Stakeholder Outcomes: Task 3

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Task 3 Summary

Task Status and Look Ahead:

- 3.1 Develop Core Instrumentation Plan for TREAT
  - Instrumentation Plan – Draft Completed (FY16)

Subtasks for irradiations in OSTR have been modified to be performed in TREAT

- 3.2 Perform initial benchmarking evaluations
  - Design instrument holder (Same for MITR and TREAT - Complete)
  - Design irradiation conditions for tests (MITR - Complete, TREAT - ongoing)
  - Acquire instruments and build holder assembly (Same for MITR & TREAT - in process)
  - Safety Evaluation Report (SER) (MITR - 06/2017, TREAT - beginning)
  - Performing Instrumentation Test Experiments (MITR - 07/2017, TREAT – early 2018)

Important Considerations:

- Not required for restart – cannot interfere with current TREAT systems
- Driven by model validation needs (temporal, spatial, spectral)
- Ultimate goal is characterization of test specimen conditions

Perspective on Instrument Selection

- General strategy of using state-of-the-art with next generation device comparisons – in-core instrumentation
- Flux and Fluence (spectral, temporal, spatial)
  - Dosimetry (fission and activation wires) - used extensively in TREAT historically and in future, provides baseline for comparing other instruments, co-develop counting/uncertainty techniques
  - Micro-pocket fission detector – high priority instrument for TREAT experiments program, important for early information about the functionality of the sensor in addition to other ongoing related projects
  - Miniature fission chamber – interesting to compare with MPFD, though sensor has limited range of applicability in TREAT
  - Miniature ion chamber
  - Self-powered neutron detector – delayed-response type available for use in MITR, strong interest for incorporating prompt response type similar to those used in historical tests for online flux measurement
  - Self-powered gamma detectors - interest for material heat rates

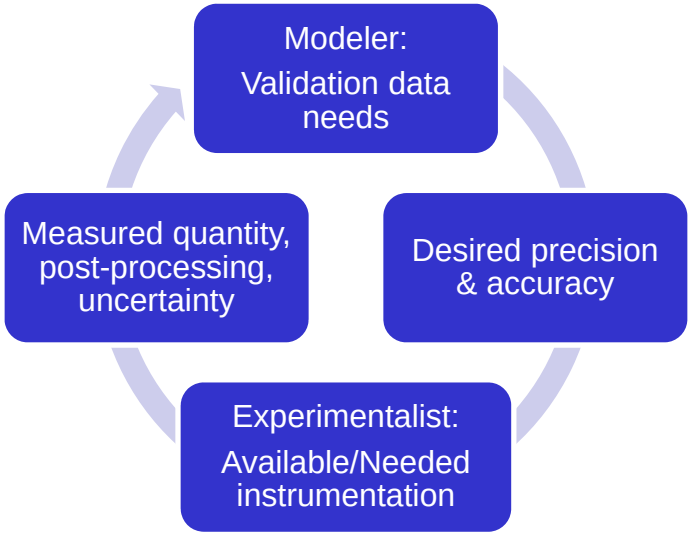
Close collaboration with CEA/Photonis

- Temperature
  - Thermocouples

Opportunities & Challenges

- Measurement uncertainty quantification and comparisons
  - Coordinate with dosimetry efforts at INL to do counting at MIT and INL
- Instrumentation benchmark evaluations in TREAT
  - Incorporate lessons-learned from MITR testing
  - Current test planned for M8-Cal vehicle – MARCH vehicle may also be an option
  - Possibility to include prompt-response SPND in TREAT test?
  - Uncertainty remains in regards to engineering process and TREAT safety requirements - continue close coordination/integration with TREAT experiment support team
  - Question remains about instrument assembly activity levels and possible implications for post-test handling requirements – not expected to be a concern
  - What tests to run in TREAT? Incorporate input from other IRP tasks (Task 1), Mammoth team, etc.

    For measurements at the experiment location in the TREAT core:
    - What are the needs from advanced modeling (which ultimately serve the needs of the potential fuels experimenters for better obtaining specimen energy deposition)?



Summary

- MITR tests are well-poised for execution this summer
  - A good combination and variety of radiation sensors are included
  - Continue engaging physics testing/dosimetry team at TREAT (Jim Parry/David Chichester)
  - Will provide helpful input to second stage of in-pile testing at TREAT
- Modification to change testing from OSTR to TREAT significantly increases the value of the testing for TREAT programs
  - Some concern/risk about exercising a new/developing process in preparation of TREAT tests – all parties understand this situation - steps taken
  - Test can be incorporating into physics testing phase of TREAT operations (Jan. – March 2018)
- Task 3 is progressing on schedule with promising direction and potential outcomes

Follow-on Group Discussion

What tests to run in TREAT?

For measurements at the experiment location in the TREAT core:

What are the needs from advanced modeling (which ultimately serve the needs of the potential fuels experimenters for better obtaining specimen energy deposition)?

- Recreate transient performed in MITR
- Repeat historical transients performed in M8-CAL
- Include fast ramp to power – other shaped transient?
- Effects of dysprosium filter (move test article axially in M8-CAL)