



Process and Flow Modeling of Nuclear Fuel Facilities

MTV Kickoff Meeting

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Paul Wilson
U. Wisconsin-Madison



Introduction and Motivation

- Utility of new monitoring technologies depends on their deployment in real facilities and systems
- Requires knowledge of material inventories and flows at various points in those facilities/systems
- Individual facility models can provide some insight
- Details of inventories/flows may depend on material arriving at those facilities as part of complete fuel cycle system



Mission Relevance

- Enhanced ability to assess risks of nuclear material diversion within individual facilities and across systems of facilities
- Complements acquisition pathway analysis with information about flow rates and accumulation times
- Provides insight for deployment strategies for new monitoring technology



Technical Work Plan

- Identify important facilities for development of more detailed modeling
 - Motivated by nuclear policy collaborators and advisors
- Introduce sub-facility modeling & simulation capability within Cyclus facility archetypes
 - Material Balance Areas and Key Measurement Points
 - Detailed process modeling
- Apply Cyclus to acquisition pathway analysis
 - Added benefit of flow modeling for timeliness assessment
- Simulate responses of monitoring technology as deployed within facilities



Expected Impact

- Better understanding of real-world impact of new monitoring technologies
- Ability to combine signals from across multiple connected facilities for improved situational awareness
- Focal-point of interaction with nuclear policy experts on deployment opportunities and monitoring needs



Collaborations and Partnerships

- Close collaboration with TAMU and Princeton partners
- Opportunities for collaborations with Sandia
 - Dr. Ben Cipiti had developed facility models for material control & accountability
- Opportunities for collaboration with ETI & PNNL
 - Dr. Paul Whitney using Cyclus facility models in data science application
- Opportunities for collaboration with ORNL
 - Dr. Andrew Worrall investigating Cyclus
 - Interest from



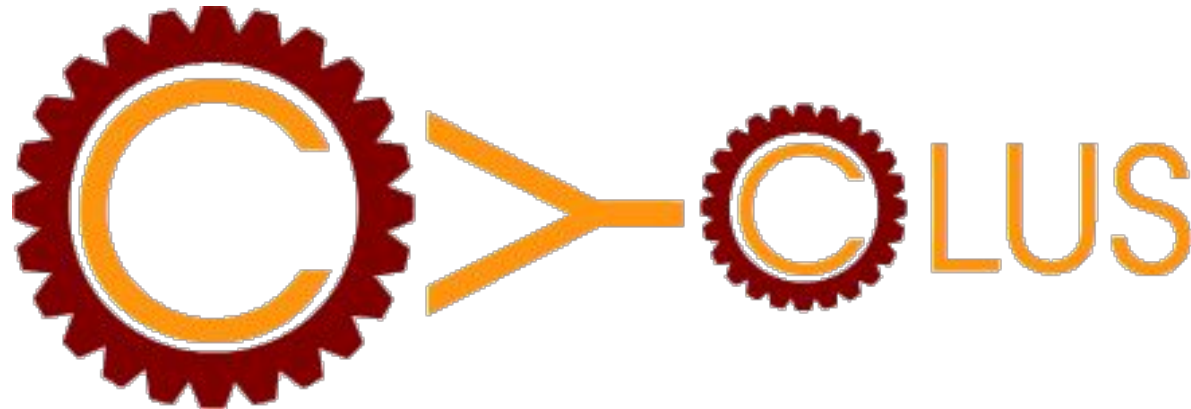
MTV Impact

- Increased/enhanced national laboratory engagement on facility modeling
- Policy engagement to identify highest impact facilities and fuel cycle systems
- Opportunity for transfer of Cyclus to national labs
 - Leverage existing interest from PNNL, ORNL, LANL, LLNL



Conclusion

Insights into diversion risk and the utility of monitoring technology at the nexus of modeling & simulation and nuclear policy



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