

# RI-PB Design with ASME PSD-1

## ANS RP3C CoP

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# PSD-1, Plant Systems Design

- ASME Plant Systems Design standard is currently in draft and targeted for publication in Q3 or Q4 2025.
- Not just for nuclear. It is for any plant with potential for significant hazards to the worker, public or environment.
- Focus is on new plant design but can be used for major modifications or design reconstitution.

# PSD-1 Takeaways

1 of 2

- Plant hazard analysis and risk evaluation risk-informs the design (RI)
- Systems engineering provides structured approach for performance-based design (PB)
- PSD-1 Integrates these to provide a RIPB design
- PSD-1 also integrates risk to plant performance and availability with safety risk

# PSD-1 Takeaways

2 of 2

- PSD-1 is a hub for alignment of ANS and other design standards
  - both RIPB and prescriptive/deterministic

# Topics

- 3-Key PSD-1 Processes
- PSD-1 Overview
- PSD-1 Structure
- Systems Engineering Process
- Risk Evaluation Process
- Hub for Alignment of Design Standards
- Summary



# 3-Key PSD-1 Processes

1. Conduct plant process hazard evaluations and analysis in the early phases of design that:
  - a. Provide early identification of hazards, including strategies to avoid and mitigate them
  - b. Advance as the design matures
  - c. Provide structure to the development of a quantitative risk assessment

# 3-Key PSD-1 Processes

(Continued)

Incorporate and integrate:

2. Systems engineering design processes, practices, and tools with traditional architect engineering design processes, practices, and tools
3. Risk informed probabilistic design processes, practices, and tools with traditional deterministic design processes using reliability and availability targets

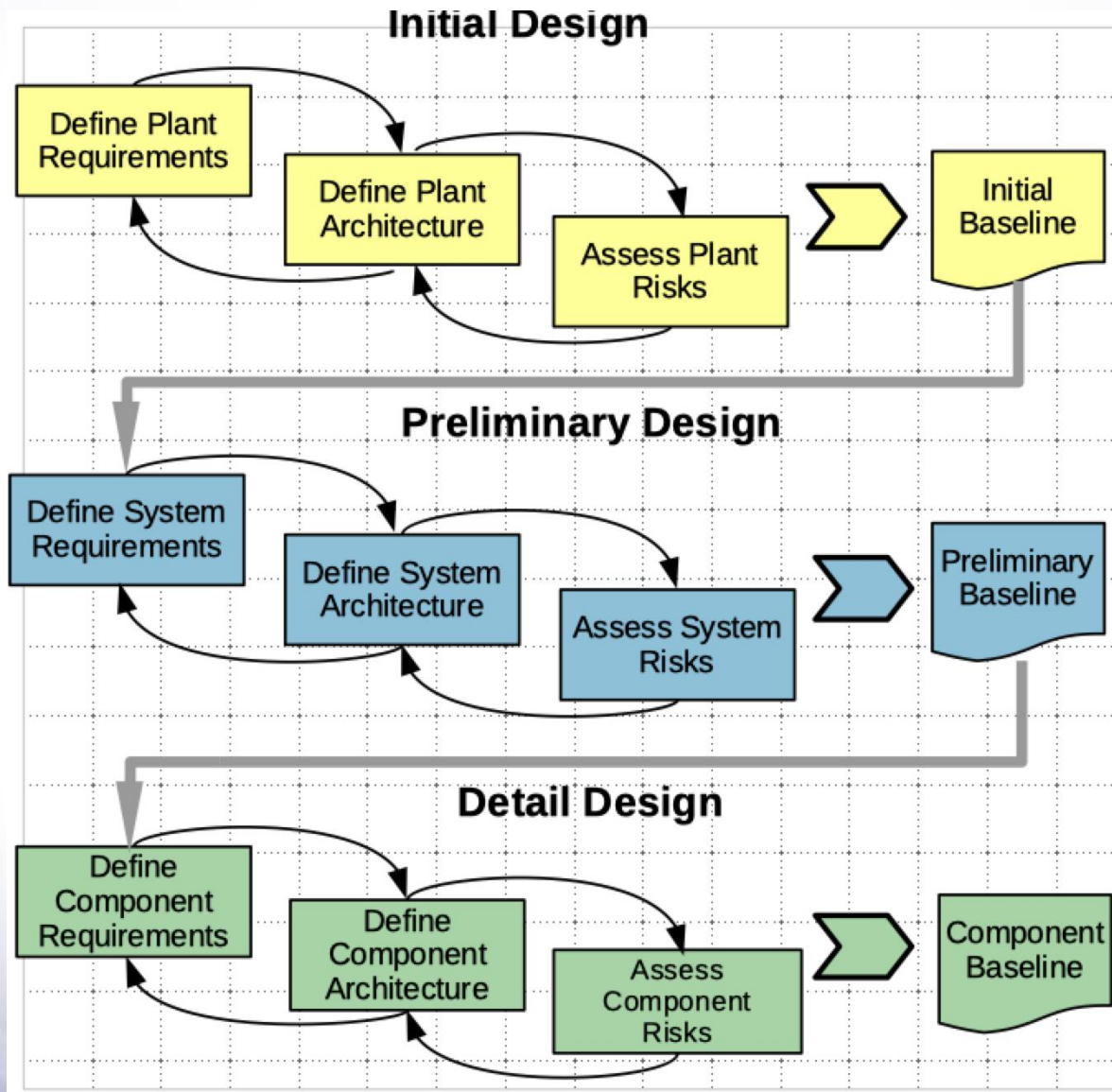
# PSD-1 Not Prescriptive

Although this Standard does not include planning in its scope, it is expected that the project organization develops, documents, and implements a plan describing how applicable parts of this Standard are integrated into overall project planning and design processes.

<b>Requirement Number</b>	<b>Description</b>
PP.1-1	The project organization shall DEVELOP, DOCUMENT and IMPLEMENT a plan describing how applicable parts of this Standard are integrated into overall project planning and design processes.
PP.1-2	As a minimum, the project planning and design process documents(s) shall INCLUDE the approach and methods for planning and executing: (a) applicable systems engineering activities described in Part 2 of this Standard. (b) applicable risk evaluation activities described in Part 2 of this Standard, including any specific Part 2 requirements for planning and execution. (c) applicable probabilistic design activities described in Part 2 of this Standard.
PP.1-2.1	For PP.1-2, the applicable work products shall INCLUDE: (a) the strategy and procedures for conducting the activity (b) the rationale for decisions made, including trade studies where applicable (c) applicable assumptions and constraints.



# PSD-1 Overview

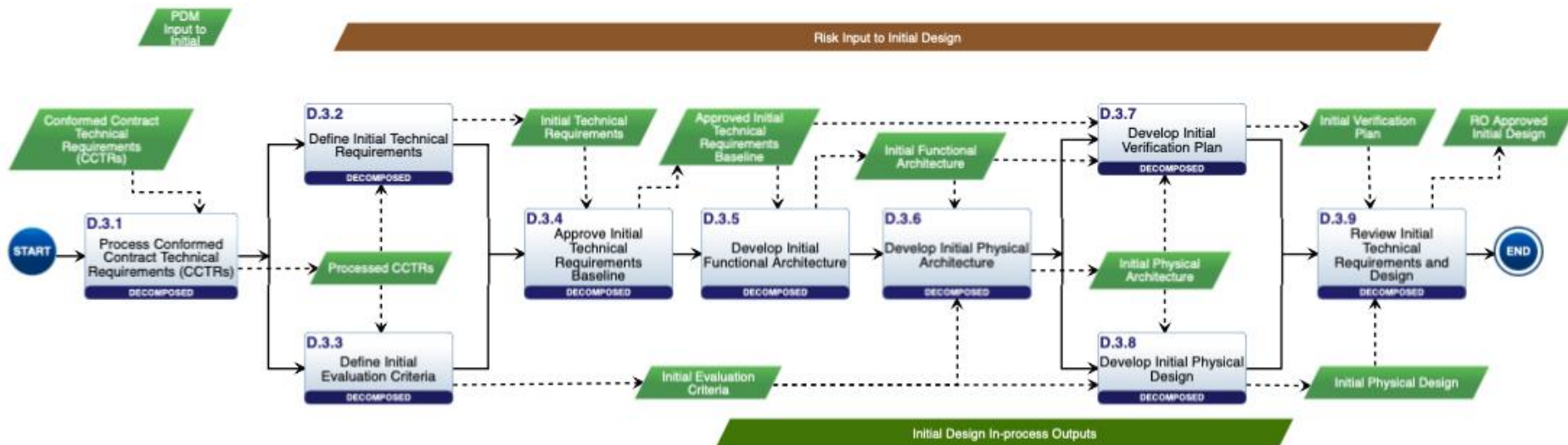




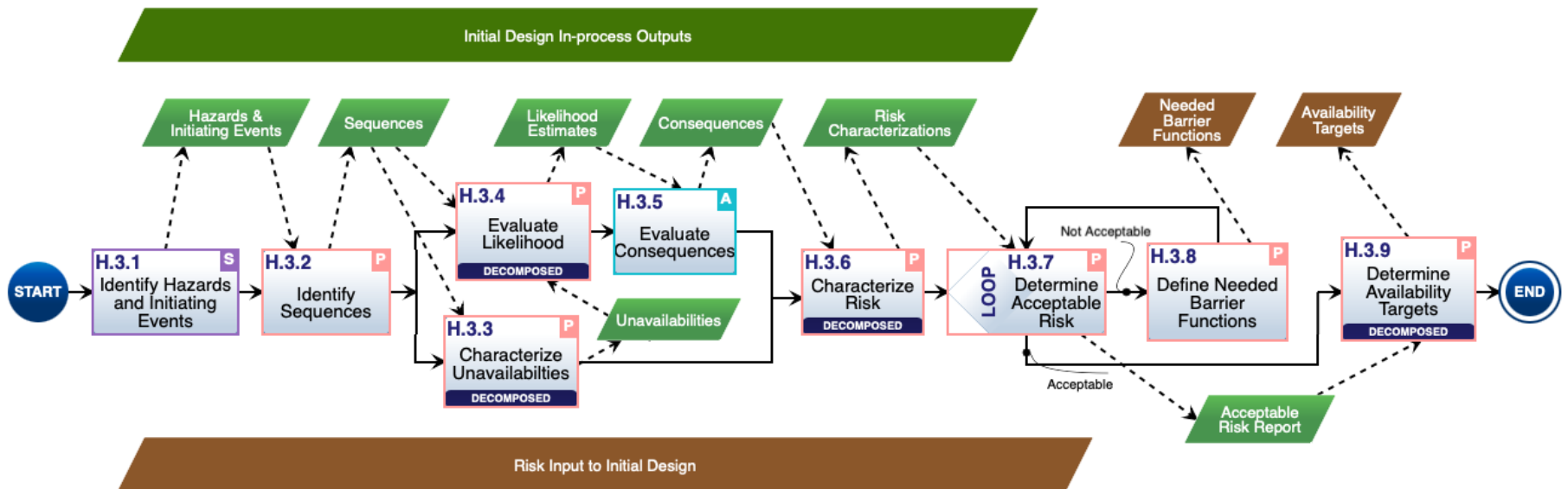
# PSD-1 Top Level Structure



# Systems Engineering Process



# Risk Evaluation Process



# PSD-1 Provides for RI & PB Design

- Plant hazard analysis and risk evaluation risk-informs the design (RI)
- Systems engineering provides a structured approach for performance-based design (PB)
- PSD-1 integrates these to provide a RIPB design
- PSD-1 also integrates risk to plant performance and availability with safety risk



# PSD-1 Provides for RI & PB Design

- Plant hazard analysis and risk evaluation risk-informs the design (RI)
- Systems engineering provides a structured

**PSD-1 takes NEI 18-04 guidance from a licensing perspective and implements it for design.**

design

- PSD-1 also integrates risk to plant performance and availability with safety risk

# PSD-1: Hub for Alignment of Design Standards 1 of 5

- PSD-1 integrates risk evaluation standards into qualitative and quantitative hazard analyses processes
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- PSD-1 integrates other design standards in the systems engineering processes

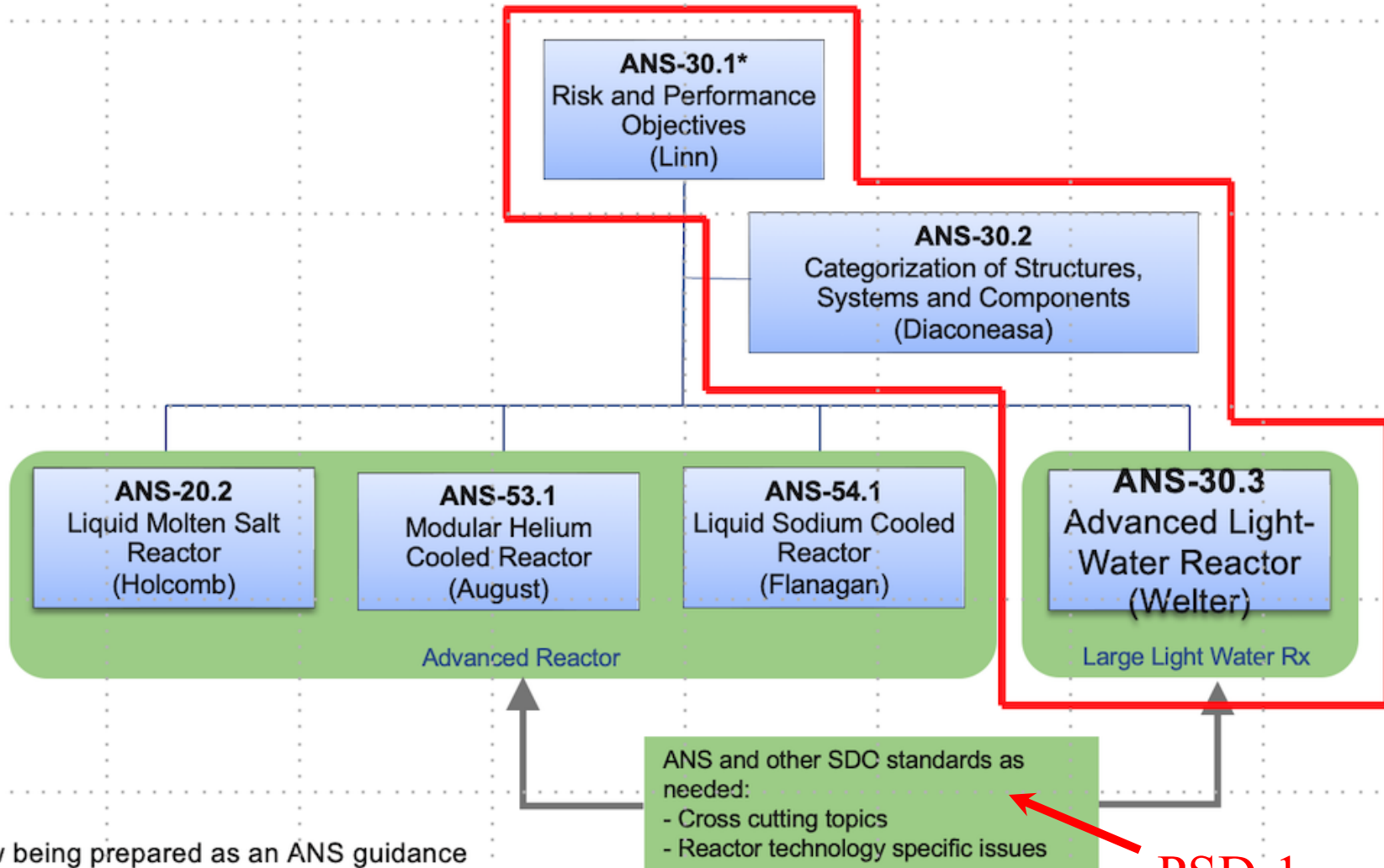
# Hub for Standards Alignment

2 of 5

PSD-1 provides a general description of how activities are performed but does not provide detailed information on how to perform the activities.

- Detailed “how to” references are provided in toolboxes.
- These references include industry standards.
- There are toolboxes for each of the 3 key technical areas.
  - For example, ASME/ANS RA-S-1.4 – 2021, Probabilistic Risk Assessment Standard for Advanced Non-Light Water Reactor Nuclear Power Plants, is included in the risk evaluation toolbox to provide a detailed resource on how to perform a PRA.
- This is one way that PSD-1 is a hub for standards alignment.

# Hub for Standards Alignment

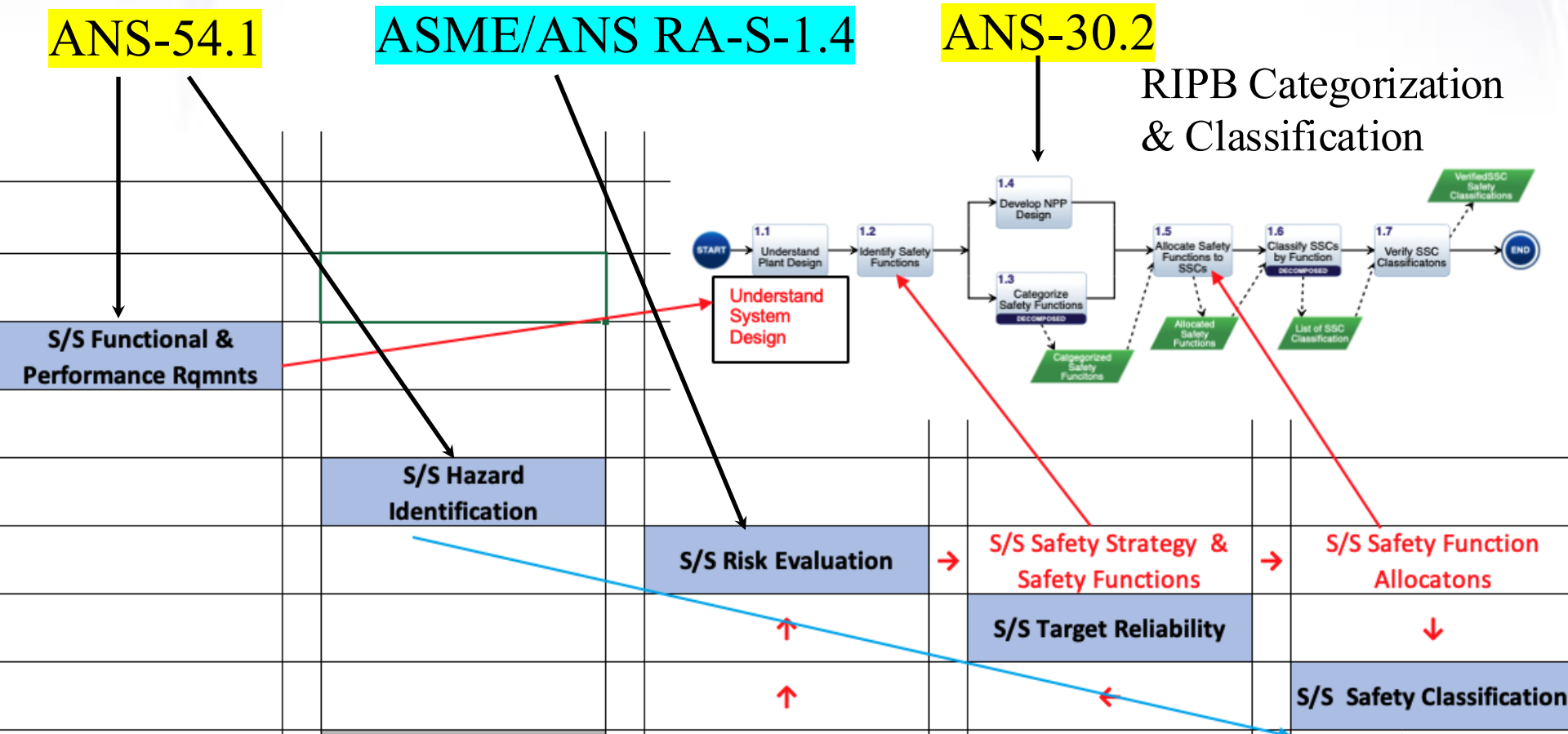


ANS-30.1 is now being prepared as an ANS guidance standard, not as an ANSI consensus standard

PSD-1

# Hub for Standards Alignment

4 of 5



S/S = Systems and Structures





# PSD-1 Not an Added Burden

Means to enhance current design processes, methods and tools to:

- Reflects current design practices
- enhance health, safety, and environmental risk reduction
- reduce the cost of new plant design, construction, commissioning, and life cycle costs
- increase cost and schedule certainty
- increase licensing and construction certainty
- further optimize operating plant performance and availability
- provide capability for cloud-native publishing

# Summary

(1 of 2)

- ✓ Plant hazard analysis and risk evaluation risk-informs the design (RI)
- ✓ Systems engineering provides structured approach for performance-based design (PB)
- ✓ PSD-1 integrates these to provide a RIPB design
- ✓ PSD-1 Not Prescriptive – Not a Burden

# Summary

(2 of 2)

- ✓ PSD-1 integrates risk to plant performance and availability with safety risk
- ✓ PSD-1 is a hub for standards alignment
- ✓ PSD-1 integrates risk evaluation standards into qualitative and quantitative hazard analyses processes
- ✓ PSD-1 integrates other design standards in the systems engineering processes