ENCLOSURE

NextEra Energy Duane Arnold, LLC
Additional Information to Support Regulatory Conference (EA-13-223)

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Duane Arnold Energy Center
Regulatory Conference
Reactor Core Isolation Cooling Pump Trip

January 7, 2014

Nuclear Excellence Model

Vision

We are a team that delivers consistent excellent performance

Mission

We will produce energy in a safe, reliable, cost effective way, while caring for our employees, communities and the environment

Values

- Conduct all activities to demonstrate a deep respect for Nuclear Safety
- Live the Safety Guiding Principles
- Be a Self-Improving Culture & Learning Organization
- Maximize the time spent on Prevention and Detection to minimize / eliminate Correction activities
- Foster a work environment where we are the employer of choice

Core Principles

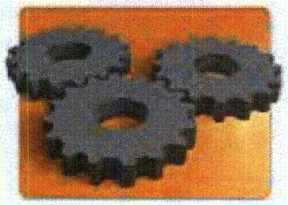
- Operationally Focused
- Passion for Excellence
- Engaged Leaders
- Standardized Processes
- Responsive to Stakeholders
- Effective Workforce Planning
- Engaged Employees
- Effective Long-Range Planning
- Strong Teamwork
- Strong Ownership & Accountability
- Effective Supervisors
- Worklife Balance

Strategic Focus Areas

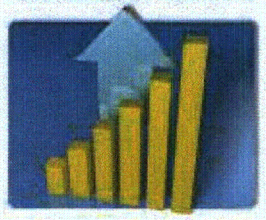
Operational Excellence

Organizational Effectiveness

Generation Reliability



Effective Business & Financial Performance



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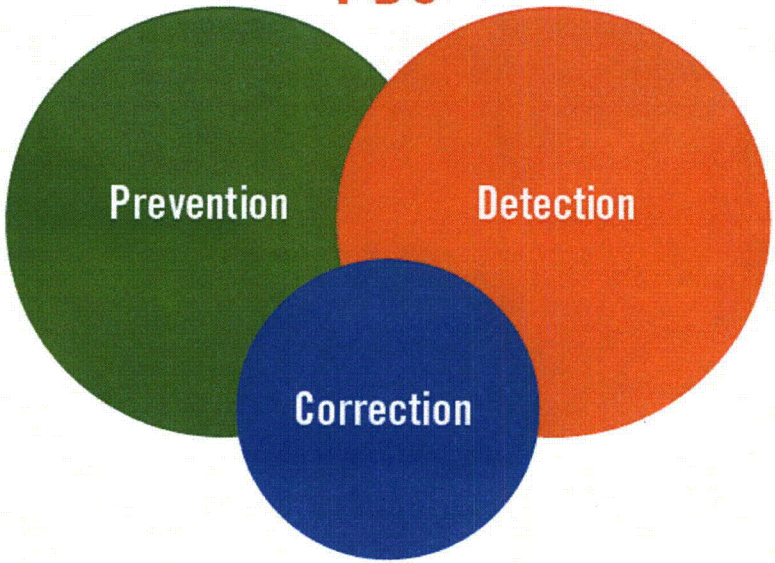
PDC



"Do the job right the first time"

Value

Maximize the time spent on
Prevention and Detection
to minimize / eliminate Correction activities

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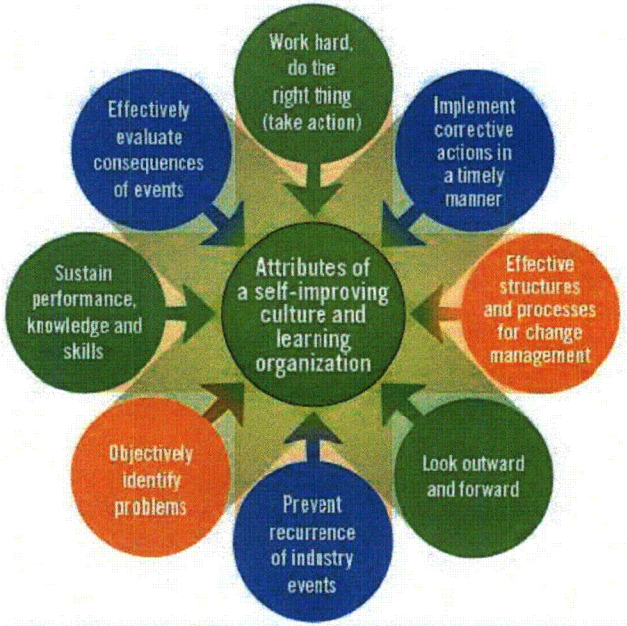
SIC/LO



Value

Be a Self-Improving Culture
& Learning Organization

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Attendees

- Richard Anderson, Site Vice President
- Tom Gordon, Assistant Operations Manager
- Anil Julka, Fleet Risk and Reliability Manager
- Mike Davis, Site Licensing/EP Manager
- Larry Lee, ERIN Engineering
- Jeff Pladsen, Reactor Operator
- Jim Petro, Fleet Licensing Director

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Agenda

- Opening Remarks – Rich Anderson
- Performance Deficiency – Rich Anderson
- Root Cause Evaluation – Tom Gordon
- Corrective Actions – Tom Gordon
- Operations Response to RCIC Trip – Tom Gordon
- Risk Significance – Anil Julka
- Closing Remarks – Rich Anderson

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Opening Remarks

Rich Anderson
Site Vice President

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Opening Remarks

- **RCIC is an important contributor to our accident mitigation capability**
  - Operability of all safety systems must always be understood and continually assessed
- **Risk Significance of August 2013 Event**
- **New Information Will be Discussed Today**

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Event Summary

- **On June 21, 2013, the Control Room Operators noted RCIC turbine speed indicator was indicating 1200 RPM with the system in standby**
  - Condition Report initiated
  - Immediate Operability Determination not performed because the speed indicator is not safety related, and is used for indication only
- **Work Request initiated to calibrate speed indicator**
  - Work scheduled to coincide with next RCIC surveillance test on August 22, 2013 to minimize unavailability of RCIC
- **On August 22, 2013, troubleshooting of speed indicator commenced in accordance with Work Request**
  - Troubleshooting was stopped when expected response was not obtained
- **Subsequent Quarterly Surveillance test commenced on August 22, 2013 and the RCIC pump tripped on over-speed**

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Performance Deficiency

- **Performance Deficiency**
  - Failure to perform an immediate operability determination in accordance with site procedures on June 21, 2013, when a RCIC system turbine speed indicator in the main control room was found degraded.

Causal Evaluation Corrective Actions
Operations Response to RCIC Trip

Tom Gordon

Assistant Operations Manager

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Cause Analysis

- **RC1 –** The RCIC dropping resistor in the RCIC governor power supply failed due to previously unknown resistor material changes made by the manufacturer that reduced performance margins in the given application. This resulted in overheating and ultimate failure.

- **RC2 –** Screenings of the Condition Report and Work Request failed to correctly assess RCIC operability due to process gaps

Immediate and Interim Corrective Actions

- **Immediate Actions**
  - On August 23, 2013, the dropping resistor in the RCIC governor power supply was replaced and the RCIC system was declared operable on August 24, 2013.
  - The Past Operability Evaluation determined that the RCIC system was inoperable from June 21, 2013 through August 24, 2013.
- **Interim Actions**
  - Actions are in place to check the output voltage of the dropping resistor on a weekly basis in order to verify its condition.
  - Maintenance actions have been implemented to replace the dropping resistor every three months.

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Corrective Actions

- **Sustainable Corrective Actions**
  - The RCIC governor power supply will be modified to provide 50% margin to thermal aging and provide monitoring of output to detect any failures.
  - Operability Evaluation process will be revised to provide guidance to conduct an independent review of the Operations Shift Managers Immediate Operability Determination on the top ten significant SSC's.
    - An Operability Work sheet will be added to the Condition Report screening process for the top ten risk significant SSCs.
    - A new automatic generated report of the previous 24 hour Condition Reports along with Immediate Operability Determination (IOD) notes transmitted to key management team members for daily review.
    - Weekday 0800 Operations alignment meeting reviews previous 24 hour Condition Report IODs with Operations Shift Manager.

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Operations Response to RCIC Trip

- Site Procedures and Training support Operating RCIC in manual
  - SAMP 703 provides clear guidance
- Simulator Crews were observed to take actions to manually initiate RCIC and maintain adequate core cooling

Operations Response to RCIC Trip

- The operating crew in the simulator immediately recognized the over-speed condition during the surveillance testing.
- A separate operating crew was placed in postulated Station Black Out (SBO) with HPCI not available, and the RCIC speed control failure to determine their response. The crew was not aware of the planned scenario.
  - Operators immediately recognized the RCIC over-speed trip.
  - The crew made several attempts to restart RCIC, noting each time that injection was occurring prior to the over-speed trip.
  - The panel operators informed the Control Room Supervisor (CRS) that normal speed control of RCIC was not working and manual control of MO-2405 trip throttle valve was being used to control turbine speed. Simulator override prevented this from being successful.
  - The Operations Shift Manager (OSM) declared SBO Emergency Action Level (EAL) and implemented the use of CR-01 checklist which directed use of Emergency Management Guidelines (EMG's). Once in EMG's the OSM followed the guidance provided to implement SAMP-703, local manual control of RCIC, SAMP 703 ordered at 13 minutes into transient. Scenario is terminated.

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Operations Response to RCIC Trip

- Operating Crew implementation of SAMP-703, Manual Operations of RCIC
  - SAMP-703 is part of the non-licensed operating training program and is reviewed bi-annually in Licensed Operator Requalification.
  - Multiple operators were directed to walk through the performance of SAMP-703, including wait times for valve manipulations, accessing components in a locked High Rad area, etc.
  - All walkthroughs, including appropriate briefings were completed within the time necessary to commence RCIC injection prior to vessel water level reaching top of active fuel.
- An operating crew was then placed in the simulator to re-perform the original SBO with HPCI out of service and RCIC governor control system failure. This time the simulator over-ride on MO-2405 was removed which would allow for its use to control turbine speed.

Operations Response to RCIC Trip

- An operating crew was then placed in the simulator to re-perform the original SBO with HPCI OOS and RCIC governor control system failure. This time the simulator over-ride on MO-2405 was removed which would allow for its use to control turbine speed.

Adequate core inventory has been proven to be maintained by operating RCIC in manual while throttling MO-2405

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PRA and Risk Significance

Anil Julka

Nuclear Risk and Reliability Manager

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Process for Comparing NRC and NextEra Energy (NEE) Results

- SPAR used to evaluate significance comparing NRC and NEE assumptions
- NEE (with ERIN support) developed SPAR model that emulates NRC assumptions (difficult without having detailed cutsets from NRC evaluation)
- NEE SPAR model adjusted to more accurately reflect most impacting DAEC PRA model inputs and DAEC operations input
  - DAEC PRA model conforms to RG 1.200 rev 2
  - PRA staff developed new human error probability (HEPs) evaluations based on existing procedures, training and simulator observations

Comparison of NRC and NEE Key Model Inputs/Assumptions

- NEE SPAR model has been adjusted to appropriately reflect the as-built, as operated plant.
- The following slides highlight the key inputs and assumptions that impact the significance but were omitted from the NRC SPAR model.
- By not including these inputs in the NRC SPAR model, the change in risk is significantly overestimated.

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MANUAL RECOVERY OF RCIC THROTTLING MO-2405 FROM CONTROL ROOM

- NRC assumed no procedure directed use of valve MO-2405, the RCIC turbine stop valve, to manually control RCIC speed. This assumption significantly skews the results high.
- NEE version of the SPAR model calculations supports credit for recovery of RCIC via manual operation of MO-2405 from the Main Control Room.
- Basis for NEE crediting action to throttle MO-2405:
  - 1C04C, section A-5 of the Alarm Response Procedure provides explicit RCIC trouble shooting guidance which would quickly lead to throttling MO-2405.
  - OP-AA-100-1000, Conduct of Operations procedure, requires operators manually throttle when automatic controls fail – this requirement is covered in routine operator training. To make this action more reliable a Human Performance Aid has been installed on control room "cane handles" to physically indicate in which direction valves can be throttled – [2 set screws on each side of MO-2405 cane handle indicate it can be throttled in both directions].
  - Operators are experienced in using MO-2405 in this way when they perform the RCIC overspeed test which requires throttling of MO-2405.
  - SBO Simulator Scenario [September 12, 2013] - Operators clearly demonstrated that their first action to recover RCIC was to throttle MO-2405.

Manual Recovery of RCIC Throttling MO-2404 from RCIC Room

- Procedure SAMP 703 provides explicit direction on how to manually start RCIC without electric power. RCIC is manually controlled at the RCIC Room.
- Simulator Scenario demonstrated local action feasible. DAEC Operations performed a crew executed SBO simulator scenario with HPCI OOS to assess the likelihood of RCIC recovery before reaching TAF. The operators identified the need to implement SAMP 703, "RCIC OPERATION FOLLOWING LOSS OF ELECTRIC POWER" early in the event and were able to recover RCIC and operate it manually within one hour, before reactor level reached TAF.
- Availability of DC Power shortens time to implement and allows manual operation from control room. For this PD, DC power availability is not impacted therefore some of the SAMP 703 steps can be skipped.
- Conservatively Not credited in NEE SPAR Model – action subsumed by control room throttling of MO-2405, given the potential for high dependency on manual operation of MO-2405 from the control room.

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Credit for CRD During Loss of Feedwater (LOF)

- NRC SPAR model does not credit high pressure (HP) RPV makeup using CRD pumps during a LOF event.
- DAEC PRA model credits successful HP RPV makeup using 1 of 2 CRD pumps without operator action.
  - However, the NEE SPAR model conservatively requires 2 of 2 CRD pumps for success.
- CRD alone is not credited as a high pressure makeup source in the Fire SPAR model due to potential uncertainty in the cable location data for the CRD system and its support systems.

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Connection Between Loss of Offsite Power and EDG HVAC

- NRC model generically assumes LOOP results in EDG HVAC failure and requires operator recovery (open doors) but this does not represent how the DAEC EDG system functions.
- DAEC EDG HVAC is dependent on EDG operation NOT on offsite power.
- EDG HVAC failures are included as part of EDG failure data in DAEC PRA.
- NEE SPAR model not adjusted – left as conservatism since crediting previous changes results in reduction to green.

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Fire PRA

- Credit for throttling MO-2405 reduces fire risk to GREEN.
- Conservatively, no credit taken for CRD in NEE Fire SPAR.

LERF

- NRC uses a 0.6 CDF multiplier to calculate LERF based on assuming the dominant scenarios are associated with the RPV at high pressure. High pressure is defined as > 250 psig.

- NEE evaluation shows risk to be dominated by SBO. The SBO procedure directs aggressive RPV cooldown and maintaining RPV pressure between 200 and 150 psig within 2-3 hrs. This pressure range maintains RCIC function.

- Per NRC IMC 0609 Appendix H (table 5.2) a 0.1 multiplier is recommended for RPV at low pressure.

- Using a 0.1 multiplier, LERF is GREEN.

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ΔCDF and ΔLERF Results

- NRC results are from NRC Inspection Report dated November 14, 2013
- NEE results are from ERIN SPAR Report dated November 21, 2013 – including NEE inputs and assumptions noted in previous slides.

ΔCDF			
Model	Delta CDF (64 Days)		
	Internal Events	Fire	Total
SPAR – NRC Inputs	1.6E-06	1.9E-6	3.5E-06
SPAR – NEE Inputs	1.14E-07	1.93E-07	3.07E-07

ΔLERF			
Model	Delta LERF (64 Days)		
	Internal Events	Fire	Total
SPAR – NRC Inputs	Not Available	Not Available	1.1E-06
SPAR – NEE Inputs	1.14E-08	1.93E-08	3.07E-08

The results differ significantly due to generic assumptions in the NRC SPAR and NRC decision to give no credit for RCIC recovery actions

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Closing Remarks

Rich Anderson

Site Vice President

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