ROSATOM

THE STATE ATOMIC ENERGY CORPORATION “ROSATOM”

Rosatom’s NPP Projects and potential cooperation with the Czech Republic

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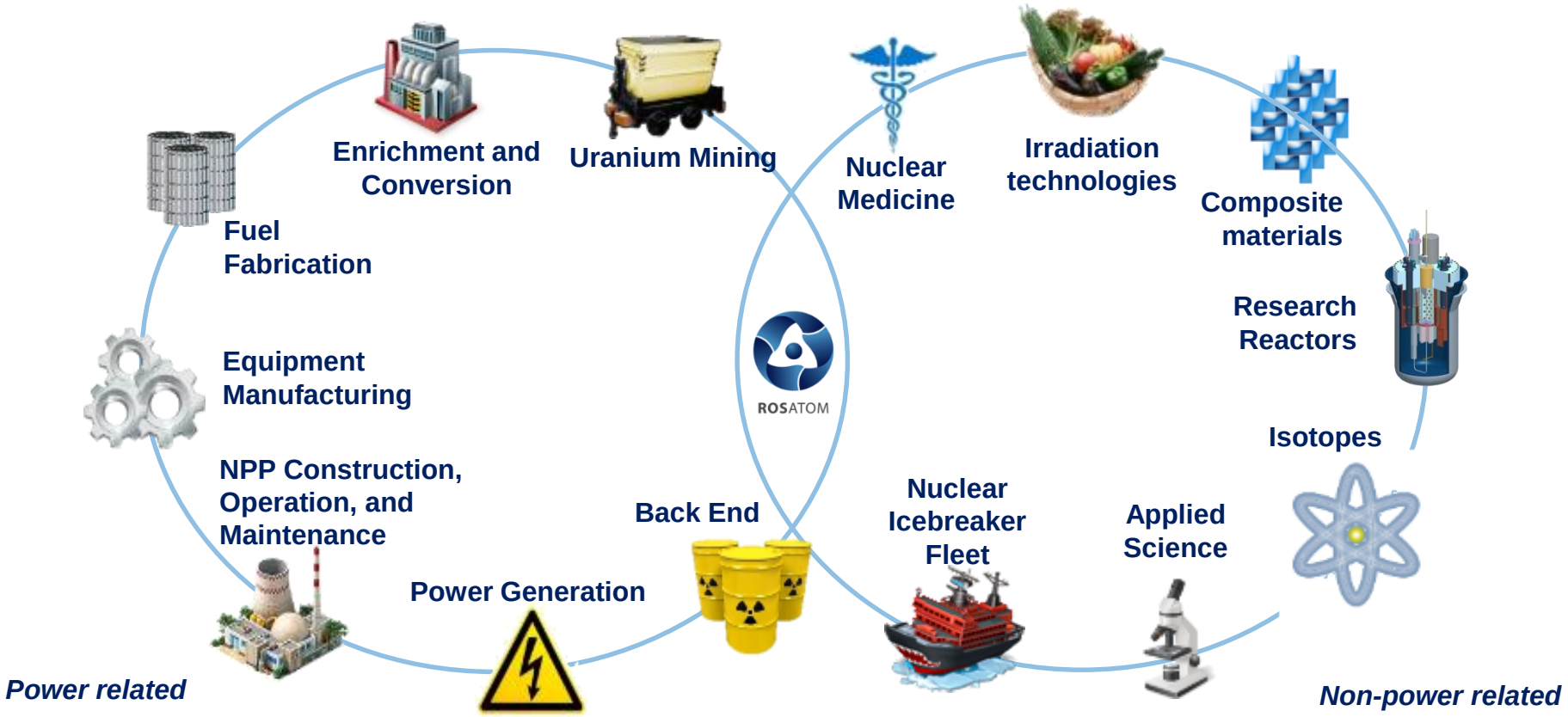
SUMMARY

ROSATOM: Global Leadership in Nuclear Power

Rosatom State Corporation is a vertically integrated and the world's only company of a complete nuclear power cycle with more than 70 years of experience



ROSATOM Key Facts & Figures

340 enterprises

250,000 employees

35 NPP units (**27,9 GWe**) in operation in Russia

42 NPP units under construction and implementation globally

over $133 bln. orders backlog for the next 10 years

 # 1

- in new NPP construction
- in uranium enrichment
- in fast neutron reactors
- in nuclear icebreakers
- in floating NPP
- biggest Research reactors fleet

 # 2

- biggest NPP fleet owned and operated
- in uranium deposits

Key competitive advantages:

Guaranteed supply
of complete life-cycle products and services in nuclear power

Flexible capabilities
of NPP supply from components and services to turn-key and BOO projects

Innovative technologies
proven by years of reliable operation and constant development

Diversified product range
stretching far beyond nuclear power

Rosatom safe and mature VVER technology is one of the most referenced globally

Years	Total
2006-2011	4
2011-2016	6

In 10 years

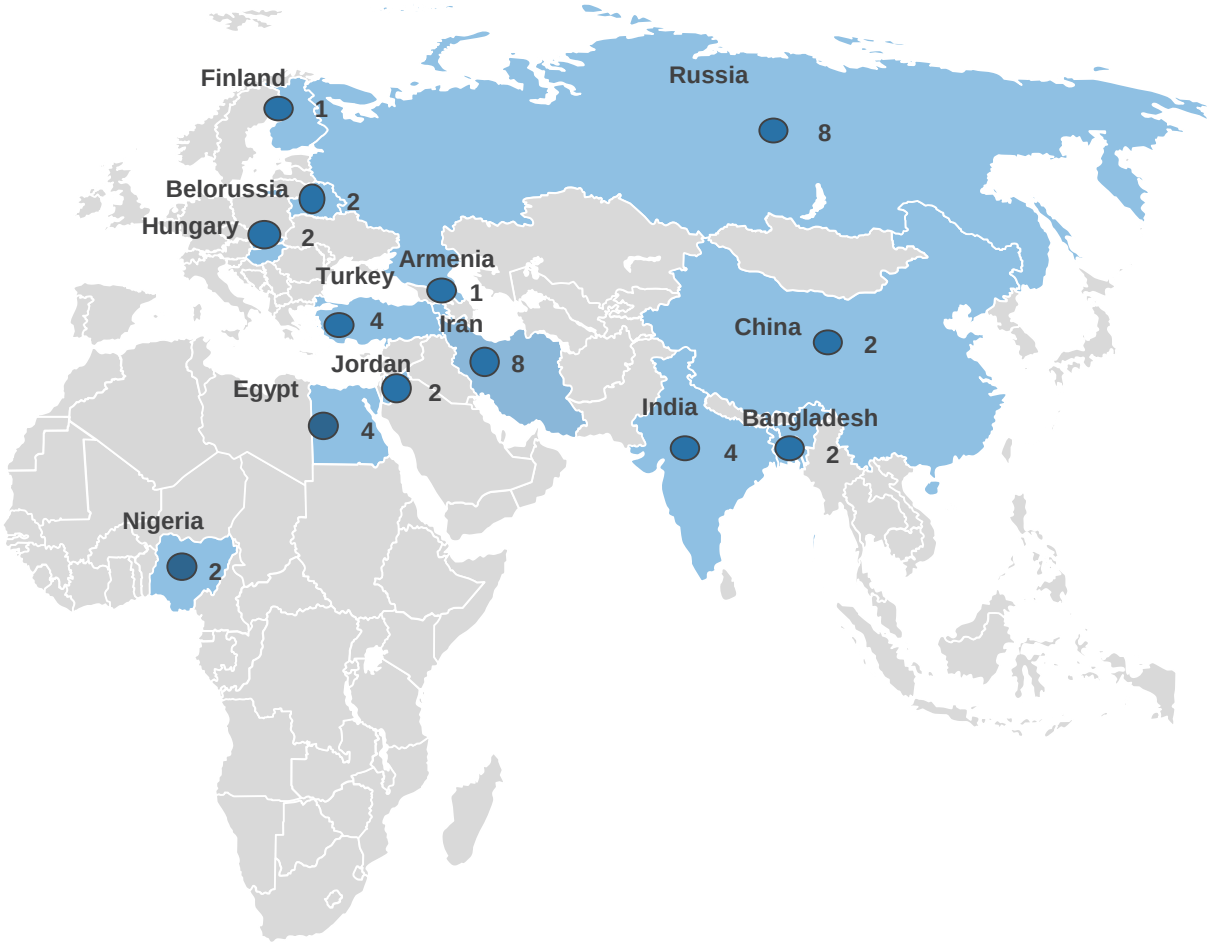
10 units commissioned

Global fleet of VVER type reactors		
Country	**Constructed**	**In operation**
Armenia	2	1
Bulgaria	6	2
China	2	2
Czech Republic	6	6
Finland	2	2
Germany	6	-
Hungary	4	4
Iran	1	1
India	2	2
Russia	21	18
Slovakia	6	4
Ukraine	15	15
TOTAL	**73 units**	**57 units**

ROSATOM VVER NPPs are highly welcomed worldwide

Belarus NPP
Generation 3+

Leningrad NPP-2
Generation 3+



- in implementation

Recently commissioned NPP units

Russia, Rostov NPP Unit 2 - 1000 MW

2010

Russia, Kalinin NPP Unit 4 - 1000 MW

2012

Russia, Rostov NPP Unit 3 - 1000 MW

2014

Russia, Novovoronezh NPP II, Unit 1 - 1200 MW

2016

2011

Iran, Busher NPP Unit 1 - 1000 MW

2013

India, Kudankulam NPP Unit 1 - 1000 MW

2015

Russia, Beloyarsk NPP Unit 4 – 864 MW

2016

India, Kudankulam NPP Unit 2 - 1000 MW

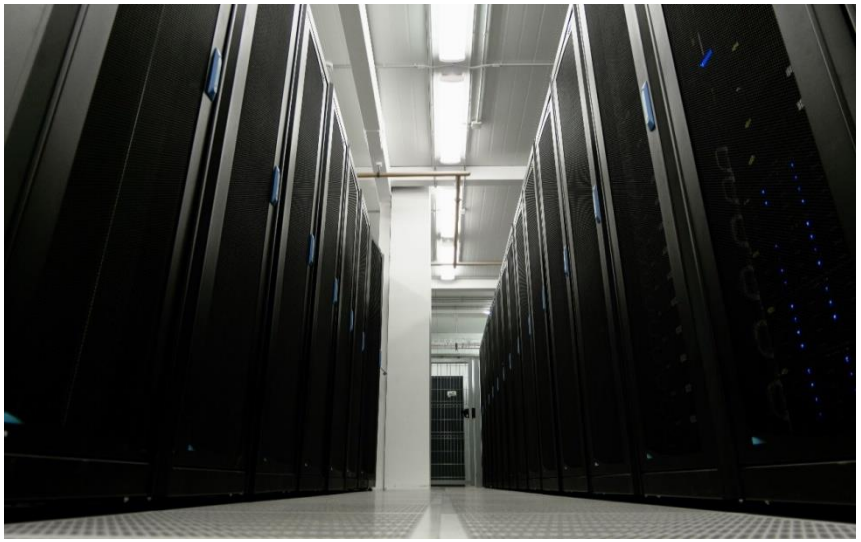
Information technologies

Industry 4.0

participation in the governmental program Digital economy

Data centres

commissioning of Mendelejev data centre in the vicinity of Kalinin NPP in December 2018



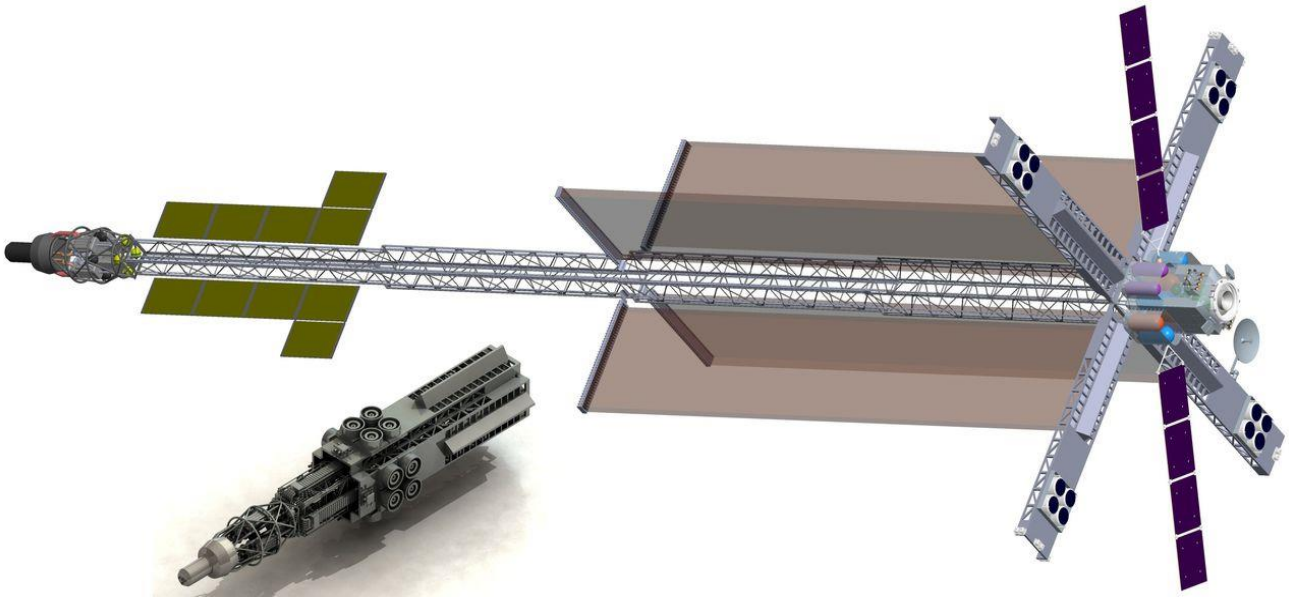
Supercomputers

supercomputers utilization during the design phase of new nuclear build projects; development of supercomputer capable of 1 exaflops (a billion billion calculations per second)

Cryptocurrencies

plan to establish cryptocurrency mining farms in the vicinity of Leningrad NPP-II

Space exploration



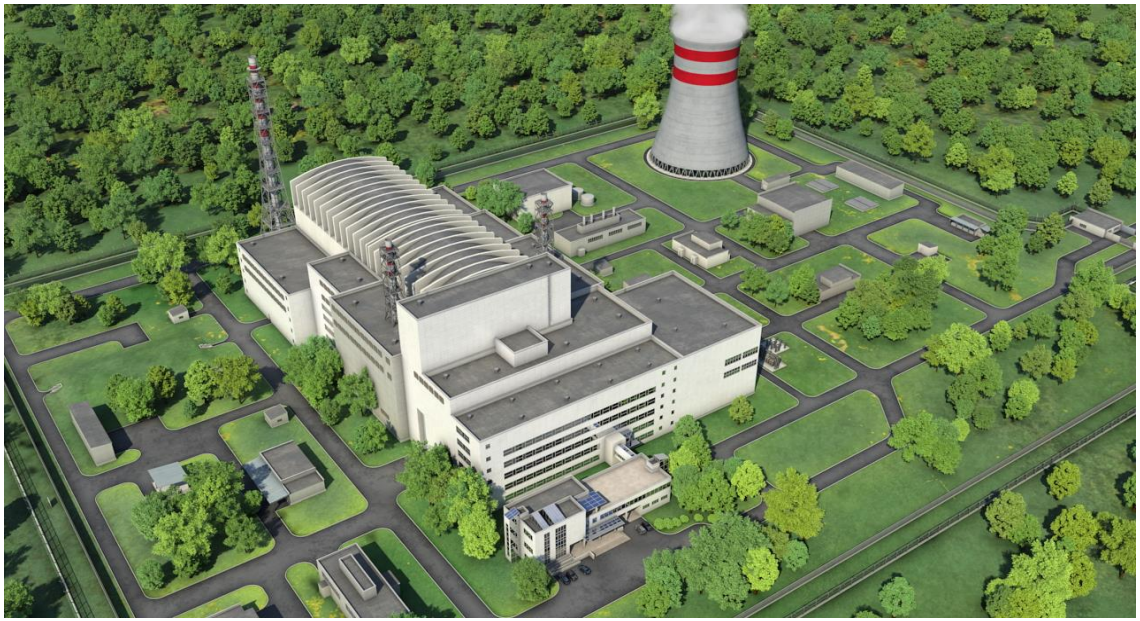
Nuclear space propulsion

development of nuclear reactor for propulsion system that can reach Mars in 90 days

Radioactive sources

supply of neutron sources for space projects Curiosity, Philae and Chandrayaan

Innovations in the nuclear industry



MBIR

construction of the world’s most powerful fast research reactor

Breakthrough

project to implement closed nuclear fuel cycle technologies

Cooperation with the Czech industry

Deliveries of Czech companies http://rosatom.doublev.cz/

Memorandum of Understaning signed between Rosatom and Czech Power Industry Alliance on 20th June 2017 in Moscow

- Steering Committee and Working Group formed
- 2 meetings held in Prague, one in Moscow
- 3 priority projects – Hanhikivi, Paks-2, Akkuyu
- Direct contacts with respective procurement managers being established
- List of items to be procured under preparation

Examples of successful cooperation with the Czech companies

KABELOVNA KABEX a. s.

Core products

- LOCA-cables
- hermetic cable bushings

Anton Slobodin,
statutory director KABELOVNA KABEX

"Supply of cables and hermetic cable bushings for VVER-1200 Generation III+ reactors in Novovoronezh NPP-II and Leningrad NPP-II confirms the high technological level of our company. These are the most advanced nuclear units currently in operation. Thanks to the fact that we have adopted the production for the Generation III+ nuclear power plants, which so far are being built only abroad and which have higher demands than the Czech NPPs, we also increased the quality of production for the domestic market because we have the opportunity to extend the competencies of our designers and workers.“

SIGMA GROUP a. s.

Core products

- Medium- and high-flow pumps and pump units
- industrial pumps
- special pumps for the nuclear power sector

Milan Šimonovský
Chairman of the Board of Directors of SIGMA GROUP

„Rosatom gives us the opportunity to supply new pumps for the primary circuit safety systems. The basis of the success of mutual cooperation is a quality product. Therefore, Sigma is planning to modernize and increase the capacity of specialized testing laboratory (diagnostic and measuring technology), painting workplaces, and last but not least final assembly workplace (with clean assembly parameters).”

Thank you for your attention

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Back-up slides

Rosatom's Projects abroad

ROSATOM

EPC + IGA financing	 Belarus	2 Units EPC + Fuel Supply	 Hungary	2 Units; EPC + Fuel Supply + O&M
	 Egypt	4 Units; EPC + Fuel Supply + O&M + Spent Fuel Treatment	 Bangladesh	2 Units; EPC + Fuel Supply + O&M
Project Financing + BOO	 Finland	1 Unit Project Financing + BOO + PPA (Mankala model)	 Jordan	Plan: 2 Units PDA and IGA signed Pre-investment stage
	 Turkey	4 Units IGA for construction Long-term PPA		
EPC Supplies Contract + IGA financing	 India	Plan: 4 Units EPC Supply + Fuel Supply		
EPC Supplies Contract	 China	4 Units EPC Supply		
EPC	 Iran	Bushehr-2 NPP (two power units)		

Turkey. Akkuyu Units 1- 4. General information
Key events and further projects steps

Key events and further steps

- Technology VVER-1200 with total capacity 4,800 MW (4x1200 MW)
- First NPP in Turkey
- First BOO project in nuclear industry
- Intergovernmental Agreement between Russian Federation and Turkey
- Akkuyu Nuclear JSC, Owner and Operator of Akkuyu 1-4
- Up to 49% of equity available for sale
- Long-term PPA for amounts of electricity to be generated by NPP: 70% of Units 1 and 2, and 30% of Units 3 and 4, for 15 years from COD, at pre-agreed price in US Dollars

Hanhikivi-1 NPP, Finland. General information
Key events and further projects steps

Main parameters:

Power units: 1 x 1200 MW

Reactor type: VVER-1200

Commissioning: 2024

Key events and further steps

12/21/2013	02/25/2014	11/27/2014	2015–2018	2018–2024	2024
Conclusion of: • EPC-contract • Fuel delivery contract • Maintenance Contract • Financial Contract	Conclusion of IGA on cooperation between Russia and Finland	Decision-in-Principle (political approval) has been received by Fennovoima (Owner) for NPP construction from the Parliament of Finland	Preparation of the site and development of the infrastructure	NPP construction	Start of operation

Belarusian NPP. General information. Key events and further projects steps

Main parameters:

Power units: 2 x 1200 MW

Reactor type: VVER-1200

Implementation scheme: EPC (turnkey)

Key events and further steps

03/15/2011	01/31/2012	07/18/2012	11/02/2013	2016–2017	2019–2020
Signing of IGA on cooperation in NPP construction	Signing Contract for development of design and top-priority detailed design documentation for the Belarusian NPP	Signing General contract for construction of NPP	Signing of decree N499 on construction of the Belarusian NPP, which allows JSC Atomstroyexport, the general contractor, to start construction of the Belarusian NPP	Signing • Contract of nuclear fuel delivery • Contract for removal of spent nuclear fuel • Contract for NPP service maintenance	Commissioning of power units 1 and 2

Kudankulam NPP, Units 3, 4. General information. Key events and further projects steps

Main parameters:

Power units: 1000 MW

Reactor type: VVER-1000

Key events and further steps

10/04/2014	January 2016	10/08/2016	29/08/2016	28/06/207
Signing GFA for construction of Units 3 and 4 of Kudankulam NPP	The Indian regulatory authority issued a permit for starting the construction Units 3, 4	Unit 1 Kudankulam NPP handed over to the Indian nation	Grid connection of unit 2 Kudankulam NPP	Pouring of the first concrete Unit 3

- **Unit 5-6 Kudankulam NPP – June 01, 2017 signing of the general agreement for construction of the third stage of NPP**
- **Up to total of 12 new units by 2030 – set in Strategic vision on cooperation in nuclear sphere**

Tianwan NPP. General information. Key events and further projects steps

Main parameters Unit 1-2:

Reactor type: VVER-1000

Capacity: 2000 MW (2 x 1000 MW)

Construction period: 1998 – 2007

Main parameters Unit 3-4:

Reactor type: VVER-1000

Capacity: 2000 MW (2 x 1000 MW)

Construction period: 2011-2018

Key events and further projects steps

1997	2007	2010	2018
Units 1-2 General Contract signed	**Units 1-2** Start of commercial operation	**Units 3-4** General Contract signed	**Units 3-4** Start of commercial operation

Rooppur NPP. General information. Key events and further projects steps

Main parameters:

Power units: 2 x 1200 MW

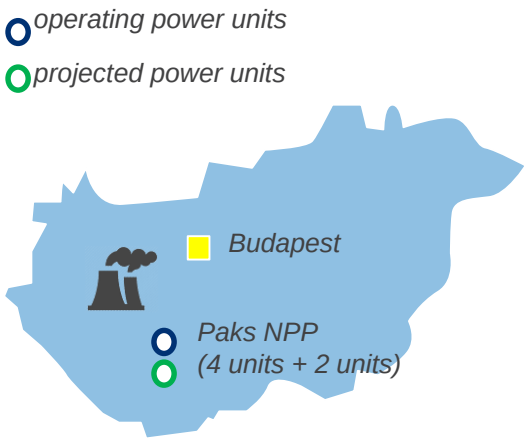
Reactor type: VVER-1200

Implementation scheme: EPC (turnkey)

Key events and further projects steps

02/11/2011	02/11/2013	25/12/2015	22/06/2016	Second half of 2017	2022-2023
Signing of IGA on cooperation in NPP construction	Laying the first stone in the foundation of the future Rooppur NPP	Signing of EPC contract for construction of NPP	BAEC received the license for Rooppur NPP site, the approval of the selected NPP design and the permit for commencement of preparatory works	Pouring of the first concrete	Commissioning of units 1, 2

Hungary, Paks 2 NPP. General information. Key events and further projects steps



Main parameters:

Power units: 2 x 1200 MW

Reactor type: VVER-1200

Key events and further steps

03/28/2014

Signing
- FIGA, 80% of financing of the joint credit

12/09/2014

Conclusion of the contracts:
- EPC
- Service maintenance
- Fuel

Currently

- March 2017, European Commission gave the project the final green light.
- March 2017, project obtained the site license from the Hungarian Atomic Energy Authority.
- April 2017, the Hungarian environmental authority of second instance issued its decision about the environmental license of the Paks 2.