



# Nuclear Energy Updates

## U.S. Risks Losing Clean Electricity As Nuclear Plants Shut Down

APS, December 2013. Four nuclear power plants, sources of low-emissions electricity, have announced closings in 2013. If plants continue to shut down instead of extending operations the nation risks losing 60 percent of its clean electricity starting in 2030, according to a new report, *Renewing Licenses for the Nation's Nuclear Power Plants* by the American Physical Society (APS).

Power plants across the country, including ones in California, Wisconsin, Florida and Vermont, are being shuttered as utility companies opt to build natural gas plants rather than extending operation of nuclear reactors. Operators of an additional 38 reactors in 23 states are facing decisions on whether to extend operating licenses. Currently, there are approximately 100 nuclear reactors in the United States.

"Nuclear power plants provide the nation with a source of clean energy at a time when renewables such as solar and wind are not yet ready to fill the potential gap in the nation's base power needs created by the

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## REGULATORS REMOVE NEGATIVE FINDINGS AGAINST TVA NUCLEAR PLANTS

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*Chattanooga Times Free Press, February, 2014.* TVA's nuclear power program, rated among the country's worst two years ago after regulators discovered safety problems at all three of the utility's plants, is on the mend. The U.S. Nuclear Regulatory Commission is lifting negative findings against each of TVA's operating nuclear plants this month after inspections late last year showed TVA has resolved questions over potential flood risks to the riverfront power plants.

Regulators on Wednesday night said they are removing both "yellow" and "white" warning flags thrown against TVA's Watts Bar plant near Spring City. That comes after NRC also agreed over the past couple of weeks to lift a negative "red" flag at the Browns Ferry Nuclear Plant in Alabama and lifted a "white" flag given the Sequoyah plant near Soddy-Daisy. TVA President Bill Johnson said TVA's nuclear program is improving and has set a goal of being a top quartile performing utility within the next several years. "Our operational performance in nuclear has not been as good as it should be -- that's obvious from any indicator that you look at," he said. "But we are making progress as you can begin to see by our results." TVA is investing tens of millions of dollars to protect its nu-

## On Wall Street and All Around the Electricity Grid

Mark Flanaganat, NEI



*NEI Nuclear Notes, February, 2014.* If you missed NEI's Wall Street Briefing – and you might have if you were in a snow bound part of the country this winter– there was off key singing, a scandal and a major fistfight. Well, ok, none of that, but a pretty good overview of the nuclear world in 2013 and 14. You can watch the archived webcast and view the slides at the presentation (as a PDF) at <http://www.ustream.tv/channel/nei-s-wall-street-briefing>. It's handy to have the latter at hand while viewing the former.

What you can't see is how well attended and managed the event was, especially during a major snowfall. The trick in succeeding at this kind of event is to make sure the media has an opportunity to talk to the speakers. You can see the print press in action during the Q&A, but TV and radio reporters need special consideration – and got it, with several of the speakers able to appear on camera or on microphone to do one-on-one interviews.

This is important, because it gets the messages at the briefing out to a larger audience – the one that doesn't read newspapers but is still generally interested in energy topics. You can't really pick this up in the video, but it's key to getting out the nuclear story.

One of the points about nuclear energy that has gained considerable traction is its role in grid stability. Particularly in unregulated “merchant” electricity markets (that is, mostly outside the old south), older, smaller nuclear power plants provide a diversity of supply and help stabilize the electric grid, but, to quote NEI President and CEO Marv Fertel at the Wall Street briefing, they also “are vulnerable to weak market conditions. Absent necessary changes in policies and practices, this situation has implications for reliability, long-term stability of electricity prices, and our ability to meet environmental goals.”

There is more concern with increased environmental regulation on coal plants knocking them off the grid, but recognition that losing *any* baseload energy plant, including nuclear reactors, has the unintended impact of potentially destabilizing the grid by sidelining 24/7 baseload energy.

Unless you believe that natural gas prices will stay below \$4 per million Btu for the next 20 years, there is no rational economic reason or public policy rationale to allow nuclear plants with safe and reliable operations, like Kewaunee in Wisconsin and Vermont Yankee, to shut down, as both will have done by the end of this year. Sooner or later, they must be replaced and, when they are, they will be replaced with generating capacity that will produce higher-cost electricity, and provide perhaps only 10 percent of the jobs lost when a nuclear plant closes.

Fertel is among a group responding to a forum question about Senator L. Murkowski's report (dated February 4, 2013) and also about the armed attack on a California substation suggesting terrorist activity against the grid. The latter is very important but more correctly an issue for grid operators.

Some of the other responses show that Murkowski and Fertel are on to something. This is Hal Quinn, president and CEO of the National Mining Association, taking it from the coal angle (NMA also includes uranium mining among its concerns):

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## On Wall Street and All Around the Electricity Grid

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“The alarms sounding from this winter’s arctic weather conditions may foreshadow what lies ahead as looming regulatory deadlines threaten a growing portion of the coal-based power plant fleet that today generates 40 percent of the nation’s electricity, more than any other energy source. EIA’s Annual Energy Outlook 2014 just raised the official forecast for coal plant retirements to a total of 60 gigawatts by 2020. In energy industry terms, that’s just around the corner – and 60 GW is a sizable portion of the 310 GW of total coal-based capacity that existed a little more than a year ago. And that has implications for the grid. More reasonable regulations based on the best available clean coal technologies would be a much wiser course – bolstering grid reliability while continuing to provide environmental gains for the nation.”

Now, obviously, there are competing priorities at work here – carbon emissions vs. grid reliability. In the nuclear instance, carbon emissions do not apply, but the relative value of nuclear generated electricity certainly does. If nuclear energy can keep the grid stable when other energy types cannot – as natural gas could not during the recent cold snaps – isn’t that worth something?

It could be that the the polar vortex caused this issue to snap to the fore, but Murkowski was certainly working on her report well before that. Let’s call it a fortuitous coincidence that provided an opportunity to talk about the grid – and emphasize another area in which nuclear energy shines.

*(Mark Flanaganat, NEI Nuclear Notes, February, 2014.)*

## How can Nuclear Power be Cheap?

John Stewart, Director, Policy and Research

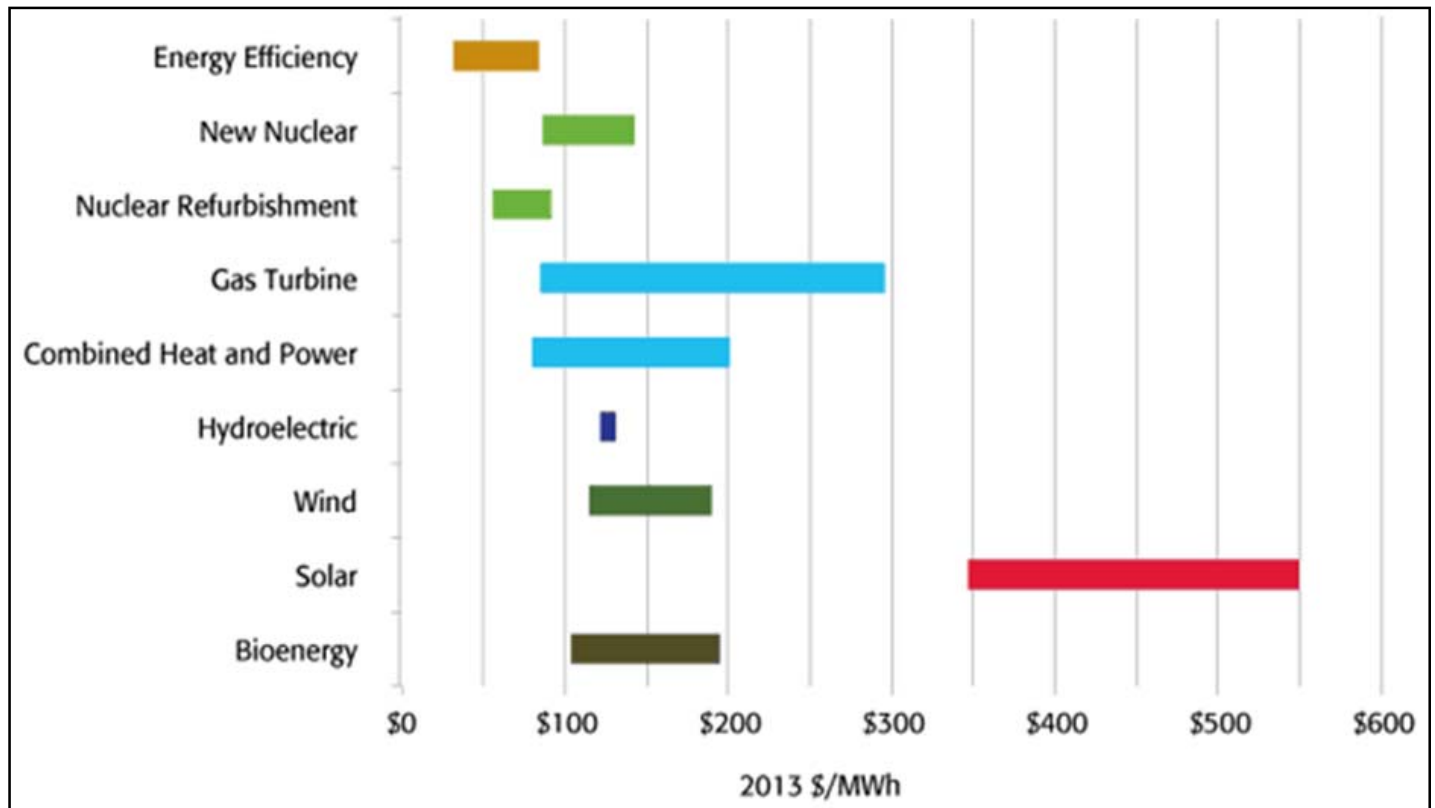
*Canadian Nuclear Association, February, 2014.* I once had a beloved old car – a 1984 Volvo – that didn’t look great, and needed regular work, but ran beautifully. I only scrapped it because my girlfriend hated it. That decision, I figure, cost me several thousand dollars over the next two years as I paid for a pricey lease on a new car.

The two most basic ways to get value out of equipment are to make sure you use it, and to keep it a long time. Cars are getting more expensive and complex, but this doesn’t stop us from buying them. It does lead us to keep them 50% longer than we did a decade ago. These days, my wife and I share our old car with my brother and his wife. We spread the fixed costs of ownership across two families’ driving needs, cutting the fixed costs per family in half. Equipment that’s expensive can still be highly economic. Up-front cost isn’t an obstacle if the equipment runs efficiently, gets used a lot, and lasts a long time.

A nuclear reactor is a big piece of equipment, and the business of owning one is like owning a vehicle, only more so. For nuclear plants, looks don’t count. These plants are designed to run extremely well for a long time, and they do it. They typically produce electricity at 80% or more of their designed capacity, and they last – with refits – for fifty or sixty years. That’s a lot of use over a very long time. How many products do you – or even your employer – own that you know

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## How can Nuclear Power be Cheap?



will have five to six decades of life? The result is cheap, reliable power, as this chart from the Ontario Power Authority shows: A jurisdiction where I do a lot of weekend driving, the province of Quebec, recently decided to decommission its only nuclear plant, rather than give it a mid-life refit. The decision came one week after the election of a new provincial government – before it had even been sworn into office.

The government then asked for an economic analysis. In other words, they made their decision – it was written into their election platform – and then asked for backup. The province's electrical utility, which had planned to refit the plant, came back with re-worked numbers that raised the refit cost by 126%, and the cost of shutting it down by only 12%. Surprise, surprise: the new numbers justified the announced decision.

The utility's new estimate for refit cost was \$4.3 billion. But a refit of a similar reactor came in at \$2.4 billion in neighboring New Brunswick. There, Energy Minister Craig Leonard was quoted saying, "If you look at the market today and try to obtain 700 megawatts of baseload emission-free power for \$2.4 billion, you're probably going to be searching for quite a while." (iPolitics.ca, July 16, 2013, item by K. Bissett).

This story isn't unusual. We often get rid of good things for poor reasons (as with my Volvo). And we more often than not have poor reasons for shutting down reactors early. Many, like Quebec's, are political (kind of like scrapping a car at a girlfriend's request). These days, some good nuclear plants

## How can Nuclear Power be Cheap?

are driven out of business by ultra-cheap fossil fuels. In these cases we are not giving enough weight to clean air or to having alternatives. The latter is like scrapping our cars because the local taxi service is giving us a month's worth of free rides. The problem, of course, is what happens at the end of the month. We're caught without cars, we're hostages to the taxi business, and we're paying taxi fares two to four times a day. Our cost of getting around has quintupled! This is why so many countries continue to choose nuclear. According to the WNA, nearly twice as many reactors will start up as shut down by 2030. India has six future units under construction, Russia has ten, China has twenty-eight. A long list of other countries are following, from Turkey to Saudi Arabia to Argentina. Yes, nuclear power generating capacity has a capital cost and it takes time to build. But as we have seen, high capital cost is compatible with good economics. Good efficient equipment, used well, maintained well, and kept long, pays off.

*(John Stewart, Canadian Nuclear Association)*

## Fracking Could Dispose of Nuclear Waste

*Tia Ghose, Staff Writer*

*LiveScience, December, 2013.* Nuclear waste could one day be disposed of by injecting it into fracking boreholes in the Earth, at least if one scientist's idea takes hold.

The method, presented here Monday (Dec. 9) at the annual meeting of the American Geophysical Union, would mix nuclear waste with other heavy materials, and inject it a few miles below the Earth's surface into drilled holes. The key is that, unlike fluids used in most hydraulic fracturing, or "fracking," the nuclear slurry would be heavier than the rock in which it is injected. "It's basic physics here — if it's heavier than rock, the fracture will propagate down," said study co-author Leonid Germanovich, a physicist and civil and environmental engineer at the Georgia Institute of Technology. In theory, then, the nuclear waste would inch downward, going deeper into the Earth over time.



A drilling rig in North Dakota near the town of Stanley. Fracking is used in this area to tap oil reserves.

But the idea is still theoretical, and at least one expert thinks there are too many practical and safety concerns for the scheme to work. "I can't see it being a feasible concept, for many reasons," said Jens Birkholzer, head of the Nuclear Energy and Waste Program at Lawrence Berkeley National Laboratory in Berkeley, Calif.

### Contentious issues

Hydraulic fracturing, or fracking, involves drilling a deep well more than a mile (1.6 kilometers) below the surface, and injecting fluids into the hole at high pressure. This creates cracks or fissures through which the fluid can propagate. Environmentalists fear that fracking can contaminate the wa-

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## Loan Program for Reactors Is Fizzling

*New York Times, February, 2014.* Energy Secretary Ernest Moniz is announced that he will finish a \$6.5 billion loan guarantee and another soon for \$1.8 billion to help three Georgia electric companies build the first new nuclear reactors in the United States in three decades.

But the announcements are coming far later than anticipated and may effectively end a program that Congress established in 2005 to jump-start a new generation of nuclear plants. At one point, the program was expected to support more than \$50 billion in loans for nuclear projects.

The guarantees are to go to Georgia Power, a subsidiary of the Southern Company, which owns 45.7 percent of the Vogtle nuclear project, near Augusta, and the Oglethorpe Power Corporation, a nonprofit consortium of smaller companies, which owns 30 percent. A third company, MEAG, a consortium of municipals, which owns 22.7 percent, will get a guarantee of \$1.8 billion soon, according to government officials.

Little in the nuclear loan guarantees program has gone as planned. Congress authorized \$17.5 billion in lending authority in 2005, on the theory that a nuclear renaissance was about to begin but that it would require credit help from Washington. In 2011, the administration, with bipartisan support, called for adding \$36 billion.

But the construction boom never happened. The Energy Department offered a \$2 billion guarantee to Areva, a European nuclear company, to build an enrichment plant in Eagle Rock, Idaho, but Areva later dropped the construction plans. Another company, USEC, is seeking a \$2 billion loan guarantee for the same purpose, to commercialize a new enrichment technology it is demonstrating in Piketon, Ohio, but it is having a hard time convincing the department that it is a good investment.

Constellation Energy, the company that owns Baltimore Gas and Electric, combined with Areva to plan a reactor about 50 miles south of Washington and sought a guarantee for a \$7.76 billion loan, but the department asked for an \$880 million payment in exchange for taking the risk. In October 2010, negotiations broke down and Constellation walked away from the planned reactor.

The department has negotiated for years with the Vogtle reactors' builders over loan terms. Southern had asserted that it would take the loan if the terms were better than it could get on the commercial market. The reactors are scheduled to enter service in 2018 and 2019.

Thomas A. Fanning, Southern's chairman, said in an earnings call on Jan. 29 that it would save the company's customers \$200 million — substantial, but a fraction of the total project cost, now expected to be in the range of \$15.5 billion.

Antinuclear groups have predicted that Vogtle would never be finished or be profitable and that the government would never recover its investment. But Southern has a strong balance sheet and captive customers, whom the Georgia Public Service Commission can force to pay for the investment.

## Loan Program for Reactors Is Fizzling

The Vogtle loan guarantees may be the only ones under the program. The only other new nuclear construction project in the United States at the moment is the V. C. Summer 2 and 3 reactors, which are similar in design to the Vogtle units. The lead company in the Summer project, South Carolina Electric and Gas, intends to go it alone. Stephen A. Byrne, the company's chief operating officer, told analysts on Feb. 13 that it was easier to raise money commercially. "Everything we offer is over-subscribed," Mr. Byrne said. Getting a government loan guarantee requires extensive financial disclosures to the federal government, and paying fees. "I'm not sure why I'd want to," he said.

*(By Matthew Wald, The New York Times - February. 18, 2014)*

## Fracking Could Dispose of Nuclear Waste

ter supply. Other studies have found that the process of injecting the wastewater from fracking into the Earth can trigger small-scale earthquakes. Advocates of the process in the oil and gas industry, meanwhile, contend that fracking is safe and that fears about the process have been overblown. Nuclear waste disposal causes controversy of its own. The government initially planned to bury its long-term nuclear waste — which can be radioactive for 100,000 years — deep in mines underneath Yucca Mountain in Nevada, but after almost 40 years of opposition from environmentalists, the plan was put on hold indefinitely.

### Theoretical work

Germanovich had wondered whether fracking could safely dispose of nuclear waste, as long as the fluid went downwards into the rock and not back up into surface water. The team used a theoretical model to describe the nuclear slurry's trajectory through the rock, then looked through past research and found that the physics of the problem had been well studied in the lab. As long as fluids are pumped at the proper rate, the heavy slurry of radioactive waste would fall straight down in a long, finger-like projection towards the Earth's core, and it wouldn't spread outward, Germanovich said. The team is now partnering with an outside company to do small-scale field experiments (with non-radioactive materials). The basic physics make sense, Birkholzer said. "If it's heavy enough, then it shouldn't come up," he told LiveScience.

### Many obstacles

But that is only one of many obstacles. Researchers would need to make sure the boreholes were placed correctly, so that there was no chance the nuclear waste could somehow contaminate an underground water supply. And because these materials will be radioactive for more than 100,000 years, it's important to find a solution that won't fail a mere 10,000 or 20,000 years down the line. And with such deep boreholes, there aren't good chances to inspect the subsurface or the geology of the rock, Birkholzer said. In addition, the work of injecting the radioactive slurry into the borehole could be tricky. "You really don't want to be close to this material," Birkholzer said. "The whole worker-safety issue is to me a big concern." Even current fracking projects occasionally have accidents, he said. For some nuclear waste, the government is considering drilling deep, wide

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## **U.S. Risks Losing Clean Electricity As Nuclear Plants Shut Down**

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loss of nuclear power. Utilities should consider extending the licenses of power plants, which unlike coal and natural gas plants, do not emit any major air pollutants as identified in the Clean Air Act,” said Roy Schwitters, chair of the APS report.

Although natural gas is cheap, its future remains uncertain. Questions about concerning the availability of the gas in the U.S. and infrastructure and environmental costs associated with fracked wells.

Four prominent climate and energy scientists recently released an open letter to world leaders, calling on them to support safer nuclear energy systems as a practical way to address global warming. “While it may be theoretically possible to stabilize the climate without nuclear power, in the real world, there is no credible path to climate stabilization that does not include a substantial role for nuclear power,” states the letter from Ken Caldeira (senior scientist, Department of Global Ecology, Carnegie Institution); Kerry Emanuel (atmospheric scientist, MIT); James Hansen (climate scientist, Columbia University Earth Institute); and Tom Wigley (climate scientist, University of Adelaide and the National Center for Atmospheric Research).

Extending operating licenses for reactors in a safe and reliable way is a smart move, as they are a “near carbon-free source of energy,” according to the APS report. The Nuclear Regulatory Commission allows power plants to operate up to 60 years, but extensions are available for an additional 20 years. The report finds that there are no technical show stoppers to running some plants for up to 80 years.

Furthermore, it urges utilities to consider the financial and environmental consequences of carbon emissions in their business decisions regarding nuclear and natural gas plants. Such considerations can also be factors for socially responsible investors who are concerned about increased carbon emissions in the U.S. Investors, with more than \$3 trillion in assets and who use an environmental, social and governance criteria, have been effective at encouraging companies to consider environmental consequences in their business decisions.

The APS report specifically recommends the following:

- An Enhanced Energy Strategy Pathway — As long as licenses can be safely renewed, U.S. energy strategies should make renewal a feasible choice. For example, for energy security and climate change reasons, the federal government or individual states could enact policies that support lowest-carbon sources; or, financial institutions could weigh environmental impact in valuating utilities and banks that finance utilities.
- An Enhanced Research Pathway — A more substantial, fundamental research effort, with a long-term commitment, would better inform the assessments that will drive a decision whether to seek continued operation beyond the current license period. With additional resources, the current program at the U.S. Department of Energy would grow both deeper and broader, serving to reduce financial risks and uncertainties.
- An Enhanced Leadership Pathway — The U.S. government should have a concentrated program to support the development, manufacturing and licensing of new nuclear reactors that can be built, operated and eventually decommissioned in a manner that is safe, environmentally sound and cost-effective.

*(American Physical Society—December 12, 2013)*



# Fracking Could Dispose of Nuclear Waste

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boreholes and burying the material miles below the Earth's surface. But those proposals would encase the radioactive material in thick, shielding canisters that could be safely accessed if needed, Birkholzer said.

*(By Tia Ghose, Staff Writer, LiveScience, December 11, 2013)*

## **REGULATORS REMOVE NEGATIVE FINDINGS AGAINST TVA NUCLEAR PLANTS**

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clear plants on the Tennessee River from potential floods. The March 2011 tsunami in Japan that damaged the Fukushima nuclear plant showed the potential problems from unexpected floods and TVA's own enhanced computer models have uncovered greater risks than previously considered from dam breaks on the Tennessee River. "Over the past couple of years,

TVA has put a lot of emphasis on this and we've invested a lot of money in the plants to get the reliability of their equipment in shape so they can run well," Johnson said. "What we need to focus on now is our operational behavior. Going forward, our goal is to be thought of as one of the better fleets in the country." In trying to license its unfinished Bellefonte Nuclear Plant in Alabama four years ago, TVA discovered that some of its flood risk assessments used to license the Watts Bar, Sequoyah and Browns Ferry nuclear plants were inadequate. TVA has had to install new waterproof seals and doors and raise the flood protection levels for key equipment at the plants to ensure that the plants would operate safely in the event of a dam break and maximum flood.

John T. Carlin, the site vice president at Sequoyah Nuclear Plant, said the problems "were professionally embarrassing" but pushed TVA to improve training, procedures and equipment. "It's made us operate safer and better," Carlin said following a public hearing with the NRC this week. Even nuclear power critics credit TVA for improving the way it operates its plants. "I do think TVA is improving, but we're still carefully monitoring these plants," said Sandra Kurtz, an anti-nuclear activist for the Sierra Club and the Bellefonte Efficiency and Sustainability Team. "These are still very old and very dangerous reactors and these ice condenser reactors (at Sequoyah and Watts Bar) are not very robust to begin with so we're extra concerned about their operations." As TVA improves its operating nuclear plants, the utility also is preparing to request an operating license for a second reactor at its Watts Bar Nuclear Plant -- the first in the U.S. in two decades. Despite initial delays and cost overruns, Johnson said the project is now on schedule toward being finished in 2015. There are potential problems when plant equipment is tested and begins operating, Johnson said. "But I think these risks are very well understood, well planned for and we have mitigation in place so I think we have this project in pretty good shape," he said.

*(Associated Press /Chattanooga Times Free Press, February 18, 2014)*

# NWI Products And Services

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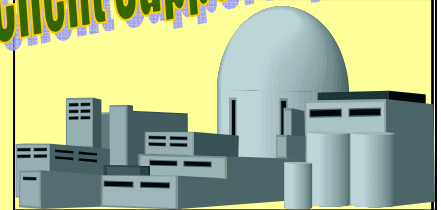
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*The following key activities are being conducted by NWI professionals...*

- PPL SSES PM Optimization & Maintenance Rule
- TVA Nuclear Power Group—BFNP QA/Performance Improvement
- Xcel's Monticello EPU Project
- Entergy—Nuclear Oversight, Performance Improvement/CAP, Maintenance & Training Support
- FENOC Perry Plant's Fukushima FLEX Mod Planning/Scheduling
- Duke Energy's Catawba Ops & MTE Training
- EPRI LOOP Study

## Client Support Update



## Thank You

We wish to express special thanks to the following clients for making NWI a preferred consulting company.

- Entergy's Pilgrim, Palisades, and Grand Gulf Stations
- PPL Susquehanna Steam Electric Station
- TVA's Browns Ferry Nuclear Plant
- Xcel Energy's Monticello
- FENOC's Perry Nuclear Plant
- Duke Energy's Catawba Nuclear Station
- EPRI
- FENOC Fleet Flex Project

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