Multiple approaches on supporting nuclear program development and contracting of NPPs

ROSATOM

STATE NUCLEAR ENERGY CORPORATION ROSATOM

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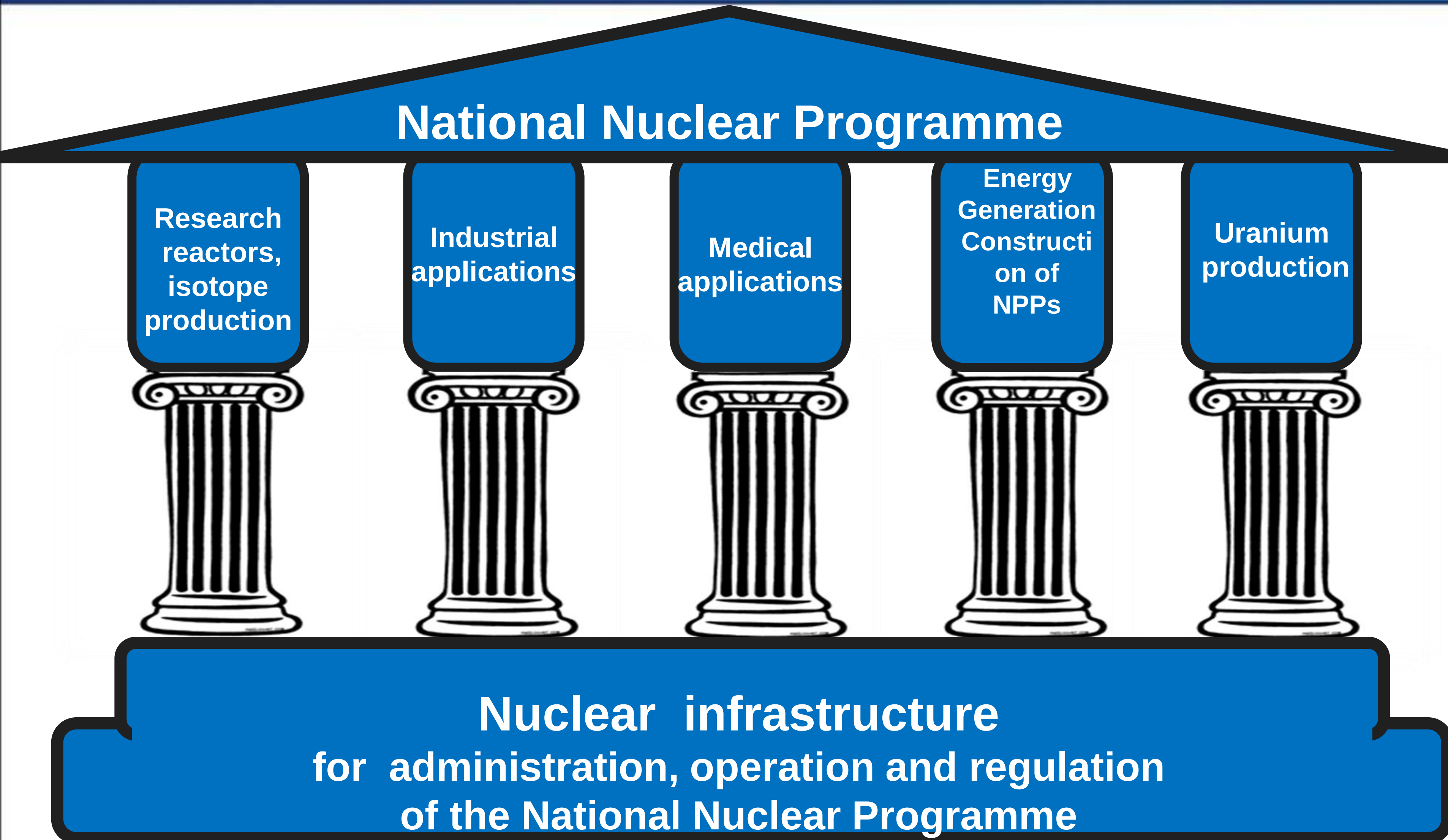
Russia

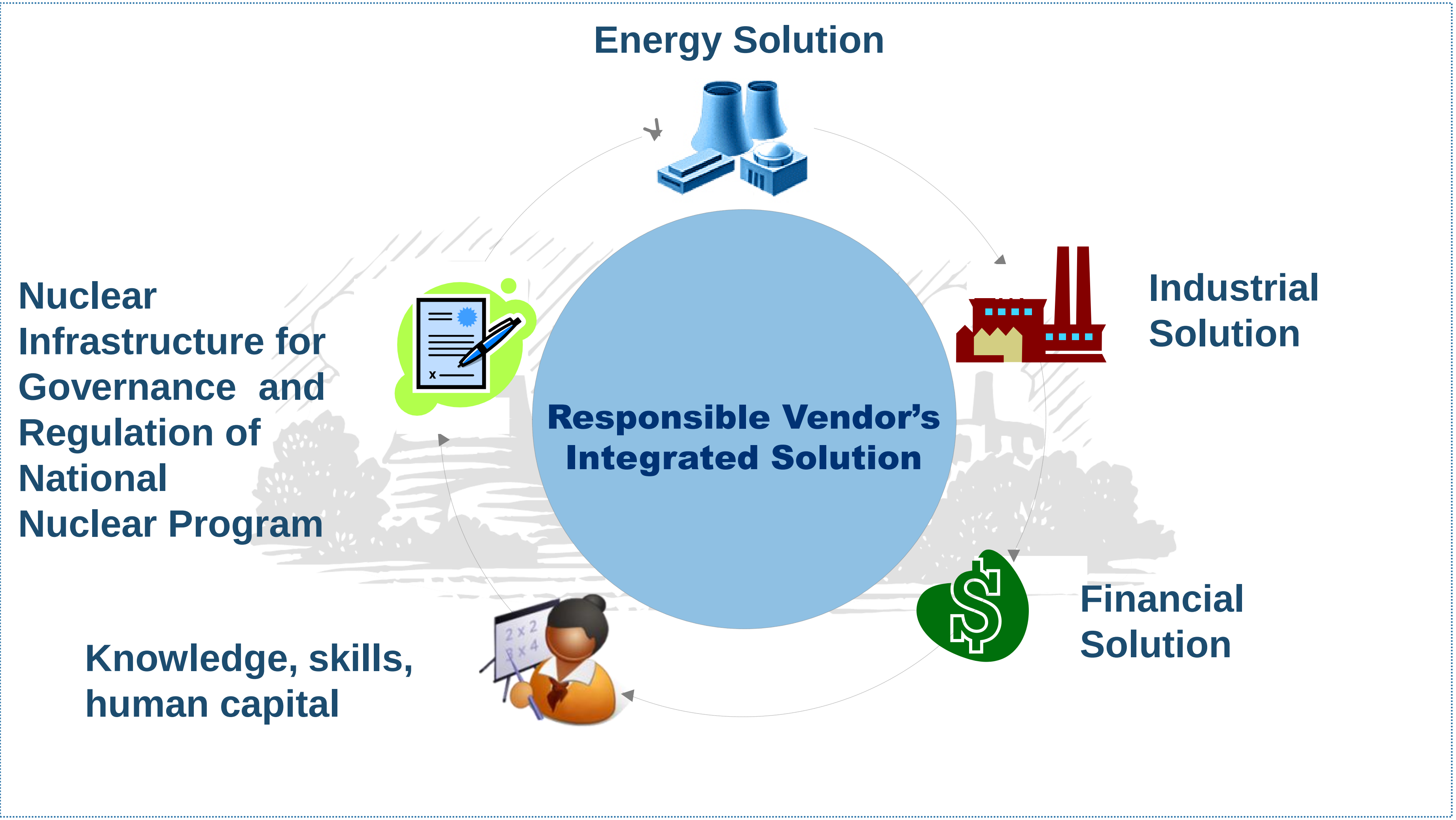
Technical Meeting
Topical Issues on Infrastructure Development:
Development and Management of National Capacity
for Nuclear Power Program

11-14 January 2013
IAEA, Vienna, Austria

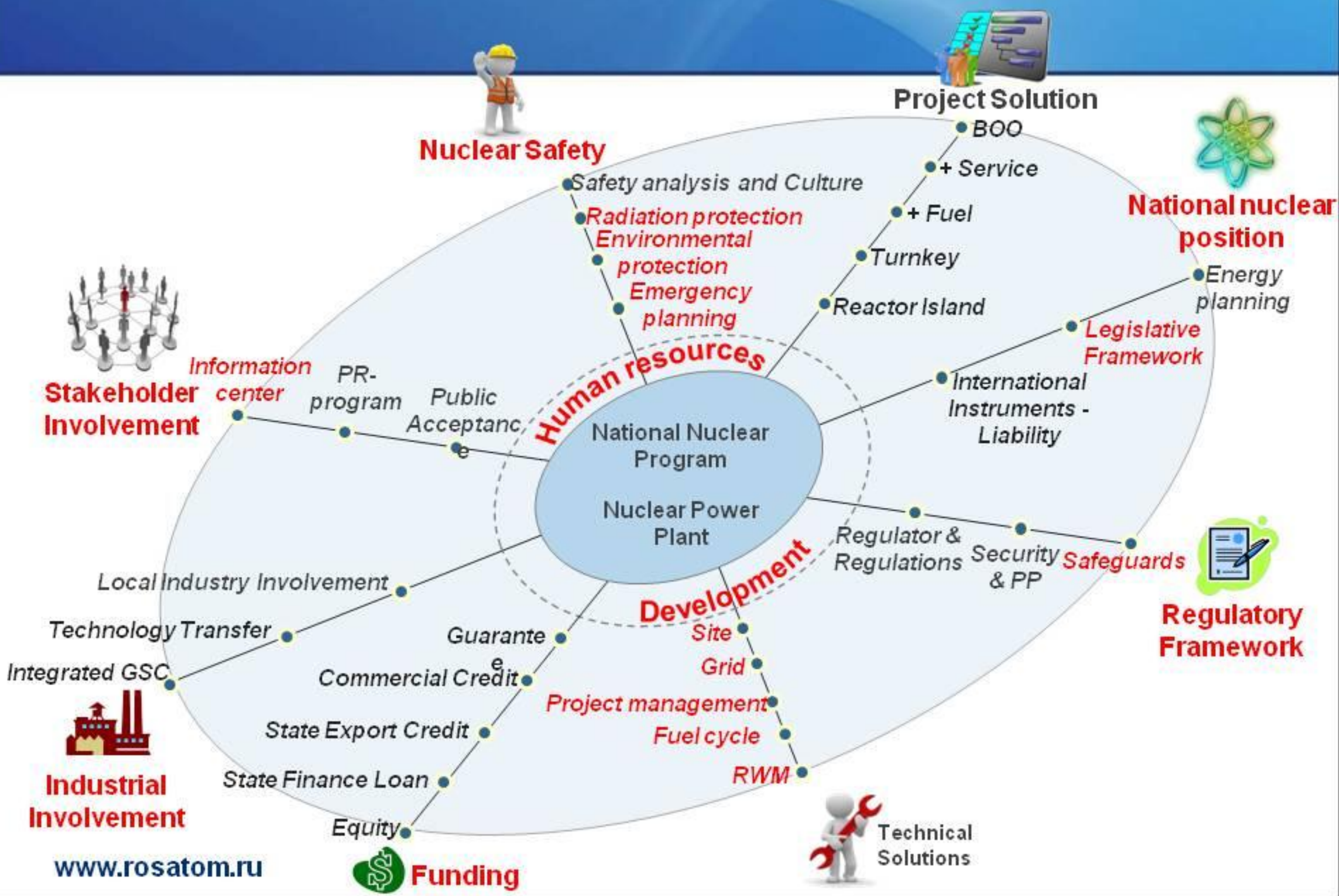
Nuclear Infrastructure is a basis for the National Nuclear Programme



Rosatom Offers Complete Solution for Nuclear Power Programme



INTEGRATED OFFER



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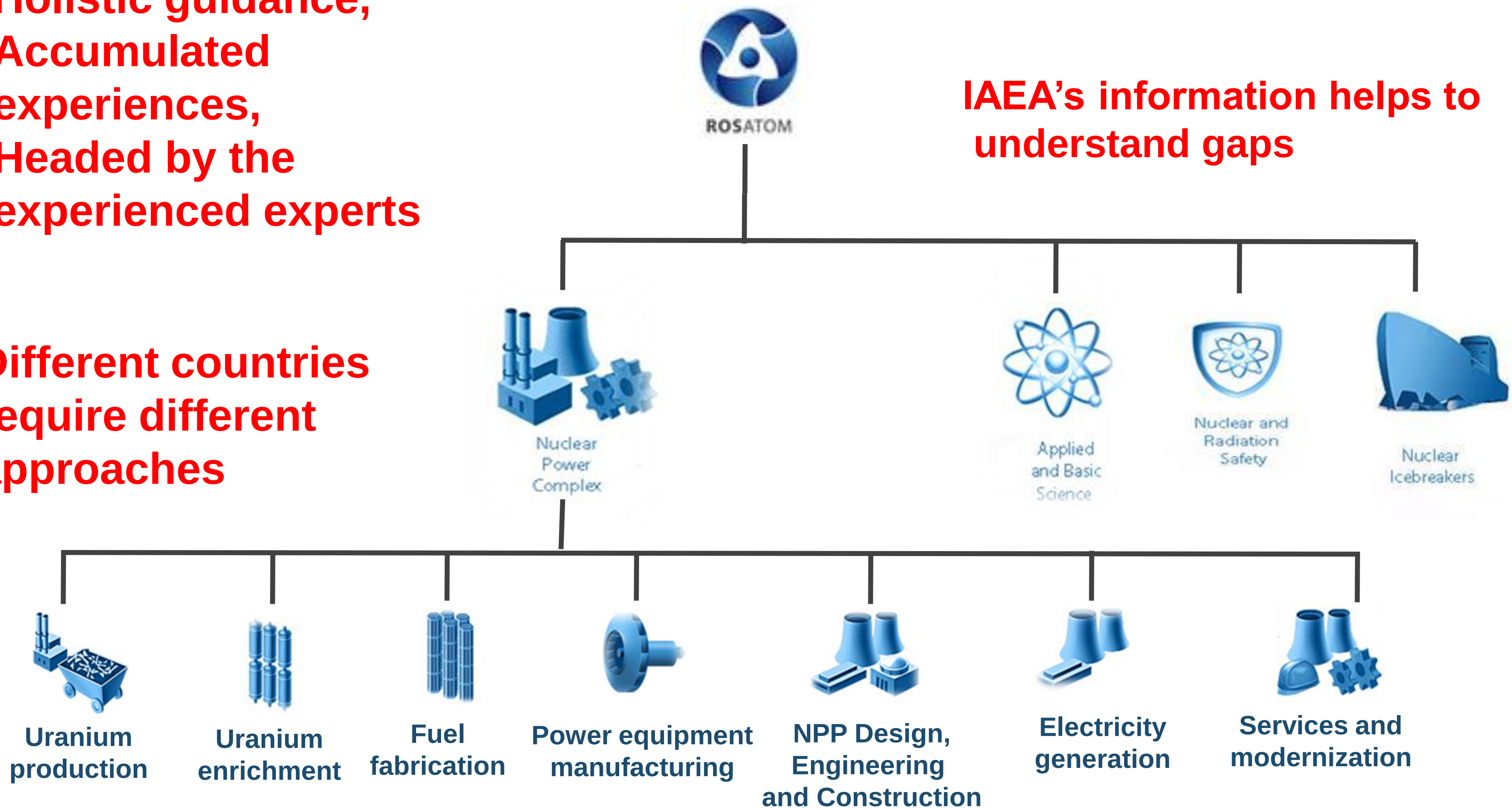
Fully Integrated Nuclear Technology Company and Its Experience

Holistic guidance,
Accumulated experiences,
Headed by the experienced experts

IAEA's information helps to understand gaps

Different countries require different approaches



Russian Approaches to Support Newcomers

A. Localization of on-site construction and manufacturing (China, India, Belarus)

B. Turn-key project (Iran, Vietnam, Bangladesh)

C. Build-own-operate (Turkey)

Contractual models

BOO: Built – Own – Operate

BOOT: Built – Own – Operate – Transfer

EPC: Engineering – Procurement – Construction

Split packages

Each contractual model requires different Owner's organization and capabilities

BOO **Model Example - Akkuyu NPP**

Akkuyu is the first NPP project configured on BOO principles

- Project value – $ 20 bn.
- Construction period – 2011-2021
- Reactor type –VVER
- Total capacity – 4 800 MW (4 units)

Owner/Investor return – selling of electricity

Customer's needs

Specific customer's requirements for the vendor:

- **Build, own and operate the NPP (BOO)**
- **Train local personnel**
- **Maximize local content**
- **Support local legislation development**
- **Cooperate in licensing and nuclear safety**
- **Ensure lifetime fuel supply**
- **Upgrade, maintain and decommission NPP**
- **Ensure spent fuel and nuclear waste treatment**
- **Implement social responsibility programs**

A large number of the customer's specific demands indicate the necessity of the vendor's responsible approach

Contractual models –BOO(T)

BOO(T): Built – Own – Operate – (Transfer)

BOOT is the same as BOO model in the beginning, later the transfer of ownership and return investments through selling the NPP .

Transfer is based on the contract conditions, it can be finished later.

Staff is trained and coached in parallel with normal operation.

Transfer depends on the human capacities of the utility and the country.

Contractual models - EPC

EPC: Engineering – Procurement – Construction – “turn key” model

Require “Intelligent Customer”, an utility, as a qualified partner to the vendor and as its natural opponent

Utility creates Bid Invitation Specification, evaluates the vendor proposal, leads the contract negotiation, licensing, supervises the construction, participates in commissioning, operation,…

For a newcomer countries without NPP in operation this is a very difficult position. . The possibilities are either long preparation of utility core team – 200 people – or with assistance of knowledgeable consultant, which creates the risk of dependency on the consultant and this solution is financially demanding (paying thousands man/month)

Tianwan NPP, China

Lianyungang, Jiansu province

Key Factors

Russia's scope of obligations:

•NPP design
•Equipment and material delivery
•Construction and installation activities in nuclear island and turbine building
•Power plant commissioning
•Chinese personnel training

The Chinese Party:

- Additional design requirements
- Civil construction and installation (BOP)
- Non safety related equipment

Kudankulam NPP, India

Key Factors

Russia's scope of obligations:

- elaboration of the working documentation to perform construction, installation and pre-commissioning activities,
- equipment and material manufacture and delivery for the reactor compartment, turbine hall and other NPP buildings and structures

The Indian Party: performs construction, installation and pre-commissioning activities at NPP site

Contractual models

Split packages: **– utility is managing the construction and interfaces between the systems, packages or islands**

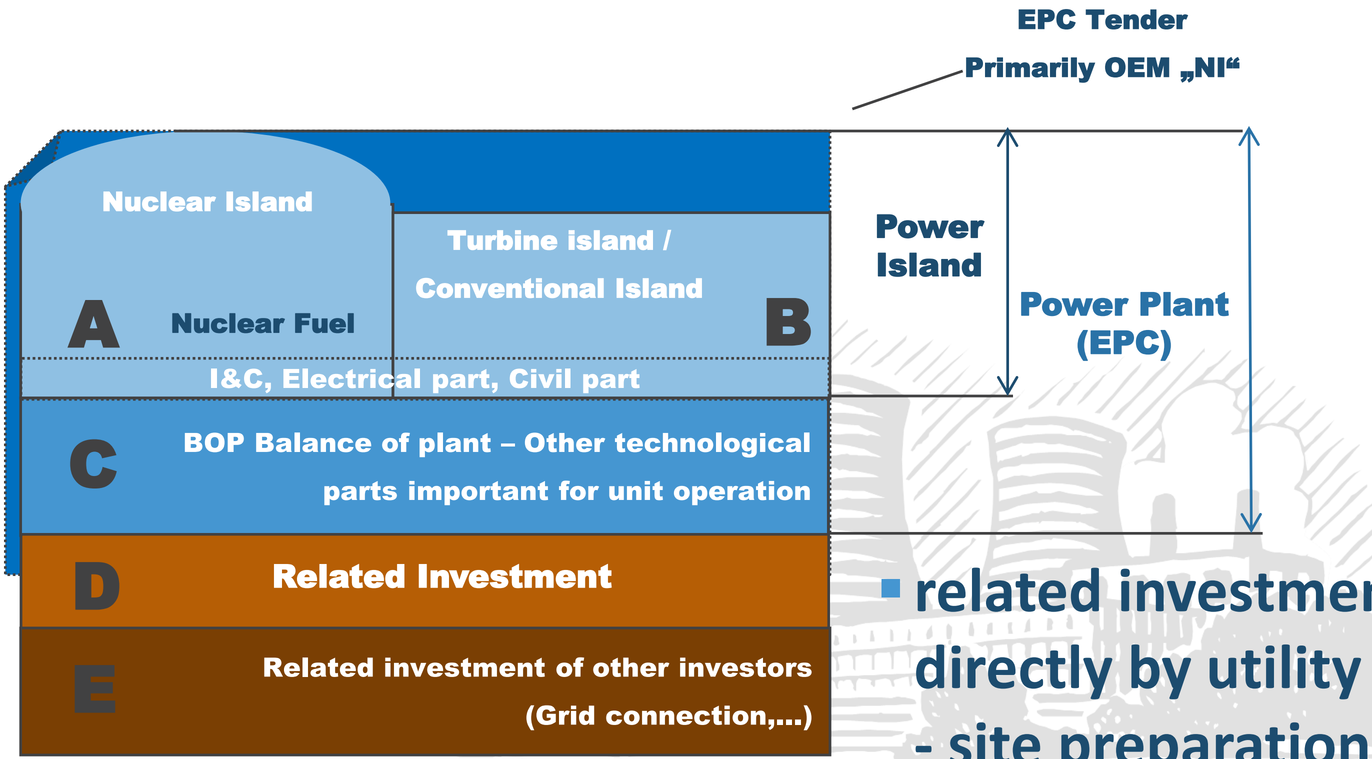
Model convenient for the experience strong nuclear utility –ROSATOM, EDF

Theoretically cheaper, but require broad engineering support and capabilities

Economical in the case of construction of series of new blocks

Different contractual models require different organizational structure of the owner/operator.

Procurement model - example



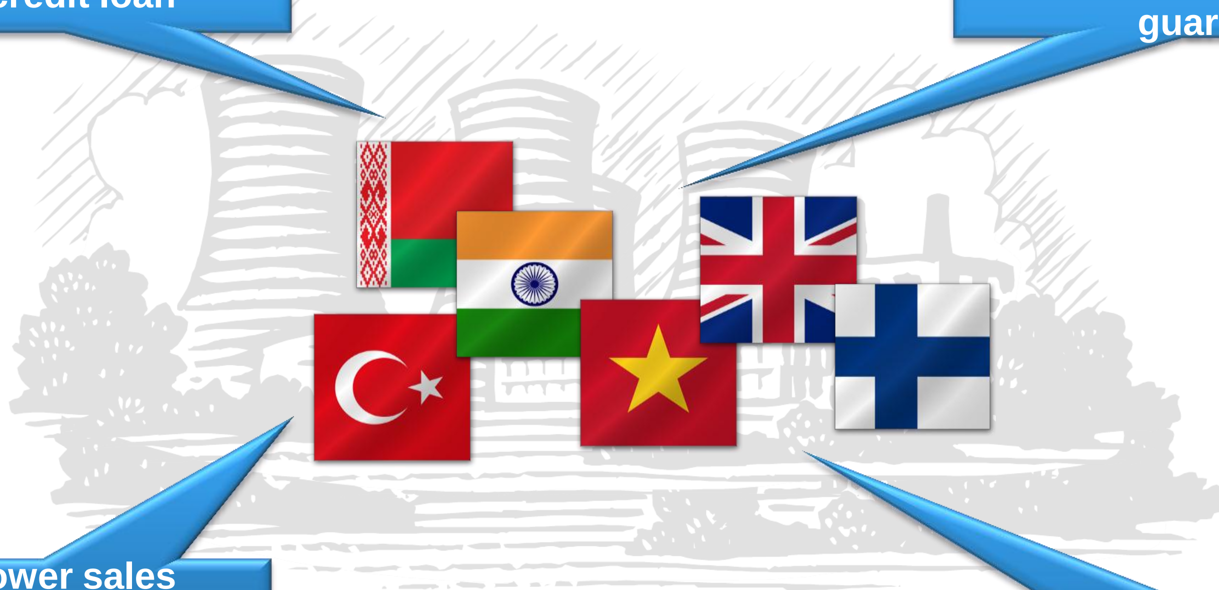
- 2 contracts:
  - EPC turn key
  - nuclear fuel
- related investments arranged directly by utility
  - site preparation, roads improvements,...

The role of the state has become a key factor, to which there is no alternative, for the implementation of nuclear power projects

Today there is already a wide selection of mechanisms for state support from state financing to Contract for Difference

Export credit loan

Investment recoverability guarantee



Electric power sales guarantee

Export credit agencies

The priority is the increase in efficiency and flexibility of implementation of tools of state support and financing in implementation NPP construction projects

Russian Experts are ready to assist in Nuclear Infrastructure Recent International Seminar in Russia

Goal: **To build up a group** of Russian Experts for providing assistance to embarking countries.

•**To learn the essentials** of the IAEA approach and recommendations and National nuclear power plans

•**To work out the guidelines** for each infrastructure element

•**To establish interaction** and understanding between Russian Experts and their international counterparts on NI issues

Outcome:

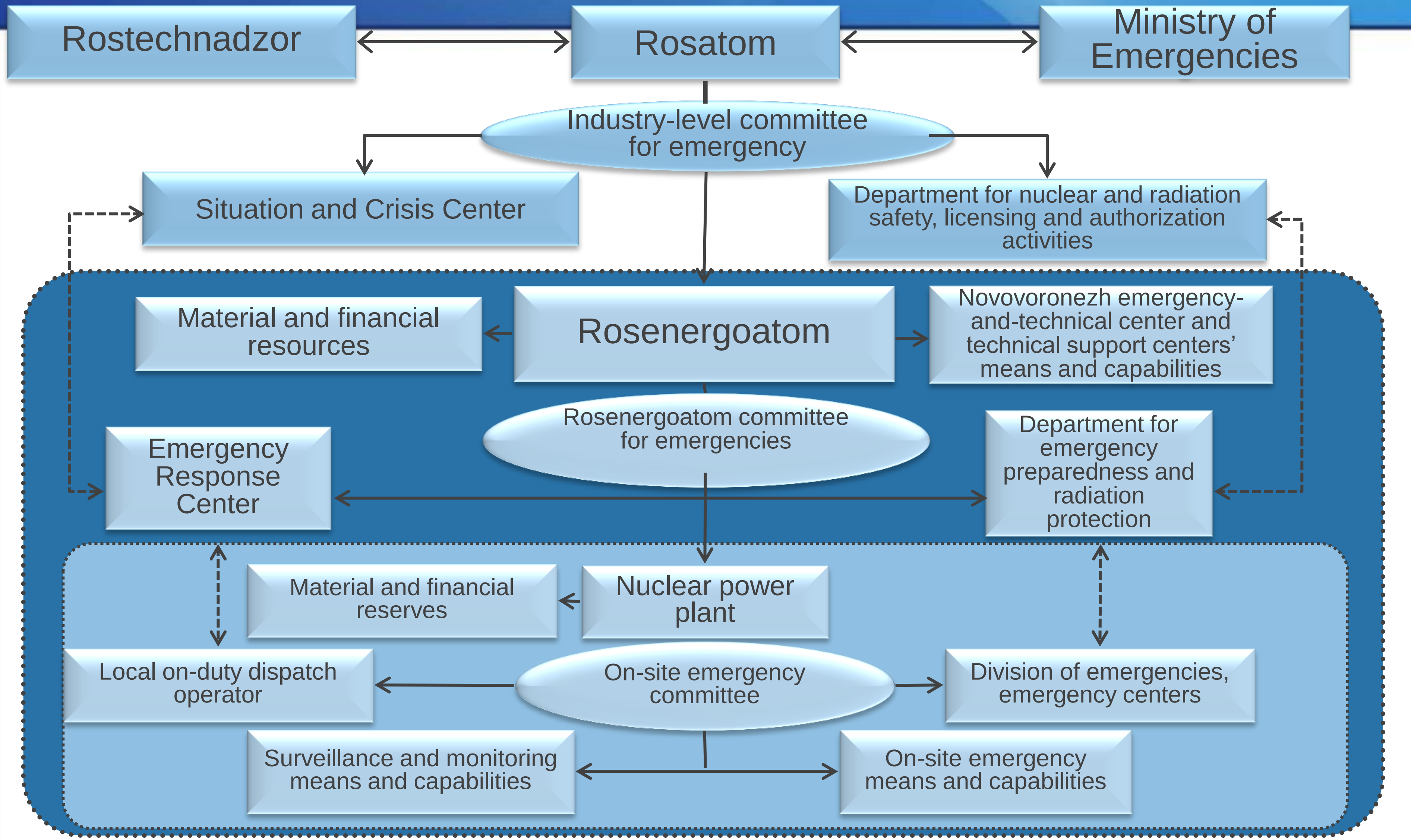
•**Road map** for each element of NI: structure, functions, forms

•**Training courses**, E& T **Services**, Internship, On-job-training.

•**Assistance** in development of regulations, "strategies & plans", etc.

•**Specific solutions: "Centers"** based on Russian experience.

Organizational structure of emergency planning and operations



Emergency Prevention and Response

Complex of technical and organizational measures:

- Emergency planning: prevention and mitigation
- Risk management
- Emergency events classification

- Levels of responsibility
- Crisis assessment and management centers (central, regional, on facility)
- Emergency response centers and equipment
- Emergency communication means/tools

- Personnel training
- Awareness of the people
- Radiation protection, medical care
- Rehabilitation and re-access planning

Structure of the Russian legal documents and norms in the field of nuclear energy

Constitution

Federal laws
International treaties

Decrees of the President,
Government Decree

Legislation and regulations of the Russian Federation

Technical regulations

Federal rules and regulations the use of nuclear energy

Administrative Regulations

Rostechnadzor's regulatory documentation

IAEA's

Safety

Standards

Guidelines

Safety Guide

National standards, enterprise standards, codes of practice

Recommendations

Regulatory Documents for VARANS

In 2011: 7 documents were developed (now are being updated taking into account Fukusima lessons)

In 2013: 17 documents are expected

In 2012: 14 documents were developed by 5 employees of VARANS under supervision of Russian experts

Matching of regulations developed by different suppliers is needed.

Establishment of an international campus in Obninsk based on Obninsk branch of NRNU MEPhI and CICE&T

START: **2010**

Advance training of foreign specialists on the programmes of Russian nuclear education

	prs.
Egypt	42
Vietnam	30
Jordan	8
Mongolia	5
Total :	***85***

2011

Expanding the pool of countries-recipients of Russian nuclear education

	prs.
Vietnam	110
Turkey	50
Kazakhstan	40
Bangladesh	11
Jordan	10
Mongolia	8
Total:	***up to 260***

2012

Formation of the interuniversity cooperation programme

Forecast: *up to 490*

2016

Implementation of a system of Russian nuclear education export in 25 countries

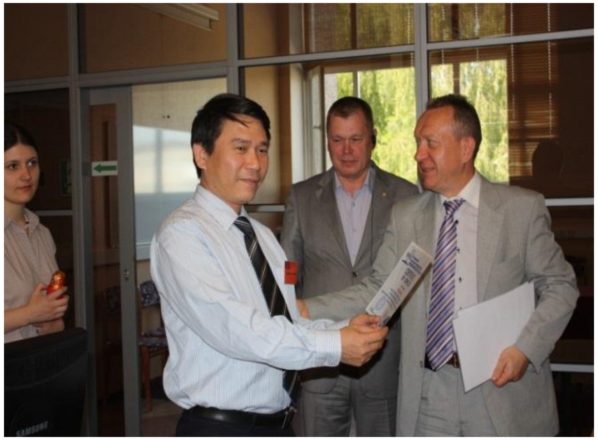
- Promoting Consortium of Rosatom's reference universities in international education market.
- Opening of International Nuclear Education Center in Tomsk.
- Nuclear power engineering training in the Obninsk International Center for *1100 foreign specialists* simultaneous.

Programmes of international cooperation in education and knowledge transfer:

- ENEN-RU project «Cooperation infrastructure development in the field of nuclear education" (Rosatom-Euratom agreement)
- Educational programmes of IAEA, WNU
- Working group on formation EurAsEC Cooperation Council
- Cooperation programmes with foreign universities (Turkey, Vietnam)

Example: Training Top Managers in Nuclear Power Program for Vietnam

5- 18 June 2011



St Petersburg training center

Course: Project Management for NPP under Construction

20- 27 August 2011

Balakovo NPP site

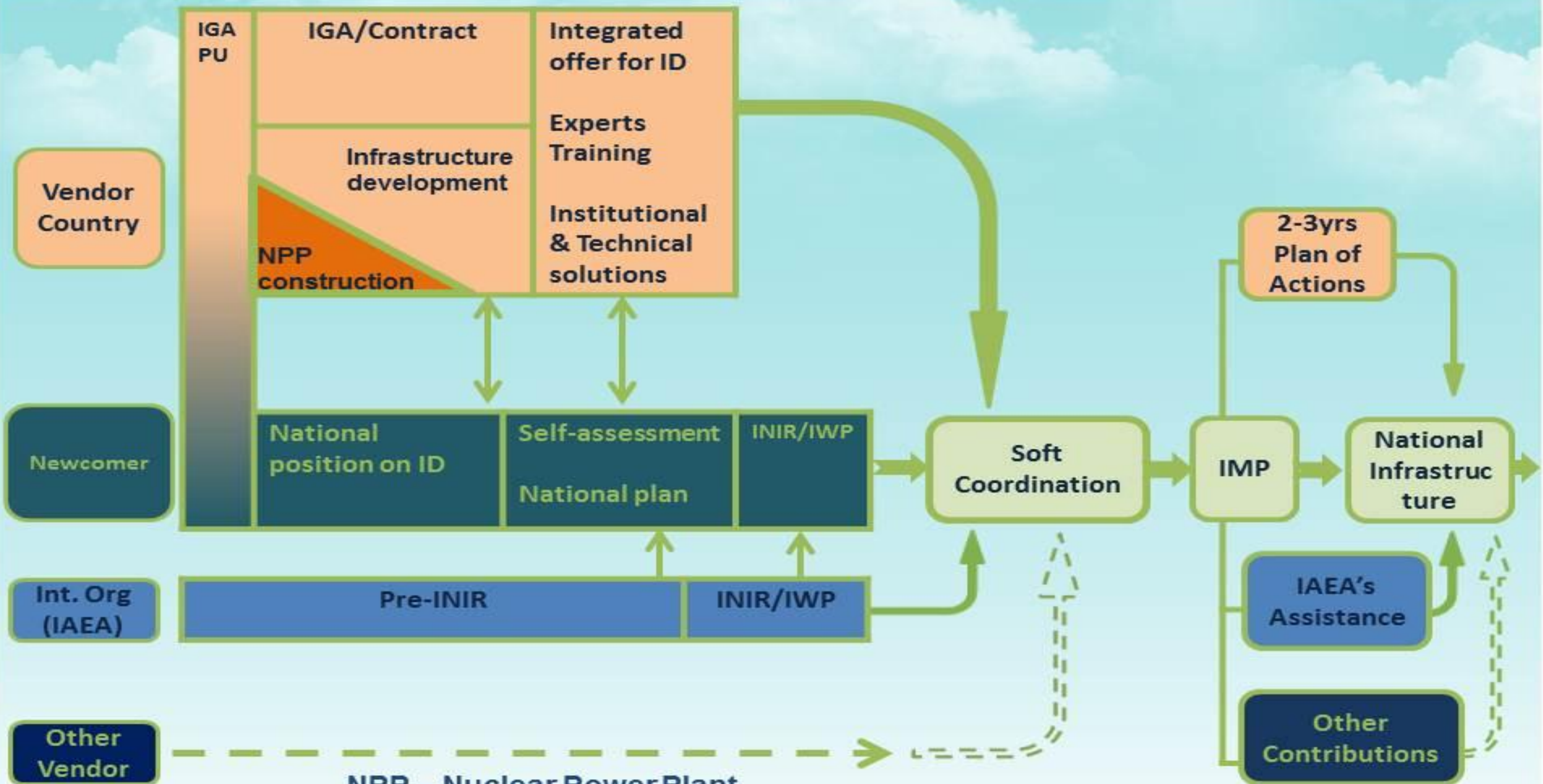
Course: Reactor physics for engineers

02- 15 October 2011

Novovoronezh NPP site

Course for NEPIO: Initialization of national nuclear power programmes

Conceptual approach to the nuclear infrastructure development



NPP – Nuclear Power Plant
IWP – Integrated Work Plan
INIR – Integrated Nuclear Infrastructure Review
IMP – Integrated Master Plan
IGA PU – Intergovernmental Agreement Peaceful Use

Experience from Russian -Bangladesh interaction on building nuclear infrastructure

1. ***Self Assessment*** *done by BGD (Decision taken…) - 2011*

2. *IAEA assessed nuclear infrastructure (**INIR mission**) - November 2011*

3. ***Report*** *was sent to **the Bangladesh Government** - February 2012*

4. *1-st consultations on **sharing of the assessment results** (SAR, INIR report, IWP) between experts (IAEA, Bangladesh, Russia) - February 2012*

5. *Assessment **results were sent** to Russian experts - April 2012*

6. *Russian experts **considered results** and made initial proposals – May 2012*

7. *2-nd consultations (IAEA, Bangladesh, Russia) on the **development of the IWP**. Agreed on **grouping of elements** and on a need to developed **detailed***

   2-3 year plans *by the groups of BD\RF experts - May 2012*

8. *Two group of experts (SHI and HRD) **visited Dacca - June 2012***

Conclusions

- Different countries implement different approaches.
- Rosatom promotes comprehensive, integrated, flexible support
- There is a need to strengthen internal and external coordination
- IAEA helps to understand gaps and to share results of INIR missions and Integrated Work Plan.
- Soft coordination is a useful tool for increasing efficiency of nuclear infrastructure development.
- Matching of support provided by different suppliers is needed.

Thank you for your attention