

## Nuclear Industry Updates

### A Growing Fragility in the U.S. Electricity System

NEI (April 28, 2014) - Posted by Mark Flanagan . In any large market, there are trends that can be predicted and trends that cannot. For example, the loss of San Onofre (and some hydro plants) in California can be predicted to have an impact on the energy market, not least through an increase in carbon emissions. It would seem this is true, per this report from California ISO (the grid managers): The generation gap caused by having less hydro-electric and nuclear generation was filled, in large part, by natural gas. Natural gas generators supplied about 40 percent of ISO energy in 2013, up from 39 percent in 2012 and 28 percent in 2011. That's not too bad – solar energy increased during the same period from 5 percent to 8 percent, so that helped stave off carbon emissions. However, this is the unpredictable part, with no nuclear mention whatever the report states that while total wholesale electric costs increased by 31 percent in 2013, after controlling for the 30 percent in natural gas prices last year, costs rose by 5 percent, primarily because of implementing the state's greenhouse gas emissions cap-and-trade program.

Another factor nudging prices higher in 2013 was a decrease in in-state hydroelectric generation, which was down about

40 percent in the fourth quarter from 2012.

In other words, everything would have been fine if we could just ignore natural gas - which provided most of the electricity. San Onofre was down during 2013, so it doesn't really count in these calculations.

The Los Angeles Times does not directly address California ISO's report, but treats the rising cost of electricity as a permanent condition:

A fifth of all power-generating capacity in a grid serving 60 million people went suddenly offline, as coal piles froze, sensitive electrical equipment went haywire and utility operators had trouble finding enough natural gas to keep power plants running. The wholesale price of electricity skyrocketed to nearly \$2 per kilowatt hour, more than 40 times the normal rate. The price hikes cascaded quickly down to consumers. Robert Thompson, who lives in the suburbs of Allentown, Pa., got a \$1,250 bill for January.

Now, we can milk the polar vortex as much as anyone – and have – but the Times explains why the vortex – a temporary condition – signaled the onset of a new reality:

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### A New Look at Reactor Decommissioning

David McIntyre, Public Affairs Officer (April 24, 2014) - Four nuclear power plants closed in 2013 and another is expected to shut down later this year. That puts decommissioning in the spotlight – so the NRC has produced a new video explaining how it's done. By way of background, the owners of Crystal River 3 in Florida,

Kewaunee in Wisconsin, and San Onofre 2 and 3 in California already have taken the first steps toward decommissioning their plants. They've certified that they permanently ceased operations and removed the fuel from the reactors into their spent fuel pools. Their licenses no longer

(Cont. on Pg. 5)

## Nuclear Helps Exelon Achieve Emissions Goal

World Nuclear News (April 2014) - Upgrades of its existing nuclear power reactors has helped Exelon meet its self-imposed greenhouse gas emissions target seven years earlier than planned. The utility has called on US policymakers to recognize nuclear's role in meeting the country's emission reduction goals.

In 2008, Exelon launched its Exelon 2020: A low carbon roadmap business strategy, under which it aimed to reduce, offset or displace its 2001 carbon footprint by the year 2020. It aimed to eliminate 17.5 million tonnes of annual greenhouse gas emissions primarily through energy efficiency and smart grid programs, economic renewable energy investments, and increased output from its nuclear power plants.

The company has now announced that in 2013 it reduced or avoided more than 18 million tonnes of emissions, meeting its goal seven years earlier than planned. Exelon said that it was able to meet its target early despite the energy industry undergoing major changes since it launched Exelon 2020. These changes include the natural gas boom, the growth of renewables and the expansion of "beyond-the-meter solutions."

As well as the closure of four inefficient, carbon-intensive fossil generating units under the Exelon 2020 program, the company has added 316 MWe of generating capacity at its nuclear power plants since 2008 through a series of upgrades. Exelon is the operator of the largest nuclear power plant fleet in the USA with 22 units at 13 sites, plus a 43% interest in the two-unit Salem plant. Its total nuclear generating capacity is 21,682 MWe. Exelon estimates that these plants avoid some 82 million tonnes of greenhouse gas emissions annually.

Exelon president and CEO Chris Crane commented, "Our reliable, always-on nuclear fleet produces enough affordable, carbon-free energy to power 17 million homes annually." He added, "It is part of a US fleet that provides 64% of our nation's carbon-free electricity, up to a quarter of which could be at risk of early retirement."

Speaking at a meeting of the United States Energy Association in Washington DC yesterday, Exelon chief strategy officer William Von Hoene said that US policymakers must avoid early retirements of nuclear power plants. "The unfortunate reality for nuclear right now is that despite being the largest, most reliable and lowest-emitting power plants - and among the lowest cost - they are not getting recognized or compensated for those attributes," he said. "Renewable energy is an important and growing part of our own generation portfolio and a critical component of our efforts to advance clean energy, but government policies designed to incent investment in low-carbon resources end up threatening that very goal by putting increased economic pressure on certain nuclear plants."

Von Hoene warned that the USA would not be able to meet its emission reduction targets without its nuclear fleet. "The loss of 25% of existing nuclear facilities would cut US progress toward achieving its 2020 climate change goals in half," he suggested. "In fact, closing even a few nuclear plants could make achieving state and national carbon reduction goals difficult or impossible." The Obama administration has pledged to cut greenhouse gas emissions by 17% below 2005 levels by 2020. He stressed, "Our state and federal lawmakers need to seriously examine, now, how their policies must change if they want to preserve the benefits of the nation's nuclear fleet."

Last year saw four US power reactors at three sites - Crystal River, Kewaunee and San Onofre - enter early retirement for economic reasons. These retirements amounted to 3576 MWe of capacity, reducing the US total nuclear generating capacity to 99,098 MWe at 100 reactors.

## A Growing Fragility in the U.S. Electricity System

But it exposed a more fundamental problem. There is a growing fragility in the U.S. electricity system, experts warn, the result of the shutdown of coal-fired plants, reductions in nuclear power, a shift to more expensive renewable energy and natural gas pipeline constraints. The result is likely to be future price shocks. And they may not be temporary.

It gets worse: In California, residential electricity prices shot up 30% between 2006 and 2012, adjusted for inflation, according to Energy Department figures. Experts in the state's energy markets project the price could jump an additional 47% over the next 15 years.

Let's back up a moment and note that nuclear energy performed like a champ during the vortex. Unlike coal, uranium doesn't chunk up in cold piles or get stranded in frozen pipes as does natural gas. If it's at the reactors, it's running the reactors until a spring or fall outage.

There's a bit of nuclear presence in the story: the mandate is just one market force. California has all but phased out coal-generated electricity. The state lost the output of San Onofre's two nuclear reactors and is facing the shutdown of 19 gas-fired power plants along the coast because of new state-imposed ocean water rules by 2020.

"Our rates are increasing because of all of these changes that are occurring and will continue to occur as far out as we can see," said Phil Leiber, chief financial officer of the Los Angeles Department of Water and Power. "Renewable power has merit, but unfortunately it is more costly and is one of the drivers of our rates."

One story and a report – from a single state, albeit a large one – does not herald the coming of Mad Max-style dystopia. Here's the thing: leaning on renewable energy and natural gas while discounting nuclear and hydro power is throwing California's energy profile out of whack. I have more faith than writer Ralph Vatabedi in the capacity of energy mavens to correct course – they'd better, since that's their jobs – but conflicting mandates likely make it harder than not for them to navigate to a solution.

The story ends this way: "If power gets too expensive, there will be a revolt," Leupp [Alex Leupp, an executive with the Northern California Power Agency] said. "If the state pushes too fast on renewables before the technology is viable, it could set back the environmental goals we all believe in at the end of the day."

Or it may remind Mr. Leupp that nuclear energy is not only still around – not least at California's Diablo Canyon facility – but can still do a lot for mitigating both carbon and cost issues. The whole article is worth a read, though you have to filter out some of the more panic-stricken overtones. Nuclear energy feels like the solution to the California puzzle hiding in plain sight; I suspect others may come to that conclusion, too. Is nuclear energy a panacea? No, of course not, but it does answer to an exceptionally broad portfolio of energy issues.

NUCLEAR ENERGY INSTITUTE NUCLEAR NOTES

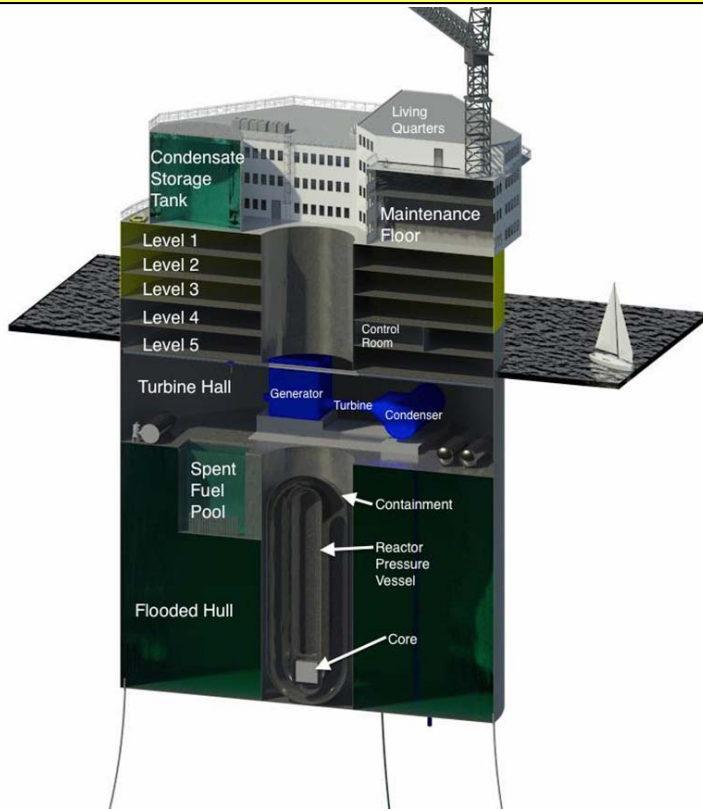


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## Floating Nuclear Power Plants Could Avoid Disasters Like Fukushima



A cutaway of the proposed plant. The reactor is located under over 300 feet of water.

By Jacob Kastrenakes (April , 2014) - Researchers have an idea for how future nuclear reactors can avoid the trauma that led to the 2011 disaster at Fukushima: by building new plants five to seven miles out into the ocean. "This affords some absolutely crucial advantages," Jacopo Buongiorno, a professor of nuclear science and engineering at MIT, which led the research. In particular, Buongiorno says that this distance into the ocean will remove the risk of tsunamis, which won't throw big waves in such deep water, and of earthquakes, the seismic waves of which will be damped by the ocean.

But the plan also offers one far more critical advantage: the ability to avoid potential melt-downs by using the ocean's water as a coolant. "The ocean itself can be used as an infinite heat sink," Buongiorno says. "The decay heat, which is generated by the nuclear fuel even after the reactor is shutdown, can be removed indefinitely." Under the team's plans, nuclear plants would be floating on platforms similar to what's used for offshore oil drilling,

and they'd be designed so that they would automatically be cooled by ocean water should the plant's systems fail by keeping the reactor deep underwater. They don't say how this might impact surrounding sea life.

Underwater cables would transfer power back to shore

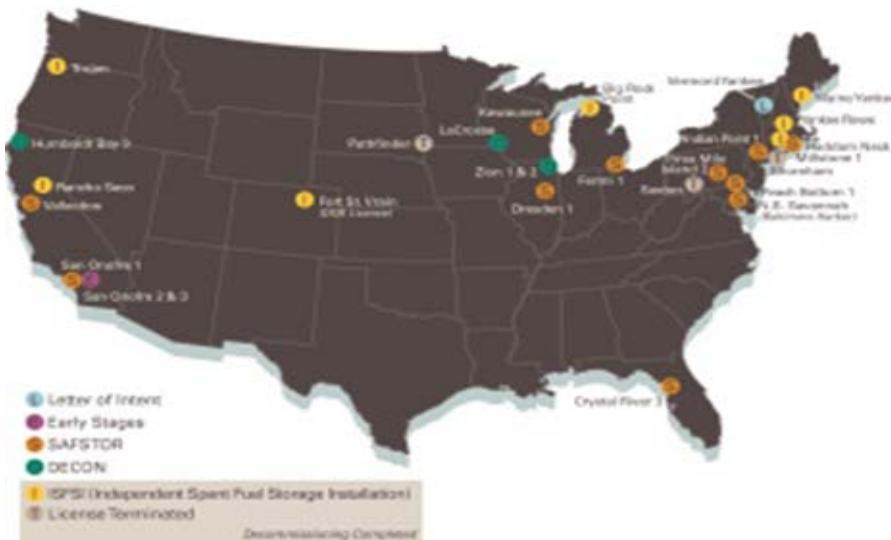
Those advantages would theoretically allow nuclear plants to avoid what happened at Fukushima, which was unable to cool its reactors after being struck by an earthquake and tsunami. MIT believes that the design could be expanded to any size of nuclear plant, and that it's a logical location since these plants are frequently placed beside large bodies of water anyway. These plants would be constructed at a shipyard and then towed to their location offshore. They would be moored to the seafloor, and an underwater cable would transmit electricity back to land. A living quarters for employees would even be placed on the top floor of the plant.

Though Russia is already at work building a floating nuclear plant, it's being placed right beside the shore — not miles out, which would give it the big advantages that MIT is proposing here. It's not clear how long it might take before someone puts this design to use, but MIT argues that it should even be cost effective than other designs by cutting down on elements like concrete that can lead to delays and inflated costs. The work is being presented this week at the Small Modular Reactors Symposium, hosted by the American Society of Mechanical Engineers.



## A New Look at Reactor Decommissioning

### Power Reactors Decommissioning Status



reports on the plant. Crystal River submitted its report last December. Plant owners typically combine two decommissioning approaches: DECON, in which the plant is dismantled and the site cleaned up to the NRC's specifications, and SAFSTOR, maintaining the plant as is for a period of time before final cleanup. Waiting allows the radioactivity at the site to decay, making cleanup easier. (A third approach, entombing the reactor in place, has never been used by NRC licensees.)

Two years before the license is to be terminated, the plant owner submits its License Termination Plan to the NRC. The NRC surveys the site to verify the cleanup has been successful before terminating the license (or amending it if spent fuel is still stored there).

Even more information about the decommissioning process can be found on the NRC website.

allow them to operate the reactors. The owners of Vermont Yankee will do the same when that plant stops operating as scheduled late this year.

The companies then have up to two years to develop and submit decommissioning plans – called the post-shutdown decommissioning activities report, or PSDAR. The report includes a description and a schedule for decommissioning activities and their estimated cost. The report also includes a discussion of why any anticipated environmental impacts have already been reviewed in previous

Posted by Moderator, David McIntyre,  
Public Affairs Officer



## LANDMARKS FOR CHINESE REACTORS

World Nuclear News (April 2014)—Two of China's recent nuclear reactor start-ups are progressing towards full operations. A final test-run has begun in preparation for commercial operation at Ningde 2, while Hongyanhe 2 is now operating at 100% power for the first time.

The 168-hour test-run at China General Nuclear Power Corporation's (CGN's) Ningde 2 is the last of a series of online operational exercises before the 1020 MWe unit begins full-power operations. The CPR-1000 pressurized water reactor was connected to the grid in January, and will be one of four at the site in north-east Fujian province, co-owned by CGN (46%), China Datang Corp (44%) and Fujian Energy Group (10%). Ningde 1 entered commercial operation in 2013, and Ningde 3 and 4 are expected to begin operations in 2014 and 2015 respectively.

Meanwhile, CGN has announced that Hongyanhe 2 has reached 100% power for the first time. The unit, also a CPR-1000, was declared in commercial operation in February after being connected to the grid last November.

Hongyanhe is owned and operated by Liaoning Hongyanhe Nuclear Power Co, a joint venture in which CGN holds a 45% stake alongside China Power Investment Corp (45%) and Dalian Municipal Construction Investment Co (10%). Two further units at the site are expected to start up by the end of 2015.

## SECURITY HOLES IN POWER GRID HAVE FEDERAL OFFICIALS SCRAMBLING



Bay Area News Group (April.2014)— Adam Crain assumed that tapping into the computer networks used by power companies to keep electricity zipping through transmission lines would be nearly impossible in these days of heightened vigilance over cybersecurity.

When he discovered how wrong he was, his work sent Homeland Security Department officials into a scramble.

Crain, the owner of a small tech firm in Raleigh, N.C., along with a research partner, found penetrating transmission systems used by dozens of utilities to be star-

tingly easy. After they shared their discovery with beleaguered utility security officials, the Homeland Security Department began sending alerts to power grid operators, advising them to upgrade their software.

The alerts haven't stopped because Crain keeps finding new security holes he can exploit.

"There are a lot of people going through various stages of denial" about how easily terrorists could disrupt the power grid, he said. "If I could write a tool that does this, you can be sure a nation state or someone with more resources could."

Those sorts of warnings, along with vivid demonstrations of the grid's vulnerability, such as an incident a year ago in which unknown assailants fired on a power station near San Jose, nearly knocking out electricity to Silicon Valley, have grabbed official attention. In Congress, the vulnerability of the power grid has emerged as among the most pressing domestic security concerns.

It is also among the most vexing.

Lawmakers have expended considerable energy on the issue, to limited effect. At times, they appear to be working at cross purposes. Some members of Congress want to empower regulators to force specific security upgrades at utilities. Others are attacking whistle-blowers and the media, demanding an investigation into disclosures of how easily the country's power grid could be shut down.

The magnitude of the problem is underscored by concerns raised by insurance giant Lloyds of London, which is known for a willingness to insure pretty much everything.

Lloyds' appraisers have been making a lot of visits lately to power companies seeking protection against the risk of cyber attack. Their takeaway: Security at about half the companies they visit is too weak for Lloyds to offer a policy.

"When Lloyds won't insure you, you know you've got a problem," said Patrick Miller, founder of the Energy Sector Security Consortium, a Washington-based nonprofit that advocates tougher cybersecurity measures for the electricity industry.

The challenges are compounded by lingering tensions between federal law enforcement and the industry. Each accuses the other of being territorial and evasive, neglecting to share confidential incident reports, intelligence analyses and other sensitive data.

Power companies, eager to keep regulators at bay, find themselves in a bind. They need to show quickly that they are equipped to protect the grid against outside attacks. They warn the grid is so massive, complicated and fragile that any tinkering needs to remain the responsibility of those who operate it day to day, not well-intentioned, but inexperienced-

(Cont. on Pg 7)

## **SECURITY HOLES IN POWER GRID HAVE FEDERAL OFFICIALS SCRAMBLING**

enced federal regulators.

"The notion of ... a single government agency giving an order to direct changes in the grid is extremely dangerous," said Gerry Cauley, chief executive of the North American Electric Reliability Corp., the quasi-governmental organization through which utilities manage the power grid.

Even security experts who criticize Cauley's organization for moving too slowly agree his argument has merit. The problem, said Scott White, a security technology scholar at Drexel University in Philadelphia, is that, "you are basically dealing with these monopolies that are determining for themselves which expenditures are a priority. Security has not generally been one."

Utilities deny they've ignored the problem, pointing to the billions of dollars they say they've spent to upgrade outdated computer systems and close security holes.

They are signing contracts with security firms like Booz Allen Hamilton to investigate such things as to how to keep potentially mischievous devices out of the equipment they buy, often from foreign suppliers. The security firms help clients sift through reams of confidential intelligence provided by federal agencies. They simulate cyber attacks.

"It is the equivalent of war gaming, like the military does," said Steve Senterfit, vice president of commercial energy at Booz Allen Hamilton.

But critics, including many in Congress, say more needs to be done to shore up a grid increasingly exposed to attacks. They note that so-called smart grid technology, which allows operators to calibrate the flow of energy from an increasingly diverse pool of sources, has opened new security risks.

The technology relies on devices in remote locations that constantly send signals to substations to help control when juice needs to be brought on and offline. The smarter the grid becomes, though, the more entry points an attacker can exploit.

"The whole idea of a smart grid is to push equipment further and further away from the substations," Crain said. "Some of it is even in people's homes. It's physically impossible to secure it all."

The vulnerabilities Crain exposed, for example, had been overlooked because taking advantage of them requires an attacker to have access to closed, local networks. Now, a cyberterrorist with a little knowledge and the right laptop can gain that access and cause chaos in a regional power system merely by linking up with the control panel at a secluded electric vehicle charging station.

Other attacks, as the Silicon Valley incident showed, can take shape without computers. Last month, New Jersey's Regional Operations Intelligence Center, a state agency that monitors security threats, published a report revealing constant breaches at power stations. The incidents involved people armed with such mundane equipment as false identification, wire cutters and crowbars.

The report, first disclosed in the Washington Free Beacon, a conservative newspaper, declared the power grid "inherently vulnerable" to attack.

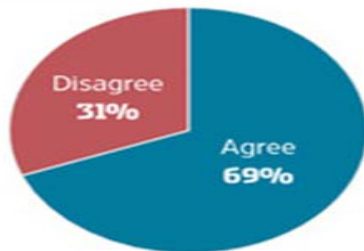
"Many of the grid's important components sit out in the open," the report said, "often in remote locations, protected by little more than cameras and chain-link fences."



## Smart Thinking

Utility executives are optimistic that smart-grid technology will improve their business in a number of ways, but they see several barriers that will need to be overcome to realize the full benefits.

**The benefits from smart-grid technology will exceed the initial forecasts.**



Source: Accenture Ltd. interviews with 54 utility executives in 13 countries conducted in 2013.

The Wall Street Journal

### Percentage of utility executives who said the following are important or critical drivers of the deployment of smart technologies

Improve levels of service for end customers	93%
Improve grid reliability and outage response	89%
Improve end-consumer energy efficiency and conservation	81%
Lower the costs of distribution operations	79%
Accommodate distributed sources of energy	74%
Accommodate new sources of demand (e.g., plug-in electric vehicles)	72%

### What are the main current barriers for the deployment of smart solutions for your network?

Limited return on investment from smart-grid technology	67%
Lack of regulatory or policy support	56%
Lack of mature technology solutions	52%
Cybersecurity concerns	48%
Consumer antipathy or opposition	37%
Lack of skills	24%

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