



# **RIC 2006**

## **Session: Th5BC**

### **"Materials Degradation"**

Materials Research Needs in the Foreseeable Future  
Karen Gott  
Coordinator Materials and Chemistry Research  
Swedish Nuclear Power Inspectorate  
March 9th, 2006

# Disposition

**Industry needs concerning materials degradation**

**What are the issues?**

- Examples of degradation mechanisms

**How should we go about solving the issues?**

- Resource needs
- International collaboration?

# Industry needs concerning materials degradation

## The nuclear industry needs to ensure that

- Decisions and regulations are based on the best information available
- Utility submissions, inspection and ageing programs are based on the best information available
- Research is performed to ensure the safety of the plants and to support the regulations
- Competent people are available to work in both the utilities and the regulatory bodies

# **Need for understanding**

**SKI believes that good regulations in the field of materials degradation are based on a comprehensive understanding of the major factors affecting the degradation mechanisms.**

**Without this understanding it is not possible to develop effective risk based inspection programs or to assess whether the mitigating measures introduced will in fact mitigate and not aggravate the situation.**

# **Need for research**

**It is therefore essential that research includes efforts to deepen our understanding of the materials degradation mechanisms. This applies to both the utilities and the regulator.**

**When degradation is found in the plant it is vital to investigate the root cause to contribute to this understanding.**

**International information exchange is important to ensure that research can be initiated in a timely manner and performed in a cost effective manner.**

# What are the issues?

## Examples of currently identified degradation mechanisms not yet fully understood

- Primary Water Stress Corrosion Cracking
- Intergranular Stress Corrosion Cracking in Nuclear Grade materials
- Irradiation Assisted Stress Corrosion Cracking

# Potential problems arising from uprating or extending the life of existing plants

## Will mitigation methods remain effective?

- Hydrogen Water Chemistry and Noble Metal applications
- Replacement materials in steam generators

## Will materials ageing be more severe or rapid than expected?

- Radiation embrittlement
- Cast stainless steel

## Are current materials data sufficient and of the necessary quality?

- Disposition curves
- Validity for plant application

# Are there new issues?

**NRC and EPRI have taken initiatives to identify new potential materials degradation issues.**

**Other countries can use these but will need to assess their applicability to their plants because of differences in materials and operational practice.**

**Reductions in research budgets for materials research will hamper the possibility of timely management of the inevitable degradation and the attractiveness of this area of expertise for the Young Generation.**



# Resource needs

## Materials research is expensive

- High temperatures and pressures
- Tight environmental control
- Irradiated material

**In the materials field (as many others) the experts are also ageing. There are few courses and text books directed to the specific problems of the nuclear industry, so most experience must be passed on an individual basis – working on the job.**

# International collaboration? + & -

- + More information for a given amount of money**
- + Access to equipment and expertise not otherwise readily available**
- + Next generation can develop contacts so they know where to get information not always available in other ways**
- Difficult to launch**
- Often lacking in flexibility**
- Can tie up too large a portion of budget**
- Not normally tailor-made to specific needs**

# Conclusions

- Materials degradation has been identified as one of the limiting factors for continued operation of our plants. It is therefore essential that materials research has the resources to develop an understanding of these problems in order to enable timely management of potential degradation.
- Materials research is expensive and there is a need for collaboration both on the national and international levels.
- Most of the experts are approaching retirement and it is essential that there is a smooth exchange of knowledge to provide continuity and enable new problems to be tackled in a manner that ensures public confidence.