Institute for Energy Technology and the OECD Halden Reactor Project

an introduction

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NKS-R Decommissioning Seminar, 6th – 7th November 2013
### Board
- Auke Lont

### CEO
- Eva S. Dugstad

### HALDEN PROJECT
- Fridtjov Øvre
- Margaret McGrath

### Independent foundation
- Strong international orientation
- Experiment-oriented
- Operates 2 reactors
- Basis in nuclear technology
- Ca. 600 employees—turnover 140 mill. USD

### Nuclear technology
- Brit Farstad

### Nuclear Safety and Reliability
- Margaret McGrath

### Safety Man–Technology–Organisation
- Jon Kvalem

### Energy and Environment
- Arve Holt

### Petroleum technology
- Tore Gimse
OECD Halden Reactor Project

- International collaborative research for Safe and Reliable Operation of Nuclear Power Plants
  - affiliated to OECD NEA in Paris
  - located in Halden, Norway
  - operated by Institute For Energy Technology, IFE
- Halden Agreement first signed in 1958
  - Renewed every 3rd year
  - Current program period from 2012 to 2014
  - 3-year budget ~ 70 million USD
  - OECD countries, through a Signatory organization, signs the Halden Agreement
- Associated Party Agreement (APA)
  - an extension to the original Halden Agreement to allow for multiple independent organizations in a country, or non-OECD countries, to participate to the HRP
- HRP is jointly funded by its members:
  - 20 countries
  - > 100 nuclear organizations worldwide
- Participant types
  - Utilities, Vendors, Licensing Authorities and R&D centers
### HRP member organisations – Signatories og Associated Parties

#### Signatory members:
- **Norway** – IFE - Institutt for energiteknikk
- **Belgium** - SCK/CEN - Belgian Nuclear Research Centre
- **Denmark** - Risø DTU
- **Finland** - TYÖ – JA ELINKEINO-MINISTERIÖ - Finnish Ministry of Employment and the Economy, operated by VTT
- **France** - EDF - Electricité de France
- **Germany** – GRS - Gesellschaft für Anlagen- und Reaktorsicherheit mbH
- **Japan** - JNES - Japan Nuclear Energy Safety Organization
- **Korea** - KAERI - Korean Atomic Energy Research Institute
- **Spain** - CIEMAT - Spanish Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas
- **Sweden** - SSM - Swedish Radiation Safety Authority
- **Switzerland** - ENSI - Swiss Federal Nuclear Safety Inspectorate
- **UK** - NNL – National Nuclear Laboratory
- **USA** - US NRC - United States Nuclear Regulatory Commission

#### Associated Parties:
- **Czech Rep.** - NRI - Czech Nuclear Research Institute
- **Slovakia** - VUJE Slovak Nuclear Power Plant Research Institute
- **Russia** - “TVEL” JSC.
  - Research Centre “Kurchatov Institute”
  - Research Institute VNIIAES
- **Kazakhstan** – Ulba Manufacturing company
- **USA**
  - GE/ GNF - Global Nuclear Fuel
  - Westinghouse Electric Power Company
  - EPRI - Electric Power Research Institute
  - DOE – US Department of Energy (INL&ORNL)
- **Japan**
  - JAEA, CRIEPI (incl. Toshiba og 11 utilities) and Mitsubishi NF (incl. MHI)
- **France**
  - IRSN - French Institut de Radioprotection et de Sûreté Nucléaire
  - CEA - Commissariat à l’énergie atomique et aux énergies alternatives
- **EU JRC** Transuranium, Karlsruhe

NEW!! UAE – FANR – Federal Authority of Nuclear Regulation
Governance and Organization of the Halden Project

- Sponsors
  - 20 countries
  - ~ 100 org.

- Halden Board of Management

- IFE, Norway
  - Owner
  - Execution
  - Operation
  - Liabilities

- OECD NEA

- Dissemination of Project results
  - Enlarged Halden Program Group Meeting

- Halden Project Management
  - Fridtjov Øwre
  - Margaret McGrath

- HBWR
- Fuels and Materials Research
  - Margaret McGrath
- Man Technology Organization
  - Jon Kvalem
- MTO labs
Joint and Bilateral Programs

- All Joint Programme **deliverables** are open to the HRP members.
- In addition to the joint programme, HRP members can also carry out experiments and other contract work through **Bilateral arrangements**.
Halden & Reactor plant
HBWR located in a mountain cave– start up 29.06.1959
Fuels & Materials experiments

Outlet Coolant Thermocouples
Fuel centre - line Thermocouple (TF)
Double H 3 Coil
Neutron Detector (V-type)
Diameter Gauge
Differential Transformer (LVDT)
(Here used as Cladding Extensometer)
Shroud (Ø 73/71mm)
Inlet Coolant Thermocouples
Inlet Turbine Flowmeter
Calibration Valve

Reactor operated from main control room
Experiments operated from experimenters room
On-line data acquisition
Database

Distribution to Members

04.11.2013
Safety MTO
(Man-Technology-Organisation)
Sector: Safety MTO

- **Key parameters**
  - ~75 people
  - Turnover 2012: 121 MNOK (20 MUSD)
- MTO-lab

- **Departments**
  - Industrial Psychology
  - Software Engineering
  - Systems & Interface Design
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<th>Field</th>
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<td>Physics &amp; engineering</td>
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<td>Computer science</td>
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- Human performance, human reliability and organisational factors
- Control room design & evaluation – control room systems
- Human System Interfaces
- Future operations concepts & Integrated operations
- Virtual and augmented reality applications
- Safety critical software
Summary

• Halden Reactor Project a center for nuclear safety research since 1958
  • 20 countries participate in a jointly funded research program
  • Halden Reactor is the most versatile nuclear test reactor in the world
  • Hammlab is a unique test bed in the MTO area
• More countries and companies are interested in participating in the HRP
• The Halden Board of Management recently unanimously expressed their willingness to support the continued operation of the Project

Fredriksten fortress @ Halden: The Nuclear Fortress

Remember:
EHPG 14\textsuperscript{th}-19\textsuperscript{th} Sept. 2014
http://ehpg.hrp.no

Best wishes for a successful seminar on Decommissioning!