



Institute of Nuclear Power Operations

Configuration Management Challenges

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Agenda

- Plant Evaluation & WANO Peer Review Trends
- Faint Signals
- Design Related SCRAMs & Consequential Engineering Errors
- Nuclear Fuel Reliability

Evaluation/Peer Review Trends –

Performance issues:

- EN.1 - Engineering Fundamentals
 - Critical thinking, decision making, and ***thoroughness with focus***
- CM.2 – Use of Equipment Tagouts to abandon equipment
- CM.3 – Long Term Tmods to support plant operation
- CM.3 – New Software interprets high stator cooling water flow on all instruments as faulted condition warranting trip
- CM.3 – Backlogs of drawing or procedure updates after projects/modifications

Evaluation/Peer Review Trends –

Improved Performance:

- CM.2 - Operational Configuration Control
 - Temp changes made to plant by non-engineering workers

Critical Thinking Failure Modes

- When evaluating a plant condition or modifying the plant, failure to:
 - *Identify or validate assumptions*
 - *Identify critical parameters or attributes*
 - Identify high risk/potential consequence
 - Consider all options to address or modify
 - Consider what is the worst that could happen

Faint Signals

- Engineering managers not challenging the work of engineers to:
 - Ensure proper identification & management of risk associated with decisions
 - Verify assumptions are valid for design changes or evaluations of equipment degradation
- Inadequate supervisor engagement with engineers
 - Need driven by inexperienced engineers

Design Related SCRAMs & Consequential Eng Errors

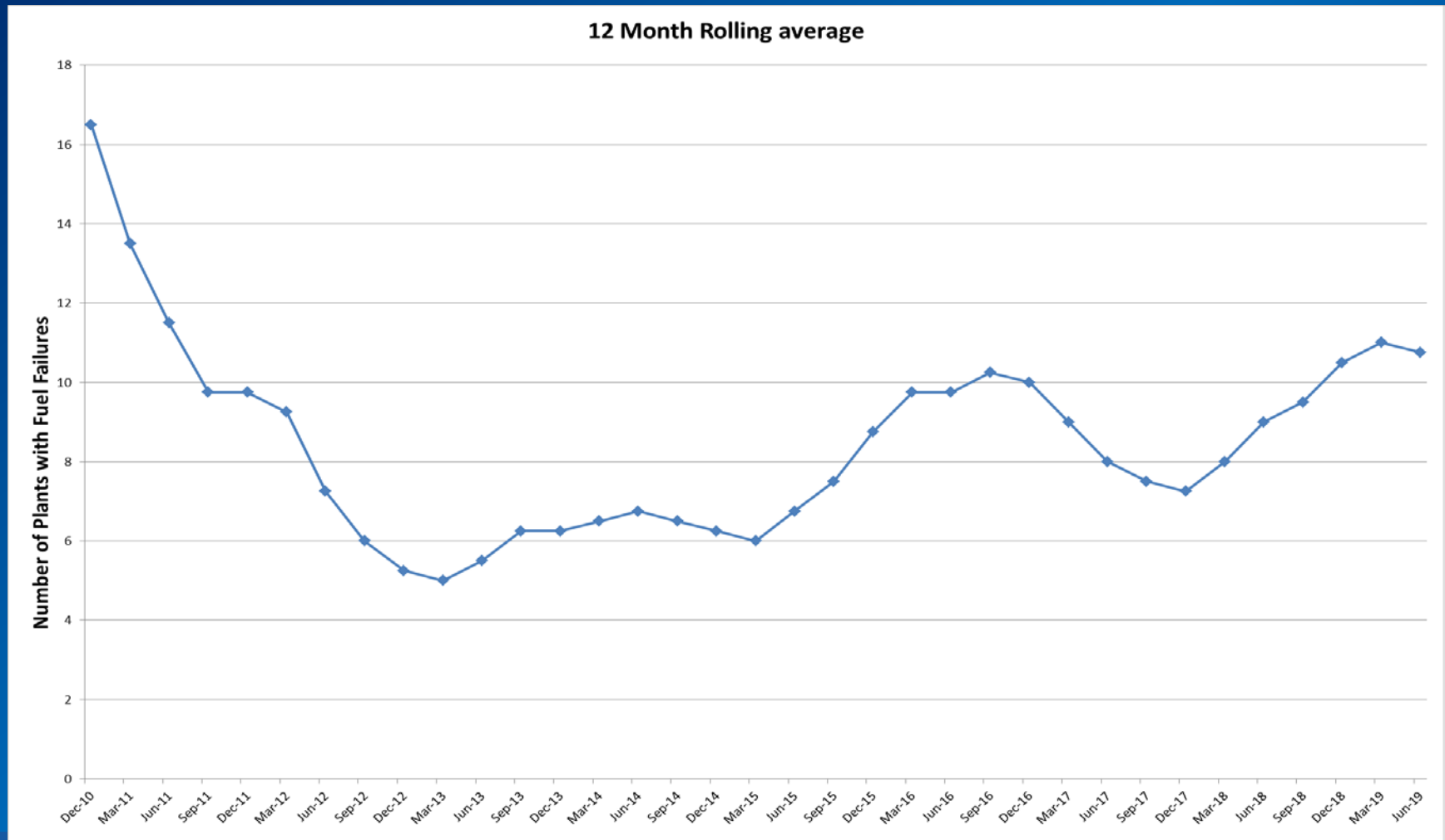
- Poorly implemented fundamentals is the issue
 - Reduced Margins
 - Not aware of actual plant conditions
 - Low margin condition not identified as input to modification
 - Vibration is causing failures of modified equipment
 - Cyclic fatigue resulting in failure
 - Vibration affected newly installed sensitive relay
- Third party review effectiveness
 - Critical parameters not identified for review
- Use of FMEA to guide design & mod testing



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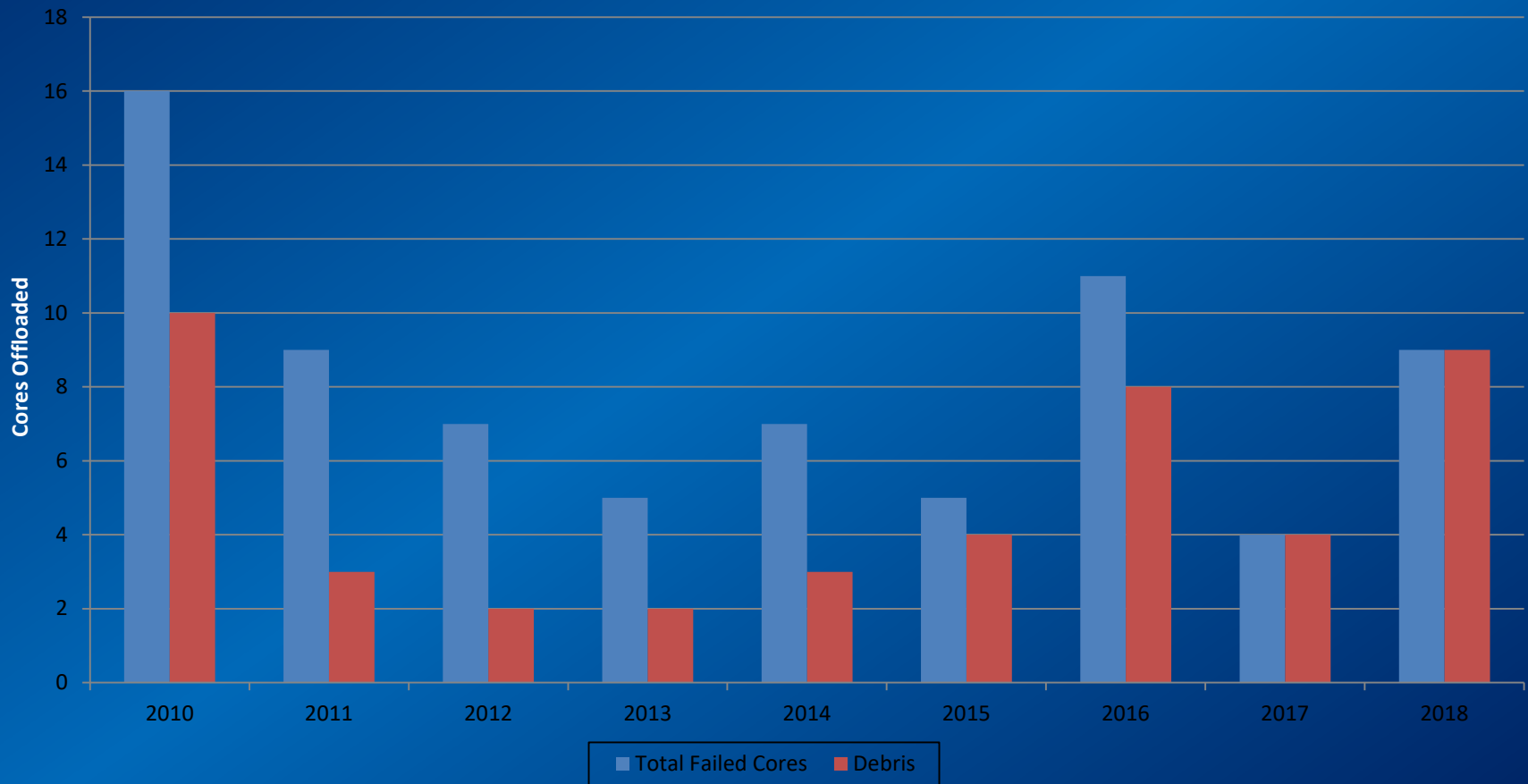
2019 Fuel Performance Update

Cores with Fuel Failures



Debris induced Fuel Failures

Cores Offloaded & Failure Type Identified



Five Direct Causes of Debris

- **Internal System /Component degradation**
- **Weak Implementation of Foreign Material Controls**
- **New design changes or existing design vulnerability**
- ***Equipment operated incorrectly***
- **Use of new unfiltered flow paths to the reactor vessel, or water sources containing debris**



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