



Review of  
**Nuclear Operations**

**Florida Power & Light Company**

January 2024

BY AUTHORITY OF  
The Florida Public Service Commission  
Office of Auditing and Performance Analysis



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**PA 23-03-002**



# TABLE OF CONTENTS

<b>CHAPTER</b>	<b>Page</b>
<b>1.0 Executive Summary</b>	
1.1 Scope and Objectives .....	1
1.2 Methodology .....	1
1.3 Commission Audit Staff Analysis .....	2
1.4 Commission Audit Staff Observations.....	4
<b>2.0 FPL Nuclear Operations Internal Controls</b>	
2.1 Company Nuclear Review Board.....	5
2.2 Management Review Committee .....	18
2.3 FPL and Nuclear Industry Performance Indicator Controls.....	18
2.4 Nuclear Safety Culture Controls .....	20
<b>3.0 PTN and PSL Forced Outage Causes and Costs</b>	
3.1 Commission Audit Staff Analysis – Forced Outages .....	23
<b>4.0 Company Comments .....</b>	<b>39</b>

## TABLE OF EXHIBITS

<b>EXHIBIT</b>	<b>Page</b>
1. FPL Unplanned Outages/SCRAMS .....	24
2. Selected Unplanned Outages/Scrams 2017 – 23 .....	25
3. Commission Audit Staff Analysis of Selected Outages .....	26

## 1.0 Executive Summary

The Office of Auditing and Performance Analysis initiated this operational audit at the request of the Florida Public Service Commission's (FPSC or Commission's) Division of Engineering to assist its analysis of issues in Docket Number 20230001-EI.

This audit report addresses nuclear operations at Port Saint Lucie Units 1&2 (PSL) and Turkey Point Units 3&4 (PTN) over the period 2017-2023.

### 1.1 Scope and Objectives

The primary objectives of this audit were to review, evaluate, and document FPL's internal controls and procedures governing the following:

- FPL's execution and management of PSL and PTN operational activities including detecting and correcting observed deficiencies.
- FPL's outage management practices for both planned and forced outages, including cause determination through Root Cause Evaluations, and execution of the resulting corrective actions deemed necessary.
- FPL's formal internal monitoring and reporting of PSL and PTN operational deficiencies to Senior and Executive Management, and operations management's response to their directives.
- FPL's monitoring and use of operational performance indicators, internal and external audit reports, consultant reports, and QA/QC reviews.
- NRC's programmatic monitoring and inspection of FPL's nuclear performance, its compliance with 10 CFR Part 50, and management's response to NRC input.

### 1.2 Methodology

Commission audit staff gathered and analyzed hundreds of documents regarding the performance of FPL's nuclear plant operational performance over the period 2017-2023. Commission audit staff conducted multiple extended teleconference interviews with FPL Senior and Executive Managers responsible for the company's nuclear operations.

Commission audit staff elected to use a seven-year study period to provide a broad perspective for analysis and recognition of trends and patterns of behavior in FPL's management and operation of PSL and PTN. Commission audit staff placed emphasis on several key internal control processes including: NextEra's Company Nuclear Review Board (CNRB), FPL's Management

Review Committee, Nuclear Safety Culture Monitoring Panel, and Nuclear Assurance organization.

Commission audit staff also reviewed 10 CFR Part 50, applicable Florida Statutes, and selected portions of records from Docket Nos. 20210001-EI, 20220001-EI, and 20230001-EI.

As authorized by Sections 350.117(2) and (3), Florida Statutes, management audits are conducted by staff to assess utility performance and the adequacy of operations and controls:

(2) The commission may perform management and operation audits of any regulated company. The commission may consider the results of such audits in establishing rates; however, the company shall not be denied due process as a result of the use of any such management or operation audit.

(3) As used in this section, “management and operation audit” means an appraisal, by a public accountant or other professional person, of management performance, including a testing of adherence to governing policy and profit capability; adequacy of operating controls and operating procedures; and relations with employees, customers, the trade, and the public generally.

Commission audit staff’s standard of review for internal controls is primarily the Institute of Internal Auditors’ *Standards for the Professional Practice of Internal Auditing* and the *Internal Control - Integrated Framework* developed by the Committee of Sponsoring Organizations (COSO) of the Treadway Commission. Internal controls assessments focus on the COSO framework’s five key elements of internal control: control environment, risk assessment, control activities, information and communication, and monitoring. Commission audit staff seeks to comply with the Institute of Internal Auditors Performance Standards 2000 through 2500.

### **1.3 Commission Audit Staff Analysis**

During 2019, FPL experienced 12 forced outages; seven at PTN, and five at PSL. In 2020, PTN forced outages increased to 16, while PSL outages dropped to four. In 2021, PSL forced outages rose to 12 and PTN forced outages dropped to 10. During 2022, forced outages at both PTN and PSL dropped to zero and three, respectively.

As the trend of increased forced outages grew, so did FPL management's recognition of operational performance deficiencies and problems at all four units. From at least 2018, Senior and Executive Management increasingly recognized and sought to address deficiencies in management engagement, FPL and vendor work quality, equipment reliability, procedural compliance, and other significant shortcomings at PTN and PSL.

Between 2017 and 2023, FPL’s formal Root Cause Evaluations of forced outages cited issues such as vendor performance errors, deficient FPL human performance, repeat outage causes, latent design issues, and failures to comply with FPL procedures.



During 2019, a handful of incidents at PSL and PTN led the company to conduct a Common Cause Evaluation. This report described “integrity issues” involving eight FPL employees and managers. These incidents led to substantial fines imposed by NRC for violation of federal regulations. In September 2019, the NRC issued a \$232,000 Civil Penalty for FPL’s 2017 violation of 10 CFR 50.7(a) for a Regional Vice-President’s removal of a contractor employee who raised safety concerns. In 2019, FPL discovered that several craft level employees and three supervisory level employees had falsified maintenance records and engaged in a cover-up of the violation. The NRC eventually imposed a \$150,000 Civil Penalty for these violations.

FPL initiated ongoing training of managers and monitoring to achieve and maintain a respectful and safety-conscious work environment. Improvement in these areas was achieved and no similar issues regarding FPL’s safety culture appear to have arisen since 2019.

During 2020, in response to the observed operational deficiencies and outages, FPL established a task force to determine the extent of the wide-spread operational performance decline. This effort initially focused on PTN, was later broadened to include PSL. In late 2020 FPL developed a performance improvement correction action plan, which led to ongoing improvement initiatives into 2021 and 2022.

Over the period 2020 to date, FPL’s objectives included re-establishing managers’ commitment to high performance standards, effective operational oversight, improving plant operational proficiency, and reversing a decline in maintenance and equipment reliability performance. Other actions included replacement of key managers, obtaining consulting assistance from the Institute of Nuclear Power Operations, and initiating additional monitoring of Turkey Point operations by NextEra’s Corporate Governance and Oversight organization.

These improvement initiatives began to yield beneficial results during 2021. Forced outage numbers decreased in 2022 and 2023, and performance indicator metrics scores improved.

## **1.4 Commission Audit Staff Observations**

Based upon the extensive information gathered and analyzed, commission audit staff made the following observations regarding FPL's operational performance at St. Lucie Units 1&2 and Turkey Point Units 3&4 over the period 2017-2023.

### **Observation 1**

As early as 2018, significant operational performance concerns were noted by FPL Executive Management, as evidenced by minutes of meetings of both the Company Nuclear Review Board and the Management Review Committee.

### **Observation 2**

As early as 2018, inadequate operational performance at PTN and PSL was observable from the results of the performance metrics monitored and used by FPL to evaluate PTN and PSL.

### **Observation 3**

FPL's Root Cause Evaluations for six of its forced outages over the period 2020 through 2022 raise questions regarding whether actions FPL either took, or failed to take, may have caused the company to incur replacement power costs.

### **Observation 4**

During 2020, FPL launched a performance improvement program, with a goal of attaining excellent performance at PTN and PSL.

### **Observation 5**

FPL's performance improvement efforts appropriately made changes among FPL nuclear program management personnel at various levels and targeted the Maintenance, Operations, and Engineering functions.

### **Observation 6**

During 2021, the performance improvement efforts provided positive results in the operational effectiveness of PTN as reflected in the number and duration of outages.

### **Observation 7**

During 2022, the performance improvement efforts provided positive results in the operational effectiveness of PSL as reflected in the number and duration of outages.

### **Observation 8**

PTN and PSL presently perform in the first quartile of the U.S. nuclear industry-standard performance rating system.

### **Observation 9**

FPL's internal controls maintain a healthy Nuclear Safety Culture that provides a safety-conscious and respectful work environment at PTN and PSL.

## 2.0 FPL Nuclear Operations Internal Controls

Commission audit staff believes the collective set of internal controls related to the management and operation of FPL's nuclear units is complete and adequate for their intended purposes. Focused attention to standards and performance quality over the past few years have refined and improved internal controls.

In this review, Commission audit staff focused its efforts on obtaining a clear understanding of the events, trends, and practices that drove FPL nuclear operational performance over the study period. To obtain a clear picture of key events of the past five years, Commission audit staff focused on what it determined to be the key internal control processes that both guided, and documented, FPL's nuclear operational performance:

- Company Nuclear Review Board
- Management Review Meetings
- Key Performance Indicators
- Nuclear Safety Culture Controls

These control processes provide self-evaluation of operations, problem identification and implementation of corrective action. They serve to keep all levels of management up to date on performance quality, emerging problems and risks, and corrective action. For the purposes of its analysis, Commission audit staff found that a clear understanding of the track record of PTN and PSL operations over the study period could be gained by examining the documented record of the functioning of these key controls.

This documented record exists mainly in the form of internal and external audit reports, meeting minutes, outage Root Cause Evaluations, and performance indicator metrics results.

### 2.1 Company Nuclear Review Board

FPL's Company Nuclear Review Board (CNRB) is organized as an advisory group to the Executive Vice President/Chief Nuclear Officer. The board is composed of NextEra's corporate Vice Presidents, Site Vice Presidents, and key site leaders, as well as guest utility employee members and contract consultants.

The CNRB provides a review and evaluation mechanism for executive and senior management regarding plant operations and results. It meets twice a year to discuss the status of FPL/NextEra's nuclear fleet operations. Meetings usually take place over two days.

Extensive preparation precedes each CNRB meeting. Subcommittees representing the site departments (e.g. Maintenance, Engineering) hold meetings to discuss challenges and results relevant to their duties.

The CNRB Chairman prepares for meetings by interviewing various levels of plant management and the senior NRC resident inspector. As the following excerpts reflect, the CNRB Chairman presents his analysis of the various areas of operation, including discussion of identified notable “gaps” and their causes. The CNRB assigns corrective actions to address gaps and deficiencies. These are entered into a corrective action tracking system and resolution and follow-up are addressed in subsequent CNRB meetings.

Commission audit staff reviewed the CNRB minutes over the period 2017 to date. As expected, the minutes reflect a rigorous self-examination which appropriately reflects a prioritization of both safety and productivity. The participants exhibit a critical, questioning attitude, vigorously probing and challenging performance gaps and deficiencies. Each meeting addresses trends and events, recent outages, NRC inspection results, and performance indicator results.

Commission audit staff believes the CNRB was and is an effective and appropriate control for bringing observed deficiencies to the attention of all levels of management. The CNRB is vigorously used in keeping with its written charter. This process leads to identification of corrective actions, promotes ongoing monitoring of results and direction of corrective action needed.

Commission audit staff notes that the CNRB minutes often reflect dissatisfaction with the performance of managers and employees at PTN and PSL. Over a period of years, criticisms cite management being inadequately engaged, allowing erosion of high standards, failing to model appropriate leadership behavior, and failing to deliver acceptable operational results.

More specific to operations, CNRB members repeatedly refer to chronic equipment reliability issues, work proficiency gaps, and inadequate planned outage preparation. Commission audit staff notes that in multiple instances, CNRB members and participants directly blame forced outages or increased outage duration on FPL errors and performance deficiencies. Detailed discussion of specific outages is provided in Chapter 3 of this report.

The following quoted passages from the CNRB Minutes record the unvarnished and often harsh observations and conclusions of FPL’s most senior managers responsible for obtaining maximum productivity from the company’s most valuable generation assets. Commission audit staff believes these words were not chosen casually and the comments were not made lightly.

Commission audit staff believes that a thorough review of these minutes provides a valuable perspective on how FPL Executive Management viewed the performance of PSL and PTN over this seven-year period. In the following pages, extensive excerpts are reproduced to underscore the continuing themes and tone of dissatisfaction present in feedback recorded. Italics have been used to denote direct quotes from FPL’s minutes.

### 2.1.1 CNRB Minutes - 2018 Issues

#### **Chairman's Report, CNRB Meeting #677, 7/26/18**

*GAP Problem Statement: The station [PSL] is not meeting fleet expectations for execution of the attributes of active leadership resulting in risk not being recognized, acceptance of poor equipment performance and failures to call out substandard leadership behaviors.*

Commission audit staff notes a CNRB directive was issued to “identify and close gaps in work quality” [and take] “action to include identifying repeats, assignment extensions, operating experience, and extent of condition.”

#### **Chairman's Report, CNRB Meeting #680, 1/23/19**

*Two issues were identified...*

- 1. Station leadership [PTN] is not engaged with the workforce or processes at the right level to ensure consistent and sustainable results. As a result, performance in engineering is declining (indicated by poor equipment reliability including multiple repeat equipment issues) and there have been multiple Maintenance human errors and near misses. Additionally, the station is behind in their outage preparations...*
- 2. The pace of resolving important regulatory issues has not been improved.*

Commission audit staff notes the referenced “regulatory issues” relate to NRC resident inspectors’ concerns regarding a non-cited violation involving improper close-outs of incomplete work orders.

The issue that leadership was “not engaged with the workforce or processes at the right level” was repeatedly cited by the CNRB. Managers and supervisors were urged to become more accessible to employees for coaching and to improve communications skills.

#### **Operations Subcommittee Summary: CNRB Meeting #680, 1/22/19**

*GAP Problem Statement: The [PTN] Operations department standards in the control room have degraded to the point where [we] have serious concern about performance if intervention is not taken...based on past successes, the site is overconfident and this has led to a casual approach and an erosion of standards. ...Recommendations: Improve awareness of conditional risk, degraded equipment, or off normal evolutions that may require a formal strategy to ensure over confidence and complacency are eliminated.*

Commission audit staff notes that during this January 2019 timeframe, these comments would apply to conditions that existed during some portion of 2018. The issue of managers accepting lower standards of work and diligence is cited in minutes over period 2019-2022.

## 2.1.2 CNRB Minutes – 2019 Issues

### **Chairman’s Report, CNRB Meeting #682 3/25/19**

*Two issues were identified...*

1. *The pace of addressing fleet expectations for sustaining performance and gaining margin is slow and not well defined...with very specific actions that are driven by the [PSL] site director. This is resulting in declining performance in several important areas...*
2. *Station regulatory performance [with NRC] is declining and does not have the attention of the senior leadership team and therefore lacks very detailed actions to quickly correct the declining performance and improve margin.*
  - a) *The [PSL] station will receive a repeat non-cited violation [from NRC]... in the next quarterly exit on control of transient combustibles. The station received a very similar NCV during the third quarter 2018 exit and corrective actions for this issue are ineffective.*
  - b) *The NRC has identified corrosion control as an issue based on the recent corroded support for a [Component Cooling Water] flow instrument which placed the unit in shutdown limiting condition for operations action statement. The corroded support was first identified in 2016 and was not classified as a yellow work order and no action was taken until the support was inspected in March of this year. [2019]*
  - c) *There are recent examples where operations failed to notify the resident [NRC] inspectors of plant events in a timely manner...The [NRC] senior resident identified this as a declining trend.*

### **Turkey Point Summary, CNRB Meeting #690 1/22/20**

*The following Gaps were noted by the CNRB:*

1. *There is an adverse trend in Equipment Reliability at PTN. Troubleshooting evolutions, including those involving enactment of the Failure Investigation Process lack rigor and formality to ensure equipment issues are resolved in a timely manner....*

*Driver: Lack of leadership engagement through the entire complex trouble shooting process from initiation to closure.*

Commission audit staff notes the continuing references to leadership deficiencies including station senior leadership. The noted failure to address a specific adverse condition refers to NRC non-cited violations in 2018 and 2019 for close-out of incomplete work orders. Commission audit staff notes the control of the referenced transient combustibles issue, raised by the NRC in 2018 and 2019, was not resolved by FPL until December 2022.

## 2.1.3 CNRB Minutes – 2020 Issues

### **St. Lucie Summary, CNRB Meeting #690 1/22/20**

*The Safety Culture Evaluations of four recent Root Cause Evaluations (RCE) were reviewed and found to be cursory with few conclusions or lessons learned.*

*This represents a missed opportunity to use the RCEs to drive behavior changes and improve safety culture....*

*The following Gaps were noted by the CNRB:*

- 1. The common cause analysis of reactor trips does not address personnel or leadership behaviors that have contributed to the events....*

*In addition, individually, the root cause evaluations of some of the most recent trips [outages] lack analysis of personnel and leadership behaviors that have contributed to the events....*

- 3. [PSL] has the worst Operational Focus in the [U.S. nuclear] industry and Unit 2 is in the bottom quartile. These results are driven by operational transients driven by equipment failures. One of the two drivers the station has identified to resolve the numerous equipment failures is: the risk assessment process system did not ensure critical information is translated into work plans, procedures and testing plans for implementation at the working level.*

Due to the important role Root Cause Evaluations of forced outages play in correcting deficiencies, Commission audit staff believes these criticisms of inadequate post-outage analyses and failure to identify and apply lessons learned are noteworthy.

Commission audit staff also notes the mention of recurring poor equipment reliability at both PTN and PSL. This issue contributed to making 2020 a low point in PTN's operational history, prompting recognition of needed changes and the development of a strategic improvement plan.

**Turkey Point Chairman's Report, CNRB Meeting #690 1/22/20**

- Based on interviews, observations and a review of program documentation, the CNRB did not identify issues with the functioning of the Safety Culture and Safety Conscious Work Environment programs. However, subsequent to the CNRB, the Chairman reviewed the Common Cause Evaluation (CCE) for the "Trend in Integrity Issues" in 2019 which addressed behaviors that were inconsistent with the station's safety culture. Among the proposed corrective actions is increased engagement with and by the bargaining unit to help create a better understanding of fleet standards for the completeness and accuracy of information. However, the CNRB Chairman concluded that sustainable improvement in the culture of integrity will also require an increase in the frequency and quality of first-line (non-bargaining unit) supervision in the field, including timely coaching, counseling, and accountability actions.*

Commission audit staff notes that this early 2020 CNRB meeting addressed a 2019 Common Cause Evaluation document, subtitled "Trend in Integrity Issues." This report evaluated three 2019 instances of falsification of work-related documentation at St. Lucie. Six bargaining unit personnel were terminated, as was one supervisor level employee. A second supervisor opted to retire voluntarily due to his involvement.

Also during 2019, a significant ethics event at Turkey Point resulted in an NRC Notice of Violation of 10-CFR 50.7(a) which protects employees reporting safety concerns from adverse action such as termination. This violation indicated an inadequate Nuclear Safety Culture at the plant. Both investigations caused the NRC to impose substantial civil penalties against FPL.

The lasting impact of these actions included ongoing self-evaluation of FPL's Nuclear Safety Culture practices and recognition of significant failures by managers, including a Regional Vice-President who was responsible for the violation of 1-CFR 50.7(a).

**Turkey Point Executive Summary, CNRB Meeting #693 12/02-04/20**

*The following Gaps were noted by the CNRB: ...*

4. *Gap - PTN improvement plan lacks a vision, strategy, and sustainable actions. Multiple department plans are not yet integrated into a concise, prioritized, risk-based plan with metrics/success measures ...*

*Formal CNRB Action: Site Leaders should enhance the PTN improvement plan using the guidance contained in INPO 12-011, "Continuing the Journey to Excellence – An Implementation Framework to Significantly Improve Nuclear Plant Performance, Recovery Guidance for Corporate and Station Leaders."*

Commission audit staff notes INPO 12-011 is a management guide available only to member utilities. It is a resource widely used by nuclear plant managers seeking to diagnose or correct performance problems. INPO 12-011 focuses on the following leadership behaviors: active management engagement, accountability for detecting and correcting deficiencies, intrusive corporate governance/oversight, close monitoring of performance metrics, motivating initiative in supervisors in operating the plant, maintaining a questioning attitude, and emphasis on continuous learning.

As FPL developed and refined its recovery plan for PTN in late 2020, it relied heavily on these foundational elements for success promoted by INPO. Present executive management stated that extensive interaction with INPO personnel and peer nuclear industry managers provided valuable and productive guidance. Other INPO guide documents were consulted and applied in corrective action planning.

Commission audit staff believes that as of 2020 many of these key behaviors emphasized by INPO had been employed by FPL's nuclear division. However, FPL realized a renewed effort and re-emphasis of these basic principles was needed. A key decision was made to install a new Chief Nuclear Officer, resulting in a renewed focus.

**Turkey Point Executive Summary, CNRB Meeting #693, 12/04/20**

- *The CNRB reviewed the draft Turkey Point improvement plan and reported a decline in operational, maintenance, and equipment reliability performance at the station since the last CNRB review. [January 22, 2020] The CNRB concluded that continued elevated intervention will be necessary to arrest the performance decline and sustain performance improvement....*



- *NRC Senior Resident Inspector (SRI) – SRI informed the CNRB that there have been a “step change” in improvement in the quality of communications with the [new] site leadership team. SRI also stated that station leaders were “not very self-critical and had grown complacent with their level of performance prior to the reactor trips the week of August 17 [2020].....*

Commission audit staff notes that the NRC SRI’s recognition of improved communication with new site leadership is positive in the light of prior issues the NRC had noted with PTN communication and responsiveness.

**St. Lucie Actions Reviewed and Closed, CNRB Meeting #693 12/02-03/20**

*MS-AI-20-690-3...There was a recent HU [human performance] issue in electrical maintenance with lifted landed leads that revealed the HU plan did not validate the craft and leadership understand how to perform their HU tools. Interviews with several craft reflect very limited leadership field presence... to reinforce with HU tools.*

FPL’s Root Cause Evaluation of the outage noted complacency by the technicians due to past success landing leads had resulted in failure to use a protective insulating barrier in the work.

At the December 2020 meeting, the Closure Comments regarding an action item stated, “This action is closed based on a review of the additional actions taken...The additional actions taken are addressing the gaps in leadership presence and reinforcing behaviors....”

Despite these efforts related to corrective action MS-AI-20-690-3, on December 10, 2021 a two-day PSL1 outage occurred, once again involving lifted leads. FPL’s RCE noted a maintenance supervisor chose to deviate from the work management process and also failed to validate readiness and adequately execute drawings review.

**2.1.4 CNRB Minutes - 2021 Issues**

**Turkey Point Executive Summary, CNRB Meeting #695 3/23/21**

- *CNRB’s assessment of the Nuclear Assurance (NA) Function – [PTN] Station engagement with NA is lacking and therefore is not contributing to some issues or achieving accelerated improvement. Numerous directors/managers highlighted they did not partake in actions to engage NA because it was not a part of their mental model or because they felt experience was lacking to the point where they would not add value. There was little response when asked what efforts were taken by them to improve it.*

The referenced Nuclear Assurance function establishes, maintains, and interprets Quality Assurance practices and policies. It also conducts and oversees a program of internal audits and evaluations of nuclear unit operations. Commission audit staff notes the referenced lack of cooperation with, and confidence in, the Nuclear Assurance function by operations managers represents disregard for FPL policies and procedures.

**Turkey Point Summary, CNRB Meeting #695 3/23/21**

*Licensing/Performance Improvement*

- *The station currently has a Root Cause Evaluation in process as a result of the most recent reactor trip and is expecting a supplemental IP 95001 inspection letter from the NRC as a result of exceeding white criteria for Scrams per 7000 [operating] hours.... In addition, Turkey Point has also incurred classifications of two OE [Operational Experience] preventable events resulting from 2 Trip/Transient events.... In addition, an OE preventable classification was assigned as a result of the 8/19/20 Reactor Trip...Most notable were knowledge gaps and an incorrect mental model for conducting a reactor startup....*

Commission audit staff notes the Scrams per 7000 Hours metric is used by the NRC to measure outage frequency. In this instance three outages in August 2020 decreased Turkey Point's rating for this metric. Significantly, both the August 17 and August 19 outages were classified as "OE preventable" by FPL.

**St. Lucie Summary, CNRB Meeting #695 3/22/21**

*INPO 19-003, "Staying on Top"*

- *The station has implemented a "Staying on Top" strategy to reinforce the five INPO 19-003 values. The station is focused mainly on identification of deviations from excellence standards and being self-aware and self-correcting. PSL Operations management has developed scoring and trending tools to assess each individual and the entire crew against the leadership team and effectiveness-essential outcomes. In addition, indexes have been developed to assess, score and trend observational criticality, shift manager leadership and overall crew engagement. Results are reviewed daily and observations of poor quality are rejected and coached.*

Commission audit staff notes that the INPO 19-003 document is a resource used by member utilities to instill a self-aware, self-correcting mindset that values continuous learning and leadership engagement. Use of INPO 19-003 was a central focus in FPL's ongoing improvement plan efforts in 2021.

**Turkey Point Summary, CNRB Meeting #697 12/01/21**

- *Online schedule execution has declined...for the last four months. Current performance is the lowest in the last two years and is fourth quartile.*
- *CNRB interviews indicated that Maintenance leaders lack sufficient understanding or regarding vulnerabilities created by vendor work. Examples included:*
  - *Outage delays due to gripper issues on the fuel handling mast despite Framatome having had challenges with the equipment [during] the previous outage.*
  - *Several rework items associated with Siemens turbine maintenance.*

- *Several performance gaps were evident during the Fall 2021 [refueling] outage which ultimately extended the outage 16 days beyond the duration goal. Many of the issues that extended the outage were due to poor vendor performance.*

*Items that have historically challenged the station and which the station has means of addressing were not included in the schedule to ensure they were addressed prior to negatively impacting the outage....*

*Action: Develop and implement core business monitoring within Maintenance to ensure: (i) plant repairs receive first priority; (ii) proper oversight of vendor performance is conducted; and (iii) critical maintenance station responsibilities such as predictable and timely work execution are maintained at acceptable levels...*

Commission audit staff notes the CNRB’s reference to “performance gaps” ultimately causing a 16-day extension to a refueling outage relates to a PTN Unit 3 outage on November 7, 2021. Multiple references to performance gaps, bring the adequacy of FPL’s vendor oversight efforts into question. The CNRB cites prior vendor failures and difficulties as possible missed signals and implies that demanding closer accountability from vendors would have been prudent. The CNRB specifically requires measures be taken to ensure that “proper oversight of vendor performance is conducted.”

**Turkey Point Executive Summary, CNRB Meeting #697 12/02/21**

- *Safety Culture and Safety Conscious Work Environment (SCWE)*  
*The CNRB assessed the health of the SCWE at Turkey Point. The CNRB’s review of Employee Concerns Program [ECP] data revealed the continued steady use of the program since the last review. Noteworthy trends from the investigations indicated a degradation in employee trust due to management behaviors and [deficient] quality and clarity of leader communications.*

*While there was no widespread evidence that employees fear harassment, intimidation, or discrimination from raising concerns, the CNRB gained insights from interviewees and review of the Nuclear Safety Culture Monitoring Panel documents which reinforce the opportunity for station leaders to enhance the rigor and professionalism of communications to strengthen trust and respect.*

Commission audit staff notes that due to the NRC’s self-described primary focus on the issue of safety, all U.S. nuclear units must monitor the health of their plant safety culture. This includes providing a work environment where plant workers feel comfortable in raising safety concerns to managers. To promote free reporting of safety concerns, FPL’s Employee Concerns Program provides a mechanism for reporting concerns for further inquiry overseen by the Nuclear Assurance function. At this CNRB meeting, the Nuclear Safety Culture Monitoring Panel reported that based on employee surveys and analysis of ECP reports, workers are comfortable raising safety concerns.

A related goal for managers is to foster a respectful work environment where managers' behaviors exhibit appropriate degree of respect in dealing with workers. This respectful tone also promotes the degree of comfort in reporting safety concerns.

This December 2021 CNRB discussion of Nuclear Safety Culture reflects ongoing attention to this issue, and need for improvement in providing a Respectful Work Environment. An improvement initiative was launched using a management approach called Intent Based Leadership. The concept of Intent Based Leadership centers on ownership. It encourages *giving* more control and responsibility for work to those closest to it, as opposed to *taking* control, given they are at greater distance from that work. FPL also developed and delivered targeted communication training for managers to listen and communicate respectfully.

**Turkey Point Executive Summary, CNRB Meeting #697 12/01/21**

- *Equipment Performance Index Lacks Specific Behavior-Based Drivers*  
*The stated Driver indicates that “station leaders have not driven high standards as evidenced by shortfalls...leading to multiple repeat reactor trips caused by water intrusion mitigation, latent design vulnerabilities, and oversight fundamentals.*  
*Interviews with Engineering managers indicated that no aggregate actions have been taken yet to address the...Critical Equipment Failure metric. PTN is currently in the fourth quartile for this metric.*

Commission audit staff notes that as 2021 ended, though FPL was a year into its improvement program efforts, the CNRB continued to cite issues such as failure to motivate adherence to high performance standards. The CNRB appears to express frustration in noting specific causal connections to reactor trips.

### **2.1.5 CNRB Minutes - 2022 Issues**

**Turkey Point Executive Summary, CNRB Meeting #699 5/04/22**

- *Safety Culture and Safety Conscious Work Environment*  
*The CNRB noted a focused effort on improving the safety culture of the station. The 2022 One Fleet One Team...focused on four site priorities. One of these priorities is Treat People with Respect using the Intent-Based Leadership principles.*
- *Nuclear Safety Culture Monitoring Panel*
- *The CNRB reviewed the meeting minutes for the 4Q2021 Nuclear Safety Culture Monitoring Panel. The panel moved [the performance rating for] Respectful Work Environment from Red [Poor] to Yellow [Acceptable] based on completion of respectful workplace training by the leadership team and a site wide survey that showed improvements in the Nuclear Safety Culture Trait Attributes of: Respect is Evident and High Level of Trust.*

FPL's focus on leadership maintaining a respectful work environment appears to have showed positive results by mid-2022. At this meeting the CNRB observed a steady or declining rate of use of the Employee Concerns Program, possibly indicating fewer operations and safety concerns were being handled with supervisors rather than by anonymous ECP reports. The board also noted that Employee Concerns Program reports were being used as learning opportunities. The CNRB noted the rate of Employee Concerns Program feedback was lower than in 2021.

**Summary, CNRB Meeting #699 5/04/22**

- *Progress has been made with improving leadership focus on core business monitoring and execution.... However, at the time of this review significant progress has not been made with indicators to provide direct evidence of the effectiveness of these actions. For example, the total backlog for Non-Preventive Maintenance online Work Orders continued to increase from 7,185 in April 2021 to 7,873 in April of 2022. [increase of 9.6%] Additionally, critical and non-critical Preventive Maintenance items in the second half of grace continues to be [rated in the] fourth quartile [among U.S. nuclear units.] A follow-up item is recommended for the next review to determine progress on metrics to demonstrate long term effectiveness of these initiatives.*

**St. Lucie Executive Summary, CNRB Meeting #699 5/04/22**

*Action Items [From CNRB #697 12/02/21, reviewed for closure]*

*MS-AI-21-697-1...Maintenance core business is insufficient to ensure key aspects of maintenance fundamentals, specifically preparation, performance, and ownership are being demonstrated. These gaps have led to increased outage durations, 4<sup>th</sup> quartile performance [of Key Performance Indicators] and increasing backlogs.... Maintenance leadership has been content with recovery and has yet to establish the fundamentals of core business monitoring required to ensure sustainable high performance. Action: Develop and develop core business monitoring within Maintenance to ensure: (i) plant repairs receive first priority; (ii) proper oversight of vendor performance is conducted; and (iii) critical maintenance station responsibilities such as predictable and timely work execution are maintained at acceptable levels....*

*Progress has been made with improving leadership focus on core business monitoring and execution. However, a follow-up item is recommended for the next review to determine progress on metrics to demonstrate long term effectiveness of these initiatives.*

Commission audit staff notes that repeat backlogs of maintenance work was noted by the CNRB as a deficiency as early as 2017.

**St. Lucie Executive Summary, CNRB Meeting #699 5/04/22**

- *INPO 19-003, Staying on Top*  
*The station's focus on improving performance using the "Intent Based Leadership" model was evident at senior level meetings. In contrast, two recent plant shutdowns caused by [deficient] worker performance indicate continued weakness in either [the INPO traits of] Excellence in Standards or Self Awareness/Self Control....*

*The following Gaps were noted by the CNRB:*

- 1) *Operations experienced several refueling outage delays due to a gap in proficiency for plant recovery and startup.*

*Driver: Proficiency gaps exist in the department for plant recovery and startup from refueling outages that was not corrected from previous outages by incorporating into procedures for consistent performance.*

*Action: Develop a plan to address proficiency gaps.... Consider a review of all Operations previous Outage delays and Operational Experience for quality of closure and adding additional detail to startup procedures for consistent performance....*

- 4) *Outage lessons learned are not sufficiently corrected and codified to provide long term sustainability of the actions.*

Commission audit staff notes that in 2022 while FPL continued its efforts to implement an improved managerial model, it was apparent that changing worker performance habits and trends would require an ongoing effort. Unsatisfactory worker performance, proficiency gaps, and failure to benefit from lessons learned hampered planned outage execution and forced outage prevention.

### **2.1.6 CNRB Minutes - 2023 Issues**

At the time Commission audit staff completed its data gathering and analysis, one 2023 CNRB meeting had been conducted on June 21, 2023.

**Turkey Point Summary, CNRB Meeting #703 6/21/23**

*GAP: Setting organizational direction and oversight (Resolution will require fleet and site collaboration.)*

*Inconsistencies with the implementation of fleet and site strategic initiatives:*

- *Proficiency: Practice-Like-We-Play is inconsistently implemented across the station departments...*

- *Peer team meetings are tactical versus strategic in nature and lack formality.*
- *Communications of ongoing organizational changes within engineering, chemistry and operations has not resulted in a true understanding of the change by the technicians.*

***Driver:*** *Senior leaders have not ensured the organization understands the importance and priority for the implementation of strategic initiatives. Additionally, communications provided for the strategic plan have not clearly delineated the importance of each focus area and penetrated throughout the leadership team....*

Commission audit staff notes the continuing theme of deficiencies in management communication and oversight are called out and are directed up to the senior plant level.

- *Online Work Management (Site Ops & Jupiter West Site Specific)*  
*Previous CNRBs (699 & 701) noted increasing backlogs. A formal action was assigned and backlog trends arrested...The poor work management behaviors that resulted in the increasing backlogs appear to still exist and are now resulting in poor critical scope survival. The CNRB recommends the site perform benchmarking of the northern fleet to replicate actions taken to improve performance.*

Commission audit staff notes though work order backlogs appeared to have been eliminated, the CNRB noted the causal behaviors have still persisted. The CNRB suggested contacting other NextEra nuclear units for assistance.

***The following Gaps were noted by the CNRB, new actions listed:***

***Gap:*** *The Reactor Coolant System overflow operating experience was an example of a missed opportunity to learn from such incidents as a 4.0 critique was not performed. Additionally, the causal evaluation performed was insufficient to ensure that crew dynamics [and] leadership are fully engrained in the culture of PSL operations....*

***Gap:*** *Managers and Supervisors have not validated that understanding of online IFIT [One Fleet One Team] work management roles and responsibilities have penetrated down and across the organization...*

***Drivers:*** *Fleet and site leaders have not consistently verified their understanding of the process amongst one another that would allow provision for a consistent platform for embedding the core value elements within the workforce....*

## **2.2 Management Review Committee**

Management Review Meetings are held bimonthly to provide forums at both corporate and site levels for the corporate senior management team to conduct oversight and monitoring of operational performance, production, and goal attainment. Management Review Meetings, though more frequently held than Company Nuclear Review Board meetings, largely involve the same set of participants.

NextEra's Executive Vice President/Chief Nuclear Officer sponsors these meetings, the FPL Site Vice Presidents serve as chair, and the Vice President – Nuclear has authority over the agenda, attendees, and presentations made. Like CNRB meetings, Management Review Meetings are attended by site senior leaders who participate and make presentations regarding their areas of responsibility.

The meeting agendas include updates and briefings on functional area performance metrics data, status updates on fleet and site improvement initiatives, and address abnormal or unanticipated events. Both CNRB meetings and Management Review Meetings serve to inform Senior and Executive Managers, and to address key operational issues, events, results, goals and objectives.

Management Review Meetings clearly provide the key information needed by corporate and FPL Senior and Executive Management to understand the status of operations, the challenges being faced, and the plans for resolution. Like CNRB meetings, discussions at Management Review Meetings result in the creation and assignment of action items. They are systematically tracked and revisited at following meetings until resolved.

Following a Management Review Meeting, the actual set of presentation documents from each meeting serves as the formal minutes. In contrast, the CNRB minutes capture transcribed questions, answers, and comments of the participants. Comparison shows similar topics being discussed at each by many of the same participants. However Commission audit staff notes the CNRB meeting minutes give a more tangible picture of reactions to information presented and tones of comments made.

Commission audit staff believes that the benefits of Management Review Meetings complement those provided by the Company Nuclear Review Board. Both provide effective means of maintaining focus on excellence in nuclear operations at PTN and PSL.

## **2.3 FPL and Nuclear Industry Performance Indicator Controls**

Performance indicator metrics are an essential tool to monitor the functioning and management of FPL's nuclear units. The company monitors sets of metrics that provide a "rating system" for the results and trends of PSL's and PTN's operational performance. Customized metrics



document the execution of all aspects of maintenance, engineering, operations/operational focus, work management, organizational effectiveness, and equipment performance.

### **2.3.1 Institute of Nuclear Power Operations Performance Indicators**

As a member of the Institute of Nuclear Power Operations (INPO), FPL provides operational performance-related data for assessment and analysis. Using this data, and proprietary analytical tools, INPO prepares a full set of nuclear operations performance metrics for its member utilities' internal use. The set of INPO metrics and ratings have become the "gold standard" by which U.S. nuclear units measure themselves. As a condition of INPO membership, all participating utilities, including FPL, are bound by non-disclosure agreements regarding metrics results. Therefore this full set of INPO data regarding FPL was not available to Commission audit staff for review and analysis. As of fourth quarter 2023, FPL internally reported the performance metrics scores for both PTN and PSL had returned to the highest ratings in a number of years.

### **2.3.2 FPL Performance Indicators**

Similar to the INPO metrics, FPL has developed and customized a set of performance metrics to analyze operational data. The FPL performance metrics results are monitored by management to maintain awareness of operational performance. These performance indicator results are discussed and analyzed extensively at FPL's bimonthly Management Review Meetings. Commission audit staff believes FPL's internal performance metrics set is an appropriate and effective internal control.

#### **PTN Performance Indicator Trends**

As expected, performance in many of FPL's indicators is driven by the impact of events such as forced outages, power reductions and extended refueling outages. In general terms, PTN performance metric results between 2017 and 2023 can be divided into three periods.

At the beginning of this period many of PTN's metrics scores reflected unsatisfactory to poor performance. However between late 2017 and 2019, PTN's scores steadily improved notably. In 2020, scores maintained stability until July and August 2020 when a series of four outages resulted in poor scores for measures related to SCRAM frequency and Generation Loss.

As described previously, these problems at PTN led to a comprehensive improvement initiative. Despite some setbacks from occasional outages in late 2020 and 2021, the improvement efforts began to show positive results in early 2022. Since then, PTN performance indicator scores had markedly improved as of mid-2023.

#### **PSL Performance Indicator Trends**

As noted, many indicator scores are driven by the impact of events such as forced outages, power reductions and extended refueling outages. Over the period 2017 through mid 2023, trends in PSL metrics scores are less distinct than those at PTN.

In late 2017 some lagging PSL performance indicators improved and then maintained stability through much of 2018. However, outages in October 2018, December 2018, and September 2019 led to a run of unsatisfactory metrics scores. Indicator scores were largely stable from late 2020 through late 2021. In December 2021 and September 2022, and three partial forced outages in October and November 2022 led to unsatisfactory scores.

## **2.4 Nuclear Safety Culture Controls**

In addition to inspections monitoring nuclear operations performance, the NRC requires nuclear utilities to monitor their Nuclear Safety Culture. The NRC defines this as “the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment.” The NRC’s ongoing evaluation of safety culture is part of its Reactor Oversight Process, which includes inspections and ongoing observation by resident inspectors at all plants.

FPL relies on a variety of Nuclear Safety Culture controls including the Nuclear Safety Culture Monitoring Panel, Nuclear Safety Culture Assessments, and the Nuclear Assurance and Assessment function. Commission audit staff believes these and related controls provide an appropriate system of monitoring and supporting the health of safety culture at PTN and PSL.

### **2.4.1 Nuclear Safety Culture Assessments**

Nuclear safety Culture Assessments are required by FPL procedures to be performed separately for PTN and PSL approximately every two years. These assessments consider the presence of key organizational traits that support healthy safety focus such as personal accountability, effective safety communication, respectful work environment, leadership safety values, and promotion of a questioning attitude. These assessments also review Root Cause Evaluations to gain awareness of safety risks revealed through events such as outages.

### **2.4.2 Safety Conscious and Respectful Work Environment Surveys**

Workers’ attitudes towards safety are studied using Safety Conscious Work Environment and Respectful Work Environment surveys. These surveys assess the degree of comfort plant staff has with raising a work concern regarding safety. Results are tracked over time to identify trends and patterns with employee perceptions of management’s willingness to accept and listen to safety concerns.

### **2.4.3 Nuclear Safety Culture Monitoring Panel**

The Nuclear Safety Culture Monitoring Panel plays an ongoing oversight role in monitoring safety culture status. The panel is comprised of plant staff representing all operational areas and functions to provide a cross-functional viewpoint. NSCMP meetings occur three times a year. At meetings, the status of each of the organizational safety traits mentioned above is discussed. A color-coded rating system is used for each trait to measure status and allow tracking of trends. The panel reports periodically to the Management Review Committee.

#### **2.4.4 Nuclear Assurance Organization**

The Nuclear Assurance organization plays a key role in safeguarding FPL's Nuclear Safety Culture efforts, primarily in directing the administration of the Employee Concerns Program (ECP). The ECP provides an alternative channel for plant employees to report concerns about safety practices and other problems.

Employees may also opt to report such concerns directly to their supervisor or managers, or to the NRC. The ECP option gives an employee with safety concerns the ability to make a report anonymously. This allows FPL to learn of potential problems when employees fear possible negative impacts from direct contact with superiors. If plant workers are not comfortable reporting their concerns about any safety issue, significant problems could remain unaddressed. This risk makes a healthy ECP program vital to Safety Culture.

Nuclear Assurance oversees investigating reported employee concerns, maintaining auditing procedures, overseeing investigation quality, and documenting case history, findings, and corrective action taken.

Commission audit staff carefully reviewed the handling of concerns by FPL employees over the study period. Though questions regarding investigation quality arose in 2019, FPL engaged a consultant who recommended process improvements. Commission audit staff believes FPL responded appropriately to the recommendations and documented closure of its corrective action plans.

Subsequent to these improvements, Commission audit staff found no evidence of attempts by PTN or PSL management to suppress employees reporting safety concerns. The results of ongoing Safety Conscious Work Environment surveys provide additional evidence that employees are willing to report their concerns.

Nuclear Assurance also plans and executes a system of internal audits that address Quality Assurance and Quality Controls issues, organizational effectiveness, verifying performance improvement through corrective actions, and compliance with NRC regulations. Periodic status reports are provided to the Chief Nuclear Officer, and CNRB meetings regularly include statements regarding the effectiveness of Nuclear Assurance operations.



## 3.0 PTN and PSL Forced Outage Causes and Costs

Generating unit outages fall into two basic categories - forced outages and planned outages. Planned outages include cyclical refueling outages that are carefully scheduled and executed to minimize generation loss. Maintenance activities are often scheduled to coincide with refueling outages to minimize their impact. On occasion, a refueling outage may be extended one or more days if an unexpected maintenance issue is discovered while the unit is down.

Forced outages are caused by either unexpected automatic trips or by manual trips executed by plant personnel upon detection of abnormal operating conditions and performance. Because of their unexpected and often complex nature, forced outages generally pose a higher risk of lost of days of operation and higher costs than planned outages.

### 3.1 Commission Audit Staff Analysis - Forced Outages

Once a forced outage occurs and safety assessments are made, the highest priority task is cause determination. The utility marshals resources to identify the root cause and extent of the problems identified. The Root Cause Evaluation (RCE) entails a highly technical and precise examination of plant components, reconstruction of operator actions, review of plant maintenance and operating records, and application of expert knowledge and judgement.

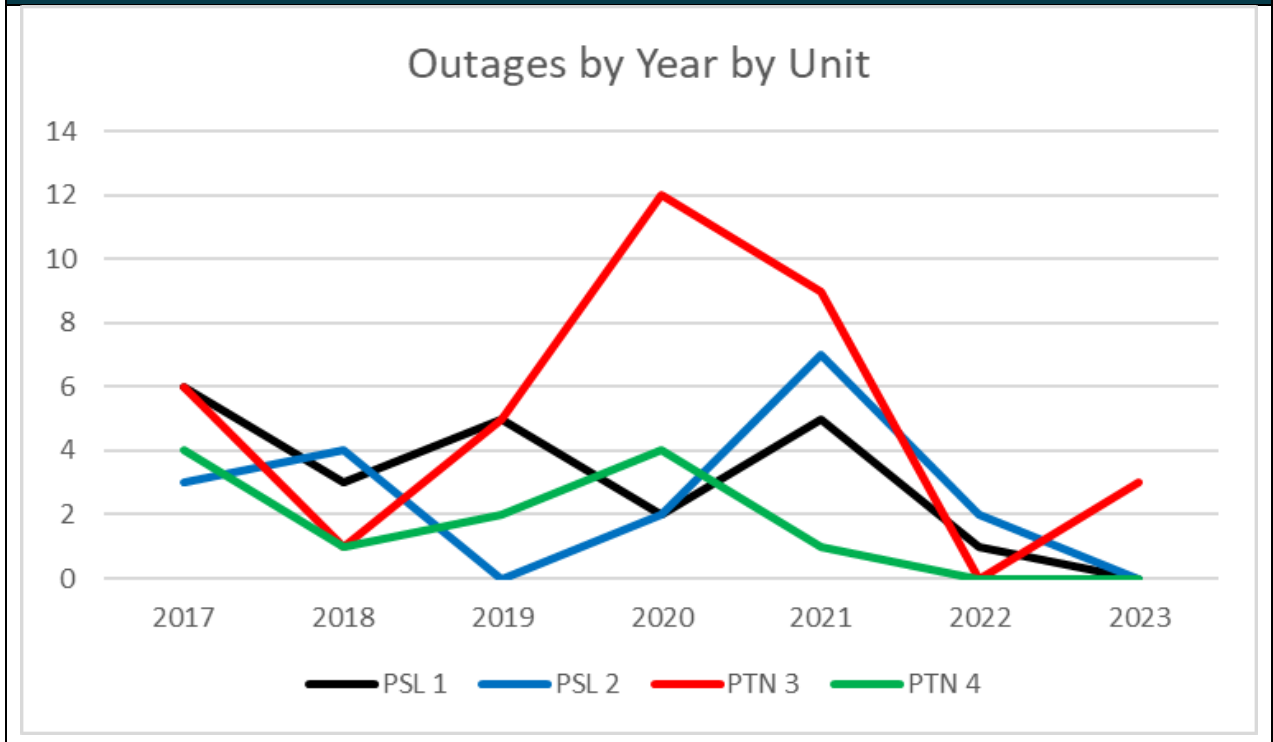
The utility focuses on cause determination, identifying appropriate corrective actions, and returning the plant to operational condition. Because the RCE may identify a root cause that is deemed preventable (such as operator error or failure to perform maintenance that caused a key component failure) it may give indications regarding responsibility for the outage.

Ultimately, the disposition of the incremental repair and restoration costs must be accounted for by the utility and regulators. The NRC may be involved in the RCE process, focusing on operational and compliance issues as part of its Reactor Oversight Process.

The replacement power costs resulting from a forced outage may come before the Florida Public Service Commission. The Commission's examination and decision-making necessarily involve application of traditional prudence standards used by PSCs and PUCs.

Commission audit staff reviewed the outage record for both PTN and PSL over the years 2017 through mid-2023, a period during which over 80 planned, forced, and partially-forced outages occurred. **Exhibit 1** below depicts FPL's unplanned outages and SCRAMS for each units separately over the 2017 through 2023 period. Unplanned outages for both PTN 3 and PTN 4 peaked in 2020. PSL 1 and PSL 2 unplanned outages peaked in 2021.

## FPL Unplanned Outages/SCRAMS



**Exhibit 1**

*Source: Document Response 1-20*

Commission audit staff conducted interviews with FPL Executive Management to obtain understanding regarding selected outages. This information was compared with the Root Cause Evaluations, and the records of minutes and reports from the Company Nuclear Review Board and Management Review Meetings.

Through this process, Commission audit staff selected the eight forced outages listed in **Exhibit 2**. These involve various problematic issues such as quality of vendor oversight, human performance failures, repeat causality, latent design issues, and procedural non-compliance.

<b>Selected FPL Unplanned Outages/SCRAMS 2017 – 2023</b>			
<b>Plant</b>	<b>Begin Date</b>	<b>Duration</b>	<b>Outage Description</b>
PSL 2	10/26/17	3 days	Unit 2 turbine control system malfunction and turbine trip
PTN 4	07/05/20	15 days	Unit 4 reactor trip due to generator lockout from loss of exciter
PTN 3	08/19/20	1 day	Reactor trip caused by N-3-31 source range counts
PSL 2	01/20/21	3 days	Unit 2 automatic reactor trip due to an unexpected deenergization of the 480v motor control center 2B2
PTN 3	03/01/21	3 days	Unit 3 trip during restoration from Reactor Protection System (RPS) testing
PSL 1	05/14/21	4 days	Outage SL1-30 extension due to failure of four Control Element Assembly (CEA) lower gripper coils
PSL 1	12/10/21	2 days	Unit 1 manual trip due to insufficient feed flow to 1A steam generator
PSL 2	01/06/22	14 days	Unit 2 CEA #27 Control Element Drive Mechanism (CEDM) failure

**Exhibit 2**

*Source: FPL Response to D.R. 1-20*

The eight selected forced outages are chronologically discussed in detail in subsections **3.1.1** through **3.1.8** below. Excerpts from FPL’s Root Cause Evaluations are included and italicized for emphasis in these subsections.

**Exhibit 3** presents excerpts taken from the associated Root Cause Evaluations and an NRC Special Investigation Report performed to analyze these eight outages.

**Commission Audit Staff Analysis  
of Selected Outages**

**FPL Root Cause Evaluation Excerpts**

**Begin Date**

PSL 2  
Automatic Reactor Trip  
Begin Date: 10/26/17  
End Date: 10/28/17  
Duration: 3 days  
CE: CR 2232849

**UNIT 2 TURBINE CONTROL SYSTEM MALFUNCTION AND TURBINE TRIP**  
**RC:** The direct cause of the spurious solenoid malfunctions could not be determined conclusively... The most probable root cause is the Turbine Control System design is inadequate to prevent common cause failure in the fail-safe Emergency Trip coincidence logic, and lacks adequate indications or diagnostic features for detecting malfunctions when they occur. ...  
 ...Previous similar malfunctions have occurred in single solenoids and these were found to be due to malfunction of Digital Output (DO) modules. Evaluations of the prior events revealed that the DO circuit cards had surface contamination and corrosion. Based on these findings (along with the overnight temperature drop) the Failure Investigation Process (FIP) concluded that malfunction of a DO module (or modules) due to environmental conditions played a role in the trip...  
**CC:**... An adverse trend in spurious TDM solenoid operations was identified in 2016, which required long term corrective action to fully address; however, interim actions for increased condition monitoring and/or proactive component replacement were not adequately developed as a bridging strategy for the long term actions...  
**Per Safety Culture Evaluation RC:** ...the legacy design changes implemented remote I/O cabinets and did not rigorously review environmental aspects of the design. The Engineering Change implementing the TCS replacement was developed more than 5 years ago under a larger scope, and independently managed, Extended Power Uprate project. This aspect is considered as a legacy and no longer indicative of current plant performance...

PTN 4  
Automatic Reactor Trip  
Begin Date: 7/5/20  
End Date: 7/20/20  
Duration: 15 days  
RCE: AR 2361794

**UNIT 4 REACTOR TRIP DUE TO GEN LOCKOUT FROM LOSS OF EXCITER.**  
**RC:** A weakness in the Exciter PM Program resulted from a failure to fully assess risk of PMG stator winding age making it more susceptible to failure when exposed to water/moisture.  
**SC1:** Weakness in Exciter PM Program based on existing OEM and Industry recommendations which were Condition Based, and did not require Time-Based PMG stator rewind, thereby increasing susceptibility to failure from other stressors.  
**SC2:** OEM procedure 3.2.2.1 did not include site specific weather sealing requirements based on OE [operating experience] - latent error.  
**CC:** Instructions in PTN procedure 0-GMM-090.1, 'Exciter Removal, Inspection and Installation,' in providing discretionary guidance in lieu of a mandated requirement on Exciter housing application of site specific weather seals for prevention of water intrusion.  
**Lessons Learned:** Vendor recommendations and current industry practices alone with regards to equipment maintenance may not be sufficient to support equipment reliability. The PM philosophy at PTN developed for maintain the Exciter and Generator components relied upon the recommendations of the OEM and the Industry (CONDITION-BASED) and are considered robust. However, they lacked a requirement to perform a TIME-BASED rewind of the Exciter components. This lack of a rewind requirement allowed the equipment to age which increased susceptibility to failure from other external stressors. Single Point Vulnerability SPV components which are similar in design...should be reviewed for appropriate Life Cycle Management (LCM) activities which specifically address age.



**Commission Audit Staff Analysis  
of Selected Outages**

**FPL Root Cause Evaluation Excerpts**

**Begin Date**

PTN 3  
Automatic Reactor Trip  
Begin Date: 8/19/20  
End Date: 8/20/20  
Duration: 1 day  
RCE: CR 2365970

**REACTOR TRIP CAUSED BY N-3-31 SOURCE RANGE COUNTS****RC:**  
Knowledge gaps and incorrect mental model for conducting a reactor startup and operating below the Point of Adding Heat (POAH.)  
**Direct Cause:** ...Contrary to procedural requirements, the Reactor Operator (RO) failed to verify proper Source Range (SR) and Intermediate Range (IR) overlap and block the SR Nuclear Instruments prior to reaching the reactor trip setpoint of  $1 \times 10^5$  CPS...  
**Conclusion:** This is a people failure with a safety culture gap in training.  
**CC:** ...Lack of operator and operations leadership's self-awareness of proficiency gaps and procedure deficiencies.  
**Conclusion:** ...This is are [sic] organizational and programmatic failures with safety culture gaps in procedure use and adherence, teamwork, avoiding complacency, and conservative bias.  
**NRC SPECIAL INSPECTION REPORT: [December 9, 2020]** The team determined that the following were contributing factors to the human performance errors identified:[Experience level of the crew, JIT Training, Operator Fundamentals breakdowns, Oversight and Control of the Startup Evolution, Confusing Indications, and Distractions.]The team determined that numerous plant procedures were not adhered to during this event, including the following:[Procedure 3-GOP-301, 'Hot Standby to Power Operations,' Rev. 53, Step 5.21, Procedure 3-GOP-301, caution statement prior to Step 5.16.3 and procedure OP-AA-103-1000, Rev. 13, Section 3.7 caution statement, Procedure OP-AA-100-1000 'Conduct of Operations,' Rev. 25, Attachment 5, Section 3.2, Procedure OP-AA-100-1000 'Conduct of Operations,' Rev. 25, Attachment 4, Section 3.3, Procedure OP-AA-100-1000 'Conduct of Operations,' Rev. 25, Attachment 4, Section 3.1, Procedure OP-AA-103-1000, Reactivity Management, Rev. 13.] ...During correspondence with the vendor, the licensee was informed that they were not following the guidance described in vendor document RRS-VICO-02-326, 'A Predictive Maintenance and Evaluation Guide for Ex-Core and In-Core Detectors used in Westinghouse Pressurized Water Reactors,' dated May 2002... The licensee failed to establish a preventive maintenance for the SRNIs which rendered a required SRNI N32 inoperable and unable to perform its special function.

**Commission Audit Staff Analysis  
of Selected Outages**

**FPL Root Cause Evaluation Excerpts**

**Begin Date**

PSL 2  
Automatic Reactor Trip Begin  
Date: 1/20/21  
End Date: 01/22/21  
Duration: 3 days  
RCE: CR 2381509

**Unit 2 AUTOMATIC REACTOR TRIP DUE TO AN UNEXPECTED DEENERGIZATION OF THE 480V MOTOR CONTROL CENTER 2B2RC:** The legacy drawings for the undervoltage relay assemblies in the Control Element Drive Mechanism Control System (CEDMCS) did not conform to PSL 2 train and channel design conventions such that design details including power supply assignments were not clearly defined.

...Previous Occurrences:  
4/20/1987 - This event is similar in that a 1987 reactor trip resulted from a similar SPV. Summary: The LER documents that the CEDMCS wiring discrepancy was corrected before the LER was submitted. It is evident that the 1987 corrective action was not complete or not sustained so that it prevented the 2021 reactor trip...

7/26/1983 - This event is similar in that a 1983 reactor trip resulted from a similar SPV. Summary: PC/M 392-283 (D-11) documents the 2-out-of-4 trip logic of the turbine trip by reactor trip as the cause for the actual plant trips (D-02.) It is evident that the 1983 corrective action was not complete or not sustained so that it prevented the 1987 reactor trip....

...This meets the definition of Repeat Event provided in PI-AA-104-1000, Condition Reporting: Two or more independent occurrences of the same or similar event resulting from the same fundamental problem for the same fundamental cause for which previous root cause analysis has occurred and corrective action failed...

...Even though the previous event occurred at St. Lucie over thirty years ago, the corrective actions from the 1983 and 1987 events should have been expected to prevent this event. The potential inadequacy of these legacy corrective actions is analyzed further into the support/refute matrix.

PTN3  
Automatic Reactor Trip  
Begin Date: 3/1/21  
End Date: 3/4/21  
Duration: 3 days  
RCE: CR 2385529

**UNIT 3 TRIP DURING RESTORATION FROM RPS TESTING**  
**RC:** IAW 0-PMR-049.01, steps for cleaning and lubricating cell switch contacts is conditional based, rather than prescriptive.  
**CC1:** Test points to detect failed contacts were not installed.  
**CC2:** Failure to follow WEC MPM cell switch maintenance and replacement frequency.  
**Direct Cause:** ...While no exact direct cause was identified, The RCE team determined the most probable direct cause was hardened graphite grease on the cell switch #2 contact 1-2 causing a tracking path which incorrectly indicated the contact was in an open state....  
**Proof Statement:** ...The Unit 3 trip was caused by inadequate procedure guidance in 0-PME-049.01 for cleaning and lubricating cell contacts and is corrected by revising procedure 0-PME-049.01 to require cleaning and lubrication of cell switch contacts...  
**...Westinghouse Failure Analysis Conclusions:** ...The cell switches appeared to be original supplied equipment. They were not properly maintained, and the hardened lubrication could cause the stationary contacts to become dislodged, as documented above. In addition, to contributing to the dislodging the stationary contacts, excess or dry grease can cause improper indications from the switch contacts. This could be considered a possible cause of failure.

**Commission Audit Staff Analysis  
of Selected Outages**

	<b>FPL Root Cause Evaluation Excerpts</b>
<b>Begin Date</b>	
<p>PSL 1 Outage Extension Begin Date: 5/14/21 End Date: 5/17/21 Duration: 4 days RCE: CR 2392617</p>	<p><b>OUTAGE SL1-30 EXTENSION DUE TO FAILURE OF FOUR CONTROL ELEMENT ASSEMBLY LOWER GRIPPER COILS.</b>  <b>RC:</b> ...Loss of software configuration control by the vendor. While revising the Coil power Management Drawer (CPMD) firmware, ...an unplanned software change was inadvertently coded into the firmware revision. The unplanned firmware change removed overcurrent protection for the impacted CEA coils that would otherwise have protected these coils prior to change being implemented.  <b>CC:</b> Event triggered when the CPMD in question shifted its AC to DC rectification to extreme firing angles, after sensing high disconnect switch resistance in the circuit. This high resistance in the sensed loop had never been encountered at any of the operating units using similar systems worldwide, nor was it encountered during a lengthy Factory Acceptance Test (FAT) from May through August 2019. ...The offending CPMD firmware revisions did not conform to the vendor's 'Standard Rod Control Systems Software Development Process' (WNA-IG-00874-GEN) in that a software change was made to CPMD firmware without proper requirements definition, software design and code review in advance. Nor did a 2-way software audit occur after the code change...Had WNA-IG-00874-GEN been followed, then the LG overcurrent protection would not have been removed during SL-30 [refueling outage,] and the damage to the four CEA's LG coils would have been obviated.  <b>Proof Statement:</b> ...Excessive current supplied to four CEA LG Coils causing their failure was caused by error in software configuration that removed overcurrent protection during a revision and is corrected by restoring overcurrent protection to CRC firmware and improved the rigor of software configuration management process for future revisions.</p>
<p>PSL 1 Manual Reactor Trip Begin Date: 12/10/21 End Date: 12/11/21 Duration: 2 days RCE: CR 2413519</p>	<p><b>UNIT 1 MANUAL TRIP DUE TO INSUFFICIENT FEED FLOW TO 1A STEAM GENERATOR</b>  <b>RC:</b> FIN (Fix It Now) Supervisor chose to deviate from the FIN work management process and failed to validate readiness to perform FIN work prior to work execution.  <b>CC1:</b> The Planner developed the work instructions based on a historical work order and did not adequately review the controlled drawings to identify the interaction between this circuit and the other control valves.  <b>CC2:</b> The technicians were complacent due to past success landing leads and did not use an insulating barrier to prevent impacting the circuit from inadvertent contact and an assumption that all affected valves were isolated.</p>

**Commission Audit Staff Analysis  
of Selected Outages**

Commission Audit Staff Analysis of Selected Outages	
Begin Date	FPL Root Cause Evaluation Excerpts
PSL 2 Outage By Tech. Spec. Begin Date: 1/6/22 End Date: 1/20/22 RCE: CR 2415359	<p><b>UNIT 2 CEA #27 CEDM FAILURE</b></p> <p><b>RC:</b> Station leaders and stakeholders in refueling work activities have not ensured that Reactor Services activities are aligned with FME program requirements for complex tools. The resulting inadequate plans prevented discovery of a pin broken from the SCOUT tool during CEA coupling, which migrated into CEDM #27.</p> <p><b>Safety Culture Evaluation:</b> The causal factors are related to Cross-Cutting Aspect H.5 Work Management: The organization implements a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work and the need for coordination with different groups or job activities.</p> <p>The Foreign Material Intrusion Risk posed by a SCOUT tool failure was not managed adequately under the work process for CEA coupling. In accordance with FME program requirements the Complex Tooling Inspection Checklist should have been used to identify and mitigate these risks. The RSS FME plan did not address complex tooling activities. A work order applicable to the RSS support tasks was not used, therefore, the associated planning inputs and FME program interfaces (work steps, briefing prompts, forms, etc.) normally included in work orders by work planners were not available to the crew.</p>

**Exhibit 3**

*Source: FPL Root Cause Evaluations dated 12/15/17, 9/28/20, 3/9/21, 7/29/21, 6/2/22, and NRC Special Investigation Report dated 12/9/20.*

Commission audit staff believes that all eight of these outages raise questions relating to circumstances and causation. These eight forced outages, their circumstances, and resulting root cause evaluations are discussed chronologically in subsections **3.1.1** and **3.1.3**.

**3.1.1 PSL 2 Automatic Reactor Trip 10/26/17 – 10/28/17**  
**Unit 2 Turbine Control System Malfunction and Turbine Trip**

Though no single Root Cause was determined as a result of FPL’s analysis of this outage, the “Most Probable Root Cause” noted “The Turbine Control System design is inadequate to prevent common cause failure in the fail-safe Emergency Trip coincidence logic, and lacks adequate indications or diagnostic features for detecting malfunctions when they occur.” Commission audit staff believes this statement calls into question the adequacy and prudence of FPL’s decision-making regarding outage prevention controls.

The Root Cause Evaluation also refers to FPL’s 2016 identification of the solenoid malfunctions and realization that both interim and long-term corrective actions were needed. Commission audit staff notes that despite awareness of needed actions, the Root Cause evaluation states “however, interim actions for increased condition monitoring and/or proactive component replacement were not adequately developed ....” Commission audit staff believes that this lack

of proactivity in 2016 may constitute failure to take prudent corrective action based upon the information that was known to FPL at the time.

**Root Cause:** *The direct cause of the spurious solenoid malfunctions could not be determined conclusively.*

**Most Probable Root Cause:** *The Turbine Control System design is inadequate to prevent common cause failure in the fail-safe Emergency Trip coincidence logic, and lacks adequate indications or diagnostic features for detecting malfunctions when they occur....*

*...Previous similar malfunctions have occurred in single solenoids and these were found to be due to malfunction of Digital Output (DO) modules. Evaluations of the prior events revealed that the DO circuit cards had surface contamination and corrosion. Based on these findings (along with the overnight temperature drop) the Failure Investigation Process (FIP) concluded that malfunction of a DO module (or modules) due to environmental conditions played a role in the trip....*

**Contributing Cause:** *...An adverse trend in spurious TDM solenoid operations was identified in 2016, which required long term corrective action to fully address; however, interim actions for increased condition monitoring and/or proactive component replacement were not adequately developed as a bridging strategy for the long term actions....*

**Per Safety Culture Evaluation Root Cause:** *...The legacy design changes implemented remote I/O cabinets and did not rigorously review environmental aspects of the design. The Engineering Change implementing the TCS [Turbine Control System] replacement was developed more than 5 years ago under a larger scope, and independently managed, Extended Power Uprate project. This aspect is considered as a legacy and no longer indicative of current plant performance....*

### **3.1.2 PTN 4 Automatic Reactor Trip 7/5/20 – 7/20/20**

#### **Unit 4 Reactor Trip Due To Gen Lockout from Loss of Exciter**

FPL's Root Cause statement labels the lack of routinized ongoing preventive maintenance as a "weakness." More importantly, it notes FPL's "failure to fully assess the [Permanent Magnetic Generator] stator winding age making it more susceptible to failure when exposed to water/moisture.

Significant Cause 2 noted that the OEM procedure did not include site specific weather sealing requirements and apparently labeled the lack of weather sealing requirements based on OE as a "latent error." The Contributing Cause stated that the applicable PTN procedure also included no mandate for site specific seals to prevent water intrusion and damage.

Ultimately at issue was the advisability of the lack of routine calendar-based inspections of the Permanent Magnet Generator Stator. Instead, under FPL's condition based approach, action was taken in response to an observed adverse condition.

FPL's RCE Executive Summary notes, "In summary, failure of the Unit 4 Permanent Magnet Generator stator occurred due to an aged winding in combination with water intrusion."

Commission audit staff observes that an effort to assess the risk that the stator's age combined with water intrusion would make it vulnerable to failure would have necessarily observed the *lack* of a requirement for weather sealing. Given the open precipitation exposure of the plant's design, Commission audit staff believes such a risk analysis would reasonably have led to the addition of weather sealing protection. Since FPL observed that the stator winding failed due the "combined effects of aging and water intrusion," the lack of proper risk assessment is responsible for the winding failure.

**Root Cause:** *A weakness in the Exciter PM [Preventive Maintenance] resulted from a failure to fully assess risk of PMG [Permanent Magnet Generator] stator winding age making it more susceptible to failure when exposed to water/moisture.*

**Significant Cause 1:** *Weakness in Exciter PM Program based on existing OEM and Industry recommendations which were Condition Based, and did not require Time-Based PMG stator rewind, thereby increasing susceptibility to failure from other stressors.*

**Significant Cause 2:** *OEM procedure 3.2.2.1 did not include site specific weather sealing requirements based on OE (operating experience) - latent error.*

**Contributing Cause:** *Instructions in PTN procedure 0-GMM-090.1, 'Exciter Removal, Inspection and Installation,' in providing discretionary guidance in lieu of a mandated requirement on Exciter housing application of site specific weather seals for prevention of water intrusion.*

**Lessons Learned:** *Vendor recommendations and current industry practices alone with regards to equipment maintenance may not be sufficient to support equipment reliability. The PM [Preventive Maintenance] philosophy at PTN developed for maintain the Exciter and Generator components relied upon the recommendations of the OEM and the Industry (CONDITION-BASED) and are considered robust. However, they lacked a requirement to perform a TIME-BASED rewind of the Exciter components. This lack of a rewind requirement allowed the equipment to age which increased susceptibility to failure from other external stressors. Single Point Vulnerability SPV components which are similar in design...should be reviewed for appropriate Life Cycle Management (LCM) activities which specifically address age.*

### **3.1.3 PTN 3 Automatic Reactor Trip 8/19/20 – 8/20/20 Reactor Trip Caused By N-3-31 Source Range Counts**

Commission audit staff notes this outage involved numerous human performance failures. FPL's Root Cause Evaluation variously cites shortcomings such as "Knowledge gaps and incorrect mental mode for conducting a reactor startup...." It also notes the Reactor Operator's failure to

follow procedures. Finally, the RCE states, “This is a people failure with a safety culture gap in training.”

The NRC, in its own Special Investigation Report, identified several contributing factors to the human performance errors including the crew’s lack of experience with the specific tasks involved, breakdown in operator fundamentals, and distractions. The NRC also noted FPL’s lack of adherence to seven of the company’s procedures. The report stated, “The licensee failed to establish a preventive maintenance for the [Source Range Nuclear Instruments] which rendered a required SRNI N32 [Channel] inoperable and unable to perform its special function.” In all, 15 corrective action tasks were developed to remedy this event.

**Root Cause:** *Knowledge gaps and incorrect mental model for conducting a reactor startup and operating below the POAH [Point of Adding Heat.]*

**Direct Cause:** *...Contrary to procedural requirements, the RO [Reactor Operator] failed to verify proper Source Range (SR) and Intermediate Range (IR) overlap and block the SR Nuclear Instruments prior to reaching the reactor trip set point of  $1 \times 10^5$  CPS....*

**Conclusion:** *This is a people failure with a safety culture gap in training.*

**Contributing Cause:** *...Lack of operator and operations leadership's self-awareness of proficiency gaps and procedure deficiencies.*

**Conclusion:** *...This is are [sic] organizational and programmatic failures with safety culture gaps in procedure use and adherence, teamwork, avoiding complacency, and conservative bias.*

**NRC Special Inspection Report: [December 9, 2020]**

*The team determined that the following were contributing factors to the human performance errors identified:*

*[Experience level of the crew, JIT Training, Operator Fundamentals breakdowns, Oversight and Control of the Startup Evolution, Confusing Indications, and Distractions.]*

*The team determined that numerous plant [FPL]procedures were not adhered to during this event, including the following:*

*[Procedure 3-GOP-301, ‘Hot Standby to Power Operations,’ Rev. 53, Step 5.21, Procedure 3-GOP-301, caution statement prior to Step 5.16.3 and procedure OP-AA-103-1000, Rev. 13, Section 3.7 caution statement, Procedure OP-AA-100-1000 ‘Conduct of Operations,’ Rev. 25, Attachment 5, Section 3.2, Procedure OP-AA-100-1000 ‘Conduct of Operations,’ Rev. 25, Attachment 4, Section 3.3, Procedure OP-AA-100-1000 ‘Conduct of Operations,’ Rev. 25, Attachment 4, Section 3.1, and Procedure OP-AA-103-1000, ‘Reactivity Management,’ Rev. 13.]*

*...During correspondence with the vendor, the licensee was informed that they [FPL] were not following the guidance described in vendor document RRS-VICO-02-326, ‘A Predictive Maintenance and Evaluation Guide for Ex-Core and In-Core Detectors used in Westinghouse Pressurized Water Reactors,’ dated May 2002...The licensee failed to establish a preventive maintenance for the SRNIs*

*which rendered a required SRNI N32 inoperable and unable to perform its special function.*

### **3.1.4 PSL 2 Automatic Reactor Trip 1/20/21 – 1/22/21** **Unit 2 Automatic Reactor Trip Due to Unexpected De-energization of 480v Motor Control Center 2B2**

Commission audit staff notes that this 2021 outage is noted by FPL's RCE to have similarities with trips in both 1983 and 1987. The Root Cause was identified to be legacy drawings for under voltage relay assemblies not conforming to PSL 2 train conventions, leaving power supply assignments not clearly defined. The corrective actions for the 1983 trip proved to be incomplete or not sustained since they did not prevent the subsequent 1987 trip. Once again, the corrective actions for the 1987 trip proved to be incomplete or not sustained, thus failing to prevent this 2021 trip.

FPL observed "this meets the definition of Repeat Event provided in PI-AA-104-1000, Condition Reporting: Two or more independent occurrences of the same or similar event resulting from the same fundamental problem for the same fundamental cause for which previous root cause analysis has occurred and corrective action failed."

Commission audit staff notes that FPL's RCE states, "Even though the previous event occurred at St. Lucie over thirty years ago, the corrective actions from the 1983 and 1987 events should have been expected to prevent this event."

Finally, after the automatic reactor trip, FPL took corrective action by "revising control system wiring drawings to show under voltage relay assembly assignments between assigned power supply channels." Commission audit staff believes the repeat nature of this outage calls into question the adequacy and prudence of FPL's prior corrective actions and attention to Operational Experience.

***Root Cause:*** *The legacy drawings for the under voltage relay assemblies in the CEDMCS [Control Element Drive Mechanism Control System] did not conform to PSL 2 train and channel design conventions such that design details including power supply assignments were not clearly defined.*

***Previous Occurrences:***

*...This event involved a reactor trip due to an undesired recreation of a single point vulnerability (SPV). While most reasonable repeat event reviews look back as much as five years, significant events such as plant trip warrant a life of the plant review.*

*4/20/1987 - This event is similar in that a 1987 reactor trip resulted from a similar SPV. Summary: The LER [Licensee Event Report] documents that the CEDMCS wiring discrepancy was corrected before the LER was submitted. It is evident that the 1987 corrective action was not complete or not sustained so that it prevented the 2021 reactor trip....*



...7/26/1983 - This event is similar in that a 1983 reactor trip resulted from a similar SPV. Summary: PC/M 392-283 (D-11) documents the 2-out-of-4 trip logic of the turbine trip by reactor trip as the cause for the actual plant trips (D-02.) It is evident that the 1983 corrective action was not complete or not sustained so that it prevented the 1987 reactor trip....

...This meets the definition of Repeat Event provided in PI-AA-104-1000, Condition Reporting: Two or more independent occurrences of the same or similar event resulting from the same fundamental problem for the same fundamental cause for which previous root cause analysis has occurred and corrective action failed....

...Even though the previous event occurred at St. Lucie over thirty years ago, the corrective actions from the 1983 and 1987 events should have been expected to prevent this event. The potential inadequacy of these legacy corrective actions is analyzed further into the support/refute matrix....

### **3.1.5 PTN 3 Automatic Reactor Trip 3/1/21 – 3/4/21** **Unit 3 Trip in Restoration from Reactor Protection System Testing**

Similar to the July 5, 2020 PTN Unit 4 Generator Lockout from Loss of Exciter, facts surrounding this trip and the resulting RCE raise issues concerning preventive maintenance practices.

FPL's RCE states, "The reactor trip was caused by an unknown failure of the 3B reactor trip breaker." However, the Root Cause statement notes "[Procedure] IAW 0-PMR-049.01, steps for cleaning and lubricating cell switch contacts is conditional based, rather than prescriptive [required on a time basis.]" The Direct Cause states "While no exact direct cause was identified, the RCE team determined the most probable cause was hardened graphite grease on the cell switch #2 contact 1-2, causing a tracking path which incorrectly indicated the contact was in an open state." FPL's RCE Proof Statement notes "inadequate procedure guidance...for cleaning and lubrication of cell switch contacts."

**Root Cause:** IAW 0-PMR-049.01, steps for cleaning and lubricating cell switch contacts is conditional based, rather than prescriptive.

**Contributing Cause 1:** Test points to detect failed contacts were not installed.

**Contributing Cause 2:** Failure to follow WEC MPM cell switch maintenance and replacement frequency.

**Direct Cause:** ...While no exact direct cause was identified, the RCE team determined the most probable direct cause was hardened graphite grease on the cell switch #2 contact 1-2 causing a tracking path which incorrectly indicated the contact was in an open state....

**Proof Statement:** ...The Unit 3 trip was caused by inadequate procedure guidance in 0-PME-049.01 for cleaning and lubricating cell contacts and is corrected by revising procedure 0-PME-049.01 to require cleaning and lubrication of cell switch contacts....

*Westinghouse Failure Analysis Conclusions: ...The cell switches appeared to be original supplied equipment. They were not properly maintained, and the hardened lubrication could cause the stationary contacts to become dislodged, as documented above. In addition to contributing to the dislodging the stationary contacts, excess or dry grease can cause improper indications from the switch contacts. This could be considered a possible cause of failure.*

### **3.1.6 PSL 1 Outage Extension 5/14/21 – 5/17/21 Outage SL1-30 Extension Due To Failure of Four Control Element Assembly (CEA) Lower Gripper Coils**

Commission audit staff notes that this outage extension was caused by a vendor error resulting in an unplanned software change that was “inadvertently coded” into a firmware revision. FPL did not have access to the vendor’s proprietary software. Regardless, it is not clear what vendor oversight efforts FPL made such as verifying the vendor’s firmware controls.

In describing the identified Contributing Root Cause, FPL stated “The offending [inadvertent] firmware revisions did not conform to the vendor’s ‘Standard Rod Control Systems Software Development Process’ (WNA-IG-00874-GEN) in that a software change was made to CPMD firmware without proper requirements definition, software design and code review in advance. Nor did a 2-way software audit occur after the code change...Had WNA-IG-00874-GEN been followed, then the LG overcurrent protection would not have been removed during SL-30 [refueling outage,] and the damage to the four CEAs’ LG coils would have been obviated.

***Root Cause:** ..Loss of software configuration control by the vendor. While revising the Coil power Management Drawer (CPMD) firmware, ...an unplanned software change was inadvertently coded into the firmware revision. The unplanned firmware change removed overcurrent protection for the impacted CEA coils that would otherwise have protected these coils prior to change being implemented.*

***Contributing Root Cause:** The event was triggered when the CPMD in question shifted its AC to DC rectification to extreme firing angles, after sensing high disconnect switch resistance in the circuit. This high resistance in the sensed loop had never been encountered at any of the operating units using similar systems worldwide, nor was it encountered during a lengthy Factory Acceptance Test (FAT) from May through August 2019.*

*...The offending firmware revisions did not conform to the vendor’s ‘Standard Rod Control Systems Software Development Process’ (WNA-IG-00874-GEN) in that a software change was made to CPMD firmware without proper requirements definition, software design and code review in advance. Nor did a 2-way software audit occur after the code change...Had WNA-IG-00874-GEN been followed, then the LG overcurrent protection would not have been removed during SL-30 [refueling outage,] and the damage to the four CEAs’ LG coils would have been obviated.*

***Proof Statement:*** ...Excessive current supplied to four CEA LG Coils causing their failure was caused by error in software configuration that removed overcurrent protection during a revision and is corrected by restoring overcurrent protection to CRC firmware and improved the rigor of software configuration management process for future revisions.

### **3.1.7 PSL 1 Manual Reactor Trip 12/10/21 – 12/11/21** **Unit 1 Manual Trip Due To Insufficient Feed Flow To 1A Steam Generator**

Commission audit staff notes that FPL’s identified Root Cause and Contributing Causes 1 and 2 involve FPL employee performance gaps and deficiencies. A supervisor’s willful deviation from a defined management process, failure to review necessary drawings, complacency in performing of key tasks, and failure to use an insulating barrier led to questions about prudence of actions.

***Root Cause:*** FIN [Fix It Now] Supervisor chose to deviate from the FIN work management process and failed to validate readiness to perform FIN work prior to work execution.

***Contributing Cause 1:*** The Planner developed the work instructions based on a historical work order and did not adequately review the controlled drawings to identify the interaction between this circuit and the other control valves.

***Contributing Cause 2:*** The technicians were complacent due to past success landing leads and did not use an insulating barrier to prevent impacting the circuit from inadvertent contact and an assumption that all affected valves were isolated.

Sixteen months earlier, two August 2020 PSL 1 incidents also involved lifted leads and human performance issues. According to FPL’s Root Cause Evaluation, “...there were human performance issues that led to this event.” A presentation to the December 2020 Management Review Meeting described this gap as follows: “Maintenance managers have not developed the necessary skills and abilities of the [General Maintenance Leaders] and maintenance supervisors to effectively identify, coach and correct human performance behaviors which have resulted in station events.” The first event involved an Instrument Bus loss of power due to 1B Inverter Trip. The second occurred when an intake cooling water header non-essential header isolation valve failed to close. The occurrences of these human performance gaps, during consecutive years, and FPL’s 2021 reference to “complacency” appear to indicate inadequate corrective action was taken in 2020.

### **3.1.8 PSL 2 Outage by Technical Specification 1/6/22 – 1/20/22** **Unit 2 CEA #27 Control Element Drive Mechanism (CEDM) Failure**

Commission audit staff notes FPL’s language in the RCE is critical of the company’s handling of Foreign Material Intrusion risks involving “complex tooling activities.” The Safety Culture

Evaluation points out, “The Foreign Material Intrusion Risk posed by a SCOUT tool failure was not managed adequately under the work process for CEA coupling. In accordance with FME program requirements the Complex Tooling Inspection Checklist should have been used to identify and mitigate these risks. The RSS FME plan did not address complex tooling activities.

**Direct Cause:** *An L-Slot pin fractured from the SCOUT tool during CEA #27 coupling. The pin later migrated into the #27 CEDM and lodged between the upper gripper lath magnet and pull-down magnet resulting in binding of the CEDM motor.*

**Root Cause:** *Station leaders and stakeholders in refueling work activities have not ensured that Reactor Services activities are aligned with FME program requirements for complex tools. The resulting inadequate plans prevented discovery of a pin broken from the SCOUT tool during CEA coupling, which migrated into CEDM #27.*

**Safety Culture Evaluation:** *The causal factors are related to Cross-Cutting Aspect H.5 Work Management: The organization implements a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work and the need for coordination with different groups or job activities.*

*The Foreign Material Intrusion Risk posed by a SCOUT tool failure was not managed adequately under the work process for CEA coupling. In accordance with FME program requirements the Complex Tooling Inspection Checklist should have been used to identify and mitigate these risks. The RSS FME plan did not address complex tooling activities. A work order applicable to the RSS support tasks was not used, therefore, the associated planning inputs and FME program interfaces (work steps, briefing prompts, forms, etc.) normally included in work orders by work planners were not available to the crew.*

## 4.0 Company Comments

On December 11, 2023 Commission Audit Staff provided a copy of the draft report to FPL to review for factual accuracy and identification of any material that might be considered confidential and proprietary. FPL had the opportunity to file a formal request for confidential classification in accordance with *Rule 25-22.006 (3), F.A.C.* Staff also invited FPL to submit written comments that each wanted included in the final report. FPL's comments appear in their entirety below.



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January 5, 2024

Carl Vinson  
Florida Public Service Commission  
Office of Auditing and Performance Analysis  
2540 Shumard Oak Boulevard, Room 110  
Tallahassee, FL 32399-0850

Re: Office of APA, Review of FPL Nuclear Plant Operations

Dear Mr. Vinson:

This letter is Florida Power & Light Company's ("FPL") response to the Office of Auditing and Performance Analysis's draft report regarding its Review of FPL Nuclear Plant Operations. FPL has reviewed the draft report and has numerous concerns, including fundamental disagreements with many of the statements, inferences and conclusions included therein.

In light of staff's representations of its intent to include the report with staff testimony that will be filed in the formal proceeding in Docket No. 20240001-EI, FPL will address its concerns and areas of disagreement and will raise any legal challenges associated with and in response to the report at the appropriate juncture in this proceeding.

FPL requests that this response letter be appended to the final report. Please feel free to contact me with any questions regarding this transmittal.

Sincerely,

A handwritten signature in blue ink, appearing to read "MJM", is written over the typed name "Maria Jose Moncada".

Maria Jose Moncada

:21798490