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Human Resources and Training: A Mandatory Gate for Water Cooled Reactors in the 21st Century

IAEA – Vienna – 30 October 2009

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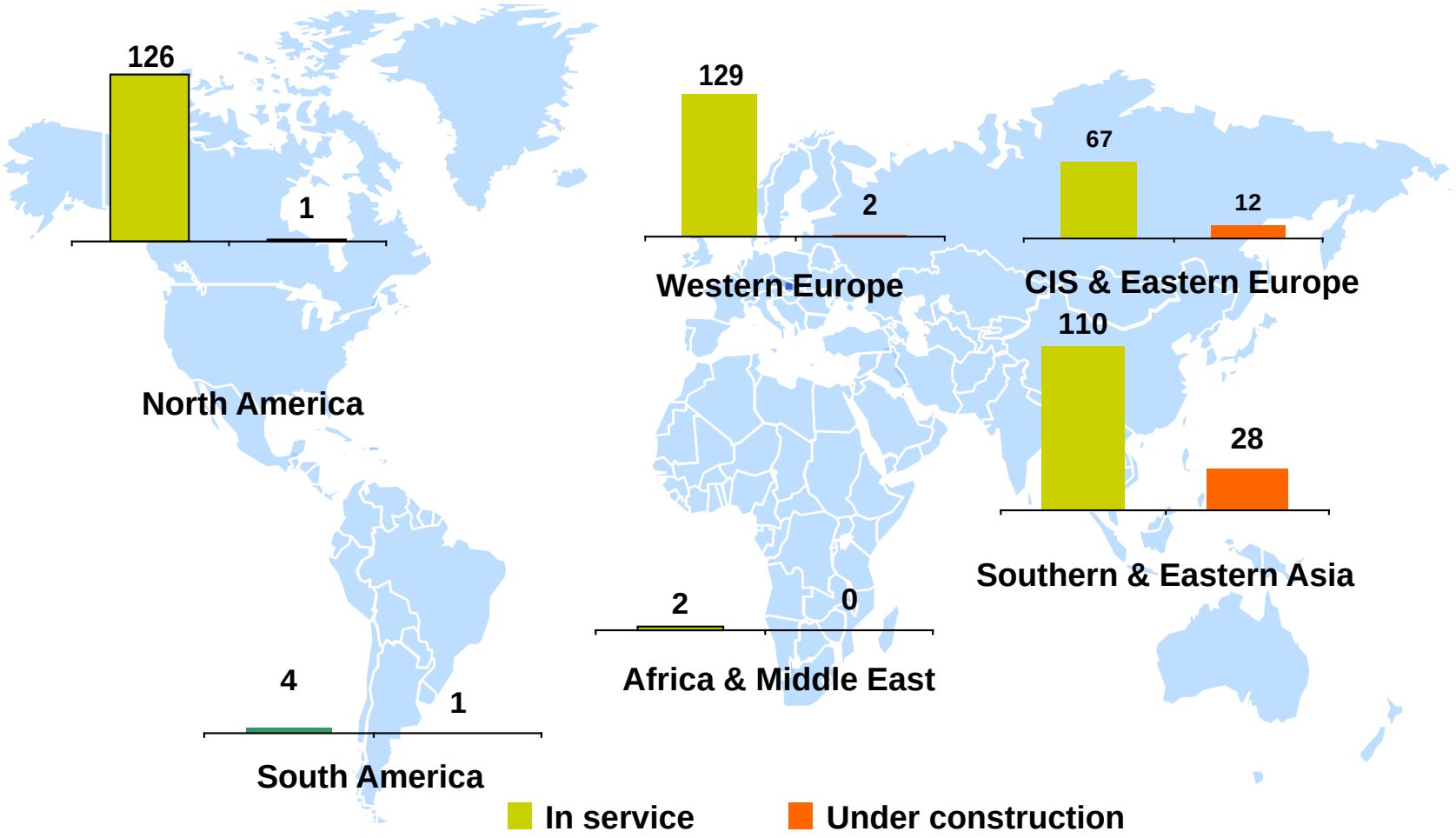
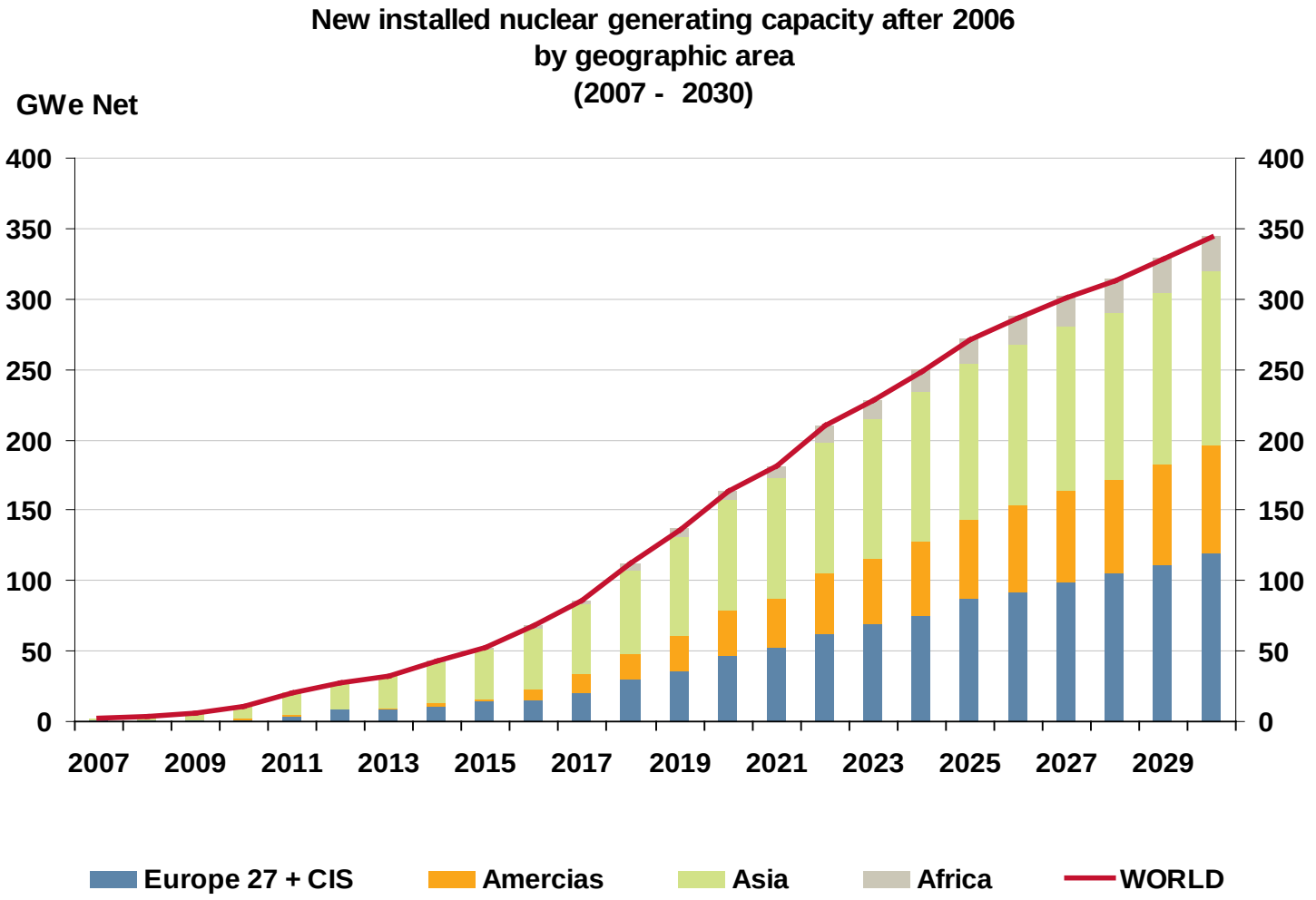
Power Reactors
Existing Fleets and New Builds (2008)



The Renaissance of Nuclear is ahead of us



Bridging the Gap

An integrated manufacturing approach

- **Continuous deliveries of quality products and process improvements for existing plants and new build projects**

Chalon Saint Marcel

- 30 years of operations
- Workshop: 39 000 m²
- Reactor Pressure Vessels, Steam Generators, Pressurizers, Safety Injection Accumulators

2900m² Extension in 2006

JSPM (Jeumont)

- Start of operation: 1898
- Workshop: 13 000 m²
- Reactor Coolant Pumps and Motors, Control Rod Drive Mechanisms

1200m² Ext. by 2012

2 new production lines by 2011

Sfarsteel (Creusot)

- Heavy forging and machining
- Workshops: 85 000 m² (4 sites)

AREVA since 2006

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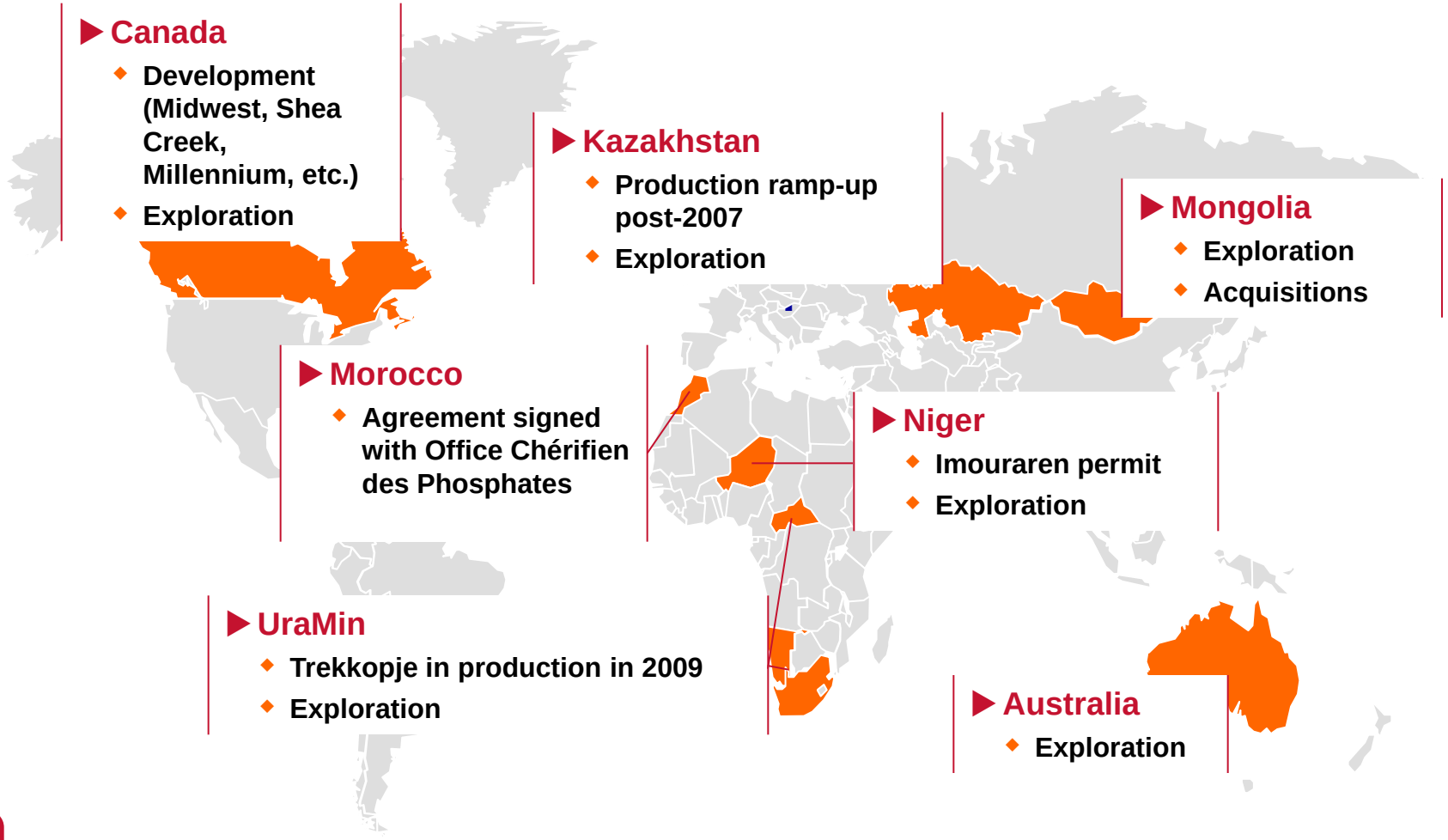
Making the fuel cycle secure for our customers

Developing our mineral deposits



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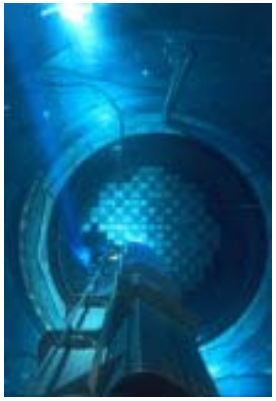
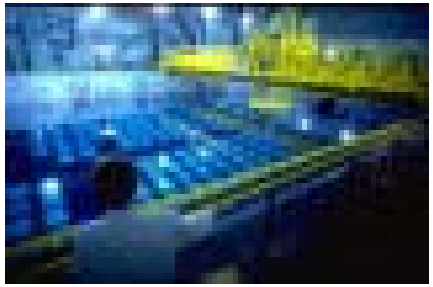
New builds of course….
but we must not forget to supply and service existing Nuclear Power Plants

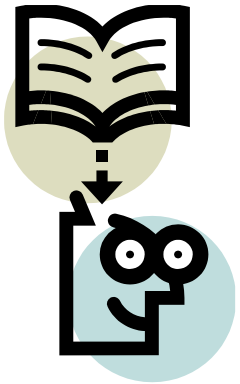



What does it mean ?

For Human Resources



and Training

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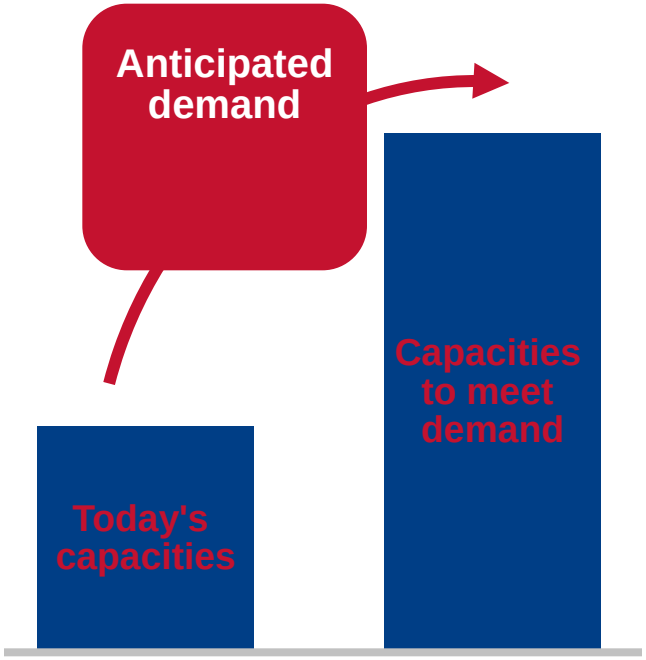
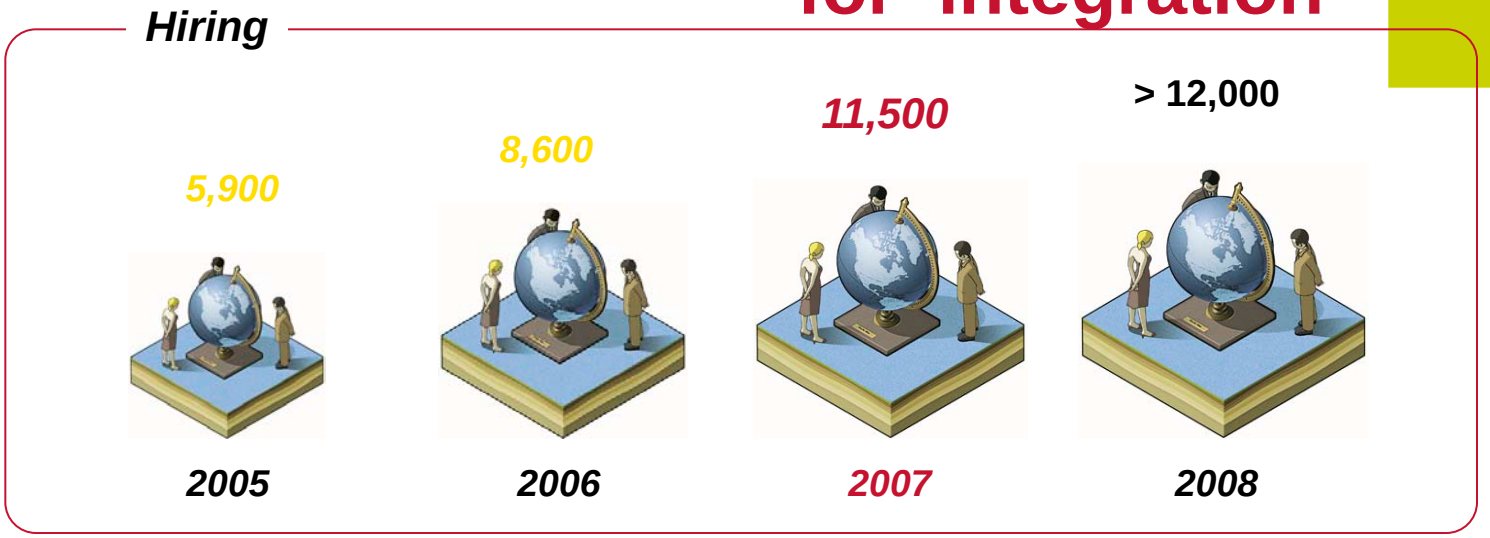
Anticipated growth: The “Bridge the Gap Program”

- **Driven at the highest level of and across the organization**
  - Processes able to build on experience and improve efficiency
  - Organization to deliver
  - Personnel competences and experiences
- **Secures resources and capacities along the whole value chain**
  - Mining and uranium supply
  - Fuel capacities
  - Industrial production capacities
  - Supplier capacities
  - Engineering resources
  - Project management resources



Human Resources is an essential part of our “Bridge the Gap” program

Training is the key success factor for integration



- **Recruitment and integration of new employees**
  - **Partnerships with schools, universities to adapt their degree courses**
  - **Training (to develop talent and to transfer knowledge)**
  - **Mentoring (coaching by experienced personnel)**
  - **GAPExpert (to renew the AREVA's expert population)**
  - **Transfer of competencies from senior experts**

AREVA nuclear training facilities

A comprehensive training program

Nuclear Safety: **design bases, the safety principles, safety culture.**

Radiological Protection: **radiological issues: risks, standards, ALARA principle and the responses to incidents & accidents.**

Nuclear & reactor physics: **nucleus structure, the reactor kinetics, dynamics & control.**

Thermal Hydraulics & Material issues

PWR: **exercises on simulator (operation modes and reactions of a PWR).**

Nuclear Fuel Management: **front and back end, fuel reload, economic analysis, open and closed cycle.**

Nuclear Waste Management: **waste conditioning & storage, nuclear safety issues related to the nuclear wastes.**

Maintenance: **The European maintenance standards, the maintenance methods, in service inspection & equipment behaviour.**

General Training capabilities in France

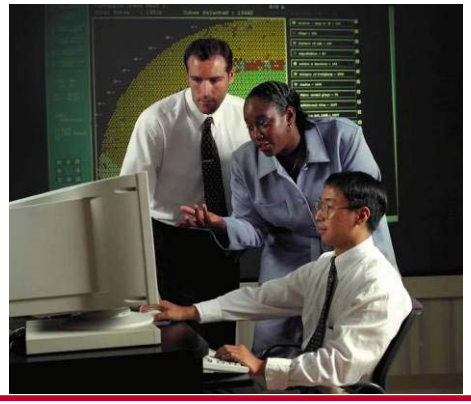
1) **Experts, post-graduation level**
   - INSTN Saclay (Commissariat à l'Energie Atomique),
   - ENSTA (Master with the support of AREVA)
   - Internship opportunities within Institut de Radioprotection et de Sûreté Nucléaire for the safety experts

2) **Engineers, master degree**
   - INSTN training
   - Program at the Grenoble University in close relationship with CENG & ENSTA (3 years)

3) **Technicians, graduate and training**
   Training centers + on the job training (provided by the operators EDF and GDF Suez)

Maintaining the Expertise: Example of Safety Analyses

- Safety Reassessment
- LOCA/non LOCA safety analysis
- Accident analysis
- Probabilistic Risk Assessment
- Seismic analysis



An Example: Training Modules for our Nuclear Services teams in Germany

Training Modules	Reactor Type	Training Location
Module 1: PWR Plants and Systems	PWR	Essen/Offenbach
Module 2: Human Performance, Human Factors	PWR/BWR	Essen/Erlangen
Module 3: Components of the Nuclear Steam Supply Systems	PWR	Erlangen
Module 4: Handling of Heavy Loads and Large Components	PWR/BWR	Zwentendorf
Module 5: Outage Performance	PWR	Erlangen/Chalon
Module 6: Handling of Service Tools & Equipment and Lifting Beams (P 1)	PWR	Erlangen
Module 7: Handling of Service Tools & Equipment and Lifting Beams (P 2)	PWR	Erlangen
Module 8: In-Service Inspections, Visual Inspections and Metallography	PWR/BWR	Erlangen
Module 9: Fuel Assemblies from A-Z	PWR/BWR	Lingen

Training Modules for our Nuclear Services in Germany: BWR dedicated modules

Training Module	Reactor Type	Training Location
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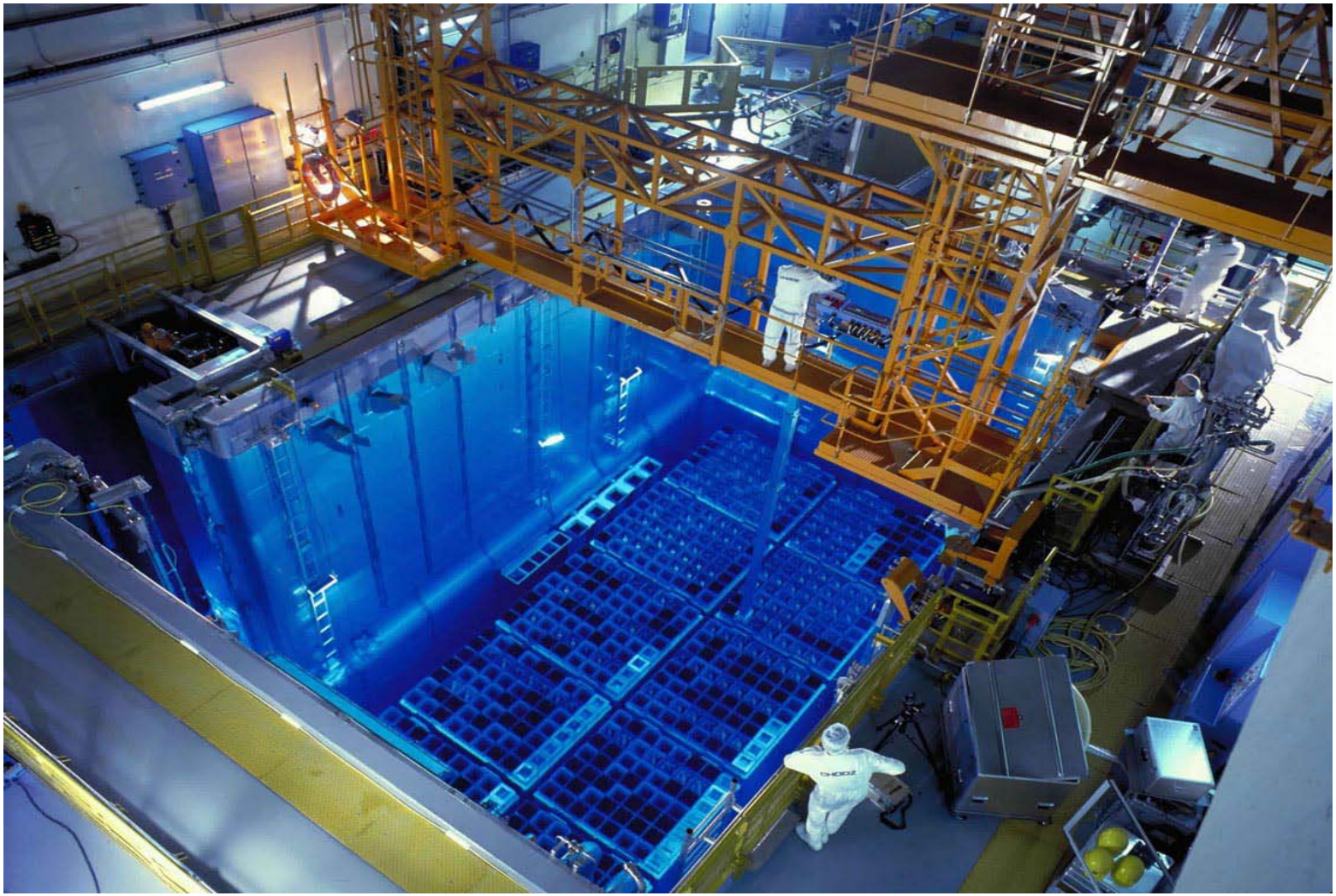
Module 3: Components of the Nuclear Steam Supply System	BWR	Zwentendorf
Module 5: Outage Performance	BWR	Zwentendorf
Module 6: Handling of Service Tools & Equipment and Lifting Beams	BWR	Zwentendorf
Module 7: Assembly and Disassembly of BWR control rod drives	BWR	Zwentendorf



The CETIC center in Chalon

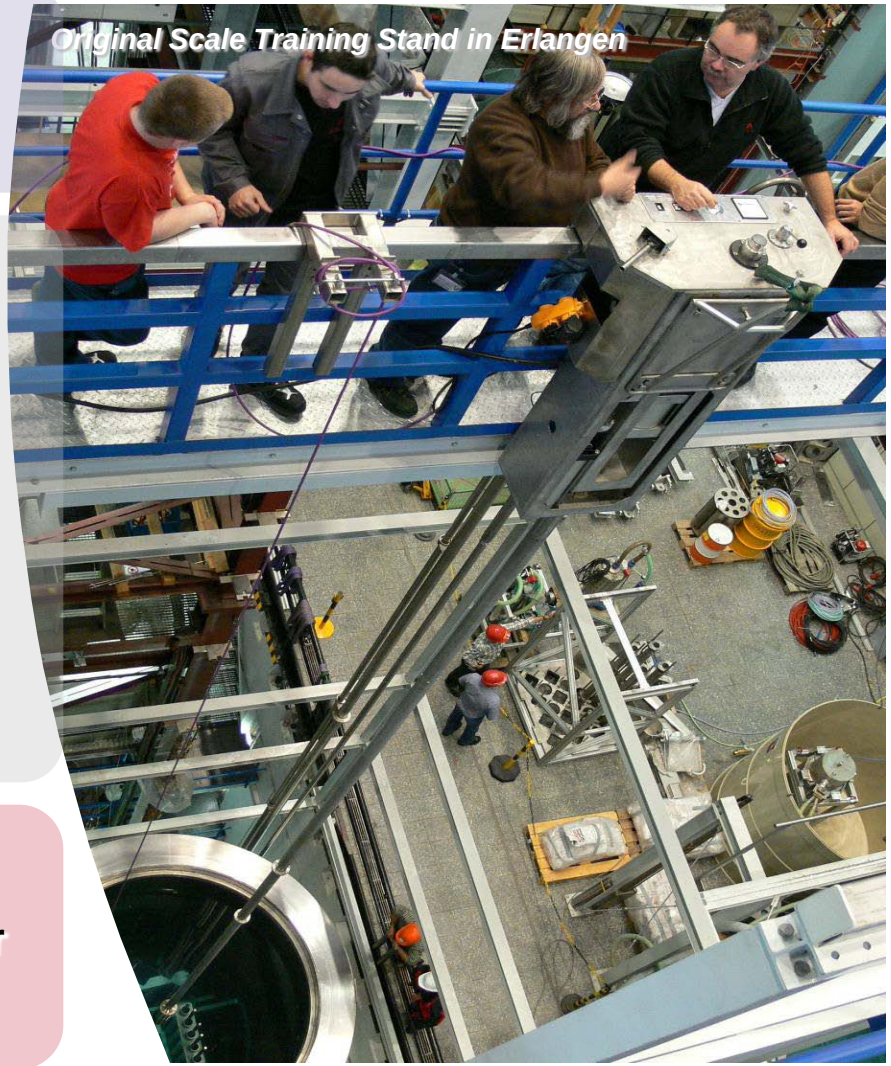
Hands-on Training Facility

Conditions like on the 21m level

Training possibilities:

- **Coupling and decoupling of control rod drives**
- **Removal and insertion of level measurement nozzles**
- **Removal and insertion of in-core instrumentation lance**
- **Insertion of guide bellmouth**

Outlook:
Development of a training, qualification and test stand for new service tools and equipment


Original Scale Training Stand in Erlangen

Hands-on Training Facility

Original non-contaminated RPV closure head of the formerly planned NPP Biblis C

Training possibilities:

- **Assembly and disassembly of RPV closure head sealing**
- **Opening and closing of in-core instrumentation nozzles**
- **Assembly and disassembly of RPV closure head vent line**

Outlook:
Establishment of a training cooperation with Garlock Helicoflex

Original RPV closure head in Erlangen

Thank you for your attention…