Spring 2013
Volume 9, Issue 2

Nuclear Energy Impacts: A Look Back in Time

Two years after Fukushima, Japan's nuclear lobby bounces back

TOKYO (Reuters) - Thu, Mar 7 2013. By Mari Saito and Linda Sieg.

The crowds of anti-nuclear protesters have dwindled since Japan's "Summer of Discontent" last year, and a new government is keen to revive the country's atomic energy industry, but Morishi Izumita says he is not about to throw in the towel.

"We can't give up. I'm here every week," said 64-year-old Izumita, one of hundreds gathered outside the prime minister's office one Friday nearly two years after a huge earthquake and tsunami triggered the world's worst nuclear disaster since Chernobyl in 1986 at Japan's Fukushima Daiichi plant. "We need to be out here protesting. Not giving up is the important thing," he added, as other activists banged on drums and chanted "Stop nuclear power, protect our children".

As Japan approaches the second anniversary of the Fukushima Cont. on Page 9

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Flooding complicates clean-up at Japanese nuclear plant

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TOKYO—Fri Mar 8, 2013 5:51am EST (Reuters) - Tokyo Electric Power Co is struggling to stop groundwater flooding into damaged reactors at its wrecked Fukushima plant and it may take four years to fix the problem, possibly delaying the removal of melted uranium fuel.

A March 11, 2011, earthquake and tsunami knocked out cooling equipment at the company's Fukushima Daiichi plant north of Tokyo, triggering the worst atomic disaster since Chernobyl in 1986. More than 160,000 people were forced from their homes.

Nearly two years later, hundreds of metric tons of groundwater is seeping into the damaged reactor buildings every day and mixing with water still being poured on the leaking reactors through a jerry-rigged cooling system. Dealing with the contaminated water has been especially tricky because of equipment failures and high levels of radiation. Shunichi Suzuki, Tepco's general manager for research and development of Fukushima Daiichi decommissioning, said on Friday stopping the groundwater was crucial. "Every day we have approximately 400 metric tons of groundwater," Suzuki told Reuters in an interview. Tepco is building a bypass system to try to stop the groundwater flowing from high ground into the buildings.

On Thursday, March 8, 2013, the Japanese government told Tokyo Electric Power Co. (Tepco) to revise, by June, its roadmap for cleaning up the site, which is expected to take 30 to 40 years. Experts say it could cost at least $100 billion to close the reactors down.

Plugging leaks in the reactors and removing the water is a necessary before removing melted fuel from the

Impact of Fukushima Dai-ichi Crisis

Already strapped to produce profits, the nation's nuclear fleet is anticipating an update from the Nuclear Regulatory Commission in February on possible expensive post-Fukushima retrofits. Exelon's Peach Bottom Plant in York County, Pa., was featured in a simulation by the NRC of a catastrophic accident in 2011 because its boiling water reactor is similar in design to the crippled Fukushima Dai-ichi reactors in Japan. The test found that Peach Bottom came within an hour of core damage. Debate in a congressional hearing following the test focused in part on the role of hardened vents at Fukushima. "Seismic, flooding, hardened vent filtration. Those are the things that may come down the line, and may be expensive," Shahkarami said. "That is the reason some of these plants might shut down because they can't afford to modify." Shahkarami, who visited Fukushima days before the tsunami in 2011 and has been there several times since, discounts some of the parallels being made between U.S. plants and the Fukushima catastrophe. "The Fukushima event was a people problem, it wasn't a technology problem. Our operators are licensed, and we depend

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Flooding complicates clean-up at Japanese nuclear plant

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three damaged reactors.

Two years after the disaster, Japan is facing a third year with most nuclear reactors shut because of safety fears the accident raised. The shutdowns have forced Japan to import more fossil fuels for electricity generation pushing it into a current account deficit.

PLUGGING HOLES—One of the most daunting tasks remains the disposal of water contaminated after it is poured onto the reactors. Radioactive material must be filtered out and stored. Work to treat and store the contaminated water is behind schedule, partly because of the groundwater flooding in. On Thursday, the company announced another delay in an operation to remove most radioactive material from the water. Tepco also needs to plug leaks in the reactors made by firms which included General Electric Co, Hitachi Ltd and Toshiba Corp so they can filled with water to reduce radiation exposure and prepare for the removal of fuel. "We are developing remote technologies to do that, but in case there are too many holes and it is difficult to repair all of them, we have to take a different approach," Suzuki said.

The company may resort to pouring a cement-like material into the reactors' suppression chambers to plug leaks it has not been able to locate, Suzuki said. "One approach we are considering is putting grout, like cement," he said. "In other words, filling it in. That would block all the holes." Removing the ground water may take two to four more years, Suzuki said, adding that it wasn't possible to give a firm schedule. Tepco is building tanks to hold the water and has capacity for 320,000 metric tons of water but wants to increase that to 400,000 metric tons by June. The utility is considering several measures to dispose of the water, including treating and releasing it into the sea. But Tepco officials said they would not go ahead with that without the consent of authorities. Credit: Reuters

Impact of Fukushima Dai-ichi Crisis

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on them to make a decision right on time. Let's talk about venting. Our procedure says once you get to [a certain] pressure, you are going to vent. There is no question in my mind that my operator would vent; they would never let the pressure build up like it did at Fukushima," Shahkarami said. "Fukushima, at the end of the day, was human error issues and cultural issues. They had the opportunity to arrest that, and they didn't do it. There were opportunities to mitigate problems way before it happened, and they didn't do it. I don't believe in this country we have that issue. We do not pick up the phone and call the president of the country to make a decision on venting or not. The reactor operator and a shift operator in a control room make that decision. They were calling their prime minister. The prime minister flew to the site; they were worried about venting and having him present. That's a cultural issue."

Southern California Edison Comments on MHI Evaluation of San Onofre Nuclear Plant Steam Generators

ROSEMEAD, Calif., March 8, 2013 — An evaluation by Mitsubishi Heavy Industries (MHI) made public today cites ineffective tube supports, dry steam and high steam flow velocity as causes of excessive wear in the steam generators MHI supplied to Southern California Edison's (SCE) San Onofre Nuclear Generating Station.

SCE previously disclosed these same causes based on its own investigation, and the Nuclear Regulatory Commission's (NRC) augmented inspection team report last July found that MHI's use of faulty computer modeling in the design process caused MHI engineers to inadequately predict the dryness of the steam, measured by void fraction, in the replacement steam generators.

MHI repeatedly reassured SCE of the efficacy of the design. During the design phase of the project, MHI advised SCE that, based on its own review and analysis, the maximum void fraction that MHI expected to occur was acceptable, did not require additional design changes or measures, and that the replacement steam generators would perform as warranted.

"SCE's own oversight of MHI's design review complied with industry standards and best practices," said Pete Dietrich, SCE senior vice president and chief nuclear officer. "SCE would never, and did not, install steam generators that it believed would impact public safety or impair reliability."

In fact, MHI states in its root cause report (page 41), that its analysis of conditions in the steam generator during the design phase (which calculated void fraction and steam flow velocity) concluded that the thermal hydraulic conditions in the San Onofre steam generators were acceptable, and specifically that there was no need to reduce void fraction1. Additionally, SCE never rejected a proposed design change to address void fraction based on its impact on compliance with 10 CFR 50.59.

"At no time was SCE informed that the maximum void fraction or flow velocities estimated by MHI could contribute to the failure of steam generator tubes," said Dietrich. "At the time, the design was considered sound." SCE is disappointed that MHI decided on its own to redact some information in its evaluation about the flaws in the computer codes. However, the NRC publicly disclosed the computer code flaws three months before MHI completed its evaluation. In addition, the corrective actions and other statements included in the evaluation make it evident that there were

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Southern California Edison Comments on MHI Evaluation of San Onofre Nuclear Plant

problems with the computer modeling that failed to predict conditions that led to the tube-to-tube wear.

SCE has proposed operating Unit 2 at 70 percent to decrease velocity and decrease steam dryness to increase damping, thus preventing the conditions that led to excessive wear. The proposed restart plan was validated using a different computer model and has been reviewed by independent experts.

The San Onofre nuclear plant is the largest source of baseload generation and voltage support in the region and is a critical asset in meeting California's summer electricity and clean energy needs. Both units at San Onofre are currently safely shut down. Unit 2 remains shut down since it was taken out of service Jan. 9, 2012, for a planned outage. Unit 3 was safely taken offline Jan. 31, 2012, after station operators detected a leak in a steam generator tube.

NRC approval is required before SCE can restart Unit 2. The repair, corrective action and restart plan for Unit 2, along with additional technical information to address questions from the NRC, are available to the public at www.SONGScommunity.com

US Nuclear Power: Bloodied, but Unbowed

February 8, 2013. in Utility Stocks.—Duke Energy Corp (NYSE: DUK) announced this week that it will permanently close the Crystal River nuclear plant it acquired as part of last year's merger with the former Progress Energy.Crystal River's operating license won't expire until 2016. The 36-year-old Florida reactor, however, had been closed for some time, following the 2009 discovery of cracks in the concrete building housing the 860-megawatt reactor. And while a company report last year concluded a fix would cost $1.49 billion, indications were rising that the expense could soar as high as $3.43 billion in a worst case.

The decision of what to do with Crystal was rumored to have played a role in the ouster of Progress' former CEO. Initially slated to be CEO of the post-merger Duke, he had allegedly favored spending whatever it took to get the nuke back up and running. But whatever the backroom politics, the move seems to have boiled down to simply this: extreme uncertainty about the cost of restarting an aging nuclear plant that may not have been relicensed by the Nuclear Regulatory Commission (NRC). In the end, that option just didn't stack up against the availability of cheap natural gas-fired generation to replace it. The decision to shut Crystal isn't entirely painless. An insurance settlement will enable Duke to recover the estimated $835 million in refunds for amounts already billed to its Florida customers relating to the plant. And there's no real assurance of what Florida regulators will pass along in rates from the needed investment in generation to replace Crystal.

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China May Sell Nuclear Reactors Overseas This Year, Daily Says

By Benjamin Haas - Mar 7, 2013 11:34 PM CT.—China may sign the first foreign orders for its CAP1400 nuclear reactor this year, the China Daily reported today, citing Sun Qin, chairman of the nation's largest atomic plant builder. The first orders for the Chinese-developed technology will probably come from South America or Asia and may be finalized if a CAP1400 reactor begins construction in China by the end of the year, the newspaper said. Sun, chairman of China National Nuclear Corp., declined to identify specific countries. The Chinese technology is attractive because of the "favorable and unconditional" credit conditions offered to other nations, according to the report. CNNC didn't immediately respond to faxed questions about the loans or the countries that are interested in buying reactors. Gu Jun, general manager of State Nuclear Power Technology Corp., said on Feb. 1 in Beijing that "exploration of the global market" for the CAP1400 will start this year. SNPTC is China's state-owned nuclear technology company. The CAP1400 reactor is based on Toshiba Corp's (6502) Westinghouse AP1000 design. China was the first country to start construction of the so-called third generation reactor, and later increased the power it can produce from 1,000 megawatts to 1,400 megawatts with an eye toward exports. China may account for more than half of the nuclear capacity built between 2010 and 2020 worldwide, according to Deutsche Bank AG. Chinese companies will have a "strong domestic playing field to raise their profile," helping them to become key competitors globally, Michael Tong, a Hong Kong-based analyst at Deutsche Bank,

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Even all that, however, was worth it to eliminate Crystal as a future drain on Duke's earnings and balance sheet. And the company's investors seem to agree, as the stock has rallied sharply since rumors of the decision began to emerge. Credit raters also apparently concur. Moody's, for example, issued an opinion following the announcement that affirmed credit ratings for Duke and its Progress Energy unit. The rater noted the insurance settlement, low gas prices, avoidance of a long and uncertain restart process, and flexibility in decommissioning the plant as reasons for its favorable view. Duke has up to 60 years to completely decommission the facility, allowing it to cover the cost with the $600 million fund already established without raising new money to finish the job. That's about as close to a win-win for the company and its shareholders as is possible in a case that involves such a huge asset. The broader question is whether we'll see more nuclear plants shut down this way–and will this affect plans to build a new generation of nuclear power plants in the US?

Not the Only One—To be sure, Crystal's not the only nuke from the old generation of plants being shut down as we speak. Dominion Resources (NYSE: D), for example, has plans to shut the Kewaunee nuclear facility in Wisconsin. The reason isn't operating plants or relicensing, as the NRC had already renewed its right to operate until 2033. Rather, it was the plant's small size that makes output uncompetitive with gas-fired generation at these prices.

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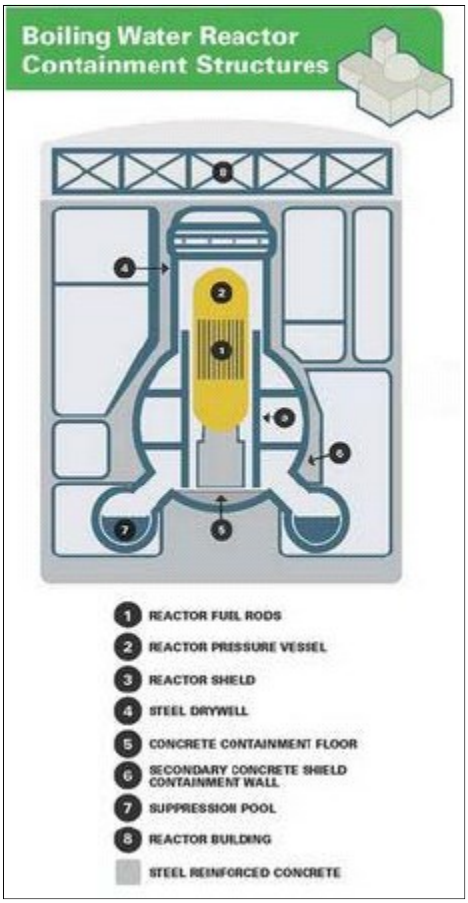
Filtered Vents and Boiling Water Reactors: It's Not About the Costs



Recently, we've seen a spate of media reports that have accused the nuclear industry of opposing the installation of filtered vents on Mark I and II boiling water reactors (BWRs) simply because of cost considerations.

Needless to say, a number of us here at NEI are troubled by that accusation given the extensive research industry has produced buttressing our position that demanding that filtered vents be installed on every Mark I and II BWR is a "one-size fits all" solution.

Instead, the industry advocates what we call a "performance-based" approach where each of the 31 BWRs in the U.S. would make an individual determination of what course constitutes the best way forward -- an approach that would neither rule out nor mandate the installation of filtered vents.

To shed some additional light on this alternate way forward, Jason Zorn, NEI's assistant general counsel and Steven Kraft, NEI's senior technical advisor for used fuel management, have co-authored an article called, "Filtered Vents and Boiling Water Reactors: It's Not About the Costs." We've posted the article in full at our Safety First microsite, but here is the relevant excerpt:

Is there a better solution? Yes.

One approach marries the need to cool the uranium fuel debris by injecting water into the containment building with filtering radioactive material from the vent gases with that water.

A September 2012 report by the Electric Power Research Institute (EPRI) evaluated several potential radiation filtering strategies and assessed their abilities to avoid radiation releases. The report emphasized the need to cool the fuel debris during a severe accident. Otherwise, the melted fuel will rupture containment and releasing radioactive materials into the environment bypassing the vent and any filter that might be installed.

Ensuring core cooling this way has the added benefit of "filtering" radioactive material inside the containment building. The water in containment would work the same way that it would in an external filter. Thus, keeping damaged fuel cool through the injection of water, with its inherent filtering capability, challenges the basis for compelling external filters at 31 reactors.

This is not a new concept. In the late 1980s, when the NRC wanted the BWR Mark I plants to add containment vents to prevent over-pressurization during an accident, the vents were piped through the internal suppression pools (water already in containment as part of the existing design to cool and reduce the pressure of the containment atmosphere during accidents). NRC staff reviews dating back to 1993 stated that an "external filter would not significantly increase the removal

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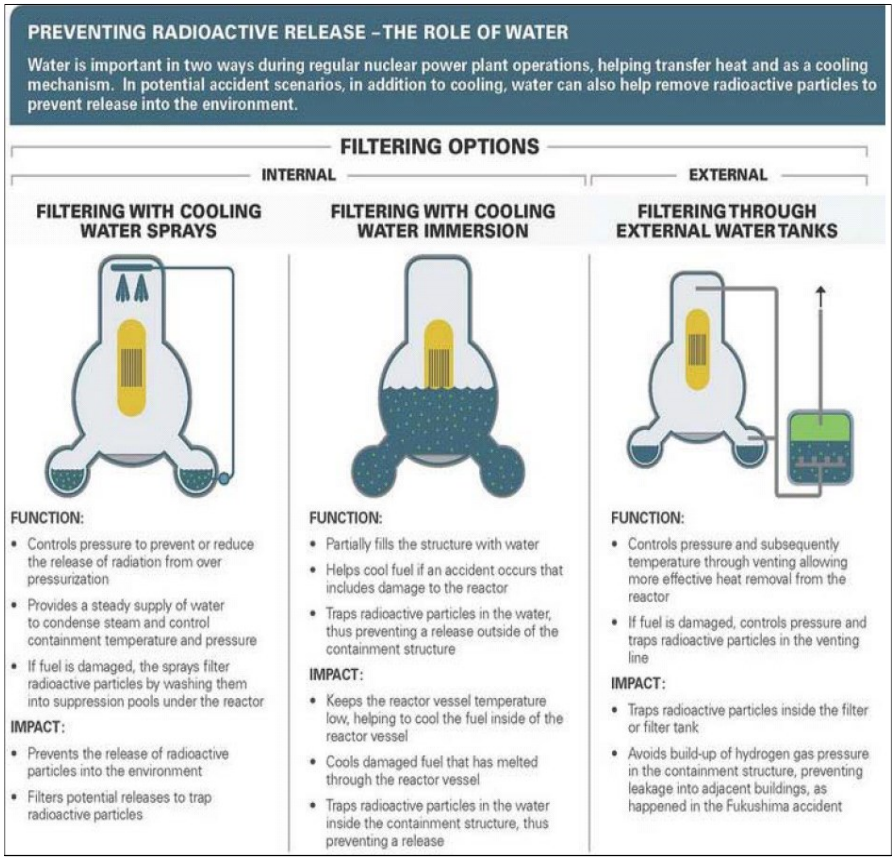
Filtered Vents and Boiling Water Reactors: It's Not About the Costs

of radioactive material…."

In light of the significant body of research on this issue, the industry has recommended that the NRC consider less-prescriptive filtering strategies. Consistent with the EPRI research, filtering strategies focus primarily on providing additional ways to get water to the fuel during a severe accident and to control pressure in containment. Rather than a prescriptive solution like external filters that has limited benefit and may not provide for additional water to cool the core, the industry envisions that each company would assess the issue on a site-by-site basis and develop an approach that best suits each site.



As pointed out numerous times industry testimony and letters to the NRC, filtering strategies based on the individual plant evaluations could result in the installation of a vent filter if that's what makes sense for a given plant.

Even the NRC's Advisory Committee on Reactor Safeguards -- an independent body that reviews NRC staff activities and provides independent recommendations to the Commission – supports the proposal to look at performance-based solutions at each reactor.

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Dominion had tried in vain to find a buyer for the facility, which sells its power wholesale and therefore does not fit the company's strategy of focusing on fee-based business and long-term contracts. The resulting $281 million write-off of the plant's value, however, is minor for a company of its size. And a trust fund will pay for the shutdown of the plant and removal of radioactive material. The upshot is a decision based on economics that will wind up saving Dominion money in the long run, while allowing it to eliminate another part of its business with variable profitability. And as with Duke's move on Crystal, the market's view has been positive.

There are other nuclear plants in the US where economics combined with politics may spur similar decisions. California's San Onofre nuclear plant, jointly owned by units of Edison International (NYSE: EIX)

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disaster on March 11, its anti-nuclear movement appears to be struggling and disgraced pro-nuclear forces are rallying.

Although a recent survey showed some 70 percent of Japanese want to phase out nuclear power eventually, an equal number back their new, pro-nuclear prime minister, Shinzo Abe, who wants to restart off-line reactors if they meet new safety standards as he pushes policies aimed at reviving a long-stagnant economy.

The anti-nuclear movement will have a chance to show its strength this weekend as Japan commemorates the disaster. The Metropolitan Coalition Against Nukes, which organized many of last year's mass protests, has called for a mass rally to protest outside parliament on Sunday, the eve of the anniversary.

The March 11, 2011 quake and tsunami killed nearly 19,000 people and smashed Tokyo Electric Power Co's Fukushima plant, triggering meltdowns, spewing radiation and forcing some 160,000 people to flee their homes, many never to return. The disaster also destroyed a carefully cultivated myth that nuclear power was cheap and safe - and mobilized Japan's often apathetic voters in huge anti-nuclear demonstrations during a 2012 summer of discontent.

Half a year later, the pro-nuclear Liberal Democratic Party (LDP) swept back to power - not because voters had changed their minds about energy policy, but because neither the then-ruling Democratic Party of Japan (DPJ) nor smaller opposition parties provided a credible standard-bearer for anti-nuclear sentiment.

Now, the issue seems to have been swept aside amid hopes Abe can revive the economy and restore dented national pride. "Two years have passed, the economic situation is getting better ... and it may be true people are forgetting about energy issues," said Hiroshi Takahashi at the Fujitsu Research Institute, a member of the panel that drafted the DPJ government's plan to exit atomic energy by the 2030s.

NUCLEAR CORRIDORS OF POWER—Takahashi, along with most other experts who questioned whether Japan should stick with atomic energy, has been bumped from the panel as Abe's government begins its policy rethink.

Abe's government plans to review from scratch his DPJ predecessor's plan to exit nuclear power while boosting renewable sources of energy such as solar and wind power, and wants to restart off-line reactors that are certified safe under standards now being drafted by a new Nuclear Regulatory Agency.

"The 'nuclear village' is back in the driver's seat," said Jeffrey Kingston, director of Asian studies at Temple University's Japan campus. The term 'nuclear village' refers to the powerful nexus of politicians, bureaucrats and utilities that for decades promoted atomic power in Japan. "All the noises from the government are in favor of restarts ... They own the corridors of power." All but two of Japan's 50 reactors remain switched off after the disaster and no more are expected to be restarted until after July, when the new regulator is due to finalize tougher safety requirements more in line with international norms. That would also be after an upper house election that Abe's ruling bloc needs to win to cement its grip on power. The 58-year-old Abe, who has focused on reviving the stagnant economy since taking office in December, is enjoying sky-high popularity ratings of around 70 percent.

Surveys suggest, though, that anti-nuclear sentiment may be simmering beneath the surface. Fifty-nine percent in an Asahi newspaper poll last month wanted Japan to abandon atomic energy by the 2030s and another 12 percent by a later date. Only 18 percent said Japan should stick with nuclear energy indefinitely.

Nuclear energy supplied nearly 30 percent of Japan's electricity needs before Fukushima and proponents argue it is vital to provide a stable electricity supply, keep down utility rates and prevent Japanese manufacturers from fleeing overseas in ever greater numbers, taking jobs with them. "You'd think that people would have acquiesced to the so-called facts, but that doesn't appear to be the case," said Andrew DeWit, a professor at Rikkyo University in Tokyo who writes about energy policy. "People are not going out into the streets but there is a lot of outrage. It's like a dry forest waiting for a spark and restarts will be the real test."

US Nuclear Power: Bloodied, but Unbowed

and Sempra Energy (NYSE: SRE), is one candidate. Unit one has already been shut. Units 2 and 3, meanwhile, have been out of operation since January 2012, when operator Edison discovered steam generator damage. And the NRC has not acted on a plan for a restart of Unit 2, held at 70 percent capacity to avoid shaking damaged pipe.

To be sure, California needs the energy, which is enough to power 1.4 million homes. Politics, however, is decidedly anti-nuclear in Sacramento, with powerful forces suggesting very damaging lawsuits if San Onofre's owners push ahead to restart the reactors. That's despite the fact that the CEO of California's Independent System Operator has asserted that the power grid will "remain fragile" until the reactors are operating again.

Limits of Shutdowns—San Onofre remains a very uncertain situation, and the plant is a likely candidate for eventual shutdown. But given that California's already sky-high power rates will only go higher if that happens, it's highly doubtful most other states will follow that example. For one thing, despite being much maligned in the press, the vast majority of nuclear plants continue to run efficiently and safely. Exelon Corp (NYSE: EXC), for example, owns and operates 20 percent of US nuclear power capacity and reported a 93 percent operating rate in the fourth quarter of 2012.And Entergy Corp (NYSE: ETR), which is the next largest operator, came in with a 90 percent operating rate, despite an outage at a New York plant due to a transformer issue. That compares with an average nationwide operating rate of about 65 percent in the mid-1990s, when most plants were owned by regulated utilities.

As for low natural gas prices, utility executives tend to have a much longer view than the public. Gas prices are low now, and the consensus view is they will likely remain so for some years yet. That, however, was also the conventional wisdom in the late 1990s, when a building boom of gas plants spurred demand and sent prices soaring into double-digits by 2005. It may be a while before we see gas prices surge again in the country, given the surplus of shale capacity.

But with demand rising in North America and export capability developing, sooner or later they're going to move closer to global prices, which are at double-digits in both Asia and Europe. When that happens, nuclear power is going to look a lot more attractive. And the trick could turn even faster if Washington does eventually enact a carbon tax, or even as Environmental Protection Agency regulations on carbon dioxide are tightened.

To be sure, nuclear power is on its heels now. But those who expect a mass wave of shutdowns of existing capacity–or for Southern Company (NYSE: SO) and SCANA Corp (NYSE: SCG) to cancel construction of new plants–are setting themselves up for disappointment. At 20 percent of the US power mix, nuclear isn't going away, no matter how much some may hope it will.

NWI SUPPORTS ANS CONTE

The American Nuclear Society's Conference on Nuclear Training and Education was held in Jacksonville, FL February 3-6, 2013. An International Forum for the Discussion of Issues Facing Nuclear Energy Training and Education was supported by over 30 vendors including NWI with over 350 participants from the US and international nuclear energy representatives. Variaous themes included HU Performance Improvement, Workforce Planning/Recruiting, Personnel Training/Qualification/Education, Accreditation/International Standards, Nuclear Uniform Curriculum Program/Partnerships, Engineering Education/Use of Technology, Leadership Development, IAEA/ Developing Workforce/Newcomer Countries, Training for New Nuclear Plants, Impact of Fukushima, Simulator Changes in the Industry, Operator Fundamentals, Safety/Nuclear Security/Safeguards Training and Education & Holding the Line on SAT.

NWI Products And Services

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- TVA Nuclear Power Group—QA/Performance Imp. Support
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- Entergy—Nuclear Oversight/Safety Review/Outage Management
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Thank You

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