

Application Narrative for DE-FOA-0001281  
**Error and Uncertainty Propagation for Fuel Cycle Calculations**  
2016 CFA Capabilities 10565

**Technical Workscope Identifier:** FC-5.1b

**Time Frame:** 3 years

Most of the development work for this project will be carried out on desktop workstation computers with free and open source software and software libraries.

For performing large parametric analyses, the University of Wisconsin has a shared computing capability with a combination of high throughput computing (HTC) and high performance computing (HPC) resources. The UW-Madison Center for High Throughput Computing (CHTC) provides open access to these computing facilities for all researchers at no cost, with options for purchasing preferred access if the researchers needs warrant it.

The CHTC manages a distributed computing resource with approximately 5,000 dedicated cores and 5,000 opportunistic cores, and provides seamless access to the Open Science Grid and other national resources. This HTC capability routinely provides 300,000 CPU hours per day to UW researchers and is well suited to the calculation modes expected in this proposal. This Center is also exploring opportunities to offer free or low cost access to commercial computing resources, including Amazon EC2.

The CHTC also manages a new high performance computing (HPC) cluster, with 768 cores, 3 TB of RAM, and a 56 Gb/s Infiniband interconnect. This system is projected to grow over the next three years to up to 4 times this size.

The Cyclus team maintains a modern software development infrastructure in support of ongoing software quality assurance. This infrastructure includes a variety of modern software project management tools: revision control, automated testing, automated and manual documentation, bug tracking. Related projects are already managed under source code revision control system (git/GitHub) that provides detailed tracking of all changes to the code base. A test suite has been developed and new tests will be added for each new capability. This test suite is automatically executed (CircleCI) with each proposed change in the revision control system to identify any flaws that may be introduced. Automated documentation tools are used in the source code to create a detailed reference for the interfaces and additional background documentation. Out-of-code detailed reports and publications will supplement the information on each new capability. Finally, a bug tracking system (GitHub issues) is deployed to help users and developers to understand known issues and to track their resolution as a developer community. As new capability is added, it will come under the same quality assurance practices as described here for the existing capabilities.