IAEA 60 Years
Atoms for Peace and Development

Overview of the IAEA's Technical Cooperation Programme

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Outline of Presentation

1. **IAEA's statutory mandate for**
   Technical Cooperation (TC)

1. **TC framework: key policy documents**
   - **Resources (financial and human)**
   - **Financial resource management**
   - **TC assistance in NPP area**

2. **TC project RER2015 – NPPs Operation Safety (for LTO of NPPs)**

Three pillars” of the IAEA

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Safeguards & Verification

Safety & Security

Science & Technology

Agency's Technical Assistance

- **Regular Programme**
  - Developed and implemented by the Technical Departments
  - Issue standards and guides
  - Validate nuclear techniques (CRPs)
  - Advisory service and review missions
  - Funded from regular budget and extra-budgetary

- **TC Programme**
  - Managed from Regular Budget (MP6 No programmatic activities)
  - Managed by TC Department
  - Funded from TCF and EBT
  - Supported by all Departments
  - Developed jointly with Member States

Complement each other

How does the IAEA operate?

Technical Cooperation: A shared responsibility

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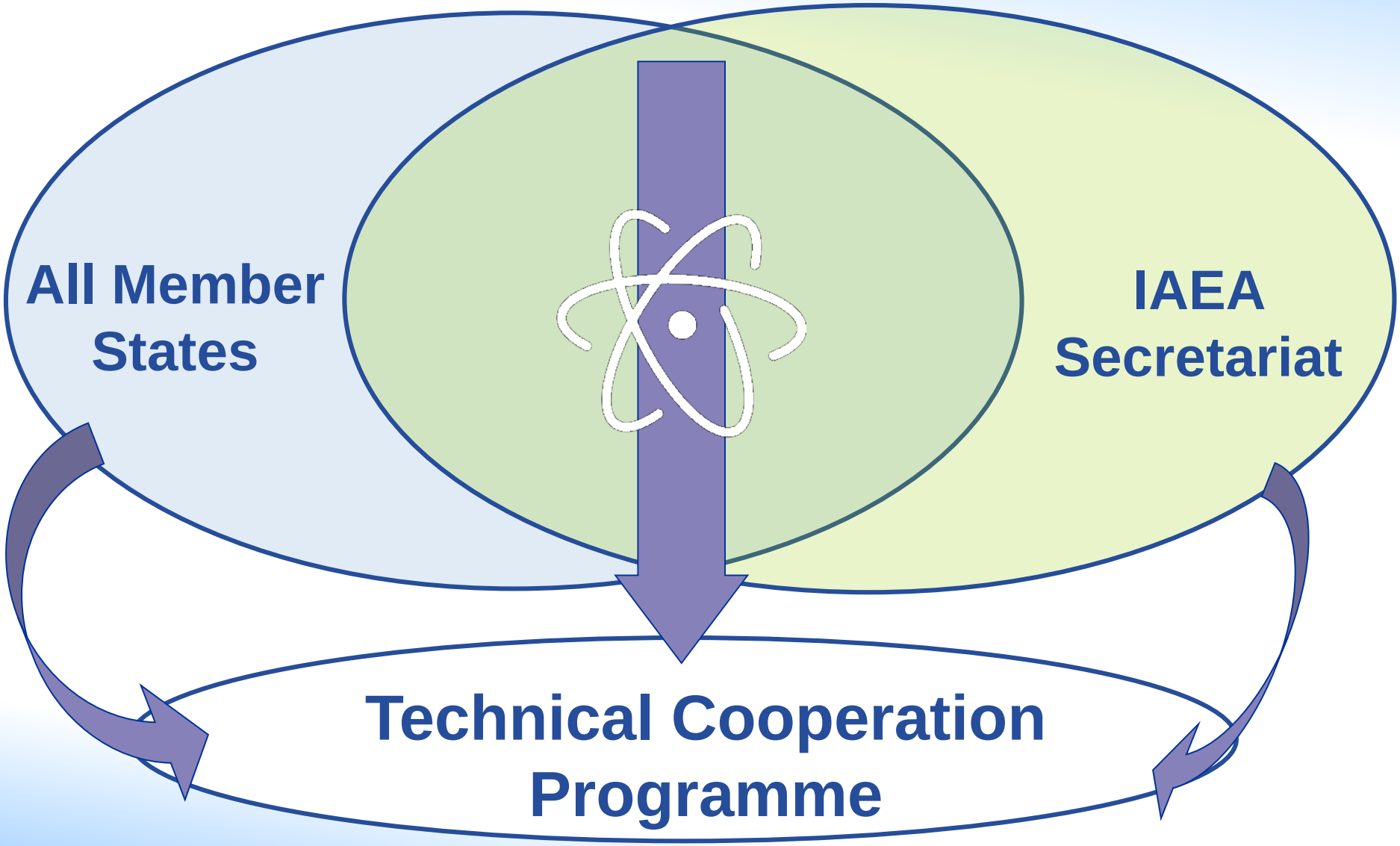


TC Programme Features

- Responds to Member States' needs and results based/oriented
- Jointly developed with Member States
- Flexibility –accommodates emerging needs and emergencies
- Projects can be approved beyond the biennium
- Dynamic project workplan
- Financed from different sources
- Contributes to development goals
- Transparency

Key principles for the TC programme

- Contributes to development goals
- Responding to Member States' needs
- Peaceful use undertaking
- Safety and security
- Member State ownership and shared responsibility
- Non-discrimination
- Cooperation among Member States and with partners
- Transparency

TC facts and figures

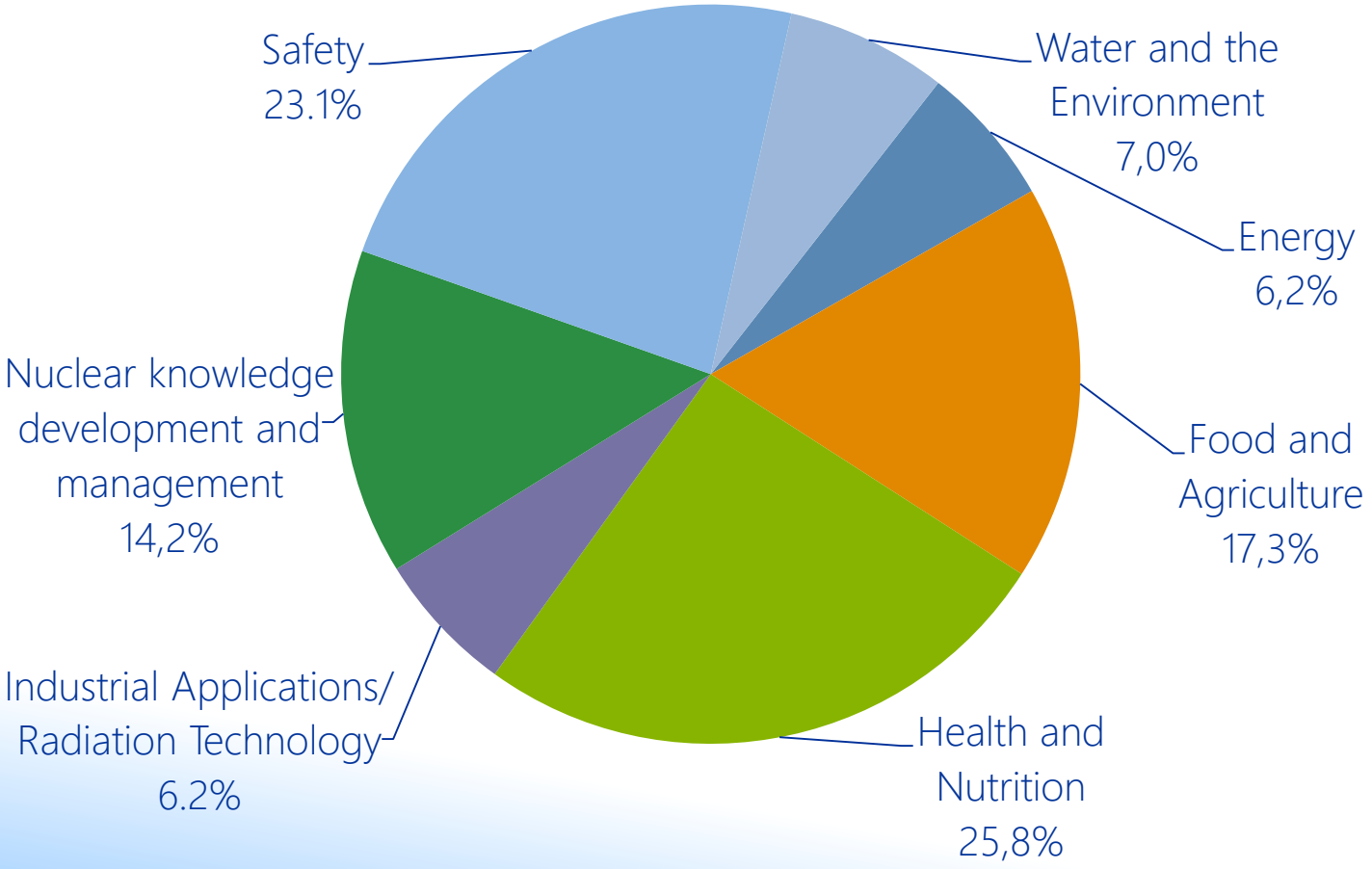
- TC Department: ~225 staff
- 170 Member States – all, in principle, eligible for TC support
- 146 countries and territories participate in the TC programme
- 37 LDC recipient countries
- 80% of recipients are non-nuclear power countries
- No field presence

We work in four regions

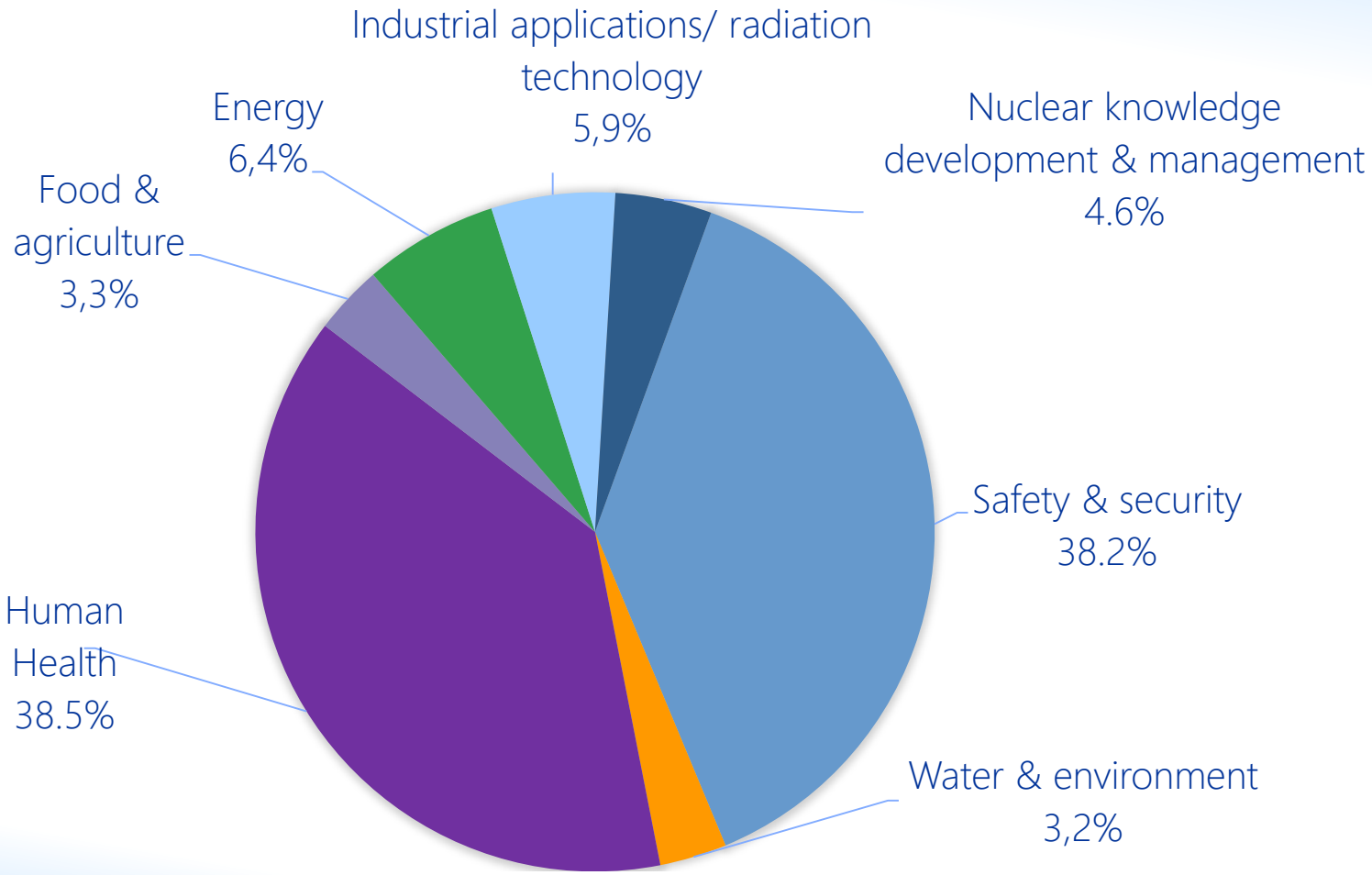
Overall TC Programme Areas

2018-19 TC programme

about €85 million/year from TC Fund



Europe and Centrol Asia' budget about 25M Euro for 2018-19: Core programme



TC Delivery Mechanisms

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National

- Infrastructure building
- Address country's specific needs
- About 60-65% of the programme
- 141 MSs with national designs for 2020-2021 TCP

Regional

- Networking and experience sharing
- Address issues of common interest and issues of regional dimension

Interregional

- Networking and experience sharing
- Address issues of common interest to the four regions

Types of support

- Expert advice
- Fellowships, Scientific Visits
- Workshops, training courses
- Equipment and materials

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Capacity Building

- Training courses & workshops/meeting
- Fellowships
- Scientific visits
- Expert missions

Procurement

- Radiotherapy machines
- Gamma irradiators
- Accelerators : E-beam, ion-beam
- Reactor vessel

Safety and Security

- Strengthening regulatory safety infrastructure
- Legal issues

Technical cooperation programme (TCP): Areas of activity

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Health & Nutrition



Food & Agriculture



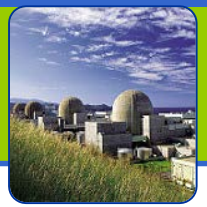
Water & Environment



Radiation Technology



Energy


Safety and Security


Knowledge Management



2018-2019 TC Program: National projects

Member States and Territories with **national** TC programme	136
Project concepts received	871
Projects proposed for approval by BoG	579

2018-2019 TC Program:
Regional and Inter-regional projects

4 regions have regional projects	About 156
Inter-regional projects	About 15

Member States Europe & Central Asia

- MSs with TC national programmes: 29
- MSs participating in TC regional programme only: 4
- Others

TCEU Reginal Current Cycle Portfolio of Projects: 2018-2019

115 TCEU projects:

87 National projects

28 Regional projects

TCEU Future Portfolio of Projects (2020-2021…)

TCEU projects:

~ **100** National projects

~ **27** Regional projects

NPPs Operation Safety Project

- **RER2015 -** Strengthening Nuclear Power Plant Lifetime Management for Long Term Operation (LTO)

- **Objective:** To enhance the NPP safety level for extended operation and with respect to international practice through exchanging experiences gained by the operating organizations in the Europe Region in performing studies to justify the safe and long term operation of NPP and by the regulatory authorities to license the LTO.

Continue

- **Specific problems:** connected with LTO, such as maintenance effectiveness monitoring, ageing management, time limited ageing analysis management processes, and others. A number of important issues were covered in the frame of previous IAEA regional projects on LTO, such as: methodologies and techniques on online monitoring of equipment performance (maintenance and qualification); approaches in the field of passive components resource evaluation and strength analysis; and regulatory requirements to LTO.
  - Mainly focused on operating countries for improvement of plant performance and enhancement of safety
  - TCEU MSs - nine countries
  - TCF

Main Data

- **Project duration: 4 years as of 2018**
- **Field of Activity: 06 - Nuclear power reactors**
- **Total approved budget: EUR 900,375.00**
- **10 TCEU participating Member States:**

- **Armenia, Bulgaria, Czech Republic, Hungary, Russian Federation, Slovakia, Ukraine, Slovenia, Romania, (Uzbekistan)**

- **Main focus on operating countries for improvement of plant performance and enhancement of safety.**
  - **Support outside EU countries based on request**

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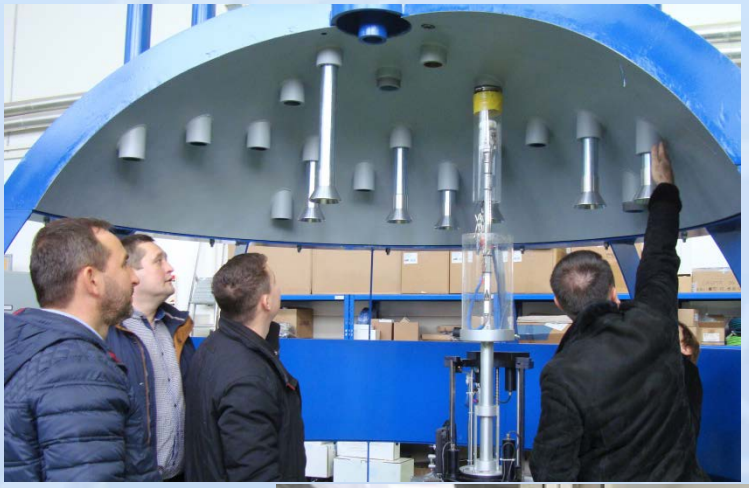
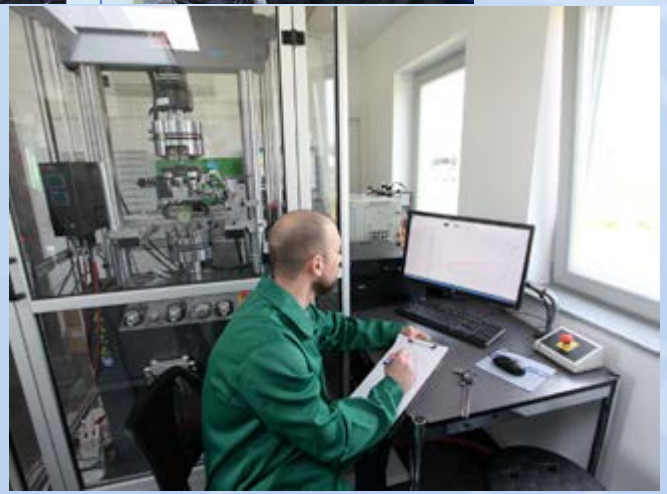
Completed training courses in 2018





April 2018:

Training Course on the Advanced On-line Monitoring Methodology to Predict the Residual Life Time of Critical Structures, Systems and Components through Experimental Approach

Germany

WSs/Meetings in 2018

- *March*: Workshop on Strengthening Capabilities for Nuclear Power Plant Safety, Performance and Life Service

Qinshan-II 4 x 650 MWe PWR

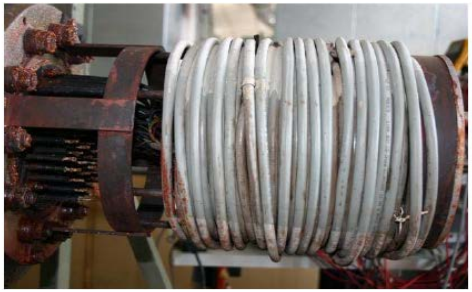
Qinshan 2 x 650 MWe Candu

Qinshan 1 x 330 MWe

- *July*:
  - *Support management system attendance from TECU*.

WSs/Meetings in 2018

- ***September*: Wworkshop on Technical challenges in the application and licensing of digital I&C systems**
  - *Digital I&C modernization and licensing practices*
- *September*: Workshop on plant life management for long term operation
  - *Economics of long term operation and implementation for 10 – 20 Years extension*
- *November*: Workshop on Equipment Qualification issues in frame of LTO (Seismic impacts and harsh environment conditions)
  - *Harsh environment in LOCA condition and Equipment survivability*



Workshop/meetings in 2019

1	Regional Workshop on the Economic Feasibility and Improving Effectiveness of Assets for Nuclear Power Plant One-Time or Consecutive Long Term Operations	Zagreb, CRO	7-9 May
2	Regional Workshop on Equipment Qualification for long term operation of nuclear power plant	CZR	20-24 May
3	Regional Workshop on maintenance optimization for improvement of safety and performance	??	8-12 July
4	Regional workshop on Knowledge management and human resource development programme for long term operation in NPPs	ROM or BUL ??	August
5	Regional workshop on Advanced I&C applicaton and licensing process	HUN ??	16-20 September
6	Regional workshop to define the root cause of Materila degradation such as stress corrosion cracking, fatigue and radiation embrittlement	GFR ??	14-18 October

Training Courses in 2019

1	Group Scientific Visit on Strengthening Capabilities for Nuclear Power Plant Safety, Performance and Service Life, Learning from the Experience of China	Beijing, CPR	22-26 April
2	Group scientific visit to learn knowldege preservation and transfer, HRD programme for long term operation, Learning from the Experience of RoC	Gyeong Ju, ROC	5-9 August

Activities in 2020

- A workshop on Long Term Operation of NPPs and Global Platform for Nuclear Supply Chain

- Other TBD

Brief Introduction of

Global Platform for Nuclear Supply Chain

(website: www.hweall.com)

Objective of Platform to be established:

(1) Global nuclear Equipment Database

- To collect the Equipment and Component data provided by suppliers.
- To form a global nuclear equipment and component database by storing the data in a certain structure.

(2) Global nuclear supply capability Database

- To collect the capability and performance data provided by suppliers.
- To form a global supplier's capability and performance database by storing the data in a certain structure

(3) Procurement Platform for utilities

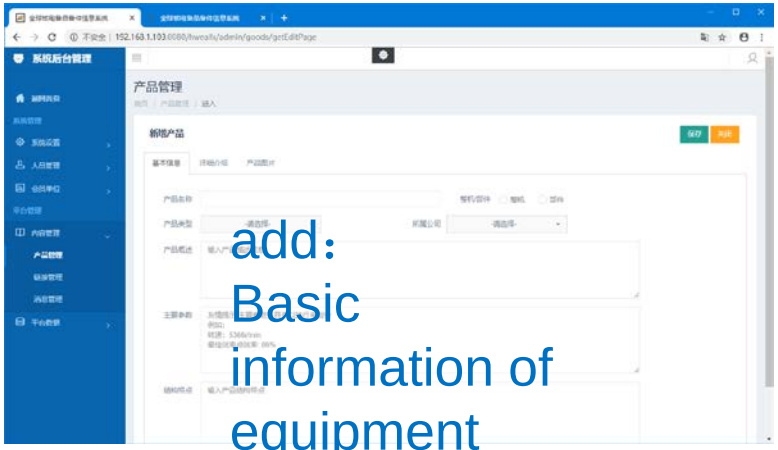
- Utilities can find the most suitable products by searching the names of the equipment and components.
- Utilities can find the most capable suppliers by searching and comparing suppliers' capability and performance.

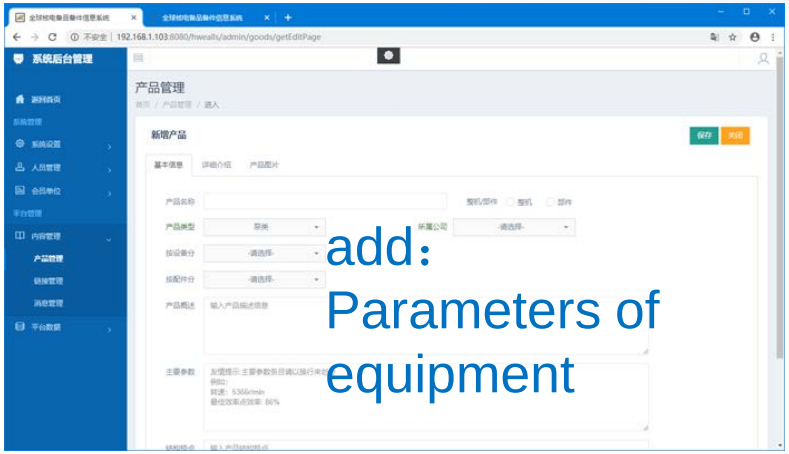
(4) Exchange Platform between utilities and suppliers

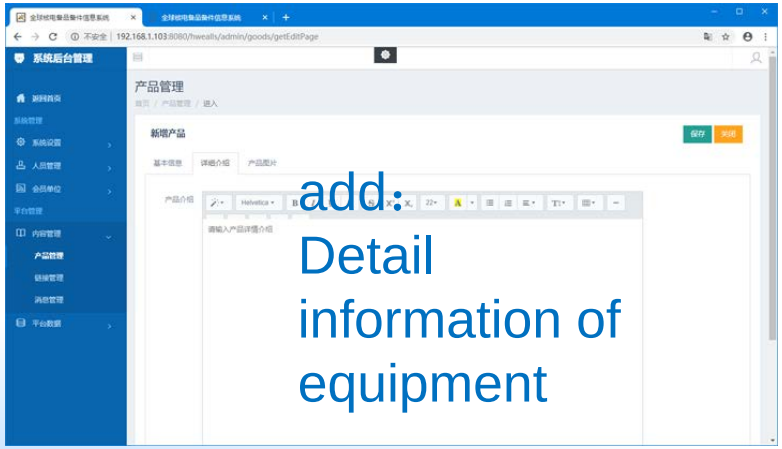
- Utilities can release the purchase demands and capable suppliers contact them actively.
- Utilities contact directly the capable supplier found out on the platform.

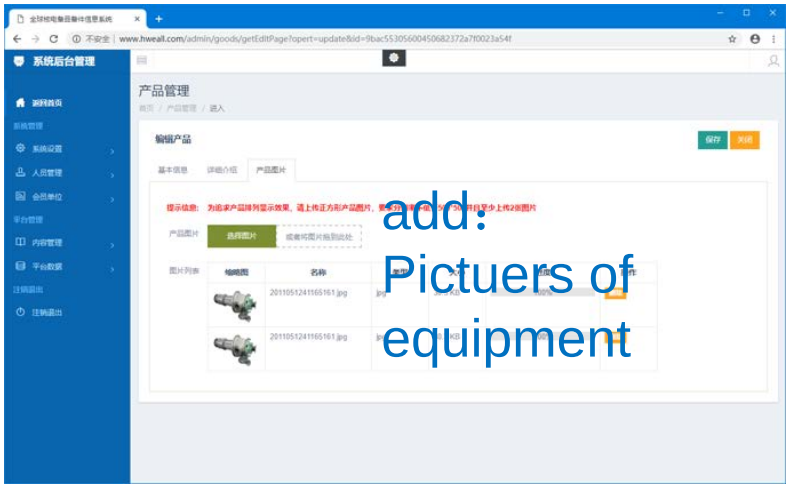
Adding Equipment information by suppliers

Registered Supplier can add its equipment to database by itself.



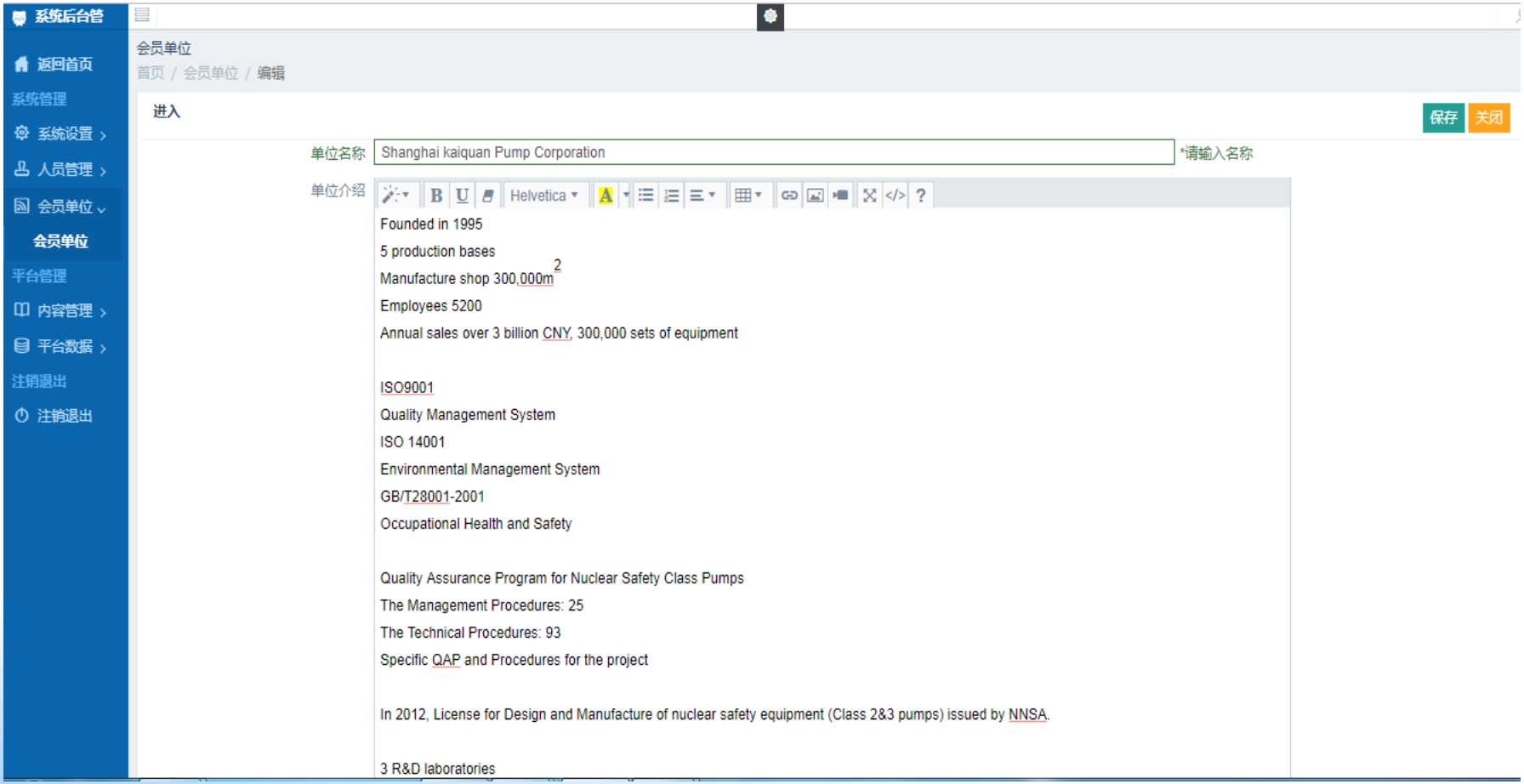






Adding capability and historical performance by suppliers

Registered Supplier can add its capability and performances to database by itself.



False information prevention mechanism

1.Review of supplier's information

Operating Organization of platform review supplier information and authorize the supplier different level rights of uploading information.

2.Review of equipment information added by supplier

Operating Organization of platform review the equipment information and decide if the information could be showed to the visitors of platform

Function of searching

Two types of searching tool

1.Searching by Navigation Bar

2.Searching by Inputting key words

Display of searching results

Key parameters

Picture of equipment

Basic information
Features
Introduction of Supplier
Related documents

Prospect for Platform

1. **To release the English version next week.**
2. **To improve the interface of platform.**
3. **To invite more suppliers to provide data by every efforts.**
4. **To cooperate with worldwide organizations to expand influence and application of platform.**
5. **To develop the Database of Equipment Quality on Block Chain based technology in next several months.**

Looking forward to cooperation with and share to all people and organizations FREE.

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Q and A ?

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IAEA Technical Cooperation Programme

Technical cooperation: delivering results for peace and development

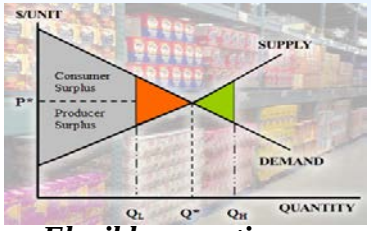
Operating Nuclear Power Plants

Tech. Area

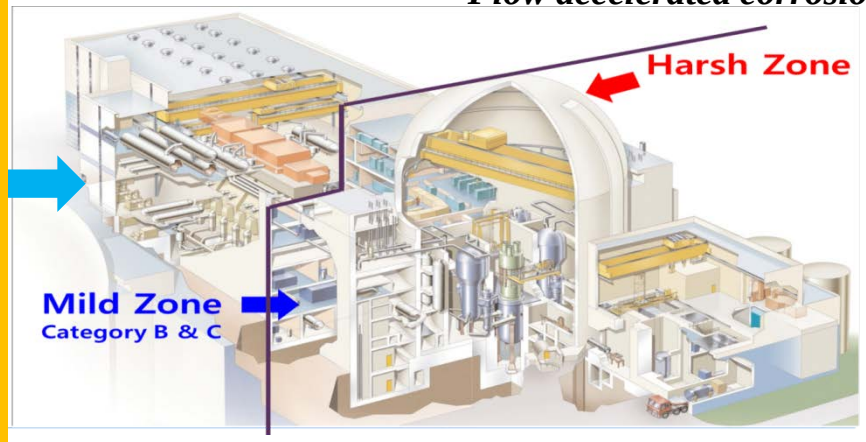
- Reactor core Management
- Plant Life Management for long term operation
- Operation and Maintenance programmes
- Thermal performance monitoring and optimization
- System upgrade and Modernization
- Performance monitoring and organization improvement
- Equipment Reliability
- Surveillance Test or In-service Test through Advanced

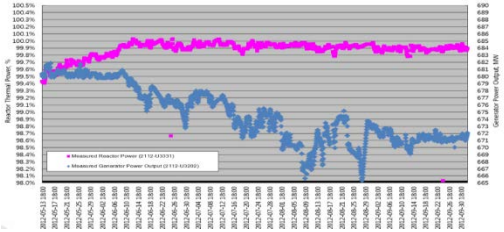
HFE

Flow accelerated corrosion



Flexible operation



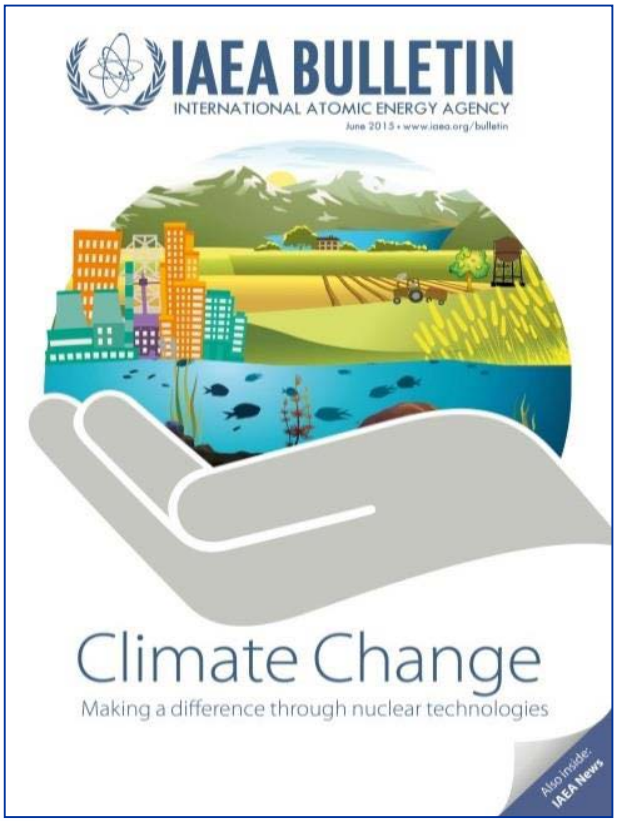


Thermal Performance monitoring

Inventory Control Management

Asset management

Role of Nuclear and Climate Change



Need to anchor nuclear as a core asset to meet 2˚C goal and SDGs

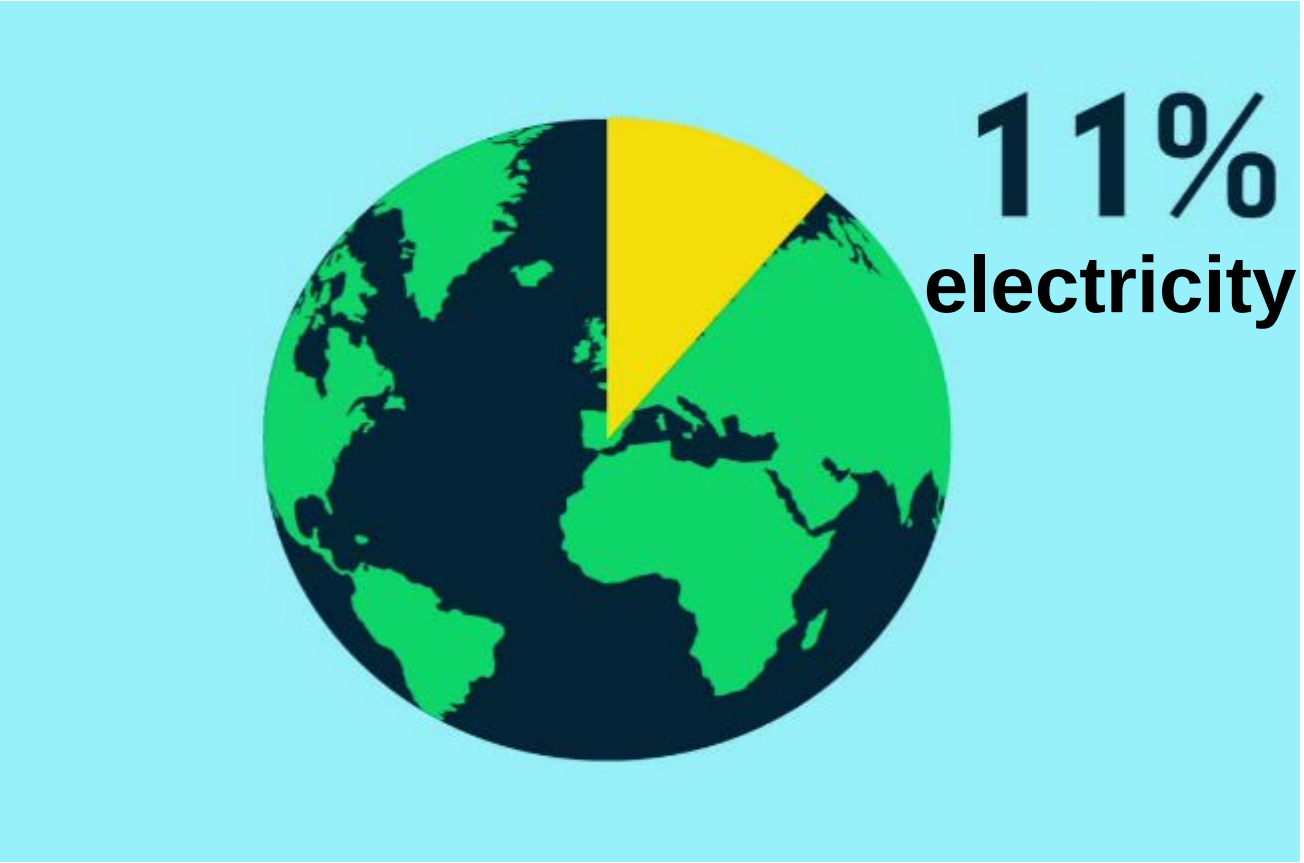
How NPPs can support Climate Change ?

- **Low-carbon electricity available today in large capacities.**
- **11% of the world's electricity but actually 1/3 of the low-carbon electricity.**
- **Energy security**

We shall do much more…

SDGs : Sustainable Development Goals

Nuclear power



NP Reactors

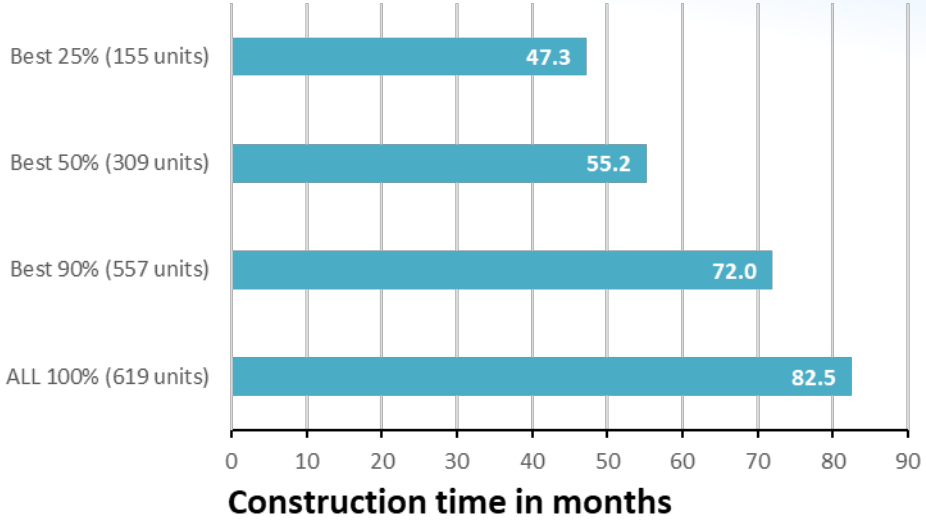
(as of 31st March 2019)

449 in operation

396 GW(e) Capacity

55 under construction (2/3 in Asia)

Lessons Learned from Nuclear Power Plants Build Projects

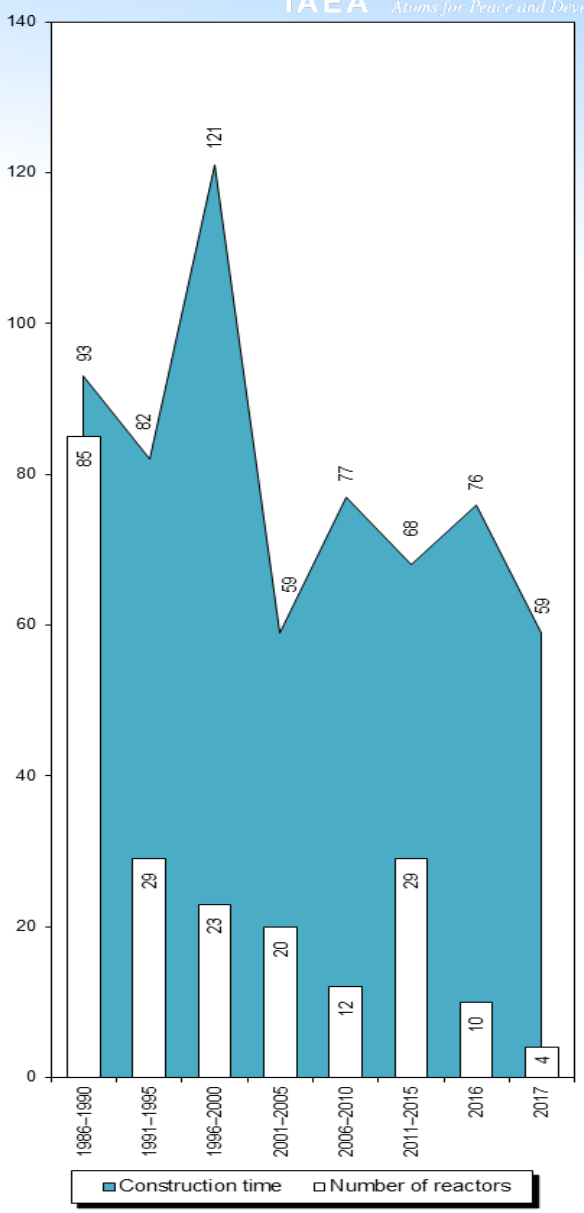


- Construction time have shortened
- Historical average is 83 months
- Best 50% were build in 55 months

But, among 57 reactors currently under construction, 23 are above 83 months.

- FOAKs
- Complexity
- Industrial abilities

And total cost of construction increased a lot



Median of construction time in months

Reference: IAEA-PRIS

Information System for Engineering Data Management, based on 3D models

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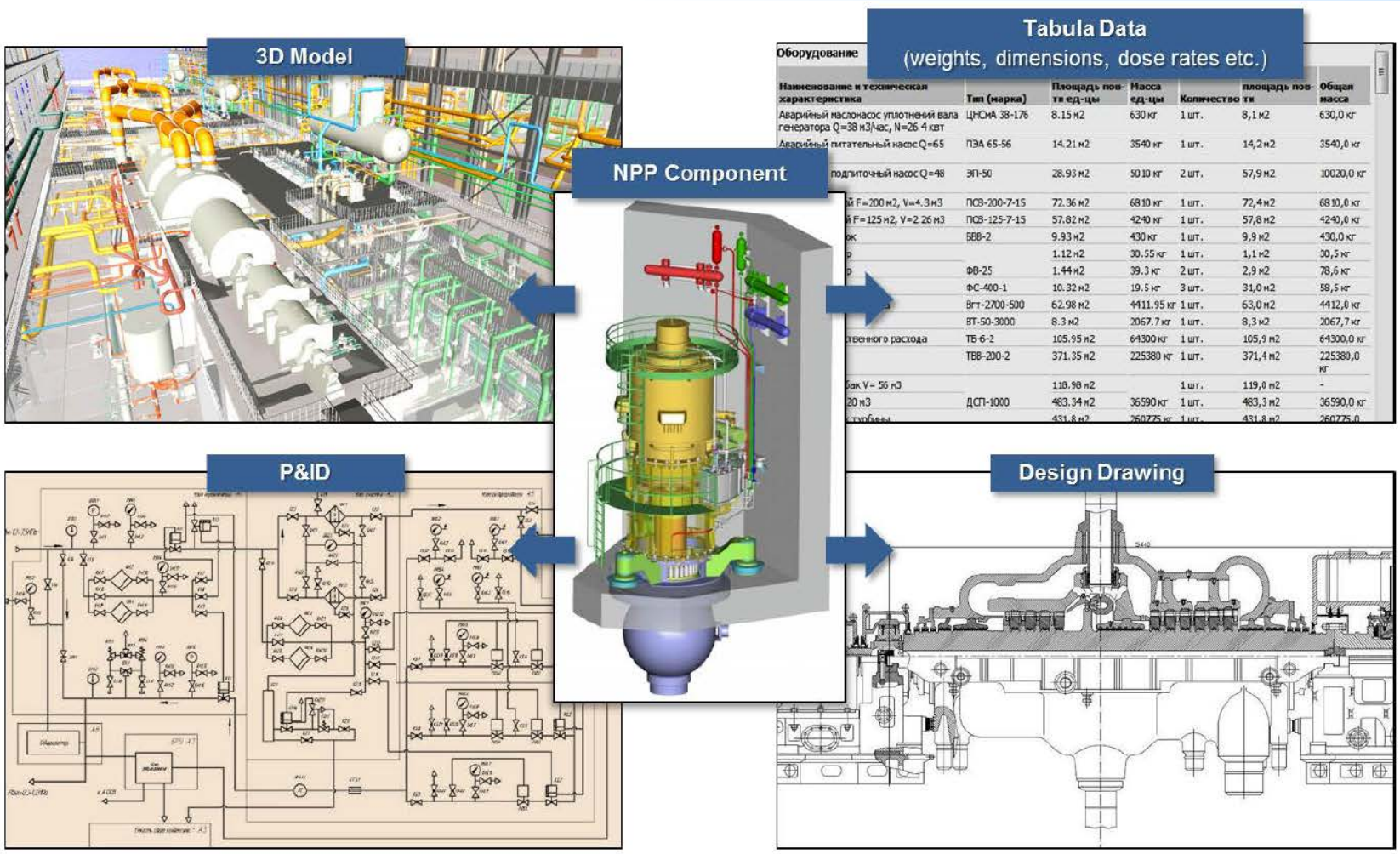

Project Management during Construction

- Competent project management
  - Organization, coordination and control
  - Achieving technical excellence by working to quality standards, optimizing the schedule and the supply chain, and minimizing costs
- Capacity building
  - Human resource development for construction management and technology for a new NPP construction

Looking to the future

- Strengthen engagement with MSs and partners to ensure effective, sustainable and tangible results of TCs work.
- Examine ways and means to render resources for TCF sufficient, assured and predictable.
- Strengthen TCs visibility and awareness of TCs work
- Working with the private sector and non-traditional donors while maintaining IAEA ethics and standards
- Ensuring flexibility to respond to emerging needs
- TC programme and SDGs

Q and A ?

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IAEA Technical Cooperation Programme

Technical cooperation: delivering results for peace and development

NPPs projects

- **RER2014:** Facilitating Capacity Building for Small Modular Reactors: Technology Developments, Safety Assessment, Licensing and Utilization for 2 years.

- **Objective:** To contribute to a new way how to cover the European demand for clean and emission-free flexible resources of electricity and heat, work in synergy with renewables, and to decrease dependency on fossil fuel imports.

Continue

- **Specific problems:** SMR design and technology development have undergone a rapid advancement in the past decade with interest from both expanding and newcomer countries. There are about 50 design concepts, a few of which are tested, but only three designs are currently under an advanced stage of construction. The designs cover a wide range of types, starting from well-known pressurized water reactors (PWRs), but made smaller and compact to more innovative ones (reactors cooled by liquid metals or salts). These types of reactors are promising from several aspects: Technically, they are not completely new. There is experience in the fields of power technologies, military or space. Emphasis on compactness and long refuelling periods substantially reduces building time at the site and safeguards problems, without the necessity of a substantial further technical development (as e.g. Generation 4 reactors). This technical evolution and smaller size may also reduce the time and effort for safety assessment, and the widely accepted principle of a graded approach may reduce the time to obtain the license. This may be further reduced by building identical units on a greater scale (so far, power reactors are more or less built individually). --------.

Project Facts: RER2014

- **Title:** *Facilitating Capacity Building for Small Modular Reactors: Technology Developments, Safety Assessment, Licensing and Utilization*
- **Budget:** EUR 450,450
  - Approved Budget TCF: EUR 355,950
  - Extrabudgetary contribution (footnote-a/): EUR 94,500
- **Duration:** 2 years (Jan 2018 - Dec 2019)
- **Development Objective:** *To contribute to a new way how to cover the European demand for clean and emission-free flexible resources of electricity and heat, work in synergy with renewables, and to decrease dependency on fossil fuel imports*
- **Outcome:** *Knowledge in all aspects of SMR technology, licensing, safety assessment, economy and implementation increased*
- **Activities: Exchange of experience on all aspects of SMRs including**
  - **Design and technology of water and non-water cooled SMRs;**
  - **Infrastructure, economic and financing aspects of SMRs;**
  - **Non-electric nuclear applications, technology assessments and specific issues on engineering, construction and the industrial supply chain of SMRs;**
  - **Design safety, safety assessment, principles for emergency preparedness and response as well as regulatory framework and licensing issues for SMR development.**
- **Participating Member States:** 16*

**Albania, Armenia, Azerbaijan, Croatia, Czech Republic, Greece, Hungary, Lithuania, Northern Macedonia, Poland, Romania, Russian Federation, Slovak Republic, Tajikistan, Turkey, and Ukraine.*

Nuclear Fuel Projects

- **RER2016 -** Enhancing the Capabilities in the Diversification of Power Reactor Fuel Supplies for 2 years.

- **Objective:** To enhance capabilities in the safe and efficient use of nuclear power with diversified nuclear fuels sources.

Continue

- **Specific problems: i**n accordance with the European Energy Security Strategy May 2014, it is suggested that an overall diversified portfolio of power reactor fuel supply is needed for all plant operators. Some efforts have been made to diversify the nuclear fuel supply, e.g. for Russian pressurized water reactors (VVER). Although it was successfully applied at some nuclear power plants, it was abandoned for different reasons. Such experience needs to be shared for the licensing of new types of fuel assemblies for power reactors among the countries which plan such diversification. These issues need to be addressed because they are related to the implementation and licensing of new fuel assembly types for reactors of various designs identified and analysed. Among all, safety concerns are of high interest and critical importance.

RER2016 Enhancing the Capabilities in the Diversification of Power Reactor Fuel Supplies

Project Budget: EUR 388,500
- TCF: EUR 336,000
- Extrabudgetary contribution (footnote-a/): EUR 52,500

Project Duration: 2 years (Jan 2018 - Dec 2019)

Development Objective: To enhance capabilities in the safe and efficient use of nuclear power with diversified nuclear fuels sources

Project Outcome: Capacity of the participating Member States enhanced through analysis and sharing of issues related to the implementation and licensing of new fuel assembly types for reactors of various designs

Targeted Member States: 10 TCEU MS (ARM, BUL, CZR, HUN, KAZ, ROM, RUS, SLR, TUR, UZB)

RER2016 Enhancing the Capabilities in the Diversification of Power Reactor Fuel Supplies

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Activities in 2018

- Regional coordination meeting (26-27 March 2018, Vienna, Austria)
- Workshop on Fuel Supply Strategy & Preparation for Request for Proposal & Bid Evaluation (26-27 June 2018, Vienna, Austria)
- Workshop on Licensing and Operation of Mixed Cores (4-6 Sep 2018, Vienna, Austria)
- Workshop on Qualification of codes and methods for the analysis of mixed cores using multiple products (11-13 Dec 2018, Vienna, Austria)

Activities in 2019

- Workshop on safety assessment and independent oversight of mixed core licensing (19-21 June 2019, Vienna, Austria)
- Workshop on safety assessment of mixed cores using multiple products (France, TBC, Sep 2019)
- Workshop on impact on fuel diversification on fresh and spent fuel management (TBC, Nov 2019)

Comers through Inter-regional Project: INT2018

- **Title:** Supporting Knowledgeable Decision-making and Building Capacities to Start and Implement Nuclear Power Programmes
- **Objective:** To bring together countries that are considering nuclear power as an option and countries that are actively preparing for the introduction of nuclear power.
  - Support Member States to take knowledgeable decisions to start nuclear power programmes;
  - Support nuclear power capacity building in Member States to develop the necessary competencies and organizations.
- **Duration:** 2016–2019 (4 years)

Continue

- **Specific problems: t**his project brings together countries that are considering nuclear power as an option and countries that are actively preparing for the introduction of nuclear power and involves two primary objectives:
  - Part 1: Supporting Member States to take knowledgeable decisions to start nuclear power programmes;
  - Part 2: Supporting nuclear power capacity building in Member States to develop the necessary competencies and organizations.
  - Mainly support for new comers and expansion countries
  - Funded by USA, Korea and Russia (In case of Russia, only accepted to organize training course at Russia)
  - Events were held in Korea, USA, Russia and Japan etc.
  - All EBP fund, not TCF

2018 Summary of activities

- **Funding sources:** approx. 6.6 million EUR (76% Extrabudgetary Funding / 24% TCF)
- **Participating MSs**: Embarking and Expanding Countries as Determined by NPSG
- 19 activities planned (all implemented)
- 6 additional activities implemented
- 372 participants* trained for 25 activities = average of 15 people / activity
- 25% of participants were women
- 40 external experts contracted from 22 Member States

Continues

- 4 multi-donor training courses implemented (3 in Vienna, 1 in Korea)

- 33 activities planned for 2019

*Note: a few people participated in multiple activities

-

Project in Uranium Production and Environment: INT2019

Title: Deploying Technology and Management of Sustainable Uranium Extraction Projects

Objective: To implement an effective uranium extraction strategy to meet fuel needs for nuclear power generation.

- More than 45 Member States participate in this projects.
- TCF

Continue

Specific problems: sustainable uranium production is critically important for secure, socially accepted uranium fuel security, notably in nuclear ‘new comer’ countries, some of which are looking to source fuel from their own uranium resources. Comprehensive extraction (CX) is a sustainable way of looking at extraction of uranium and other valuable commodities like rare-earth elements (REEs), and recycling/reusing residues (waste) in one integrated process.

The gaps and deficiencies identified in a systemic way:

- a) focusing on training and supporting project leaders and their leadership teams as they develop the concepts and design for comprehensive extraction multi-resource projects focused on multi-partner local mining and extraction of uranium or extraction of uranium as a co- or by-product;
- b) creating collaborative interregional networks suited to global rather than solely national approaches to such projects;

Continue

- c) supporting those projects that have already committed to using an improved Pre-Feasibility Study (PFS) template developed by the IAEA expert working group with enhanced design, leadership and commercial realism in mind;
- d) assisting those MSs who have identified the central requirement for enhanced policies and practices in regard to strengthening the processes of social acceptance, critical materials management and waste hierarchy driven waste management practices, and environmental sustainability.

Project in Decommission & Remendiation

INT9183 - *Overcoming the Barriers to Implementation of Decommissioning and Environmental Remediation Projects*

Overall Objective:

To increase progress in implementing decommissioning and environmental remediation programmes with special focus on project implementation, complementing the work of the existing collaborative networks and project coordination activities

Specific Objective:

Strengthened MS frameworks for implementation of D&ER programmes, comprising: - legal and regulatory framework including relevant guidance documents - funding schemes - waste management infrastructure - access to relevant technology - arrangements for public involvement in decision making

Continue

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Outputs:

- Increased number of personnel qualified to work on implementation of decommissioning and environmental remediation

- Knowledge and experiences on implementation aspects of decommissioning and environmental remediation disseminated reflecting relevant experiences in the Member States

Project in RWM

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RER9143 *Enhancing Radioactive Waste Management Capabilities*

Overall Objective:

To enhance radioactive waste management capabilities by leveraging regional cooperation, knowledge sharing and infrastructure development

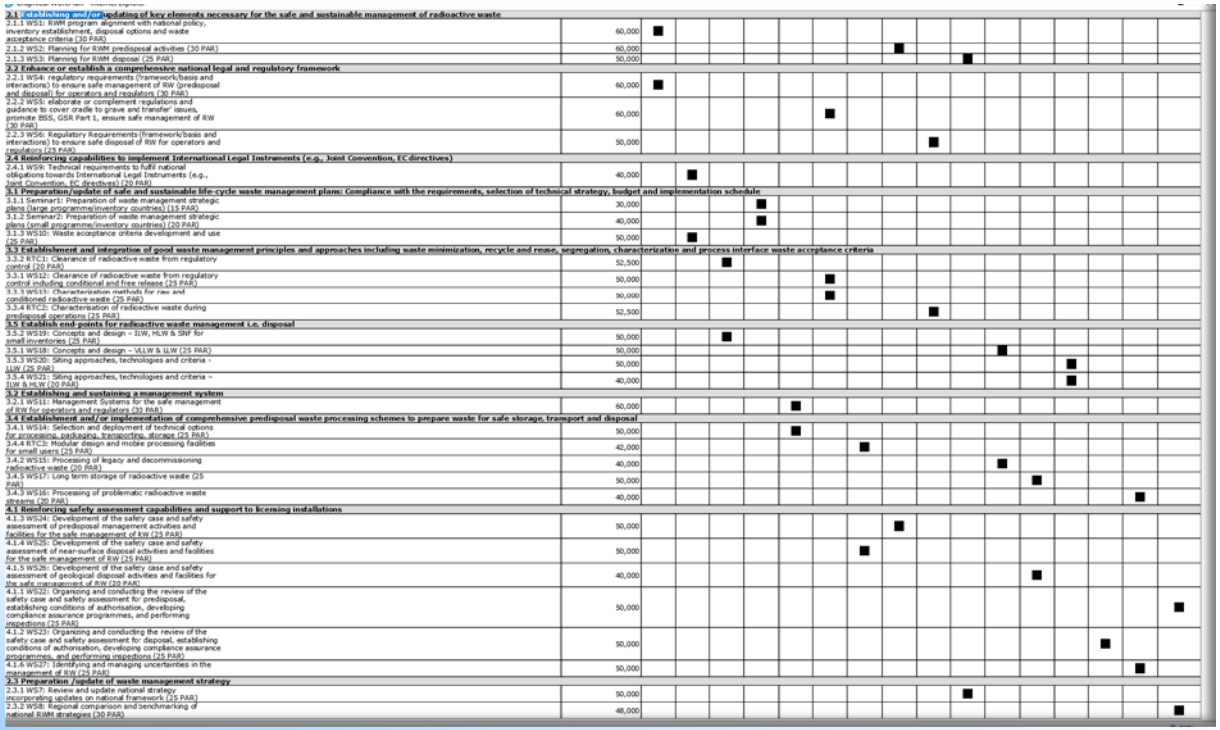
Specific Objective:

Improved capabilities of operators and regulators of radioactive waste management (predisposal and disposal) facilities.

Continue

Outputs:

- Established and/or strengthened national framework to enable safe and sustainable waste management in participating Member States.
- Enhanced capacities of waste owners/waste management organizations to plan and establish viable approaches to implement safe and sustainable life-cycle waste management activities, from waste generation to disposal



- Capacities of national regulatory authorities to license and exercise regulatory control over facilities and activities for the safe management (predisposal and disposal) of RW upgraded and reinforced

Main activities in Remediation

RER9145 - *Supporting Human Resource Capacity Building for Developing and Implementing Integrated Programmes for Remediation of the Areas Affected by Uranium Mining*

Overall Objective:

To assist in resolving the nuclear legacy problems in the territories affected by uranium mining in the Europe region and to develop competencies in order to properly manage remediation programmes and projects as well as to monitor and operate the ex-uranium production legacy sites.

Specific Objective:

Required skills and competencies of qualified personnel in the management of remediation programmes and projects developed for resolving the nuclear legacy problems in the territories affected by uranium mining in the Central Asia region.

Continue

Outputs:

- Practical competencies developed in the participating Member States with respect to designing and implementing remediation programmes in areas affected by uranium mining.
- Uniformity ensured in approaches, practices and standards followed by affected MS to efficiently implement relevant national activities
- Conformity of national approaches to international standards (IAEA and others) ensured.

Project in Decommission

RER9146 ***Enhancing Capacities in Member States for the Planning and Implementation of Decommissioning Projects, for 4 years***

Overall Objective:

To contribute to ensuring the safety and protection of workers, the public and the environment by conducting planning and implementation of decommissioning activities.

Specific Objective:

Capacities enhanced in MSs for the planning and implementation of decommissioning projects of small nuclear facilities or medical, industrial and research facilities that use radioactive materials and sources.

Continue

IAEA 60 Years Atoms for Peace and Development

Outputs

- 80% of the identified small facilities have decommissioning plans under development or drafted
- 30% of identified facilities have decommissioning plans approved or under implementation

Project in RWM

RER9150 ***Improving Capabilities to Efficiently Implement Large Ongoing Decommissioning Projects and Waste Management with Minimization of Risks Based on Initiatives and Potential Synergies***

Overall Objective:

To contribute to the efficient implementation of optimized solutions for large ongoing decommissioning projects, waste management and remediation of sites in Lithuania, Slovakia, Bulgaria and Ukraine

Specific Objective:

Capabilities in participating MSs to implement decommissioning projects and manage RAW safely and effectively with minimization of risks on the bases of common shared experience and best proven international practices improved

Continue

IAEA 60 Years Atoms for Peace and Development

Outputs:

- Competence for overall management of decommissioning projects enhanced;
- Knowledge and experience on best proven international decommissioning procedures disseminated
- Expertise for RAW treatment and conditioning facilities and procedures shared and increased
- Approaches for safe storage and disposal of RAW shared and knowledge/experience harmonized with international standards

Q and A ?

IAEA 60 Years
Atoms for Peace and Development

IAEA Technical Cooperation Programme

Technical cooperation: delivering results for peace and development