ROSATOM

Nuclear Power Development: Rosatom perspective

Alexey Kalinin
Head, International Business, Rosatom

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Fully Integrated Nuclear Technology Company

65

Anniversary of Russian Nuclear Industry 2010

ROSATOM

- Nuclear Power Complex
  - Uranium production
  - Uranium enrichment
  - Fuel fabrication
  - Power equipment manufacturing
  - NPP Design, Engineering and Construction
  - Electricity generation
  - Services and modernization
- Applied and Basic Science
- Nuclear and Radiation Safety
- Nuclear Icebreakers

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

VVER Global Fleet

Country	Constructed
Armenia	2
Bulgaria	6
China	2
Czech Republic	6
Finland	2
Germany	6
Hungary	4
Iran	1
Russia	17
Slovakia	6
Ukraine	15
TOTAL	**67**

Rosatom operating NPP fleet in Russia

Balakovo NPP Units in operation: 4 Capacity: 4000 MW	**Kola NPP** Units in operation: 4 Capacity: 1760 MW	**Kursk NPP** Units in operation: 4 Capacity: 4000 MW	**Leningrad NPP** Units in operation: 4 Capacity: 4000 MW	**Beloyarsk NPP** Units in operation: 1 Capacity: 600 MW
Kalinin NPP Units in operation: 4 Capacity: 4000 MW	**Novovoronezh NPP** Units in operation: 3 Capacity: 1880 MW	**Rostov NPP** Units in operation: 2 Capacity: 2000 MW	**Smolensk NPP** Units in operation: 3 Capacity: 3000 MW	**Bilibino NPP** Units in operation: 4 Capacity: 48 MW

Rostov NPP, unit 2

Key Project Parameters

Reactor design: VVER-1000 (V - 320)

Gross capacity: 1000 MW

First criticality: **22 Jan 2010**

First grid connection: 18 Mar 2010

Kalinin NPP, unit 4

Key Project Parameters

Reactor design: VVER-1000 (V - 320)

Gross capacity: 1000 MW

First criticality: **08 Nov 2011**

First grid connection: 24 Nov 2011

Tianwan NPP, China

Lianyungang, Jiansu province

Key Parameters

Reactor design: VVER-1000 (V-428)

Total Gross Capacity: 2120 MW (2 x 1060 MW)

First criticality:

20 Dec 2005 (unit 1)
01 May 2007 (unit 2)

First grid connection:

12 May 2006 (unit 1)
14 May 2007 (unit 2)

Commercial operation date:

17 May 2007 (unit 1)
16 Aug 2007 (unit 2)

Legal basis: IGA (1992)

Busher NPP, Iran

Key Parameters

Reactor design: VVER-1000 (V-446)

Total Gross Capacity: 1000 MW (1 x 1000 MW)

First criticality: **08 May 2011**

First grid connection: **03 Sep 2011**

Commercial Operation Date: **30 Jul 2012 (anticipated date)**

Legal basis: IGA (1992)

Construction on the "turn-key" basis

Kudankulam NPP, India

Key Parameters

Reactor design: VVER-1000 (V-412)

Total Gross Capacity: 2000 MW (2 x 1000 MW)

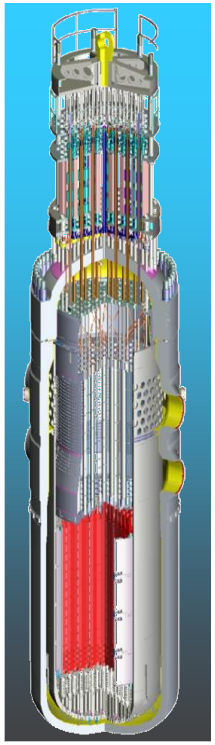
First criticality: **2012 (anticipated date)**

First grid connection: **2012 (anticipated date)**

Legal basis: IGA (1998)

Rosatom Gen III+ NPP design

What is VVER?
(Water-Water Power Reactor)



- **Forefront** of nuclear technology – Generation **3+** reactor
- **Proven and mature** solutions – **≈1400** reactor years of total operating time
- A high level of **internal safety** gained through evolution of design
- Most **demanded capacity** suitable for various grid conditions – **1000-1200 MWe**
- **Long – run** facility – design lifetime of the main equipment: **60 years**
- **High performing** source of supply – availability factor **≈ 92 %**

Protection from outer impacts

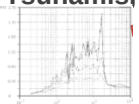
Airplane crash

Outside explosions

Hurricanes, tornadoes

Snow load

Tsunamis, floods



Earthquakes

- Meets **all** current Russian and international **safety standards** and the **IAEA requirements**
- Widely **referenced** by utilities
- **EUR certified**

Novovoronezh NPP-II

Key Parameters

Reactor design: VVER-1200 (V-392M)

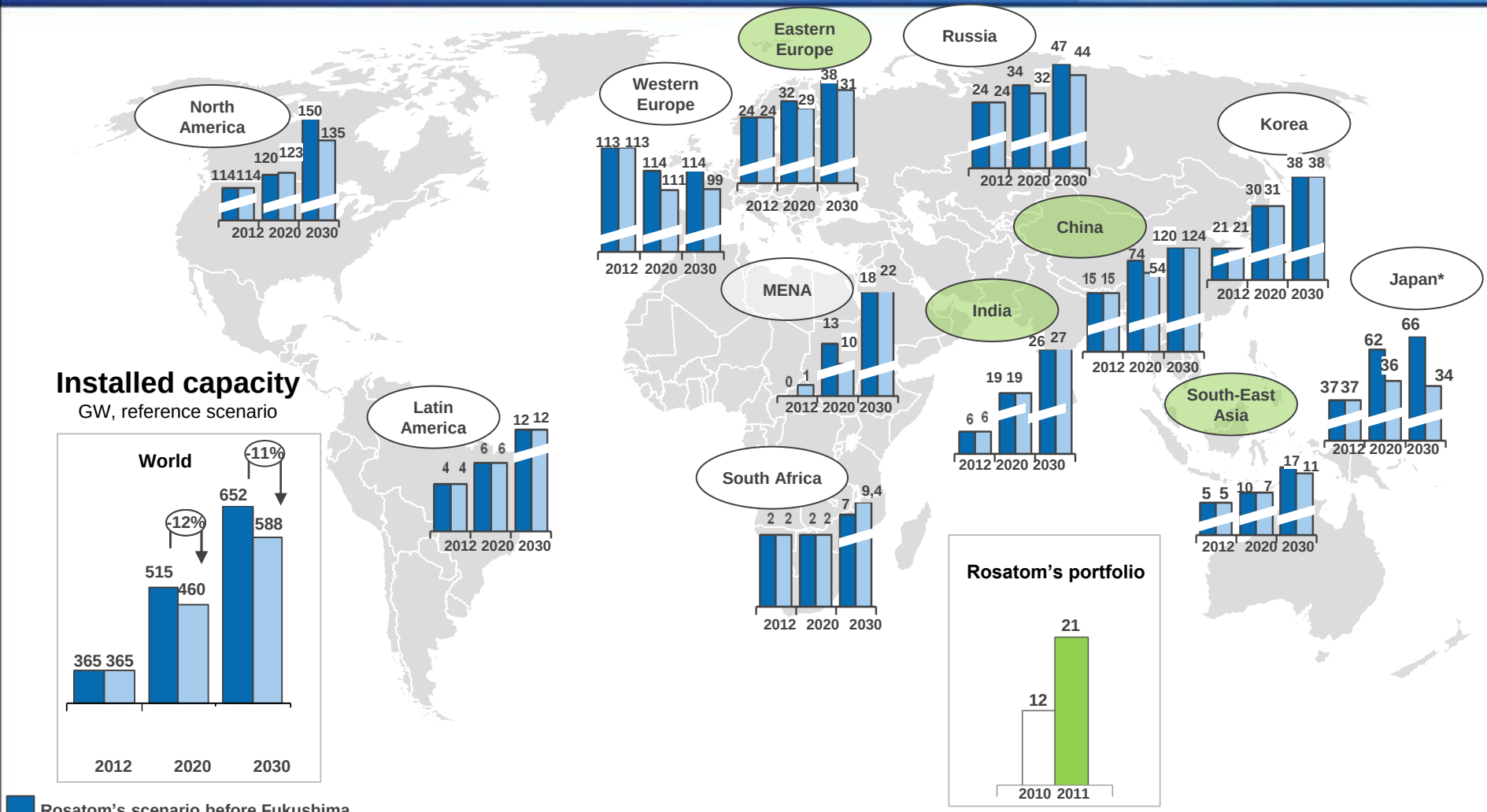
Total Gross Capacity: 2400 MW (2 x 1200 MW)

Construction start:

24 Jun 2008 (unit 1)
12 Jul 2009 (unit 2)

Commercial Operation Date:
end of 2013 (anticipated date, unit 1)
end of 2014 (anticipated date, unit 2)

How strongly did Fukushima affect the plans to the world's nuclear energy development?

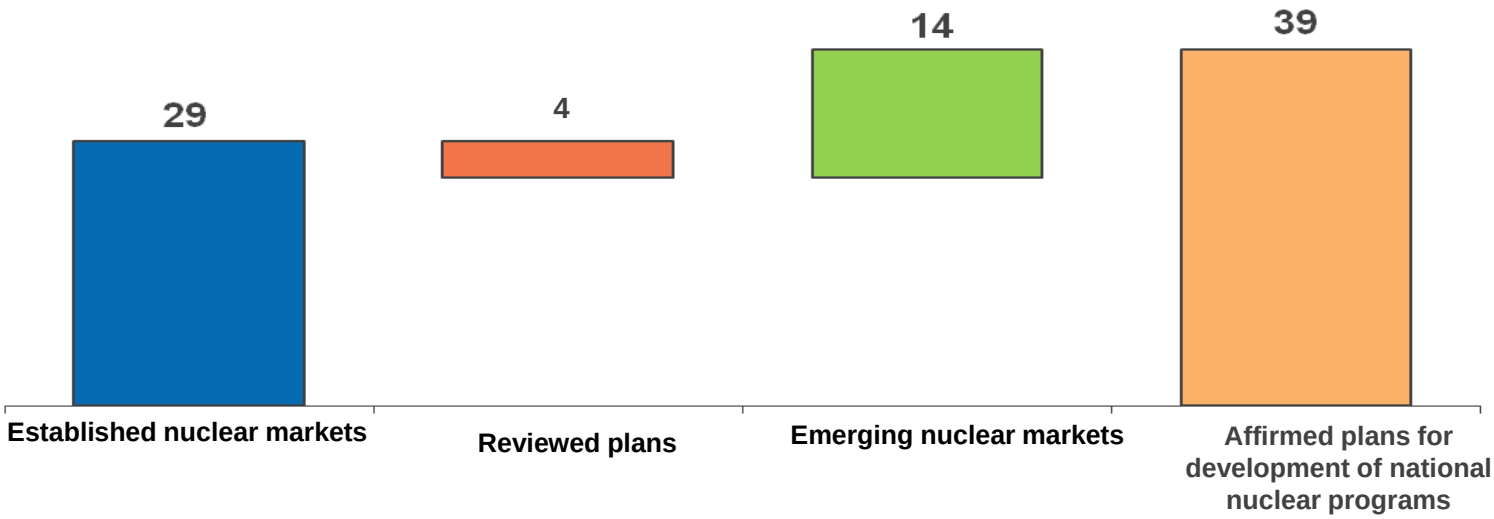


* Does not include national nuclear power program potential strategy revision (to be revised shortly)

Source: Rosatom

Emerging Markets Become Increasingly Important in New Build

Countries' decisions on the development of nuclear energy
Number of countries

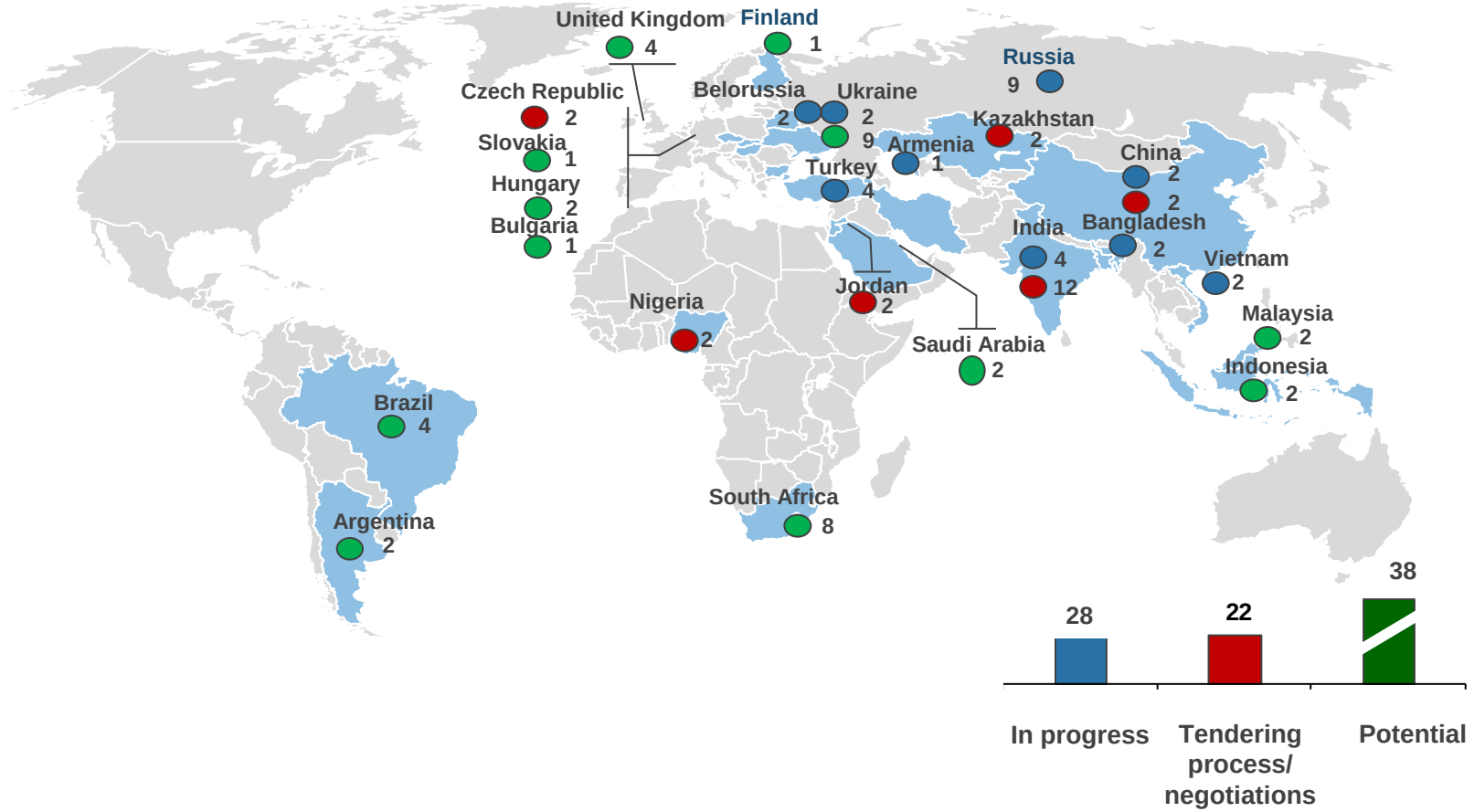


For example,
- France
- USA
- Russia
- Czech Republic
- …

For example,
- Germany
- Switzerland
- Italy
- Belgium

For example,
- Turkey
- Vietnam
- UAE
- Belorussia
- …

Rosatom NPP construction projects worldwide



Rosatom NPP construction perspective backlog – more than 80 units

Nuclear power plant brings more than just energy

Additional gains from NPP construction

- Job creation
- Electricity export opportunities
- Development of science and education
- Tax payments growth
- Energy security development
- Country's reputation growth at regional level
- Social infrastructure development
- Industry and construction sector development
- Growth of demand in other sectors of economy

Freezing of nuclear energy development is equal to rejection of social and economic development

An integrated solution should be the only form of a vendor's offer in current conditions

Energy Solution

Modern NPP design (Gen III+)
NPP construction and life cycle management support (fuel, services, modernization)
Operation & maintenance

Industrial Solution

NPP equipment manufacturing, service & works localization,
Technology transfer,
Certification of local suppliers, participation in third countries projects

Financial Solution

BOO projects implementation;
State credits,
Partnership projects

Knowledge, skills, human capital

Personnel education & training (incl. traineeship on NPP sites),
R&D base development,
NPP operation experience exchange

Regulation, Infrastructure and Public acceptance

Creation and development of regulatory base
NFC facilities construction,
SNF & RW management,
Social-political programmes support

SAFETY
- basic principle

Akkuyu NPP project profile

Akkuyu is the first Rosatom' foreign NPP project configured on BOO principles

Site – Akkuyu, province Mersin, Turkey

Key parameters

- Project value – $ 20 bn.
- Implementation period – 2011-2021
- Legal basis – Intergovernmental Agreement of May 12, 2010
- Reactor design – NPP-2006 (VVER-1200)
- Total capacity – 4 800 MW (4 units)
- PPA period –15 years, fixed price terms

Project highlights

- First NPP project in Turkey
- Sound Russian and Turkish State encouragement
- Strong support to Turkey with regulatory system establishment and personnel training
- The project is implemented in close cooperation with Turkish partners, involvement of Turkish suppliers mainly in civil construction
- International investors are welcome to join the project with up to 49% Akkuyu SPV stake

Ninh Thuan NPP project profile

Ninh Thuan NPP is the first to be constructed in Vietnam

Site Ninh Thuan – Vietnam

Key parameters

- Construction period – 2014-2020
- Legal basis – Governmental Agreement of October 31, 2010
- Reactor design – NPP-91 (VVER-1000)
- Total capacity – 2 000 MW (2 units)

Project highlights

- First NPP project in Vietnam
- Ninh Thuan NPP meets Vietnamian electricity needs
- Strong support to Vietnam with regulatory system establishment and personnel training
- Russian state credit comprehensive financing solution
- Significant local content sourcing, especially in civil construction
- Broad localization programme envisaged
- Strong political support from the Vietnam government

Contacts in Rosatom

Dr. Kirill Komarov Deputy Director General, Development and International Business
e-mail: *kbkomarov@rosatom.ru*

Assistant: Maria
tel.: +7(495)969-29-39, ext. 3236
e-mail: *mimosur@rosatom.ru*

Alexey Kalinin Director, International Business
e-mail: *aakalinin@rosatom.ru*

Assistant: Natalia
tel.: +7(499)949-25-37

Alexander Vlasov Senior Manager, International Business
e-mail: *avvlasov@rosatom.ru*
tel.: +7 (499) 949-20-25