
**22nd INPRO Dialogue Forum on
successful development and sustainable deployment of SMRs**

**STATUS AND CHALLENGES OF NUCLEAR ENERGY
PROGRAMM IN UZBEKSITAN**

May 6 - 10, 2024
Jeju, ROK

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Uzbekistan and IAEA Cooperation



1994 – Became a Member State of IAEA

During this time...



Technical
Cooperation
Programme

Completed – 100 TC Projects



Financed – 20 mln. USD



Attended – 2,0 thousand

Areas of cooperation:



Healthcare

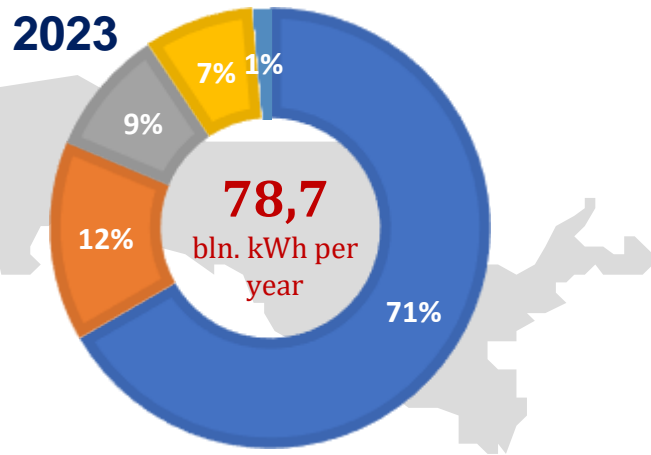


Science

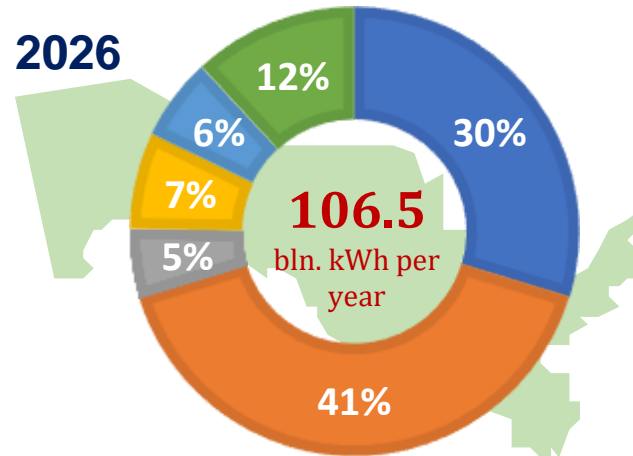


**Agriculture and
water**

THE URGANCY OF NUCLEAR ENERGY DEVELOPMENT



■ Government TPP
■ Private TPP
■ Coal TPP
■ Hydro power plants
■ Photovoltaic power plants



■ Government TPP
■ Private TPP
■ Coal TPP
■ Hydro power plants
■ Photovoltaic power plants
■ Wind power plants

NATIONAL STRATEGY FOR REDUCING GREENHOUSE GAS EMISSIONS

Reducing emissions by 35 % per GDP compared to 2010
 PD – 436
 02/12/2022

PARIS2015
 UN CLIMATE CHANGE CONFERENCE
 COP21·CMP11

- No diversity
- Unbalanced system
- High gas and oil consumption
- High CO2 emissions
- High electricity price

- High diversity
- Reducing CO2 emission
- Competitive price generation
- Less reliant of natural gas
- High energy security

- In **2023**, over **78 billion kWh** of electricity were generated;
- **About 90 %** of electricity is generated from burning **organic fuels**;
- Diversification of the country's fuel and energy mix by including **"green"** energy generation;
- By **2026**, it is expected that consumption will increase to **106.5 billion kWh and 120 billion kWh** by **2030**;
- About half of the energy is planned to come from **"green"** sources, including nuclear power plants in the future. 3

BACKGROUND



The Uzbekistani government is actively considering **nuclear energy** generation as a strategic solution to address its energy, economic, and ecological objectives for the 2030s.

THE DECISION HAS MADE



TC Program support

- Workshops / Training courses
- Advisory services
- Training tools
- Review missions

SEED site safety assessment mission and an INIR nuclear infrastructure assessment mission have already been conducted. In January 2023, the second stage of the SEED mission was carried out.

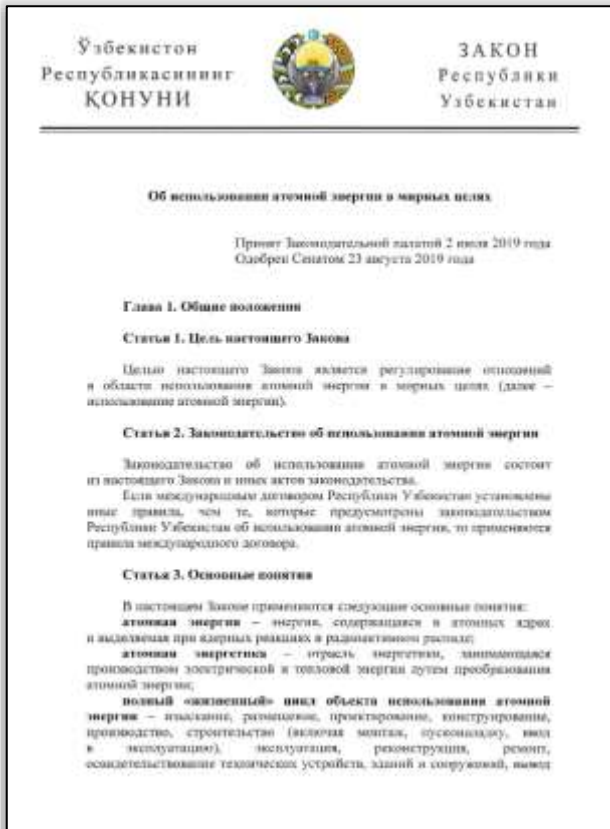
19 nuclear infrastructure issues



Uzbekistan has prepared a self-evaluation report (SER) which has covered the 19 areas related to the progress status and state of development of the country's nuclear infrastructures, in accordance with the methodology recommended by the International Atomic Energy Agency (IAEA)

LAW OF THE REPUBLIC OF UZBEKISTAN ON USE OF ATOMIC ENERGY IN THE PEACE PURPOSES

The Law on the Peaceful Uses of Atomic Energy was signed by the President of the Republic of Uzbekistan on September 9, 2019



The law consists of 10 chapters and 59 articles

Purpose of the Law :

Development of a legal framework for the activities of newly created state organizations and systems in order to ensure safety in the use of atomic energy, as well as the introduction into national legislation of effective mechanisms for ensuring safety in the use of atomic energy.

When developing the draft of Law, the best foreign experience of countries that use nuclear energy for peaceful purposes was studied:



Basic principles of Law:

- priority protection of life and health of citizens, property of individuals and legal entities, as well as environmental protection;
- Providing nuclear safety and security;
- information availability;
- ban on the production of nuclear weapons and other nuclear explosive devices.

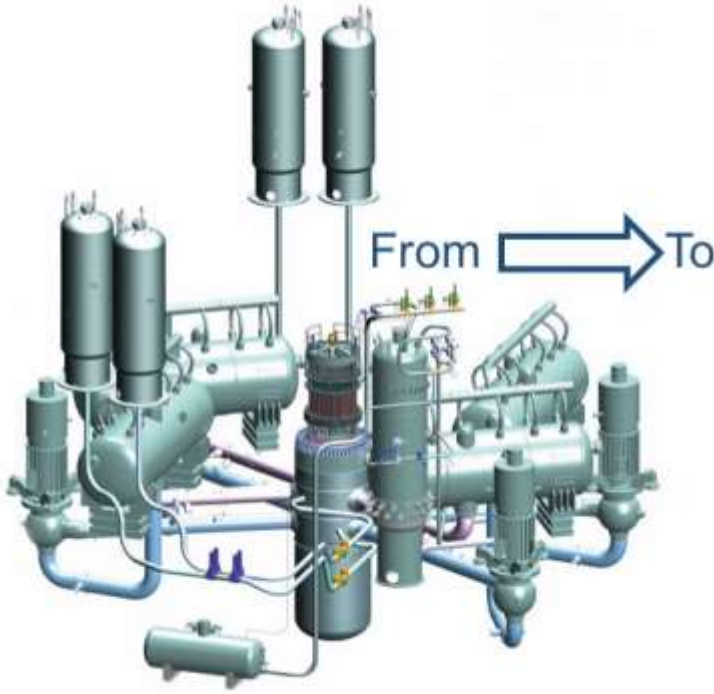
Law Objectives:

- development of a regulatory framework for the functioning of newly introduced institutions and systems for ensuring the use of atomic energy;
- unification of all applicable norms and rules in the field of nuclear energy, bringing them into line with international obligations signed by the Republic of Uzbekistan;
- introduction into national legislation of the most effective mechanisms to ensure the safety of citizens and legal entities when using atomic energy, used in countries that successfully use nuclear energy.



IAEA recommendations received

SMALL – BUT OUTSTANDING



SMALL

- Output < 300 Mwe
- Up to 90 % smaller size

MODULAR

- Factory Production
- Portable & Scalable

REACTOR

- Nuclear Fission
- Heat & Electricity



Enhanced Safety

- 60 years of experience
- Innovative internal design
- Less power and fission material



Easy Grid Adaptation

- Output up to 300 MWe;
- Lower CAPEX for grid adaptation;
- Replacing existing coal plants.



Flexibility

- Back up variable renewables;
- Load follow operation.



Local Installation

- Less demand for water resources;
- 90 % less area for SMR plant.

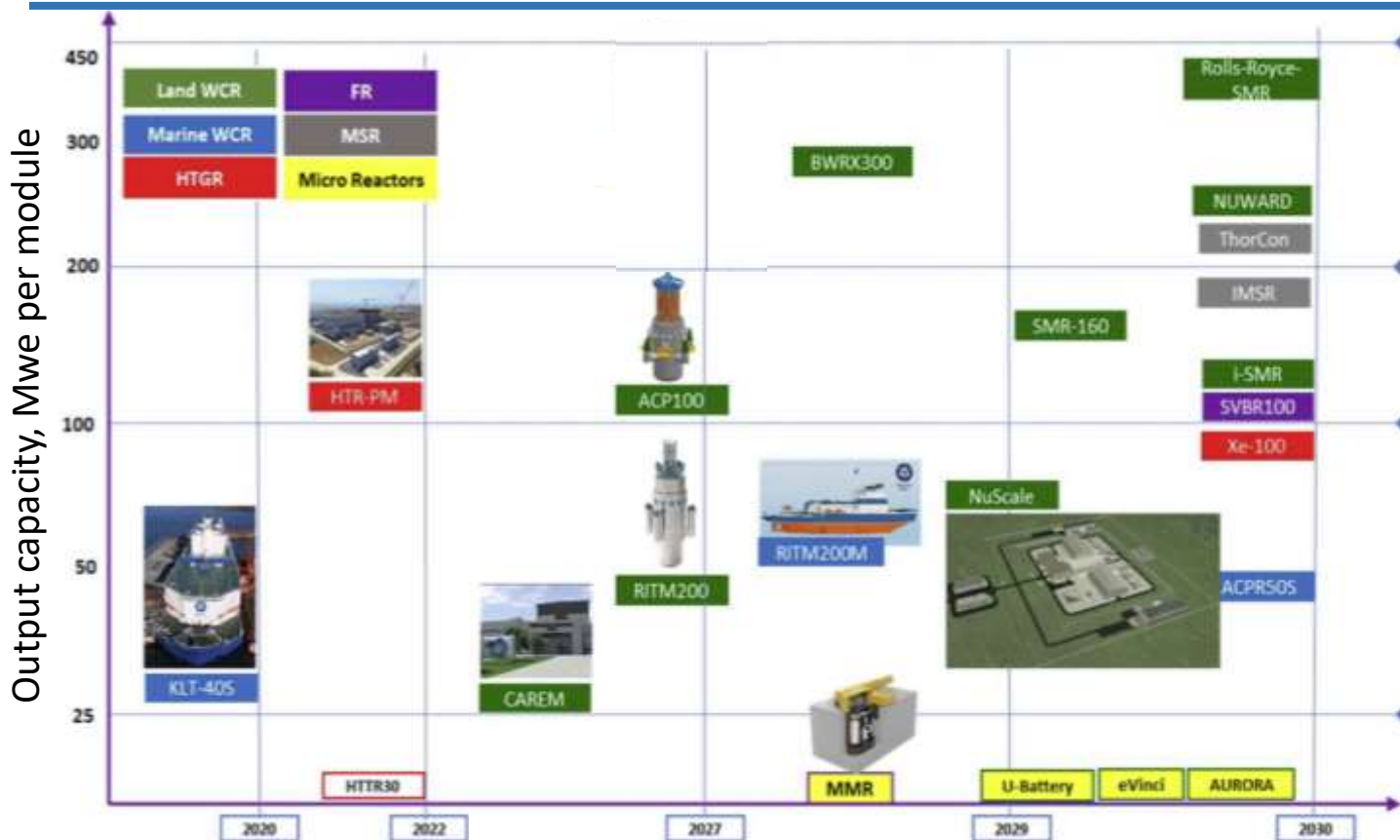


H₂

Non Electrical Applications

- Heat 285 – 850 °C ;
- Industrial cogeneration.

POTENTIAL SMR DESIGNS FOR UZBEKISTAN



(Planned) Connection to the grid SMRE designs around the world

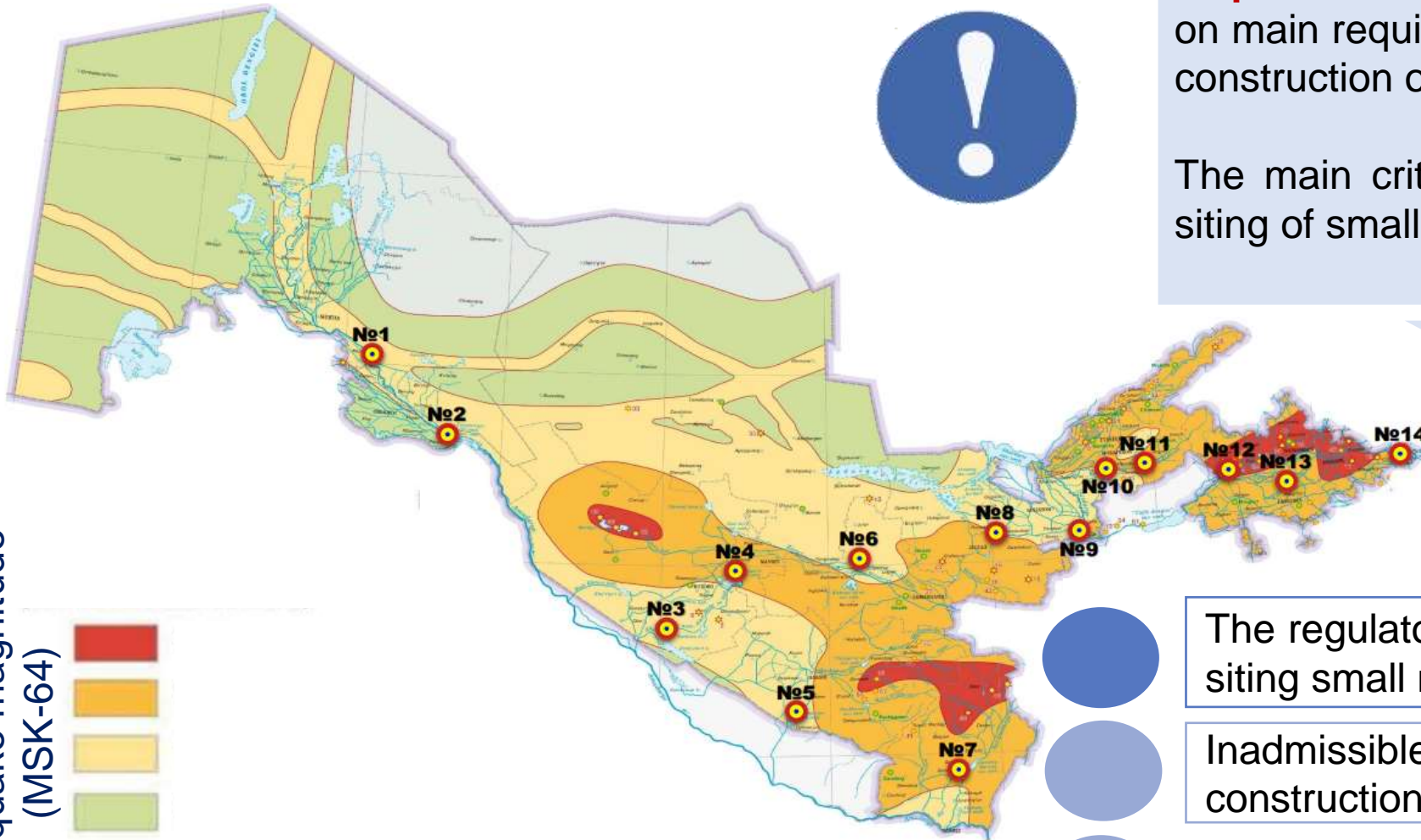
Roadmap to SMR deployment in Uzbekistan

SMR designs that are planned to be deployed by the end of the 2030s may be considered by the Government of Uzbekistan to help achieve its energy policy goals. A **Techno-Economic assessment** needs to be done to select a successful reactor candidate that meets the **economic, financial, and technical** needs and expectations of the Uzbek government.

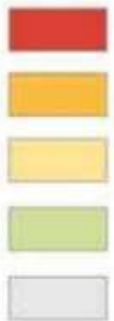
PRELIMINARY SITE ASSEMENT FOR THE CONSTRUCTION OF SMR

14 potential sites evaluated and assessed based on main requirements and criteria for the safety of construction of NPPs.

The main criteria and requirements for the safe siting of small nuclear power plant construction.



Earthquake magnitude
(MSK-64)



The regulatory framework for selecting areas for siting small nuclear power plants.

Inadmissible conditions for siting the construction of small nuclear power plants.

Unfavorable conditions for siting the construction of small nuclear power plants.

NPP PROGRAM CHALLENGES

□ THE PROJECT'S ADAPTATION TO THE CLIMATIC CONDITIONS OF THE REGION.



The water resources problem in the region

According to estimates by international experts and scientists, Central Asia is expected to face the following challenges:

- A **sustainable deficit** of **water resources** in the region;
- By 2040, water availability is projected to **decrease by 25%**;
- Glaciers in Kyrgyzstan are expected to **shrink by 30-40%** by 2025; Tajikistan has already **lost more than 30%** of its glaciated area.



Dry cooling system factors



Positive factors:

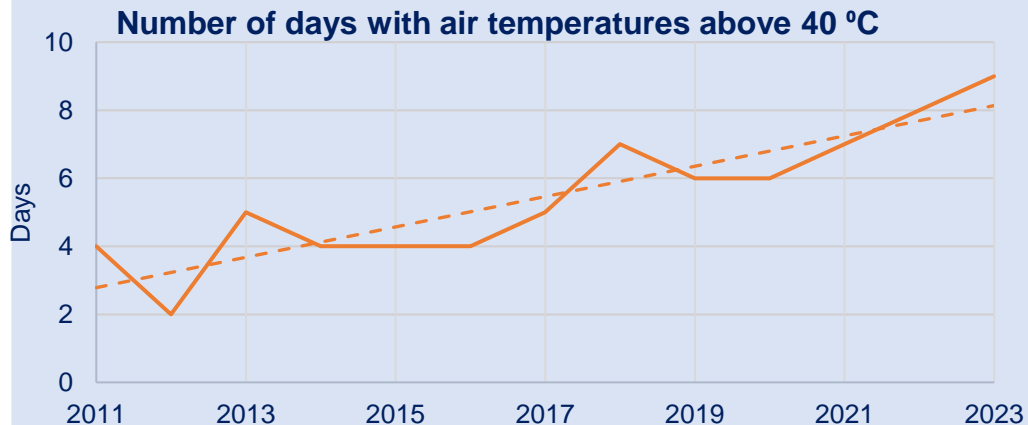
- **Reduces** irreversible **water losses** at the NPP;
- **Decreases** operational costs for **water treatment** in the third circuit;
- **Minimal impact** on the environment.

Negative factors:

- Lack of a reference solution for NPP;
- High sensitivity to weather conditions;
- Decrease in generation during hot periods.



Ambient air temperature increase



Half-speed turbine technology



- Has a **greater vacuum reserve** and the ability to operate stably under adverse conditions (high temperature) in combination with a dry cooling system.
- The most widely used type of turbine for NPPs worldwide.

NPP PROGRAM CHALLENGES

❑ INTEGRATION OF NUCLEAR POWER INTO THE ENERGY SYSTEM (ES).



Increasing the share of renewable energy sources (RES) is characterized by an unstable and variable nature of electricity generation.



The significant volumes of renewable energy sources in the power system dictate the need for additional balancing tools to be developed.



Insufficient "spinning" reserve capacity in the power system can lead to cascading outages of the power system in the event of a nuclear power plant (NPP) failure.



Low capacity of the main transmission lines and weak connections to neighboring power systems limit the throughput capacity.



For the **stable operation** of the power system and successful integration of **nuclear power plants**, it is necessary to:

- to develop system and emergency automation tools;
- to develop main electrical grids;
- and to implement **maneuverable sources** of electricity generation into the power system.



OBTAINING PERMISSION PROCEDURE FOR SITING THE NUCLEAR POWER PLANT

Step	Procedure
1	Complex engineering surveys aimed at determining the location area and selecting the priority site.
2	Preparation of an Environmental Impact Assessment report.
4	Preparation of a feasibility study / analysis or a techno-economic calculation for the construction project of a nuclear power plant (NPP).
5	Development of a preliminary safety Assessment report (Introduction, Chapter 1, Chapter 2).
6	Approval from the government of the Republic of Uzbekistan "On the Selection of a Site for the Placement of a Nuclear Power Plant."
7	Conducting an expert review of the safety Assessment report for the selected site.
7.1	Submission of the Preliminary Safety Assessment Report (PSJR) to the regulator for the expertise.
7.3	Expertise of the Preliminary Safety Assessment Report.
7.4	Issuance of permission for siting the NPP at the selected location.

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Thank you!
VISIT UZBEKISTAN !

