

# NUCLEAR MONITOR

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A PUBLICATION OF WORLD INFORMATION SERVICE ON ENERGY (WISE)  
AND THE NUCLEAR INFORMATION & RESOURCE SERVICE (NIRS)

## Editorial

Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- We pay tribute to Michael Mariotte from the Nuclear Information and Resource Service, who died on May 16.
- We look at an issue that Michael followed closely for three decades: the demise of nuclear power in the U.S. and the industry's try-ons to win greater state subsidies to turn loss-making plants into profitable ones.
- Steve Thomas writes about China's nuclear export ambitions.

The Nuclear News section has reports on Peter Diehl's annual review of the global uranium industry, a fatal uranium mine accident in India, and the ongoing debate in Saudi Arabia regarding prioritization of nuclear or renewables.

Feel free to contact us if you have feedback on this issue of the Monitor, or if there are topics you would like to see covered in future issues.

Regards from the editorial team.

Email: [monitor@wiseinternational.org](mailto:monitor@wiseinternational.org)

## Michael Mariotte 1952–2016: Counterweight to Nuclear Energy

*Mary Olson, Diane D'Arrigo and Tim Judson from the Nuclear Information and Resource Service present this tribute to Michael Mariotte.*

**NM824.4559** After a brave struggle against pancreatic cancer for three years, Michael Mariotte died peacefully at home and with his family on May 16, 2016 at 63 years of age. He is survived by his wife Tanya, their young daughters Zoryana and Kateryna, his friend and ex-wife Lynn, and their children Nicole and Richard, as well as his sister Julie, brother Jeff, and sister-in-law Marsheila. And of course he leaves a seasoned, experienced and growing anti-nuclear movement with many more victories to win. He asked friends and colleagues to do something fun in his memory. That was his way, to honor life by living and enjoying it to the fullest.

Michael, along with singer-guitarist Diana Quinn, guitarist David Wells and a changing cast of bassists began performing in 1978 as Tru Fax and the Insaniacs. One of the band's most popular songs, 'Washington', co-written by Michael, became something of an alternative-culture anthem of the time.



## Monitored this issue:

<b>Michael Mariotte 1952–2016: Counterweight to Nuclear Energy</b> – Mary Olson, Diane D'Arrigo and Tim Judson	<b>1</b>
<b>More doom and gloom for the nuclear power industry in the U.S.</b> – Jim Green	<b>5</b>
<b>China's nuclear exports may struggle to find a market</b> – Steve Thomas	<b>8</b>
<b>Nuclear News:</b> – WISE-Uranium: 2015 Mining Issues Review – India: Uranium mine accident kills three people – Saudi minister prefers solar over nuclear	<b>9</b>



Let us be clear: without Michael Mariotte's decision in the mid-1980s to devote his talents to stopping the nuclear industry, many things would be very different today. Michael could not do what he did without NIRS, and the many thousands of people who work with NIRS could not have produced the results they did without Michael at the helm. This is one telling of this story.

### **Dispassionate passion:**

The smartest one in almost any room ... but never resting on his own analysis; always digging, asking the next question, checking the facts. Michael was a journalist and an organizer and at bottom it was these talents that made his leadership of the civilian end of the US anti-nuclear community so deft. Michael's dispassion was sometimes misunderstood as indifference, but he was standing back, watching as the pieces of a puzzle would come together. Michael's ability to zero-in with the precision of a hawk on the pressure point that could lead to change, and then write the words that would mobilize thousands onto a path of action created much of the passion in our community that has resulted in so many victories over the past 30 years.

Michael's dedication to evidence and documentation provided credible, reliable information and analysis from routine reporting to hardcore litigation. He fully supported and sometimes led nonviolent direct action.

### **Writing:**

Michael's 31+ year tenure at NIRS is characterized by dedicated writing. He joined NIRS in February 1985 to write and edit Groundswell, NIRS publication for the grassroots anti-nuclear movement which provided in-depth reporting and analysis. In it Michael wrote articles so classic (including *Nuclear Is Not the Solution the Greenhouse Problem*) that many, if reprinted today, would hardly need updating. NIRS had already established itself as the go-to source for information on reactor operations and capacity factors, which were calculated weekly by staff and published twice a month in the Nuclear Monitor. Prior to the internet, this publication was the only readily available source of good facts on nuclear energy performance, and lack thereof, for the financial and policy worlds. He did not pursue a desire to go into the field of socially responsible investing but rather stayed with NIRS to inform that realm of the financial and other dangers of nuclear power and its fuel chain.

Michael kept the Nuclear Monitor alive and expanded it when publication of Groundswell ended (circa 1989). By 2000, with a staff of seven, he was far too busy with other aspects of NIRS work to write as he had before. Indeed hand-off of the publication of the Nuclear Monitor was a key element in NIRS's affiliation with the World Information Service on Energy (WISE) that year. WISE continues regular production of the Nuclear Monitor in conjunction with NIRS.

Michael's commitment to reporting was again in evidence on his daily log of events as the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi meltdowns unfolded in 2011. The NIRS website often "broke" news that was only reported by others days and weeks later. Michael gave equal voice to the post-Chernobyl era when he visited Pripyat in 1996, organizing delegations

of experts and activists. He visited Germany in 1997 and 1998 during the massive demonstrations and blockades against nuclear waste transport to a centralized nuclear waste site. In these travels Michael helped establish the NIRS / WISE network, a global chain of grassroots "relays" spanning the globe. The European portion of this network, with Michael and Tanya Murza (to later become his wife), hosted a major conference on Chernobyl in Kiev, 2006, the 20th anniversary of that nuclear horror.

GreenWorld ([www.safeenergy.org](http://www.safeenergy.org)), Michael's blog is the "bookend" bringing Michael back to his first love: clear, insightful and often acerbic reporting on the state of the nuclear escapade. He started it in 2013 when he handed the NIRS Executive Director position to Timothy Judson, who had been a young activist at the Action Camps years before. As he moved into his role of NIRS President, GreenWorld became Michael's primary platform for the past two-plus years. Michael's last post, on May 2 – a piece about Exelon, the United States' "greediest electric utility" – was only two weeks before his death.

In 1981, Michael was the founding editor of an alternative weekly newspaper that evolved into the Washington City Paper. He continued to work at the paper in a variety of positions, including managing editor, until 1985, when he joined NIRS.

### **Legislative Action:**

Choose your battles. Do what you can to maximize your odds. Walk away when you can't win, but be sure to reveal the tilt in the table as you go. Michael and NIRS lost some legislative battles in the 30 years that Michael led NIRS, but we won a lot more and a very key reason for that was that Michael knew how to "count votes." Better than almost anyone. He retained a universe of small bits of information that he gathered in numerous dimensions that added up to a very keen sense of who we "had" on our side in Congress; who was hopeless; and how to swing the others. NIRS lost when Congress reversed what had been an enormous NIRS legal victory on reactor licensing, passing legislation allowing streamlined "one-step" licensing of new nuclear reactors ... but the silver lining in the same energy bill was NIRS' equally historic reversal of the Nuclear Regulatory Commission's (NRC) policy called "Below Regulatory Concern" that would have deregulated about one-quarter of nuclear power's so-called "low-level" radioactive waste and permitted it to be disposed into regular trash and commercial recycling streams. Michael was not a fundamentalist, he was a realist. At the same time he believed firmly that people have the real power.

In 1995, in the face of industry and government efforts to make the technically, morally, legally flawed Yucca Mountain site in Nevada on Western Shoshone land the nation's high-level nuclear waste dump, Michael designed the Stop Mobile Chernobyl Campaign. This national effort successfully stopped industry efforts to revise the Nuclear Waste Policy Act to allow shipment of the intensely radioactive nuclear fuel to the Yucca Mountain Site prior to approval of that site as a permanent repository. Enlisting the populations along the nuclear transport routes expanded our community greatly and the Stop Mobile Chernobyl campaign became a signature for

building NIRS's base at the very time that email and on-line organizing was being invented.

In the Bush-Cheney years, and on into the Obama administration, Michael and NIRS had a coordinating role in a large coalition of national groups opposing taxpayer funded nuclear "loan guarantees" that would underwrite new reactor development, and other subsidies to the nuclear industry. The coalition stopped expansion of this program time after time and created much more scrutiny for the loan-guarantee program overall. Michael did the grassroots outreach and action alerts that resulted in hundreds of thousands of electronic "hits" to congress over that period.

### **Electronic Organizing:**

NIRS had a computerized database of its supporters in the early 1990s thanks to Michael. As soon as "dial-up" existed, he created the very first electronic bulletin board that anti-nuclear people could post to ... back before Windows or Websites. When the NIRS website was set up, Michael became its librarian, personally posting thousands of relevant documents in a public space where people can download any of them ([www.nirs.org](http://www.nirs.org)). Michael created email distribution lists as soon as there was email, long before the advent of on-line email list services like "Democracy in Action." When these major on-line list utilities became available, Michael helped NIRS supporters to swell into the tens of thousands.

### **Legal Action:**

Michael supported a great many grassroots actions to challenge nuclear licenses. This included research, recruiting experts, referrals to attorneys, bird dogging any Congressional and NRC actions on the cases and providing coverage in NIRS publications. He himself stepped into the ring in 2008 as part of the Chesapeake Safe Energy Coalition, filing a challenge to the proposed third nuclear reactor at Calvert Cliffs on the Chesapeake Bay near Washington, D.C. The Coalition won, stopping the new reactor because of "foreign ownership," thanks largely to Michael's unwavering prosecution of the US utility Constellation and its French Partner, Electricité de France. NRC's denial of a license for the construction of Calvert Cliffs Unit 3 was the first time the public had defeated a reactor operating license application, and is one of the crowning accomplishments of Michael's long work to stop nuclear energy. This had the effect of also preventing the 9-Mile Point 3 nuclear reactor proposed in New York State on Lake Ontario by the same foreign ownership partnership.

NIRS, with local New Jersey organizations, challenged the license extension of the Oyster Creek nuclear reactor, the first time a full hearing was held and a contention accepted by the Atomic Safety Licensing Board. The historic contention was against continued operation of this Fukushima-Mark 1-style reactor with a severely corroded dry-well containment, pitted to half the thickness of the wall in many places at the bottom.

Michael pursued and publicized tips NIRS received that the fire barriers in many nuclear reactors were actually made out of combustible, flammable material (Thermolag). This resulted in major legal actions within the industry against the fraudulent company.



Michael Mariotte (left) with Ralph Nader. In 2014, Michael received a lifetime achievement award from a consortium of environmental groups for his activism promoting a nuclear-free, carbon-free future. The award was presented by consumer advocate Ralph Nader.

He supported NIRS staff, along with Union of Concerned Scientists, expert watch-dogging of the Davis-Besse reactor pressure vessel corrosion ("hole in the head") and demand for investigation into NRC's mishandling of the near disaster. This might have saved the world from a nuclear tragedy near Toledo in 2002, mid-way between Chernobyl and Fukushima.

NIRS was part of the successful court challenge to inadequate radiological standards for proposed high level radioactive waste repository at Yucca Mountain.

In 1999 Michael backed a creative scheme to ask the NRC to require renewable energy back-up power on all reactor sites in time for the 1999 "Y2K" computer roll-over.

### **Grassroots:**

All of the work NIRS has done has been possible because of the engagement with local people in all 50 states, Washington, D.C. and other countries. Whether shining a spotlight on a bad federal regulation, pushing on Congress to do the right thing, or raising funds to pay expert witnesses, it is only possible with the hundreds and often thousands of NIRS supporters and allies taking action. Michael believed in this: we, together, have the power. He several times worked to mobilize people in a bigger way. He was part of the MUSE (Musicians United for Safe Energy) at Madison Square Garden and outside the Capitol in DC (1979) and its revival in 2011 in Mountain View in the wake of Fukushima meltdowns.

Michael instigated six Action Camps to train grassroots activists from 1998-2001 and supported two "climate convergences" in 2007 and 2008, all to teach nuclear issues and non-violent direct action. Michael also knew that NIRS and our community must lead on climate. He mobilized our community to be a key hub of the People's Climate March in 2014 and the Paris Climate Summit activism in 2015. Michael knew how to move a movement. Michael also had absolutely no interest in the kind of drama that haunts some long-term leadership roles. This was a tremendous asset: NIRS staff were cut lose to WORK, to research, educate, organize, coordinate with the safe energy advocates across the country and around the world.

## **Victories:**

None of these belong to Michael any more than the grassroots leaders, funders, and hundreds to tens of thousands of people who take action ... but Michael put his War Horse stamina and courage of conviction into all of the victories listed on this page ... and more:

## **Nuclear Reactors Shutdown:**

*Since Michael took the helm at NIRS these operating reactors shut down:*

Big Rock Point  
Crystal River 3  
Connecticut Yankee  
Kewaunee  
Yankee Rowe  
Maine Yankee  
Millstone 1  
San Onofre 1, 2, 3  
Shoreham  
Trojan  
Zion 1, 2  
Rancho Seco  
Fort St. Vrain  
Vermont Yankee

## **Reactor License Challenge:**

Every single new US Construction / Operating License (COL) was challenged by NIRS or the grassroots network which NIRS supports.

## **Fuel Chain Front-End:**

Michael's support for, strategy and advocacy on behalf of an impoverished African American community in Homer, Louisiana were instrumental in stopping a uranium enrichment facility proposed a by major US European consortium. The NRC decision denying the license was an early environmental justice victory which is cited in law school text books. After Tennesseans kicked it out of their state, NIRS legally challenged it again in New Mexico.

## **Energy Economics:**

Michael helped to ensure that the budding socially-responsible investment community was fully informed about the tremendous financial debacle of the first-build of reactors, which included 99 cancelations, many after significant investments by teacher's retirement funds and others. He worked with international allies to prevent investments in reactors and nuclear fuel chain facilities.

A great 30-minute interview with Michael is posted online. *The interview was taped* at the Northeast Action Camp for a Nuclear-Free New England in 1998. Michael provides a comprehensive picture of the world-wide nuclear power situation. He talks about his trip to Chernobyl and effective challenges to the nuclear industry in Europe and the U.S. [www.youtube.com/watch?v=wVyqiURd8eg](http://www.youtube.com/watch?v=wVyqiURd8eg)

*The Washington Post and the New York Times published obituaries for Michael:*

[www.washingtonpost.com/local/obituaries/michael-mariotte-no-nukes-activist-and-punk-band-drummer-dies-at-63/2016/05/21/7fbf12f4-1d19-11e6-9c81-4be1c14fb8c8\\_story.html](http://www.washingtonpost.com/local/obituaries/michael-mariotte-no-nukes-activist-and-punk-band-drummer-dies-at-63/2016/05/21/7fbf12f4-1d19-11e6-9c81-4be1c14fb8c8_story.html)

[www.nytimes.com/2016/05/24/us/michael-mariotte-a-leading-antinuclear-activist-dies-at-63.html](http://www.nytimes.com/2016/05/24/us/michael-mariotte-a-leading-antinuclear-activist-dies-at-63.html)

## **So-Called "Low-Level" Waste:**

The 1985 Low-Level Radioactive Waste Policy Amendments Act triggered scores of industry and government attempts to site new dumps. NIRS, with Michael's strong support, assisted challenges in 20 states against new unlined, soil trench burial of so-called "low-level" waste (some hotter than nuclear weapons high level waste), weakening regulations and shifting liability for commercial nuclear power waste to states. NIRS continues to fight to keep radioactive waste from being deregulated or cleared from radioactive controls. Michael was instrumental in the big victory overturning the NRC "Below Regulatory Control" or BRC Policies in 1992 but repeated that fight eleven more times against NRC and other federal and state agencies and international entities.

## **High-Level Waste / Mobile Chernobyl:**

Consolidated storage sites stopped during Michael's tenure:

Tennessee  
West Virginia  
Mescalero Apache Reservation (NM)  
Skull Valley Goshute Reservation (UT)  
Yucca Mountain, Western Shoshone land (NV)

The Nuclear Waste Negotiator was defunded and 25 tribes sent "bribe" money back to DOE.

The Stop Mobile Chernobyl Campaign educated the nation on nuclear waste transport and supported President Clinton's veto of revisions to the Nuclear Waste Policy Act.

The DOE's license application for a repository at Yucca Mountain was withdrawn and the Nuclear Regulatory Commission stopped reviewing it (until reversed by court order).

## **MOX / Plutonium:**

Every step of the MOX (mixed oxide) plutonium fuel program was challenged and every license step had an intervention.

## **Climate Change:**

In 2006, Michael helped mobilize an international alliance of anti-nuclear groups for United Nations climate talks in Copenhagen, which prevented nuclear power from being adopted as a solution to global warming. In 2014, he orchestrated a mobilization of thousands of anti-nuclear activists for the People's Climate March under the banner of a Nuclear-Free, Carbon-Free contingent.

# More doom and gloom for the nuclear power industry in the U.S.

**Author:** Jim Green – Nuclear Monitor editor

**NM824.4560** Senior management at Omaha Public Power District (OPPD) have recommended that the Fort Calhoun single-unit nuclear plant in Nebraska should close at the end of 2016. CEO Tim Burke made the recommendation to the company's board of directors on May 12 and the board is expected to vote on the recommendation on June 16.

"The economic analysis clearly shows that continued operation of Fort Calhoun Nuclear Station is not financially sustainable," Burke said.<sup>1</sup> OPPD board member Tom Barrett said: "You have to say enough is enough and curb the costs. That's the cold, hard facts of this business."<sup>2</sup>

The reactor has been in commercial operation since September 1973 and is licensed to operate until August 2033.<sup>1</sup> If it is shut down later this year, it will be closed 17 years ahead of its licence expiration.

The Fort Calhoun plant has been in the wars in recent years.<sup>2</sup> It was taken offline for refuelling in April 2011, then suffered a fire and was flooded later in 2011. The Nuclear Regulatory Commission (NRC) later found dozens of safety deficiencies and put the plant in an intense oversight program to address "significant performance and/or operational concerns."<sup>3</sup> OPPD spent a reported US\$180 million (€161m) addressing a list of 450 "restart action items" cited by the NRC.<sup>4</sup> Workers spent more than eight million hours completing more than 69,000 tasks, OPPD said, while the NRC spent 23,000 hours on inspections and evaluations.<sup>4</sup> The plant restarted in December 2013 and has operated under a normal level of regulatory oversight since April 2015.

Dan Yurman summarizes the dramas:<sup>5</sup>

*"In 2011 the flood stricken Ft. Calhoun reactor postponed its restart to sometime in 2013. It shut down in April 2011 for a scheduled fuel outage. Rising flood waters along the Missouri River in June damaged in the plant site though the reactor and switch yard remained dry.*

*"The plant's management had initially resisted demands by the NRC to strengthen its flood barriers, and only installed them a short time before the rising Missouri river came within a few feet of overtopping the inflatable boom that kept water out of the reactor and turbine building and the plant switchyard.*

*"In the pre-dawn hours of June 27, 2011, a fork lift punctured the eight foot high, 2000 ft. long boom being used to keep the flood waters out of the plant. Plant operators started emergency diesel generators as the flood waters approached the switchyard and the plant was taken off the grid. Emergency repairs prevented significant damage to the facility.*

*"The plant did not restart once the flood receded. The NRC resident inspectors found numerous deficiencies in plant operations and imposed a stiff set*

*of requirements on it. The agency said the Ft. Calhoun plant must fulfil a long list of safety requirements before the NRC would let it power back up. To speed things along, OPPD hired Exelon to operate the plant. It took until December 2013 to get a green light from the NRC to re-start the reactor to generate electricity and revenue for the utility.*

*"In February 2012, OPPD cancelled plans for a power uprate, also citing the multiple safety issues facing the plant."*

Tim Burke has recommended to the board that some of Fort Calhoun's 478-megawatt capacity should be replaced with wind energy and gas. He said that not all of the plant's capacity must be replaced because energy efficiency measures are constraining demand. If the board adopts the recommendations, OPPD's renewable generation will make up 49% of its energy portfolio by 2020. In 2014, OPPD approved a long-term generation plan that included the phase-out some of its coal-burning plants, conversion of others to natural gas and the addition of 400 megawatts of wind power.<sup>2</sup>

In its 2015 annual report, OPPD estimated that the costs to decommission Fort Calhoun would be about US\$884 million (€793m), but the utility only has about US\$373 million (€335m) set aside for decommissioning.<sup>2,5</sup>

## Illinois

Two other vulnerable nuclear plants are Exelon's Clinton and Quad Cities plants in Illinois. Exelon said in early May that it will close Clinton and Quad Cities in 2017 and 2018 respectively if Illinois legislators fail to legislate to shore up its profits. The two plants have lost US\$800 million (€718m) in cash flow from 2009 to 2015, CEO Christopher Crane said. "Without adequate legislation, we no longer see a path to profitability and can no longer sustain ongoing losses. In order to reverse course, we would need Illinois to cover our cash costs and operating risk," he said.<sup>6</sup>

David Kolata, executive director of the consumer advocacy nonprofit Citizens Utility Board, warned that with a proposed price floor for nuclear power "you socialize risk and privatize profit." He suggested that if a price floor is established, a price ceiling should also be established.<sup>7</sup>

Illinois Attorney General Lisa Madigan was blunt in her criticisms of Exelon and its subsidiary ComEd: "It's outrageous that Exelon and ComEd are again requesting a bailout when they are both profitable companies. This proposal would force consumers to pay more only to boost the companies' profits further. The legislature has more important matters to address than padding ComEd and Exelon's profits."<sup>8</sup>

Abraham Scarr with the Illinois Public Interest Research Group said: "ComEd and Exelon want you to believe

their ‘Next Generation Energy Plan’ will put Illinois on the path to a clean energy future. Don’t believe the hype. They claim their bill will jump start solar, but the solar industry opposes it. They claim their new rate structure helps consumers, but consumer advocates oppose it. They ask for ‘equal footing’ with wind and solar, without counting the \$5.58 billion (€5b) Illinois ratepayers have already poured into their nuclear fleet. ... It is time to transition to a clean, renewable energy economy and do so in a way that is fair to consumers and to the communities most impacted by our energy system. But instead of rising to these challenges, the ComEd-Exelon bill seeks to forestall this transition and wring as much profit from ratepayers as possible while delivering little in return.”<sup>8</sup>

Tim Judson, executive director of the Nuclear Information and Resource Service (NIRS), said: “There is just no way to justify the scale of economic intervention the industry says it needs to make uncompetitive reactors viable. In state after state where nuclear plant owners are seeking subsidies to stave off reactor closures, the cost of operating aging reactors is greater than the cost of replacing them with renewables and energy efficiency. Operating aging, uneconomical reactors can only increase the risk of nuclear accidents. States will be better off letting uneconomical reactors close, and ramping up their clean energy plans. It will be cheaper for consumers, create more jobs, limit radioactive waste, and accelerate greenhouse gas reductions.”

Exelon warns of a “dramatic increase in carbon emissions” if Quad Cities and Clinton are closed<sup>9</sup>, but it ain’t necessarily so. Both coal and nuclear are on the chopping-block in Illinois. Bloomberg reported on May 2016: “Following a four-year drop in electricity demand, power companies there announced the closing of coal and nuclear plants that account for more than 10 percent of generating capacity. The shutdowns come amid a fourfold increase in cheap wind from neighboring states and growing competition from generators burning low-cost natural gas. Exelon Corp., the operator of 11 nuclear reactors in Illinois, and Dynegy Inc., which has 10 coal-fired plants in the state, are asking lawmakers to bail out their money-losing assets to prevent further job-cutting, closures and, in Exelon’s case, preserve carbon-free electricity production.”<sup>10</sup>

Dynegy said on May 3 that it would shut coal units with a capacity of 1,835 megawatts over the next year, with an additional 500 megawatts under review.<sup>10</sup>

“You’ve got free wind power coming from the west and cheap gas coming from the east and that’s not a good place to be for coal and nuclear power plants,” said Travis Miller, an analyst with investment research firm Morningstar Inc.<sup>10</sup>

### **Growing list of reactor closures and looming closures**

The average age of the U.S. nuclear fleet is 35 years.<sup>11</sup> That’s the equivalent of about 70 human years so it’s no surprise that a growing number of reactors are falling off the perch:

- Dominion’s Kewaunee in Wisconsin and Entergy’s Vermont Yankee have closed for economic reasons since 2013. Both plants were licensed to keep operating into the 2030s.
- Southern California Edison permanently shut down the last two operating reactors at the San Onofre plant in California in 2013, after steam generators replaced in a US\$700 (€628m) million upgrade failed, only a couple of years after their installation.
- In February 2013 Duke Energy announced that the Crystal River nuclear plant in Florida would be permanently shut down, following a botched attempt to repair the concrete containment dome.
- Entergy’s FitzPatrick plant in New York will be closed in 2017, and Entergy’s Pilgrim plant in Massachusetts is slated to be closed in 2019, but could close sooner.
- Exelon’s Oyster Creek plant in New Jersey is scheduled to be permanently shut down by December 2019.

Responding to the Fort Calhoun news, Matt Crozat from the Nuclear Energy Institute said: “This announcement reflects the fact that several nuclear power plants around the country are vulnerable to weak market conditions, particularly smaller facilities in competitive markets.”<sup>5</sup> Marvin Fertel from the same organization said on May 19 that 15–20 reactors in the U.S. are at risk of being shut over the next 5–10 years due to economic challenges such as low power prices, and competition from gas and renewables.<sup>12</sup> He said that small, single-unit plants (such as Fort Calhoun) are the most vulnerable.

It can now be said with certainty that new build (five reactors are under construction) will be outpaced by closures this decade in the U.S., and it’s highly likely that the pattern will repeat itself in the 2020s. BP’s recently-released ‘Energy Outlook: 2016 Edition’ projects a 13% decline in nuclear power generation in North America from 2014–2035 (and a 29% fall in the EU).<sup>13</sup>

### **Summit**

On May 19, the Department of Energy (DoE) hosted an invitation-only summit to discuss nuclear power’s precarious situation.<sup>14</sup> It was promoted as an action-oriented forum, the live webcast was popular and the hashtag (#ActforNuclear) trended.<sup>15</sup>

Secretary of Energy Ernest Moniz told the summit that “the importance of incentivizing continued operation is very clear, but the solutions are less clear.” He said that the DoE’s Quadrennial Energy Review is assessing the future of the existing nuclear fleet and how nuclear plant operators might be supported. But Marvin Fertel from the Nuclear Energy Institute seemed underwhelmed with the prospect of another report: “A report on it doesn’t do anything unless the RTOs [regional transmission organizations] and FERC [the Federal Energy Regulatory Commission] do something with it.”<sup>12</sup>

Tim Judson from NIRS characterizes the challenges facing the industry differently: “The energy markets are not the problem facing the nuclear industry – it’s that the costs of operating aging reactors are rising so dramatically, while the costs of clean energy are falling. There is no doubt that



Fort Calhoun flood, 2011.

the US needs a comprehensive and sensible energy policy to mitigate the climate crisis. It's just that nuclear is part of the problem, not the solution.”

As Judson wrote in Nuclear Monitor #808, the Clean Power Plan released by President Obama last August gave the nuclear industry only a small fraction of the incentives it was seeking.<sup>16</sup>

A May 11–12 conference was hosted by the OECD Nuclear Energy Agency (NEA) in Paris to address nuclear power's economic problems.<sup>17</sup> As with the U.S. DoE conference, the NEA conference seems to have been heavy on gloom and short on solutions. NEA director general William Magwood said: “In the flux of great change, it can be difficult to finance even modest projects. Nuclear power plants are not modest projects; with total costs ranging from about €6 billion to €12 billion and total project times reaching up to a decade, building a nuclear power plant is one of the most

complex of all industrial sector undertakings. Therefore, as one might expect, financing nuclear power plants can often present significant challenges.”

Magwood added: “I am ready to stand here today and declare that the markets are broken; they don't work and don't do what they are supposed to do. The time has come to recognise that we have a situation where large utilities are losing money and are almost on the verge of bankruptcy.”<sup>17</sup>

Magwood also questioned the economics of small modular reactors, noting that vendors will need to sell “dozens, scores if not hundreds to make it work”. He added: “And if you're selling them to more than one country, are you going to have to go through the entire regulatory process every time you go to a country. If you do that, you may end up making them uneconomic just by the fact that you have to spend huge amounts of money to get the licence.”<sup>17</sup>

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# China's nuclear exports may struggle to find a market

**Author:** *Steve Thomas – professor of energy studies at the University of Greenwich, London.*

**NM824.4561** China's nuclear power industry has eyed up a big push to export its technologies as countries around the world consider low-carbon alternatives to coal.<sup>1</sup> But despite an increasingly clearer field for Chinese nuclear exports – mainly because of the woes dragging down French and Russian competitors – selling reactors abroad is likely to prove to a much tougher task than had first been thought. Perhaps the biggest uncertainty is whether there will be much of a nuclear export market at all.

Since 2008, reactors built in China have accounted for the majority of the world's new reactor construction. In 2015, seven new construction projects were launched, six of which were for China. While there are a large number of countries talking about buying reactors, many of which would be their first nuclear projects, the history of these types of exports suggests only a small number of these will be translated into real orders.

Moreover, many countries have major concerns about relying on China for the supply of such a strategically important piece of infrastructure. In particular, their concerns centre on the quality of components, the rigour of the Chinese regulatory system, the risk of dependence on China and the potential leakage of technologies that have hugely strategic geopolitical use.

There is little hard evidence on the precise impact of these issues on decision-making but it is clear that they warrant serious questions from any country wanting to buy reactors from China.

For example, Philippe Jamet, a French nuclear safety commissioner, said in 2014: "Unfortunately, collaboration [with China] isn't at a level [where] we would wish it to be".<sup>2</sup> He added: "One of the explanations for the difficulties in our relations is that the Chinese safety authorities lack means. They are overwhelmed."

China's great strengths in nuclear are its well-oiled component supply chain and the ability of its vendors to call on Chinese government finance. For example, the Industrial and Commercial Bank of China has agreed to offer loans of 74 billion yuan (€10.1b; US\$11.2b) to support CGN's nuclear project in Romania.

There is also a presumption that Chinese reactors will be cheap, although until China competes in open markets, we don't know this for sure.

An advantage to China is that its competitors in the nuclear export market are in various states of disarray. Of the two historic market leaders, France's Areva is mired in debt, while Westinghouse isn't in much better shape. US-headquartered Westinghouse was bought by Toshiba in 2006 and the Japanese company's reactor division has made losses from 2012 onwards. The Toshiba group as a whole is expected to lose US\$4.5 billion (€4b) for 2015. In July last year, Toshiba

admitted it had overstated its profits for the previous six years, resulting in a record fine from the Japanese authorities and its credit rating being reduced to junk.

Progress with construction of the eight reactors using the AP1000 design is no better than with the European Pressurised Reactor (EPR), developed by France's Areva. Four reactors in China are now at least three-to-four years late while the four in the US suffered further delays and are also several years late after only two years of construction.

## Russia's woes

The real competitor appears to be Russia, which claims a formidable book of about 20 firm orders in Bangladesh, Egypt, Finland, Hungary, India, Iran, Jordan, Turkey and Vietnam – far more than the rest of the nuclear vendors put together. It also claims to be in advanced negotiations in Saudi Arabia, South Africa and Nigeria.

Like China, there has always been a presumption that Russia would be able to supply the finance and that Russian reactors would be cheap. The combination of sanctions against Russia and the collapse of the world oil price has left Russia with depleted financial reserves. Since the Chernobyl disaster, it has supplied only about a dozen new orders and its ability to provide the five or six reactors per year, which are needed to fulfil its order book, must be in serious doubt.

## China ramps up

To examine the Chinese nuclear export industry in more detail, it's worth going back over the last decade to chart the development of the country's domestic developments

In 2008, China began to build new nuclear reactors for its home market at a rate of six to eight per year, not seen since the French nuclear programme of the 1970s. This programme was based on technology similar to that used by the French then, and was built under a technology licence with the French company Areva.

The Fukushima disaster of March 2011 brought this programme largely to a halt for the next four years, until reactor construction on a wider scale restarted in 2015 with six new construction starts.

By 2015, China was looking to export markets for reactors. The Chinese vendors claimed these new designs were their own intellectual property and so were able to offer them for export without requiring the permission of their foreign partner. The three companies do not compete in the same countries.

The first major Chinese export success was in 2013, when China National Nuclear Corporation (CNNC) announced it had sold an ACP-1000 reactor to Pakistan.

In November 2015, Argentina announced an agreement with CNNC to build two reactors.<sup>3</sup> The first would use

Canadian 'CANDU' technology, a technology that CNNC was familiar with from the two CANDU plants it operates in China.

The second would be an HPR1000. Given that Argentina's previous reactor took 33 years to build, mainly because of financial problems, it is not clear when and how quickly the CNNC projects will proceed.

China General Nuclear Corporation (CGN) has a focus centred mostly on Europe. In 2013, the French utility, EDF, announced that CGN and CNNC would be part of the consortium that would build the two EPR reactors at Hinkley Point C in the UK, taking up to a 40% stake between them.

In October 2015, when more details of the Hinkley deal were announced, CNNC had disappeared from the picture, for reasons not explained, and CGN was expecting to take a 33.5% stake.

It said it would also take a 20% stake in a follow-up station, Sizewell C. However, more significant was that EDF would release land at one of its sites, Bradwell, for CGN to build HPR1000 technology.

The plans are at an early stage and CGN has not announced how many reactors it plans to build there, or what the timescale is.

Nevertheless, if it was able to build in UK, it would be a huge fillip to its export plans because of the prestige

that winning an order in such a long-established nuclear power as UK would bring.

China's other main opportunity is in Romania where it is bidding to build two CANDU reactors. But, in common with Argentina, Romania appears a high risk, low probability market without much to gain from success.

In November 2014, Turkey announced a deal to buy four reactors from China's State Power Investment Corporation (SPI), two using the Toshiba AP1000 design and two using the CAP1400, with construction start forecast for 2018/19.

It remains to be seen whether any of Turkey's four orders will go ahead. SPI is one of five vendors competing in South Africa for an order for six to eight reactors, but it does not appear to be a front-runner. As is the case for so many nuclear markets, there is a large risk that no orders will be placed.

Areva (owned by the French state and a potential target for takeover by Chinese companies) is essentially bankrupt and in the process of a government rescue. A potential takeover would give Chinese companies an apparently golden opportunity to gain access to markets and to technologies, such as uranium enrichment and spent fuel reprocessing, that it has long wished for.<sup>4</sup>

*Reprinted from China Dialogue, [www.chinadialogue.net/article/show/single/en/8911-Why-China-s-nuclear-exports-may-struggle-to-find-a-market](http://www.chinadialogue.net/article/show/single/en/8911-Why-China-s-nuclear-exports-may-struggle-to-find-a-market)*

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## NUCLEAR NEWS

### WISE-Uranium: 2015 Mining Issues Review

Peter Diehl, coordinator of the WISE-Uranium project, has published a review of global uranium mining issues in 2015. The comprehensive review covers uranium prices; exploration projects; mine development projects; alternate uranium recovery projects; issues at operating uranium mines and abandoned mines; decommissioning issues; legal and regulatory issues; and uranium trade and foreign investment issues.

A few things that caught our eye:

Protests in 2015 included:

- In Tanzania, activists climbed Mount Kilimanjaro in July in an endeavour to call African governments to ban uranium mining and nuclear weapons.
- In Germany, protests against uranium transports on Hapag Lloyd ships were held in ten cities. The Bonn City Council adopted a resolution against uranium transports across the city.

Industrial actions at uranium mines included:

- Workers held a three-day strike at Areva's Akouta mine in Niger in April.

- Contract workers handed over a petition to the management of Rössing Uranium in October, complaining about working conditions at the Rössing uranium mine in Namibia.
- Namibian contract workers downed tools at the Chinese-owned Husab uranium mine project in Namibia in June 2015. In November, the Namibian High Court declared the strike illegal.
- At Paladin's Langer Heinrich uranium mine in Namibia, workers protested against unsafe working conditions. Later, a report by the office of the Prime Minister confirmed a lack of safety at the mine.
- Over 300 miners at the Crucea uranium mine in Romania protested by staying underground in March.

Abandoned mines issues:

- The U.S. government announced it would fund a clean-up evaluation (not the clean-up itself!) of 16 abandoned uranium mines on Navajo land.
- The cause of the mysterious sleeping sickness that plagued residents of two villages in Kazakhstan was

identified as carbon monoxide exhalation from the former Krasnogorsk uranium mine. The local authorities decided to move both villages to a safer location.

Decommissioning issues:

- The U.S. Justice Department announced that it has awarded more than US\$2 billion (€1.79b), in compassionate compensation to eligible claimants under the Radiation Exposure Compensation Act. These claimants include former uranium miners, among others.

Health impacts:

- An international cohort study found an association between protracted low-dose radiation exposure and leukemia among nuclear workers, and it moreover confirmed the Linear No-Threshold model for low dose rates.
- Heading in the opposite direction, in response to a petition, the U.S. NRC invited comment on a request to replace the Linear No-Threshold model for radiation effects with the radiation hormesis model.

Peter has an eye for the idiosyncratic and the hypocritical. As a proxy for the general state of the industry, he tracks the number of companies adding or removing the word uranium from their company name. Reflecting another miserable year, two companies removed the word uranium from their company name in 2015 and another announced its intention to do so. Peter notes that the previous year's "anticyclical exception, a company changing its name to "NX Uranium, Inc." apparently did not evolve into a high-flier, as it produced no news at all – thus confirming our then suspicion that the name must be correctly read as "Nix Uranium, Inc."

In relation to Areva's defamation action against anti-nuclear activists, Peter writes: "In France, an Appeals Court dismissed Areva's legal action against an anti-nuclear activist. In 2014, a Paris court had condemned the NGO Observatoire du nucléaire to pay penalties of several thousand Euros for "defamation" of Areva in a 2012 press release titled "Nuclear/corruption: AREVA offers a plane to the President of Niger...". So, in the end, the Appeals Court apparently shared the surprise we expressed in last year's review: "how can it ever be possible to defame a company that has 181 entries in its Hall of Infamy on the WISE Uranium website?"

Peter's "Mind-blowing Company News of the Year Award" for 2015 went to struggling Australian uranium explorer Capital Mining for its announcement that it was diversifying into growing cannabis in Canada. The company's share price doubled on the day of the announcement!

The WISE Uranium Project – [www.wise-uranium.org](http://www.wise-uranium.org) – is a unique and remarkable resource. Some of the resources of interest include:

- The 2015 Uranium Mining Issues Review: [www.wise-uranium.org/uissr15.html](http://www.wise-uranium.org/uissr15.html)
- Annual uranium reviews stretching back to 1998 are posted at [www.wise-uranium.org/indexu.html](http://www.wise-uranium.org/indexu.html)

- Uranium mine issues, sorted by mine, country, topic, etc.: [www.wise-uranium.org/indexu.html](http://www.wise-uranium.org/indexu.html)
- Uranium news database, searchable by continent, country and topic, and with an option to retrieve relevant news over the current year or since 2012: [www.wise-uranium.org/new.html](http://www.wise-uranium.org/new.html)
- Uranium companies: [www.wise-uranium.org/ucomp.html](http://www.wise-uranium.org/ucomp.html)

### **India: Uranium mine accident kills three people**

In a major accident in the Turamdih uranium mine near Jadugoda in Jharkhand, three workers died on May 28 and 10 severely injured workers were admitted to the Tata Main Hospital.

India's Coalition for Nuclear Disarmament and Peace said:

"We are shocked by the accident causing such huge loss and stand with the families and friends of the affected in their moment of grief. We support the demand of the workers and the local community that an independent probe into the accident must be initiated, and the deceased and injured must be immediately and duly compensated.

"This accident raises some serious concerns which the local community and the larger civil society has been voicing for decades. The Uranium Corporation of India Limited (UCIL) functions in complete non-transparency and unaccountability. To cut costs, it compromises with safety measures and employs contractual workers routinely in dangerous work in brazen violation of standard norms.

"The criminal negligence and contempt for the surrounding population, which is mostly Adivasi and poor, is shocking. Toxic and radioactive waste is left in open tailing dams and uranium ore is transported in open vehicles. A number of peer-reviewed studies have shown high incidence of radiation-borne diseases in the area. India's present nuclear regulator, the Atomic Energy Regulatory Board (AERB) is entirely unequipped and ineffective owing to its non-independence.

"We demand that the government must put a moratorium on expanding the uranium mines and initiate an independent enquiry into safety and radiation affects in Jharkhand, involving environmental experts, labour unions and the civil society."

*Coalition for Nuclear Disarmament and Peace, Press Release, 29 May 2016, [www.cndpindia.org/criminal-negligence-uranium-mine-takes-3-lives-govt-must-probe-stop-expansion/](http://www.cndpindia.org/criminal-negligence-uranium-mine-takes-3-lives-govt-must-probe-stop-expansion/)*

### **Saudi minister prefers solar over nuclear**

Solar energy could overtake nuclear ambitions in Saudi Arabia as the kingdom looks to shake up its power sector, according to deputy economic minister Ibrahim Babelli.<sup>1</sup> He said on May 25 at the Menasol conference in Dubai that not only was solar cheaper, but it also lacked the security risks that come with nuclear power stations.

"I don't think we need nuclear power plants in Saudi Arabia," he said, adding that the potential to marry solar technologies with storage capabilities makes it a "no-brainer".

Last year, the kingdom said its nuclear capacity target of 17 gigawatts would be delayed 12 years to 2040. In March 2016, deputy crown prince Mohammed bin Salman released a transformation plan setting a renewable energy target, including solar and wind, at 9.5 GW by 2023.

Riyadh-based Acwa Power, involved in both solar PV and concentrated solar power (CSP) outside of the kingdom, said the volume of CSP projects has to increase to push down costs.

“In five years from now we’ll see PV with a [cost-efficient] battery lasting for four hours, but CSP will still be there and take a big part of the baseload,” said Andrea Lovato, Acwa’s executive director of business development. “The real game changer will be two countries: Saudi Arabia and China.”

In an April 2015 paper, M. V. Ramana and Ali Ahmad from the Program on Science and Global Security, Princeton University, summarized their research on the economics of Saudi Arabia’s power options:<sup>2</sup>

“We compared the electricity generation cost from nuclear reactors with three alternatives: natural gas based power plants, solar energy from photovoltaic cells and concentrated solar power stations. What we found was that unless natural gas prices rise dramatically, that would remain the cheapest source of electricity generation – nuclear electricity would be more than twice as expensive than that produced by gas. The reason is simple: the very high capital cost of constructing a nuclear reactor, typically running into several billions of dollars. For example, the latest estimate for one of the three ongoing projects in the United States, in which two new 1,117-MW reactors are being built near Jenkinsville, S.C., is \$11 billion (€9.87b). Electricity from gas would continue to be cheaper even if a relatively high carbon cost (even above \$150/ton-CO2 in some scenarios) were imposed. ...

“But in the case of oil, our analysis showed that it does make economic sense to shut down oil based power plants and replace those with nuclear reactors – or natural gas. But Saudi policy makers may have already realized that and nearly 100 percent of installed capacity in recent years is based on natural gas.

“The real surprising result that came out of our analysis was that solar technologies are very competitive with nuclear reactors. The key point is that it would take at least a decade, quite possibly more, for a country like Saudi Arabia to generate its first unit of nuclear electricity, even if the decision were to be made tomorrow, and solar photovoltaic and concentrated solar technologies have both been experiencing dramatic declines in prices. Based on current trends, the cost of electricity from solar plants would become cheaper than from nuclear plants around the end of this decade or soon after in areas like the Middle East with ample sunshine. Nuclear reactors, in contrast, are not becoming cheaper. Some studies find evidence of “negative learning” wherein nuclear costs rise as more reactors are constructed. ...

“In addition to all the problems of nuclear power, solar power is also very appropriate to Saudi Arabia. There is substantial overlap between the electricity demand and solar insolation patterns, and there will be little or no need for constructing expensive storage facilities to deal with the fact that the Sun doesn’t shine at night.”

1. *LeAnne Graves, 25 May 2016, ‘Saudi minister prefers solar potential over nuclear energy’, [www.thenational.ae/business/energy/saudi-minister-prefers-solar-potential-over-nuclear-energy](http://www.thenational.ae/business/energy/saudi-minister-prefers-solar-potential-over-nuclear-energy)*

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## WISE/NIRS Nuclear Monitor

The World Information Service on Energy (WISE) was founded in 1978 and is based in Amsterdam, the Netherlands.

The Nuclear Information & Resource Service (NIRS) was set up in the same year and is based in Washington D.C., US.

WISE and NIRS joined forces in the year 2000, creating a worldwide network of information and resource centers for citizens and environmental organizations concerned about nuclear power, radioactive waste, proliferation, uranium, and sustainable energy issues.

The WISE / NIRS Nuclear Monitor publishes information in English 20 times a year. The magazine can be obtained both on paper and as an email (pdf format) version. Old issues are (after 2 months) available through the WISE homepage: [www.wiseinternational.org](http://www.wiseinternational.org)

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### Contact us via:

WISE International

PO Box 59636, 1040 LC Amsterdam, The Netherlands

**Web:** [www.wiseinternational.org](http://www.wiseinternational.org)

**Email:** [info@wiseinternational.org](mailto:info@wiseinternational.org)

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