

REGIONAL WORKSHOP ON REVIEW AND ASSESSMENT OF NUCLEAR POWER PLANT LICENCE APPLICATIONS BY THE
REGULATORY BODIES

NUCLEAR POWER INFRASTRUCTURE DEVELOPMENT IN KAZAKHSTAN

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BRIEF COUNTRY PROFILE

- Kazakhstan is a transcontinental country in northern Central Asia and Eastern Europe.
- Area: 2,724,900 km² (9th largest country)
- Population: 19,88 million
- Capital: Astana
- Kazakhstan shares borders with Russia, China, Kyrgyzstan, Uzbekistan, and Turkmenistan, and also adjoins a large part of the Caspian Sea.



DESCRIPTION OF THE INTEGRATED POWER SYSTEM OF KAZAKHSTAN

Status of the Integrated Power System of
Kazakhstan on 1 august, 2023:

Generating capacity – 24523,7 MW

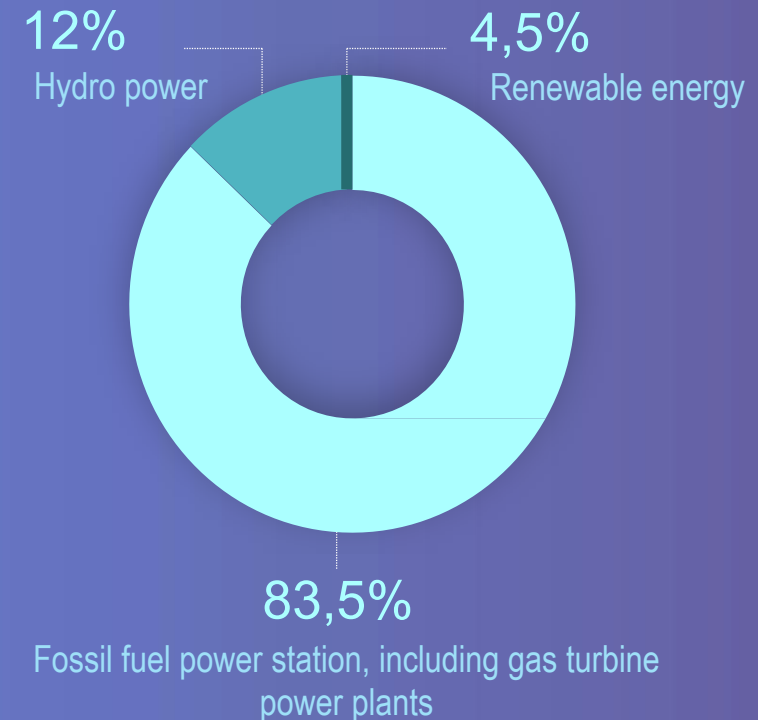
- Fossil fuel power station – 83,5%
- Hydro power – 12%
- Renewable energy – 4,5%

Electricity generation – 114,9 billion kWh

- Fossil fuel power station, including gas turbine power plants – 99,5 billion kWh
- Hydro power – 9,7 billion kWh
- Renewable energy – 5,1 billion kWh

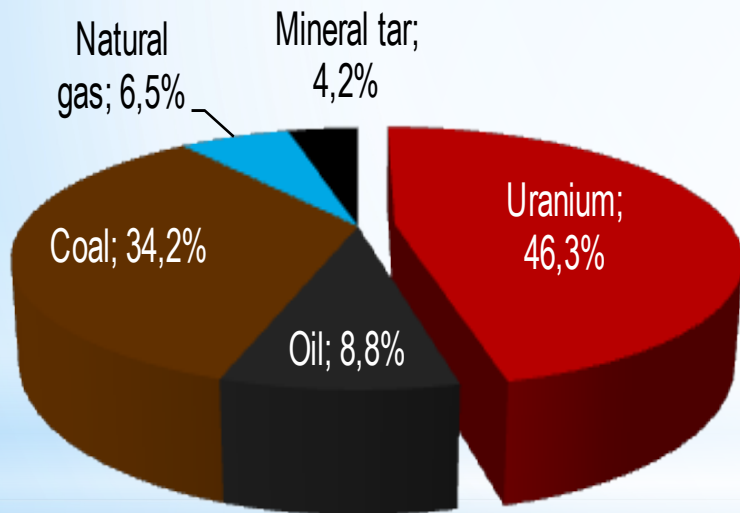
Electricity consumption – 121 billion kWh

Power Generation Structure



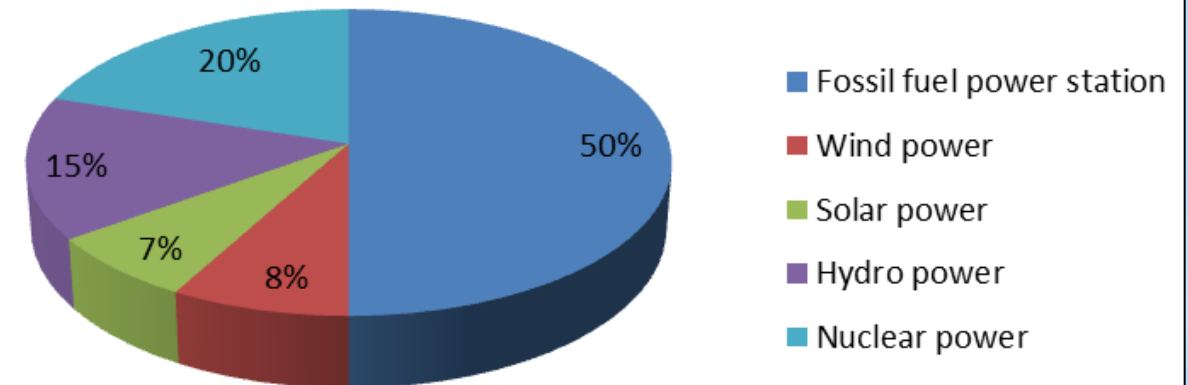
STRATEGY OF THE ELECTRIC-POWER INDUSTRY DEVELOPMENT

- Kazakhstan has a great deal of explored reserves of uranium (~12% of world reserves).
- Kazakhstan is world leader in uranium production.



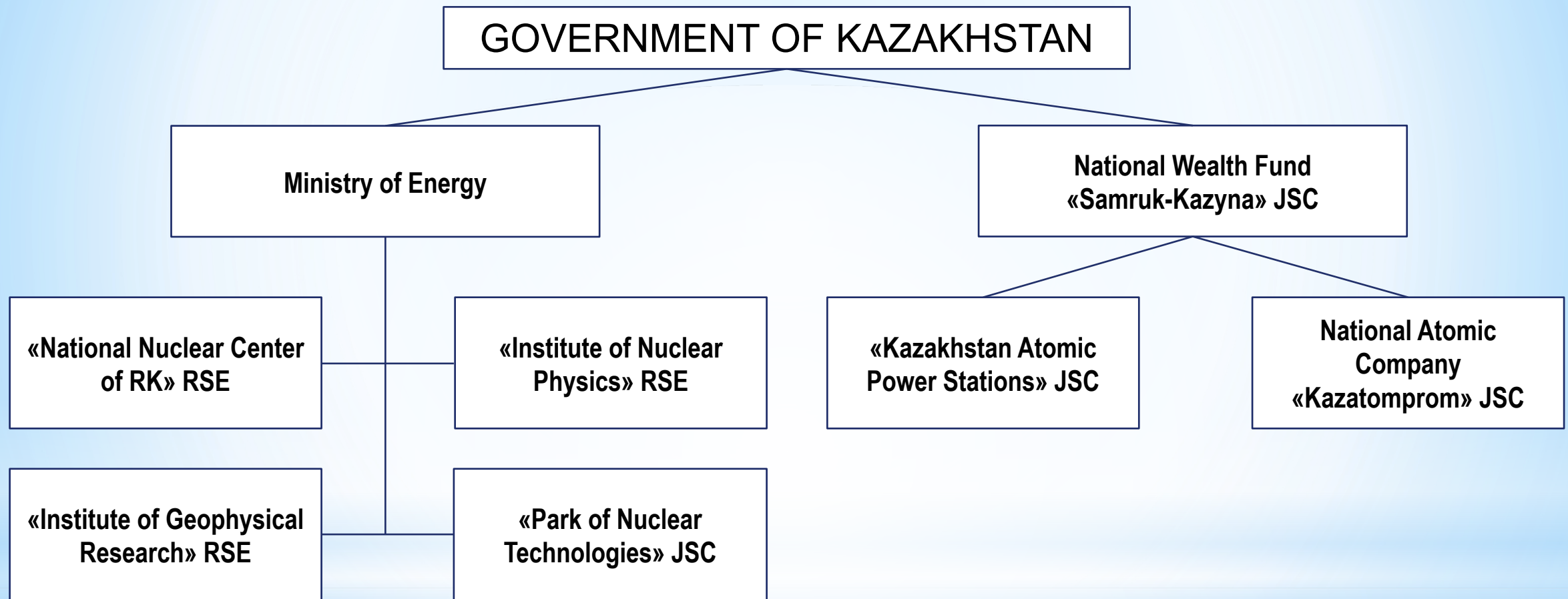
Kazakhstan's energy resources in conversion to fuel equivalent

Optimal option of Kazakhstan's electric-power industry structure in terms of energy sources diversification



Nuclear power consumption is supposed around 20%

KEY ORGANIZATIONS AND RESPONSIBILITIES FOR NUCLEAR POWER PROGRAMME



HUMAN RECOUSES DEVELOPMENT

HUMAN RESOURCES IN KAZAKHSTAN'S NUCLEAR INDUSTRY

17
people

NEPIO:
Department of Nuclear Energy and Industry of the Ministry of Energy of the Republic of Kazakhstan

21
people

Regulatory body:
Committee of Atomic and Energy Control and Supervision

22
people

Future NPP owner/operator:
LLP «Kazakhstan nuclear power plants»

18,6
thousand
people

National operator of the uranium, rare metals, nuclear fuel for nuclear power plants:
NAC Kazatomprom JSC

2 881
people

Scientific organizations:
Scientists, researchers, technicians, laboratory assistants of the NNC, INP, and UMP - 864 people.
The rest of the production staff - 829 people.
Support staff - 903 people.
Administrative staff - 285 people.

21
people

Technical Support Organization:
ALE «Scientific and Technical Center for the Safety of Nuclear Technologies»

Staff

- Selection of 300 bachelor students for training in specialized specialties
- Education in the Master's program, including the program «Bolashak»
- Passage of practices and internships at operating NPPs



Staff for NPP
2000

1300
Operational staff

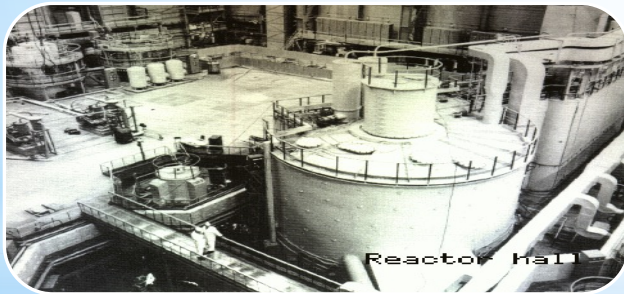
PRE-CONDITIONS OF NUCLEAR POWER DEVELOPMENT IN KAZAKHSTAN



- Uranium industry availability – world leader in uranium production , ~20% of uranium world reserves



- Scientific research & experimental base and experienced professional community



- Fast breeder reactor BN-350 and research reactors operating experience



- Nuclear legislation availability

KAZAKHSTAN DEVELOPMENT STRATEGY IN NUCLEAR INDUSTRY

Enrichment



Since 2013 «NAC «Kazatomprom» has got an access to the services in uranium enrichment through purchase of the JSC Centre for uranium enrichment.

Reconversion



Re-conversion of the enriched uranium hexafluoride (UF6) into uranium dioxide (UO2) is carried out on the existing process facilities of «UMP» JSC.

Fuel pellets



In 2010, UO2 powder for Japan was certified by Japan's Nuclear Fuel Industries, and fuel pellets for China by CNNC's China Jianzhong Nuclear Fuel.

Fuel assemblies



In December 2014 «NAC «Kazatomprom» signed an agreement with CGN on establishing the Ulba-FA joint venture in Kazakhstan for the production of fuel assemblies.

Nuclear Power Plant



Uranium mining



Production in 2018 is estimated at 21,699 tU, which accounts for 40 percent of the world's uranium production.

Conversion



The decision on the economic feasibility of building the plant will be made after receiving the technology of processing and conversion of uranium.

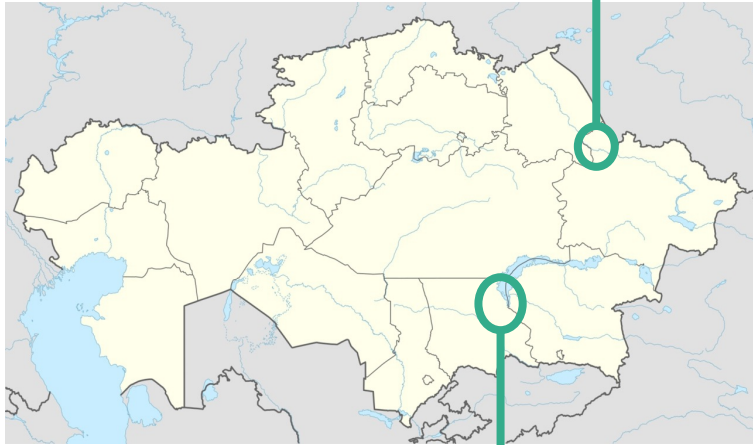
- Segments that already exist in Kazakhstan
- Segments that do not exist in Kazakhstan

EXECUTED WORK ON THE FEASIBILITY OF CONSTRUCTION OF NPP IN KAZAKHSTAN

- **2008-2009 – RSE «National Nuclear Center of RK» implemented pre-feasibility study for the construction of NPP in Kazakhstan.**
 - Based on the forecast balance of electric power of RK and electric grid development forecast till 2030 the required power capacity for new large basic sources, unit power capacity of NPP and possible NPP locations were defined. Within the FS based on energetic zones of RK five possible locations for NPP construction were considered. Three of them recommended for final consideration: Ulken (Balkhash lake), Kurchatov and Aktau.
- **2013 – Special Commission and Working Group of professional experts from relevant ministries and organizations of Kazakhstan were established to evaluate potential locations recommended in the 2008–2009 PFS.**
 - The evaluation included site visits and discussions with local decision makers. The Working Group submitted its recommendations to the Special Commission, which concluded that regions near the village Ulken (Balkhash Lake) and Kurchatov in East Kazakhstan are the most preferable for the siting of nuclear power plants.

SELECTION OF THE NPP LOCATION AREA

District of Kurchatov, East Kazakhstan region (Abay region)



District of the village Ulken, Almaty region

Area studies were carried out on the basis of IAEA documents and regulatory requirements of the Republic of Kazakhstan

Considered factors

- NPP radiation impact on the environment
- Hydro meteorological conditions
- Hydrological conditions
- Forecast water consumption
- Geological phenomena
- Impact of NPP construction on flora and fauna of the adjacent territory
- Impact of NPP operation on the hydrography of the region

2022

Governmental Nuclear Energy Development Special Commission on the Ministries' level recommended the area of **village Ulken, Almaty Region** to possible NPP construction

2023

Public hearings on NPP district selection is planned

INTEGRATED NUCLEAR INFRASTRUCTURE REVIEW MISSION

Scope of the mission: INIR Phase 1 mission reviewed status of conditions in Kazakhstan covering all the 19 nuclear power programme infrastructure issues for Phase 1.

- **22 November 2015** - the Ministry of Energy of Kazakhstan requested the IAEA to carry out an INIR Phase 1 mission.
- **31 October to 7 November 2016** - IAEA INIR Phase 1 mission was conducted.
- **28 February 2017** - Final Report was delivered to the Government of Kazakhstan.
- **28-31 March 2023** - IAEA FOLLOW-UP INIR Phase 1 mission was conducted.

List of organizations involved into INIR Mission:



Ministry of Energy



«National Nuclear Centre» RSE



«Institute of Nuclear Physics» RSE



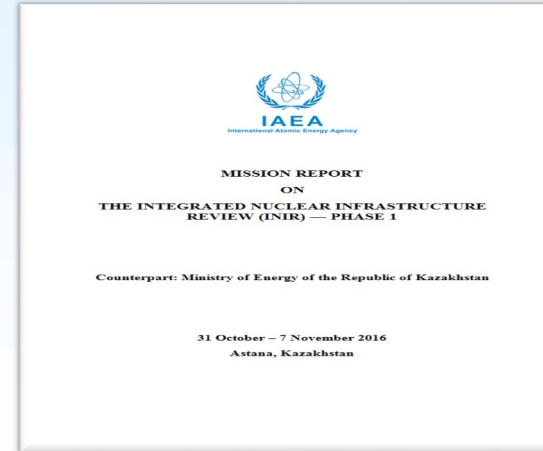
«NAC «Kazatomprom» JSC



«KEGOC» JSC



Nuclear Society of Kazakhstan



MAIN CONCLUSIONS

At the follow-up INIR mission, it was concluded that Kazakhstan has **completely addressed 4 recommendations and 8 suggestions.**

- ✓ *The follow-up INIR team concluded that Kazakhstan has fully addressed the recommendations in the areas of **coordination of the nuclear power programme, financing of the NPP, emergency planning and radioactive waste management.***

There is on-going progress in the implementation of an additional **6 recommendations and 4 suggestions.**

- ✓ *The follow-up INIR team observed that further work is needed related to the completion of the comprehensive report, assessment of the funding needed for nuclear power infrastructure, planning for further development of the regulatory body and the owner/operator, and development of a policy for industrial involvement.*

CURRENT STATUS ON NUCLEAR POWER INFRASTRUCTURE DEVELOPMENT

NATIONAL ACTION PLAN FOR THE IMPLEMENTATION OF THE MESSAGE OF THE HEAD OF STATE TO THE PEOPLE OF KAZAKHSTAN DATED SEPTEMBER 1, 2021

PRESIDENT'S ORDER:

«Proposals for the development of safe nuclear energy in Kazakhstan, taking into account the development of engineering and the training of domestic qualified personnel, including nuclear engineers»

RESPONSIBLE EXECUTORS: Government, Samruk-Kazyna

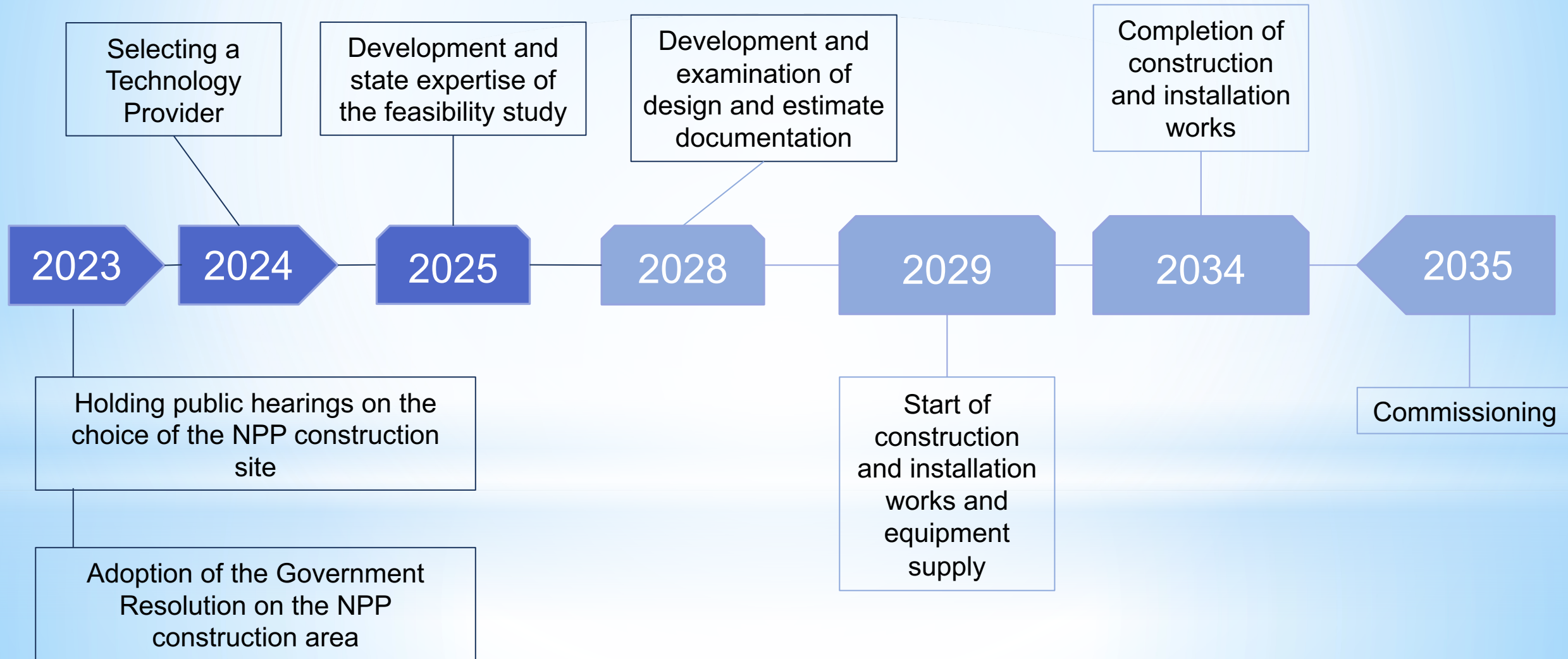
Work done:

- Marketing feasibility Section of the Feasibility Study for the construction of NPP updated.
- The capacity of the NPP up to - 2.8 GW.
- Nuclear technologies 4 vendors shortlisted
- The possible location of the NPP has been determined
- IAEA Integrated Nuclear Infrastructure Review mission

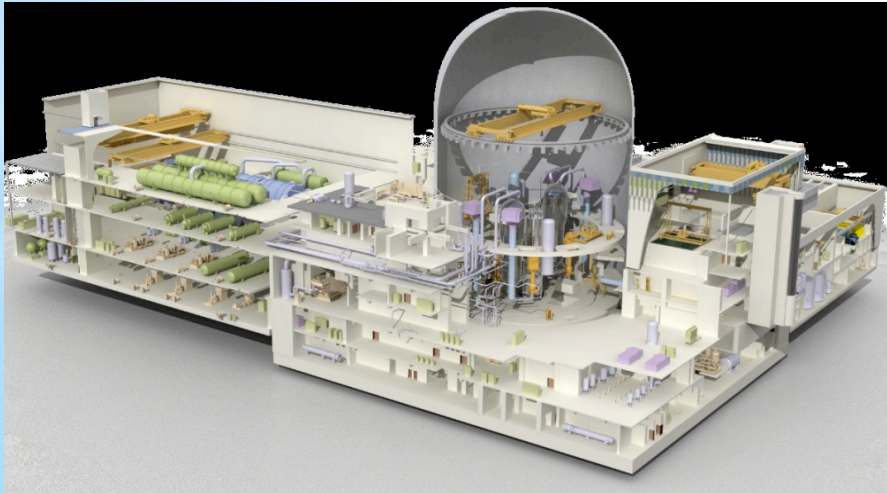
Plans for 2023:

- Public hearings
- Adoption of the Government Decree «the NPP Location Area»
- Conducting negotiations with vendors

MILESTONES IN THE DEVELOPMENT OF NUCLEAR POWER PROGRAMME



REACTORS CONSIDERED



- Received technical and commercial proposals from 5 vendors from China, Korea, Russia, USA and France
- For comparative analysis and evaluation of nuclear power technologies, together with the French company Assystem, a system of criteria has been developed based on the recommendations of IAEA documents.
- In general, 13 projects of modern reactors proposed by foreign vendors of nuclear technologies (generations III and III+) were studied

NEXT STEPS RELATED TO THE DEVELOPMENT OF THE NUCLEAR POWER PROGRAMME

- NEPIO is considering offers from potential suppliers of nuclear power plants with the choice of reactor technologies.
- NEPIO considers the offers of potential vendors.
- Then NEPIO will introduce a draft decision on the construction of a NPP to the Government. In this draft decision, a supplier with a specific reactor technology will also be specified.
- On the basis of the Government Decision, NEPIO together with the selected supplier will carry out the development of a feasibility study for NPP.

**THANK YOU
FOR ATTENTION!**

