



**РОСАТОМ**

ГОСУДАРСТВЕННАЯ КОРПОРАЦИЯ ПО АТОМНОЙ ЭНЕРГИИ «РОСАТОМ»

# **Safety Culture in the State Atomic Energy Corporation ROSATOM**

**Inspector General  
Mr. S.A. Adamchik**

**IAEA, Vienna, Austria  
22-26.02.2016**

# Stages of safety culture development and establishment of the safety priority in nuclear industry

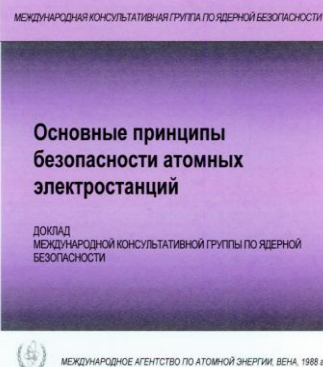
## 1986 INSAG-1

Root causes of accidents are in the human factor. It is necessary to establish and maintain “nuclear safety culture”.

## 1989

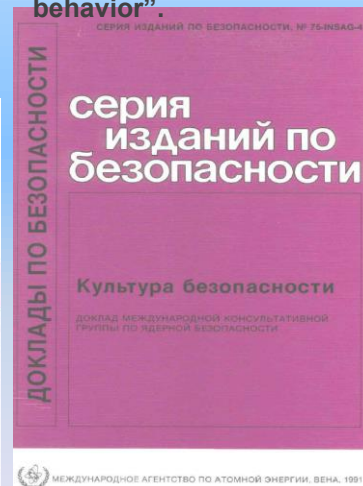
**INSAG-3** The concept of «safety culture» is called «decisive for achievement of perfection in nuclear safety» and one of «fundamental management principles».

### серия изданий по безопасности № 75-INSAG-3



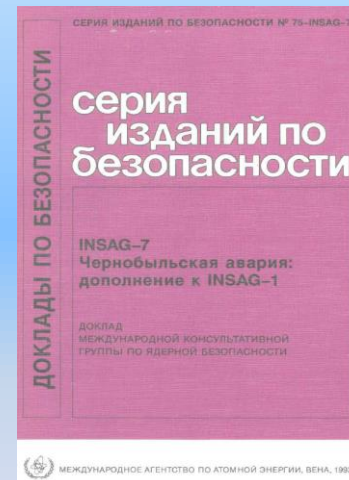
## 1991

**INSAG-4** Formulation of the safety culture definition, presentation of its concept, its components and requirements. List of questions for identification of safety culture effectiveness in organizations. Application of the term “particularities of activities ... And behavior”.



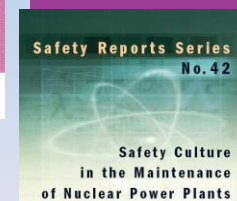
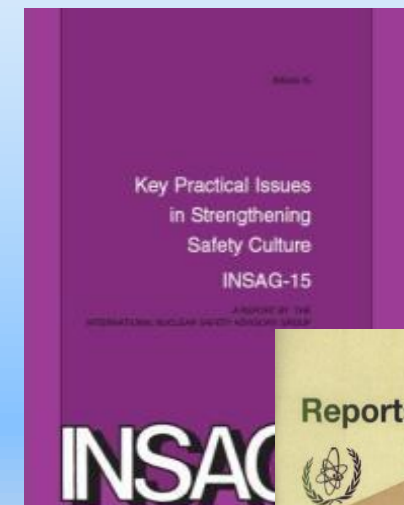
## 1993

**INSAG-7** Revision of INSAG-1 findings. Main attention is paid to safety culture during design development and elaboration of operating documentation.



## 2002

**INSAG-15** A new attempt to transfer the «intangible» safety culture properties to the universally applicable criteria for practicable application by operators and regulators.



## 1987-2015

Series of multiple reports, publications, overviews, research results, articles and presentations from nuclear experts and experts from other fields associated with technogenic hazards.



**How to formulate today?**

**How to implement?**

**How to assess?**

# What concepts of «SAFETY CULTURE» we use

«**Safety Culture** is a set of characteristics and particularities in activities of organizations and behavior of individuals that envisage such attention to issues of safety at nuclear facilities, which is determined by its significance as highest priority»

*(INSAG-4)*

«**Safety Culture** is a qualification and psychological preparedness of all individuals setting ensuring safety of nuclear power plants as priority goal and internal demand leading to mindset of responsibility and self-control in performance of all activities impacting safety»

*(Russian safety regulations  
NP-001-97 (OPB-88/97)*

«**Safety Culture**» includes values and behavior of an organization, sets by its leaders, accepted by its members that make nuclear safety a priority.  
*(WANO)*

# What objects cover **SAFETY CULTURE** as necessary environment for ensuring activities

**Nuclear Power  
Plants**



**Nuclear Ships**



**Nuclear Research  
Installations**

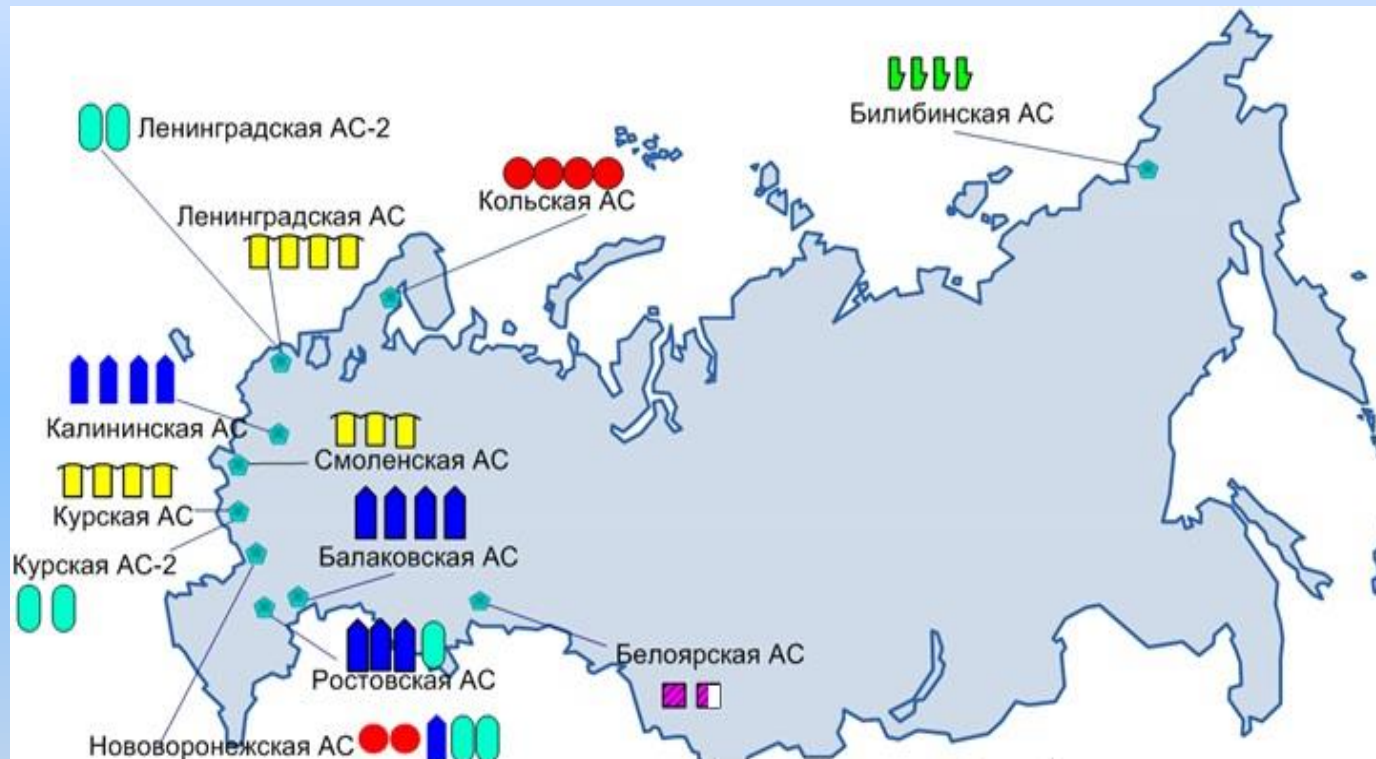


**Fuel Cycle Facilities**



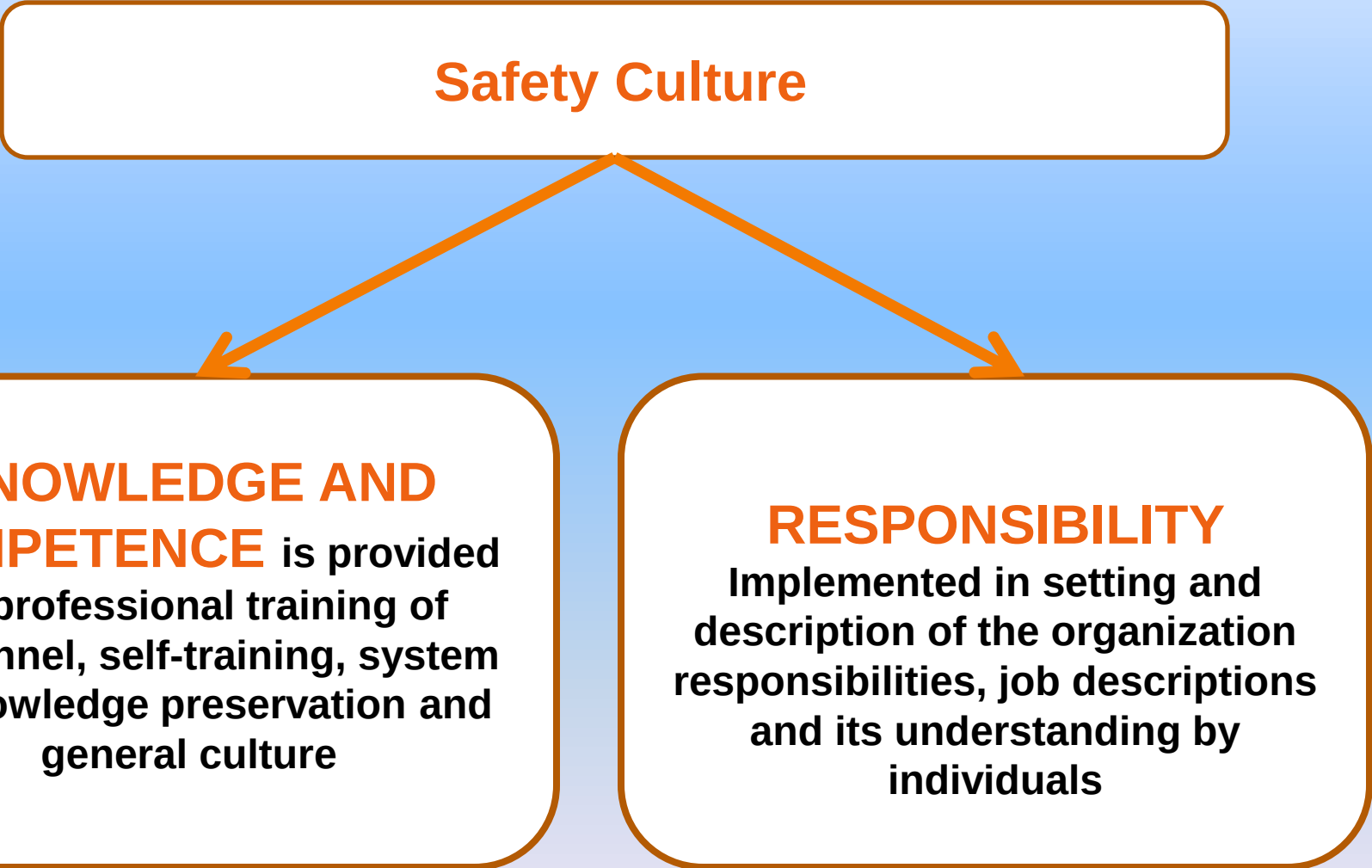


# Map of location of operating and constructing NPP Units of Russia



|                              |                                                                        |
|------------------------------|------------------------------------------------------------------------|
| <b>10</b>                    | NPPs are in operation                                                  |
| <b>34</b>                    | Units are in operation ( <b>32</b> Units are in use, as of 12.02.2016) |
| <b>1</b>                     | Unit БН-800 is in startup of pilot operation (SPO)                     |
| <b>7</b>                     | Units are under construction                                           |
| <b>26242 MW</b>              | Installed nuclear capacity                                             |
| <b>195,2 BN kW-h / 18,6%</b> | Produced electric power in 2015 / NPPs rake off in Russian Energy      |

## Safety Culture



```
graph TD; SC[Safety Culture] --> KC[KNOWLEDGE AND COMPETENCE]; SC --> R[RESPONSIBILITY];
```

**KNOWLEDGE AND COMPETENCE** is provided by professional training of personnel, self-training, system of knowledge preservation and general culture

**RESPONSIBILITY**  
Implemented in setting and description of the organization responsibilities, job descriptions and its understanding by individuals

# Organizational basics of management, development and implementation of Safety Culture



- Safety Culture at the State level

- Safety Culture at industry level - level of the State Atomic Energy Corporation ROSATOM

- Safety Culture at utility level – Electric Power Division of ROSATOM - JSC Concern Rosenergoatom

- Safety Culture at the level of Nuclear facility - NPP



# Safety Culture at the state level

## Unconditional pursue of international agreements (conventions)

Convention on nuclear safety, Vienna, 17.06.1994.  
 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, 29.09.1997  
 Convention on physical protection of nuclear material, Vienna, 26.10.1979, as amended on 08.07.2005.

## Federal laws:

Dated 21.11.1995 No. 170-FZ "On the use of atomic energy";  
 Dated 01.12.2007 No. 317-FZ "On State Corporation for Atomic Energy "Rosatom ";  
 Decree of the President of the Russian Federation dated 31.12.2015 No. 683 "On national security strategy of the Russian Federation" in accordance with federal laws dated 28.12.2010 No. 390-FZ "On safety" and dated 28.06.2014 # 172-FZ "On strategic planning.

## Regulatory and governance bodies

Independent regulator - Federal Service for Ecological, Technological and Atomic Supervision  
 Agency for governance in the area of use of atomic energy - State corporation for atomic energy "Rosatom".

## State policy

**Fundamentals of the State policy in the field of ensuring nuclear and radiation safety of the Russian Federation for the period until 2025**

*Approved by the President of the Russian Federation on March 01, 2012 Пп--539*

## System of rules and standards

NP-001-97(OPB-88); NP-022-2000; NP029-01; NP033-01; NP-038-11.....

# Safety Culture at industry level - level of State Corporation ROSATOM

## Policy of State Corporation Rosatom

Policy statement of State Corporation for Atomic Energy Rosatom is the area of ensuring safety at nuclear facilities Declaration of Rosatom values Values of State Corporation Rosatom

## Organization structure

The following divisions are integrated within nuclear power complex of State Corporation Rosatom: Mining, fuel, machine-building, power-engineering, unit for science and innovations and 'sales and trading'. State Corporation Rosatom possesses all necessary mechanisms for monitoring and control with corresponding authorities, competences and recourses.

## Personnel management system

Performance of higher educational institutions, centers of additional training, continuous training and qualification enhancement, NPP training centers, Academy of State Corporation Rosatom Implementation of personnel motivation system with application of key effectiveness indicators at all management levels and criteria of Rosatom Production System.

## Industry safety program and system of standards

Innovative projects are implemented via industrial and federal target-oriented programs based on developed and continuously refining normative basis. Industrial safety culture projects.

## Internal control system

Specialized control systems are in place in State Corporation Rosatom



## ЦЕННОСТИ ROSATOMA

### Единая команда

Мы все – Росатом. У нас общие цели. Работа в команде единомышленников позволяет достигать уникальных результатов. Вместе мы сильнее и можем добиваться самых высоких целей. Успехи сотрудников – успехи компании.

### Уважение

Мы с уважением относимся к нашим заказчикам, партнерам и поставщикам. Мы всегда внимательно слушаем и слышим друг друга вне зависимости от занимаемых должностей и места работы. Мы уважаем историю и традиции отрасли. Достижения прошлого вдохновляют нас на новые победы.

### Эффективность

Мы всегда находим наилучшие варианты решения задач. Мы эффективны во всем, что мы делаем – при выполнении поставленных целей мы максимально рационально используем ресурсы компании и постоянно совершенствуем рабочие процессы. Нет препятствий, которые могут помешать нам находить самые эффективные



### Ответственность за результат

Каждый из нас несет личную ответственность за результат своей работы и качество своего труда перед государством, отраслью, коллегами и заказчиками. В работе мы предъявляем к себе самые высокие требования. Оцениваются не затраченные усилия, а достигнутый результат. Успешный результат – основа для наших новых достижений.

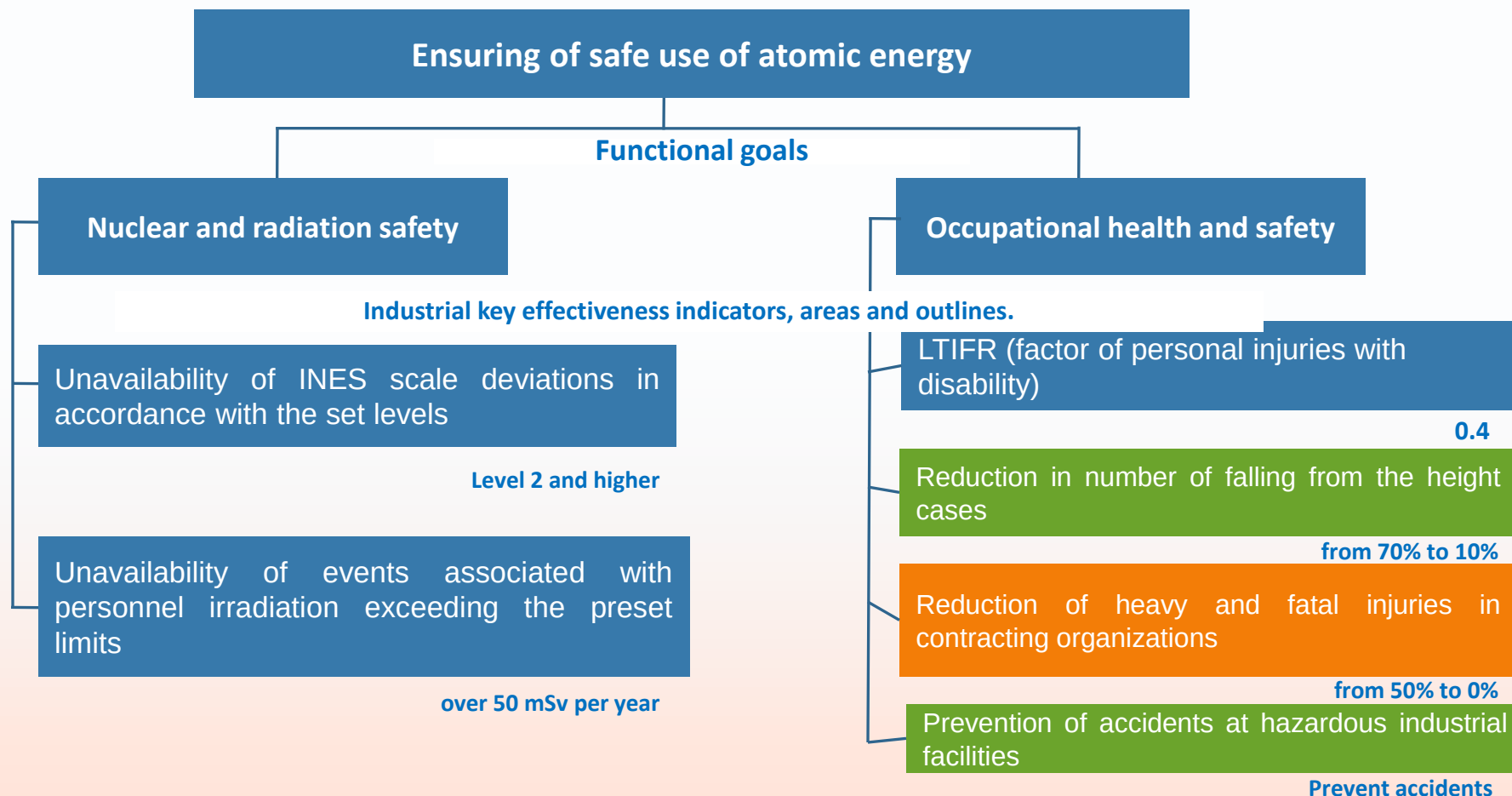
### На шаг впереди

Мы стремимся быть лидером на глобальных рынках. Мы всегда на шаг впереди в технологиях, знаниях и качествах наших сотрудников. Мы предвидим, что будет завтра, и готовы к этому сегодня. Мы постоянно развиваемся и учимся. Каждый день мы стараемся работать лучше, чем вчера.

### Безопасность

Безопасность – наивысший приоритет. В нашей работе мы в первую очередь обеспечиваем полную безопасность людей и окружающей среды. В безопасности нет мелочей – мы знаем правила безопасности и выполняем их, пресекая нарушения.

# Strategic and functional goals set by ROSATOM in the area of safety and system of its assessment via key effectiveness indicators ( KEI ).



**Implementation of key effectiveness indicators in the performance of State Corporation ROSATOM allowed significantly improving the motivation and responsibility of the employees for achievement of the set safety ensuring goals.**

■ Cross-cutting industrial KEI (Cascaded throughout the industry) ■ Cross-cutting functional KEI (Decomposed throughout the industry) ■ Personalized KEI for LP function In construction of facilities

# Transparency of State Corporation ROSATOM activities/ OSART missions in Russia is an adherent attribute of Safety Culture



- Arrangement of the 8-th International nuclear forum on Safety Culture
- State Corporation ROSATOM elaborated 6 National reports in accordance with its commitments on international conventions;
- Upon requests of the Government of the Russian Federation the IAEA international experts performed OSART missions for review of operational safety at several Russian NPPs:



**2005 - Rostov NPP**



**2008 -  
Balakovo  
NPP**

**2014 - Kola NPP**



**2011 -  
Smolensk NPP**





# Disposal of nuclear heritage in the framework of the program “Global partnership” as well as on the basis of bilateral agreements between Russia and European countries and the US.



**Used to be: Temporary storage** of reactor sections from nuclear submarines afloat in the bay of Saida-guba in Murmansk region



**Currently: On-shore storage facility of reactor sections from nuclear submarines, the result of joint project of Kurchatov Institute and EWN GmbH (Germany).**

In 2015 Decommissioned from Russian Navy 203 nuclear submarines, disposed - 197 nuclear submarines.





POCATOM

# Safety Culture at division level - level of utility JSC Concern Rosenergoatom

## Policy of SC Concern Rosenergoatom

**Devotedness of Safety Culture is included in the Ethical code of the utility JSC Concern Rosenergoatom as a key standard of behavior**

*Order dated 04.09.2015 № 9/1004-П.*

## Organization structure

**The departments and divisions for management of all stages of the NPP life cycle from design development to NPP decommissioning have been established in the structure of JSC Concern Rosenergoatom, the relevant personnel was employed.**

## Personnel management system

Training centers work at NPPs. Personnel of JSC Concern Rosenergoatom is on a regular basis trained at the courses of continuous training, qualification enhancement and professional training at the basis of Centers of qualification enhancement of State Corporation Rosatom and Academy of State Corporation Rosatom. Laboratory of the personnel physic-psychological monitoring are employed at the NPPs. Arrangement of weekly meetings with involvement of all NPPs devoted to safety issues.

## Methodological personnel support. Operational experience exchange

**Operating and maintenance procedures are in place and continuously improving. Methodological guidelines aimed at enhancement of personal adherence to importance of safety issues have been developed and are improving.**

## Normative base of organization

JSC Concern Rosenergoatom possess sufficient basis of normative-technical and organization-technical documents including Corporate standards (STO), guidelines (RD EO), specifications, instructions, memos etc.

# Invariable attribute of safety culture - transparency to information exchange at the level of divisions (operational experience exchange)



## Представление ОЭ АЭС России для зарубежных организаций

1 2 3 4 5 6

В рамках соглашений с международными организациями об обмене информацией (МАГАТЭ, ВАО АЭС) АО «ВНИИАЭС» было подготовлено и направлено:

- ❑ **53** - информационных сообщения о событиях на АЭС России в формате ИСИ МАГАТЭ/АЯЭ
- ❑ **321** - информационных сообщения для ВАО АЭС-МЦ

В рамках сотрудничества с НАЭК «Энергоатом» (Украина) за период 2011-2015 гг. в НАЭК было направлено:

- ❑ **Более 100** - отчетов о нарушениях в работе АС Концерна Росэнергоатом

*Примечание: с марта 2014 г. поступление отчетов из НАЭК практически прекратилось*

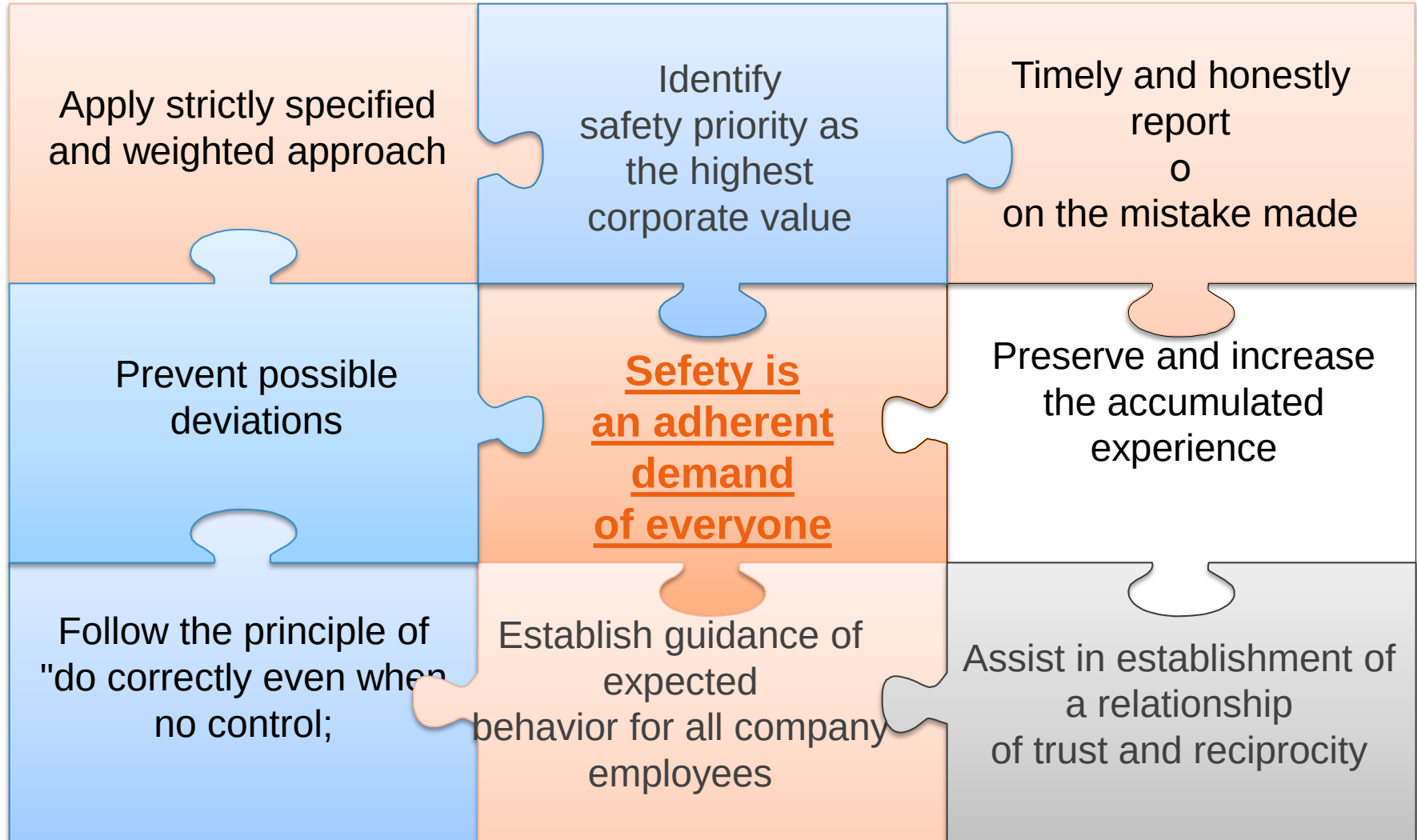
rosenergoatom.ru

17

The attributes of safety culture are available in the division, i.e. continuousness of actions and fact-based decision-making:

- Based on the lessons learned from accident of 11.03.2011 at Fukushima-Daiichi NPP «Program of safety enhancement at Rosenergoatom NPPs in 2011 and for future perspective» was approved on 27.06.2011;
- “The measures for minimization of beyond design basis accidents at NPPs” were approved on 06.07.2011...
- .....

# Application of Safety Culture at behavior level of NPP personnel (Nuclear Facilities)



# Implementation of IAEA Safety Culture development principles in the utility JSC Concern Rosenergoatom



## Notable facts in development of safety principles

- ✓ **Establishment of Safety Culture council chaired by Director General of JSC Concern Rosenergoatom**
- ✓ **Devotedness of Safety Culture is included in the Ethical code of the utility JSC Concern Rosenergoatom as a key standard of behavior**
- ✓ **Arrangement of the personnel involvement in the safety ensuring**
- ✓ **Development of the safety indicators system**
- ✓ **Modification of management structures followed with assessment of its impact to NPP safety**
- ✓ **Establishment of requirements to selection of candidates to the positions for operation of nuclear facilities.**
- ✓ **Establishment of requirements to training and qualification support of the NPP personnel.**
- ✓ **Development and implementation of operational experience accounting system.**
- ✓ **Assessment of the achieved state and dissemination of positive experience of Safety Culture development to NPPs is performed annually at Summarizing Safety Culture Day.**

# Safety indicators at nuclear facilities

## High safety level

**Compliance with the requirements of safety rules and standards**  
**Very small number of light injures; No incident at nuclear facilities**

## Acceptable safety level

**Identified deviations and violations are not associated with possibility of accidents**  
**Safety enhancement activities are performed on the regular basis in order to prevent events and failures No group and heavy injures.**

## Low safety level

**Significant violations are identified at the facility breaking the requirements of safety rules and standards that could lead to accident or incident**

## Strategic areas of activities at achievement of high Safety Culture

**Improvement of organizational factors**  
**Improvement of organization structure in industry and at the enterprises**

**Establishment of safety priority i psychology of every human being at all levels of structure in nuclear industry, at every enterprise.**



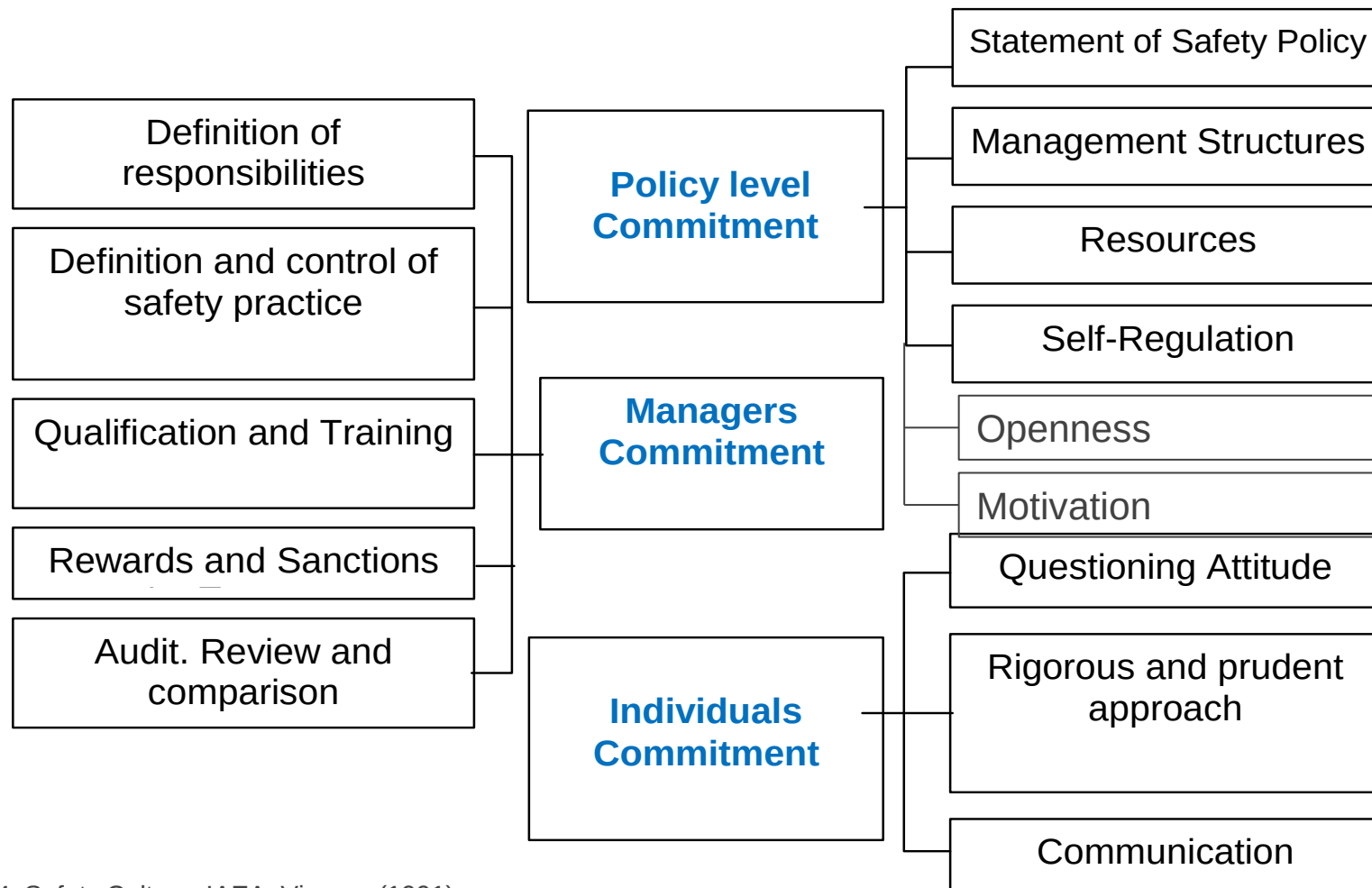
## **Safety is ensured by people**

The best equipment in the world cannot operate better than its operators. The role of human factor is extremely high, human factor is a basic element of safety ensuring.

An example of work with personnel on the basis of CICT is the annual training workshop “Summer school on Safety Culture” in 2012 - 2015, where the principal thesis is:

**«Safety is an adherent need of everyone!»**

# The most important Safety Culture components emphasized in IAEA recommendations and implemented in State Corporation ROSATOM in development of the “commitment”



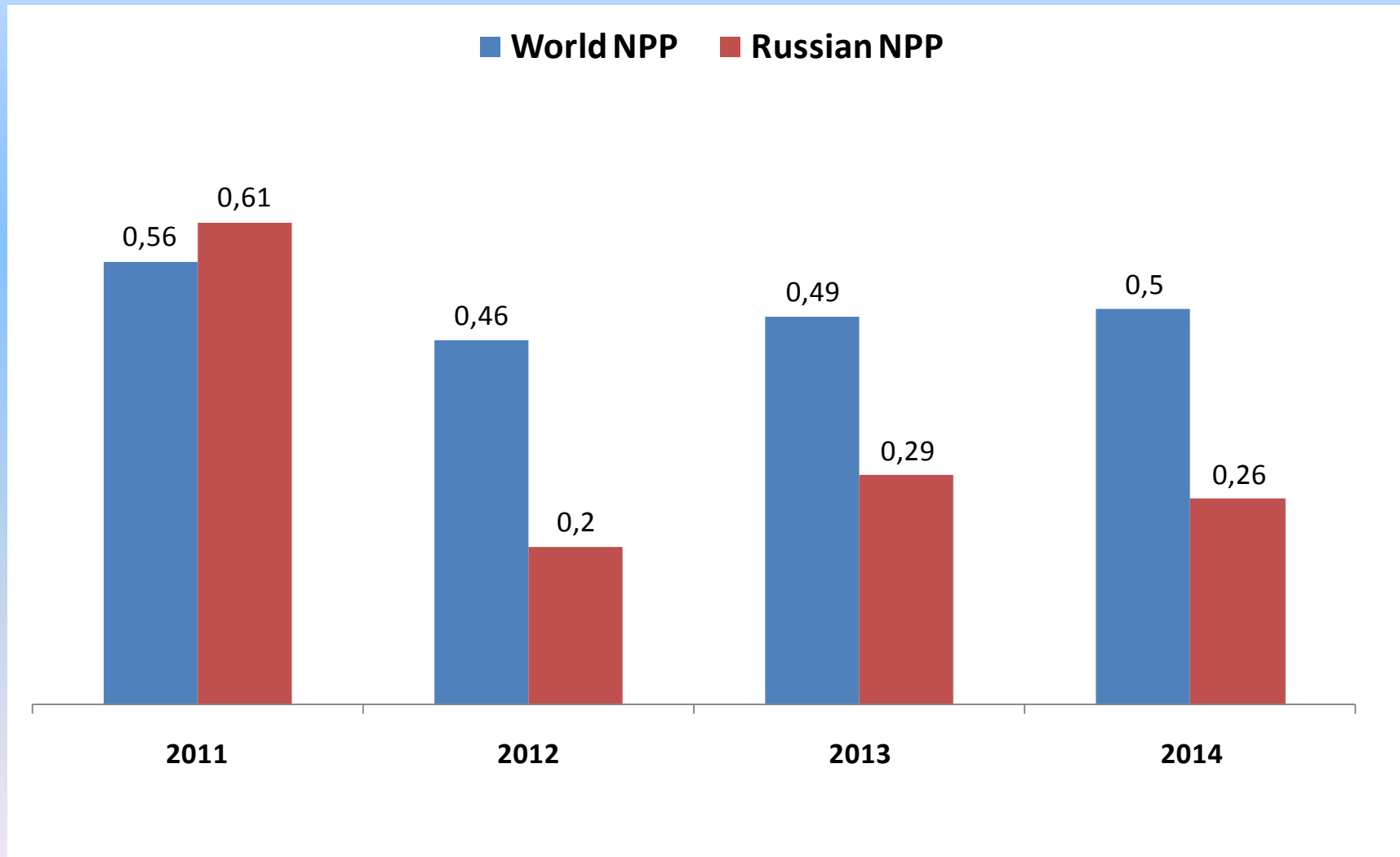
INSAG-4, Safety Culture, IAEA, Vienna (1991)

# A view at the Safety Culture components and its future development in the State Corporation ROSATOM

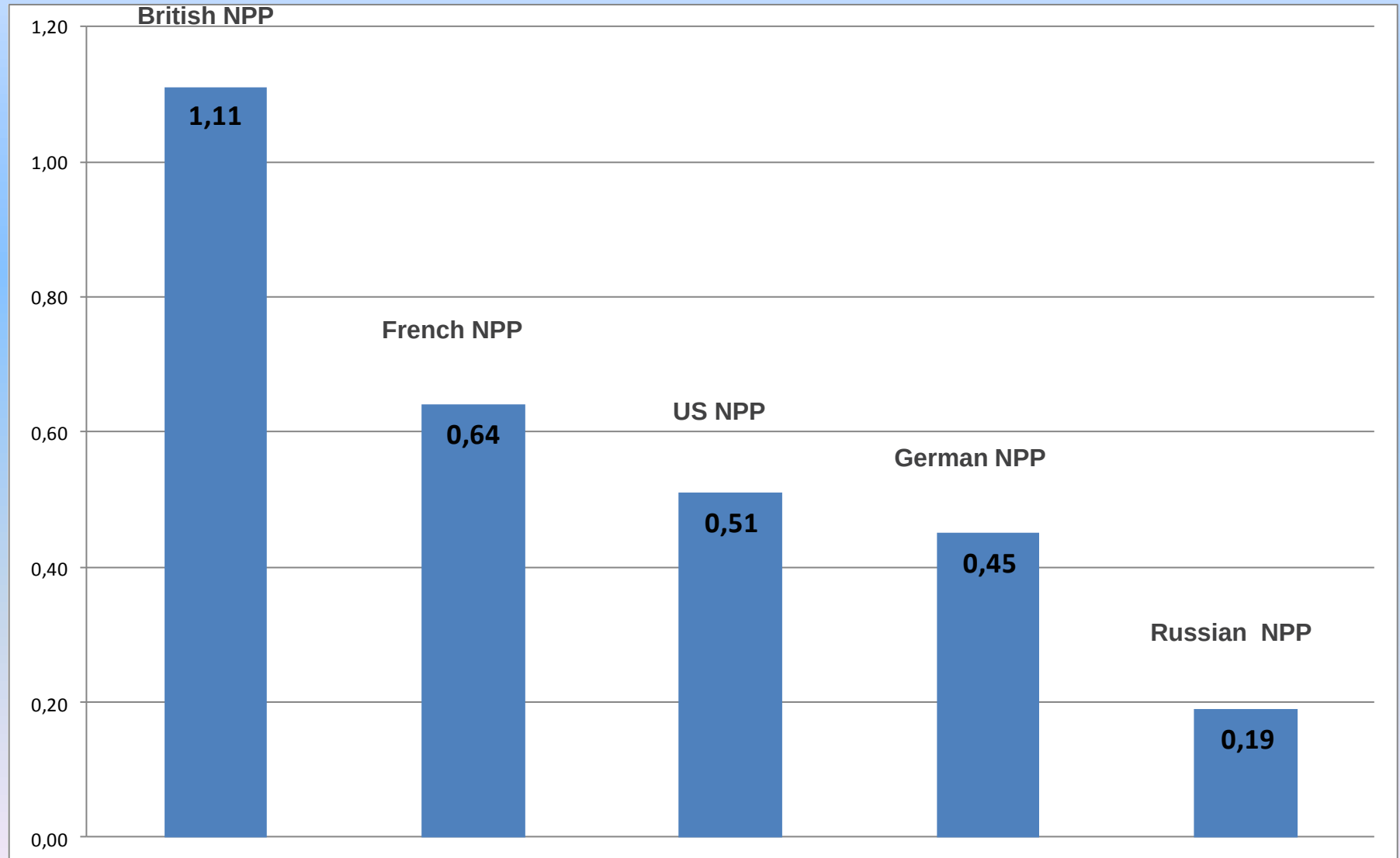


- Unconditional adherence of the personnel to the applicable rules and procedures;
- High competence and moral-psychological settings of the managers and personnel;
- Maintenance of preparedness to unmistakable actions in extraordinary situations;
- Responsibility of the organization for establishment of the corresponding conditions (organizational behavior) for the personnel work;
- Application in safety culture assessment of “anticipated” indicators;
- Prevention of root causes for deviations arisen from deficiencies in NPP operation and management;
- Active promotion of Safety Culture principles to the contracting organizations of the State Corporation ROSATOM.

# Average (for 7000 hours of operation) number of reactor shutdowns from critical state at Russian NPPs is lower than at NPPs over the world



# Position of Russian NPPs in 2015 in the international rating in accordance with indicator US7 “Reactor scrams for 7000 hrs.”

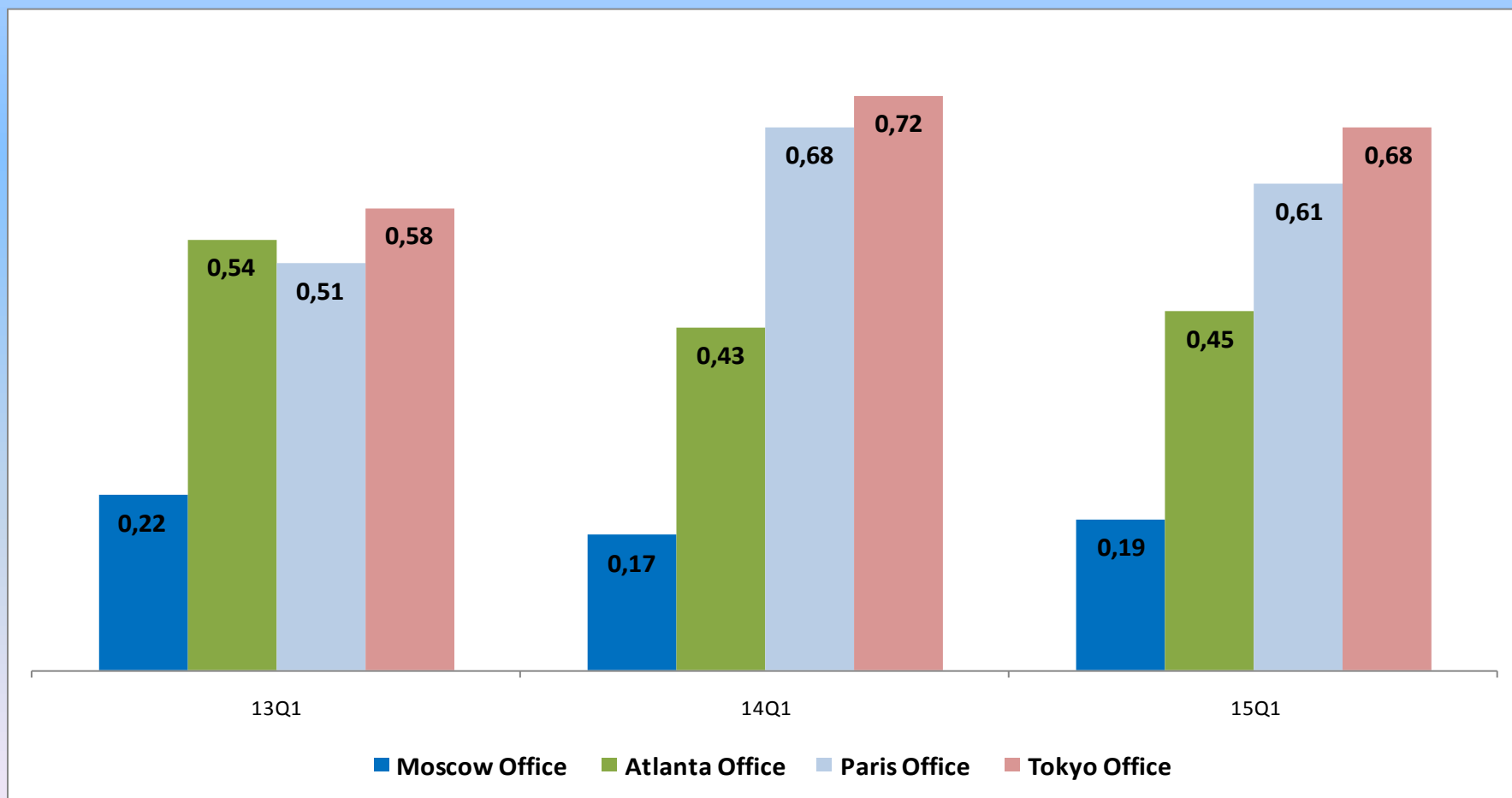


# Number of actuations of reactor emergency protection/fast-acting protection system in Moscow Office remains stable (below WANO average indicators)



## Comparison of WANO indicator

Automatic emergency protection actuation in a critical state for 7000 hours of unit operation in the I-st quarter of 2013 - 2015 (average values)

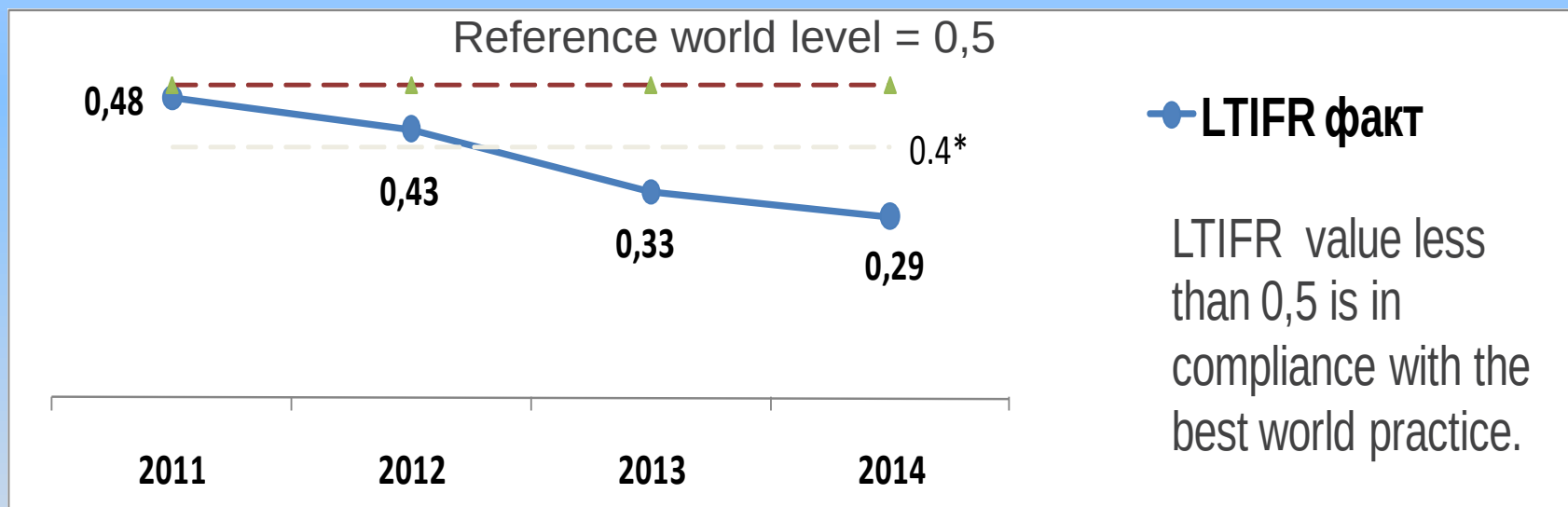




Actual values «LTIFR» in 2014 confirms achievement of target goals by chief executives of divisions, units and managing companies.

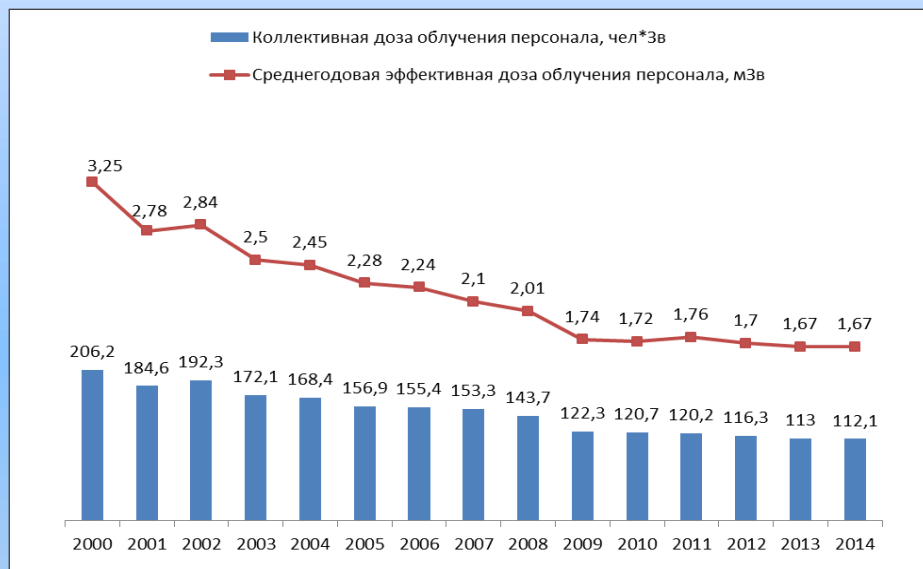


## Trend of LTIFR in ROSATOM

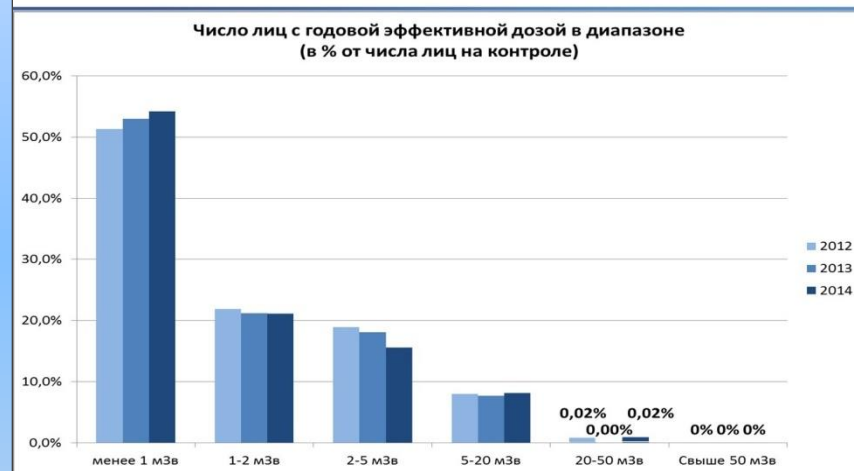


\*0.4 – basic value of «LTIFR» in ROSATOM

# Trends in the nuclear industry personnel irradiation in 2000 - 2014 and number of fires in 2007 - 2015.



## Распределение по диапазонам доз персонала отрасли в 2012-2014 гг.

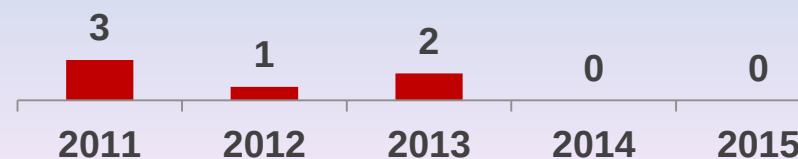


## Число лиц с дозами 20-50 мЗв по отрасли в период 2000-2014 гг.



The data on fires are given by the events associated with personnel injures or property damage exceeding 100 thousand rubles.

## Number of fires



## Facts of Safety Culture implementation allow envisaging that Russian nuclear power industry in the first half of the XXI-st century will be able to ensure:



- Optimization of fuel and energy mix with coverage up to 25 % of energy demand (over 500 TW.hr/year - triple growth)
- Optimum combination of reactor technologies in the area of atomic energy application.
- Unlimited expansion of fuel basis in implementation of fast reactors with closed fuel cycle.
- Minimization of waste amounts and environmental rehabilitation of the industrial regions.
- Regime of nuclear non-proliferation.

## Conclusion

### Act continuously in the area of Safety Culture.



- The facts stipulated in the presentation allow talking on the established safety culture, at least among the nuclear engineers, its development and closing the positions and views thanks to active international cooperation supported by the Agency (IAEA).
- The given examples of the positive trend in safety indicators of Russian nuclear industry is substantiated by deeper and deeper penetration and rooting of safety culture principles throughout all stages of life cycle of nuclear facilities.
- We deem necessary to disseminate the safety ensuring principles also to the people, who are professionally distant from nuclear area but significantly impact it.
- In 2016 it is scheduled to arrange a new “Summer school on safety culture”, this Conference is open for both Russian and foreign specialists, as well as for individuals, who devoted to resolving safety issues in nuclear industry.
- I am sure that future continuation of the discussions on quality of cultural environment and its bearers, people of nuclear industry, will be fruitful.

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*Thanks for your attention*