



ROSATOM

STATE ATOMIC ENERGY CORPORATION “ROSATOM”

POWER EQUIPMENT SUPPLY & ENGINEERING: COOPERATION OPPORTUNITIES WITH ATOMENERGOMASH & LOCALIZATION FRAMEWORK IN THE ROSATOM PROJECTS

“Atomex Asia” Forum

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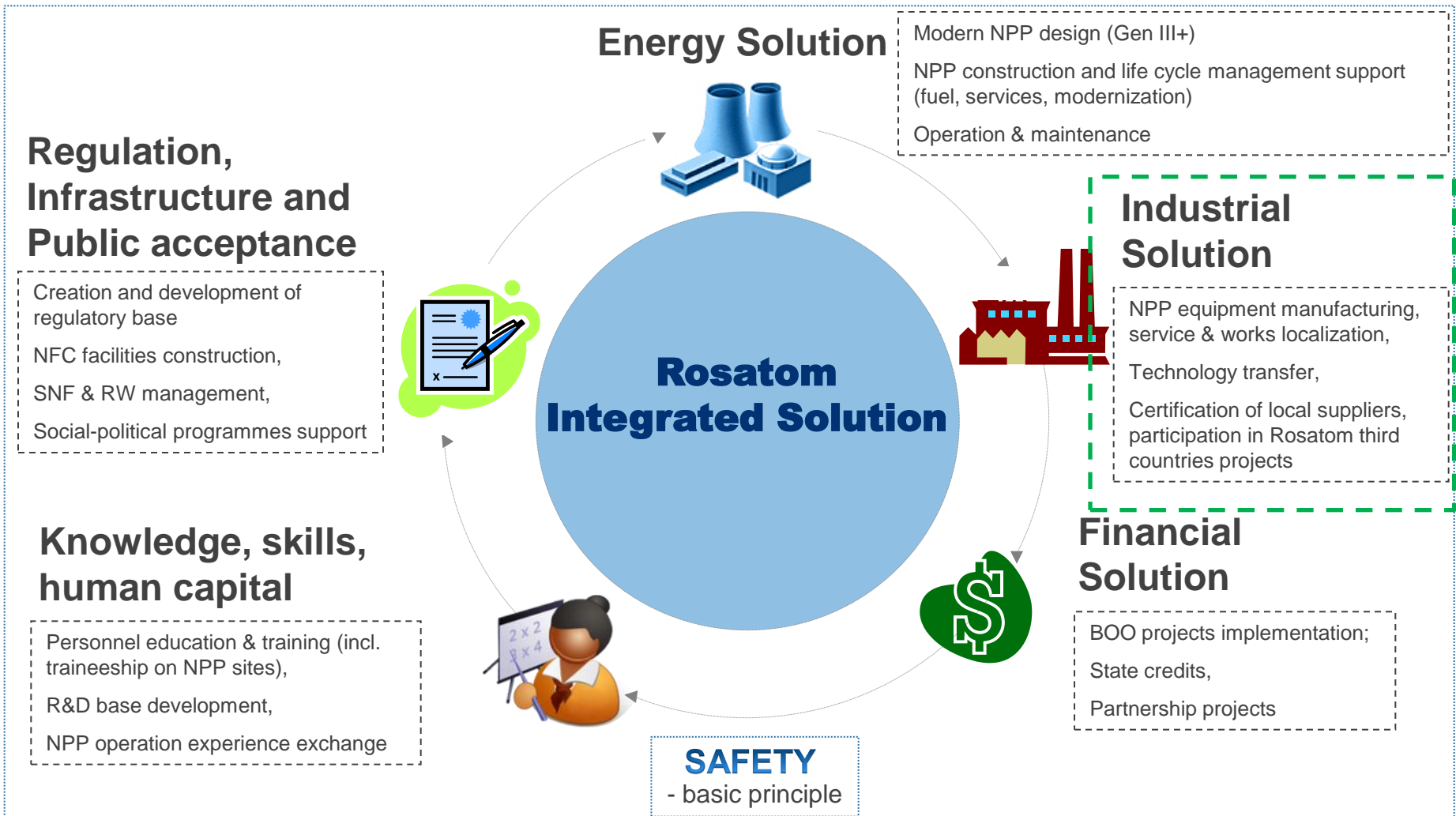
November 19th, 2014

Ho Chi Minh City, Vietnam

AGENDA

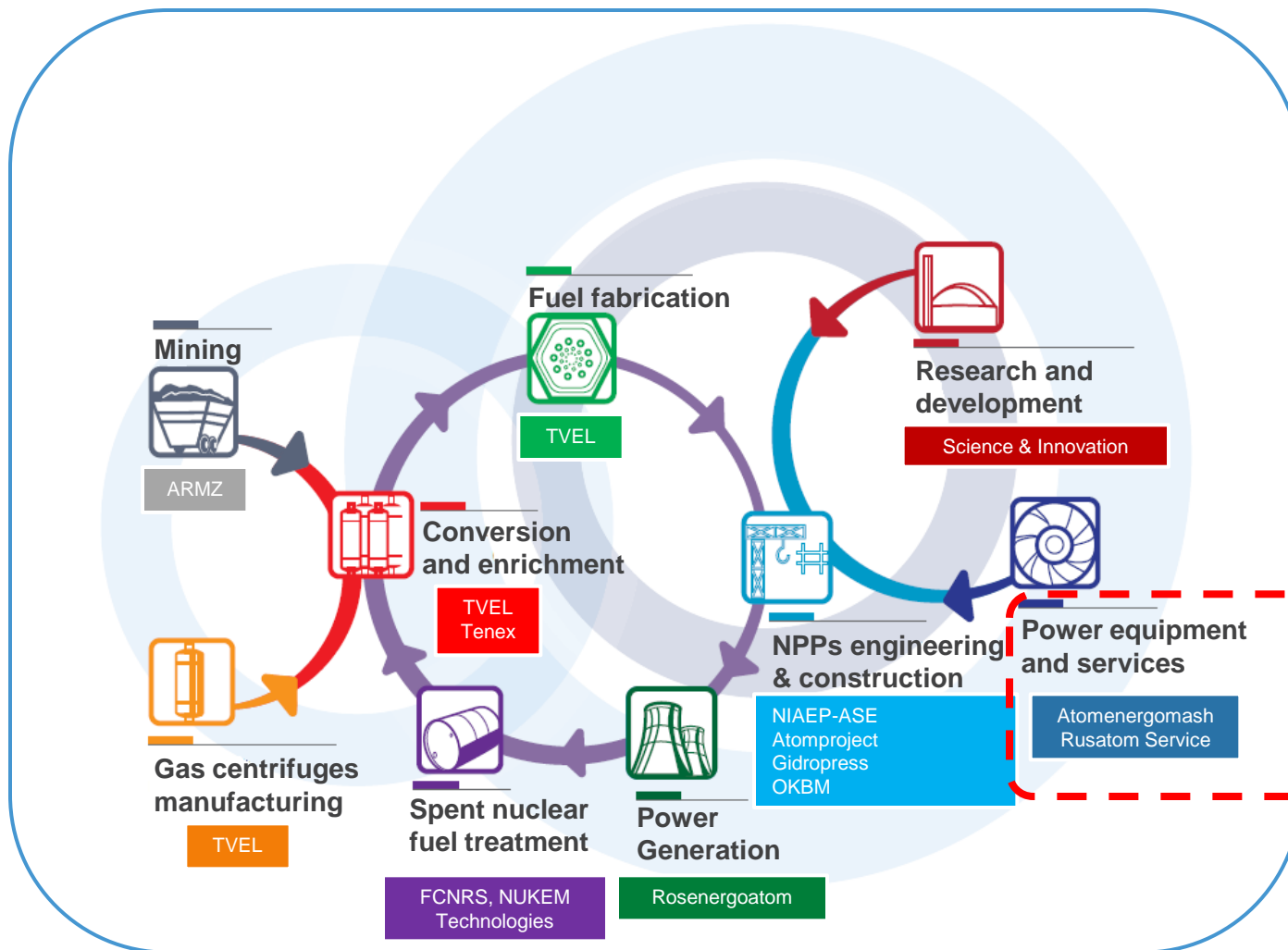
- EQUIPMENT SUPPLY IN THE NPP VALUE CHAIN
 - ATOMENERGIMASH: BUSINESS PROFILE & PRODUCT PROFOLIO
 - ROSATOM'S LOCALIZATION EXPERIENCE & FRAMEWORK
- 2 min
 - 8 min
 - 10 min
- Q&A SESSION

ROSATOM UNIQUE INTEGRATED NPP CONSTRUCTION SOLUTIONS



ROSATOM OFFERS COMPLETE INDUSTRIAL SOLUTIONS FROM URANIUM SUPPLIES TO NPP CONSTRUCTION OPERATION AND DECOMMISSIONING

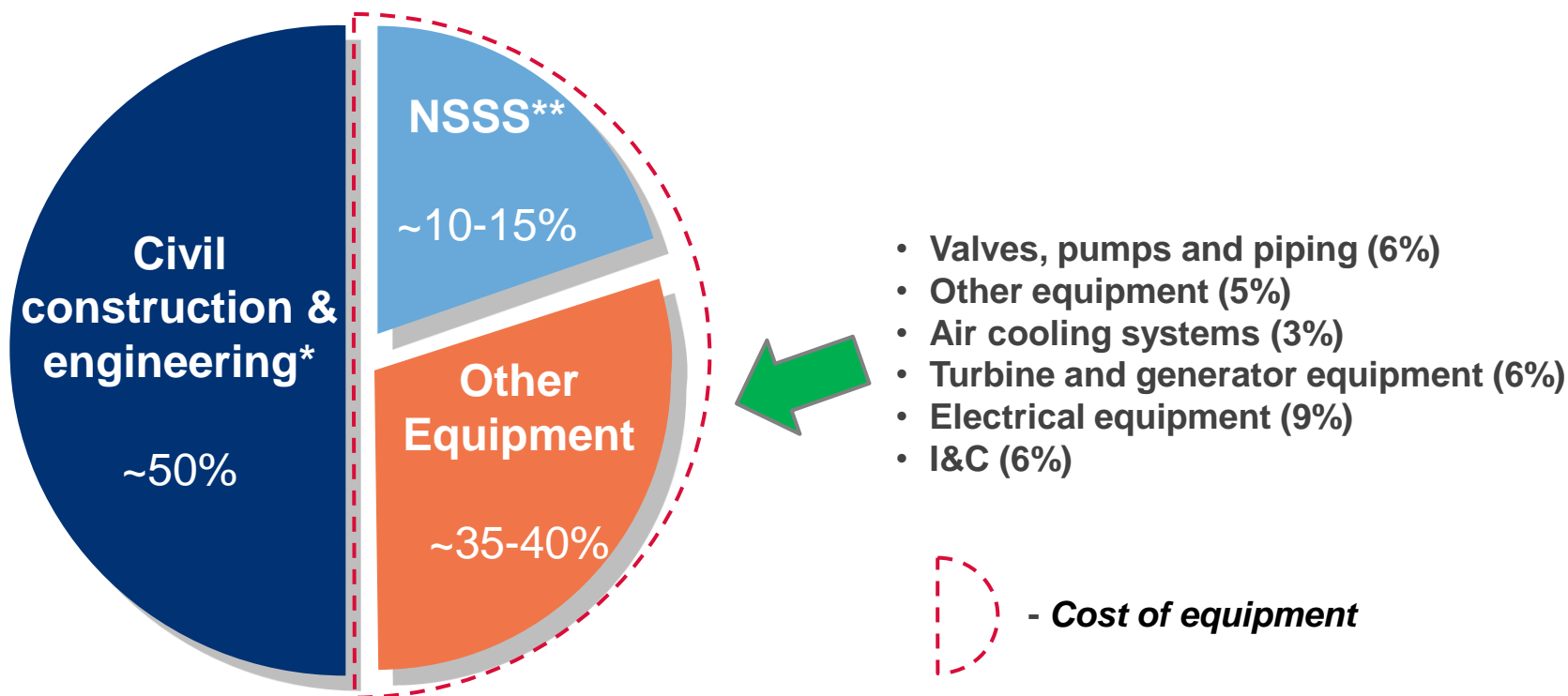
Key Activities of Rosatom*



* Boxes include names of key Rosatom's subsidiaries in the relevant sector

EQUIPMENT IS THE KEY SAFETY, EFFICIENCY & COST FACTOR

COST OF EQUIPMENT COMPRISES ABOUT 50% OF CAPEX



* Including design, project management, erection and commissioning works, training , etc.

**Nuclear steam supply system

POWER EQUIPMENT: UNIVERSAL COMPETENCES – MULTIPLE APPLICATIONS

DESIGN

MANUFACTURING

INSTALLATION

SERVICE

NUCLEAR POWER GENERATION EQUIPMENT

- Reactor vessel equipment
- Steam generators (up to 1200 MW)
- Turbine island equipment (up to 1200 MW)
- Pumps (incl. main circulation pump)
- Transportation/lifting equipment
- Control and measurement equipment
- Auxiliary equipment
- Equipment for NRW and SNF

THERMAL POWER GENERATION EQUIPMENT

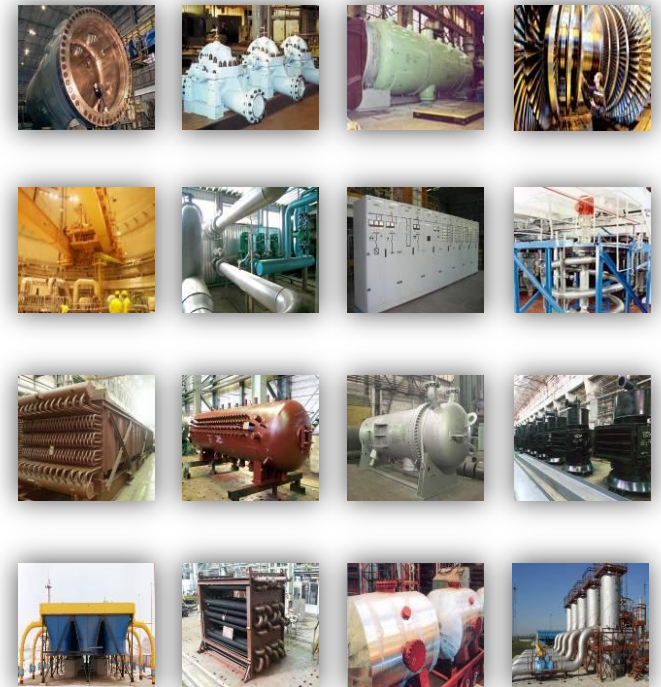
- Boilers, HRSG (up to 800 MW)
- Heat-exchangers
- Auxiliary equipment

EQUIPMENT FOR OIL&GAS INDUSTRY

- Air-cooling units and reservoir equipment
- Auxiliary equipment

METALLURGICAL COMPONENTS

- Castings (up to 300 tones) and forgings (up to 200 tones)



ATOMENERGOMASH CORPORATE PROFILE



Atomenergomash (AEM) is a leading power equipment company in Russia, supplying comprehensive solutions for nuclear, thermal power, gas and petrochemical industries

- ▶ Power equipment manufacturing and engineering branch of **Rosatom** State Corporation
- ▶ **20%** of Russian power generation equipment (PGE) industry
- ▶ Comprising more than **50** manufacturing, engineering and R&D facilities in Russia, Ukraine, Czech Republic, Hungary
- ▶ Employing a **24 000** skilled and professional workforce
- ▶ order backlog exceeds **\$3 billion**

AEM's equipment is installed at more than 13% of NPPs and at about 2% of TPPs worldwide, including 40% of power plants in Russia and CIS



Unique production capacity, strong research base and wide-ranging expertise are the basis for successful and sustainable development of AEM

KEY MANUFACTURING & ENGINEERING UNITS



Uniting enterprises of cutting-edge technological and production competences



Machine-Building Plant "ZiO-Podolsk"

One of the leading enterprises in Russia's PGE industry with more than 90 years of history, specializing in production of heat-exchange and pressure vessel equipment for nuclear and thermal power



Petrozavodskmash, branch of AEM-Tech

The facility produces equipment for the nuclear, petrochemical and pulp & paper industry.



Central Design Bureau of Machine Building

One of the leading enterprises in Russia, creating special pump and material handling equipment for nuclear power



ALSTOM Atomenergomash

The joint venture with Alstom in engineering and production of half-speed turbines and generator «Arabelle» with the output capacity of 1200-1700 MW for NPPs



OKBM Afrikantov

One of the leading design organizations of nuclear engineering in Russia, a major research and production center for mobile medium & small scale nuclear reactors and Fast Breeder Reactor technology



Volgodonsk-Atommash, branch of AEM-Tech

The company specializes in manufacturing of the main VVER reactor plant equipment and of equipment for refineries, petrochemical and mining industries



Energomashspetsstal (Ukraine)

One of the leading enterprises producing large castings and forgings of specialty steel grades for the power, shipbuilding and steel industries



Sverdlovsk Research Institute for Chemical Engineering

A leading enterprise in the field of equipment and complex process systems for the radiochemical production, nuclear-fuel cycle, treatment and disposal of nuclear waste



Arako (Czech Republic)

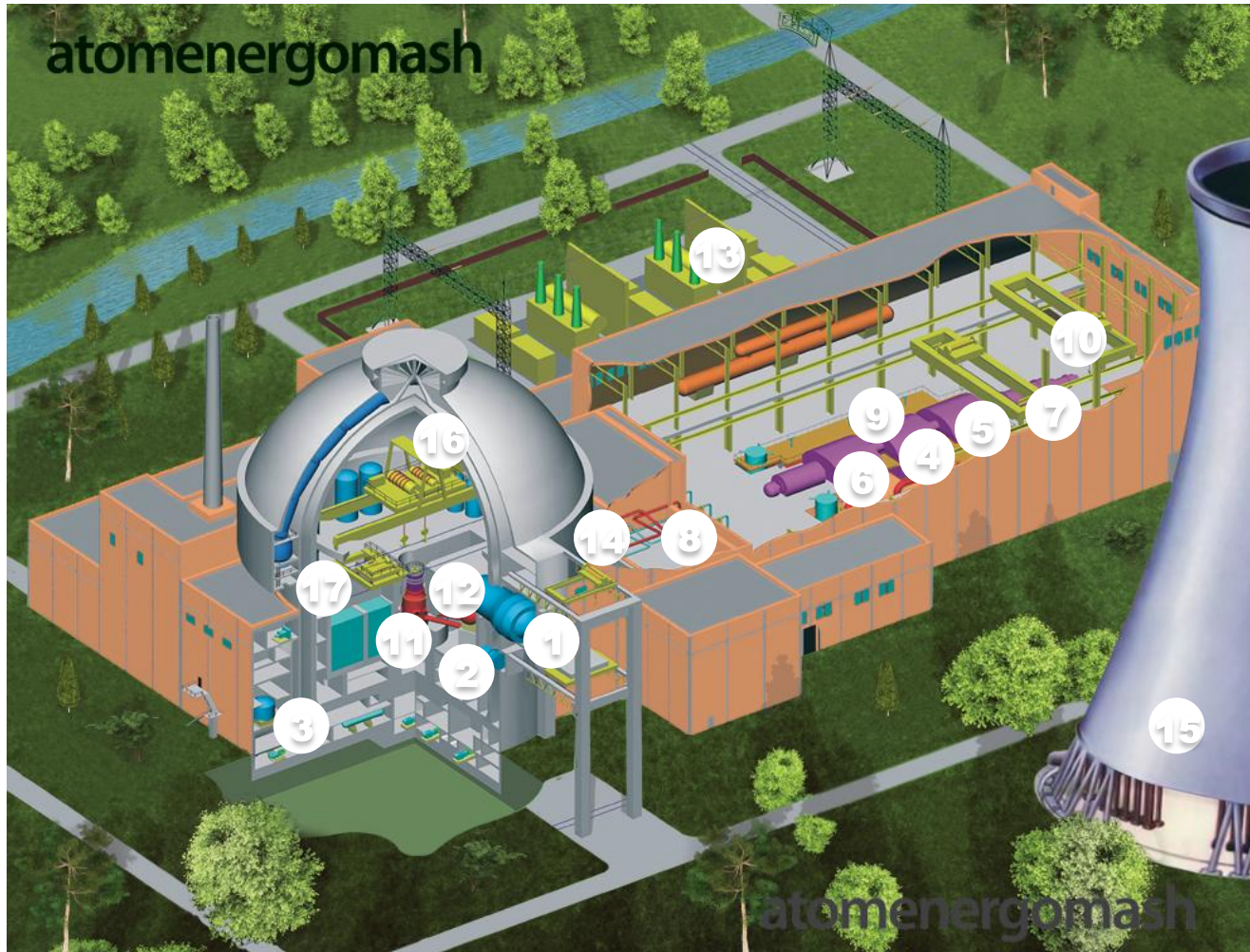
The company produces valves for the nuclear and thermal power, chemical, petrochemical and natural gas industries



OKB GIDROPRESS

Chief design bureau of VVER reactor unit technology – the complex set of engineering, experimental research and production works for nuclear power plants.

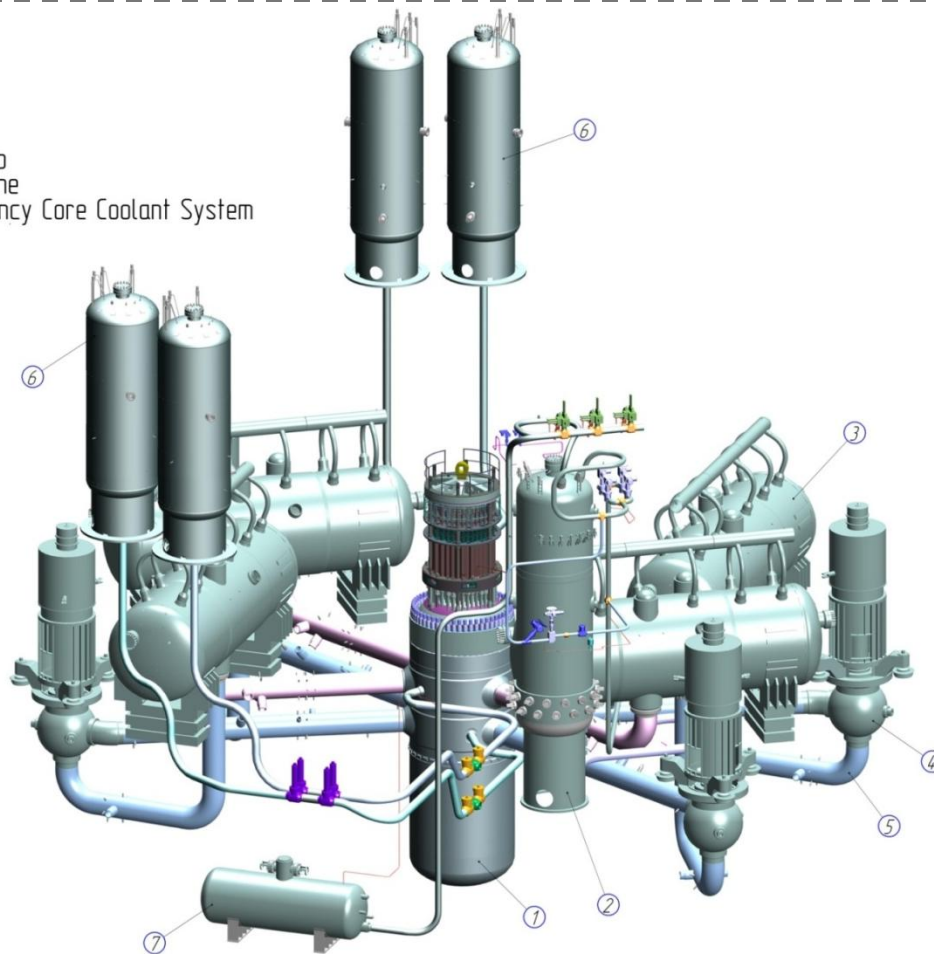
CORE PRODUCTS FOR NUCLEAR POWER PLANTS



- 1 **Steam generator**
- 2 **Piping of emergency core cooling system, pressurizer system, planned and emergency cooling down system**
- 3 **Spray heat exchanger**
- 4 **Moisture separator-reheater**
- 5 **High-pressure heater**
- 6 **Turbine piping**
- 7 **Delivery water boiler**
- 8 **Heat exchangers**
- 9 **Turbine**
- 10 **Generator**
- 11 **Reactor pressure vessel**
- 12 **Pumps, main circulation pump**
- 13 **High-voltage equipment**
- 14 **Valves**
- 15 **Cooling tower**
- 16 **Fuel handling machine**
- 17 **I&C**

VVER NSSS EQUIPMENT

- 1 - Reactor
- 2 - Pressurizer
- 3 - Steam Generator
- 4 - Main Coolant Pump
- 5 - Main Circuit Pipeline
- 6 - Vessel of Emergency Core Coolant System
- 7 - Bubbler Vessel



ARABELLE™ HALF SPEED TURBINE TECHNOLOGY

Integrating Russian and European technologies to build new generation nuclear power plants – a Joint Venture with Alstom

ALSTOM

AAEM
ALSTOM ATOMENERGOMASH

 **atomenergomash**
COMPANY OF ROSATOM

49%

51%



Manufacture of 1200–1800 MW class turbines, generators and heat exchangers for nuclear applications

Supply of complete secondary loop packages for nuclear applications

Retrofit of turbine island equipment at nuclear power plants

Supply of emergency diesel generators for nuclear applications

After-sale service of turbine hall equipment at nuclear power plants

CORE SOLUTIONS FOR THERMAL POWER PLANTS



1 Boiler equipment

HRSGs
Utility boilers
Gas and air ducts
Large-size welded structures

2 Heat-exchange equipment

Low pressure heaters
High pressure heaters
Delivery water heaters
Vessels and tanks
Water-to-water heaters
Steam-water heaters

3 Permanent pipelines

Permanent pipelines

4 Water treatment

Distilling and desalination plants
Deaerators

5 Cooling systems

Cooling systems, cooling towers

6 Auxiliary equipment

Piping

Filters

Pumps

Fans

Power
accessories

PRODUCTS FOR OIL&GAS PROCESSING INDUSTRIES



HEAT EXCHANGERS



COLUMNS



VESSELS



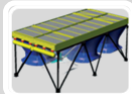
REACTOR EQUIPMENT



TUBE FURNACES



STEAM GENERATORS



AIR COOLERS



DUST COLLECTORS



REGENERATORS



**FUEL GAS, START GAS AND
IMPULSE GAS TREATMENT
UNITS**



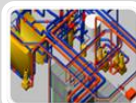
**EQUIPMENT FOR GAS-MAIN
PIPELINES**



COOLING TOWERS



VALVES



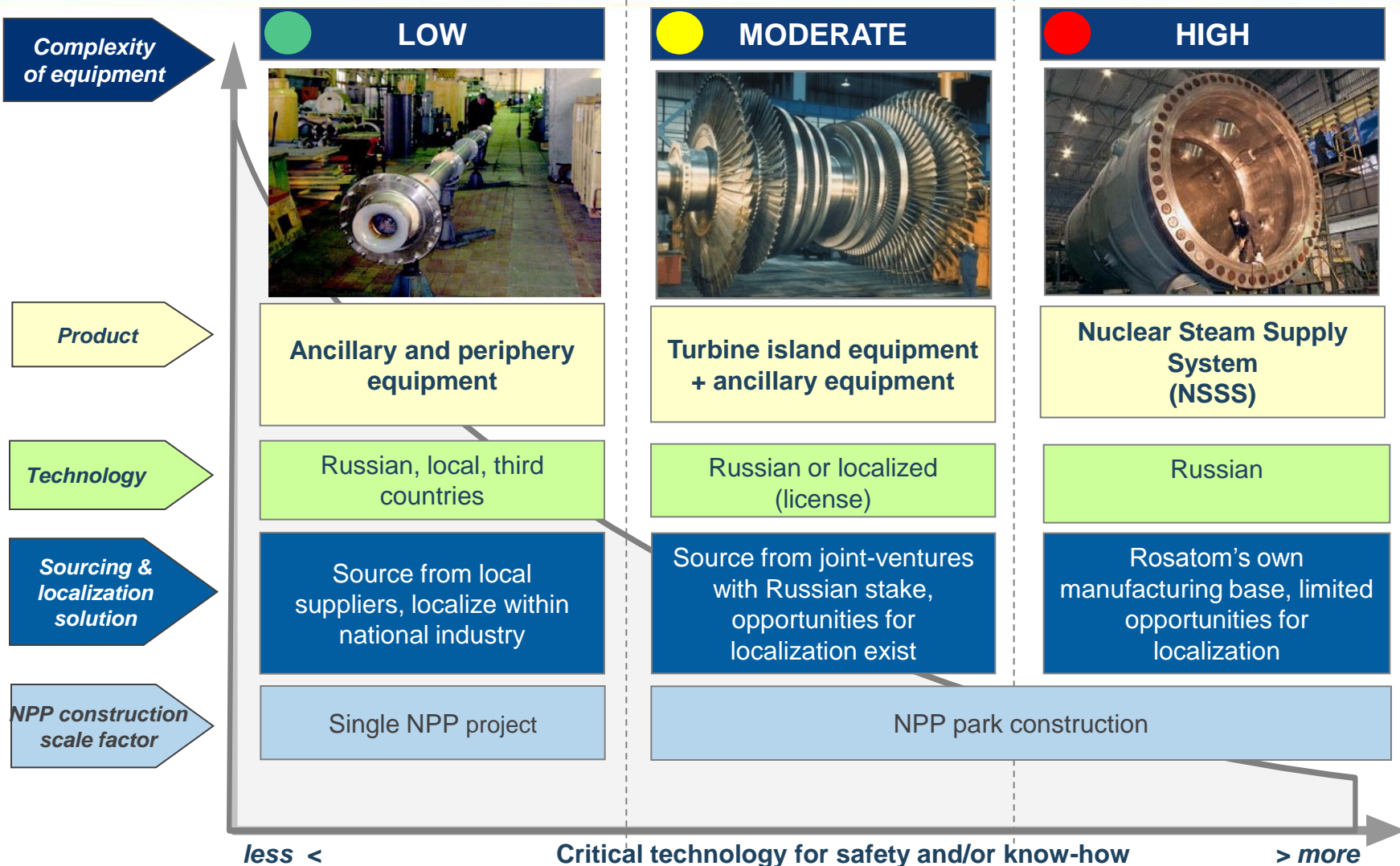
PIPELINE FITTINGS



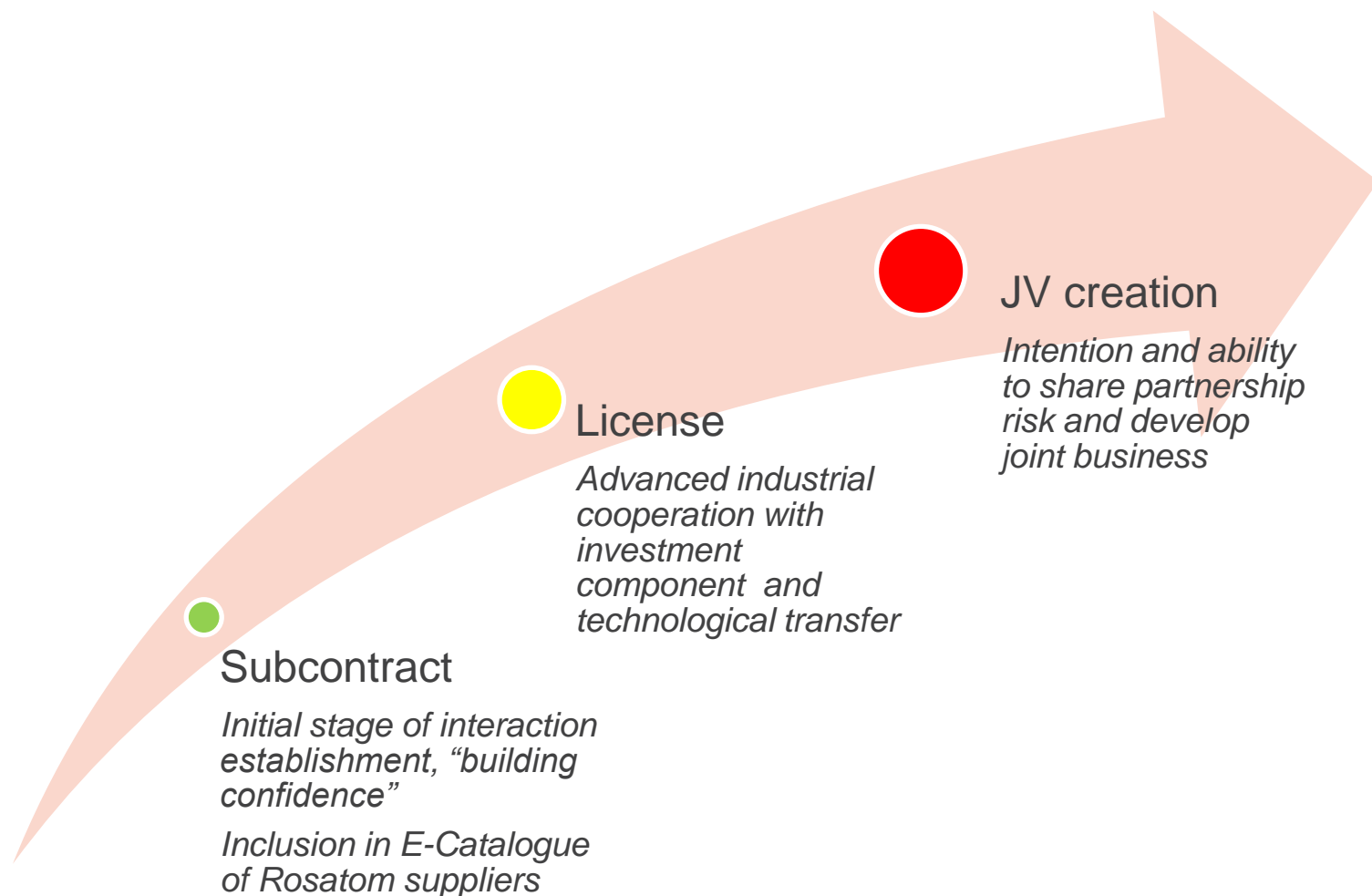
PUMPING EQUIPMENT



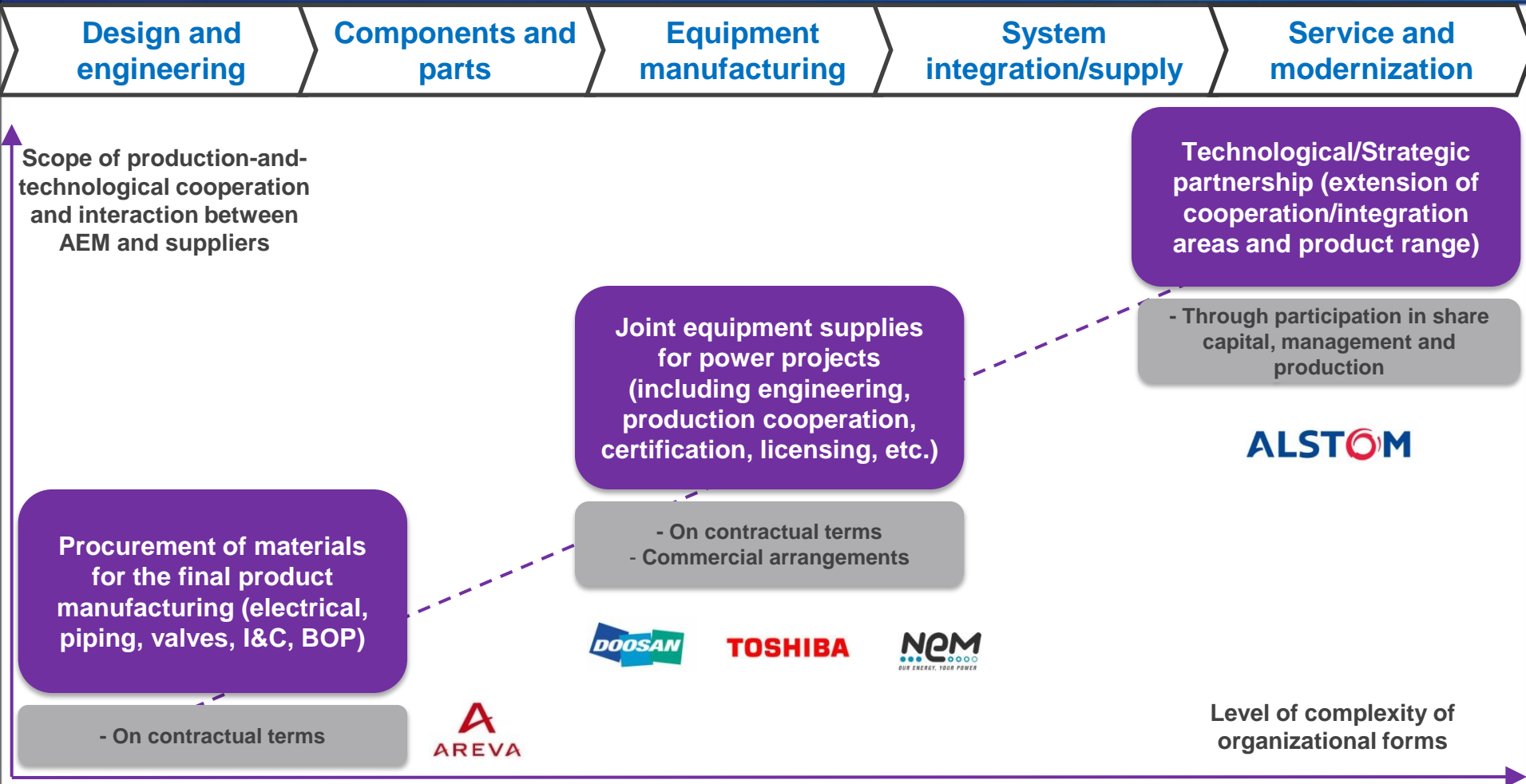
SOURCING AND LOCALIZATION SOLUTIONS FOR NPP EQUIPMENT



BASIC APPROACH ON LOCALIZATION OPTIONS IN NPP CONSTRUCTION PROJECTS



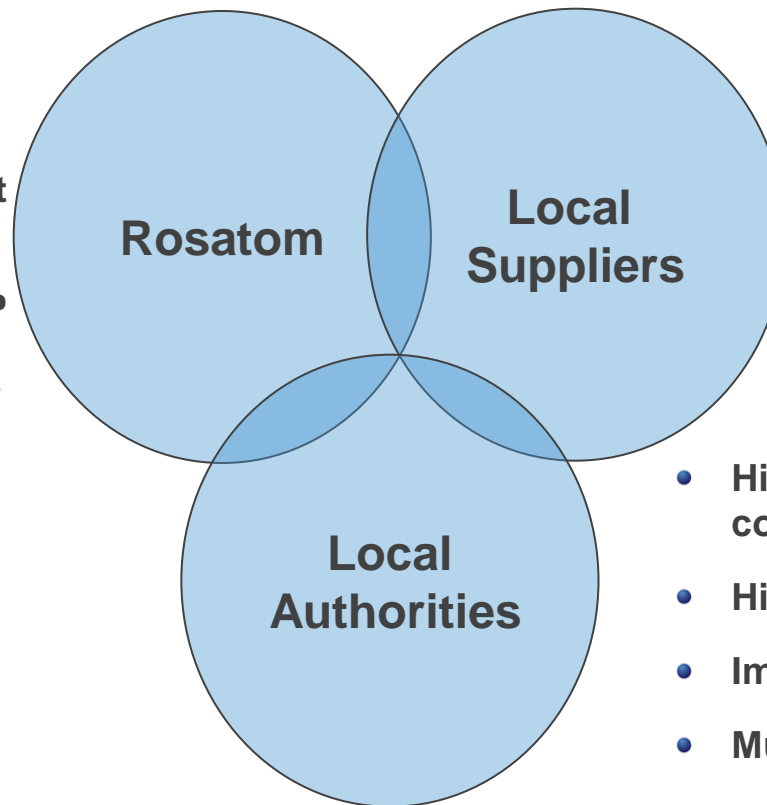
AREAS OF COOPERATION WITH FOREIGN PARTNERS THROUGHOUT THE VALUE CHAIN



AEM is willing to explore various forms of cooperation with suppliers depending on commercial and strategic interest

BENEFITS OF LOCALIZATION

- Savings from local deliveries
- Improved chances to win NPP construction contract
- Development of base for safe operation of new NPP
- Diversification of supplies



- Revenue generation
- Technology transfer
- Profits

- Higher taxes from salaries & company profits
- Higher employment
- Improved GDP per capita
- Multiplication effects

Rosatom localization solutions are based on Win-Win principle in order to support local economy through involvement of local suppliers into nuclear programme

ROSATOM'S EXPERIENCE IN EQUIPMENT PRODUCTION AND SERVICES LOCALIZATION & SOURCING: SUCCESS STORIES

1970-1980

LOVIISA Finland

First global sourcing project. Became known as “Eastinghouse”, where Siemens and Westinghouse were attracted by Russian organizations.

Is considered to be one of the most effective NPPs in the world.

1980-2000

TEMELIN Czech Republic

In implementation of this project first full scope localization approach was fulfilled.

Within the scope of Council for Mutual Economic Assistance nuclear equipment production was developed in Czech Republic, Slovakia, Poland, ...

2002-2011

KUDANKULAM India

Significant local content sourcing, especially in civil construction. Broad localization program is envisaged.

2012

Proposal for Temelin NPP 3,4 based on VVER- 1200 design

Strong involvement of European contractors. European investors participation is envisaged. Rosatom is stake holder and financing partner in the project.

Local supplier's share in equipment and services supply

20%

30%

39%

Up to
70%

SUCCESSFUL LOCALIZATION OF NUCLEAR PROGRAM BY USSR IN CENTRAL-EASTERN EUROPE

Agreement on the Multilateral International Specialization and Production Co-Operation and Mutual Supplies of Equipment for Nuclear Power Plants for the Period of 1981 – 1990



Soviet Union

Under the Agreement, the Soviet Union carried out the transfer of working drawings, production technology, consulting and providing concrete assistance in solving issues arising in the process of manufacturing of the equipment, including supply of spare parts.

Deliveries were realized from:

People's Republic of
Bulgaria



Biosecurity, capacitors, axial and artesian pumps

German Democratic
Republic



Overhead travelling cranes, transport and technological equipment

Czechoslovak Socialist
Republic



Reactor plants, steam turbines, steam generators, pipelines of the big diameter

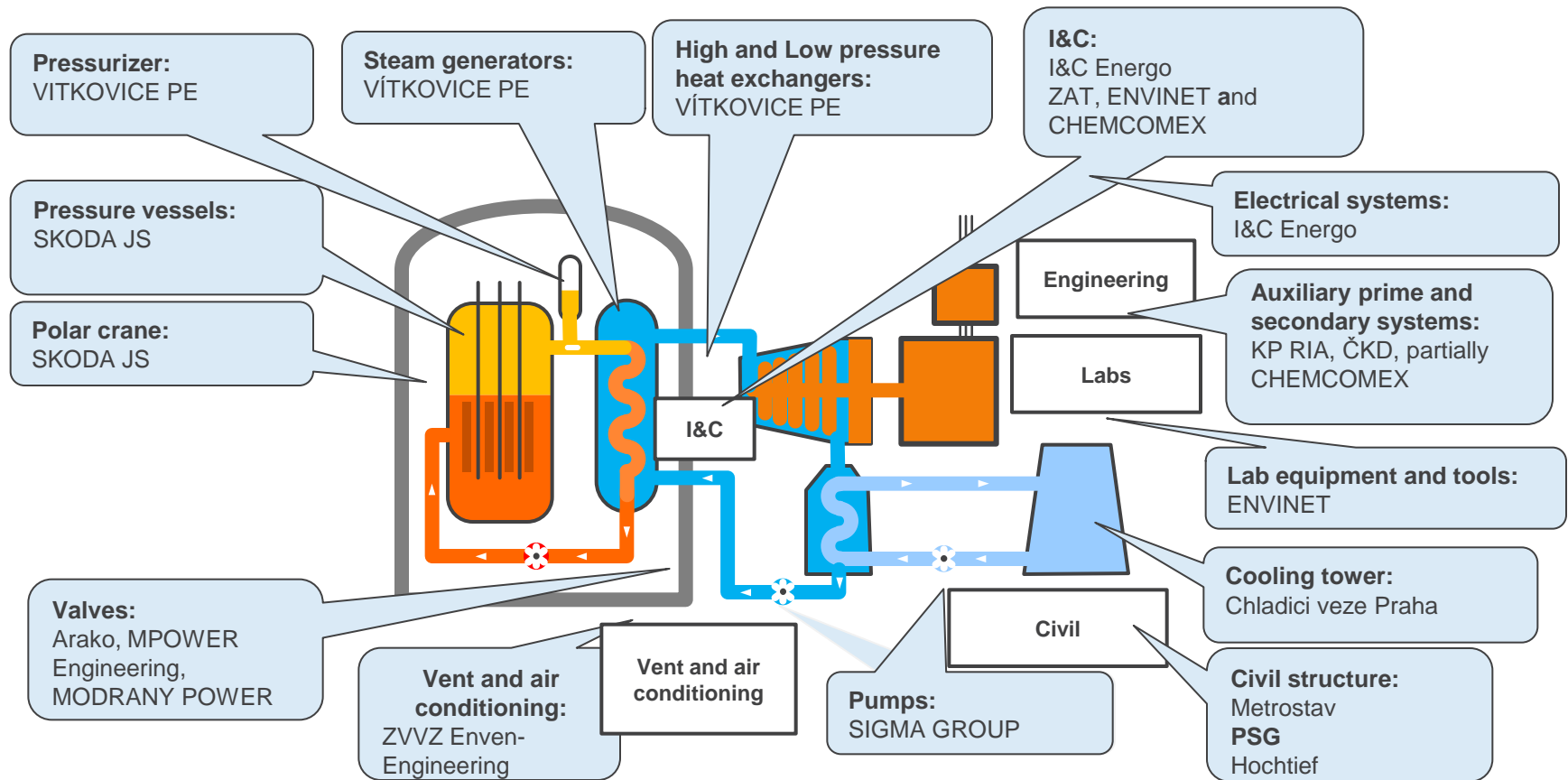
Socialist Federal
Republic of Yugoslavia



Overhead travelling cranes, nutritious and special pumps, the equipment of the multiple forced circulation circuit and drum-separators for NPP with RBMK reactors

EXAMPLE OF LOCALIZATION PROGRAM IN CZECH REPUBLIC: CURRENT LOCAL SUPPLY CHAIN

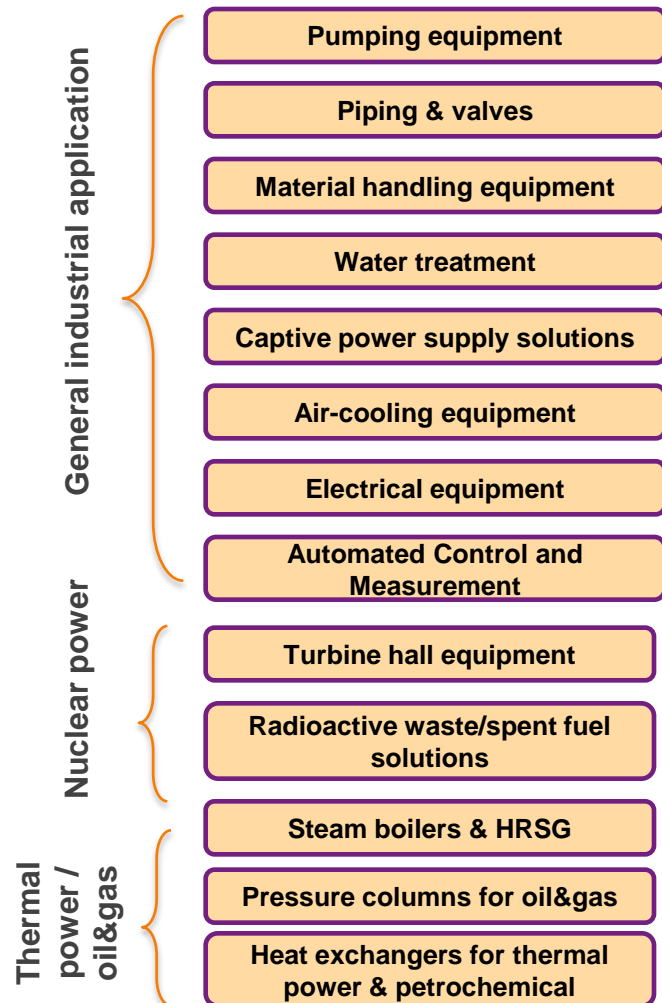
Possible Suppliers are influential and system-creative players in Czech Power industry



Local companies could have 70% of total Temelin-3,4 supplies

ATOMENERGOMASH: POTENTIAL FOR COOPERATION

Target products



Target regions



Potential scope of equipment markets for nuclear and thermal power, oil & gas and alternative energy sectors leads to the necessity of developing commercial, strategic and technological partnerships

Thank You for Attention!

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