efficiency bulletin

Aug. 17, 2017

Color Code: Green

Efficiency Bulletin: 17-19

Optimizing Program and Design Engineering Organizations

This bulletin presents optimal organizational structures and staffing levels for single and multiunit sites for program engineering (PE) and design engineering (DE) organizations, along with the enablers needed to accomplish the efficiency gains.

Addressees: **Chief nuclear officers, NEI APCs and INPO APCs**

Issue: **ENG-005, Optimize Engineering Organizations through centralization, cross-functional training, and management model changes**

Summary of Efficiency Opportunity

- Desired end-state –The processes supporting program engineering and design engineering are streamlined and standardized, resulting in effective use of resources and improved focus on equipment reliability and design change quality. The organizational realignment and centralization will allow for the most efficient use of resources.

- Value proposition (vision of excellence)—Depending on the utility's current processes, staffing levels and practices, efficiency improvements and cost savings may be achieved through centralization, use of industry standard processes, elimination of non-value added activities and remote monitoring—without compromising safety and reliability. The organizational changes proposed in this efficiency bulletin (EB) will enable a follow-up efficiency bulletin that will address transforming all organizations supporting station operations.

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- Why is it important?—The programs and processes used within PE and DE are cumbersome, resource intensive and require re-examination. The roles and responsibilities for PE and DE need to be redefined to focus on core business. With the availability of the streamlined and standard design change process, there is an opportunity for more effective use of engineering resources.

- Industry benchmark value(s)—Station/fleet performance will continue to improve. The reorganization and staff optimization will not result in the increase of backlogs or increased regulatory attention. The savings will vary as the level of centralization in program engineering and design engineering varies depending on fleet size, performance and geography.

- Measure of effectiveness—
    - Equipment reliability index (ERI) will continue to meet or exceed current performance.
    - INPO Tier 2 Indicator on Consequential Engineering Errors will not trend in the negative direction.
    - Important operating experience related to NEI 03-08, Guideline for the Management of Material Issues, as counted by the EPRI Nuclear Power Council Materials Degradation Action Plan Committee, will not trend in the negative direction.
    - Planned engineering organization changes are achieved and do not result in loss of critical skills and experience.

Background

- Engineering programs at nuclear power facilities were established primarily to implement regulatory requirements, industry standards and to address industry operating experience where similar equipment issues were identified that affected plant safety or operation. Well-run engineering programs are an important tool in extending plant life, enabling management's ability to safely run the station for an extended duration.

- Efficiency Bulletin 17-06 provides a standard design process (SDP) for the industry that will provide efficiency gains (utility-specific) and the ability to share conceptual designs among utilities. This will also allow for engineering vendors and utility design engineers to become more efficient and cost effective at developing design change packages.

- With the increasing workforce turnover, the experience and proficiency in PE and DE is declining. Centralization, cross training and the ability to work remotely, offers an opportunity for retention of experienced personnel, and the development of new engineers, for an efficient and effective workforce. The use of standard processes, such as periodic self-assessments of engineering programs, performance indicators and standard design change allows for sharing and pooling of resources and expertise.

- The optimization for the strategic engineering (SE), engineering response team (ERT) and component maintenance support (CMS) groups is covered by EB 17-18.

Key to Color Codes:

Red: NSIAC initiative – full participation required for viability
Blue: Action expected at all sites, but is not needed for broad industry viability
Green: Utility discretion to implement, consistent with its business environment

Relevant Standards

- Performance Objectives and Criteria (INPO)
    - OR.1, Station and corporate managers are aligned on the required support and allocation of resources needed to achieve and sustain high levels of nuclear, radiological, industrial, and environmental safety performance.
    - OR.2, Managers provide the staffing and resources for each department or functional area to support the accomplishment of their assigned responsibilities as well as to facilitate cross-functional responsibilities. They consider and mitigate the potential effects of organizational changes and staff reductions before these are initiated.
    - OR.3, Change management processes are implemented when applicable, and the progress of changes is systematically monitored to verify the intent of each change is met and to identify possible unintended consequences. The processes ensure the following:
        - Changes to plant equipment, procedures, and processes are planned and implemented systematically to improve safe and reliable plant operation.
        - Change objectives, responsibilities, and implementation schedules are clearly communicated, and appropriate training is provided to affected personnel.
    - LF.1, Leaders establish a culture in which personnel work together to communicate and promptly address any equipment issues and degraded conditions that could detract from nuclear safety and equipment reliability.
    - EN.1, Engineering personnel apply the essential knowledge, skills, behaviors, and practices needed to ensure equipment performs as required, the plant is maintained within design requirements, margins are controlled, and the plant is operated safely and reliably.
    - EN.2, Engineering personnel recognize and accept their responsibility to address plant technical issues and act as the site technical conscience. They uphold the plant design and licensing bases and ensure a margin of safety is maintained.
    - ER.1, High levels of reliability are achieved for equipment that supports nuclear safety, plant reliability, and emergency response capability.
    - ER. 2, Criterion 15: Engineering programs for equipment performance monitoring and testing detect degradation and allow corrective actions to be implemented before unanticipated failures occur. Engineering programs are kept current with industry improvements and operating experience to support safe, reliable equipment operation.
    - ER.3, Equipment is managed to maintain long-term equipment reliability.
    - ER.4, Activities are implemented to preserve materials and components in a manner that supports long-term, reliable plant operation.
    - FP. 1, The fire protection program is implemented to provide a high degree of protection to the plant and personnel by preventing, detecting, controlling and extinguishing fires. Design features and program controls protect structures, systems, and components to prevent significant plant damage and operational challenges and maintain safe shutdown capability.
    - CM.1, Design and operating margins are understood, considered in decision-making, and maintained consistent with design and regulatory requirements and operational constraints.
    - CM.2, Plant operation, maintenance, and testing activities are conducted in a manner consistent with the licensing and design bases and maintain configuration control.
    - CM.3, Changes to plant configuration, design, and licensing bases are evaluated, controlled, tested, and implemented while consistency is maintained among the physical plant configuration, design and licensing requirements, and the documented plant configuration.

- INPO 10-005, Principles for Maintaining an Effective Technical Conscience: Principle 1: Senior Leaders challenge decisions and corrective actions that result in degraded operating, design, or safety margins.

Relevant Regulatory Requirements

- 10 CFR 50.65, Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants
- 10 CFR 50.55a, Codes and Standards
- 10 CFR 50, Appendix B, Nuclear Quality Assurance Requirements, Criterion III Design Control
- 10 CFR50.59, Changes, Tests and Experiments
- 10 CFR 50.120, Training and qualification of nuclear power plant personnel plant specific design and licensing basis NRC commitments

Guidance

- IP-ENG-001, Standard Design Change procedure was developed by an industry engineering group and provides detailed guidance for developing design changes. This procedure is hosted on the INPO Nuclear Community site and is maintained by design oversight working group.
- INPO-15-003, Conduct of Engineering Programs at Nuclear Power Stations
- INPO AP-929, Configuration Management Process Description
- NISP-EN-03, Supporting Guidance for Optimizing Programs and Design Organizations.

Additional Guidance: The supporting guidance and recommendations for centralizing and optimizing program engineering and design engineering is available on the INPO website in a document titled, NISP-EN-03, Supporting Guidance for Optimizing Programs and Design Organizations. An overview of each section of the document follows:

Division of Responsibilities (NISP-EN-03 Attachment 1)

One of the key attributes of an efficient organization is an understanding of the roles and responsibilities of each supporting group. The organizational efficiencies envisioned in this efficiency bulletin require that programs and design engineering personnel function within clearly defined roles.

- PE's primary role is the strategic implementation of engineering programs and should not include site implementation activities such as work planning, inspection oversight or first response to emergent plant issues.
- DE's primary role is to produce design packages for plant modifications, implement station strategic priorities and respond to industry identified issues. It is not envisioned that this will include work planning, oversight during modification implementation or routine involvement in site emergent issues.

The Division of Responsibilities section of the NISP-EN-03 provides a detailed matrix of engineering activities and the group responsible for their implementation. Although this efficiency bulletin focuses on programs and design, other engineering and non-engineering groups are included for completeness. More specifically, the matrix covers activities that fall under work management, operations, maintenance, design engineering, strategic engineering, engineering response team, component maintenance support, engineering programs and nondestructive examinations group. Although this matrix was developed with input and consensus from multiple utilities and organizations, it is expected that each utility will adopt it with some variances to accommodate organizational, geographic and utility size factors. However, the theme of keeping engineering, planning and maintenance functions within the appropriate groups should be maintained for an effective implementation.

Programs Engineering Structure Basis (NISP-EN-03 Attachment 2)

This section provides the recommended organization structure required for multisite utility programs functions. To ensure effective implementation of the efficiency bulletin, key enablers were developed. Key enablers are a higher level of behavior and process adjustments that are critical to the success of implementing this change rather than the specific actions that may be different for each station. Consequently, stations should develop specific actions to apply the following key enablers:

- Leadership Advocacy—Senior leadership reinforces the centralized concept, management model compliance and support for shifting some work practices. Leadership advocacy entails fostering a positive perspective and promoting the benefits of the change and supporting a shift in work practices that includes remote reporting, remote meeting participation and reducing on-site outage control center/outage 24/7 coverage by encouraging remote work locations. It also entails reinforcing management model compliance, discipline and alignment of site and fleet roles and responsibilities. This enabler will result in organizational alignment and support for the centralized initiative as promoted by senior leadership. More clearly defined roles and responsibilities and discipline to work in role and being accountable to responsibilities. Increased focus on program impact to equipment reliability. Flexibility to transition between fleet and site positions without relocating. Centralized functions conducted remotely from any fleet location.

- Program and Design Fleetwide Assessments—Assessments are typically required by internal utility processes with frequencies based on program complexity, historical performance, regulatory inspection frequency and/or quality assurance program/design requirements. In a decentralized organization, stations tend to perform assessments of the same programs at the same time and/or frequency that include the same or similar attributes to cover governance and oversight functions. In many cases the assessments duplicate findings and/or recommendations and utilize the same fleet resources. Some utilities also require extensive outage readiness assessments that duplicate peer reviews and scope challenges. Centralizing organizations facilitates conducting fleetwide assessments, including some regulatory inspection readiness assessments. Additionally, shifting the outage scoping development to the centralized organization and conducting peer reviews in place of separate outage readiness assessments results in additional significant reductions.

- Program Health Reports Reduction—Currently program health reports are issued on average of 15 programs per station. The time required to generate each health report varies between 16-24 hours per report. Report issuance varied between annual to quarterly depending on the program, resulting in an average of 40 health reports per station. Implementation of EB 16-34, Streamline Program Health Reporting, reduces the number of formal program health reports and streamlines the program health monitoring and reporting processes. Programs are categorized as Tier 1, Tier 2 or Tier 3 programs with only 3 to 4 programs in Tier 1 requiring some routine health reports. Additionally, the frequency of reports are either annual or semiannual resulting in a required maximum of eight reports for a dual-unit boiling water reactor and 6 reports for a dual-unit pressurized water reactor. Tier 2 programs will be monitored through a set of standard industry key performance indicators. Tier 3 programs are typically point of contact programs and monitoring is at the discretion of the utility.

- Infrastructure Improvements—This enabler includes development, upgrades and implementation of an infrastructure that enables fleetwide remote program management and support. Infrastructure improvements entail; standardized suites of proven software, expanding accessibility of existing databases, transitioning to standard test equipment/software that enable fleetwide data comparison, and upgrading/expanding hardware for native file storage and sharing. Longer-term these improvements provide the capability to implement electronic (paperless) data collection, reviews and record retention to streamline program management processes.

- Task Alignment—Program and design engineers are often tasked with supporting tactical activities and emergent issues, including field management of operations and/or maintenance activities. Approximately 20 percent of PE time is spent responding to these emergent plant issues and field activities for implementing program required testing or inspections. In some cases, the PE performs the actual field test or inspection which is significantly out of role. By assigning tasks to the responsible line organization handoffs are minimized and the responsibility is with the appropriate organization. This enabler has ERT, CMS and maintenance addressing these tactical field activities and emergent issues to enable PE to focus on program strategic management, particularly in the valve, heat exchanger and snubber programs.

- Design Change Control—In some cases, requests for design changes exceed the outage/on-line guidelines of 20/40 list, requiring either contracted resources or larger design staffs. The station leaders need to establish and firmly control the outage and on-line design change appetite and reinforce expectations for the site design engineering organization to be overall design authority for each site.

- Outage Scoping—The outage scope development is currently performed at the site level for each station with reviews from corporate or fleet peers. Scoping can be inconsistent between stations based on the individuals, and reviews can be repetitive and redundant. With centralized programs, outage scoping is performed by the fleet program engineering organization for every station to ensure consistency and application of fleet and industry lessons learned. Reviews and challenges are conducted as part of the peer reviews and outage meetings.

- Outage Coverage Adjustments—The program engineering coverage is often provided 24/7 with resources on site through the outage and at times only for contingency. Due to limited qualified resources at each site, 24/7 coverage has been achieved with resources from other stations or corporate going to the site. Due to overall reduction of program engineers, on-site outage coverage will be provided 24/7 for critical path or high risk program activities only. The coverage and support for noncritical path or medium to low risk activities will be provided on-site for one shift with remote coverage as back-up for other shift(s).

- Non-Core Duties Reduction—Program engineers are assigned task management and vendor oversight responsibilities for fieldwork associated with programs implementation. This also includes contract development and field supervision of craft/vendor and nondestructive examination (NDE) personnel. PE also performs field inspections (VT-1/VT-2), testing and test equipment calibration/checks. Oversight and management of field activities are to be performed by the appropriate implementing organizations; operations, maintenance and NDE services. PE provides technical oversight, support and evaluation of inspection/test results. Inspections and testing services are provided by the appropriate field organization with PE responsibilities focused on program management and compliance.

Design Engineering Organizational Structure Basis (NISP-EN-03 Attachment 3)

This section provides an overview of opportunities that are available to improve efficiency and organizational structures in the design area. The savings realized from each will be utility dependent based on the size of the utility, their current organizational structure, reliance on vendors to provide engineering products, and the amount of money that is spent annually as part of their portfolio. Five areas of opportunity are discussed that can be implemented individually or combined to further increase the savings realized. Example organizational structures are also provided.

Fleet Governance and Oversight of Program Engineering (NISP-EN-03 Attachment 4)

This section outlines the governance and oversight activities needed to ensure proper implementation of Engineering Programs.

Fleet Governance and Oversight of Design Engineering (NISP-EN-03 Attachment 5)

This section outlines the governance and oversight activities needed to ensure proper implementation of design engineering.

Non-Fleet Organization Structure - Program Engineering (NISP-EN-03 Attachment 6)

The guidance provided in the previous sections focuses on organizations associated with multisite fleets. This section provides guidance for the organization applicable to single site utilities. The recommendations are based on following the applicable enablers outlined for the multisite utilities.

Program Engineering Effectiveness (NISP-EN-03 Attachment 7)

This section provides guidance for the implementation of well-run engineering programs and meeting performance objectives and criteria. Reference is made to INPO document INPO-15-003, Conduct of Engineering Programs at Nuclear Power Stations, which has been revised to align with some of the enablers discussed in this efficiency bulletin.

Design Engineering Effectiveness (NISP-EN-03 Attachment 8)

This section provides guidance for the effective implementation and control of design engineering activities by instituting high standards, using properly qualified personnel, providing for sufficient resource loading, monitoring and assessing performance, and holding personnel accountable for their performance. Reference is made to INPO 10-005, Principles for Maintaining an Effective Technical Conscience, which provides details for behaviors of station leaders, engineering leaders and engineers in upholding plant design requirements and protecting design and operating margins.

Change Management Considerations (NISP-EN-03 Attachment 9)

This section provides benchmarking to assist in the development of change management plans to implement the organizational changes covered by this efficiency bulletin. Detailed change management considerations are provided, including specific tasks and estimated time frames. Each station/fleet is expected to use their own change management process but may use this attachment as a benchmarking tool to ensure that a comprehensive plan has been developed.

Recommended Industry Actions

- Develop a detailed change management plan consistent with station/fleet procedures.
- Identify indicators to monitor for unintended negative trends in station performance following the implementation of this EB.
    - Examples include unexpected large component failures, high staff turnover, increasing backlogs, and outage scope expansions.

Change Management Considerations

- A robust change management plan, with realistic milestones, is necessary. A detailed change management outline is provided in Change Management Considerations (NISP-EN-03 Attachment 9). Industry experience has demonstrated that the following are key to a successful engineering reorganization:
    - Identify and revise procedures within non-engineering departments where engineering support responsibilities are being reassigned.
    - Ensure adequate staffing is maintained to support non-routine duties such as event response teams, security drills, emergency preparedness support, etc.
    - Align departments on refueling and emergent outage roles and responsibilities.
    - Implement changes in roles and responsibilities prior to commencing staff or budget reductions.
    - Ensure that engineering program responsibilities are well-defined and that none are dropped as a result of the reorganization
    - Perform interim and final effectiveness reviews.
- Prior to reorganization of programs, assess the health of programs by considering the following:
    - Personnel
        - depth and experience of personnel
    - Infrastructure
        - level of procedure and database standardization
    - Implementation
        - existing backlogs (corrective actions, document/procedures)
        - AFIs
    - Equipment
        - status of health reports, notebooks and action plans, including equipment trend reports

    The assessment should determine if any of the issues identified can be addressed by the new organization as a level of effort activity, or if the issues should be resolved prior to the reduction of resources.

Industry Activities

- Develop standard templates for conducting self-assessments.
- Develop standard templates for program health report cards and health metrics (Complete).
- Industry webinar to provide background for initiative, industry peer discussion, and provide an open forum to clarify expectations and ask questions. Webinar information can be found at https://web.inpo.org/Pages/Nuclear-Promise-Issues.aspx

Company Actions

- Identify activities that are centralized and transferred to other departments and communicate expectation to the receiving departments. Specific change management plans are developed to address each transfer.
- Assess individual proficiency prior to assigning new responsibilities and ensure bridging strategies are enacted to address any gaps with an emphasis on coaching. Based on identified challenges to proficiency performance, formulate and implement development plans including, but not limited to, training.
- Senior leaders confirm that new managers responsible for providing oversight of programs are fully aware of their oversight responsibilities as outlined in INPO 15-003 Rev. 1.
- Identify the peer team meetings necessary to integrate corporate and site functions and incorporate core function monitoring and key indicator reviews into these meetings.
- Implement and integrate roles and responsibilities into organizational procedures. Ensure that changes are captured in change management plans.

- Consider leveraging technology and the enablers as part of the change management plan.
- Consider implementation of a centralized monitoring center. Equipment with capability for remote monitoring can be efficiently monitored from a centralized fleet location on a 24/7 basis and these functions can be merged with non-nuclear sites of the business for increased efficiency.

Guiderails

Implementation of this bulletin may result in relocation of some of the program and design engineering functions from stations to a central location involving staff relocation and/or remote reporting. Industry experience shows that such relocations can result in loss of critical knowledge and experience. Consequently, stations should ensure that the following guiderails are in place:

- It is critical that the station senior leadership supports the changes and holds responsible departments accountable to perform their revised roles.
- Departments outside of engineering must explicitly accept the revised responsibilities identified in the Division of Responsibilities (NISP-EN-03 Attachment 1).
- Ensure that senior leaders understand the key assumptions (such as strong station performance and no increased regulatory oversight) made in staff sizes proposed in this EB. These are included in Attachments 2 and 3. Each station should verify that the assumptions are currently applicable prior to staff size reductions.
- Senior leaders must ensure that organizational capacity and capability is sufficient to manage operational and enterprise risk posed by emergent equipment issues and economic stressors. Challenges could include the size and scope of outages, potential or actual increased regulatory inspection, and internal corporate initiatives.
- Organizational changes and staff reductions should not be initiated without considering the potential impact on loss of critical knowledge on the performance of core duties assigned to PE and DE.
- Consistent with station/fleet commitments in response to Recommendation 2 of IER L1-14-20, Integrated Risk-Healthy Technical Conscience, conduct periodic self-assessments to identify early signs of weaknesses in technical conscience. Consider sharing any significant learnings with the industry.
- Monitor station performance for any unintended consequences because of reorganization. The following indicators are listed as an example:
    - ERI will continue to meet or exceed current performance.
    - INPO Tier 2 Indicator on Consequential Engineering Errors will maintain positive trend.
    - Important operating experience related to NEI 03-08 engineering programs, as counted by the EPRI Nuclear Power Council Materials Degradation Action Plan Committee, will not trend in the negative direction
    - Post-reorganization staffing turnover does not result in loss of critical skills and experience.
    - Engineering change quality—High number of significant field change requests (FCRs) may indicate engagement problems on the part of stakeholders in the modification development process (Reference EB-17-06, Standard Change Process).
    - Temporary mods backlog—This measures adherence to effective configuration control practices (Reference EB 17-06, Standard Change Process).
    - Impacted document updates—This measures adherence to effective configuration control practices (Reference EB 17-06, Standard Change Process).
    - Engineering change (EC) work list stability—Instability in the EC work list is typically an indication of weakness in long-range planning that can result in an increased number of Fast Track modifications. (Reference EB 17-06, Standard Change Process).
    - Program health indicators will continue to meet or exceed current performance (Reference EB 16-34, Program Health Reporting and INPO 15-003).

- Additional metrics may include engineering staffing changes, human performance issues, project implementation effectiveness, unexpected large component failures, high turnover, increased backlog and outage scope expansions.

Report Your Site's Results

Please report your company's implementation of this improvement opportunity, including the date of completion and realized efficiencies/results. Send this information along with your company point of contact to EfficiencyBulletin@NEI.org.

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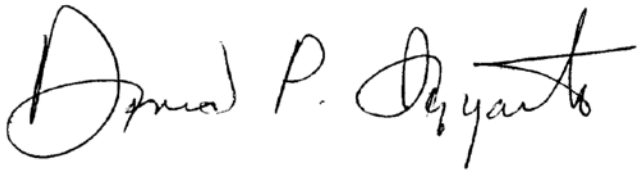

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