



**INTERNATIONAL
RESEARCH AND
BILATERAL
AGREEMENTS**

Briefing to Commission

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OVERVIEW

- **Desired Outcomes**
- **International Activities – Scope**
- **Foreign Assignees**
- **Selected Programs**
- **Summary**

Research Cooperative Desired Outcomes

- **Efficiency, effectiveness, safety and security**
- **Availability of physical facilities**
- **Ensure current state of Agency knowledge incorporates the results of international research and analyses**

What Research Activities

- **Experiments – Empiricism**
- **Verification and Validation**
- **Technical Data/Information**
- **Indirect Benefits – International consistency**

Current Cooperative Research Activities

- **Approx. 90 Bilateral or Multilateral agreements with 22 countries**
- **NRC provides intellectual capital, expert analysis, and experience to the international programs**

Current Cooperative Research Activities (cont'd)

- **NRC contributes approx. \$3.9M/yr to international programs conducted in the U.S. and abroad**
 - **NRC contributions range between \$10K/yr to \$1.2M/yr**
- **Participants contribute approx. \$1.1M/yr to Agency Programs**

Areas of International Cooperation

- **Reactor Vessel and Piping Integrity**
- **Aging of Reactor Components**
- **Thermal-Hydraulic Code Assessment and Application**
- **Nuclear Fuels Analysis**
- **Plant Performance**

Areas of International Cooperation (cont'd)

- **Seismic Safety**
- **Probabilistic Risk Assessment**
- **Severe Accidents**
- **Reactor Containment Structural Integrity**

Areas of International Cooperation (cont'd)

- **Dry Cask Storage and Transport**
- **Decommissioning**
- **Fire Protection**
- **Human Reliability**

Multilateral Agreements

- **MASCA**
- **CABRI**
- **MCCI**
- **PKL**
- **Fire Project -
Data Base**
- **HALDEN**
- **COMPSIS**
- **ROSA**
- **PAKS**
- **SCIP**
- **SERENA**
- **SETH**
- **IPDE – Data Base**
- **ICDE – Data Base**

Bilateral Agreements

- **CAMP**
- **CSARP**
- **SGTI-III**
- **Seismic Research**
- **ARTIST (PSI Switzerland)**
- **PPS-BAM**
- **Fire Research (IRSN-France)**
- **NDE-PWSCC (PINC)**
- **Phebus-Fission Products**
- **Phebus Source Term**

Active Participation in OECD/NEA Committee/Working Groups

- **CSNI**
- **PRG**
- **WGRISK**
- **WGIAGE**
- **GAMA-WG**
- **CRPPH**
- **SEGFSM**
- **SEGHOF**

Other International Initiatives

- **PROSIR-RR**
- **QUAMET**
- **NESC-4**
- **ISAB**
- **FBMSR-RRC**
- **MCMA-IBRAE**
- **IEASP**
- **MERIT**
- **PERECT**
- **SMILE**
- **VOCALIST**

Recent Foreign Assignees

- **RES hosted 6 assignees in the last 5 years from: Switzerland, Sweden, and Korea**
- **Assignment areas included: thermal-hydraulics, severe accident analysis, code modeling; environmentally assisted stress corrosion cracking analysis; and probabilistic risk assessment**

Example Projects

- **PAKS Fuel Project**
- **Phebus-FP**
- **Cabri**
- **Japanese Collaboration on Seismic Issues**
- **CAMP**
- **CSARP**
- **MCCI Project**

SUMMARY

- **International research has supported NRC programs**
- **Review projects to ensure continued relevance to NRC programs**
- **Knowledge Management**

ACRONYMS

- **ARTIST – Aerosol Trapping in a Steam Generator**
- **BAM – Federal Institute for Materials Research and Testing of Germany**
- **CABRI – the CABRI facility is a research reactor located in France**
- **CAMP – (Thermal-Hydraulic) Code Application and Maintenance Program**
- **COMPSIS – Computer-Based Systems Important to Safety**
- **COOPRA – Cooperative Probabilistic Risk Assessment**
- **CRPPH – Committee on Radiation Protection and Public Health**
- **CSARP – Cooperative Severe Accident Research Program**
- **CSNI – Committee on the Safety of Nuclear Installations**
- **EPR – Evolutionary Power Reactor (a.k.a. European PWR)**
- **FBMSR – Fuel Behavior and Material Science Research**
- **GAMA – (Working) Group on the Analysis and Management of Accidents**
- **GSI – Generic Safety Issue**
- **Halden – Halden Reactor Project in Norway**
- **I&C – Instrumentation and Controls**
- **IBRAE – Russian Institute of Nuclear Safety**

ACRONYMS (cont'd)

- **ICDE – International Common-Cause Data Exchange**
- **IEASP – Information Exchange on Accident Sequence Precursor Results, Data, Insights, and Methodology**
- **IPDE – International Piping Database Exchange**
- **IRSN – Institute of Radioprotection and Nuclear Safety (France)**
- **ISAB – International Subchannel Analysis Benchmark**
- **ISG-TIP-3 – International Steam Generator-Tube Integrity Program-3**
- **LBLOCA – large break loss of coolant accident**
- **LOCA – loss of coolant accident**
- **MASCA – Material Scaling**
- **MCCI – Melt Coolability and Concrete Interaction**
- **MCMA – MELCOR Code Modernization and Assessment**
- **MERIT – Maximizing Enhancements in Risk Informed Technology**
- **MOX – Mixed-Oxide Fuel**
- **NDE – Non-Destructive Examination**
- **NEA – Nuclear Energy Agency (OECD/NEA)**

ACRONYMS (cont'd)

- **NESC-4 – Network for Evaluating Structure Components**
- **OECD – Organization for Economic Cooperation and Development**
- **PAKS - Paks fuel project**
- **PERECT – Prediction of Irradiation Damage Effects in Reactor Components**
- **PINC – Program for the Inspection of Nickel Alloy Components**
- **PKL – Primarkreislauf Test Facility, an integral thermal hydraulic test facility located in Erlangen, Germany**
- **PPS – Package Performance Study PRA – Probabilistic Risk Assessment/Analysis**
- **PRG – Program Review Group**
- **PROSIR-RR – Probabilistic Structural Integrity of a PWR Reactor Pressure Vessel-Round Robin**
- **PWSCC – Primary Water Stress Corrosion Cracking**
- **QUAMET – Qualification Methodology**
- **ROSA – Rig of Safety Assessment**
- **RRC – Russian Research Center-Kurchatov Institute**
- **SBLOCA – Small break loss of coolant accident**
- **SCIP – Studsvik Cladding Integrity Project**
- **SERENA – Steam Explosion Resolution for Nuclear Application**

ACRONYMS (cont'd)

- **SETH – Senior Group of Experts on Nuclear Safety Research Facilities and Programs Thermal Hydraulics**
- **SEGFSM – Special Experts Group on Fuel Safety Margins**
- **SEGHOF – Special Experts Group on Human and Organizational Factors**
- **SGTI – Steam Generator Tube Integrity-Phase III**
- **SMILE – Structural Margin Improvements in Aged-Embrittled reactor pressure vessel with Load History Effects**
- **SNAP – Symbolic Nuclear Analysis Program (graphical user interface)**
- **TRACE – TRAC RELAP Advanced Computational Engine**
- **UO₂ – Uranium Oxide**
- **WG – Working Group**
- **WGIAGE – Working Group on Integrity and Aging**
- **WGRISK – Working Group on Risk Assessment**
- **VOCALIST – Validation of Constraint-Based Methodology in Structural Integrity**