Experience of Rosatom with SMRs
Future vision

Alexander Kharichev
Key Account Director – MENA, Asia
Rusatom Overseas
Electricity access is a driver for national welfare growth

ACCESS TO ELECTRICITY PROVIDES PEOPLE WITH ACCESS TO EDUCATION, MEDICINE AND BUSINESS DEVELOPMENT

Insufficient, unreliable or costly access to power is among TOP-5 constraints for all sizes of business

1.06 billion people still do not have access to electricity

Power outages cost in South Asian countries is estimated 4% of GDP annually

in African countries 1-2% of GDP annually
Access to energy, %

- OECD Europe
- North America
- Pacific
- CIS
- Latin America
- ASEAN
- China
- India
- Sub-Saharan Africa
- MENA

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Stumbling blocks we face to achieve stable generation and sustainable energy mix

LIMITATIONS OF THE CURRENT SOLUTIONS:

CONVENTIONALS LIMITATIONS:
- CO₂ emissions
- Fuel prices fluctuations

RENEWABLES LIMITATIONS:
- Climate conditions
- Energy intensive industries

INFRASTRUCTURE LIMITATIONS:
- Undeveloped power grids
- Energy storage is onerously expensive

MARKET LIMITATIONS:
- Energy price volatility
- Fuel dependency

THE SUPPLY OF FLEXIBLE AND CLEAN ENERGY SOURCES IS NOW BEING FORMED ON THE ENERGY MARKET
New energy ecosystem. We can’t ignore the changes

DECENTRALIZED SYSTEMS

DIGITAL ECOSYSTEMS

FLEXIBILITY

“CONSUMER-DRIVEN” MARKET

CONSUMER AS A FULL-FLEDGED PLAYER
Population gaining access to electricity by 2030

INVESTMENT IN GRID INFRASTRUCTURE

$391 BILLION

29% GRID

23% MINI-GRID

48% OFF-GRID

Over 485 million, or 72%, of the additional people who gain electricity so through DECENTRALISED SYSTEMS.
We need to match countries’ needs with technological achievements to overcome existing challenges

- Stable Generation
- Flexible Placement
- Easy Grid Connection
- Costs Predictability
SMRs are the only solution to cover all market demands

- Load-following capabilities
- Generation III+ safety systems
- 6.6-100 MW capacity range
- Off-grid deployment
- Modularity
- Short construction period
- More than 6 years fuel campaign

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Small NPP compared to the other types of power generation technology

<table>
<thead>
<tr>
<th>TARIFF DETERMINATION PERIOD</th>
<th>ENVIRONMENTAL FRIENDLINESS</th>
<th>BASE LOAD AND UNINTERRUPTED GENERATION</th>
<th>INDEPENDENCE FROM FUEL SUPPLIES</th>
<th>MODULARITY</th>
<th>CONNECTION SPEED</th>
<th>LOAD FOLLOWING</th>
<th>LOW PRICE FOR ELECTRIC POWER FOR THE FINAL CONSUMER</th>
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<tbody>
<tr>
<td><strong>SMALL NPP</strong></td>
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<tr>
<td>No risks of significant accumulated price increase of electric power</td>
<td>No CO₂ emissions to the atmosphere</td>
<td>Stable electric power supply</td>
<td>Fuel supply infrastructure is not required</td>
<td>Wide range of locations possible to be selected</td>
<td>Short period to start power supply</td>
<td>Capable to ensure basic and peak generation</td>
<td>Ceteris paribus, the most important parameter for the consumer</td>
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<td><strong>RES</strong></td>
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World’s first floating nuclear power plant
FNPP Akademik Lomonosov

AKADEMIK LOMONOSOV
FNPP THE FIRST-OF-A-KIND PROJECT
COMMISSIONING DATE: 2019

After commissioning FNPP will replace aging power generating capacities providing electrical power to the city of Pevek, one of the major Arctic ports in the North-East of Russia.
FNPP: Optimized Mobile Solution for Coastal Areas Power Supply

**Optimization Results**
- **by 28 m** – length reduction
- **by 5 m** – beam reduction
- **by 9000 t** – draught reduction
- **30%** – capacity increase

<table>
<thead>
<tr>
<th>Technical Parameters</th>
<th>Value</th>
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<tbody>
<tr>
<td>Electric capacity</td>
<td>100 MW</td>
</tr>
<tr>
<td>Refueling cycle</td>
<td>up to 10 years</td>
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<tr>
<td>Design life</td>
<td>60 years</td>
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<tr>
<td>Displacement</td>
<td>12,000 m tons</td>
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<tr>
<td>Length</td>
<td>112 m</td>
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<tr>
<td>Beam</td>
<td>25 m</td>
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<tr>
<td>Draught</td>
<td>4.5 m</td>
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Land-based NPP based on RITM Series SMR

2 × 50 Mw(e) – 100 Mw(e)

2 RITM-200 Reactors

TECHNICAL PARAMETERS

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<tr>
<th>Parameter</th>
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<tbody>
<tr>
<td>Electric capacity</td>
<td>100 MW (2 × 50 MW)</td>
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<tr>
<td>Thermal capacity</td>
<td>350 MW (2 × 175 MW)</td>
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<tr>
<td>Refueling cycle</td>
<td>up to 6 years</td>
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<tr>
<td>Design life</td>
<td>60 years</td>
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<tr>
<td>Capacity factor</td>
<td>90%</td>
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<tr>
<td>Plant area</td>
<td>13 acres (0.05 km²)</td>
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<tr>
<td>Construction period</td>
<td>3 - 4 years</td>
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FLEXIBLE, TAILOR-MADE SMALL NPP SOLUTION, BASED ON RITM SERIES SMR, WHICH IS DESIGNED TO ADDRESS MOST PECULIAR CUSTOMER DEMANDS
Key challenges we need to overcome to boost SMR development

HARMONIZATION

COMPREHENSIVE ENERGY SOLUTION

EFFECTIVE LIFE-CYCLE

STANDARD DESIGNS
SMRs to become the core of the energy mix of the future

ADVANCED ECOSYSTEM

SMR SYNERGY WITH MODERN SOLUTIONS within the modern energy ecosystem:

- RENEWABLES
- ENERGY STORAGE
- SMART GRIDS

SUSTAINABLE DEVELOPMENT

SMRs IS A DOORWAY TO ACHIEVE SDGs SET BY THE UNITED NATIONS

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