

A Systems Engineering Process for Safeguards Design

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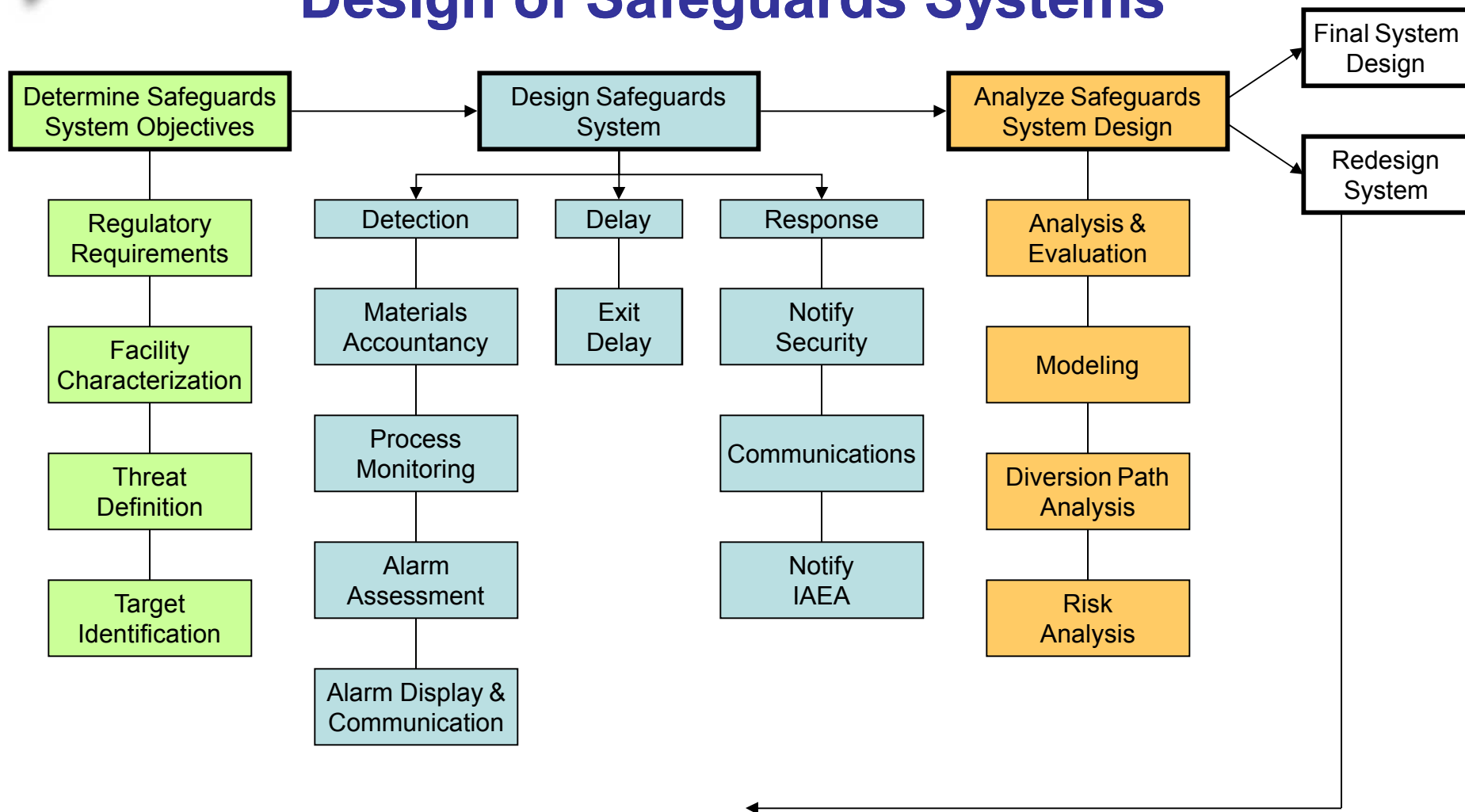
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Presentation Outline

- Describe an initial version of a systems engineering process for safeguards design and evaluation to support the development of new fuel cycle facilities
 - Safe, secure, efficient, cost-effective
 - Support the demonstration that these facilities meet regulatory requirements
- Focus on *process* to provide a framework
 - Integrate safeguards technologies for material control and accountability (MC&A), including measurement equipment, process monitoring, and modeling and analysis tools
 - Apply for design and evaluation of different combinations of safeguards technologies for a range of facility types
 - Patterned after the Design Evaluation and Process Outline used for physical protection systems
- Identify existing tools that can be applied at different steps
 - Safeguards Software Inventory

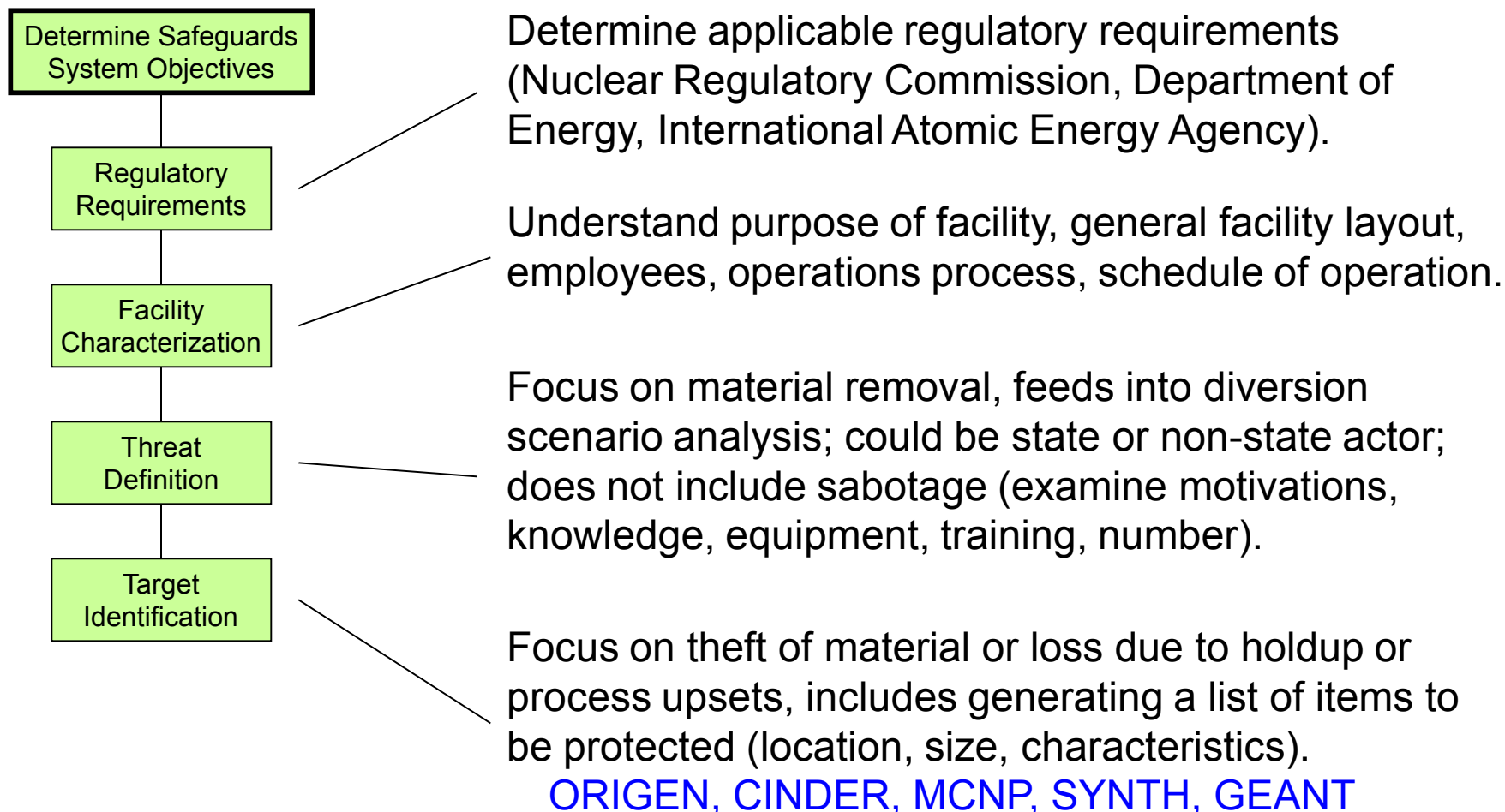
A Systems Engineering Approach to the Design of Safeguards Systems



(similar to the Design and Evaluation Process Outline developed for physical security)

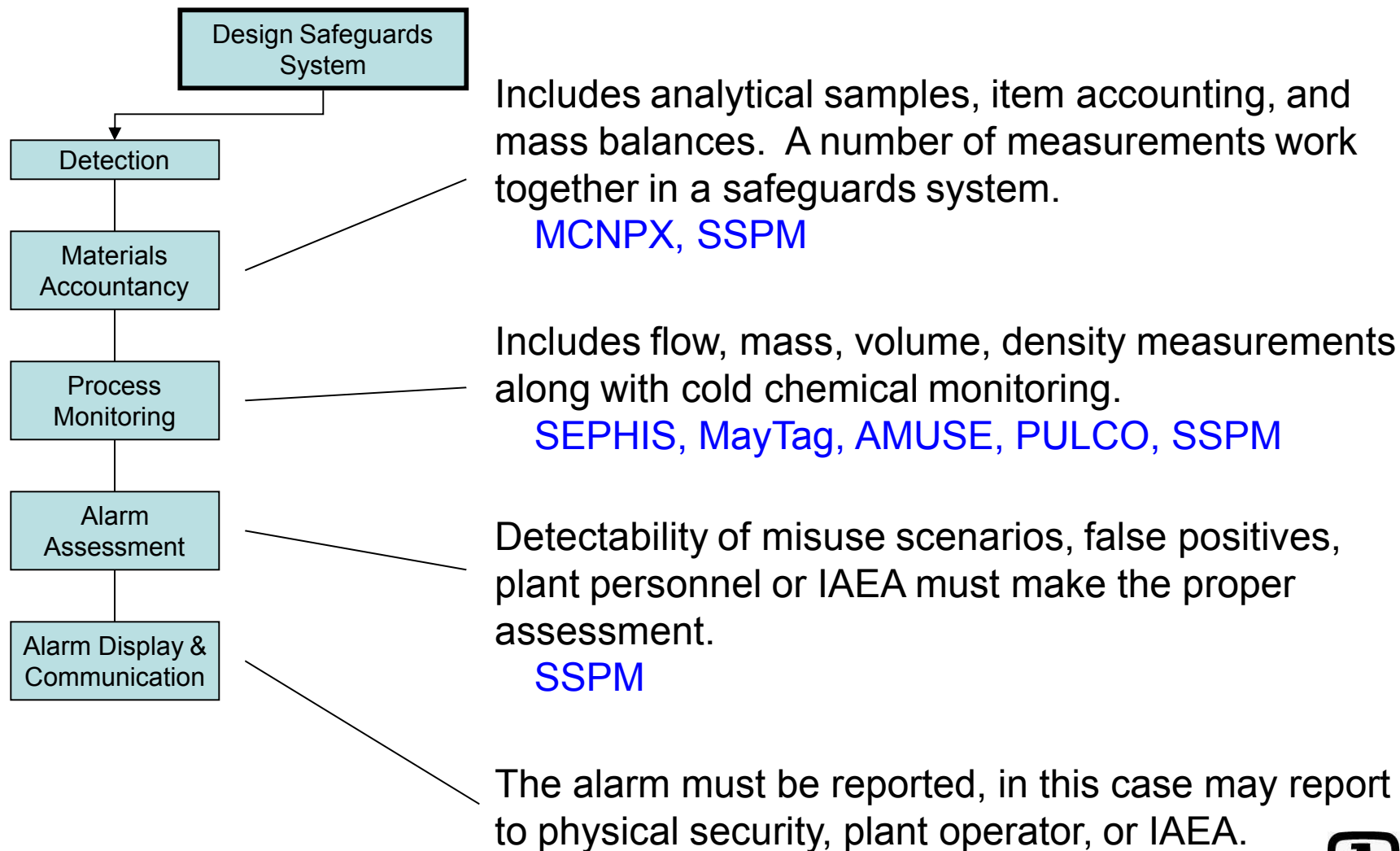


Determine Safeguards System Objectives



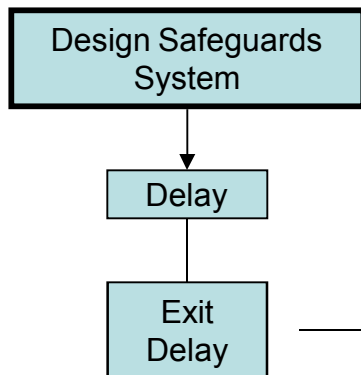


Design Safeguards System





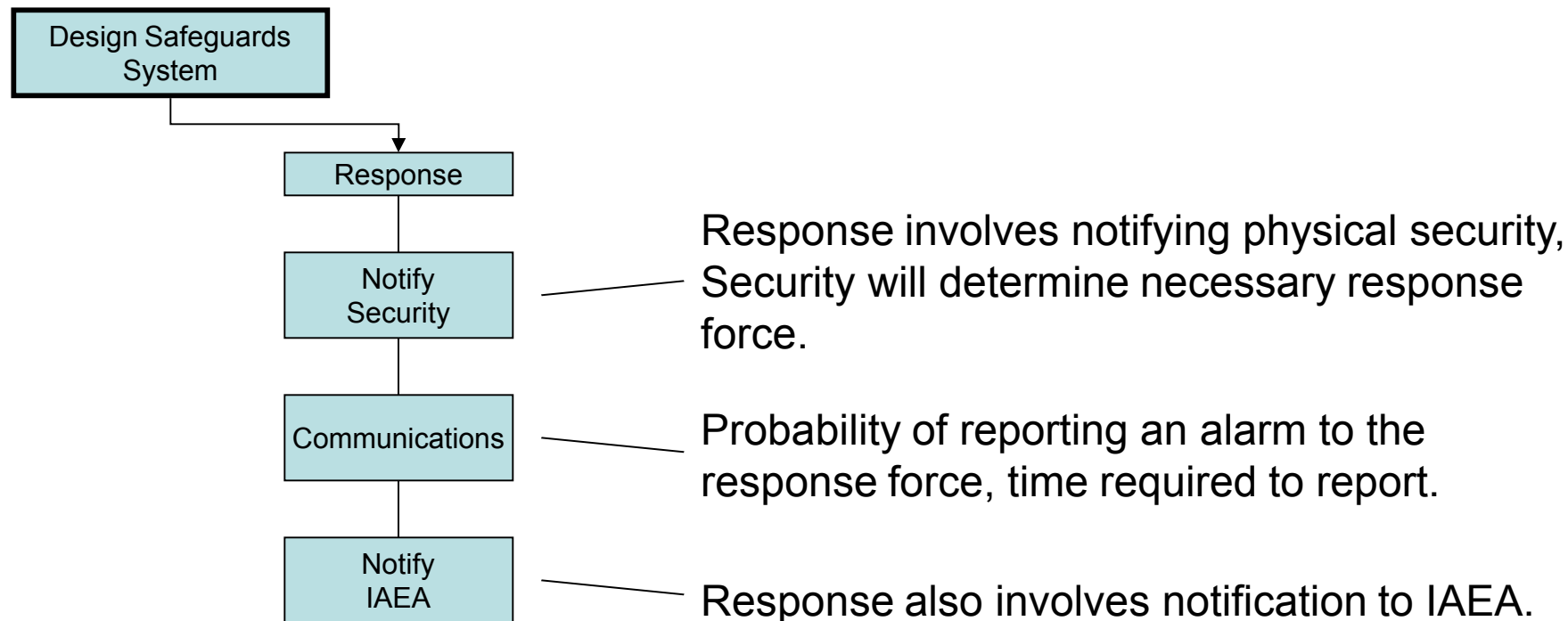
Design Safeguards System



Exit delay is of most importance to safeguards, depends on detection time and time to accumulate one significant quantity of material.

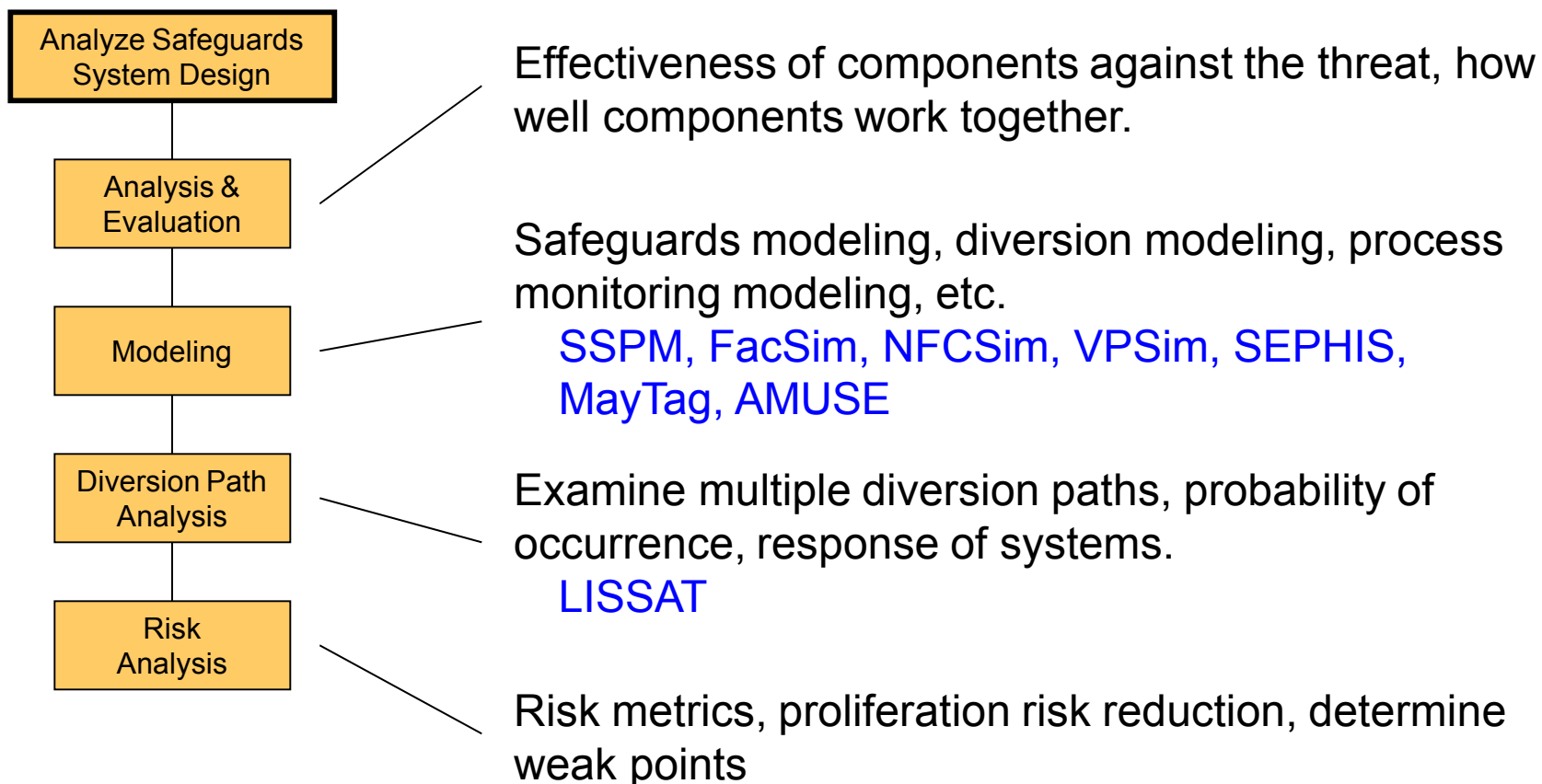
Other work integrating MC&A with physical protection has developed strategies for protracted theft timelines.

Design Safeguards System





Analyze Safeguards System Design





Demonstrating the Process

- **Focus has been on demonstrating “Analyze Safeguards Design”**
 - Separations Safeguards Performance Model for reprocessing plant accountancy and process monitoring
 - Related work incorporating operational activities for MC&A with physical protection
- **Insights have been gained from integration analyses**
 - MC&A activities provide additional detection opportunities and can contribute significantly to cumulative detection
- **Integration work will continue**
 - Evaluate process monitoring measurements and high precision material measurements
 - Apply to conceptual reprocessing plant facility to integrate physical protection and safeguards systems