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General Comment

See attached file(s)

Attachments

Strategic Plan FY 2014-18 DG comments

This document is responsive to NRC request for input on a proposed Strategic Plan: Fiscal Years 2014–2018. Specifically it addresses key elements of the NRC's regulatory program include minimizing the likelihood of accidents and reducing the consequences of an accident should one occur. Impacts of radiation releases or extended plant shutdown include severe socio-economic impacts. The Plan will also influence the design and impact technologies supporting small modular reactor design certification and license applications.

PWR nuclear power plants rely on the integrity of every steam generator heat transfer tube to prevent radioactive primary coolant entering the secondary coolant circuits. Every steam generator tube is implicitly an integral part of the PWR reactor primary containment. PWR steam generator tube failure can, and has, resulted in:

- radioactive steam release to atmosphere,
- major economic penalties to the public, power utilities and the nation.

A major flaw in PWR steam generators is failure such that any steam generator's heat transfer tube allows radioactive water from the plant primary circuit to enter the secondary circuit. One outcome is over-pressuring the secondary loop and release of radioactive steam outside the containment. Steam Generators are an 'Achilles heel' for all power plant owners. Failure of any heat transfer tube is a breach of the reactor's primary containment.

Mr. Karwoski, a Senior Advisor for steam generators at the NRC, states; "Steam generators provide vital technical and safety functions at many U.S. nuclear power plants". Rupture of a steam generator tube is considered a design basis event by NRC. This reference also states NRC places a high priority on ensuring that possible steam generator tube degradation is carefully addressed through inspections, strict repair criteria and the monitoring of water chemistry to detect radiation leaking from the primary to the secondary side of the plant.

Water chemistry monitoring alone is demonstrably insufficient to detect mechanical damage mechanisms such as tube vibration, or prevent release of radioactive materials to the environment. Specialized, rapid response, steam tube damage instrumentation technology needs to be an essential plan component. NRC's only current requirement for steam tube damage monitoring instrumentation is eddy-current monitoring during plant shutdown , not real-time monitoring for events likely to result in tube, and hence core containment failure(s). Current NRC requirements are insufficient to prevent or mitigate economic and social impacts of steam generator tube failures.

Therefore I contend the Plan should be responsive to the following issues:

- ❖ NRC needs to define and require effective and timely, steam generator fault protection systems in all PWR operating nuclear power plants. The current NRC monitoring approach did not protect against or prevent the economic and safety problems of an incident, such as the recent steam generator problems at the San Onofre Nuclear Generation Station (SONGS). These problems were followed by permanent shutdown of the reactor and eventually abandonment of the Nuclear Power Plant with extensive financial and economic impacts that may take decades to mitigate.
- ❖ NRC needs to define and require effective and timely tube failure or fault protection systems on steam generators in all PWR operating nuclear power plants. Lack of such

mandated requirements and steam generator protection instrumentation has resulted in severe economic outcomes and reduced public confidence in provision of safe, economic nuclear power in the USA. Power plant verified and validated steam generator monitoring and protection systems are available that would protect the steam generator from incidents such as at SONGS.

- ❖ Lack of mandated requirements for steam generator protection instrumentation to effectively detect steam generator tube vibration and/or tube integrity resulted in reduced public confidence in safe nuclear power, and negatively impact USA nuclear economy.

In addition; sodium cooled small modular reactor designs are being designed and developed. Designs include sodium heated steam generators for which an additional steam generator tube failure mechanisms are possible due to sodium water reactions and generation of hydrogen gas.

Supporting information: NRC regulate steam generator lifetime or design changes through an update of technical specifications. NRC must plan to make real-time, online monitoring of steam generator tube bundles a requirement through an update of technical specifications for both new and existing steam generators to protect plant safety; significantly reduce economic vulnerabilities to utilities, protect plant operational staff, and reduce possibility of radioactive release to the environment. Their updated plan must reflect any research, development or implantation requirements to meet such a goal.

Plant owners recognize steam generators have a limited life compared to expected station lifetime, and plant operators for economic reasons will endeavor to replace steam generators prior to any operational problems. Effective monitoring systems will safely increase the period between steam generator replacements and improve nuclear energy economics. Steam generator lifetimes can be extended by effective NRC requirements and reliable tube damage monitoring.

NRC/ACRS communications acknowledge importance of Steam Generator tube failures "As noted by the Committee, steam generator tube integrity research continues to be an important area of research. Substantial progress has been made on understanding the initiation and progression of *(chemical)* degradation mechanisms. The staff also has worked toward an improved knowledge of steam generator response under severe accident conditions. Confirmatory research continues to be necessary as surveillance methods evolve and new techniques are employed by the industry. The staff's efforts are enhanced by the sharing of operational experience and research results made possible by the International Steam Generator Tube Integrity Program".

NRC in such publications implies chemical control of the coolant water, improved tube fabrication and welding, and loose part monitors provide damage mitigation. SONGS and other NPP incidents do not support such contentions. For example:

SONGS Economic Impact: SCE reported undetected, damaging tube bundle vibrations were present shortly after installation of two new SONGS steam generator. Lack of effective detection instrumentation and tube damage regulation or criteria may have contributed to burden the Utility with these economic impacts to return the NPP to full operation:

- Commit to spend nearly a billion dollars (or even more) on a repair that Mitsubishi had not yet designed, had not established would be successful and had not offered to pay for;
- At least five years wait for the replacement tube bundle to be installed, even if everything went perfectly;
- Committing to pursuing the replacement option before knowing whether or not the NRC would permit restart at reduced power, or when that permission might be granted, or if the other uncertainties noted above were resolved.

These, and probably other business reasons led to Southern California Edison surrendering its license to operate SONGS power plant. These are not the only financial consequences. Plant closure is estimated to remove $11 billion annually from the California economy, and also result in higher utility bills in the State (~!5%) due to higher replacement energy costs. US Energy Information Administration (EIA) has reported a 59% increase in wholesale power prices in the state, which it ascribes largely to the extended outages at the two units.

SONGS Safety Impact: USNRC issued a 'preliminary white finding of low to moderate safety significance'' for SCE 'Failure to comply with SONGS Technical Specification for maintenance of steam generator tube integrity and leakage control' and an 'apparent violation of the requirements of 10 CFR PART 50'. (The finding does not carry any fines or penalties). SCE's Senior Vice President and Nuclear Officer (Peter Dietrich) raised no arguments to the 'white finding' in his formal response to USNRC's Stephen A Reynolds! To date, NRC responses to SONGS and similar incidents can appear to support impressions they do not consider steam generator tube monitoring, radioactivity releases, or severe socio-economic consequences to need immediate research and development programs to correct this problem. The PLAN must correct any such impressions with a robust program that includes effective on-line monitoring for breaching of primary containment due to tube integrity failure or by any BY ANY IDENTIFIED OR POSSIBLE METHOD.

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(11/13/2013): http://www.songscommunity.com/docs/Economic_Considerations_WhitePaper_Final.pdf . SCE made the business decision to close SONGS. Nuclear Regulatory Commission [NRC]

"Briefing on steam generator tube degradation, transcript of proceedings", Public Meeting Before the U.S. Nuclear Regulatory Commission" FEBRUARY 7, 2013.

Backgrounder on Steam Generator Tube Issues, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/steam-gen.html

Ref3 (10/29/2013): SCE Response to Preliminary White Finding

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