

# Nuclear Energy University Programs

## Fuel Cycle Options Analysis

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# ***Outline***

- Program Overview
- Workscope Description
- Research Needs



# ***Fuel Cycle Technologies Mission and Program Objectives***

- Support decision-makers by developing a suite of options to manage used fuel
- Demonstrate technologies that support commercial deployment of sustainable fuel cycles by 2050
- Sustainable fuel cycles are those that:
  - improve uranium resource utilization
  - maximize energy generation
  - minimize waste generation
  - improve safety
  - protect the environment
  - limit proliferation risk
  - are economically viable



# *Three Potential Fuel Cycle Options*

- Once-Through
  - No recycling or conditioning of used fuel
- Modified Open Cycle
  - Very limited used fuel conditioning or processing
- Full Recycling
  - Multiple reprocessing steps and transmutation of actinides

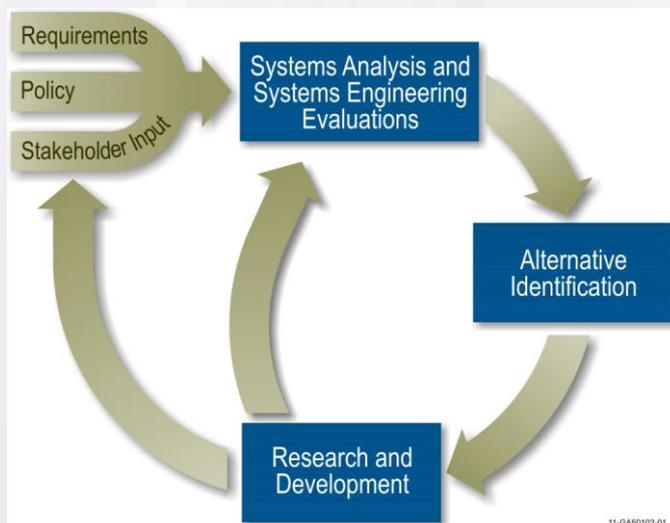
# Fuel Cycle Options: Systems Analysis and Integration

## Today's Technology Challenges

- Provide clear and credible basis for the RD&D of advanced fuel cycles
- Promote objectivity in analyses to ensure defensible basis for evaluation of options
- Ensure past, present and future R&D results are readily available
- Improve communications of technologies, processes and options with stakeholders and the public

## Development Path

- Develop fuel cycle option evaluation criteria and metrics
- Perform systems analysis and capture system data in a centralized database
- Perform fuel cycle option screenings to focus on technologies and systems for further development and possible demonstration
- Capture historical information while improving access to current and future R&D results
- Develop communication strategies to engage stakeholders and the public



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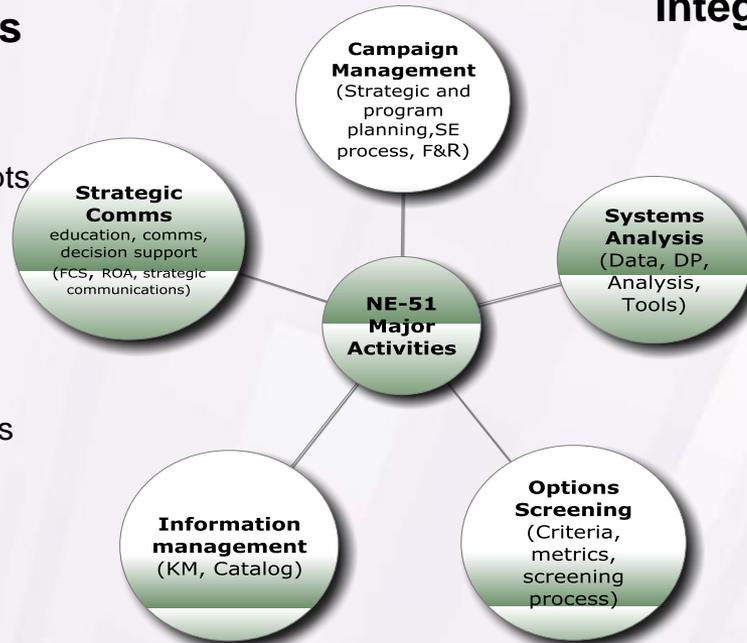
## Outcomes

- Defendable and reproducible fuel cycle screening process
- Comprehensive nuclear fuel cycle knowledge management tools
- Effective communication and R&D prioritization tools

# Campaign Elements

## Strategic Communications

- Strategic Communications
  - Identify new concepts and approaches
- Fuel Cycle Simulator
  - Work with NEUP project to develop effective communication tools
- Social Science R&D



## Integrated Fuel Cycle Analysis

- Fuel cycle analysis and data generation
- Economic Analysis
- Fuel cycle data packages
  - Engage other FCT and reactor programs for data needs
- Analysis tools development and maintenance

## Fuel Cycle Information Management

- Knowledge Management
- Fuel Cycle Catalog

## Fuel Cycle Option Screening

- Evaluation approach, criteria and metrics
  - Engage other FCT and reactor programs to provide metrics and justification
- Fuel Cycle Options: identification and grouping
  - Comprehensive set of options
  - Tractable set of groups for screening



# Fuel Cycle Options: Systems Analysis and Integration

## Technical Guidance

Provide a clear and credible technical basis for new analyses. Promote consistency in input data for new comparative analyses to ensure a defensible basis for future evaluation of options.

**Fuel Cycle Evaluation Criteria and Metrics  
Nuclear Fuel Cycle Options**

**Strategic  
Communication**

### System Analysis Reports

*(option or option group)*

1. Purpose
2. Calculation Methods/Approach,
3. Assumptions (particularly for dynamic studies)
4. Results

QA on Results

Descriptions,  
Input Data

Mass flow data

Metric Results,  
References

### Fuel Cycle Data Package (FCDP) Content (System and Technology Options)

1. System and Technology Descriptions:  
Text and graphics; References to Key Technology Reports and System Studies, including any dynamic studies.
2. Key Technical Input Parameters:  
References to Supporting Basis Documents
3. For Systems: Mass Flow Info. and References (or links) to more Detailed Isotopic/Composition Data
4. For Systems: Summary Sheet(s) of Evaluation Metrics and References to Supporting System Analyses used as basis for evaluation

QA on Fuel Cycle Description, Data, and References

**Nuclear Fuel  
Cycle  
Screening**

QA on Screening  
Process

Information

**Nuclear Fuel  
Cycle Data  
Catalog**

QA on Catalog

**Transmutation  
Library (Isotopics)**

**Reactor Performance**  
Reactor Campaigns (NE-7)

**Technology  
Inputs/Datasheets**

*(Coordinated with FCT Campaigns and Other DOE Sources)*

1. Descriptive Information
2. Performance Parameter Data
3. Supporting References

**Cost Data**

*(Cost Basis Report)*

**Fuel Cycle Options Screening**  
**Integrated Fuel Cycle Analysis**  
**Fuel Cycle Information Management**



# ***Strategic Communications***

- Problem Statement
  - Develop and facilitate deployment of sustainable fuel cycles in a dynamic political and fiscal environment that involves a socio-political evaluation of complex technologies.
- Strategy
  - Create a framework that allows fuel cycle options to be fairly evaluated (openly and objectively) in a way that allows R&D needs and priorities to be identified and communicated to non-technical stakeholders in a manner to garner support and permit rapid, effective communication of the effects of policy changes.



# Workscope Description

- The Fuel Cycle Options campaign performs analysis and evaluates integrated fuel cycle systems with the purpose of identifying and exploring sustainable nuclear fuel cycles that are candidates for future deployment. Results of these studies and R&D activities must be effectively disseminated to program stakeholders and the public in an accurate, open, and simple manner.
- Initial efforts will support development of the understanding of what needs to be communicated and why, the audiences to reach, how best to communicate the messages, and the evaluation approach to measure effective communication. Of prime importance is the development of effective communication of the benefits of alternative nuclear fuel cycle options and enabling technologies that could be developed.
- Key university research needs for this activity include:
  - Identify and develop the essential features and messages for effective communication of the fuel cycle program and its achievements;
  - Develop any tools, processes, and products to improve communication of the progress and results of the program and campaigns;
  - Interact with the public, stakeholders and other customers external to the program to develop understanding of communication needs and approaches;
  - Develop methods to evaluate the effectiveness of program communications;
  - Understanding the societal and public viewpoints associated with nuclear power and advanced nuclear fuel cycles.



# *Questions we need to answer*

- Who are our audiences?
  - How are we addressing vital concerns of stakeholders?
  - How can we effectively communicate with them?
- What information is important to communicate?
  - How does it change among varying groups?
- What challenges/barriers do we need to overcome?
- How do we assess our efforts?