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Environmental Effects

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Changing the World's Energy Future

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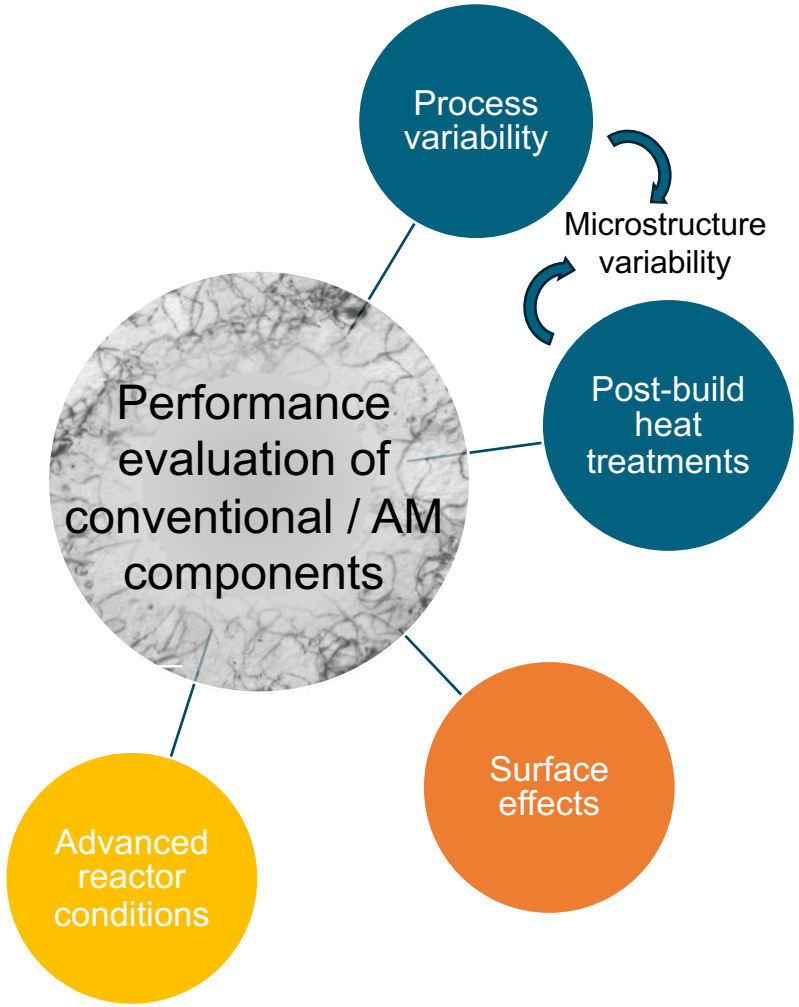
What is the Environmental Effects technical area?

- **Material evolution and lifetime in harsh advanced reactor environments must be part of a reactor material development and qualification program**
- **Evaluating in-reactor performance of new materials is one of the most critical technical hurdles for their rapid adoption in nuclear energy systems**
  - The effect of process and microstructure variability must be assessed
- **The Environmental Effects technical area covers materials degradation for topics of concern to the NRC that are not covered by ASME, including corrosion and irradiation effects on mechanical properties**
- **The Environmental Effects technical area has four broad goals:**
  - First-of-a-kind degradation data on new materials and components
  - Effect of microstructure variability on degradation
  - Getting to the answer faster (faster tests, less tests…) for rapid and effective qualification on materials performance and degradation in reactor environments
  - Establishing a technical basis for regulatory acceptance by providing needed data and models to support reactor design and operation



Example: Corrosion rate **4.6 ± 0.7** µm/year

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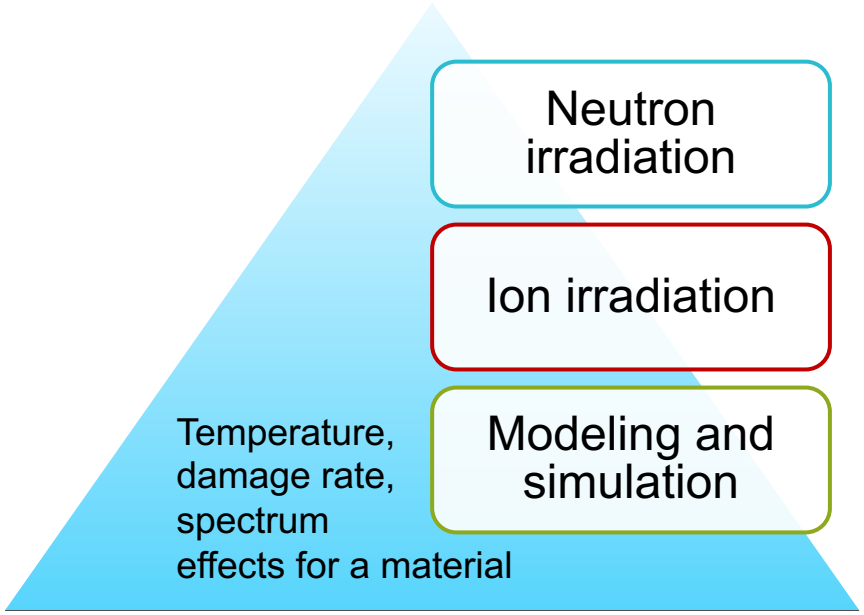
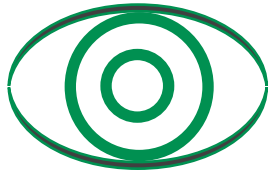
Environmental effects are reactor-specific…

…But there are ways to be cross-cutting



Computer vision

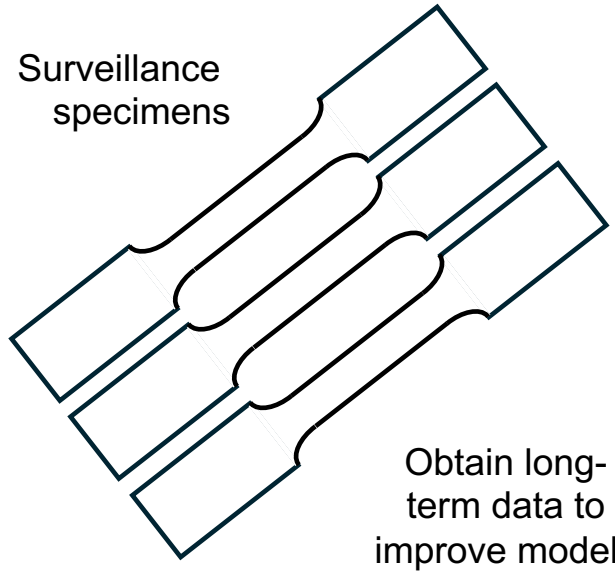


Rapidly gather quantitative data sets

Corrosion testing

Consider the same material in different environments

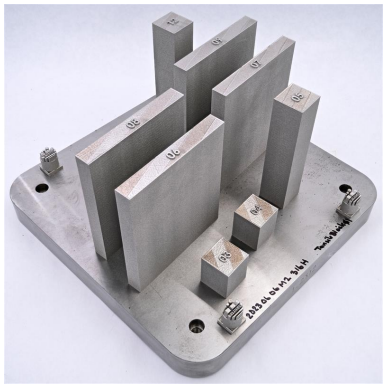
Surveillance specimens

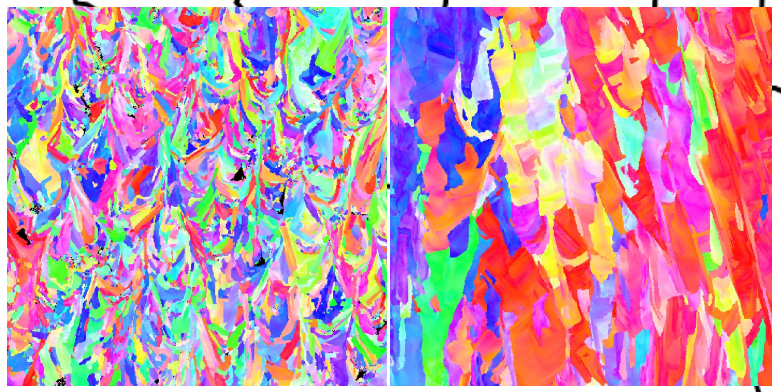


Obtain long-term data to improve models

An integrated environmental effects testing strategy for AM 316H and other materials

- Build
- Ions
- Neutrons
- Corrosion





Activities in the Environmental Effects area