



Safety Related Digital Modifications Regulatory Challenges

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Jay Amin
Luminant





Background

- Formation of DI&C Task Working Groups (TWGs: WG, SC, TFs)
- Development of Interim Staff Guidance (ISGs)
- Improved regulatory guidance **should**
 - Result in stable, predictable and timely licensing process
 - Provide clarity in areas such as Human Factors, Defense-In-Depth (D3), Cyber Security, Communications
 - Provide clarity when using Standard Review Plan – for both, NRC and Industry
 - Help ensure consistencies in interpretations and timely reviews
 - Encourage licensees to embark on use of digital technology in Safety Related (SR) upgrades to address:
 - I&C Obsolescence
 - Transition to modern proven digital technologies that:
 - Improve reliability and safety
 - Offer additional capabilities: self diagnostics, testing, information
 - Utilize knowledge & skills of modern workers



Issued Regulatory Guidance

Issued Interim Staff Guidance:

- DI&C-ISG-01(Cyber Security: ML072980159)
- DI&C-ISG-02(Diversity and Defense-in-Depth Issues: ML091590268)
- DI&C-ISG-03(Probabilistic Risk Assessments: ML080570048)
- DI&C-ISG-04(Highly-Integrated Control Rooms—Communications: ML083310185)
- DI&C-ISG-05 (Highly-Integrated Control Rooms—Human Factors: ML082740440)
- DI&C-ISG-06(Licensing Process: ML110140103)
- DI&C-ISG-07(Fuel Cycle Facilities: ML100480228)

- For the next 2+ years, Industry feedback mechanism
 - Pilot projects to validate effectiveness of issued guidance and help build confidence in the process
 - Wolf Creek (limited application)
 - Diablo Canyon

Current State



- Prudence demands careful consideration of all options when confronted with a reliability or obsolescence issue
- As an industry, Non Safety Related (NSR) digital modifications have been proven to be effective and reliable in applications such as turbine controls, feedwater controls & plant computers
- The remaining plant systems, predominantly SR upgrades are generally maintained via repair/replace and reverse engineering methods and will continue until the regulatory challenges are resolved
 - The risk of undertaking a SR digital modification is unacceptably high

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Why are more plants not coming forward with SR Digital Modifications?

Regulatory Challenges



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SR Digital Modification Challenges



- Issued ISGs to some extent have resulted in improved digital process; however, some ISGs are too rigid and offer very few alternative approaches
- DI&C-ISG-06 draft, "Licensing Process" unnecessarily cumbersome, lengthy and time consuming
 - The amount of details required with submittal of the LAR, coupled with exhaustive staff reviews adds regulatory risk and uncertainty
 - For example, the LAR approval comes *after* we have expended significant resources
- NRC concerns with 10 CFR 50.59 Reviews (NEI 01-01-ML13298A787 & NEI 96-07-ML003686043) for digital upgrades & Common Cause Failures (CCF) seen as added regulation by licensees
 - Licensees more reluctant to even perform a digital upgrade that is important to safety let alone safety-related due to regulatory uncertainty
- Cyber Security
 - Regulation and interpretation thereof is a moving target
 - Added cost burden due to unpredictable NRC position

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SR Digital Modification Challenges(cont.)



- Inconsistent Interpretation of current regulatory guidance by:
 - Licensees
 - NRC headquarters, Regions and Inspectors
 - Vendors/Integrators/Designers

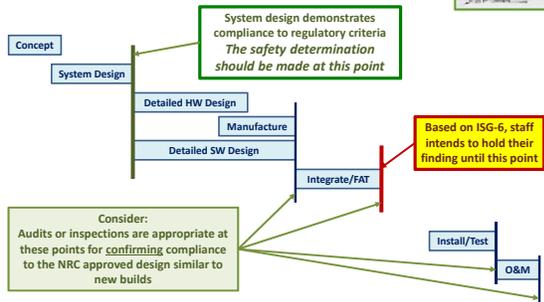
- Diminishing pool of US based "Nuclear" vendor knowledge base

- Very few new plants built in US in last 30 years has caused erosion of SR equipment vendors

- Economic drivers (non regulatory)
 - Lower gas prices
 - Deregulated markets
 - Modifications must be justifiable (Competition for limited resources)

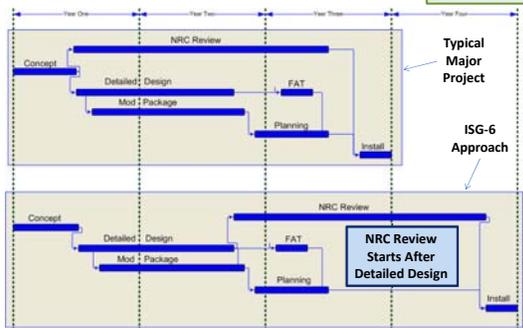
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ISG 6 Challenges/Recommendations



Safety Determination can be made much earlier in the process with follow-up inspections and audits to verify compliance

ISG-6 Schedule Impact (+1 Year)



Recommendations



- Issue Regulatory guidance or endorse industry guidance to clarify criteria for determining when digital upgrades can be performed without needing an LAR
- The LAR process (ISG 6) simplification should focus on system design and demonstration of compliance to regulatory criteria
- Safety determination should be made at the system design phase similar to new plants, with an SER issued with open items requiring specific NRC audits and inspections for confirming compliance in lieu of detailed design reviews
- Alternative to consider would be to limit reviews to just the coping analysis results for any modification that shows a new malfunction
- LAR would submit System Architecture, D3 analysis, and all the digital I&C design (specs, design, V&V, etc.) would be available for audit and/or inspection during System/Design Modification Life Cycle Development
 - NRC required confirmatory audit reviews/inspections would be integrated into system/modification development schedule

Failure to adopt current day modern technologies deprives the industry of the opportunity to effectively manage obsolescence and in reality risks decreasing equipment reliability and margins of safety

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Recommendations(cont.)



Process Simplification and Streamlining

- The NRC has some processes in place that support digital but they do not address process challenges that exist
- Industry should take the lead and develop a more structured, streamlined approach with NRC involvement that:
 - Addresses the regulatory and process concerns
 - Uses practical solutions and acceptance criteria based on reasonable assurance
 - Eliminates potential of subjective interpretations & addresses acceptability thresholds
 - Is standards based
 - Uses risk based graded approach
 - Addresses use of Commercial Off The Shelf (COTS) Equipment for SR Upgrades, including practical acceptance criteria for crediting operating experience
 - Results in revision of regulatory documents (including ISGs) where needed
- Examples:
 - Update SRM to SECY 93-087 and BTP-19 to reflect current understanding of CCF and ways to protect against it, including both prevention and mitigation
 - Update the review process and standard review plan, including BTP-14 and ISG-6. Simplify them by focusing on safety and licensing review needs
 - Develop guidance on diversity and defense-in-depth that addresses types and extent of diversity that are considered adequate
 - Develop guidance on assessing CCF with focus on failure prevention and mitigation, including acceptability thresholds to achieve reasonable assurance

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In Summary....



- Industry and staff have reached the maximum benefit achievable from the Task Working Group method of policy development
- We need to address the challenges and provide clear guidance with acceptance criteria in order for more licensees to embrace Safety Related Digital modifications through:
 - Streamlined process improvements
 - Clarity on regulations (CCF, D3, Embedded Digital, Cyber, etc.)
 - Criteria for determining when digital upgrades can be performed without needing an LAR
- The industry must have the latitude to modernize operating plants within a practical and less onerous regulatory framework

Streamlined processes with reduced regulatory burden and shifting accountability to licensees will enable more full-scale upgrades, resulting in safer, more reliable operating units

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