SAND2007-4977C

CONCEPT: Development of Approaches to the Use of Process Data for Transparency and Operational Optimization Applications

Yongsoo Hwang (KAERI) and
David Saltiel (Sandia)

Overview

- Develop an approach to modeling advanced civilian nuclear energy facilities (process and facility) that facilitates:
  - Negotiations with stakeholders about what information, if shared, would build confidence that the facility was being operated in an appropriate manner
  - The development of approaches for acquiring and transmitting that information in a trusted and secure way
  - The optimization of the design of the facility and approach to process data acquisition to benefit operators
  - The analysis of how operator-owned equipment could be used to complement information sought by national and international regulatory bodies
- Demonstrate this concept using the planned Engineering Scale Advanced Conditioning Process Facility (ES-ACPF)

Challenges Facing Operators

- Operators of civilian nuclear facilities face increasing safety, security and operational requirements promulgated by national and international regulatory agencies
- Demonstrating compliance can be costly
- In spite of requirements and monitoring by regulatory agencies, external stakeholders (national publics, environmental groups, other states) may still lack confidence that facilities are being operated appropriately

Operators need to find ways to:

1. Meet requirements of national and international regulatory bodies in a more efficient manner
2. Provide information to stakeholders to build confidence
3. Optimize processes and improve operational efficiencies

The Role of Process Data

- Two types of information about the operation of a civilian nuclear facility potentially available:
  - Information acquired by national or international regulatory agencies (including IAEA safeguards information)
  - Information acquired by operator-owned equipment (commonly referred to as “process data”)
- Process data is more plentiful, flexible, and accessible and therefore offers greater potential in meeting the challenges identified

Challenges to the Use of Process Data

- Goal 1: Meet requirements of national and international regulatory bodies in a more efficient manner
  - Agencies (especially the IAEA) are often reluctant to use information collected by operator owned equipment as it is difficult to ensure authenticity
- Goal 2: Provide information to stakeholders to build confidence
  - To achieve the goal, the information provided must be relevant to stakeholders, trusted, and provided in an understandable way. It also must not reveal sensitive or proprietary information.
- Goal 3: Optimize processes and improve operational efficiencies
  - Data acquisition strategies must be designed into facility and acquired data must be integrated and managed in a way is useful

Using Process Data to Complement Information Acquired by Regulators: IAEA Specific Concerns

- IAEA policy on the joint use of data acquisition equipment (IAEA Policy Paper 20) makes sharing of equipment and data very difficult.
- Concerns include:
  - Degree to which information acquired by the facility operator can be trusted
  - Whether the use of this data will undermine the independence of the Agency's conclusions.
  - The opportunity for operators to change declarations to match data being used to verify declarations
  - When used, IAEA approaches to authentication of information from operator-owned equipment often limit operator access and may pose safety concerns

- Ways to address these concerns:
  - Innovative Approaches to Authentication
    - Approaches that do not limit the operator's access to own equipment or create safety concerns.
  - Delay release of data to operator
  - Use of additional monitoring tools to verify consistency of data between multiple monitoring points

Using Process Data to Build Confidence Among Stakeholders

- *At a minimum*, to be of value to stakeholders, this information must:
  - Be the information stakeholders feel they need to reach an informed conclusion (This requirement is particularly complex as stakeholders often do not have enough information to understand what questions they should be asking)
  - Be trusted as authentic and accurate by the stakeholders to whom it is provided
  - Be accessible
- *At a minimum*, to be of value to facility operators, the provision of this information must *not*:
  - Create security concerns (e.g., by providing sensitive information)
  - Create additional burdens on operators
  - Risk the dissemination of proprietary information

Proposed Approach: "Process Data Use By Design"

- The key to mitigating these challenges is identify them early and design solutions into facilities
- Modeling and visualization tools can help

Approach

- Develop a model
  - What does the facility look like?
  - How does it behave?
- Develop “evaluators”
  - Tools to help answer questions about the facility and process
    - E.g.,: Where is the material? What is happening to it?
  - Tools to identify approaches to acquiring necessary information
  - Tools to assess performance

Model Use 1: Approaches to Using Process Data to Supplement Regulatory Information

- Identify potential data acquisition points of value
  - Optimize measurements to reduce uncertainty and confirm and verify standard safeguards data acquisition approaches
- Design approach to acquisition to ensure authenticity
  - Tamper-indicating equipment, improved sensor placement, modifying facility design to reduce risk of interference
- Design approach to acquisition and transmission to ensure data security
  - E.g., Where does the proximity of data transmission lines create the potential for interference, interception or modification of transmitted information

Model Use 2: Approaches to Using Process Data to Build Confidence Among Stakeholders

- Help stakeholders understand process
- Identify potential data acquisition points of value to different stakeholders
  - Design evaluator tools to aid in identification of relevant information
  - Model allows operator to mask proprietary information
  - Allows regulators to ensure that sensitive information is not released
- Design approach to acquiring and transmitting data that is trusted and secure
- Design approaches to analyzing data and providing access to analytic results that are trusted and understandable

Model Use 3:
Approaches to Using Process Data to Optimize Process and Improve Operational Efficiencies

- Identify data acquisition points of value
- Design approaches to acquiring data into facility to reduce costs and improve performance
- Help integrate and manage available data so that is available for multiple process analysis tasks (safety, environmental monitoring, process efficiency, etc.)

Demonstration

- KAERI's Engineering Scale Advanced Conditioning Process Facility (ES-ACPF)
  - Design currently underway
  - Substantial visualization and virtual design work ongoing
  - Scale and process are compatible with demonstration

Proposed Activities

- Model facility and process
  - Identify appropriate modeling tools
  - Determine how existing visualization tools can be integrated
  - Identify approaches to verification and validation of model
  - Ensure that modeling approach is compatible with other efforts (e.g., the INL SESAME and VISION models)
- Develop one or more “evaluators” for one or more of the identified applications
  - E.g., Identification and verification of appropriate process operational parameters and thresholds for notification of out-of-normal events
- Demonstrate model and evaluator to group of external stakeholders
  - Incorporate feedback

Summary

- Operators of advanced civilian nuclear facilities will need to find ways to:
  - Meet additional regulatory requirements in a cost effective manner
  - Build confidence and trust among national and international stakeholders
  - Optimize operations
- Process data can play a role in each goal
- Approach to acquisition, authentication, aggregation, analysis, and access will need to be designed cooperatively with regulators and stakeholders and will need to be designed into facilities
- A multipurpose process and facility model can be used to design these approaches in a cost effective and cooperative manner