

## **Development of Fuel Cycle Data Packages for Thorium Fuel Cycle Options**

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**Program**: FCR&D: Fuel Cycle Options

Catalogue

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## **ABSTRACT:**

## **Project Objectives:**

- Develop six fuel cycle data packages (FCDPs) for multi-stage, thermal fuel cycles which incorporate thorium, as pursuant to NEUP FY 2013 Workscope FC-5.1, over the duration of three years
- Organize and Document an International Technical Symposium on the Thorium Fuel Cycle
- Initiate and continually develop a Thorium Fuel Cycle Database which centralizes access to thorium fuel cycle literature

Project Description: At a glance, thorium (Th) fuel cycles (FCs) may offer advantages relative to those currently in commercial use. In particular, Th/U-233 FCs produce far less plutonium (Pu) and minor actinides (MAs) than cycles based on U-235 or Pu-239, and Pu fuel may be combined with Th to achieve net plutonium elimination. In spite of these potential capabilities, quantitatively assessing the benefits of the Th FC is difficult since experience, while extensive, is not consolidated. Potential inclusion of thorium fuel cycles in DOE-NE's ongoing development of Fuel Cycle Data Packages (FCDPs) represents an opportunity to examine FC options beyond those which have traditionally been considered.

In collaboration with ORNL, VU plans to develop FCDPs for six FC options. The selection of these FC options will be dictated by the objectives described in FC-5.1; correspondingly, the fuel cycles will be multi-stage and entirely in the thermal spectrum. The inclusion of Th provides inherent Pu/MA-reducing capabilities. VU will capitalize on its recent experience developing metrics for the front end of the Th FC in conjunction with fuel cycle screening work led by Idaho National Laboratory. As a result of this experience and others, VU has already gathered an extensive collection of Th FC literature and continues to do so. In combination with inclusions from ORNL's literature archives, VU will assemble a Thorium Fuel Cycle Database of thorium literature, which will facilitate not only the development of FCDPs in conjunction with this project but also any future evaluations of the thorium fuel cycle.

The pool of technical expertise applied to the project will be expanded by VU and ORNL's joint organization of an International Technical Symposium on the Thorium Fuel Cycle, which will aim to bring the understanding of international Th technology up to date, to identify potential alternative candidate FCs for FCDP development, and to identify key data gaps. With this information, VU and ORNL will be capable of developing FCDP content through the use of reactor physics and fuel cycle calculations software packages such as SCALE and ORIGEN. VU team members possess a fair amount of expertise in this area, and in collaboration, ORNL will provide access to and assistance with computing facilities. The team's extensive experience with nuclear fuel cycle projects, and Th in particular, will result in quality FCDPs and Symposium reports. This quality will further be assured by extensive peer review and documentation.

