  
and its role in an integrated EU  
energy market

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## Citation

IKEM (2023): *Roadmap for a climate-neutral, sustainable Ukrainian energy sector and its role in an integrated EU energy market*. Conclusions and Recommendations, Challenges of the Energy Transition.

## Supported by



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## Authors

**Dàmir Belltheus Avdic** | IKEM  
damir.belltheus-avdic@ikem.de

**Josefine Lyda, LL.M.** | IKEM  
josefine.lyda@ikem.de

**Ievgeniia Kopytsia, Ph. D.**  
Yaroslav Mudryi National  
Law University  
ievgeniia.kopytsia@ikem.de

**Jana Karras** | IKEM  
jana.karras@ikem.de

**Dr. Hanno Butsch** | BBH

**Johannes Graetschel, LL.M.**  
IKEM  
johannes.graetschel@ikem.de

**Vera Grebe** | BBH  
vera.grebe@bbh-online.de

**Valentyn Gvozdny, Ph.D**  
GOLAW

**Prof. Christian Held** | BBH

**Ivo Hlaváček** | Horizon 2

**Dr. Anna Lesinska-Adamson**  
BBH  
anna.lesinska-adamson@bbh-online.de

**Vivien Lorenz** | BBH

**Dr. Jana Maruschke** | IKEM

**Oleksandr Melnyk** | GOLAW

**Dennis Nill** | IKEM  
dennis.nill@ikem.de

**Sergiy Oberkovych** | GoLaw

**Carina Rastan** | IKEM

**Dr. Simon Schäfer-Stradowsky**  
IKEM  
simon.schaefer-stradowsky@ikem.de

## Reviewers

**Philipp Offenberg**  
Breakthrough Energy

**Peter Sweatman**  
Climate Strategy & Partners

## Graphic Designers

**Julie Hertel** | IKEM  
julie.hertel@ikem.de

**Odile Stabon** | IKEM  
odile.stabon@ikem.de

## Challenges of the Energy Transition

One could be forgiven for thinking that Ukraine has more urgent priorities than an energy transition, however worthy a goal that is. This would be to underestimate both the direct and indirect benefits of such a transformation, however: direct because a well-executed energy transition would be a large net gain in itself both for Ukraine and the world (and the sooner it is planned and carried out the greater the benefit is likely to be) and indirect because the energy transition is a major strategy

for the EU, which Ukraine aspires to join as quickly as possible. Moreover, the sheer scale of material destruction due to Russian aggression provides a chance to start fresh in many sectors instead of simply rebuilding yesterday's economic and energy systems. The war has also led to a great deal of innovation and flexibility among the country's administrations and institutions, which may help with the kind of forward thinking required for a green transformation.

### The importance of early and comprehensive strategies

All of these factors mean that the time for reform is as early as practical, and in fact it will take some years to properly prepare the energy transition. The Ukrainian government recognizes this fact, as is demonstrated among other things by its commendable Energy Strategy until 2050. A green future for Ukraine based on the cleanest energy sources therefore depends on a major expansion of balancing capacities – not least battery storage and hydrogen generation. This paradigm shift can

be achieved in the fastest and most efficient way by putting the necessary technical, legal, and financial structures in place early on. Prewar administrative systems or infrastructure which will not be fit for purpose in a decarbonized future should not be rebuilt in the same way. There are several cross-cutting priorities to think of when devising Ukraine's overarching strategy for the energy transition, and they are explored below.

### Energy efficiency

Energy efficiency in industrial activities, transport systems, and the built environment is a crucial component of a successful energy transition. While Ukraine has greatly reduced its energy consumption and greenhouse-gas emissions in the past several decades, this has largely been due to deindustrialization, not improved efficiency, and the energy intensity of the Ukrainian economy remains several times above the EU average.

Remedying this and boosting productivity through energy-efficiency measures should be a crucial component of energy policy as well as public and private investment decisions. Energy efficiency in industry, transport systems and the built environment reduces dependence on fossil fuels and increases security of supply and the use of renewable energy. The potential of energy efficiency is often underestimated in existing planning and investment programs, however – a fact recognized by the EU's recast Energy Efficiency Directive, which highlights the “energy efficiency first” prin-

ciple – a way of taking account of cost-efficient energy-efficiency measures in shaping energy policy and making relevant investment decisions. While taking full account of security of supply and market integration, the application of the principle in planning for Ukraine can ensure that only the energy really needed is produced, investments in stranded assets are avoided, and demand for energy is managed in a cost-effective way. The principle gives priority to demand-side solutions whenever they are a more cost-effective way to meet policy objectives than (potentially redundant) investments in energy infrastructure. In Ukraine, this should be a crucial guiding principle in the process of building a greener, more productive economy after the war. As such, it should be organically integrated into building codes, territorial plans, and transport-infrastructure strategies to ensure that energy-use lock-in is avoided and electricity prices in Ukraine remain low and competitive in the long term.

### Dealing with intermittency

As the preliminary studies carried out under the auspices of the Ukraine Energy Roadmap project show, each of them has drawbacks in the ambition to achieve a truly renewable energy future. While hydropower is a very clean form of energy, it is simply insufficient to satisfy a major portion of Ukraine's energy needs today or in a highly electrified future, and cannot easily be expanded without potentially serious environmental damage. Even so, it is very useful as a balancing form of electricity, which is required in great amounts in an energy system based largely on the cleanest renewable energy sources – that is, solar and wind power.

Nuclear-power facilities do not produce greenhouse-gas emissions in operation and produce plentiful and economical baseload power. However, the output of nuclear plants cannot be quickly adapted to shifting needs, making it unsuited to balancing intermittent renewable-energy sources.

### Direct intervention by the state

The production of clean electricity can be stimulated through market-based approaches, support to energy cooperatives and private households, and implementation of guarantee-of-origin mechanisms for electricity, as well as promoting renewable-energy sources. The government should make major investments in grid modernization and expansion, as well as smart-grid tech-

### Indirect measures

Ukraine's Energy Strategy until 2050, was adopted in the spring of 2023 and this must continue to respond to the challenges and opportunities of a future decentralized energy system and be clearly reflected throughout all relevant primary and secondary legislation. Fostering political willingness at all levels to focus on the deployment of renewable energy sources even when this is complex and difficult will be needed. Secondary legislation can facilitate the development of lighthouse projects, and generally smaller initiatives that fit a decentralized

Natural-gas turbines are another imperfect transition technology – natural gas is a fossil fuel but the most modern types of turbines are efficient and produce less greenhouse-gas emissions in operation than other types of fossil energy. Most importantly, it is suitable for balancing intermittent renewable-energy production and can quickly replace coal in this role.

In the medium term, Ukraine will need to adapt its generation and transmission system to the needs of a large-scale expansion of intermittent renewable-electricity generation. This means ensuring that there is sufficient balancing capacity. The country should focus on retrofitting and leapfrogging through clean technology deployment. Electrification and hydrogen investments will be key, as well as storage and delivery hubs which are flexible to help deliver the transition. Ukraine's natural gas pipeline system can be considered for use with hydrogen and optimized for the domestic market as well as trade with neighbors.

nologies to enable the integration of decentralized systems into the existing grid. Given likely budgetary constraints, financial support can be offset by reducing or removing subsidies for fossil fuels, and increasing taxes on emissions-intensive activities in alignment with other EU neighbors – which would have the added incentive value of making fossil fuels comparatively less attractive.

energy system better and can more easily form part of project partnerships with EU companies.

Efficient communication is a priority, including through permanent regular meetings or platforms between government, energy companies, and civil society communities. There must be a systematic mechanism for the information management of collected experiences, allowing relevant stakeholders to learn from failures and to scale up positive experiences. The Ukrainian government should encourage incumbent utilities to diversify their portfolios and invest in decentralized sys-

tems, and develop financing mechanisms that are tailored to the specific needs of decentralized sys-

tems. Civil society should be involved as much as possible throughout these parallel processes.

### Competitive and transparent markets

While free-market mechanisms have many drawbacks, well-executed and transparently governed markets will ensure a level playing field and enable high levels of innovation and dynamism. There is general consensus in EU institutions and most European governments that competitive, transparent markets are the best way to bring sustained development and prosperity. Governments have

a crucial role to play in ensuring that the market playbook is respected, rules are predictable, and private-sector actors feel secure in their investments. This requires clearly formulated primary and secondary legislation as well as transparently enforced regulations. In the energy transition in Ukraine, a special role can be played by private and public investment from abroad.

### Foreign investment and involvement

Donors, lenders, governments, and private companies from Ukraine's partner countries also have a crucial part to play in Ukraine's energy transition, through vital investments and knowledge transfer linked to green technology, practices and infrastructure, as well as technical advice and support for transparent, market-oriented regulations. Ukraine's

government should work on creating an environment that attracts productive foreign investment and involvement from public and private stakeholders from allied countries. Special programs for renewable-energy projects could be established in municipalities for international donors.

### Independent regulatory agencies

Ukraine's state agencies today have limited ability to effectively fulfill tasks related to promoting renewable energy and sustainability initiatives. They should be strengthened in their capacity to undertake tasks such as overseeing and administering new market-based schemes. They need the capacity to effectively monitor and regulate the implementation of sustainability initiatives, ensuring compliance with environmental standards and promoting a transparent and accountable energy sector. Additionally, they can provide a structured framework for rewarding producers of clean energy, thereby attracting investments, and facilitating the growth of sustainable-energy sources in Ukraine.

tor are being addressed. This institution could also launch a thinktank that researches the latest tendencies in the energy sector and translates them into concrete actions, and shares best practices and lessons learned.

Capacity-building efforts in the energy sector on the national level would benefit from a single anchoring and coordinating institution embedded in the central government which could foster regulatory consistency and see that resources are used efficiently, by avoiding duplication of efforts and ensuring that the most pressing needs of the sec-

Creating new institutions can be costly and time-consuming, and there are currently no homegrown thinktanks in Ukraine active in the relevant domains with a broad portfolio of projects. It may be more practical to build on existing institutions or to establish a network of institutions that can work together to implement capacity-building measures. International thinktanks and research centers already have expertise and experience in the fields of energy transition, energy tech, climate change and climate mitigation, and further related fields of expertise. They can also be well-connected in the international community and could help attract international funding and support for climate and energy-related projects in Ukraine.

### Bolstering human resources

Human resources are another high priority. The deployment of modern power and heat-generation and transmission equipment requires new skills and regular training and education. Salaries must reflect market conditions and encourage the recruitment of the ambitious staff required to put in place the sector transformation. This requires that the finances of state-owned enterprises involved in activities such as power distribution and district heating be improved, which can partly be achieved by more targeted and less competition-distorting tariff structures, or individual metering, for instance.

Innovation and technology talents should be supported and promoted through direct government

policy as well as encouraging and facilitating training efforts by the private sector. The government can promote knowledge transfer by partnering with organizations such as the International Renewable Energy Agency (IRENA) or making partnerships with countries that have experience in renewable-energy development. Government agencies and other stakeholders can benefit from technical assistance and capacity-building support to help them put in place regulatory reforms as well as monitor and evaluate their implementation. Finally, research and development involving the latest technological advances, such as smart grids, energy-storage systems, and energy-efficiency measures, should be a part of the postwar energy-sector reconstruction.