



NDE Research Needs for Long-Term Operation of LWRs

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Research and Development Issues**
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Topics

- NDE technique development process
- Known NDE needs

NDE technique development process

- Steps
 - Define the problem
 - Must know the target flaw
 - Location
 - Size
 - Orientation
 - Shape
 - Defining these is not the task of NDE
 - Materials science and chemistry
 - Structural engineering
 - Fracture mechanics

NDE technique development process

- Steps
 - Develop mockups
 - Must provide a realistic basis for the NDE technique
 - Correct materials
 - Correct configuration
 - Realistic defects
 - Develop sensor technology
 - Depends on the target flaw and component configuration
 - Some work could start soon, for specific tasks
 - Develop analysis process
 - Some work could start soon

NDE technique development process

- Steps
 - Develop procedures
 - Use the sensors and analysis techniques on the mockups
 - Qualification
 - Requires regulatory involvement, perhaps Code activity
 - Develop qualification criteria
 - Qualification program
 - Qualify procedures and equipment
 - Qualify personnel

NDE technique development process

- Duration
 - Requires at least two years, more likely five years
 - Qualification is the longest step
- Baseline examinations must be performed before the 60-year point

Topics

- NDE technique development process
- **Known NDE needs**

Known NDE needs

- Concrete
 - NDE methods
 - Filmless radiography
 - Radar
 - Ultrasound
 - Targets
 - Wastage
 - Cracks
 - Rebar
- Cables
 - Infrared
 - Nanocoatings

Known NDE needs

- Cast stainless steel
 - This is already an issue for $L > 40$
 - Ultrasonic examination capability poor, but may be adequate for the expected large target flaw size
 - Target flaws may be smaller when considering $L > 60$
 - The material will have experienced more thermal aging embrittlement
 - Consider development and qualification of radiographic imaging
- Plastic pipe
 - Being installed now
 - Its behavior after 40 years of service is unknown
 - Radiography, microwaves, ultrasound

Known NDE needs

- Groundwater protection issues
 - Buried piping and tanks
 - Current groundwater protection programs will need to be extended to 80 years
 - Spent fuel pool liner
 - Weld quality often poor
 - Access difficult

Known NDE needs

- Infrastructure
 - Investigate needs for input data to risk-inform the >60 license renewal NDE scope
 - Information management and recoverable archiving of data
 - NDE data should be part of each utility's Integrated Information Technology system
 - At year 70, will NDE vendors be able to read NDE data files that were recorded in year 10?
 - Inspection systems rapidly become obsolete
 - Media perishable, no longer supported