

# Operating Plants – Data Sources for Consideration in Long Term Operation

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June, 2016



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# Long Term Operation – Beyond 60 Years

- LTO in the US has multiple constraints
- Safety – there must be no degradation in safety performance
- Regulatory – must meet the ever expanding requirements of NRC
- Reliability – plant reliability/availability must remain high
- Economics – plant must be economical to operate

How do we identify Systems, Structures, and Components important to LTO?



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# Key US Performance Indicators



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# Key U.S. Performance Indicators



- Reactor Oversight Process (ROP)
- Licensee Event Reports (LERs)
- Inspection Reports (IRs)

- **Focus on Safety**

- Performance Monitoring
- Industry Trends & Analysis
- Event Reports

- **Focus on Safety & Reliability**



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# Regulatory Indicators



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# NRC Indicators Focus on Safety

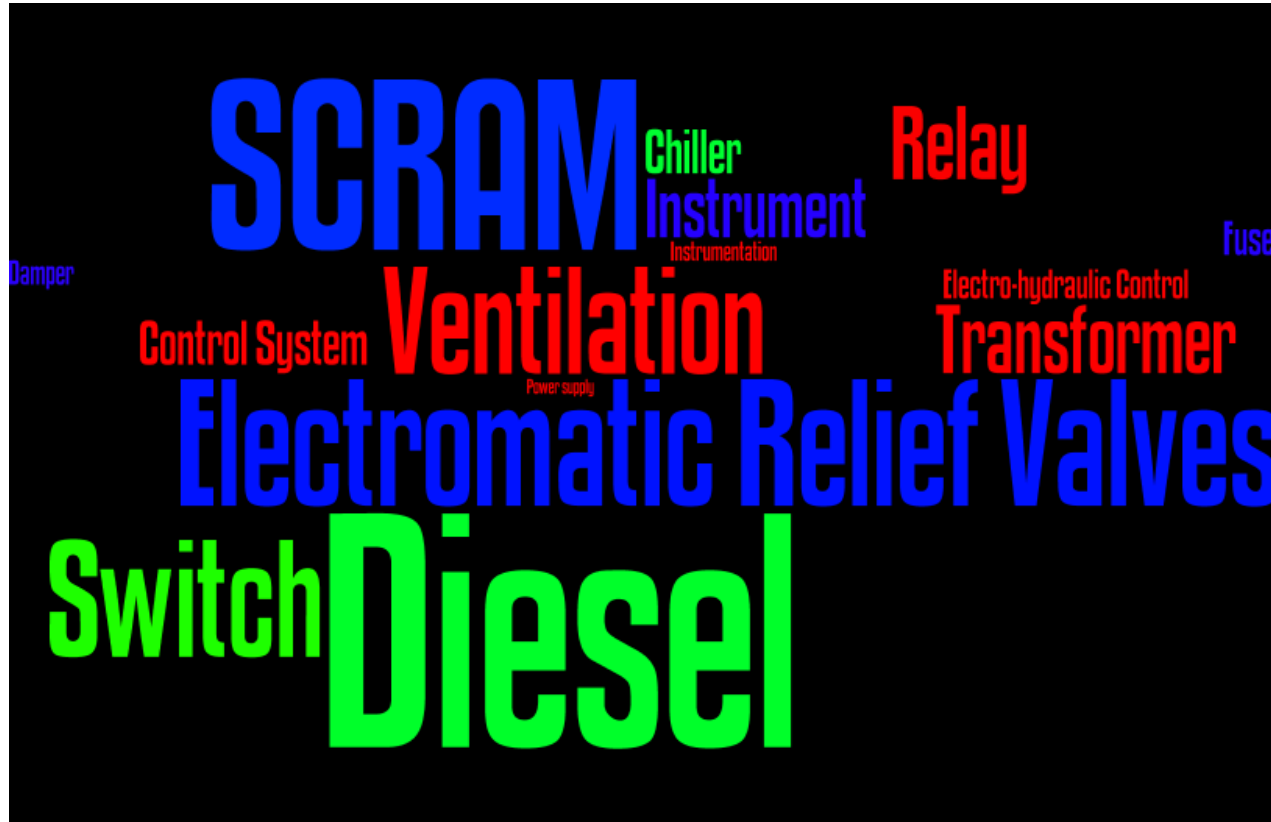


- ROP, LERs and Inspection Reports often contain redundant information (same events show up in all)
- Reviewed Five years of LER data (2011-2015)
- Many LERs were the result of SCRAMS
- Others were required reports due to safety equipment failure/unavailability
- However, unavailability due to non-safety related equipment problems may not show up



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# Word Cloud from LER Titles

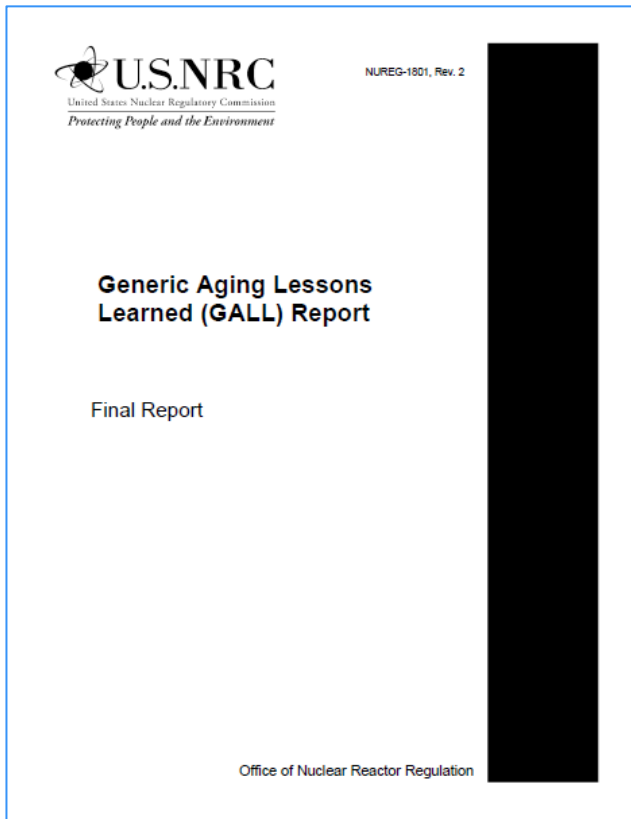


These datasets provide limited insights for Long Term Operation



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# Generic Aging Lessons Learned



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- I. Application of ASME Code (via 10CFR50.55a, as amended)
- II. Containment Structures
- III. Structures and Component Supports
- IV. Reactor Vessel, Internals, and Reactor Coolant System
- V. Engineered Safety Features
- VI. Electrical Components
- VII. Auxiliary Systems
- VIII. Steam and Power Conversion System
- IX. Selected Definitions and Use of Terms for Structures, Components, Materials, Environments, Aging Effects, and Aging Mechanisms
- X. Time-Limited Aging Analyses [Evaluation of Aging Management Programs under 10 CFR 54.21(c)(1)(iii)]
- XI. Aging Management Programs (AMPs)

Key focus is on safety related systems, structures, and components



# Conclusions

- Regulatory Performance Indicators are narrow in scope (may miss many components that will be important to Long Term Operation)
- GALL contains good insights into “generic” aging mechanisms, although application may need to be broader



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# Industry Indicators

## INPO Scram Trend Analysis



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# INPO

*Institute of Nuclear Power Operations*

## Scram Trends

**John Loyd – INPO Industry Analysis**

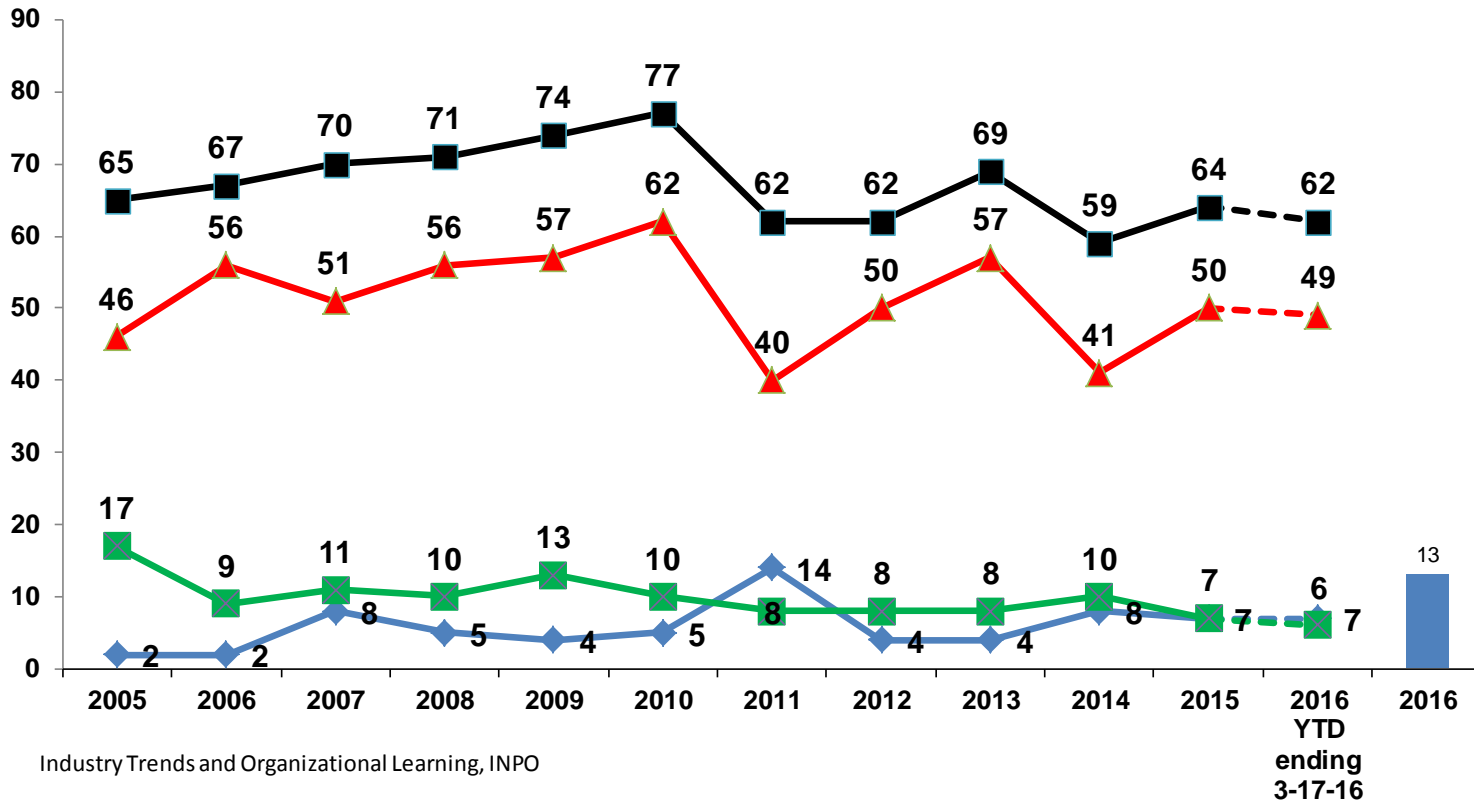
**(770) 644-8155**

**[loydje@inpo.org](mailto:loydje@inpo.org)**

Last update – 04/21/2016

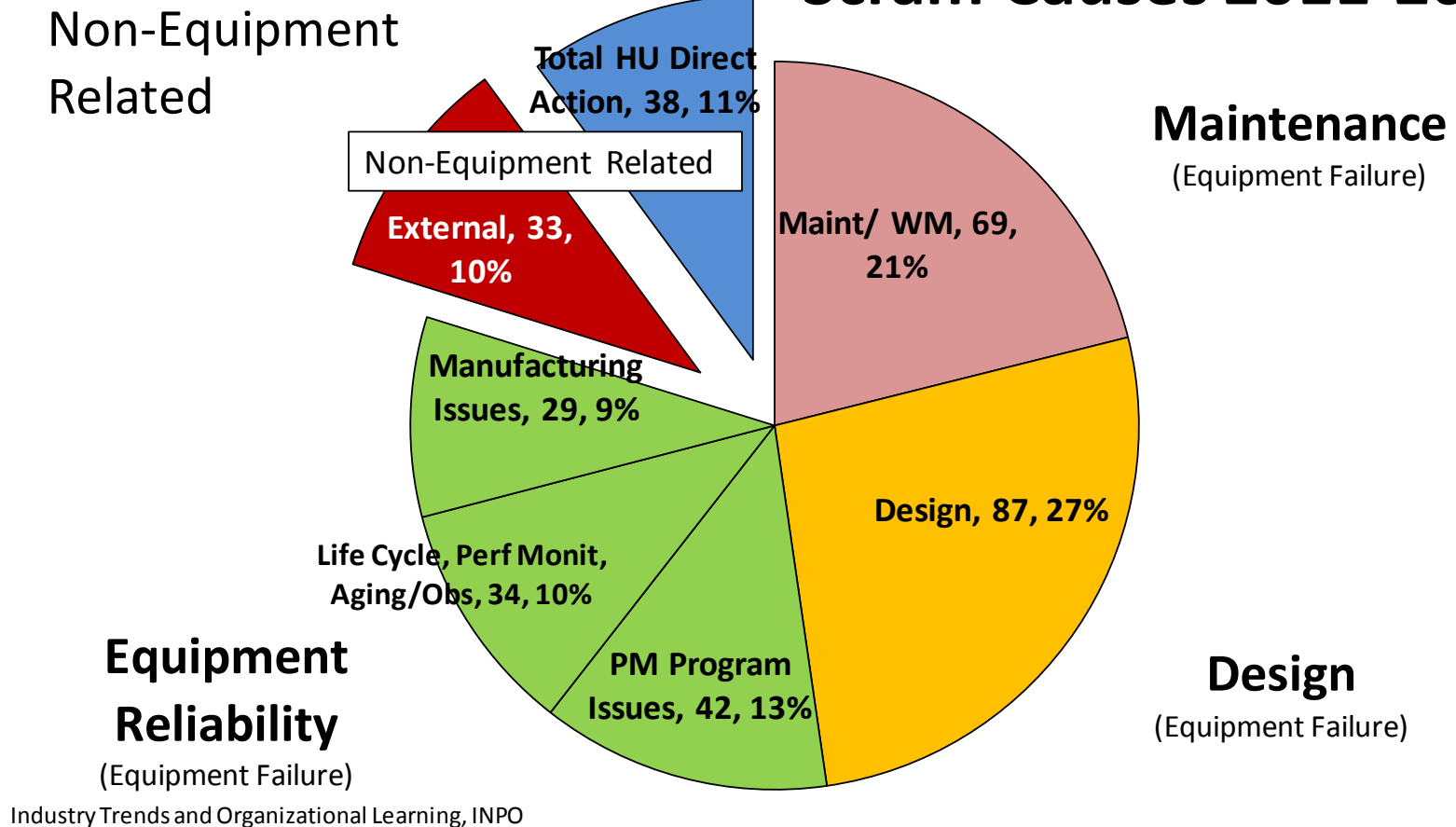
# General Scram Causes by Number

■ 2016 ■ Total Scrams ▲ Equipment ◆ External ■ Direct Human Action

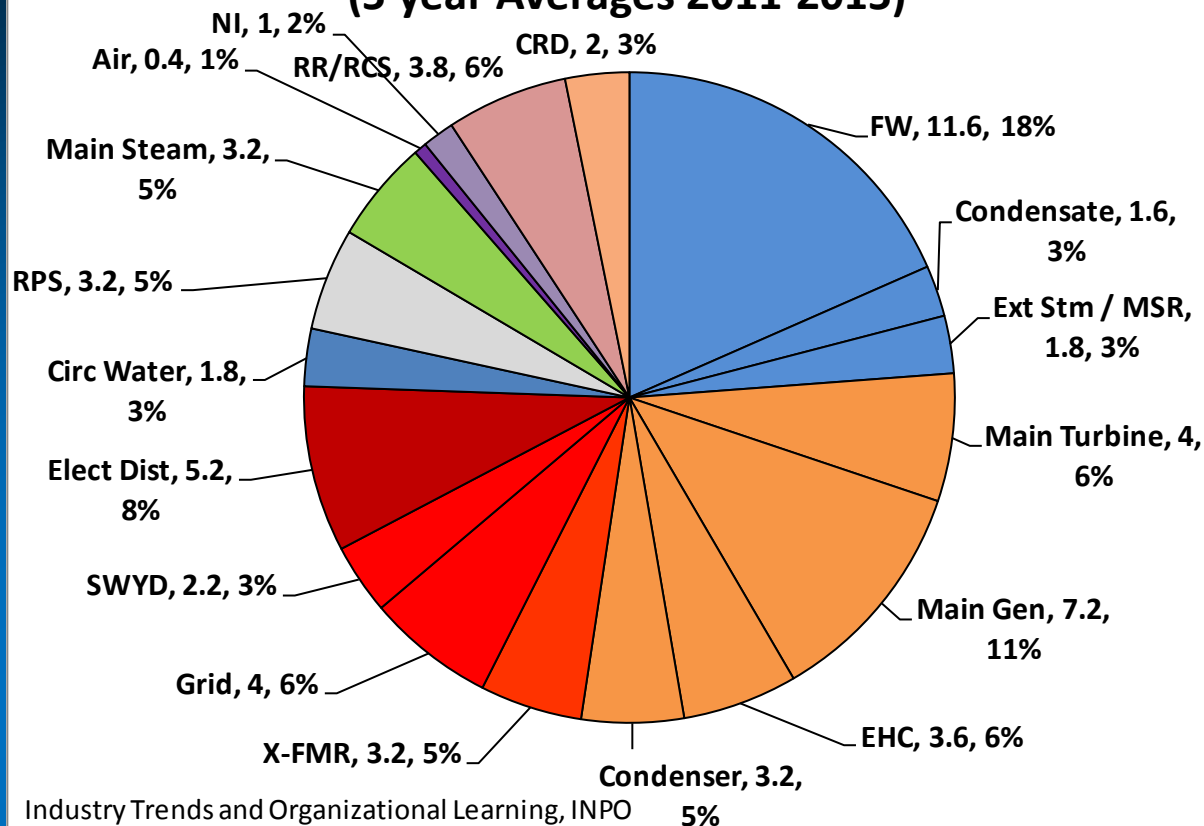


# Scram Overview

## Scram Causes 2011-2015



## Scrams by System (5 year Averages 2011-2015)



- Turbine/Generator – 28%
- FW/Condensate – 24%
- TSG- 14%

# Other Industry Data Sources

- INPO, EPRI, NEI
- BWROG, PWROG Scram Frequency Reduction Committees
- Equipment Reliability Working Group
- Preventive Maintenance Coordination Group
- AC Power Source Reliability
- Don't forget international sources (IAEA, WANO, etc.)



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# Conclusions

- Identification of SSC's important to LTO is a critical first step
- Industry Performance Indicators are more detailed in scope than NRC and probably cover SSC's of concern
- GALL may provide good basis for aging management programs beyond SSC's of NRC interest (and its use will be required for license renewal)
- Solutions to extending life of SSC's can usually be international → charter of CORDEL Working Group



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# Questions?



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