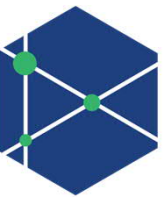


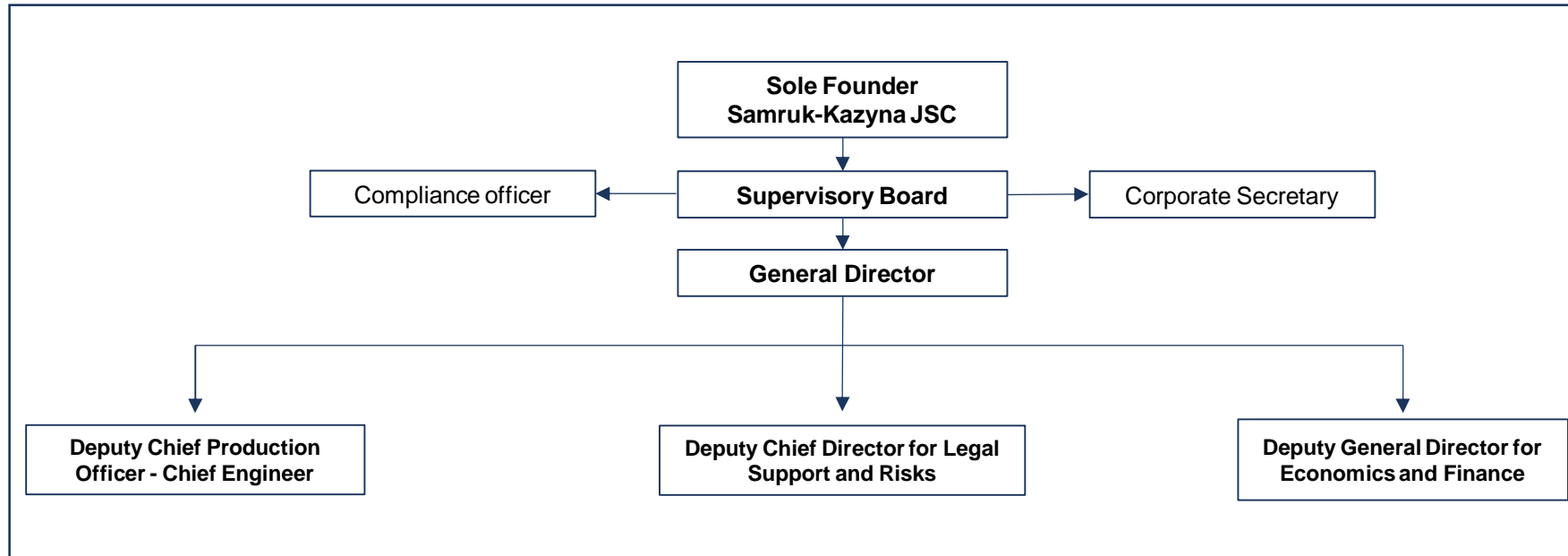
**KAЭC**  
**KNPP**

# **STATUS AND PROGRESS OF THE NPP PROGRAMME IN KAZAKHSTAN**

Astana  
October 3, 2023



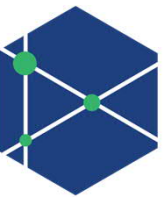
# Organizational Structure of KNPP



## Key priorities for 2023-2024:

- Conducting public hearings (held on August 22, 2023)
- Referendum on the construction of nuclear power plants
- Government decree on NPP construction area
- Determination of the implementation mechanism for NPP project (*EPC or BOOT*)
- Site characterization and development of utility requirements
- Vendor selection

# Development of the electric power industry



## Data from 2022

- Max load – **16.4 GW**
- Power consumption – **112.9 TWh**
- Generation – **112.9 TWh**
- Installed capacity – **24.5 GW**
- Available capacity – **19.0 GW**

## Forecast of power consumption and electrical loads for 2035

- Power consumption – **153 billion kWh**
- Maximum electrical load – **23 GW**

## Forecast of the degree of wear of electric power equipment for 2022-2035

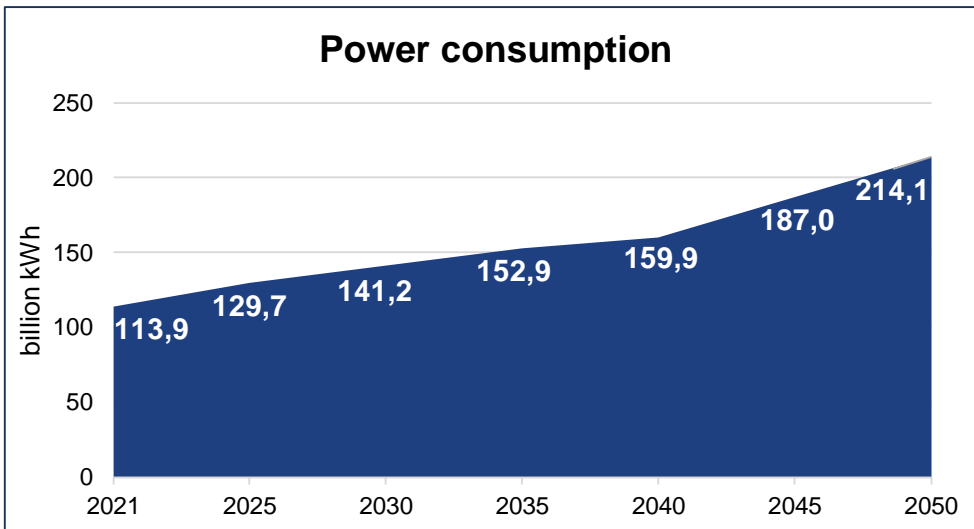
- by installed capacity – **8.1 GW**
- in terms of available capacity – **7.8 GW**

## Commissioning of new generation for the period 2022-2028

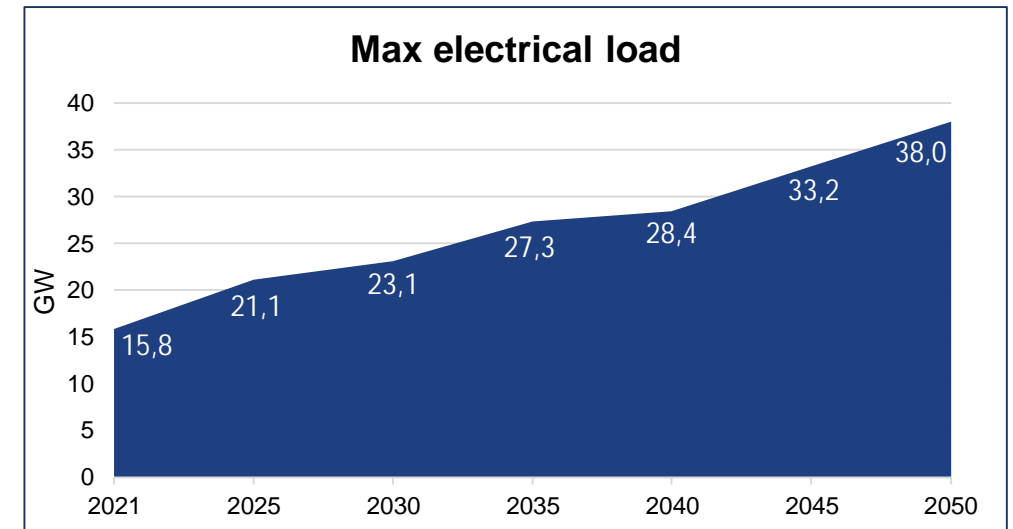
- conventional generation projects – **0.63 GW**
- Renewables – **1.5 GW**

## Forecast balances up to 2035, vision up to 2050

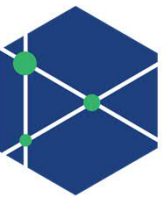
### Power consumption



### Max electrical load



# Determination of NPP power



## Development of generation until 2035

For the period 2022-2035, the total inputs, including the development of existing generation and new inputs, are according to the scenarios:

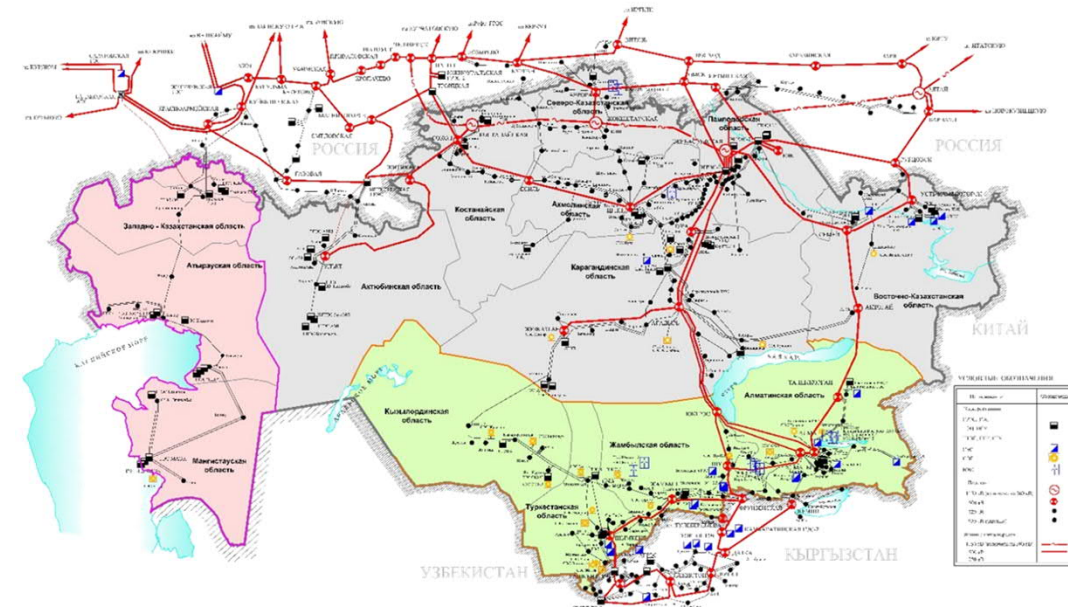
- «Green without NPP»  $\approx$  18.9 GW
- «Green with NPP in the South»  $\approx$  17.7 GW
- «Green with NPP in the North»  $\approx$  17.7 GW

## Determination of NPP power

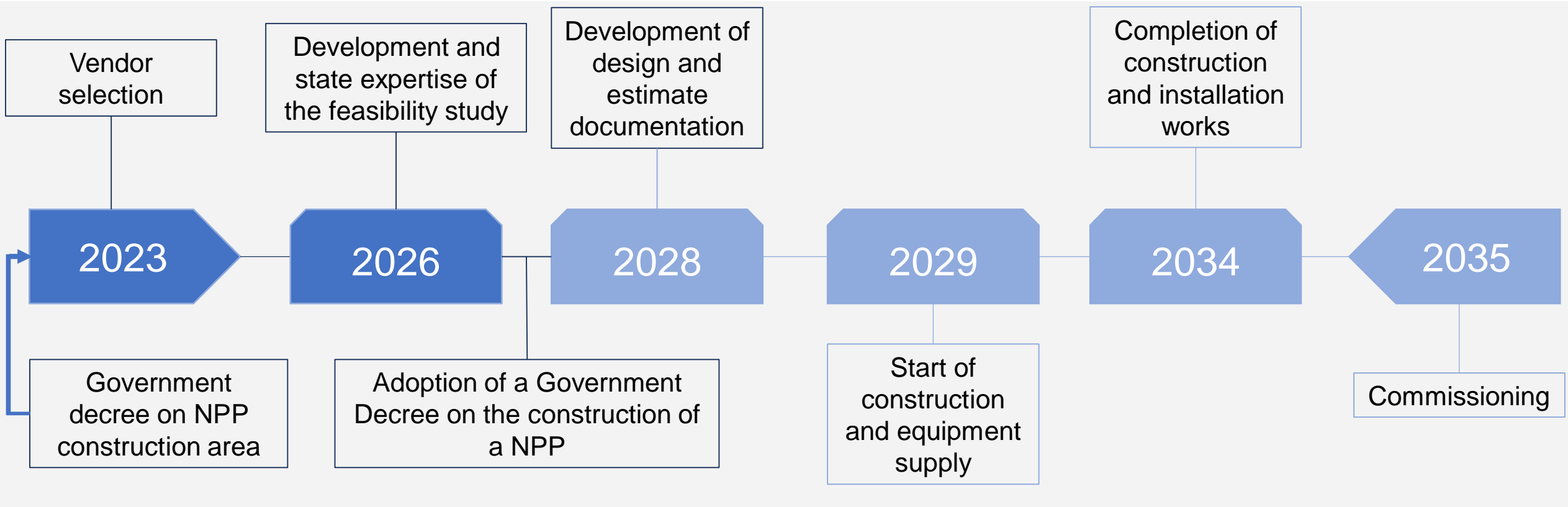
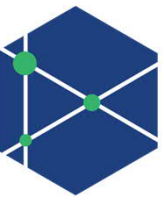
Based on the existing balances, the deficit of basic capacity for the **North-South interconnection** will be:

- by 2030  $\approx$  1.8 GW
- by 2035  $\approx$  3.2 GW
- by 2040  $\approx$  4.1 GW
- by 2050  $\approx$  5.0 GW

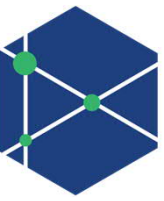
Accordingly, to cover the shortage of base capacity, it is necessary to build a nuclear power plant with at least **two units with a capacity of 1000 to 1400 MW**



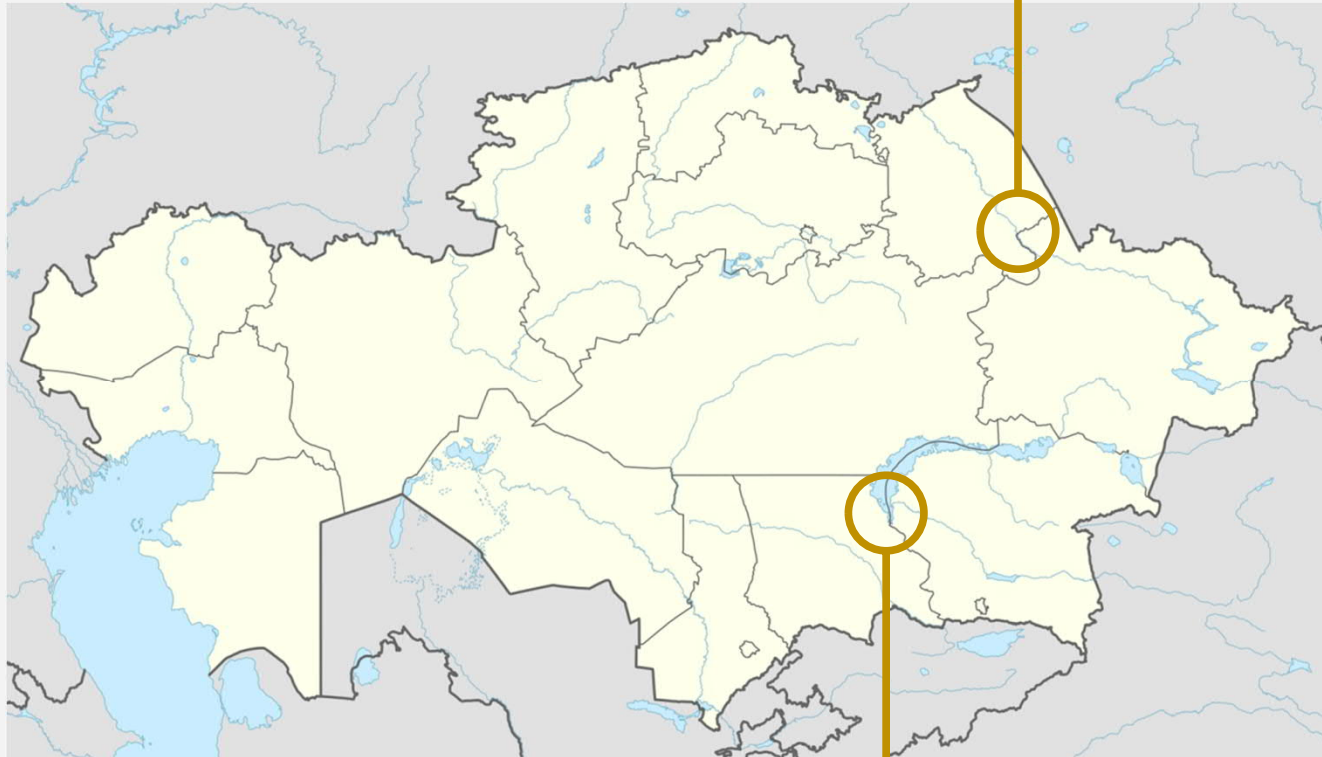
# Preliminary dates for the implementation of the NPP construction project



# Selection of the NPP location area



Area of Kurchatov,  
Abay region

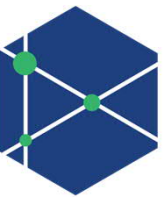


Ulken village area,  
Almaty region

Area studies were carried out in accordance with the IAEA documents and regulatory requirements of the Republic of Kazakhstan

## Considered factors

- Earthquakes and geological phenomena
- Hydrometeorological conditions
- Hydrological conditions
- Forecast water consumption
- Impact of NPP construction on flora and fauna of the adjacent territory
- Impact of NPP operation on the hydrography of the region



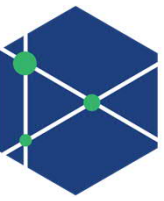
# Infrastructural advantages of the Ulken village area



Site of the unrealized project of the Balkhash coal plant

- camp for construction workers
- cooling pond
- substation 110/10 kV
- supporting substations 500/220 kV
- transit overhead line 500 kV North-South

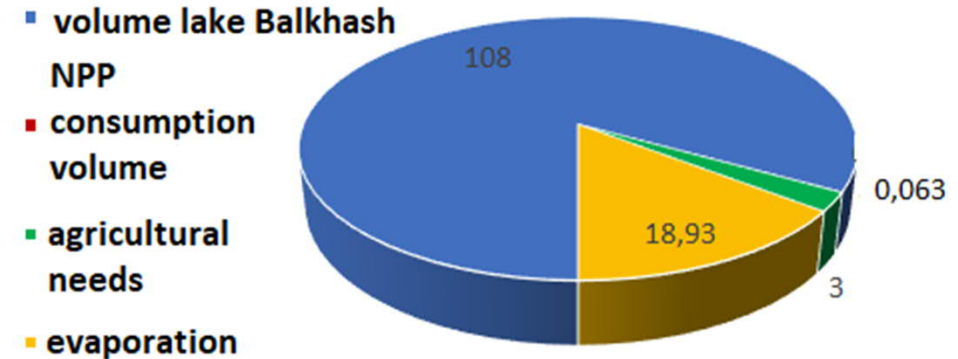
- drilling and blasting work carried out
- crushing plant and concrete unit built
- a drinking water treatment plant was built
- railway station "Kairatkol" was expanded



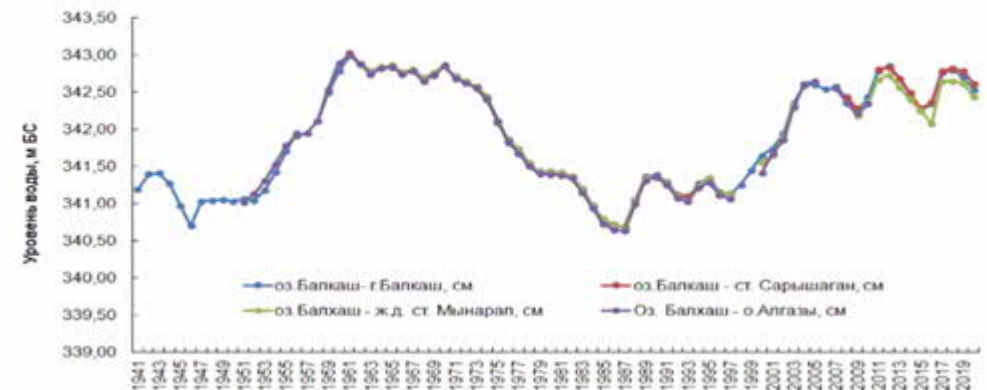
# Water consumption

- Annual water losses at cooling towers of NPP with two 1200 MW units are estimated at **~0.063 billion m<sup>3</sup>**. The volume of Lake Balkhash is **~108 billion m<sup>3</sup>**, the main feeding source is the Ili River - annual flow of about **11,56 billion m<sup>3</sup>**.
- The volume of evaporation from the surface of Lake Balkhash is **18.934 billion m<sup>3</sup>** per year. That is, annual water losses for NPP needs from Lake Balkhash will be about **~0.33%** of its natural evaporation.

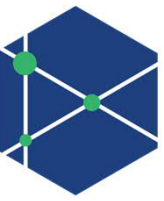
Water balance of lake Balkhash



Dynamics of average annual levels of Lake Balkhash for the period 1941-2020.



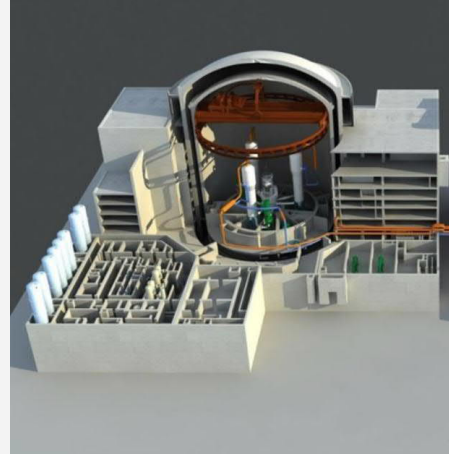
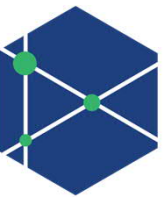




# Management of radioactive waste (RW) and spent nuclear fuel (SNF)

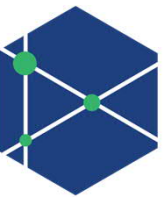
- 1200 MW reactors generate no more than 50 m<sup>3</sup> of RW per year.
- The cost of safe RAW management for 60 years of NPP operation will amount to 100-200 million US dollars
- Expenses for storage and disposal of spent nuclear fuel for the period of NPP operation (60 years) will amount to 2.5-3 bln. USD
- The cost of NPP decommissioning works is about 20% of the capital costs of construction
- Detailed calculations of the cost of safe management of RAW and SNF, as well as decommissioning of NPPs, are made at the stage of development of the project feasibility study.

# Considered reactors



- Received technical and commercial proposals from **4 vendors** from China, Korea, Russia, 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 vendors of nuclear technologies (generations III and III+) were studied

# Status and progress of work on the NPP project



2018

- The marketing section of the feasibility study was developed
- An independent international expertise was carried out

2019-2021

- Received non-binding technical and commercial proposals from leading vendors
- Short-list was developed  
CNNC - **China**  
KHNP - **Korea**  
Росатом - **Russia**  
EDF - **France**

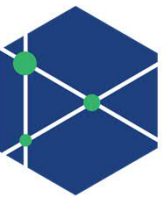
2022

- Marketing section of the Feasibility Study was updated
- In May 2022, at a meeting of the Interdepartmental Commission for the Development of the Nuclear Industry of Kazakhstan, it was proposed to select the construction area of the village of Ulken, Almaty Region, and determine the capacity of the nuclear power plant - up to 2800 MW
- In November 2022, Maslikhat of the Almaty Region agreed to the construction of a NPP, in case of positive hearings with the residents of the village of Ulken.

2023

- INIR mission completed. INIR mission experts noted that Kazakhstan has implemented recommendations in the field of coordination of the nuclear power program, emergency planning and radioactive waste management
- Price proposals for the performance of work on characterization and site selection of nuclear power plants have been received from local and foreign specialized organizations:
  - KHNP-Korea
  - Assystem - France
  - KazNIPIEnergoprom - Kazakhstan
  - National Nuclear Center – Kazakhstan
- On August 22, public hearings were held in Ulken village, and local residents expressed their support for the development of nuclear power in the region.

# Socio-economic effect of a NPP



**The construction of a NPP will have a multiplier effect in the development of the country**

## Social

- Growth of scientific, technical and highly qualified personnel potential of the country
- Creation of new jobs during construction for up to 8 000 people, high-qualified personnel up to 2 000 people for the period of operation
- 1 job during the construction of a nuclear power plant creates more than 10 jobs in related sectors of the economy

## Economical

- Support for local businesses (during the construction and installation period: \$ 2.5 - 3.5 billion)
- Lifecycle tax revenue over \$2.5-3.0 billion
- Increasing the investment attractiveness of the country

## Technical

- Development of local industry
- Comprehensive use of the potential of our own fuel base
- Ensuring reliable energy supply to consumers for more than 60 years

## Ecological

- Reducing greenhouse gas emissions to 10 million tons per year



**THANK YOU FOR THE ATTENTION**  
**QUESTIONS - ANSWERS**