

# **SOLAR AND WIND ENERGY FOR TRANSBOUNDARY ENERGY COOPERATION IN BENEFICIARY COUNTRIES**

**Republic of Armenia  
Republic of Belarus  
Republic of Kazakhstan  
Kyrgyz Republic  
Republic of Tajikistan  
Republic of Uzbekistan**



**This set of recommendations is one of the outcomes of the project called “Enhancing transboundary energy cooperation through introducing of solar and wind energy into power systems of the CIS countries to support achievement of SDG 7”.**

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The document does not necessarily reflect the position of reviewers and partners listed above who provided their comments and helped to develop this publication.



## Who We Are

The United Nations Economic Commission for Europe (UNECE) facilitates greater economic integration and cooperation among its member countries and promotes sustainable development and economic prosperity.

## What We Do

The UNECE Sustainable Energy Division works with international partners to develop and support sustainable energy systems of the future towards clean and renewable energy.

We help countries develop sustainable energy systems, national action plans and green economy policies with quality indicators, measurements and statistics.

We provide a platform for policymakers, financial institutions and technology developers to increase investment in renewable energy technology.

Thank you to International Energy Agency (IEA), International Renewable Energy Agency (IRENA), and Renewable Energy Policy Network for the 21st Century (REN 21) for their contributions.

## Introduction

The Sustainable Development Goals (SDGs) are the blueprint to achieve a better and more sustainable future for all. They were adopted by all UN member states in 2015.

SDG 7 aims to ensure access to affordable, reliable, sustainable and modern energy for all.

The objective of this report is to support decision makers across society to accelerate sustainable solutions in introducing cross-border renewable energy cooperation in solar and wind across Central Asia.

## We Developed These Recommendations by

- Analyzing national plans to achieve the sustainable development
- Exploring potential areas of development in the energy industry
- Sharing global good practice in large-scale development of renewable energy
- Consulting with local experts in the field

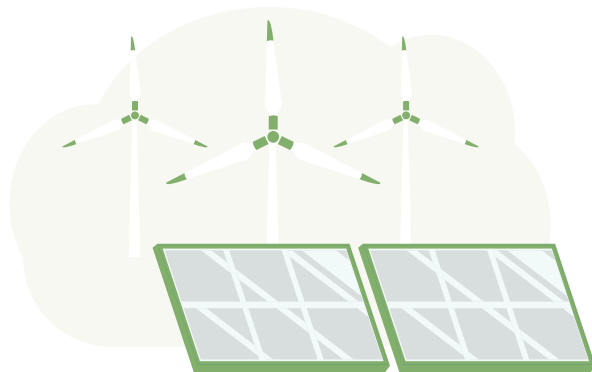
## Recommendations at a Glance

- Integrate solar and wind energy into power systems
- Create national institutes of future energy planning
- Improve methods to unify relevant, reliable, and timely statistics
- Develop legislative measures to support integration of variable renewable energy into power systems
- Harness international experience to harmonize national and international energy standards
- Utilize modern technologies for efficient solar and wind energy production
- Implement measures to reduce greenhouse gas emissions in the power sector
- Strengthen conditions for the modernization of energy systems with solar and wind energy
- Establish a guide for potential investors on renewable energy systems
- Train the national workforce to integrate solar and wind energy into power systems

# 01 | Integrate Solar and Wind Energy into Power Systems

In the beneficiary countries, target parameters for the development of RES have been developed and are being updated. The maximum plans call for an increase in the share of electricity production using wind and solar energy to a level of at least 20% by 2025 and to a level of at least 25% by 2030. Renewable energy sources such as solar and wind energy can help create jobs, reducing local air pollution.

The global experience of large-scale development of renewable energy sources indicates the need to apply different measures in the energy system, depending on the share of variable renewable energy sources (VRE) in annual production.



## Recommendations

- It is necessary to provide solar and wind power plants with electrical energy storage systems that can maintain power supply in the event of network failures, provide voltage regulation with a change in the flow of reactive power and regulation of the network frequency;
- Deploy Variable Renewable Energy plants in areas with the highest impact (close to populations with suitable weather conditions);
- Diversify energy sources. Weather patterns can often enable interplay between renewable energy sources. For example, bad conditions for wind energy production may be good conditions for solar energy production;
- Prepare for fluctuations of Variable Renewable Energy; If between 3-15% of your electricity supply, consider adapting existing regulation resources and management methods. If above 15%, consider a deep restructuring of the energy system and the introduction of new means and tools to maintain the operation of the energy system, including energy storage systems, new business models that expand consumer opportunities, transferring them from passive to active market participants, new rules for the operation of wholesale markets, etc.

# 02

## Create National Institutes of Future Energy Planning

The cost of energy production is dynamically changing due to the rapid improvement of energy technology. This is why nation states need to develop and regularly update their strategies of optimal generational energy structure. The creation of national institutes could help scientific and technical councils make more well-informed decisions.

### Recommendations

- Develop scientifically based target vision and long-term strategy for the development of the electric power industry and the fuel and energy complex (FEC) as a whole;
- Dedicate resources for creation of tools to inform interested parties on forecasts of the fuel and energy complex development, taking into account the dynamics of development and the cost of new Variable Renewable Energy (VRE) technologies;
- Prepare and publish annual reviews of the main technical and economic indicators of power plants operation;
- Prepare short and medium term plans and programs for the energy sector development, taking into account the dynamics of development and the cost of new VRE technologies;
- Commercialize the results of research activities in the fields of renewable energy sources and energy efficiency with the transformation of an innovative solution into a marketable product;
- Develop and disseminate investment guidelines for low-carbon technologies.



# 03

## Improve Methods to Unify Relevant, Reliable, and Timely Statistics

Objectives and strategies should be supported by reliable data for well-informed decisions. Authorized bodies and infrastructure organizations in the energy industry are recommended to continue work on creating and realizing the potential of efficient renewable energy systems with data at the core of decision making.



### Recommendations

- Create national information systems in the fuel and energy sectors to provide information for making data-driven decisions;
- Develop unified formats for reporting data on renewable energy sources;
- Collect, analyze and publish comprehensive data on renewable energy sources;
- Monitor the development and implementation of innovative renewable energy technologies;
- Develop and implement a standardized classification of renewable energy sources and a harmonized system for assessing their resource potential using the United Nations Framework Resource Classification (UNFC).

# 04

## Develop Legislative Measures to Support Integration of Variable Renewable Energy

Political decisions have played a vital role in increasing the share of renewables in electricity production. In 2019, 143 countries applied renewable energy regulatory policies in the power sector such as feed-in tariffs or quotas for grid services.



### Recommendations

- Develop regulatory and legal frameworks for providing favorable conditions for the supply of renewable electricity in well-connected and remote regions to encourage technological innovation;
- Provide potential investors with standard set of documentation including resource potential, feasibility studies and environmental impact assessments before auctions to accelerate deployment and encourage investment;
- Provide individuals and legal entities with financial incentives to purchase renewable energy generation equipment to actively engage citizens and businesses to use and generate green energy;
- Legislate for the right of consumers who have installed a micro-generation facilities such as solar panels to sell to guaranteeing suppliers and other energy sales companies surplus electricity;
- Increase investment activity and stimulate the implementation of projects in the renewable energy sector. Governments are encouraged to provide various incentives, including property tax on renewable energy facilities and land.



# 05

## Harness International Experience to Harmonize National and International Energy Standards

For the successful integration of solar and wind energy into power systems, it is necessary to resolve the issues of technical requirements standardization for equipment. International standardization organizations IEC, ISO and other key organizations like CIGRE have established technical requirements to ensure best practice, international cooperation and efficiency.



### Recommendations

- Use the international standards set by organizations like IEC and the ISO when developing national standards for the integration of solar and wind energy into power systems;
- Harmonize new and existing national standards, taking into account the peculiarities of national energy systems, with international standards developed in IEC technical committees (TC) and subcommittees (SC) .
- Participate in the work of CIGRE committees and expert groups to share good practice and contribute to regional standard setting;
- Develop working methods to regulate frequency of electric current to enable cross-border distribution of power for an energy connected region
- Learn from experiences and share best practice in the standardization of renewable energy sources in the Central Asia region.

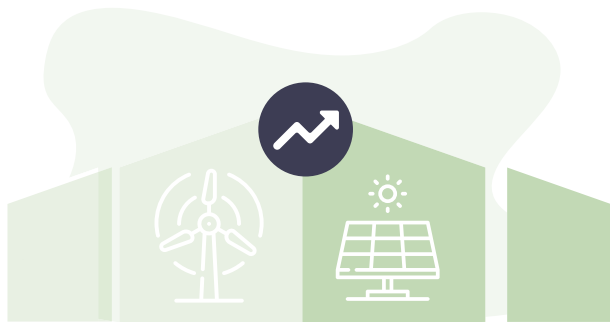
# 06

## Utilize Modern Technologies for Efficient Solar and Wind Energy Production

Analysis of national energy systems reveals key problems in the electric power industry. These include a high deterioration level of electrical networks and equipment, a shortage of flexible power plants and limited reserve electric capacity.

### Recommendations

- Prioritize measures to replace worn out power grids by modernize existing grids as well as building new "smart" power grids;
- Increase flexible generating capacities in the energy system such as gas turbines for immediate impact;
- Develop commercial pathways of different energy storage technologies for medium to long-term impact;
- Digitize equipment such as metering devices, control systems, and substations to optimize business models and the management of electricity demand;
- Modernize existing assets to ensure equipment is adaptable to changing conditions and needs of power systems;
- Develop new modeling methods to develop power systems, jointly manage classic high-voltage AC networks, super-power DC transmissions, and power electronics devices.



# 07 | Implement Measures to Reduce Greenhouse Gas Emissions in the Power Sector

All Central Asian countries have ratified the Paris Climate Agreement, committed to meeting greenhouse gas emission reduction targets.

Energy efficiency technologies and renewable energy sources play an important role in sustainable energy systems. For example, Combined Cycle Gas Turbines (CCGT), modern hydroelectric power plants, and technologies for deep complex processing of coal and nuclear energy are supporting highly efficient energy generation.



## Recommendations

- Conduct a comprehensive study of technology development in large-scale solar and wind energy projects. Further areas of study include impact assessments of health, environment, the economy and the wider energy sector. This will help legislate rational decisions while updating of national strategic documents towards achieving climate goals.
- Consider applying market mechanisms for regulating greenhouse gas emissions at national and regional levels. These could include quotas for GHG emissions, sale of permits for GHG emissions through auctions, and taxation of greenhouse gas emissions;
- Create measures in national plans to adapt power facilities due to climate change;
- Develop international cooperation between countries to reduce greenhouse gas emissions through initiatives such as bilateral joint projects;
- Create a national system of mandatory carbon reporting.

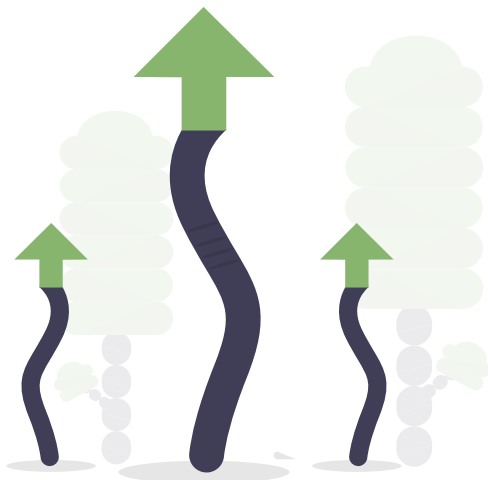
# 08

## Strengthen Conditions for the Modernization of Energy Systems with Solar and Wind Energy

The development of the national energy systems in Central Asia countries is within the framework of the Electric Power Council of the Commonwealth of Independent States (EPC CIS), the Eurasian Economic Union (EAEU), the Central Asia Regional Economic Cooperation (CAREC) Program, as well as a number of multilateral and bilateral agreements and projects. The interconnectivity of electric power systems can improve efficiency by reaching optimal usage. This can reduce operating costs and peak capacity and enable solar and wind energy to a vital part of the energy generation framework.

### Recommendations

- Develop scientifically based target vision and long-term strategy for the development of the electric
- Stabilize power systems by regulating peak loads and power flows to prepare for the variable nature of solar and wind energy;
- Promote cooperation in the Transcaucasian Electric Ring;
- Factor the cost of equipment in new VRE project planning to avoid increase in electricity price
- Ensure a reliable and affordable energy supply in the region, encouraging investment through regional financing mechanisms for renewable energy projects;
- Promote technology interplay between renewable energy and other low and zero carbon technologies to mitigate variable energy intermittency;
- Develop long-term strategies for decentralized VRE projects for rural areas, such as small scale decentralized VRE projects in mountainous areas in Tajikistan and Kyrgyzstan;
- Ensure non-discriminatory conditions for market participants and harmonization of national norms and rules;



# 09

## Establish a Guide for Potential Investors on Renewable Energy Systems

A step-by-step guide for investors for implementing renewable energy systems in Central Asia could include details on potential state support, the rules and regulations regarding auctions and project implementation.



### Recommendations

Develop a Guide for investors on the implementation of renewable energy projects. A guide could include:

- Overview of renewable energy systems in the country highlighting the development strategy and targets, resource potential, state support, and investment preferences;
- Rules regarding auction bidding including the preparation required and financial support of the application for participation in the auction;
- Details of power purchase agreements including agreements with renewable energy generating organizations at auction prices;
- Information about land registration, permits for special water use and conducting design and exploration works;
- Guidance on grid connection procedures including the nearest point of connection to electrical grid and development of power distribution schemes;
- Advice on technical specifications such as environmental permits, construction and delivery operations, state registration rights, and testing and acceptance electricity measurements.

# 10

## Train the National Workforce to Integrate Solar and Wind Energy into Power Systems

Feedback from local experts and industry professionals demonstrated existing training for personnel in renewable energy sources does not meet the desired requirements. More training is needed to develop knowledge and expertise in large-scale introduction of renewable energy sources in the region.

### Recommendations

- Enhance educational and operational programs on Energy Policy and Management, detailing the principles of socio-economic and financial aspects of energy, as well as the principles and potential technologies for solar and wind energy.
- Create national branches of leading energy higher educational institutions;
- Scale up interaction of specialized educational institutions with industry professionals from a wide range of organizations and associations;
- Create training centers and advanced training programs with the involvement of international training centers and experts;
- Create information networks for sharing expertise and insight on green energy for sustainable development.







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