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NDE Research Needs for Long-Term Operation of LWRs

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Topics

- NDE technique development process
- Known NDE needs

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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

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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

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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

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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

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Topics

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

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Known NDE needs

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

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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 develoment and qualification of radiographic imaging
- Plastic pipe
  - Being installed now
  - Its behavior after 40 years of service is unknown
  - Radiography, microwaves, ultrasound

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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

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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

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