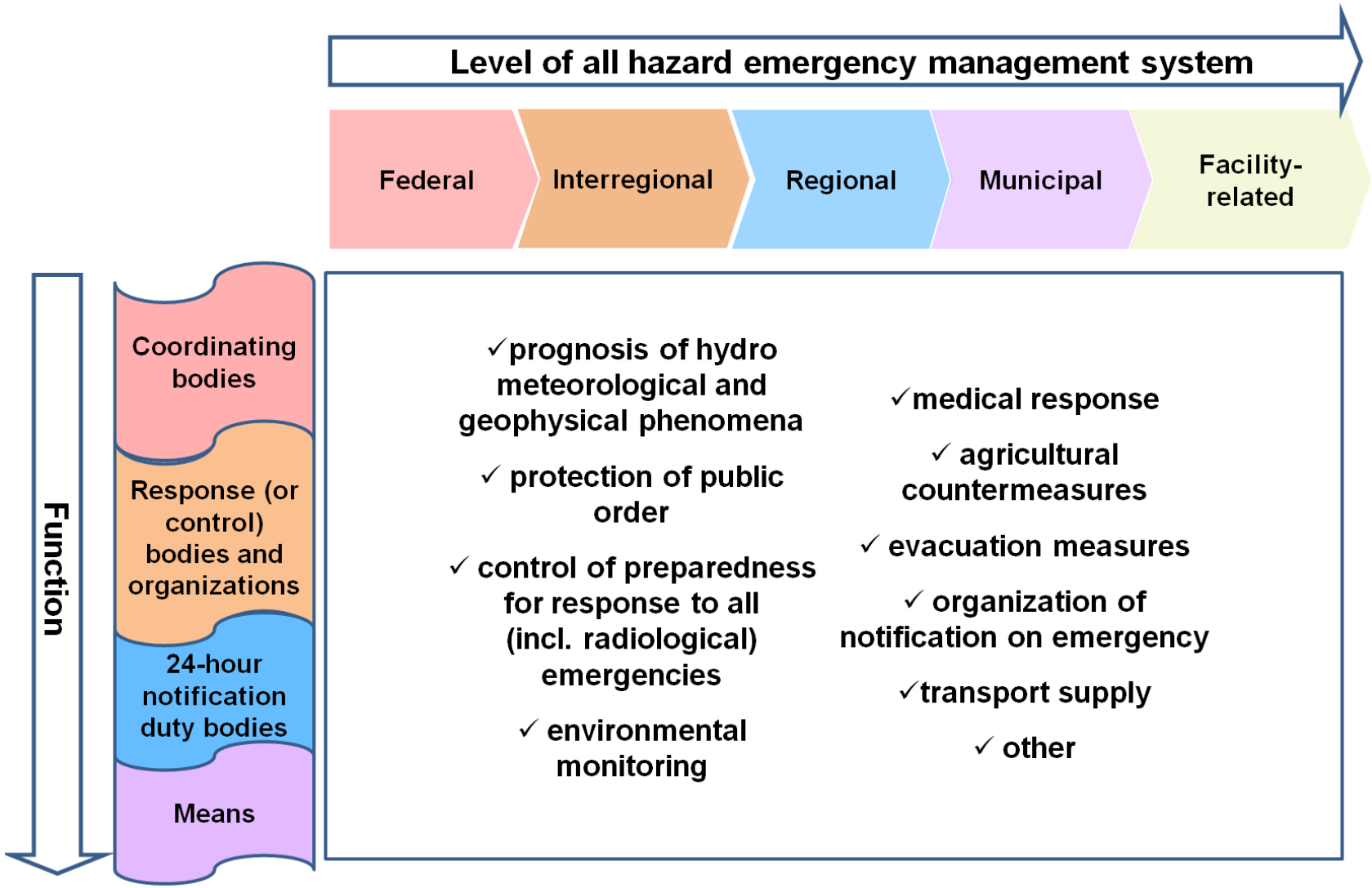
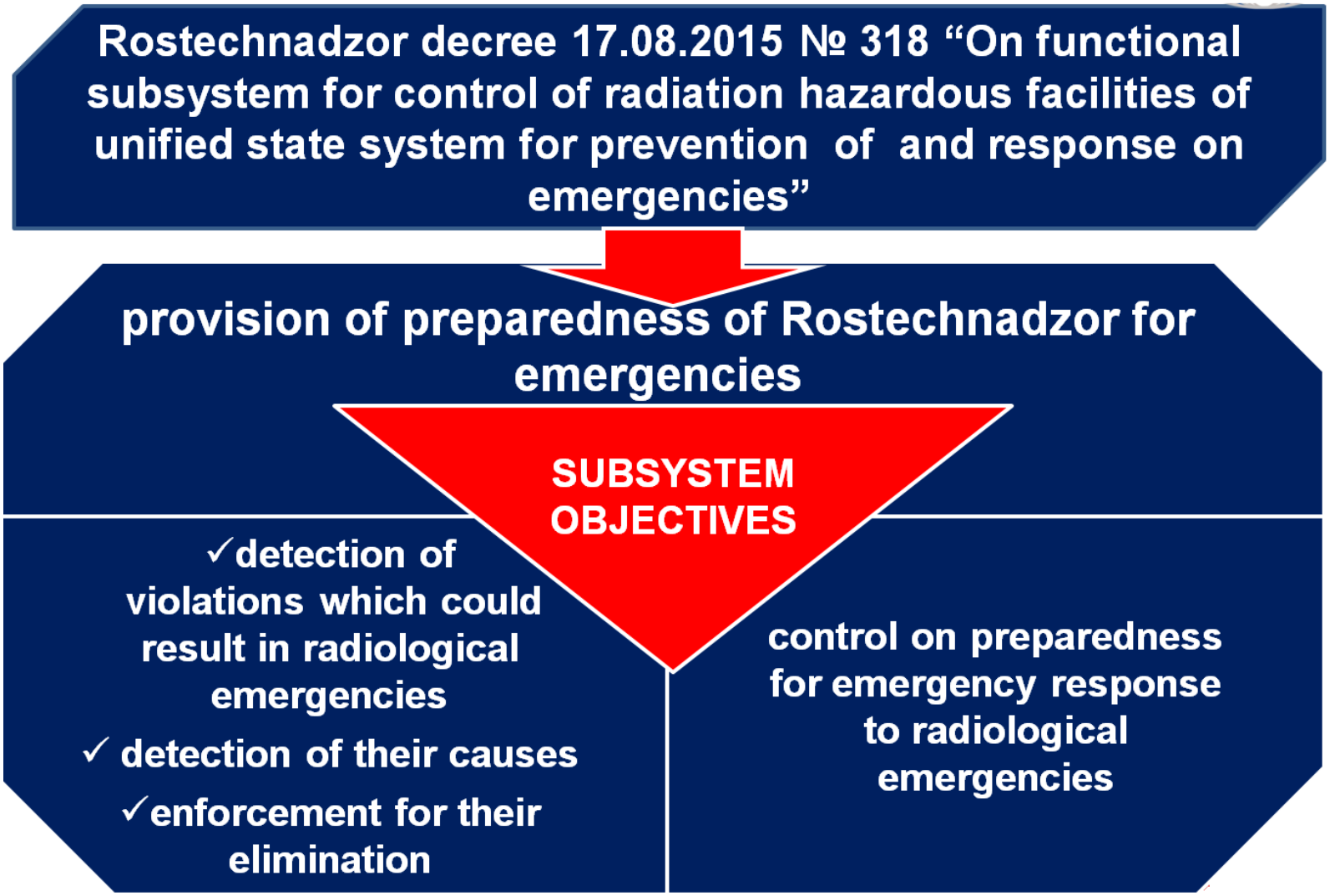
A. Shapovalov

Scientific and Technical Support to Technical and Emergency Center of Rostechnadzor

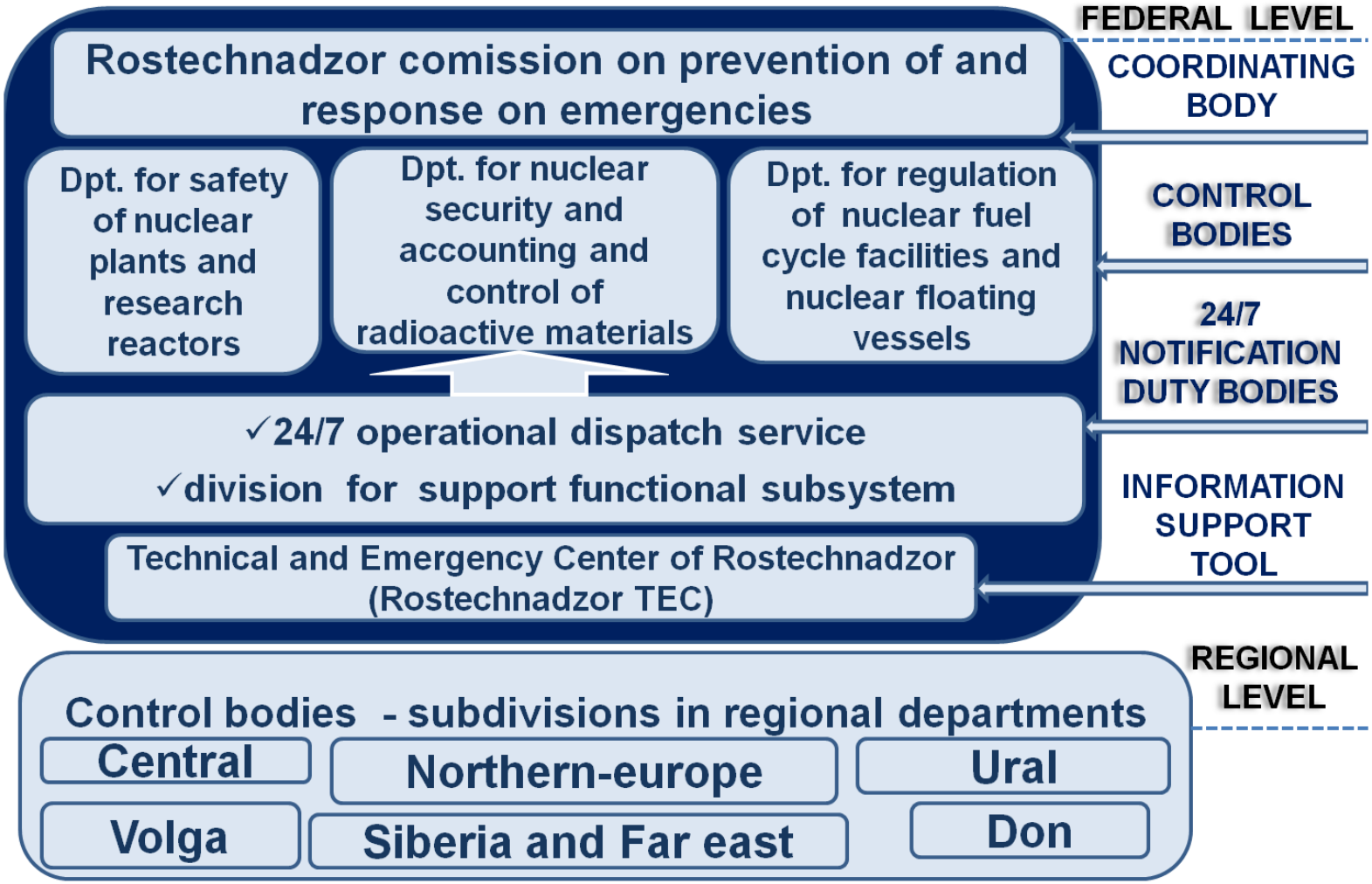
Russian All Hazard Emergency Management System



Objectives of Functional Subsystem for Control of Radiation Hazardous Facilities



Organizational Structure of Functional Subsystem for Control of Radiation Hazardous Facilities



Rostechnadzor Functions on Informing Local Authorities

- Government Decree 24.03.1997 № 334 “On exchange with emergency information in the Russian Federation”
  - state authorities, liable for control on situation on hazardous facilities, have to inform local authorities on potential and current emergencies

- Rostechnadzor functions on informing of locals under functional subsystem for control of radiation hazardous facilities
  - communication with federal and local authorities

Tasks of Rostechnadzor TEC

Routine activity

- 24/7 preparedness for reception of information on emergencies
- Preparedness to inform Rostecnadzor TEC working group members
- Maintenance of operability of evaluation codes and up-to-dateness of documents

Emergency (exercises and real emergencies)

- Informing and calling over members of Rostechnadzor TEC working groups
- Informing of authorities, media, public
- Dose assessment and prognosis
- Assessment and prognosis of integrity of physical barriers and performance of safety functions
- Control over compliance with safety regulations and emergency response plans and instructions

SEC NRS Support to Rostechnadzor TEC

Routine activity

24/7 preparedness for reception of notifications and informing of working group members

SEC NRS involvement

Development of assessment tools

Emergency (exercises and real emergencies)

Informing authorities, media, public

SEC NRS involvement

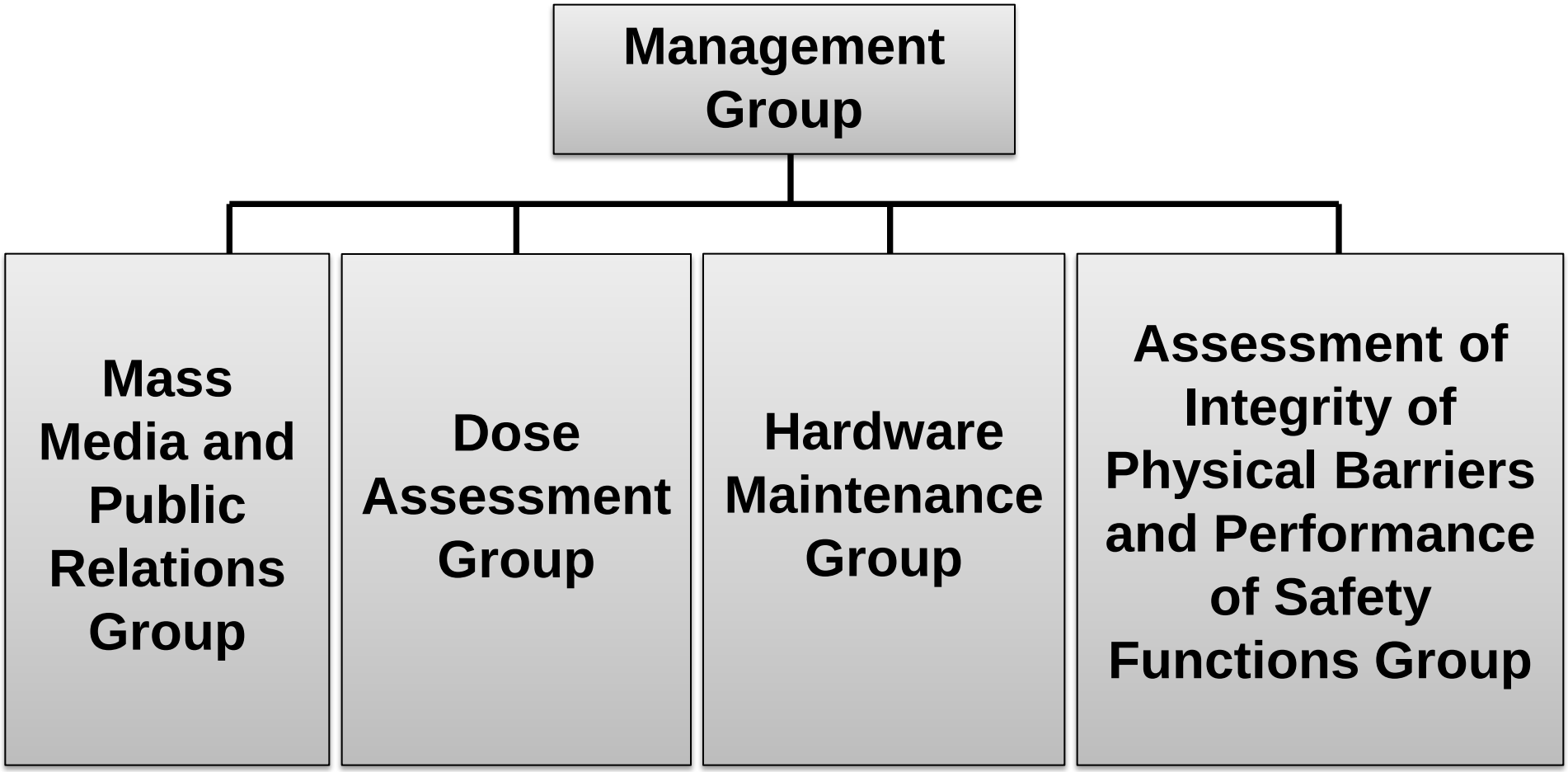
Experts-members of working groups arrive to Rostechnadzor TEC upon calling over

Carrying out dose assesment and prognosis

Carrying out assessment of integrity of physical barriers and performance of safety functions

Carrying out analysis on compliance with regulations, response plans, instructions

Rostechnadzor TEC Working Groups Organizational Structure



The Regulatory Basis for Control of Emergency Preparedness

- activation of emergency response
- notifying on emergency
- assistance to operator in emergency response
- analyzing the radiological emergency and the emergency response, investigation of causes of emergency

Control of the emergency preparedness and detection of violations that could result for an emergency

Inspections

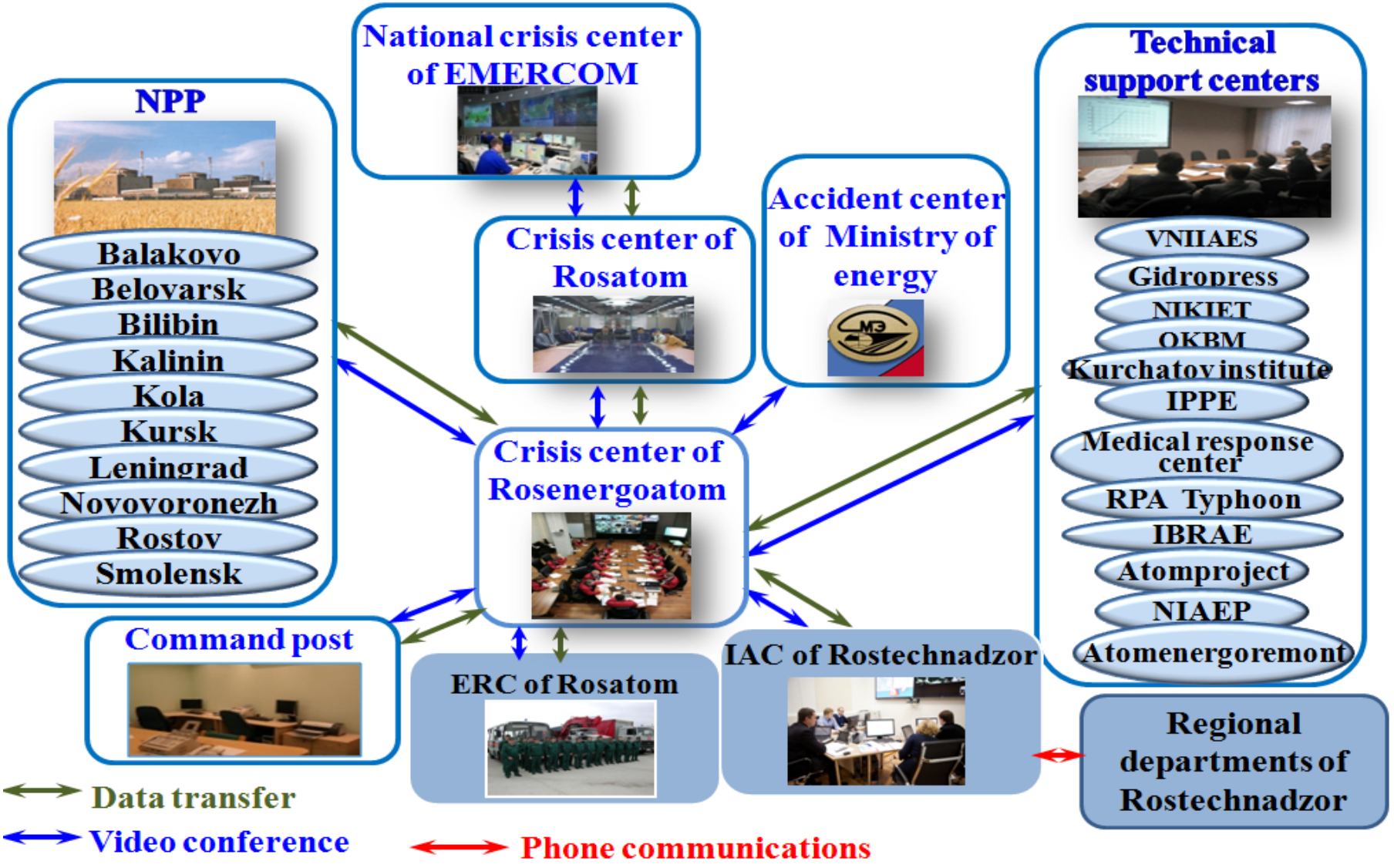
Emergency exercises

Basis of control - rules and regulations

New Regulations on Notification on NPPs Emergency

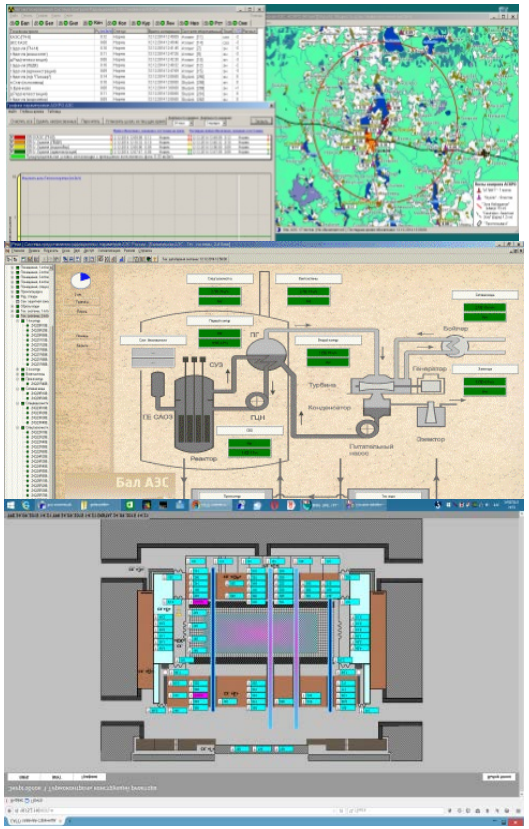
- SEC NRS developed the new regulations NP-005-16
  - much more stringent notification time objectives (within 15 minutes after classification of emergency)
  - Technical and Emergency Center of Rosenergoatom provides functioning of the unified information system under which authorities and organizations, involved in emergency response, are provided with real-time data on
    - state of NPP units
    - results of radiation monitoring of process streams, source and environment
    - meteorological conditions

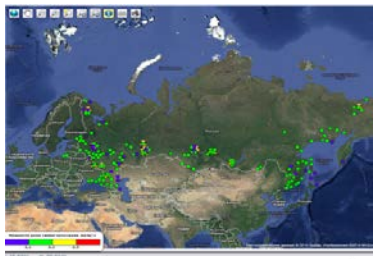
Unified Information System



Monitoring Data Received by Rostechnadzor TEC

- Within the framework of a unified information system:
  - dose rates on site and inside of buildings
  - off site dose rates
  - activity concentrations of process streams
  - non radiological process parameters
- Other sources
  - gross-beta and alpha activity concentrations off-site (SARSMS)
  - messages from operator under procedures of investigation of causes of emergency





New Requirements on Radiation Monitoring Systems

- SEC NRS developed the new regulations NP-001-15
  - radiation monitoring systems (their elements) are important for safety
  - systems for off-site radiation monitoring shall withstand external impacts and shall be provided with emergency power supply

- the compliance with new requirements will allow authorities and organizations, involved in emergency response and Rostechnadzor TEC to have off-site dose rates even in case of external events

Assessment Tools Used by SEC NRS Experts in Support to Rostechnadzor TEC

- Tools used for dose assessment :
  - NOSTRADAMUS – dose assessment due to accidental airborne releases
  - CASSANDRA – dose assessment due to accidental waterborne releases
  - methodology for generic assessment of accidental releases (IAEA TECDOC-955)
  - SCALE – core inventory calculations
- Tools used for assessment and prognosis of integrity of physical barriers and performance of safety functions:
  - Rainbow-TPP – reactor thermohydraulics and neutronics (within coolant pressure boundary)
  - TPP – 2nd circuit simulation, safety systems, containment

Methodology for Generic Assessment of Accidental Releases

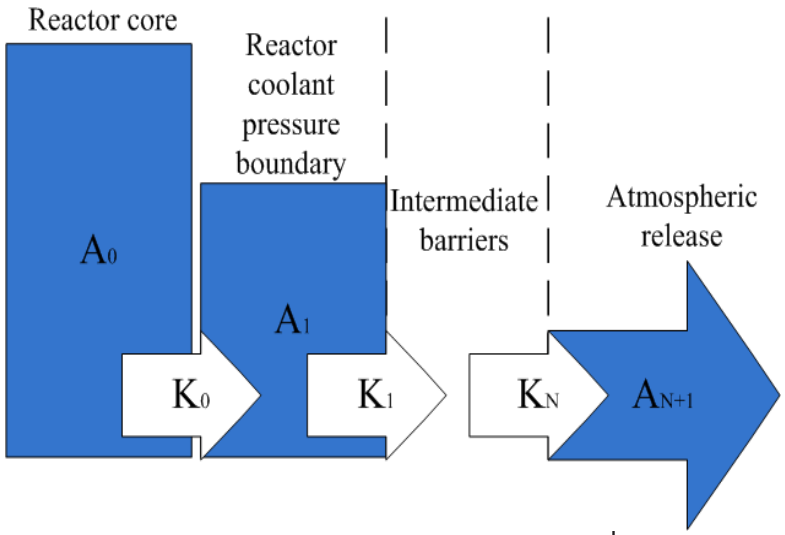
- Methodology developed by SECNRS
- Methodology adopted from IAEA TECDOC-955 and NRC Response technical manual (RTM-96)

$$A_i = A_i^0 \cdot k_0 \cdot k_1 \cdot k_2 \cdot \ldots \cdot k_n$$

A_i - activity of specific radionuclide i in release

A^0_i - activity located within the first physical barrier

- k_0 … k_n factors (specific for each release pathway) that characterize fraction of activity which not retained within specific physical barrier

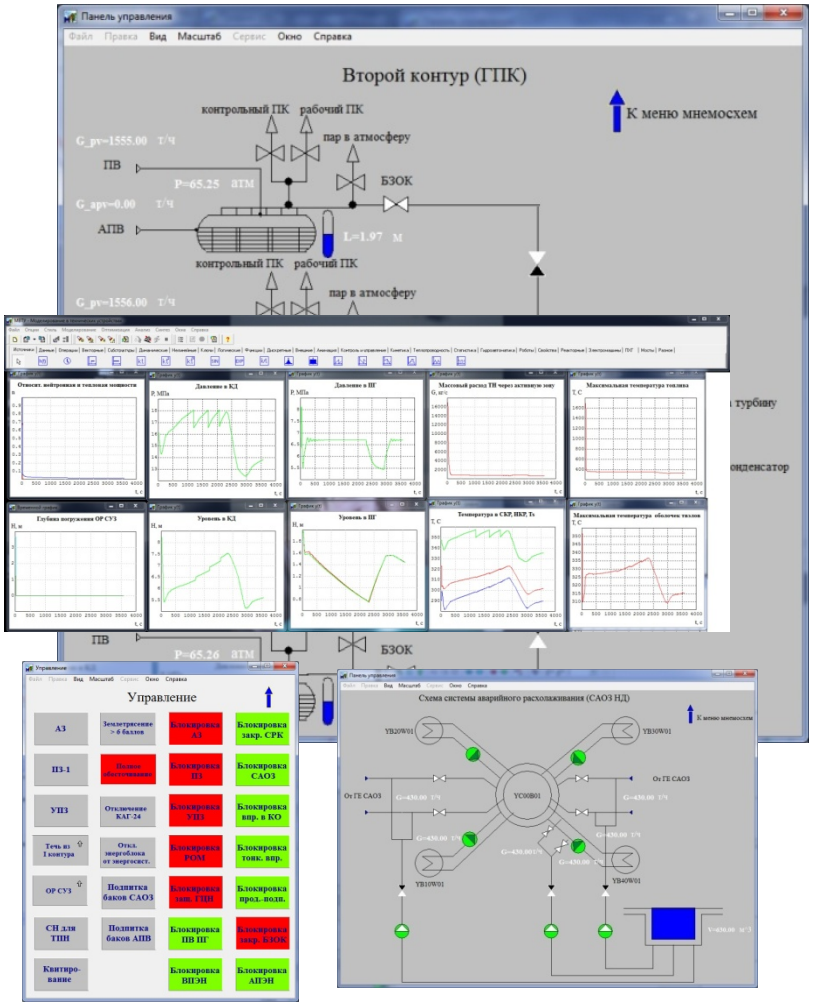


Verification of the Methodology for Generic Assessment of Accidental Releases

- Methodology applicable for WWER-1000 (V-320) is developed by SEC NRS and currently being used for assessments during emergency exercises
  - the methodology is verified by comparing of its outcome with the values of accidental releases assessed in SARs
  - also the methodology is verified by comparing of outcomes with accidental releases, estimated by technical support centers of Technical and Emergency Center of Rosenergoatom during emergency exercises
  - verification revealed satisfactory (within an order of magnitude) convergence of results (I-131, Cs-137 and Cs-134)
- Methodology applicable for RBMK-1000 is developed by SEC NRS and currently being verified on emergency exercises

An Approach Used by SEC NRS Experts in Support Rostechnadzor TEC for Performance of Safety Functions

- Simulation of basic safety systems and systems of reactor and turbine system important for safety only
- Zero dimensional neutronics model used
- Simulation of core thermohydrodynamics as a few equivalent fuel assemblies ducts and one coolant duct



Application of Computer Models

- WWER NPP operated units:
  - Balakovo NPP (units 1 - 4)
  - Kalinin NPP (units 1 - 4)
  - Rostov NPP (units 1 - 3)
  - Novovoronezh NPP-1 (units 3 - 5)
  - Kola NPP (units 1 - 4)
- Unit 1 of Novovoronezh NPP-2, under commissioning
- Unit 2 of Novovoronezh NPP-2, under construction

Improvement of Rostechnadzor TEC

- In 2013 in order to improve provision of Rostechnadzor TEC with information and to facilitate of working groups activities Rostechnadzor TEC was provided with equipment for:
  - displaying of information
  - selector communication
  - wireless control of equipment of IAC of Rostechnadzor
  - audio gain
  - videoconferencing
  - audio and video record
  - commutation
- Further improvements - automated notification system (voice message, SMS message and e-mail message) of TEC working group members

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