ROSATOM

# Rosatom SMRs

2024

# IMPRESSIVE PORTFOLIO OF SUCCESSFUL PROJECTS

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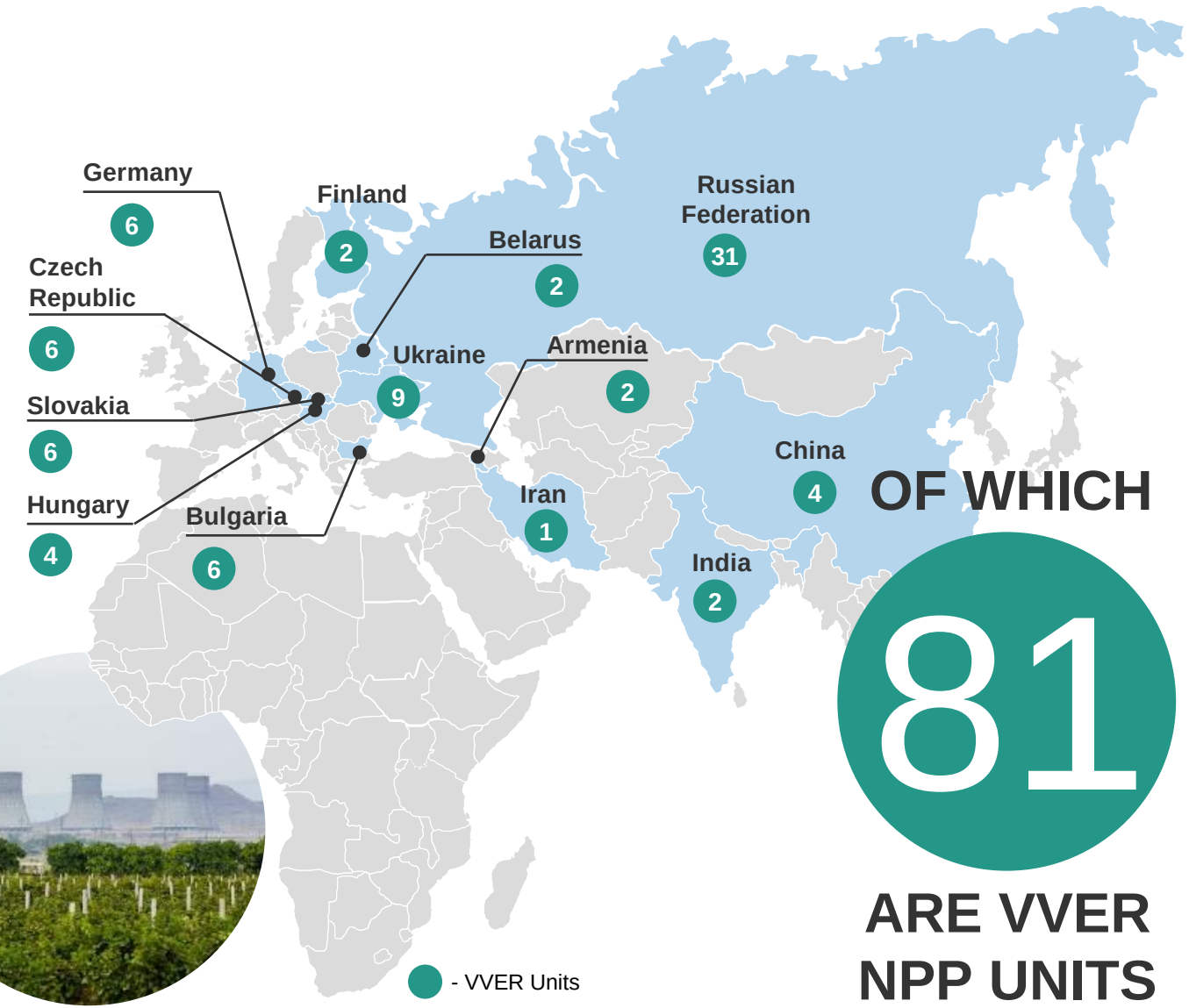
# 110

## RUSSIAN-DESIGNED NPP UNITS HAVE BEEN BUILT GLOBALLY




OF WHICH

# 81

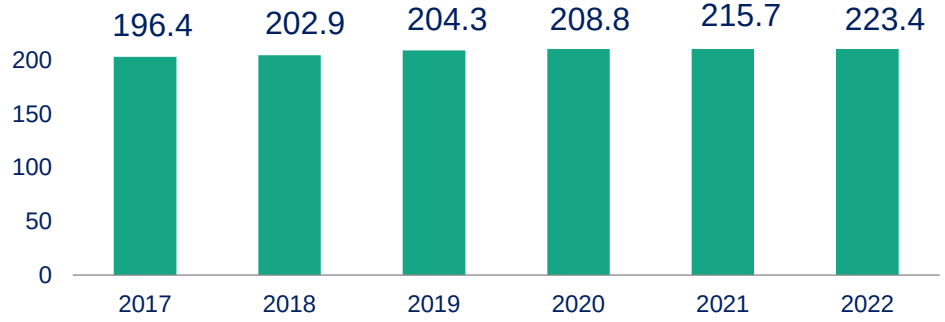
## ARE VVER NPP UNITS

# SECOND NUCLEAR UTILITY GLOBALLY

| | |
|---|---|
| **37 UNITS** | in operation at 11 NPPs |
| including **FNPP** | FPU AKADEMIK LOMONOSOV |
| **29.58 GWe** | total installed capacity in 2023 |
| **19.9%** | nuclear in Russian power generation mix in 2022 |

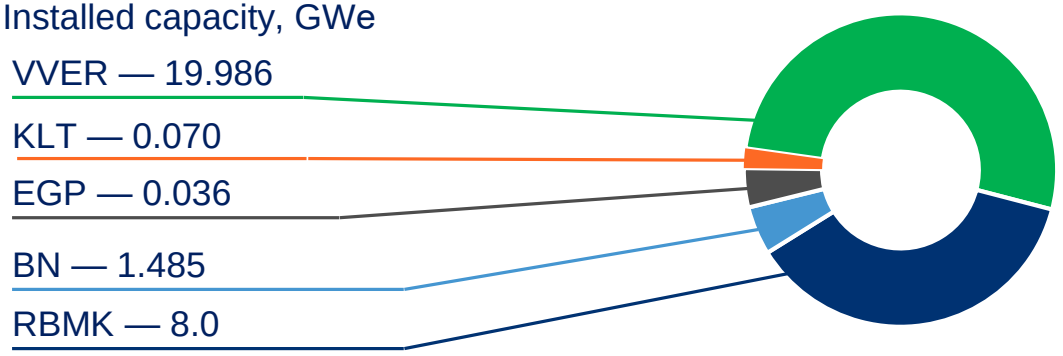

## NPP power generation in Russia

Generation dynamics, billion kW.h




## Technologies in operations portfolio

Installed capacity, GWe



# LARGE NUCLEAR CAPACITY DOMINATES

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## 18 LARGE NPP UNITS IN 18 YEARS CONNECTED TO THE GRID

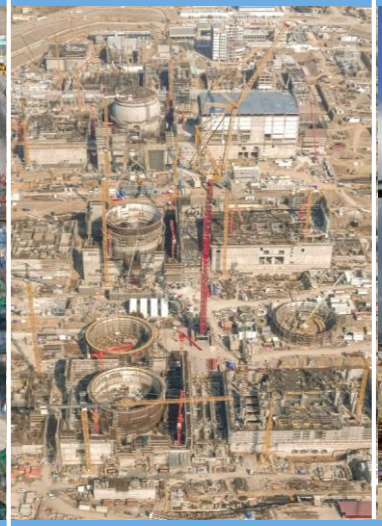
## MORE THAN 15 LARGE NPP UNITS UNDER CONSTRUCTION:

HUNGARY
PAKS II NPP
VVER-1200

CHINA
XUDAPU NPP
VVER-1200

CHINA
TIANWAN NPP
VVER-1200

TÜRKIYE
AKKUYU NPP
VVER-1200



EGYPT
EL-DABAA NPP
VVER-1200

INDIA
KUDANKULAM NPP
VVER-1000

BANGLADESH
ROOPPUR NPP
VVER-1200

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# SNPPs vs. the large NPPs can contribute towards

- Fit for Smaller grids or/and remote locations
- Flexibility of deployment
- Modularity
- Factory-built -> cost/time control
- Less frequent refueling
- Smaller emergency planning zones
- Series economy vs. economy of scale

# ROSATOM LEADS THE WAY IN SMR DEVELOPMENT
# SINCE 1954 WE BUILT MORE THAN 20 SMRs

**1954**

The first nuclear reactor that produced electricity industrially connected to the grid at Obninsk NPP

**1959**

Lenin icebreaker, the world's first nuclear powered surface ship became operational

**1974**

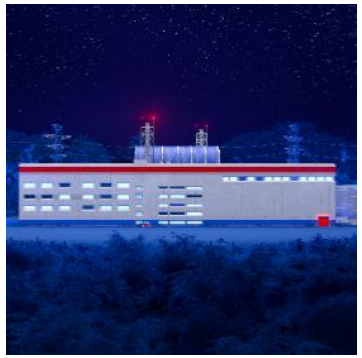
Bilibino NPP was connected to the grid

**2020**

World's only floating NPP Akademik Lomonosov entered service

**2028**

First-of-a-kind land-based SNPP to be commissioned in Yakutia region



# ROSATOM SMR SOLUTIONS: PORTFOLIO

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## Floating NPP

| | |
|---|---|
| Electrical capacity | **100 MW** |
| Fuel cycle | **up to 10 years** |
| Design life | **60 years** |
| Displacement | **16 680 tons** |
| Availability factor | **80%** |

RITM-200M

## Land-based Micro NPP

| | |
|---|---|
| Electrical capacity | **10 MW** |
| Fuel cycle | **8-12 years** |
| Design life | **60 years** |
| Displacement | **Ø 8 m x 9 m** |
| Availability factor | **90%** |

SHELF-M

## Land-based Small NPP

| | |
|---|---|
| Electrical capacity | **110 MW** |
| Fuel cycle | **up to 6 years** |
| Design life | **60 years** |
| Displacement | **0.12 km2** |
| Availability factor | **90%** |

RITM-200N

# PROOF OF CONCEPT: FIRST FLOATING NUCLEAR POWER PLANT IN THE WORLD

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- **Up to 77 MW**
  ELECTRICAL CAPACITY
- **3 years**
  FUEL CYCLE
- **300 MW**
  THERMAL CAPACITY
- **40 years**
  DESIGN LIFE

2 x KLT-40S Reactors

Fuel enrichment: **< 20%**
Mobility: **towed**

**04/2019** — Comprehensive testing of the FPU was completed

**06/2019** — Operation license is issued

**12/2019** — FNPP was connected to the grid

**01/2020** — FNPP delivered its first 10 mln kWh of electricity to the Chukotka grid

# PROOF OF CONCEPT: FIRST FLOATING NUCLEAR POWER PLANT IN THE WORLD

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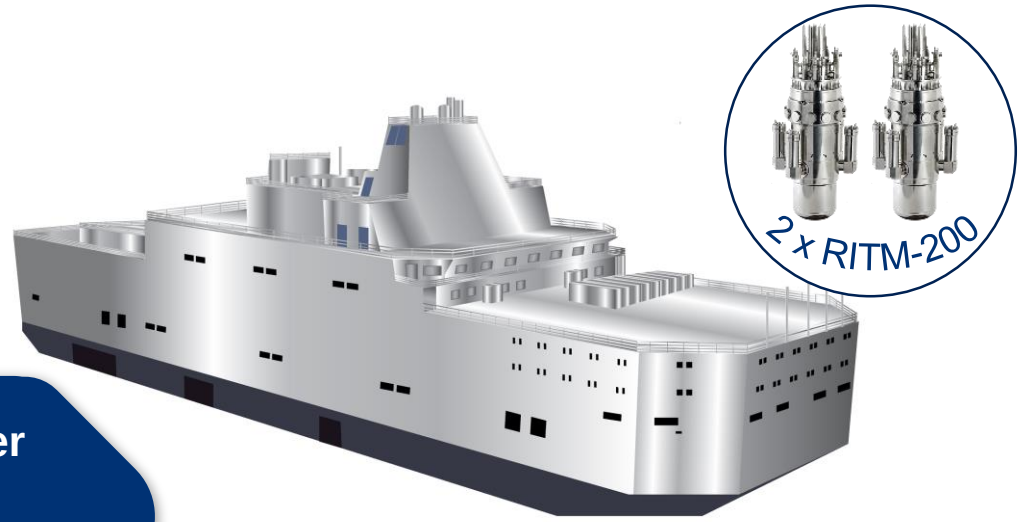


**Floating power unit (FPU) based on RITM-200M**

- **77 MWt** POWER CAPACITY
- **40 years** LIFECYCLE
- **3-4 years** REFUELING CYCLE

| | |
|---|---|
| Personnel | 366 |
| Length | 140 m |
| Width | 30 m |
| Draft | 5,6 m |
| Displacement | 21 000 t |

- ✓ Power capacity increase to 100 MWt
- ✓ Reduced hull dimensions, high maneuverability
- ✓ No fuel handling operations on-site
- ✓ Refueling period increase

- **100 MWt** POWER CAPACITY
- **60 years** LIFECYCLE
- **up to 10 years** REFUELING CYCLE

| | |
|---|---|
| Personnel | 128 |
| Length | 112 m |
| Width | 30 m |
| Draft | 5 m |
| Displacement | 16 680 t |

# POTENTIAL CONSUMERS OF ELECTRICITY

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## from Floating Power Units

01 Remote areas
02 Ports
03 Agglomerations

01 Islands
02 Archipelagos
03 Offshore sites

01 Mining sites
02 Mining and processing sites
03 Large sites under construction

# LAND-BASED SNPPs

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**2×55 MWe**
2 RITM-200N reactors

**110 MWe**

**Flexible, tailor-made SNPP solution based on RITM SMR is designed to address a wide range of customer demands**

Thermal capacity
**380 MW**
(2 x 190 MW)

Refueling cycle
**up to 6 years**

Design life
**60 years**


Availability factor
**90%**

Plant area
**0.17 km2**

Construction period
**3 - 4 years**

# LAND-BASED SMALL-SCALE NPP LAYOUT

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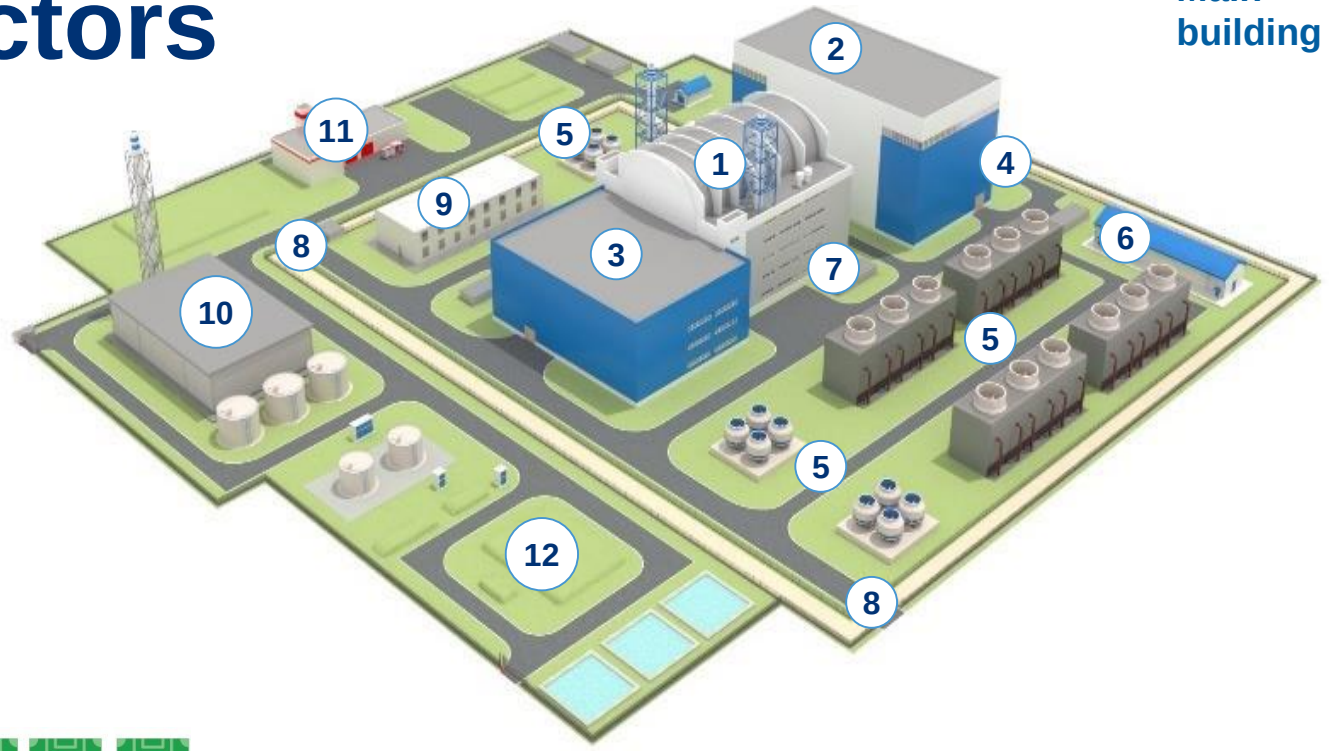
## 2 x RITM-200N reactors

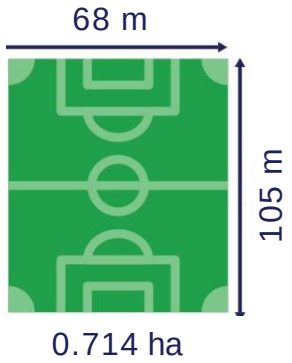


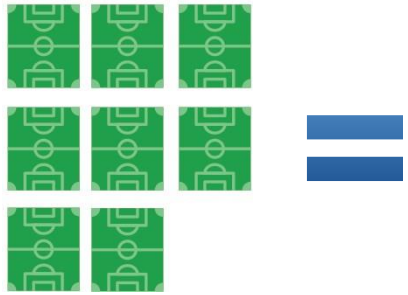

Main building

1. Reactor building
2. Turbine building
3. Radwaste building
4. Indoor switchgear
5. Cooling towers
6. Cooling water pumps
7. Safety cooling towers
8. Backup generators
9. Security gates
10. Administration building
11. Water treatment building
12. Fire station
13. Wastewater treatment

**110 МВт**

Electrical capacity



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**0.17 km²**
40 acres

# SMALL-SCALE NPP: MODULARITY

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## MODULAR APPROACH ENABLES PLANT ELECTRICAL CAPACITY EXTENSION BY CONSTRUCTING AN ADDITIONAL MAIN BUILDING AND COOLING TOWERS WITH SHARED USE OF AUXILIARY BUILDINGS

Main area (secured)

Auxiliary area (shared infrastructure)

# SMALL-SCALE NPP: MODULARITY

**01/2022** — Power Supply Agreement

**04/2023** — Siting license granted

**2028** — Expected commissioning

## FIRST OF A KIND NPP with RITM-200N reactor for an industrial client in Yakutia Region, north of Russia

- **55 MWe**
  ELECTRICAL CAPACITY
- **up to 6 years**
  FUEL CYCLE
- **60 years**
  DESIGN LIFE

# SHELF-M MICROREACTOR FOR A LAND-BASED SMALL-SCALE NPP

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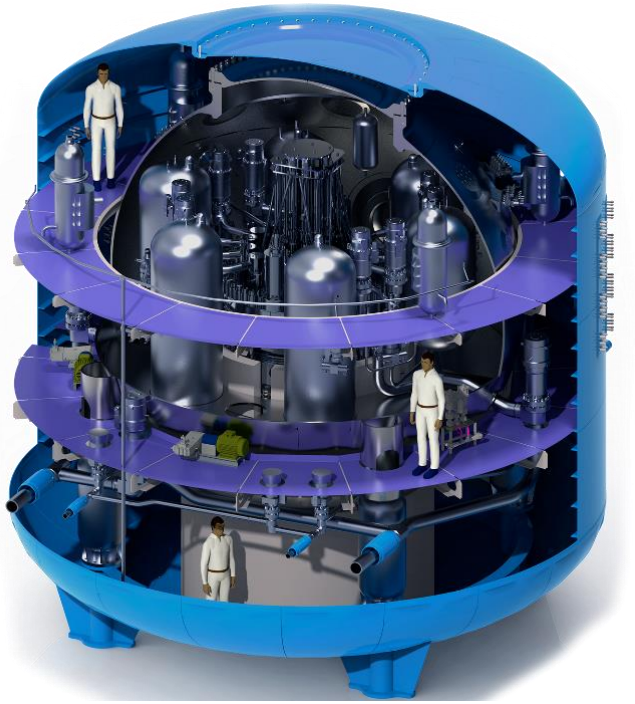
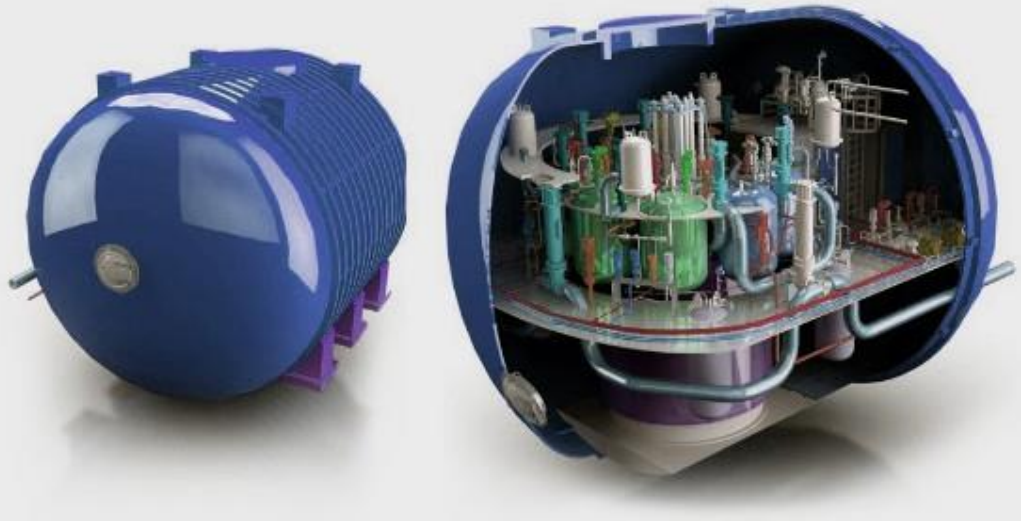
- **Integral PWR**
  TECHNOLOGY
- **up to 10 MW**
  ELECTRICAL CAPACITY
- **up to 35 MW**
  THERMAL CAPACITY



- Refueling cycle **up to 8 years**
- Availability factor **80%**
- Design life **60 years**
- Load-following capabilities **20-100%**
- Module weight **320t**
- Module dimensions **Ø 8 m x 10 m**



**2024**
detailed design
to be completed

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# READY-MADE PROJECTS AND PROJECTS WITH HIGH DEGREE OF READINESS IN RUSSIA

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**3 land-based small-scale NPP**
with two RITM-200

**1 Floating NPP**
with two KLT-40S

in operation

**2 Icebreakers**
with two RITM-200

**4 modified floating NPPs**
with two RITM-200S

under construction

## PROJECTS IN PREPARATION

**2028**

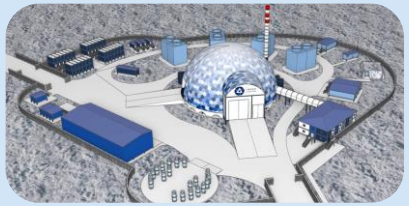
**1 land-based small-scale NPP**
with one RITM-200N on the way

**2029**

**1 optimised Floating NPP**
with two RITM-200M on the way

**2030**

**1 land-based small-scale NPP**
with microreactor SHELF-M



# Thank you
# for your attention

2024