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Optimal Operation Through R&D

By David Modeen, Electric Power Research Institute.

1. What research and development (R&D) efforts are under way at EPRI related to 80-year nuclear power plant life?

We use the term 'long-term operations,' in recognition of two distinct but related activities. One is that we're now entering the first renewal period, which takes plants from 40 to 60 years. There are needed research and engineering activities to ensure that the 40 to 60 period goes correctly. We also believe there aren't any show stoppers to go beyond 60 years for another 20 or more years of operation. So when we look at long-term operations, it's really everything in that period from 40-60 through 80 or more years of operation. And it's not just license renewal and regulatory aspects, it's a number of other critical questions like how do you keep your plant current with the best technology and how do you ensure the proper material condition of the plant for however long you run it.

What EPRI's long-term operations research is trying to do is ensure that as we adapt new technologies and we monitor for aging degradation, that we have the right technology to ensure that the plant runs well. A good example relates to concrete. In the first renewal period, there was relatively little concern from a structural point of view as well as an integrity point of view. However, we've seen some leakages like in the Connecticut Yankee spent fuel pool, some indications of boron leakage corrosion. What does that really mean more generically to the nuclear fleet? This is just one example where plant operators will need to confirm that a long-term investment in the plant will in fact pay off and the plant will remain as safe and reliable as it is today.

An interview by Newal Agnihotri, Editor, Nuclear Plant Journal at the Nuclear Energy Institute's Nuclear Energy Assembly in Washington, D.C. on May 20, 2009.



David Modeen

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Idaho National Laboratory, Institute of Nuclear Power Operations, Nuclear Energy Institute, and Nuclear Regulatory Commission Office of Research.

Modeen joined EPRI in 2003 as Vice President, Nuclear Power Sector and Chief Nuclear Officer, a position he held until 2007. In this role, he led the team responsible for developing EPRI's Nuclear Power technology R&D program and business development, working closely with both domestic and international advisors.

Modeen holds a Bachelor of Science degree in industrial engineering from Iowa State. He served five years in the U.S. Navy as a submarine warfare officer. He has served on the Institute of Nuclear Power Operations Advisory Council and is a registered nuclear and mechanical Professional Engineer in the state of Oregon.

EPRI is also doing a lot of work in the monitoring of cable conditions. We don't have the diagnostic tools today to obtain an accurate prediction of remaining useful life of our medium voltage cables. Because of evidence that certain underground cables have been wetted or submerged, the question arises, what about the integrity of the cable? We're developing a white paper currently to confirm that the cable used in nuclear plants was properly selected and designed. We are also developing test and acceptance criteria for verifying the condition of wetted medium voltage cable based on removal and forensic assessment of service aged cable.

2. What are the recent innovations in maintenance and outage support at EPRI?

We are continuing to push hard on inspection technologies and nondestructive

evaluation. We've taken our base competencies that were really focused on the metal in the primary system and reactor coolant pressure boundaries, and are applying them across the board, e.g., from a standpoint of looking at the balance of plant on the secondary side to understand and inform long-term operations decisions.

We're also heavily involved in fuel performance. The industry was not satisfied with fuel performance starting six or seven years ago. It wasn't that it was terrible, but we were looking for as close to perfection as we could achieve. In the last three years, EPRI worked with the nuclear utilities and nuclear fuel vendors to establish some guidelines to improve fuel performance in core. Part of those guidelines require fuel examinations not only when you have a problem with the fuel, but in fact with good fuel too. This can cost up to \$500,000 or more for a plant.

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We want to take measurements relative to the integrity of the fuel, the crud that is on it, and help make decisions to continually improve the performance of the fuel. By examining what good performing fuel looks like, we can hopefully move more fuel cores in that direction.

3. *What is EPRI doing with respect to nuclear power plant uprates?*

The majority of the work to achieve a power uprate is well handled by the vendor and supplier community. There have been specific issues where the industry has come to EPRI for technical assistance, such as in acoustic-induced vibration issues associated with steam dryers in the BWR fleet. In some uprate cases, the performance was not what was intended and the fixes weren't satisfactory either. EPRI has prepared a topical report documenting a suite of vendor

methodologies that can be used by utilities in demonstrating steam dryer structural integrity at power uprate conditions. The report is currently under review by the Nuclear Regulatory Commission.

We're also involved in industry concerns regarding jet pump flow-induced vibration (FIV) issues. There have been several instances of FIV resulting in moderate to severe jet pump degradation, most recently in Mexico in the fall of 2008. EPRI is currently working with the boiling water reactor community to investigate the phenomena and evaluate various mitigating solutions. As part of that effort, we're building a full-scale experimental facility in a vendor shop where we'll be able to test out some potential repairs and better understand the operating fatigue mechanisms.

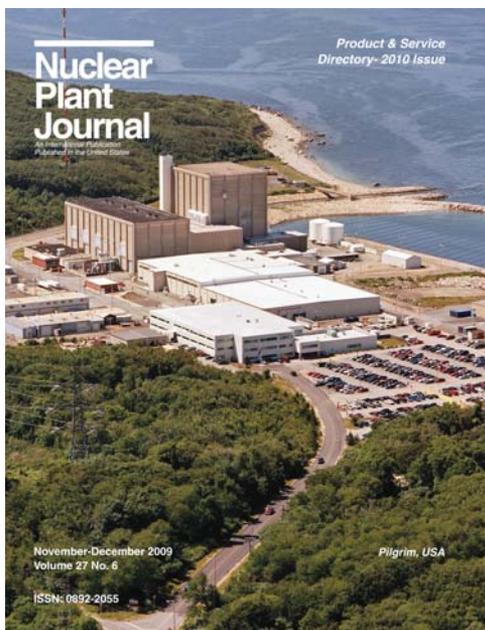
4. *Concluding comments.*

The one point I'd make relates to the long-term economic viability of nuclear power. We see the value of current plants continuing to increase: The nation's 100 gigawatts of non-emitting nuclear capacity is very important and it's going to be an achievable but significant challenge to get another 50 or 100 gigawatts of new nuclear capacity. Every way we slice, the analysis reinforces the importance of nuclear as a reliable, economical generation resource. And we believe the nuclear plant operators are committed to making the investments necessary to ensure these plants continue to operate.

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Nuclear Plant Journal's Product & Service Directory 2010

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2010 Directory

All nuclear power industry suppliers who are not listed in the 2009 Directory may register for the 2010 Directory by sending an email to npj@goinfo.com with complete contact information.

Suppliers listed in Nuclear Plant Journal's 2009 Directory will receive the 2010 Directory mailing with a list of their products and services as they appeared in the 2009 Directory.

Deadlines:

Input Form- November 18, 2009
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