



Irradiation Test Facility Assessment for Instrumentation Testing and Qualification

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Changing the World's Energy Future

Austin D Fleming



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**Idaho National Laboratory
Idaho Falls, Idaho 83415**

<http://www.inl.gov>

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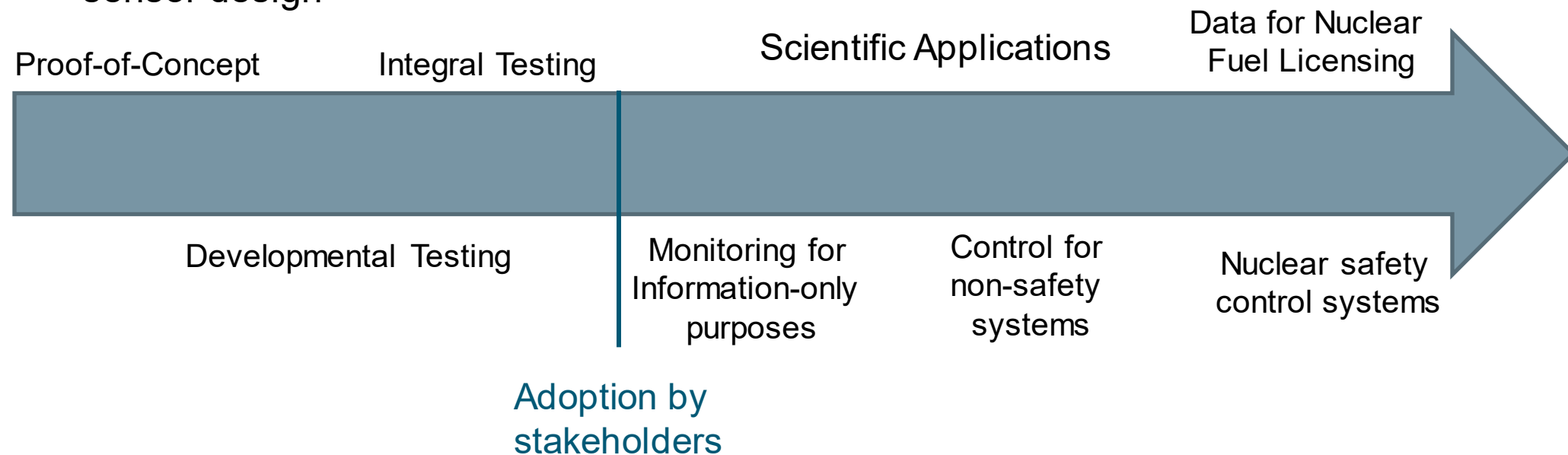
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Overview

- A broad range of need exist for the development and qualification for in-core sensors
- Low Overhead Testing
 - Provide fast and affordable results on sensor performance (quick and efficient access is prioritized over control and verification of irradiation conditions)
- Qualification testing
 - Highly controlled experiments with rigorously quantified uncertainties
 - NIST traceability references where possible with statistically significant data sets for a given sensor design

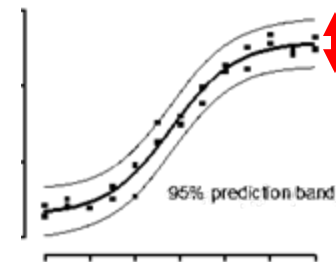


Qualification Overview

- **Devices**
 - Temperature
 - Flux
 - Pressure
 - Strain/Displacement
- **Sensors Qualification**
 - Thermocouples
 - Ultrasonic Thermometry
 - Pyrometry
 - Fission Chambers
 - Self Powered Neutron Detectors
 - Fiber optics

- **Requirements**

- House the sensor in a rigorously controlled and known environment for their specific measurand (Temperature, Flux, Pressure, Strain)



**Adequate
definition = GOAL!**

Survey of Positions

- Where to perform qualification testing for instruments?
 - Adequate flux/fluence for the instruments application
 - Large enough irradiation position to accommodate device
 - Cost effective
 - Benefit to Others (NSUF facility)
 - Majority of device is compatible with multiple facilities (risk mitigation, price point considerations, timeline implications)

Identified Positions of Interest

- The requirement for a highly controlled environment is difficult to achieve with the limited space typical of irradiation positions.
- These 4 positions identified have diameters ≥ 3 " which is much easier
- ATR medium I (3.4×10^{13} thermal, 1.3×10^{12} fast, 3.25" diameter)
- MIT 3GV (1×10^{10} - 1×10^{13} thermal, 3" diameter)
- OSU 6.5"/9.5" Tubes ($\sim 5 \times 10^{11}$ thermal 4×10^{11} fast, 6.5" or 9.5" diameter)
- NCSU standpipe (1×10^{11} thermal, 5×10^9 fast, 3.5" diameter)
- Ongoing discussion with facilities at Penn State & Texas A&M

Planned use of these Facilities

- Currently in discussion with all of the identified facilities to determine their feasibility to use for both
 - low over head and/or
 - qualification testing of instrumentation
- Compiling design constraints of each facility:
 - Geometry
 - Temperature Limits
 - Allowable Heat loads
 - Neutronic Worth/Activation Constraints
- Working on a conceptual design for an instrumentation testing platform which can be compatible with all of these locations