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Editorial

Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- M.V. Ramana and Zia Mian summarise the potential and problems of small modular reactors;
- Wen Bo writes discusses the limitations on inland nuclear power plants in China, in particular the problem of water shortages;
- Recent US Nuclear Regulatory Commission rulings give a *carte blanche* for nuclear waste production despite the absence of any coherent long-term waste management policies, and overturn a moratorium on reactor licensing;
- We summarise a scandal in the US, with the Nuclear Regulatory Commission failing to respond to or act on the warnings of a whistle-blower regarding seismic risks faced by the Diablo Canyon nuclear power plant; and
- We look at problems facing the nuclear power industry in Belgium, with three of the country's seven power reactors currently offline.

The Nuclear News section has reports on childhood leukemias near nuclear power stations; the upcoming EU state aid decision; nuclear developments in Sweden; another delay for Finland's Olkiluoto 3 reactor; the latest Nuclear Resister bulletin; a draft Atomic Act in the Czech Republic; a 'Hibakusha Worldwide' poster exhibition; and more!

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.

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Monitored this issue:

US NRC approves radwaste rule; ends reactor licensing moratorium

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NM790.4408 On August 26, the US Nuclear Regulatory Commission (NRC) approved its controversial replacement for its "waste confidence" rule that was slapped down in 2012 by a federal court and also approved a resumption of new reactor licensing and license renewal activities.

The new replacement rule essentially gives up on the notion of "confidence" that a permanent high-level radioactive waste repository will be built in any foreseeable time frame and instead expresses the agency's support for the concept that "continued storage" in the absence of a permanent repository − even for millenia − is OK with them. The votes on the two actions were both 4-0, although NRC Chair Allison Macfarlane dissented on part of the final version of the "continued storage" rule.

In 2012, a federal three-judge panel (DC appeals court) asserted that NRC had no basis for "confidence" since there is, in fact, no plan for how to manage or isolate the most concentrated radioactive wastes ever produced. Since 2012 NRC has fast-tracked an effort to recover its streamlined licensing authority by instituting a new "Waste Confidence" policy. Originally, NRC staff indicated it would take as much as seven years to truly evaluate the dangers of waste storage. A quicker way was found: use all the old assumptions, produce a generic analysis and allow the nuclear waste generators to skip any local, specific analysis of risks and impacts at nuclear power reactor sites. NRC has simply removed the word "confidence" and now writes about "continued storage" while insisting there is no significant environmental impact from this waste

In a statement on the vote, Nuclear Information and Resource Service Executive Director Tim Judson said "For two years we had hoped that logic would prevail: but no such luck. An irrational, industry-dominated NRC has affirmed carte blanche to dirty energy corporations: 'go ahead, produce as much highly radioactive waste as you want; tell us it is safe and we, the NRC, will believe you.' This decision makes it impossible for NRC to claim that it is independent. We agree with grassroots activists in nuclear power communities who have decided that this is a con job. NRC has done nothing to increase our confidence in its performance as a regulator of safety."

The NRC's "continued storage" rule almost certainly will be challenged in court on numerous grounds and by numerous parties. But in the meantime, the NRC has now lifted its moratorium on reactor licensing activities. In practical terms, there are no new reactor license applications that have been particularly inhibited by the moratorium, so unless some utility decides it really wants to press ahead with a new reactor, there will be little change there. The major license renewal case underway is that of Indian Point in New York, and the NRC is expected to resume activity on that case quickly. But the battle over Indian Point is being waged on several fronts and the NRC long has been expected to approve license renewal for those reactors. So it's not clear the NRC action will have a profound effect there either.

In her partial dissent, Macfarlane expressed concern about the failure of the Generic Environmental Impact Statement (GEIS) underpinning the rule to address what would happen in the event institutional controls over long-term waste storage collapsed − a not unreasonable position given the eons that radioactive waste is lethal and must be strictly overseen. She noted that the NRC staff acknowledged that even a temporary loss of institutional control "would have impacts similar to spent fuel storage accidents" and that a permanent loss of control "would be 'a catastrophe to the environment.'"

But the staff decided not to analyze or effectively address these possibilities in the GEIS.

Macfarlane also said that the GEIS should be a living document − revised every 10 years to take into account changing circumstances. And Macfarlane pointed out that when waste is stored on-site, as the GEIS essentially presumes, the costs are borne by the utilities. The Nuclear Waste Fund, which currently is blocked from receiving more funds by the Department of Energy, goes for a permanent repository and is far short of anticipated costs in any event. Macfarlane wrote that while "funding near-term storage is not a crisis," the NRC, and the GEIS, should recognize the "genuine reality" that the federal government − i.e. taxpayers − will pay for the long-term storage of radioactive waste.

Every proposed permanent US dumpsite has been seriously flawed. The formerly proposed nuclear dump at Yucca Mountain would leak much faster than would meet even lax safety standards. Many have recently promoted the theoretical concept of expanding the mission for WIPP (the Waste Isolation Pilot Plant) nuclear weapons waste deep geological repository in New Mexico to take civilian highly radioactive wastes; this proposal is clearly technically flawed and, given the recent fire and leaks at site, make it questionable it can even continue for that waste let alone adding more.

NRC 'waste confidence' decision:

www.nrc.gov/reading-rm/doc-collections/commission/cvr/2014/2014-0072vtr.pdf

NRC order on resuming licensing activities:

www.nrc.gov/reading-rm/doc-collections/commission/orders/2014/2014-08cli.pdf

NRC press release:

www.nrc.gov/reading-rm/doc-collections/news/2014/14-055.pdf

Nuclear Information and Resource Service statement:

www.nirs.org/radwaste/atreactorstorage/prvotewc82614.pdf

Too much to ask: why small modular reactors may not be able to solve the problems confronting nuclear power

Authors: *M.V. Ramana and Zia Mian*

NM790.4409 Over the last few years, much hope has been invested in what are called Small Modular Reactors (SMRs) as a possible way to address some of the key problems with existing nuclear reactor designs and fuel cycles and thereby offer a brighter future for nuclear power. Several countries are in the fray to develop SMRs, including the United States, Russia, China, France, Japan, South Korea, India, and Argentina. Several of these countries are providing substantial government support for such reactors. Regulatory agencies in these countries are also in the process of grappling with licensing SMRs, many of which incorporate novel features in their designs. SMR designs typically have power levels between 10 and 300 MWe, much smaller than the 1000–1600 MWe reactor designs that have become standard.

Proponents of SMRs have made extensive claims, directed both at large industrialized countries and developing countries, about the purported benefits of SMRs and their abilities to help meet various social and environmental goals. However, a careful look at the technical characteristics of SMRs suggests SMRs may not be able to solve simultaneously the "four unresolved problems" of costs, safety, waste, and proliferation, identified in a 2003 Massachusetts Institute of Technology study as responsible for the "limited prospects for nuclear power today." The leading SMR designs under development, it turns out, involve choices and trade-offs between desired features and focusing on any one goal, for example cost reduction, might make other goals more difficult to achieve.

SMR families

To simultaneously deliver lowered costs, increased safety, reduced waste, and enhanced proliferation resistance sets a very high bar for SMRs designs. The question is whether existing SMR designs can realize all of these goals? Answering this question is not straightforward. There are a very wide variety of SMR designs with distinct characteristics that are being developed. These designs vary by power output, physical size, fuel geometry, fuel type and enrichment level (and resulting spent fuel isotopic composition), refueling frequency, site location, and status of development. To make some sense of the different designs, Alexander Glaser of Princeton University has proposed that they be categorized into four families.

The first family of SMRs involves reactor designs intended to "get into the game early" and will likely be the first on the market. These are essentially scaled-down standard light water reactors, usually with steam generators located within the same pressure vessel as the reactor itself (integral Pressure Water Reactor or iPWR). Integration of the primary system has been assessed by some analysts to be "the biggest challenge to SMR development". These reactors are typically fueled with low enriched uranium, with enrichment levels of 5% or less. Not only is the enrichment of fuel in the same ballpark as conventional light water reactors, but even the fuel assembly designs are intended to be almost identical to existing designs (although scaled down in height). Because of the similarity of the fuel design, the spent fuel can be reprocessed using traditional and widely understood techniques such as PUREX.

A second family of SMRs involves a design, the high temperature gas-cooled reactor (HTGR), that hopes to "succeed the second time around." Earlier attempts at commercializing similar designs failed. These reactors typically use uranium enriched to well above 5 percent as fuel, and graphite as a moderator. Helium or carbon dioxide is often used as the coolant fluid. The fuel for these reactors is usually in the form of TRISO (tristructural-isotropic) particles, which consist of uranium coated with multiple layers of different materials that can withstand high temperatures and are hard − but not impossible − to reprocess.

The next category of reactors attempts to "deal with the waste legacy" while extending uranium resources by using uranium much more efficiently. Reactors in this family are based on the use of fast neutrons without any moderator. They may have long-lived cores, designed not to require refueling for two or more decades, and may be helium or sodium-cooled. Their distinguishing feature is their use of spent nuclear fuel or nuclear waste or even weapon-grade plutonium as fuel.

Lastly, there are designs intended as "nuclear batteries", with long-lived cores that are designed for possibly unattended operation. They are generally targeted at "newcomer" nations with small electric grids interested in developing nuclear power systems or for remote locations in developed countries. These reactors tend to be liquid metal-cooled fast reactors with high enrichment levels required for fresh fuel.

Choices and conflicts

Evaluating all the different SMR designs, even when they are organized in families, against the desired criteria of costs, safety, waste, and proliferation is not straightforward. Each of these criteria has several dimensions, and multiple technical characteristics are needed to effectively implement each criterion.

The economics of nuclear power, for example, is a challenge both because of the high cost of constructing

each facility and the high cost of generating each unit of electrical energy relative to other options for meeting the same demand. The two are related but distinct. Even if SMRs might ameliorate the first challenge to some extent, they might make the latter challenge even harder to meet. Conversely, a large energy project might produce lower cost electricity relative to a small power plant but might have difficulty getting off the ground because of the high initial expenditures.

Proliferation resistance is another characteristic that imposes sometimes contradictory requirements. One way to lower the risk of diversion of fuel from nuclear reactors is to minimize the frequency of refueling because these are the periods when the fuel is out of the reactor and most vulnerable to diversion, and so many SMR designers seek longer periods between refueling. However, in order for the reactor to maintain reactivity for the longer period between refuelings, it would require starting with fresh fuel with higher uranium enrichment or mixing in plutonium. Some designs even call for going to an enrichment level beyond 20 percent uranium-235, the threshold used by the International Atomic Energy for classifying material as being of “direct use” for making a weapon. All else being equal, the use of fuel with higher levels of uranium enrichment or plutonium would be a greater proliferation risk, and is the reason why so much international attention has been given to highly enriched uranium fueled research reactors and converting them to low enriched uranium fuel or shutting them down.

Moreover, an SMR design relying on highly enriched uranium fuel creates new proliferation risks – the need for production of fresh highly enriched uranium and the possibility of diversion at the enrichment plant and during transport. Any reduction of proliferation risk at the reactor site by reducing refueling frequency, it turns out, may be accompanied by an increase in the proliferation risk elsewhere.

Technical characteristics and consequences

The multitude of SMR designs that are being developed make it hard to make general statements with wide applicability about how well SMRs as such could meet the requirements for cost, safety waste and proliferation resistance. At the same time, the different designs do have some shared technical characteristics, and these characteristics affect how these reactors might score on different desirable criteria. The table uses the idea of SMR families to summarize some of the broadly shared technical characteristics and their impacts:

The smaller power capacity of SMRs has a largely negative effect on costs. Designers hope that this negative effect possibly could be offset somewhat through economies of mass manufacture or by regulatory authorities relaxing licensing rules. But most experts conclude that it seems unlikely that any such offsets in cost would be sufficient to make these reactors economical.

In addition, there are specific features of each of these SMR types that would tend to increase costs. For example, the lower fuel burnup in iPWRs means that fueling costs would be higher whereas the special materials used to coat the fuel particles in high temperature reactors and non-conventional manufacturing techniques also lead to higher fueling costs.

The small physical size and smaller fissile inventories of SMRs, on the other hand, benefit safety. However, in the case of fast reactors, there are other characteristics that affect safety negatively. These include the potential in the core for accidents involving disassembly and reactivity increase as well as the risks from using molten metals as coolants. Proponents of these reactors argue, not surprisingly, that they are safe, but many others view the use of fast spectrum neutrons and molten metal coolants as a significant disadvantage from a safety perspective.

The use of fast neutrons for these reactors is primarily motivated by waste reduction not safety. Indeed, SMRS based on fast neutrons do produce a lower amount of radioactive waste per unit of electricity generated. The significance of the lower rate of waste generation, however, is debatable. The problem with siting geological repositories for waste disposal has been local and public resistance. The level of resistance is not particularly sensitive to the amount of waste that might be disposed of in the repository. In other words, even if the repository were to be designed to deal with a significantly smaller volume of spent fuel, there may not be a corresponding decrease in opposition to siting the facility.

Proliferation risk, the fourth goal, depends on both technical and non-technical factors. While the non-technical factors are largely not dependent on choice of reactor type, SMRs and their intrinsic features do affect the technical component of proliferation risk. In the case of both iPWRs and fast reactors, the proliferation risk is enhanced relative to current generation light water reactors primarily because greater quantities of plutonium are produced per unit of electricity generated. In the case of HTRs, proliferation risk is increased

SMR family	Technical characteristic	Cost	Safety	Waste volume	Proliferation risk
iPWR	Smaller size, lower fuel burnup	Higher	Increased	Larger	Increased
HTGR	Lower power density and higher enrichment level	Higher	Increased	Mixed impact	Mixed impact
Fast reactors	Higher power density and higher fissile content, molten metal coolants	Higher	Decreased	Smaller	Increased

because of the use of fuel with higher levels of uranium enrichment, but is diminished because the spent fuel is in a form that is difficult to reprocess.

Conclusion

Proponents of the development and large scale deployment of small modular reactors suggest that this approach to nuclear power technology and fuel cycles can resolve the four key problems facing nuclear power today: costs, safety, waste, and proliferation. Nuclear developers and vendors seek to encode as many if not all of these priorities into the designs of their specific nuclear reactor. The technical reality, however, is that each of these priorities can drive the requirements on the reactor design in different, sometimes opposing, directions. Of the different major SMR designs under development, it seems none meets all four of these challenges simultaneously. In most, if not all designs, it is likely that addressing one of the four problems will involve choices that make one or more of the other problems worse.

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Standardised reactor designs

In addition to the rhetoric about small modular reactors, the nuclear lobby claims that standardised designs and modular construction are 'game changers' for large reactors. The Vogtle / Georgia and Summer / South Carolina projects in the US provide a test of the rhetoric. These AP1000 reactors are being assembled in large modules.[1]

A factory in Louisiana operated by Shaw Modular Solutions constructed prefabricated sections for AP1000 reactors but experienced delays due to quality assurance, design and fabrication problems. Now the firms leading the reactor projects are phasing out the Louisiana factory for work on the biggest modules and contracting with new manufacturers. The Vogtle and Summer AP1000 projects are both behind schedule and over-budget.

Nuclear Regulatory Commission (NRC) officials proposed a US$36,400 (€27,700) fine against The Shaw Group for firing a quality insurance supervisor who warned a potentially faulty part may have been shipped to a project in New Mexico. The fine was dropped after the company agreed to changes. The NRC also said that workers at the Louisiana factory feared raising safety and quality concerns to their supervisors. The NRC concluded that a welder at the Louisiana factory took a qualification test for another worker in 2010, and that a supervisor knew but did not report it.

The now-abandoned plan for new reactors at the Temelin plant in the Czech Republic gives another insight into the rhetoric about standardised designs. The Czech government's nuclear envoy Václav Bartuška has provided an insightful post-mortem of the cancelled Temelin expansion project. He notes that Areva, Westinghouse and Rosatom all argued that their offer would be a standardised design, but none of them in fact was. For example, Areva's EPR in China is 450 MWt more powerful than the one in Finland, and Areva confirmed that only 50% of the nuclear island is the same.[2]

1. 26 July 2014, 'Promises of Easier Nuclear Construction Fall Short' http://abcnews.go.com/US/wireStory/promises-easier-nuclear-construction-fall-short-24725848
2. Jan Haverkamp, 27 Aug 2014, 'Czech nuclear envoy has interesting insights into the problems with nuclear power ' www.greenpeace.org/international/en/news/Blogs/nuclear-reaction/czech-nuclear-envoy-has-interesting-insights-/blog/50403/

− *Nuclear Monitor*

Chinese inland provinces: Nuclear power at the crossroads

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NM790.4410 In the hope of becoming China's first inland nuclear power project, Pengze Nuclear Power Project (owned by China Power Investment Group) in Jiangxi Province has begun pre-construction work. However, the project has met resistance from the government and residents of the downstream Wangjiang prefecture in neighbouring Anhui Province. The Wangjiang government has publicly accused Pengze Project of falsifying its EIA report. Such confrontation shows Wangjiang's deep concern over the close proximity of a nuclear power plant.

Nuclear power requires large volumes of water for cooling. Adequate water supply is the key factor for identifying potential plant sites. Pengze was chosen due to its proximity to the Taipo Lake and the Yangtze River. However, unlike inland nuclear project areas in the United States, which often have few people downstream, China is relatively densely populated. China's vast river network and dense population distribution mean inland nuclear power stations have many inherent risks.

If radioactive liquid materials are not safely disposed of, large amounts of water used for cooling could be polluted, and the element boron from the pressurized reactor will be released into the environment along with waste-water. The polluted rivers provide drinking water and irrigation sources for many people living downstream.

Although the Pengze project in Jiangxi was opposed by Anhui province, Anhui itself has also started developing its own nuclear power projects. Wuhu Project is the first of them. It is being developed by China General Nuclear Power Group, which owns several nuclear projects, and is located in Fanchang County along the Yangtze River, upstream of Wuhu City.

Electricity generated by the Wuhu project will be delivered to the Eastern China Power Grid. In addition to satisfying its own needs, it will be exported to Zhejiang, Jiangsu and Shanghai. Huge investment and construction costs will inevitably be reflected in the electricity price. It is expected that Anhui will either become an inland nuclear power exporting province or face rising energy costs, especially in the southern part, including Wuhu city. If not, the investment costs in the Wuhu project will not be able to be recovered and thereby might become a burden on taxpayers and the provincial government.

China's nuclear power capacity growth

The National Energy Administration's 2013 Energy Statistical Report states that nuclear power currently accounts for 1.2% of China's domestic energy production. According to the 'Nuclear Power Mid to Long-Term Development Plan (2005-2020)', officially approved by the State Council in October 2007, the installed capacity of nuclear power in operation by 2020 is expected to reach 40 gigawatts (GW), and its portion of the energy mix will rise to 4%. By 2010, a new plan for 2010−2020 was drafted by the National Development & Reform Commission (NDRC), aiming to double the previous 2020 target to 80 GW.

Due to the controversy raised by this new goal, the plan was not approved by the State Council. However, since information related to this new plan had already been circulated, it raised expectations from the nuclear power industry and also helped its performance on various financing platforms including stock markets. Regardless, after the Fukushima Daiichi Nuclear Disaster in March 2011, approvals for nuclear power projects, including for all pre-project work, were suspended.

By October 2012, the State Council approved the 'Nuclear Power Safety Plan (2011-2020)' and the 'Nuclear Power Mid to Long-Term Development Plan (2011-2020)'. It should be noted that the newly approved plan only allows nuclear power build-up in specifically approved zones along the coast, and does not allow any inland projects during the 12th Five Year Plan. However, no specific target was given. Subsequently, in January 2013, the State Council's Energy 12th Five Year Plan (2011-2015) states that the installed capacity of nuclear power in operation by 2015 will reach 40 GW and the installed capacity under construction will reach 18 GW.

According to Mr. Zhang Huazhu, Director of China Nuclear Energy Association, by the end of 2020, China's installed capacity of existing and under-construction nuclear power may reach 88 GW.

As of the end of March 2014, China had completed or started construction of a total installed nuclear capacity of nearly 48.7 GW. In May and June 2014, NDRC approved an additional six new nuclear power projects in four provinces totaling 15.2 GW:

- Liaoning: Dalian Hongyanhe Phase II (2.5 GW) & Huludao Xudabao Phase I (2.5 GW);
- Shandong: Haiyang Phase II (2.5 GW) & Rongcheng Pilot (0.2 GW)
- Zhejiang: Sanmen Phase II (5 GW); and
- Guangdong: Lufeng Phase I (2.5 GW)

Water requirements

Two out of three of China's planned 28 inland nuclear plants are in medium and extremely water-scarce regions. Prior to the Fukushima Nuclear Disaster, 28 inland nuclear power projects (including previously mentioned Pengze) with 59 pre-selected plant sites were submitted by provincial governments to Beijing (pre-August 2007). These projects were classified according to the abundance of water resources. If we adopt the climate type classification of wet/dry regions: three projects are in arid and semi-arid regions and 25 projects are in wet and semi-wet regions. However, if we use the level of water scarcity, more than 17 planned projects fall in medium and extremely water-scarce regions.

A 5 GW nuclear power plant uses nearly 500,000 cubic metres of water per day. At present, China's inland nuclear power stations mainly use AP1000 units. During normal operation, four AP1000 units require a maximum of 498,600 cubic metres of fresh water per day and 156 million cubic metres per year.

By the end of July 2014, China had 19 units in operation, 29 units under construction, and 225 units being planned. To ensure safe operation, the plants will need enough water to cool the reactors for a minimum of 30 days under all circumstances. The increasing number of nuclear power projects will inevitably lead to competition for water between nuclear power plants and other energy producers.

Apart from the largest water use in "conventional islands" of the plant, the workers living within the plant site, as well as the circulation pump shaft seal and nuclear island also require lots of water. In addition, washing and sealing also require water.

The water demand during the repair period will also be much higher than that during normal operation period. Moreover, the water reuse rates among China's nuclear power plants are also very low: for example, the reuse rate of Lingao Phase I is only 3.75%.

Inland Nuclear Power Projects Planned Prior to August 2007

Province	Number of planned reactors	Level of water scarcity
jiangsu	2	Extreme
Henan	1	Extreme
Hebei	1	Extreme
Gansu	1	Medium-severe
Anhui	2	Medium-severe
Hubei	3	Medium
Chongqing	2	Medium
Guangdong	4	Medium
Zhejiang	1	Medium
Hunan	4	Light
Sichuan	2	Light
Fujian	1	/
Jiangxi	2	/
Guangxi	1	/
Jilin	1	/
TOTAL	28	

Source: Huang Bensheng, Qiu Jing, Liu Da and Ma Rui. Study on the Impacts of Inland Nuclear Power Plants on Water Security and Mitigations Measures. Proceedings of 2013 Annual Conference of Chinese Hydraulic Engineering Society, 2013

Power struggle: water authorities and nuclear developers

Nuclear power operators rely on a sufficient water supply. However, in China, water resources are managed by the water conservancy and hydropower authorities, who hold a negative view toward nuclear power. The battle between hydropower and nuclear power is fierce, and the competition exists in many areas outside of water, including lobbying for preferential policies and central investment funds, and securing bank and capital financing. The politics also differ.

The Ministry of Water Resources is trying to choke nuclear growth to protect China's limited water resources, while the nuclear power developers are requesting more water allocation for the sake of public safety. In the end, all problems, be they investment losses or threats to the environment, will be ultimately borne by the state and the people.

USA: NRC inspector warns of Diablo Canyon seismic risks

NM790.4411 The former top Nuclear Regulatory Commission on-site inspector at the Diablo Canyon reactors in California, nuclear engineer Dr Michael Peck, has recommended to the NRC that those reactors be shut down until their ability to withstand earthquakes is fully assessed. This should have been the big news a year ago: Peck wrote his recommendation − in the form of a formal Differing Professional Opinion − in July 2013. But the NRC still hasn't taken action, or even responded to it.

There are several major earthquake faults around Diablo Canyon. And not only has our understanding of earthquakes evolved dramatically since construction of the first reactor at Diablo was authorized in 1968, but at least two major faults − the Hosgri and the Shoreline faults − hadn't even been discovered then.

According to the Associated Press: "The NRC says the Hosgri fault line presents the greatest earthquake risk and that Diablo Canyon's reactors can withstand the largest projected quake on it. In his analysis, Peck wrote that after officials learned of the Hosgri fault's potential shaking power, the NRC never changed the requirements for the structural strength of many systems and components in the plant."

And the NRC has done only a preliminary assessment of the possible effects of the Shoreline fault. Diablo's owner, Pacific Gas & Electric, claims the reactors would withstand any possible earthquake from any of the faults, but given that this is the same utility that built the second unit at Diablo in a mirror image of its blueprints, it doesn't hold a lot of credibility. Pacific Gas & Electric has not only been insisting that its two Diablo Canyon reactors are safe, but has filed with the NRC to extend the 40 year licenses given for their operations another 20 years − to 2044 for Diablo Canyon 1 and to 2045 for Diablo Canyon 2.

Peck, on the other hand, who still works for NRC but not at Diablo, does have credibility. In his Differing Professional Opinion, Peck writes: "The new seismic information resulted in a condition outside of the bounds of the existing Diablo Canyon design basis and safety analysis. Continued reactor operation outside the bounds of the NRC approved safety analyses challenges the presumption of nuclear safety."

Peck writes in NRC bureaucratic language, but what he is saying can easily be summed up in plain English: The NRC does not know whether Diablo Canyon could survive an earthquake, within the realm of the possible, at any of the faults around Diablo Canyon. And the reactors should shut down until the NRC does know one way or the other. Of course, if the reactors cannot survive a postulated earthquake, the obvious conclusion is that they must close permanently.

Peck asked that his Differing Professional Opinion be made public, but the NRC has not released it. And despite the NRC's requirement that Differing Professional Opinions are to be ruled on within 120 days of filing, the NRC has not ruled on Peck's July 2013 opinion.

Friends of the Earth has filed a petition with the NRC charging that the plant is in violation of its license and must be closed immediately pending public hearings to prove it is safe. The petition charges that despite having new information that earthquake faults surrounding Diablo Canyon are capable of ground motion far greater than the reactors were designed and licensed to withstand, both Pacific Gas and Electric and the NRC have failed to close the plant pending the completion of a rigorous safety analysis and licensing review required by the NRC's rules.

The Senate Environment and Public Works Committee has announced it will hold hearings into the NRC's suppression of Dr Peck's Differing Professional Opinion. Committee chair Sen. Barbara Boxer said: "The NRC's failure to act constitutes an abdication of its responsibility to protect public health and safety."

Michael Peck, July 2013, 'Differing Professional Opinion − Diablo Canyon Seismic Issues'
http://libcloud.s3.amazonaws.com/93/5a/8/4821/Diablo_Canyon_Seismic_DPO.pdf
Associated Press, 25 Aug 2014, 'Hearings Planned After Call for Nuke-Plant Closure', http://abcnews.go.com/Technology/wireStory/ap-exclusive-expert-calls-nuke-plant-closure-25114454
Friends of the Earth petition to the NRC:
http://libcloud.s3.amazonaws.com/93/26/5/4826/Friends_of_the_Earth_NRC_petition.pdf
Other sources:
http://safeenergy.org/2014/08/25/former-top-nrc-inspector-says-shut-diablo-canyon/
www.foe.org/diablo
www.foe.org/news/news-releases/2014-08-nuclear-watchdog-petitions-federal-regulator-to-close-unsafe-diablo-canyon-nuclear-reactors
www.foe.org/news/news-releases/2014-07-diablo-canyon-secret-document-details-federal-safety-alarm

Belgium: three reactors offline

NM790.4412 Reactor #4 at Belgium's Doel power station shut down automatically on August 5 after "significant damage" was inflicted on a high-pressure steam turbine. The reactor will remain out of operation until at least the end of this year, Electrabel said. The reactor shut down following the loss of oil in its steam turbine. Initial inspections found that the oil had been discharged through a valve which had probably been left open by a worker, according to Electrabel. Belgium's nuclear safety regulator, the Federal Agency for Nuclear Control (FANC), said the oil loss probably resulted from "voluntary manual intervention." A spokesperson for GDF Suez, Electrabel's parent company, said the oil loss resulted from "intentional manipulation". Electrabel, FANC and the Public Prosecutor of Dendermonde municipality are investigating.[1]

In addition to the Doel 4 incident, the Doel 3 and Tihange 2 reactors are offline because of cracks in steel reactor casings. FANC ordered the temporary shut down of the two reactors in 2012 for inspections when ultrasound testing suggested the possible presence of cracks in their reactor vessels. Further investigations indicated that the defects are so-called hydrogen 'flakes' and were introduced during the manufacturing process.[2]

In early 2013, FANC set out a list of 16 requirements, with 11 to be met before the reactors could restart. Electrabel submitted an action plan and the reactors restarted in May 2013. But they were closed again in March 2014 after additional tests on hydrogen flakes suggested they may affect the mechanical properties of their reactor vessels. The latest outages were expected to last about six weeks, but the reactors remain offline awaiting the results of further tests.

Belgian state media VRT reported that interim test results show the vessels are weakened by the cracks and may need to remain closed until some time next year or may even remain shut permanently. Electrabel responded: "The tests are making good progress and it is totally premature to draw conclusions from them. The first partial results do not in any case allow us to anticipate a definitive shut down. Once tests are completed, a report will be sent to the FANC, which will in turn decide on the restart of the power plants." The Atomic Power Review blog suggests that the outcome may be ongoing operation of the reactors, but with restrictive operating limits.

In addition to safety risks and sabotage allegations, another concern is that FANC chief Jan Bens appears to have a slender grasp on reality. He said in May 2013: "The harbour of Antwerp is being filled with windmills, and the chemical industry is next to it. If there is an accident like a break in one of the wings, that is a guillotine. If that goes through a chloride pipe somewhere, it will be a problem of a bigger magnitude than what can happen at Doel. Windmills are more dangerous than nuclear power plants."[3]

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NUCLEAR NEWS

Childhood leukemias near nuclear power stations

Radiation biologist Dr. Ian Fairlie has written important recent articles and web-posts about the links between childhood leukemias and nuclear power plants.

Fairlie notes that "world-wide, over 60 epidemiological studies have examined cancer incidences in children near nuclear power plants (NPPs): most (>70%) indicate leukemia increases."

Data from four European countries reveal "a highly statistically significant 37% increase in childhood leukemias within 5 km of almost all NPPs in the UK, Germany, France and Switzerland. ... So the matter is now beyond question, i.e. there's a very clear association between increased child leukemias and proximity to NPPs. The remaining question is its cause(s)."

Fairlie's explanation is as follows: "First, the cancer increases may be due to radiation exposures from NPP emissions to air. Second, large annual spikes in NPP emissions may result in increased dose rates to populations within 5 km of NPPs. Third, the observed cancers may arise in utero in pregnant women. Fourth, both the doses and their risks to embryos and to fetuses may be greater than current estimates. And fifth, pre-natal blood-forming cells in bone marrow may be unusually radiosensitive."

www.ianfairlie.org/news/childhood-leukemias-near-nuclear-power-stations-new-article/

EU state aid decision looming

The European Commission may soon reach a decision on whether the UK government's subsidies for proposed Hinkley Point reactors in the UK breach EU state aid rules. Shearman & Sterling legal firm expects the decision in September or October this year – before the current Commissioner leaves office. EC guidelines for state aid in energy (applicable from 1 July 2014) do not extend to cover aid for nuclear energy, so the Hinkley Point C decision will set an important precedent for all EU nuclear projects.

An analysis by Shearman & Sterling lawyers concludes: "Ultimately, projects such as Hinkley Point C are unlikely to be prohibited on State aid grounds. Nevertheless, the eventual outcome may well mean less advantageous terms for the project. This could be with regard to a number of features of the support package, including: the duration of the Contract for Differences, the level of the guaranteed revenue under the Contract for Difference (its "strike price"), sharing any benefits with the UK in the post-Contract for Differences period, or the level of fee for the credit guarantee. While the Commission's decision can be appealed to the Court of Justice of the European Union, such an appeal is unlikely due to the political nature of State aid decisions and, in any event, would take a long time.[1]

Steve Thomas, Mycle Schneider and Antony Froggatt have recently written a detailed paper[2] about the Hinkley Point C saga and we covered the issue in detail in Nuclear Monitor last year.[3]

1. Nicholas Buckworth, James Webber and Geroge Borovas, 13 Aug 2014, 'United Kingdom: State Aid – Impact On Nuclear New Build In The EU' www.mondaq.com/x/334420/Energy+Law/State+Aid+Impact+on+Nuclear+New+Build+in+the+EU
2. Steve Thomas, Mycle Schneider, Antony Patrick Froggatt, 21 Aug 2014, 'The saga of Hinkley Point C: Europe's key nuclear decision' www.energypost.eu/saga-hinkley-point-c-europes-key-nuclear-decision/
3. UK nuclear power deal − much ado about nothing? www.wiseinternational.org/node/4032

Sweden: Breeder reactor proposal

Sweden will have general elections on September 14. On August 14, the Liberal Party leader and Minister of Education Jan Björklund announced that he had forwarded plans to establish a nuclear reactor for research purposes to the Swedish Research Council for evaluation. The announcement, made in an interview with Sweden's leading business newspaper, came out of the blue.

The Liberal Party has in recent years emerged as the most active campaigner for renewal of Sweden's nuclear power park. Otherwise, nuclear energy has been conspicuously absent in the election campaigns. It is a highly divisive issue for the parties; the larger the party, the deeper the divide.

The reactor in question is 'Electra' (European Lead Cooled Training Reactor), a breeder reactor of Swedish design. It is said to be unique in that the cooling element is unadulterated lead. The fuel is processed nuclear fuel waste and contains plutonium. The estimated cost: 1.5 billion SEK (US$210m, €160m), which all regard as a minimum.

The proposal is two years old. It originated with three universities but has apparently lain dormant in the minister's desk drawer until this past May. The Council has been asked to publish its evaluation by October 1.

Björklund's announcement provoked sharp reactions from other parties including Center, a fellow member of the ruling coalition. The Center Party leader, who seldom criticizes her colleagues, said the proposal has never been discussed in Cabinet: "We'll have to see if it lands on our table, and if it does, Center's position is clear. We will give research on green, renewable energy sources priority. They are the future."

The Social Democrats − not least the current party leader − have long been hard to pin down on the nuclear issue. But, speaking with a business reporter for Svenska Dagbladet, the Social Democrats' group leader in Parliament Michael Damberg wondered where the financing would come from, and added: "If we [the Opposition] win the election and form a new government, new nuclear power reactors will not be a priority."

− *Charly Hultén, WISE Sweden*

Sweden: Shutting down two reactors economically viable, study finds

Thomas Tangerås and Erik Lundin from the Research Institute of Industrial Economics in Stockholm have calculated the cost to Scandinavian and Finnish households if two of the nuclear power reactors at Oskarshamn, Sweden's oldest and smallest, were to be taken off line. The calculated increment would be SEK 320 (US$46, €35) per year for an electrically heated household using 25 MWh per year. That represents a rise of 3.6% overall.

A rise of 3.6% is greatly outweighed by a steady fall in prices due to overproduction of electricity in the region during the same interval.

The method used to calculate the price is unique. The researchers removed the hour-by-hour production of the two reactors from Nord Pool Spot data for 2011−2013 and then recalculated hour-by-hour market prices based on the output of the reactors that remained. The database does not support calculations for each country, only the region as a whole.

The Oskarshamn reactors (O1 and O2) have poor records, with high costs of maintenance and uncertain reliability. Whenever 'phase-out' is discussed in Sweden, these two, plus one reactor at Ringhals, are generally mentioned. Taking a third reactor such as Ringhals 1 off line would have a greater impact, however, raising the consumer price by about 10% or 1300 SEK (US$186, €142) per year.

Accentuated price peaks during winter months are a prime factor in the calculations. Higher spot prices during one-tenth of the period studied explained one-half of the increment overall.

− *Charly Hultén, WISE Sweden*

Finland's Olkiluoto 3 reactor delayed again

Finland's Olkiluoto 3 nuclear reactor will be delayed until late 2018, construction consortium Areva-Siemens said, prompting a disgruntled statement from its client Teollisuuden Voima (TVO). Areva-Siemens said construction, which started in 2005, would not be completed before mid-2016, and that operations were not expected to start until late 2018. Olkiluoto 3, which will be Finland's fifth nuclear reactor, was originally due to start operating as early as 2009, but it has been hit by repeated delays and soaring costs. TVO and Areva have traded accusations about who is to blame for delays and extra costs, and the International Chamber of Commerce's arbitration court is processing a dispute on cost overruns between the consortium and TVO. Areva said the updated schedule would not have an impact on project losses that totalled €3.9 billion (US5.1b) as of the end of June.

www.reuters.com/article/2014/09/01/finland-nuclear-olkiluoto-idUSL5N0R20CV20140901

Nuclear Resister

The August 2014 issue of the *Nuclear Resister* is out now, with information about anti-nuclear and anti-war related arrests and peace prisoner support. Stories featured in the latest issue include:

- Four protesters forced a train pulling 50 uranium containers to stop in Hamburg, Germany. They were locked together inside tubes placed under the rails. The train was stalled for over four hours.
- During another action camp in Germany, participants blocked three gates at the Büchel air force base, where U.S. nuclear weapons are stored and maintained. Three were charged with coercion, and others received notices from the police in the mail.
- Tents were pitched for the War Starts Here action base camp on August 17, just outside the boundaries of the European Battle Simulation Center at Altmark, Germany. Despite a large military presence, over the next week groups of campers entered on three different days. On the last day, 60 people embarked on a colourful parade under the eyes of police, and established a peace village inside the war games area. It took police until the next day to remove them all from the grounds.
- Three people were arrested at a protest "dead-ication" of a new Kansas City nuclear weapons parts plant.
- Hiroshima and Nagasaki Day arrests across the US: Three members of the Atlantic Life Community were arrested outside the Pentagon for protesting outside a police-designated protest zone. Anti-nuclear activists blocked an entrance to California's Lawrence Livermore National Laboratory and about 30 were arrested. Seven activists crossed the property line of Lockheed Martin in Pennsylvania; they were arrested and cited for disorderly conduct. Thirty Catholic Workers and friends held a vigil and nonviolent direct action at Vandenberg Air Force Base in California − five were arrested. Peace activists in Washington state rolled out a 60-foot-long scarf ('Wool Against Weapons') at a nuclear weapons base in a demonstration against the Trident nuclear weapons system − six were arrested after walking on entrance lanes to the base.

To read more and to subscribe to the Nuclear Resister e-bulletin or the print edition, visit: www.nukeresister.org

Czech Republic: New Atomic Act

The Czech State Office for Nuclear Safety (SÚJB) has prepared a bill for a new Atomic Act. This bill is subject to amendment and will be submitted to the Government later this year. NGO Calla, which has long followed legislation on nuclear power, has fundamental problems with the bill:

- It maintains the ČEZ's disproportionately low level of limited liability for nuclear damage.
- The bill ignores the efforts of the municipalities, in whose territory the State is seeking final deep geological repository for high-level radioactive waste, to strengthen their rights.
- The bill prevents municipalities and the public from expressing and defending their rights in permitting the location and construction of nuclear facilities. The applicant is the only participant in an administrative proceeding under the Atomic Act.

Calla, media release, 25 Aug 2014, 'New Atomic Act: advantages for nuclear energy last' www.calla.cz

Hibakusha Worldwide poster exhibition

The International Physicians for the Prevention of Nuclear War (IPPNW) has created a poster exhibition called “Hibakusha Worldwide”. It is dedicated to the millions of people whose lives have been affected by the nuclear industry: Indigenous people whose homes were turned into nuclear wastelands by uranium mining; downwinders of the nuclear weapons tests; the survivors of the bombing of Hiroshima and Nagasaki; and the people affected by radioactive fallout from civil and military nuclear accidents and nuclear meltdowns. The exhibition consists of 50 posters which can be ordered for temporary display or viewed online.

www.ippnw-students.org/hibakusha.html
Contact Alex Rosen, IPPNW Berlin, rosen@ippnw.de

USA: Nuclear whistle-blower wins reinstatement order

The US Labor Department ordered the reinstatement of an environmental specialist at the former nuclear weapons complex at Hanford, Washington, saying she had been wrongfully fired. Shelly Doss, an employee of Washington River Protection Solutions (WRPS), was fired in October 2011 after she had reported federal and state environmental violations. Doss is one of a number of employees who have been fired, driven out or harassed for raising safety concerns at the facility, according to Hanford Challenge, a watchdog group. The Labor Department found that “every time complainant voiced an environmental or nuclear safety concern, respondent took her off of that project until she hardly had any work assignments left. Complainant was slowly stripped of her job duties.”

www.latimes.com/nation/nationnow/la-na-nn-fired-nuclear-whistleblower20140820-story.html

US Navy kicks out 34 for cheating

At least 34 sailors are being kicked out of the Navy for their roles in a cheating ring that operated undetected for at least seven years at a nuclear power training site, and 10 others are under criminal investigation, the admiral in charge of the Navy’s nuclear reactors program told *The Associated Press*. The sailors were seeking to be certified as instructors at the nuclear training unit at Charleston, South Carolina. Students there are trained to work on the Navy’s 83 nuclear-powered submarines and aircraft carriers. Unlike an Air Force exam-cheating scandal that came to light in January at a Montana base that operates land-based nuclear-armed missiles, the sailors involved in the Navy cheating had no responsibility for nuclear weapons.

http://hosted.ap.org/dynamic/stories/U/US_NAVY_NUCLEAR_CHEATING

Muslim engineer banned from entering French nuclear plants

A Muslim engineer was banned from entering French nuclear power stations where he was working without explanation, his lawyer claims. The 29-year-old engineer’s pass for the Nogent-sur-Seine nuclear plant was removed without explanation in March 2014. Despite the ban being overturned once in court, he was stopped from entering another nuclear plant in July. He is challenging this.

www.energylivenews.com/2014/08/21/muslim-engineer-banned-from-french-nuclear-plant/

www.france24.com/en/20140818-muslim-engineer-banned-french-nuclear-sites-edf

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

Subscriptions:

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