

Policy brief – May 2022

Small-Scale Renewable Energy Systems

Main Findings

- Strategic programs and roadmaps for a certain period to implement small-scale capacities from renewable energy sources must be developed
- Comprehensive legislation that protects the investor's rights and prescribes the conditions for connecting to the grid, and the sale of energy produced by private energy companies must be in place
- Green tariffs, tax regulations and economic stimulation must be introduced
- Education and public awareness activities to disseminate information on renewable energy technologies have to be conducted

Introduction

The development of renewable energy generation in small scale is at an early stage in the Central Asian countries.

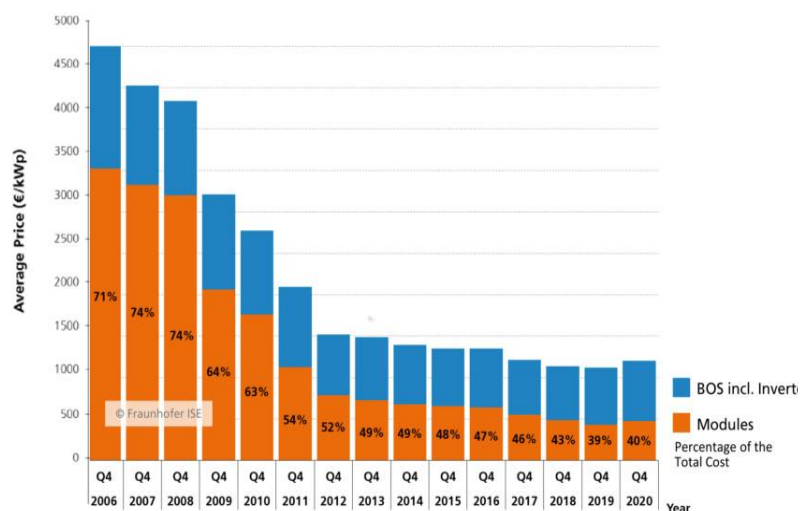
In Kazakhstan and Uzbekistan, there are legal provisions aimed at supporting small scale renewable energy systems. In all the Central Asian countries there are pilot projects of small-scale renewable energy which were implemented at the expenses of businesses or donors.

Autonomous renewable energy production facilities can replace coal used in remote rural areas and thereby mitigate the environmental consequences of over-reliance on coal. In addition, small and mini-hydroelectric power plants, as well as solar panels on house roofs, will significantly improve the population's living conditions, which are negatively influenced by their remoteness to the central power grid or by prolonged power outages. Mini-hydroelectric power plants have a minimal negative impact

on the environment and also make it possible to provide electricity to hard-to-reach areas. They require less capital and thus investments can be returned quite soon.

International context: the experience of developing small-scale distributed generation of renewable energy in Germany

Legal requirements were created for feeding electricity into the grid. For this purpose, the



Data: BSW-Solar. Graph: PSE 2021

Figure 1: Photovoltaic system (PV system) cost for 10kWp in Germany

energy legislation was changed so that small generation plants were allowed to feed

electricity into the grid without the necessity for the owner to fulfill the formal requirements of an electricity supplier.

The first subsidy programs consisted of investment grants (for example, 1000 Roofs Program, later 100.000 Roofs Program in Germany).

These subsidy programs were financed out of the normal tax revenue.

Later, a cost-based remuneration was decided in the Renewable Energy Sources Act (EEG). The determination of the remuneration level results from the commissioning date. A fixed remuneration is paid per kWh fed into the grid from the time of commissioning for 20 years plus the remaining year of commissioning.

After massive cost increases for electricity (only partly due to the EEG), «corrections of excessive subsidies» were made with one-time reductions.

In the near future, the EEG levy is to be abolished, and the additional costs are to be counter-financed from tax revenues again. However, the amount that has to be counter-financed will decrease anyway, since the feed-in tariff for new plants is already closer to the

electricity market than via the EEG remuneration.

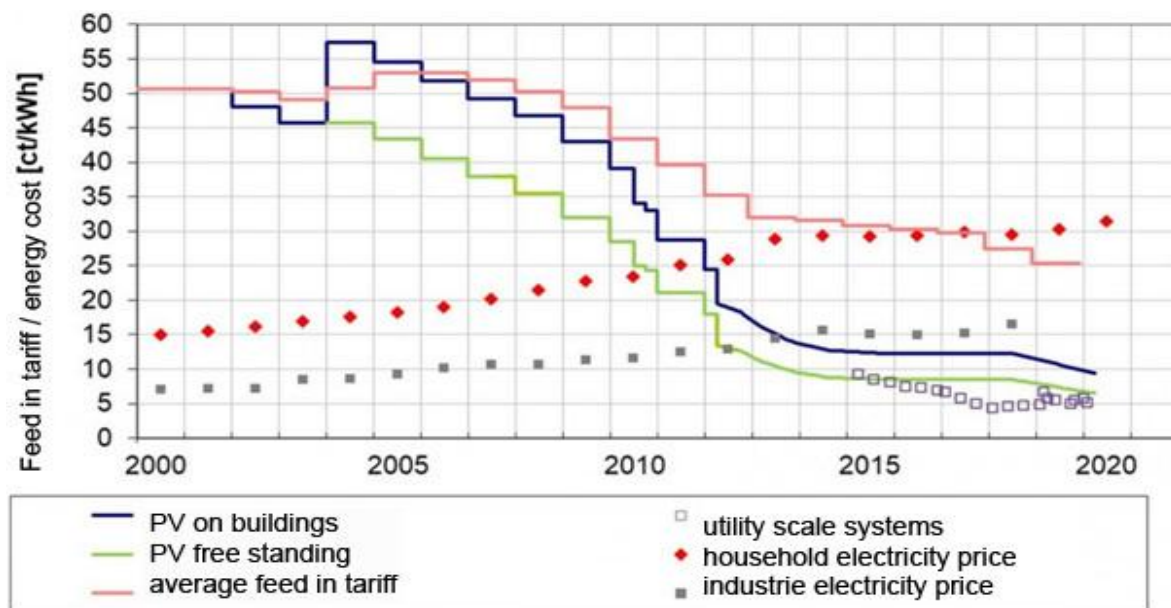
Regional context: approaches to the development of small-scale renewable energy systems in Central Asian countries

Kazakhstan

The Law of the Republic of Kazakhstan "On support for the use of renewable energy sources" has been in force since 2009, aiming at the development of large-scale renewable energy power plants and small-scale generation. However, stimulating measures for the development of small RES, such as subsidizing part of the cost of installing a small-scale RES installation and net consumption among households and small and medium-sized businesses have not yet been widely used due to existing administrative and technological barriers.

Target indicators for the development of the renewable energy sector do not single out separate goals for small-scale sources, no state and regional programs have been

Figure 2: Feed in tariff and energy costs in Germany



normal electricity price and this price is currently rising significantly. Many solar plants already receive higher revenues on the

adopted in the country.

Currently, the Ministry of Energy of Kazakhstan plans to improve legislation

regarding the development of distributed small-scale renewable energy systems.

Kyrgyz Republic

In addition to the previously mentioned barriers to the development of small-scale renewable energy generation in the regions of Central Asia, the main problem in the Kyrgyz Republic is the legislation.

The Law «On Renewable Energy Sources» of 2008 was amended in 2012 and 2019. There are no incentives or mechanisms to support the development of small renewable energy generation (subsidies, preferences).

Identified barriers and their solution for developing the renewable energy sector

- Imperfect legislation in the field of renewable energy - regulatory documents often lack enforcement mechanisms and adaptation to market conditions;
Solution: Creation of an effective legislative and regulatory framework taking into account best international practices and the country's renewable energy potential
- Lack of policy documents setting out priorities for implementation and use of small-scale renewable energy systems;

Solution: Creation of strategic programs and roadmaps for a definite period in order to implement small-scale capacities from renewable energy sources

- No incentive measures or mechanisms to support the development of small renewable energy generation (subsidies, preferences);
Solution: A clear legal regime that protects the investor's rights and prescribes the conditions for connection to the grid and the sale of energy produced by independent energy companies on conditions that allow the investor to receive back their investments.
 - Lack of qualified specialists in the field of renewable energy;
Solution: Establishment of training centres and monitoring of the implementation of specialties in educational institutions of the country
 - Weak mechanisms for financial support;
Solution: Introduction of green tariffs, tax regulations and economic stimulation
 - Low awareness of population, government agencies, organizations and agencies about the benefits of using renewable energy;
Solution: Promote education and public awareness activities to disseminate information on these technologies.
- Generally acknowledged, small distributed renewable energy generation makes it

Figure 3: Positive effects of developing small renewable energy generation are:

Sphere	Ways
Environment	Reducing CO ₂
Energy infrastructure	Reducing the load on the power system, the wear of networks, losses in networks, abandoning the construction of unprofitable electric networks
Economy	Tax revenue, creation of new «green» sustainable jobs in the sectors of production of small renewable energy installations, maintenance of renewable energy installations, design, legal financial services, etc. related;
Agriculture	Development of new lands, access to water using renewable energy technologies, which allows the development of farms and peasant farms (especially relevant to countries such as Kazakhstan, which have large undeveloped territories)
Social	Improving the quality of life of the population through access to electricity, and therefore access to the Internet and knowledge for non-electrified territories of Central Asian countries
Grid	Grid stabilization with micro-generation facilities using inverter technology with and without energy storage, allowing very fast control of generation and load. Reducing the load on the network by local generation and consumption

possible to solve both household energy



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supply problems and issues of the energy system as a whole. With reasonable use of small distributed renewable energy generation, each participant in the electricity market receives their benefits.

Policy options

Central Asia has all opportunities to create a sustainable energy industry: 5.5% of the world's economically efficient hydropower potential, mainly in Tajikistan and the Kyrgyz Republic; the presence of an average of 3000-3600 hours of solar radiation per year on the territory of Kazakhstan, Uzbekistan and Turkmenistan; the wind potential at the Dzungarian Gate alone in east Kazakhstan is 1.3 trillion kW/h per year.

Despite this potential, with the exception of large hydropower (hydroelectric power plants with an installed capacity of 40 MW or more), renewable energy sources account for only a small share of the resources used for electricity generation in the region. Excessive dependence on fossil fuels, as well as technical and financial barriers explain the lack of attention both by the authorities and private structures to the development of renewable energy. However, the risks threatening the environment and energy security are forcing the Central Asian authorities to reconsider their energy policy

and increasingly give preference to renewable energy sources.

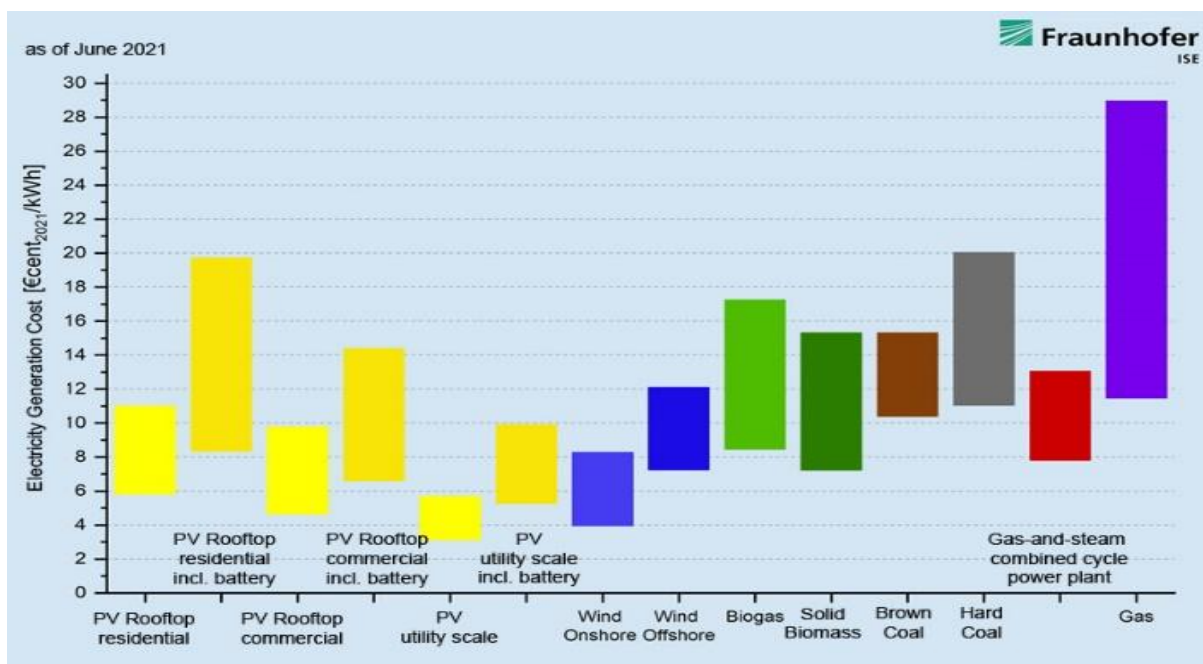
Renewable energy sources (RES) will allow Central Asian states meet the rapidly growing energy needs caused by population growth; reduce the environmental impact of fossil fuels;) solve the problem of energy security, especially in areas that are poorly connected or not connected to the central power supply networks.

RES should transform the energy sectors of Central Asian countries, but, most importantly, they should help vulnerable categories of the population who are disconnected from the central power grid or face regular and prolonged power outages.

The transition to a diversified energy balance in Central Asia, where the predominant share of energy consumption will be covered by renewable energy, is a long-term initiative and requires comprehensive measures.

Outdated energy infrastructure and a lack of investment in maintaining production facilities and power lines built in Soviet times lead to significant electricity losses in almost all Central Asian countries. Along with the modernization of the existing infrastructure, it is time to invest in the construction of a new one.

Figure 4: Electricity generation costs in Germany for new power plants



How to achieve high electricity production from small-scale renewable energy systems?

Due to the long-term securing of financing through the 20-year determination of the remuneration level, PV systems can be operated in an economically secure manner.

Depending on the location, size, design and other boundary conditions, sufficient to good expectations for PV yields and thus the achievable remuneration can be met. PV plants are included in many funds for financial investment as a safe basic stock.

Subsidies through a fixed level of remuneration instead of investment subsidies lead to high plant quality, as a long-lasting operation with high yields is necessary for economic success.

Small plants are usually not built primarily for yield considerations. Here, the owner has environmental priorities such as reducing carbon emissions. The prospect of refinancing the plant before the 20-year fixed tariff expires but earning an additional return, if the plant has a life span of significantly more than 20 years (today more likely 30 years), is also attractive to owners of small-scale PV-systems, as thus becomes part of their pension plan.

PV systems are comparatively simple with regard to the building law. Rooftop systems often do not require a permit, and ground-mounted systems can meet many requirements, such as environmental protection, more easily than other construction projects.

Small systems also have fewer requirements in terms of grid access. The necessary characteristics of the feed-in, which are required for the necessary grid stability, can be guaranteed here by the inverter manufacturers without increasing the costs.

PV systems have a low impact on the environment. There is no noise or other emissions, which means that there is a high level of acceptance among the population. In

the small systems sector, manufacturers have also further increased acceptance with visually appealing components.

Since the electricity generation costs of PV systems are almost exclusively derived from the investment costs and the yields, the cost of electricity remains constant for the entire life span and independent of the rising external electricity costs. For many people, this is an important reason to invest in PV systems (and energy storage). In particular house owners are increasingly buying or renting PV systems to protect themselves against rising energy costs.

Recommendations

Based on the presented analysis, recommendations are given to the Governments of the Central Asian countries on state support and implementation of the following incentive measures (but not limited to them):

- Introduction of financial benefits such as tax deductions, targeted assistance with subsidies, green certificates or green tariffs for households
- Introduction of net consumption
- Development of science and enhancement/capacity building, information and promotion of best practices for the use of small distributed generation using renewable energy.
- Increase steadily the installed capacity of RES through distributed generation facilities (micro-generation), partly funded by the owner and partly by the state.
- Finance the subsidization of micro-generation by taxes or by a certain surcharge on the cost of 1 kWh of energy consumed.

References

The Investor's Guide to Renewable Energy Projects in Kazakhstan

<https://www.gov.kz/memleket/entities/energy/documents/details/68180?lang=ru>

The Ministry of Energy of the Republic of Kazakhstan

<https://www.gov.kz/memleket/entities/energy/documents/details/296404?directionId=4910&lang=ru>

UNDP in Kazakhstan

<https://www.kz.undp.org/content/kazakhstan/en/home/projects/sdu/drei.html>

<https://undpkaz.exposure.co/the-solar-power-plant-launched-through-the-first-green-bonds-in-kazakhstan>

<https://www.kz.undp.org/content/kazakhstan/en/home/presscenter/announcements/2022/may/eni-and-undp-commissioned-a-project-to-modernize-and-improve-the.html>

Tetra Tech in Kazakhstan.

<https://www.tetrattech.com/en/projects/power-the-future-regional-program>

Law of the Kyrgyz Republic.

<https://rise.esmap.org/data/files/library/kyrgyz-republic/Renewable%20Energy/Kyrgyz%20Republic%20On%20Renewable%20Energy%20Sources%202008.pdf>

Energy profile of the Kyrgyz Republic.

<https://www.iea.org/reports/kyrgyzstan-energy-profile/sustainable-development>

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Bayan Abylkairova, Deputy Chief of Part, USAID Power Central Asia Activity, Kazakhstan

Tatiana Vedeneva, President of the Center for Renewable Energy and Energy Efficiency Development, Kyrgyzstan

Authors

Ainur Sospanova, Member of the Board of Directors, RES Association "QAZAQ GREEN"

Alexey Kobzev, Renewable energy and climate change projects manager, Kazakh-German University (DKU)

Contact: Alexey Kobzev, Renewable energy and climate change projects manager, Kazakh-German University (DKU), kobzev@dku.kz

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