STP Risk-Informed Approach to NRC Generic Safety Issue 191 (GSI-191)

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Introductory Presentation
at
NRC Public Meeting
February 9, 2012

Nuclear Operating Company

SOTERIA CONSULTANTS

Participating Teams from STP Risk-Informed Project on Feb 9, 2012 Public Meeting:

1. Containment Accident Stochastic Analysis (CASA)Team
2. Corrosion/Head Loss Experimental (CHLE) Team
3. GSI-191 Analysis & Methodology Implementation (GAMI) Team
4. Oversight Team
5. STPNOC Team

Containment Accident Stochastic Analysis (CASA) Team

- *Bruce Letellier, Ph.D. in Nuclear Eng.*
  - Nuclear Reactor Safety and Risk Analysis at Los Alamos National Lab
  - CASA lead for STP Risk-informed GSI-191 project
  - 10 years of experience in GSI-191

Corrosion/Head Loss Experimental (CHLE) Team

- *Kerry Howe, PE, Ph.D., BCEE.*
  - Associate Professor in the Civil Eng. Department at the University of New Mexico
  - CHLE lead for STP Risk-informed GSI-191 project
  - 5 years of experience in GSI-191
- *Janet Leavitt, Ph.D. in Environmental Eng.*
  - Post-doc in the Civil Eng. Department at the University of New Mexico
  - CHLE team member for STP Risk-informed GSI-191
  - 5 years of experience in GSI-191

GSI-191 Analysis & Methodology Implementation (GAMI) Team

- *Tim Sande, M.S. in Petroleum Eng.*
  - Engineering Supervisor at Alion Science & Technology
  - GAMI lead for STP Risk-informed GSI-191 project
  - 8 years of experience in GSI-191

- *Gil Zigler, Nuclear Eng.*
  - Senior Scientist/Engineer at Alion Science & Technology
  - GAMI team member for STP Risk-informed GSI-191
  - 20 years of experience in GSI-191

Oversight Team

- *Zahra Mohaghegh, Ph.D. in Reliability Eng.*
  - Principal Research Scientist at Soteria Consultants
  - Oversight lead for STP Risk-informed GSI-191 project
  - 8 years of experience in Probabilistic Risk Assessment (PRA)

- *Seyed Reihani, Ph.D. in Mechanical Eng.*
  - Research Scientist at Soteria Consultants
  - Oversight team member for STP Risk-informed GSI-191 project
  - 10 years of experience in catalytic combustion

STPNOC Team

- *Steve Blossom, Project Manager*
  - Project Manager at the South Texas Project Nuclear Operating Company
  - Project Manager for STP Risk-informed GSI-191 project
  - 32 years of experience in Project Management

- *Ernie Kee, Mechanical Eng.*
  - Supervisor, Risk-Informed Applications, at the South Texas Project Nuclear Operating Company
  - STP Technical Leader for STP Risk-informed GSI-191 project
  - 14 years of experience in Probabilistic Risk Assessment (PRA) at a commercial nuclear power plant

Main Goals of the Risk-Informed Project

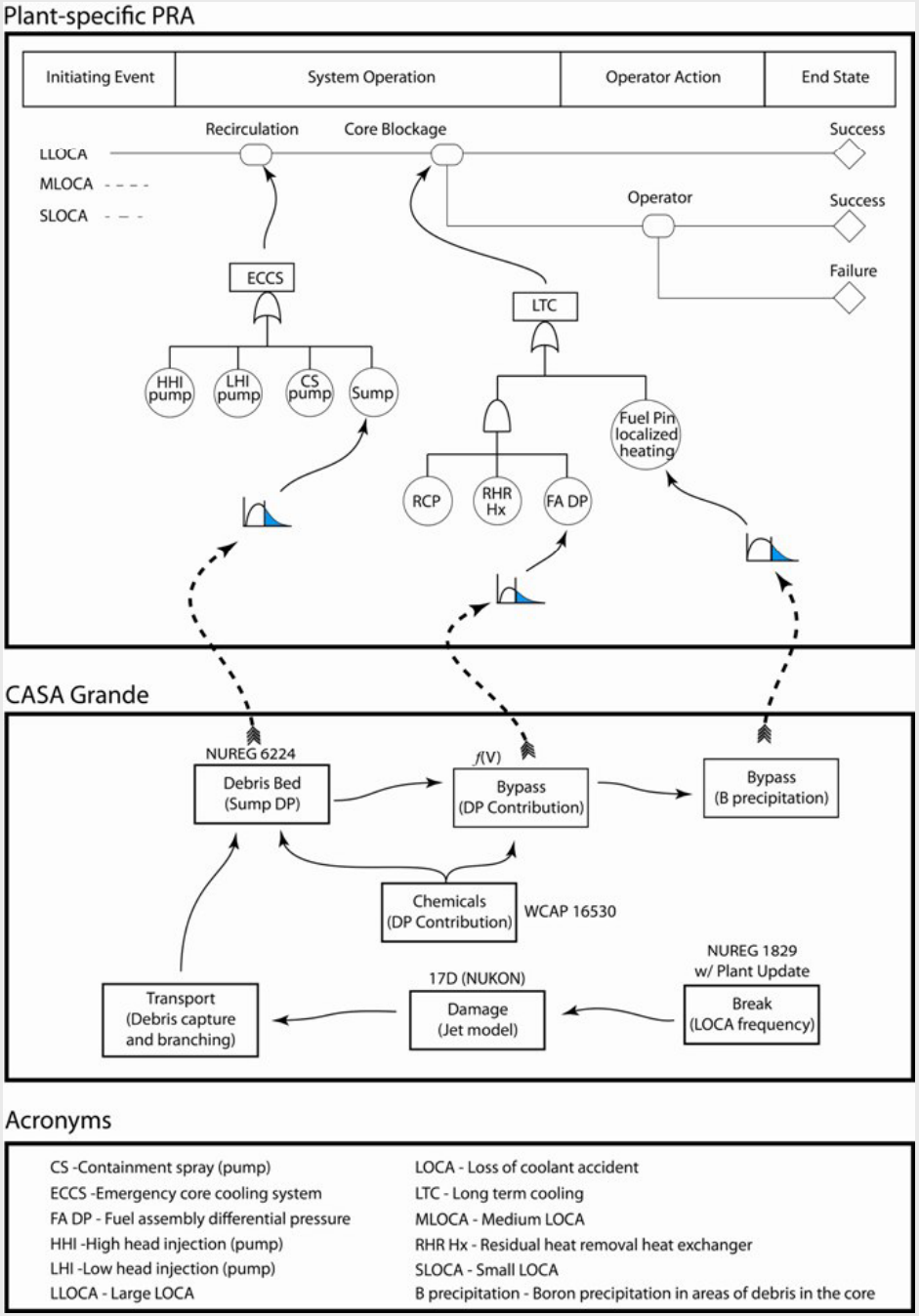
1. Through a risk-informed approach, establish a technical basis to gain NRC approval to close the safety issues related to GSI-191 by the end of 2013

2. Exemption from certain requirement's of 10 CRF 50.46 if the risk associated with the fibrous insulation in STPNOC's containment is determined as <u>non risk significant :</u>

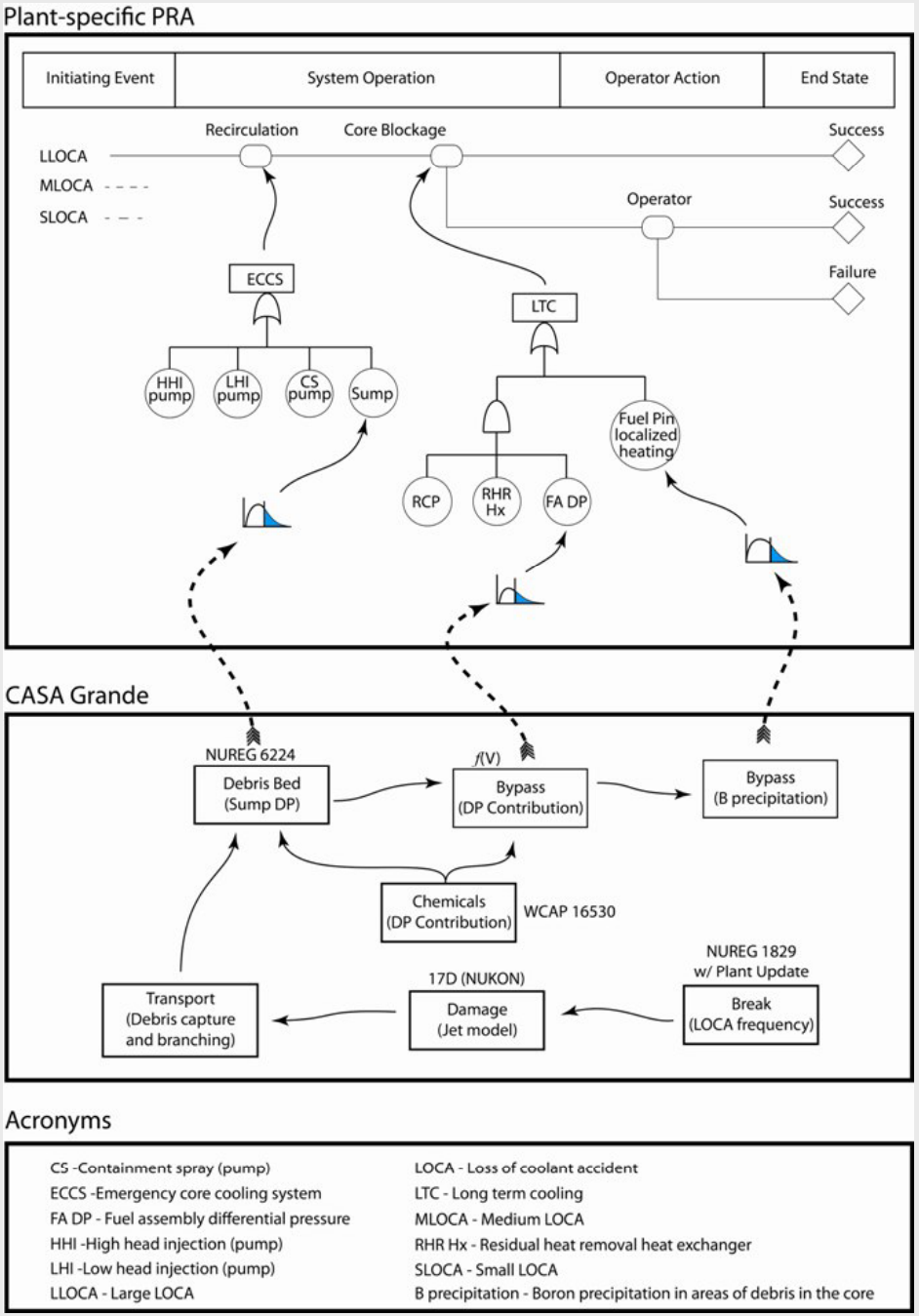
   - Decision-making is based on the difference in risk between a "perfect" design and the existing design

   - Safety issues having $\Delta CDF < 10^{-6}/yr$ and Δ LERF $< 10^{-7}/yr$ fall in Risk Region III (very small changes) as defined by Regulatory Guide 1.174

Schematic Representation of the Integrated Model, Developed for the Risk-Informed GSI-191 Project

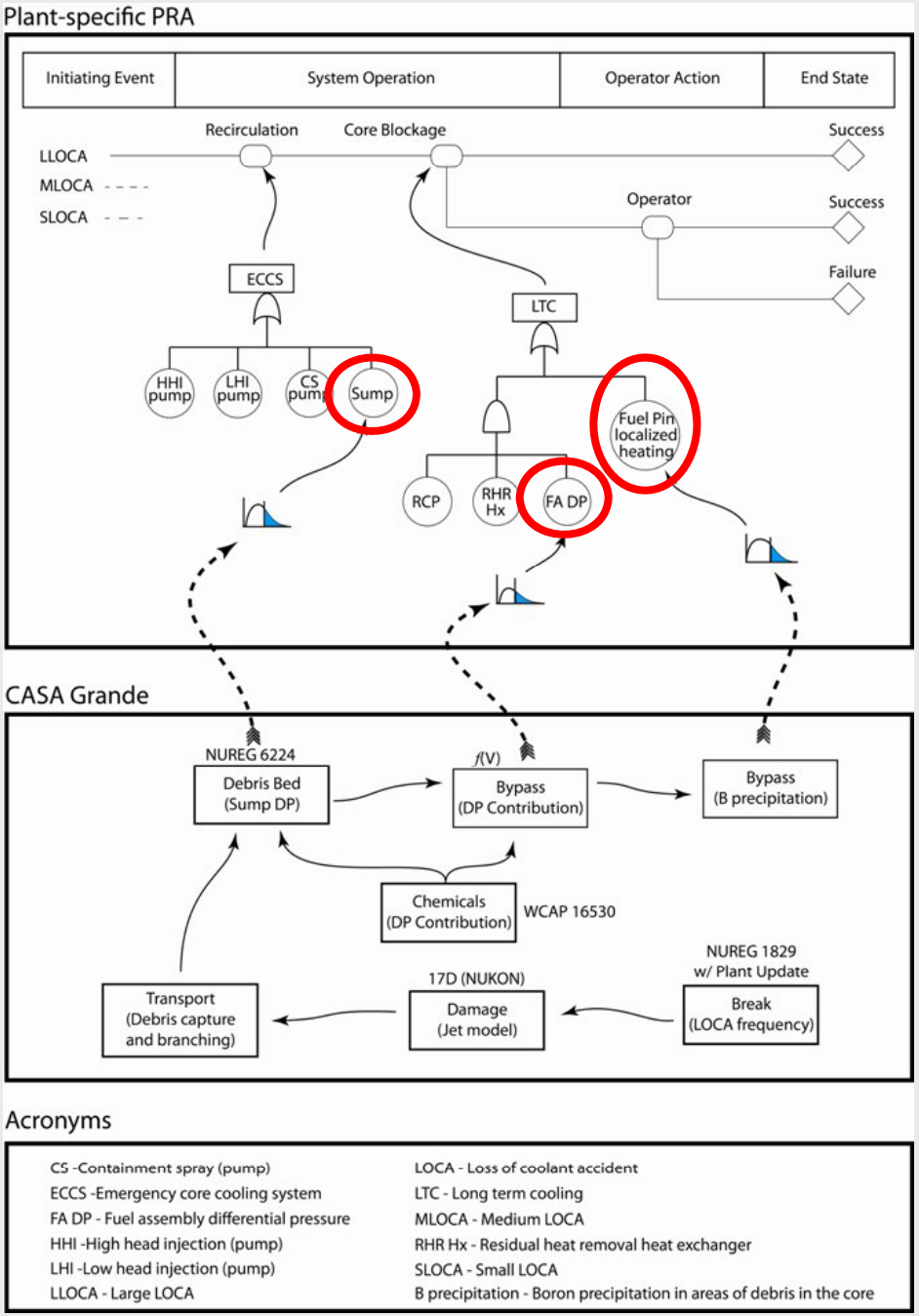


- PRA is located at the top level of system analysis.
- This PRA has the typical Power Plant Fault Trees and Event Trees covering hardware failures and operators' actions and so, has the typical PRA cut sets.



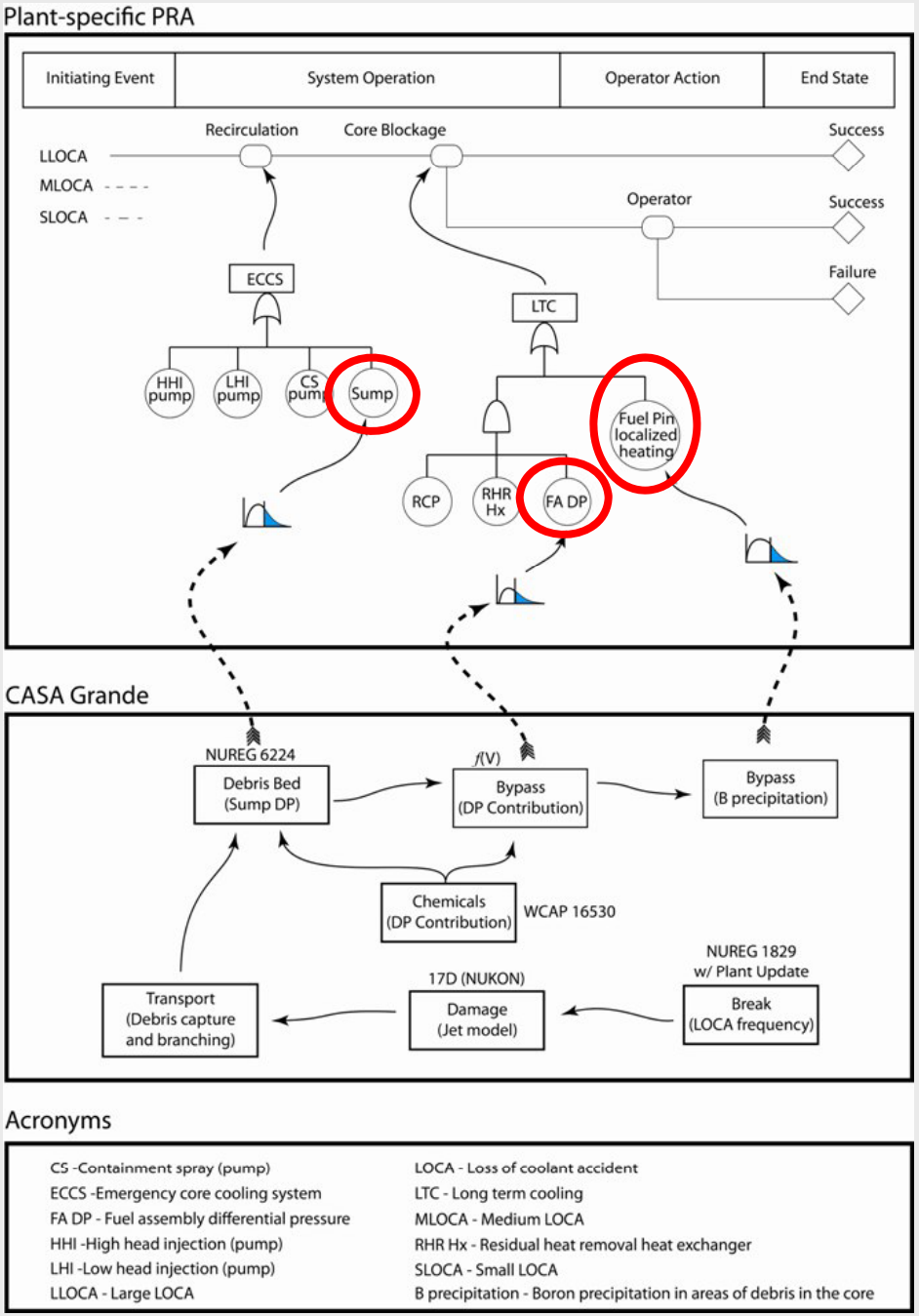
- CASA Grande provides estimates for the likelihood of three basic events of Fault Trees in PRAs.

- Rather than relying solely on historical failure data for these three basic events, the risk-informed project develops the models (in CASA Grande) for the underlying chemical and mechanical phenomena leading to the three basic events.



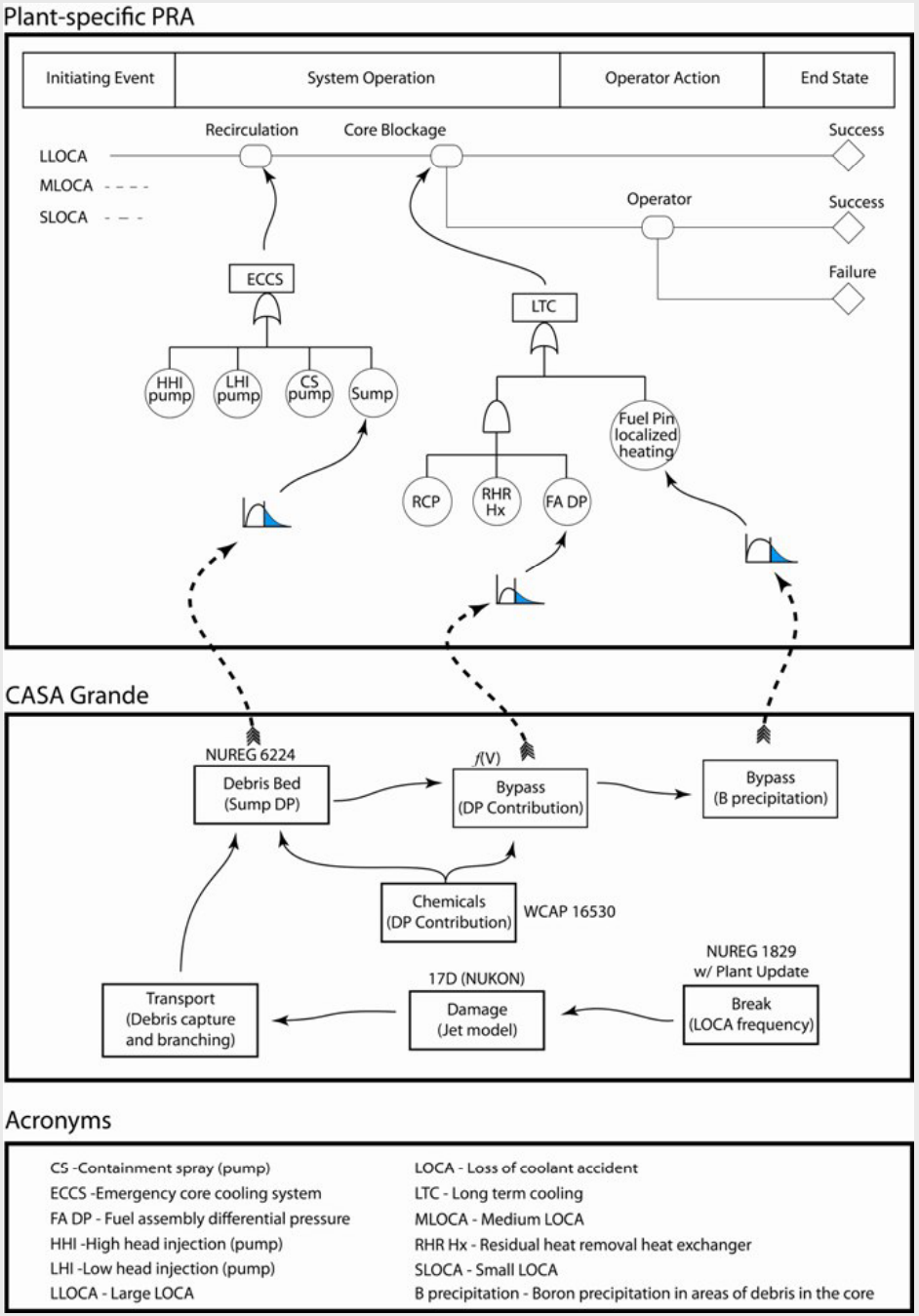
- The output of CASA Grande will give a more accurate estimate of the likelihood of these three basic events and can then be imported to Fault Trees of the plant-specific PRA in order to calculate CDF.

- CASA Grande is instrumental in opening the black boxes of two important events in the scenarios of a Power Plant PRA (i.e. recirculation and core blockage) by model-based estimations of the likelihood of their underlying basic events.



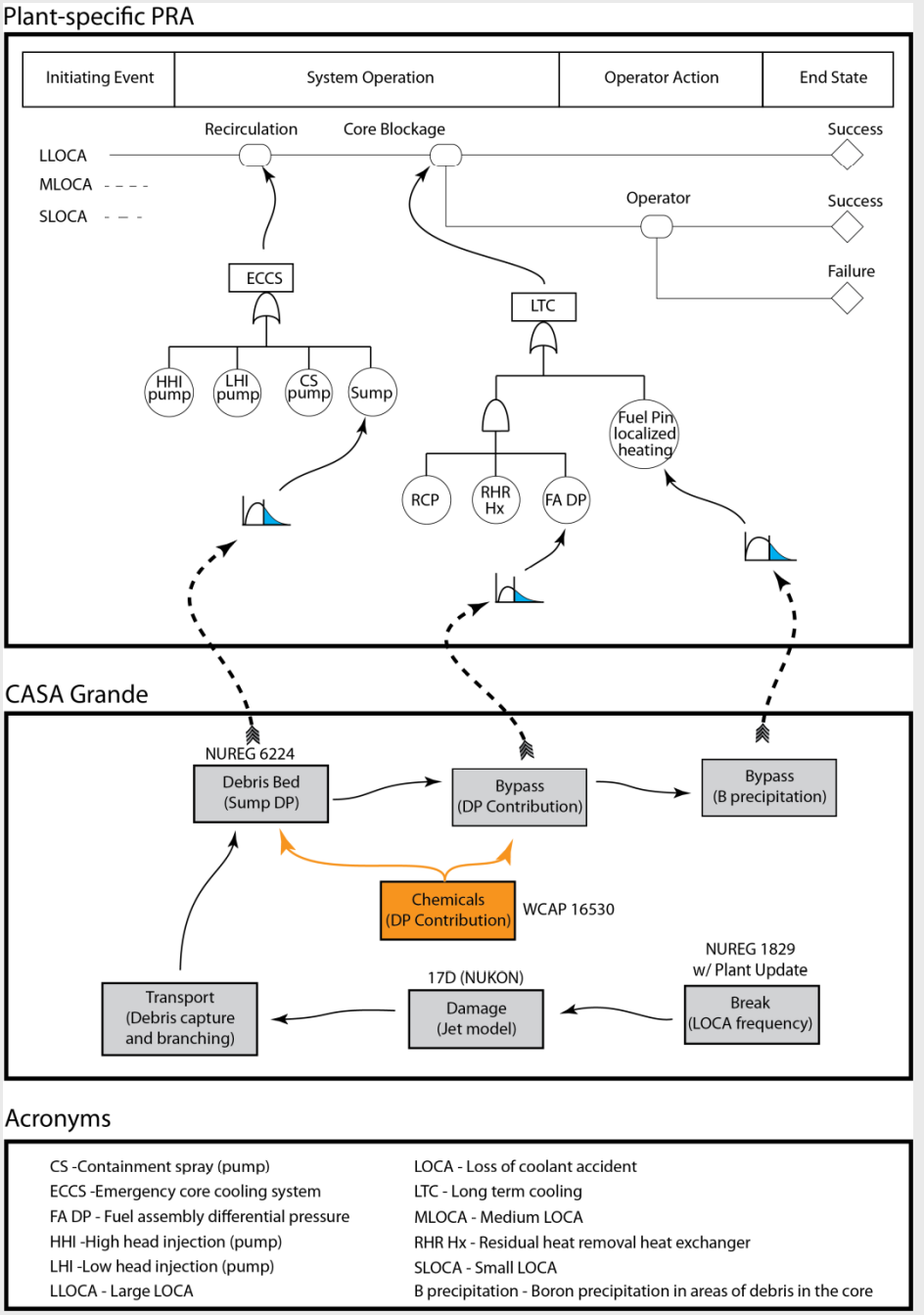
- The Risk-Informed GSI-191 project not only contributes toward the closure of the GSI-191 issues, but also makes a contribution toward PRA research and applications.

- This project improves the scientific incorporation of underlying physical failure mechanisms (i.e. chemical and mechanical phenomena) into PRA, an important topic of interest in the PRA field.



Focus of Today's Meeting: Chemical Effects

- Chemicals are hypothesized to affect both the strainer debris bed head loss and the in-vessel debris bed head loss.
- In the figure, the effect on the in-vessel debris bed head loss is shown as going through the strainer bypass path.
- Boron precipitation is separate from the chemical reaction processes and their potential debris bed blockage.



Today's Agenda

1. As necessary, discuss STP Post-meeting Notes from January 26-27 Chemical Effects Meeting

2. Methods for addressing each of the significant PIRT issues

3. Experimental apparatus configuration

4. High level alignment on strainer head loss methodology (use of NUREG/CR 6224 and CHLE experiments)

Plan for Risk-Informed Chemical Effects Testing