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Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- Gloria Kuang-Jung Hsu writes about nuclear power debates in Taiwan and whether the 2025 phase-out will be achieved.
- We write about the collapse of yet another 'small modular reactor' project: mPower in the US.
- We write about the plight of Fukushima evacuees and a court ruling holding both the Japanese government and TEPCO to account for failing to prevent the nuclear disaster.
- We summarize critical responses to disingenuous Breakthrough Institute propaganda regarding the economics of nuclear power.

The Nuclear News section has reports on a book about the polonium poisoning of Russian dissident Alexander Litvinenko; a scandal in Niger's uranium industry; funding to partially clean up abandoned uranium mines on Navajo land in the US; widespread opposition to the planned Salamanca uranium mine in Spain; radioactive waste scandals and fines in the US; and a scathing report from the French Nuclear Safety Authority about Areva's Creusot Forge foundry.

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

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Taiwan to become nuclear-free by 2025?

Author: *Gloria Kuang-Jung Hsu*

NM840.4627 Before the presidential election in early 2016, Ms. Tsai Ing-Wen, now the President of Taiwan, promised that all existing nuclear power plants will be closed by 2025. Implicitly, all reactors would operate for a maximum of 40 years, with no lifetime extension, and the fourth nuclear power plant will not become operational.

In January 2017, the Amendment of the Electricity Act passed the Legislative Yuan. Article 95 of the Amendment states "all nuclear power generating facilities shall cease operation by 2025." President Tsai's campaign promise became law. However, many uncertainties lie ahead, which will determine whether this part of Electricity Act becomes reality.

First, if the ruling Democratic Progressive Party (DPP) wins the next two presidential elections and maintains its majority in the parliament, the chance of having another amendment to Article 95 of the Electricity Act will be small.

However, since her inauguration in May 2016, President Tsai's administration has been criticized heavily not only by the oppositions, but also by many long-time DPP supporters. The latter group felt uneasy about the administration being filled with many ex-KMT old-guards, perhaps out of President Tsai's conservative nature. The KMT or Kuomintang is the Chinese Nationalist Party, retreated to Taiwan after WWII.

Indecisive on some policy issues and too hasty on others, President Tsai has united opposite sides: they are both angry and frustrated. Her poll ratings have plummeted. Although there is no credible challenger from the opposition KMT in sight yet, President Tsai's re-election campaign will not be as smooth as the past one. Many think the President will initiate a major cabinet reshuffle soon to change the current uncomfortable situation.

President Tsai also set a renewable energy target of 20% electricity generated by 2025, with the aim to fill the electricity gap created by the nuclear phase-out. Taiwan's Renewable Energy Act passed in 2009, and took effect in 2010. However, former President Ma Ing-Jiu is known to prefer nuclear and often looked down on renewables. The state-owned utility Taiwan Power Company (Taipower) was hostile towards renewables. The percentage of electricity generated by wind plus solar PV barely exceeded 1% at the end of 2016, after seven years of development. To reach 17% from 1% by 2025 is a very difficult task. Hydro and waste generate around 3% of electricity, with little growth potential.

The attitude of TaiPower is the key determining factor whether the nuclear-free law can be achieved. Taipower is a strong believer in nuclear energy. Two days after Tsai won the election in January 2016, TaiPower surprisingly updated its projection on future power shortages from high risk to little risk if Taiwan becomes nuclear-free. However, two months later, Taipower chair Huang Chong-Chiou denied that Taipower had ever made any such a U-turn in its electricity projection, and said he could not guarantee adequate electricity supply without nuclear power.

Of six operating nuclear reactors in Taiwan, four have full spent fuel pools, with no space for a whole core removal in case of emergency. Unit-1 of Chin San Nuclear Power Plant (NPP1) has been idle since December 2014, pending legislative hearings on the broken handle of a fuel assembly. On 16 May 2016, three sets of lightening buffer facilities on Unit-2 of Guo Sheng Nuclear Power Plant (NPP2) exploded. Taipower has yet to produce a satisfactory explanation, so the reactor remains shut. Despite such a precarious situation, Taipower seeks every opportunity to keep those reactors running.

As if trying to prove Chair Huang's point, in May 2016, Taipower began repeatedly issuing warnings of a possible power shortage. Seeming being manipulated, Minister without Portfolio Chang Jin-Shen suggested the restart of unit-1 of NPP1 as backup power to fill the possible electricity gap, only two weeks after Tsai's inauguration. The suggestion made little sense: at the end of 2015, total installed capacity was 48.7 gigawatts (GW) and peak demand was less than 37 GW. Wind and solar capacity combined is 3 GW. The capacity of the two idled nuclear reactors is 1.5 GW.

Nevertheless, based on data provided by Taipower, Premier Lin Chuan sided with Chang Jin-Shen. However, Chang was heavily ridiculed as lack of basic knowledge on nuclear, since nuclear is not suitable to be backup. Both Lin's and Chang's remarks immediately drew heavy criticism from civil society as well as many DPP legislators who were outraged by the betrayal of President Tsai's nuclear-free promise. Premier Lin retracted his words the next day.

This incident exposed the administration's limited understanding of Taipower, and its role in Taiwan's energy policy over the past four decades. It also showed that the administration fails to control Taipower. Even in early February, Taipower kept issuing warnings of tight electricity supply. As former Premier Frank Hsieh once said: "Taipower often uses heavily doctored information to push its own agenda. Taipower often arranges regular maintenance during peak demand."

What is Taipower's agenda? Most likely it is nuclear power. Since Taipower is a state-owned company, its management team dare not openly defy the President's nuclear-free doctrine. Instead, they use their monopoly status to block all possible options except one – nuclear.

Article 6 of the Amendment of Electricity Bill states that "in order to maintain stable power supply, power generation, transmission and distribution divisions of Taipower can merge into a controlling consortium". Instead of tearing Taipower into three individual companies as electricity liberalization should do, Article 6 did just the opposite, strengthening Taipower's monopoly position.

In case not enough renewable electricity comes online, the first alternative is to burn more fossil fuels. In fact, Taipower has plans to add at least 7.4 GW of fossil generating capacity. The consequence will be greater emissions of greenhouse gases into the atmosphere and more local pollution. As the Paris Agreement enters into force, the attempt to release more CO2 goes against the global trend, which calls for carbon neutrality by mid-century.

Some may say that since Taiwan is not party to the United Nation Framework Convention on Climate Change, there is no need to observe its rule. What happens if there are some types of economic sanction for not following the global consensus? Perhaps, nuclear should again be considered then?

Whether or not there is a healthy, vibrant development of renewable energy will determine the feasibility of the nuclear-free policy by 2025. Therefore, we demand a clear roadmap and corresponding budget allocations. Only when careful planning and actual implementation begin, can we comfortably say the nuclear-free policy is real. Without the framework and proper preparation, a promise is only a promise.

Gloria Kuang-Jung Hsu Ph.D, MPA is a Professor in the Department of Atmospheric Sciences, National Taiwan University; Chair of Mom Loves Taiwan Association; and ex-Chair of Taiwan Environmental Protection Union.

Mass protests in Taipei on March 11

Thousands of citizens took to the streets in Taiwanese capital Taipei on March 11 demanding the closure of atomic power plants and more citizen involvement in decisions on radioactive waste storage. More than 60 anti-nuclear civil society groups rallied to demand greater openness and civic participation in managing nuclear waste, and advocated a move towards more sustainable forms of energy.

Indigenous groups from Orchid Island also took part in the demonstration outside the Presidential Palace with placards calling for the removal of nuclear waste from the island nation.

Marches were also held in Kaohsiung in the south, and Taitung on the east coast.

The Ministry of Economic Affairs responded by promising to comply with a plan to decommission nuclear plants and make Taiwan nuclear-free by 2025, in addition to using renewable sources for 20% of its power needs. In a press release, the ministry said the movement towards non-nuclear sustainable energy and lower carbon dioxide emissions has been stepped up, and announced two-year and four-year plans to boost solar photovoltaic and wind energy.

http://energy.economictimes.indiatimes.com/news/power/mass-protests-in-taiwan-against-nuclear-energy-demanding-closure-of-atomic-plants/57601681

https://english.kyodonews.jp/news/2017/03/463118.html

U.S. small reactor project just got smaller

Author: *Jim Green – Nuclear Monitor editor*

NM840.4628 The mPower small modular reactor (SMR) project in the USA just got much smaller: it has been abandoned.

mPower was conceived in 2008 and announced to the world in June 2009. In July 2010, Babcock & Wilcox announced an alliance with Bechtel called Generation mPower. At the same time, Babcock & Wilcox announced that it would build an mPower test facility in Virginia, part-funded by a US$5 million grant from the Virginia Tobacco Indemnification and Community Revitalisation Commission.[1]

Generation mPower planned to apply to the Nuclear Regulatory Commission (NRC) for design certification by 2013.[1] The company aimed for NRC certification and a reactor construction permit in 2018, and commercial operation of the first two units in 2022.[2]

The idea was to produce scaled-down (195 MWe) pressurized light water reactors (PWR), drawing on decades of worldwide experience with (larger) PWRs and thus making NRC licensing simpler and quicker.[3]

Experienced, cashed-up companies ... a conventional reactor design ... R&D funding support from Virginia and from the federal Department of Energy ... what could go wrong?

It didn't take long for the project to fall apart. In 2013 Babcock & Wilcox said it intended to sell a majority stake in the mPower joint venture, but in February 2014 announced it was unable to find a buyer. In April 2014, Babcock & Wilcox announced it was sharply reducing investment in mPower to US$15 million annually, citing the inability "to secure significant additional investors or customer engineering, procurement and construction contracts to provide the financial support necessary to develop and deploy mPower reactors".[1]

More than 200 engineers, project managers, administrators, and sales-people were sacked in 2014.[4]

The Tennessee Valley Authority had been named as a lead customer and plans were developed to build up to six mPower reactors at TVA's Clinch River site at Oak Ridge, Tennessee.[5] But in 2014, TVA ended the agreement to share design and licensing costs.

In November 2012, the US Department of Energy (DOE) announced that it would subsidize mPower development in a five-year cost-share agreement. The DOE's contribution would be capped at US$226 million, of which US$111 million was subsequently paid. That funding tap was switched off after Generation mPower downsized the project in 2014, but the company was not required to repay any of the DOE funding.[2]

The Generation mPower companies spent more than US$375 million on mPower to February 2016.[2] Add that to the DOE's US$111 million contribution, and overall expenditure was nudging US$500 million.

In March 2016, Babcock & Wilcox and Bechtel came to an arrangement whereby Bechtel would attempt to secure further funding from third parties, including the DOE.[2] However those efforts have been abandoned. On 3 March 2017, Bechtel notified Babcock & Wilcox that it was unable to secure sufficient funding and was invoking a settlement provision to terminate the joint agreement. Generation mPower will terminate the program in the next few months.[3]

Bechtel spokesperson Fred deSousa said: "Bringing a new reactor program through the design, engineering and regulatory process is a very complex and expensive proposition. It needed a plant owner with an identified location and an investor willing to wait a significant period of time for a return, and these were not available."[6]

An illustration of what the mPower reactor might have looked like. *Source: Westinghouse.*

Rod Adams – who worked for B&W mPower as the Process and Procedure Development Lead from 2010 to 2013 – gives some reasons for the demise of mPower:[3]

- The financial crisis of 2008.
- The continuing reduction in natural gas prices.
- Management challenges associated with a fundamentally unequal partnership between two large, established companies, each with their own culture.
- "The aggressive effort to market the Fukushima events as a nuclear catastrophe in order to suppress a growing interest in nuclear energy development".
- "The entry of activist investors that purchased a large portion of B&W's stock and forced a major reevaluation of the project and the overall corporate structure".

Adams' statement about aggressive efforts to market Fukushima as a nuclear catastrophe is a cheap shot at environmentalists and other nuclear critics. His statement about "activist investors" is more intriguing. That's a story he discussed in a 2014 article.[4] He notes that the February 2014 announcement to sharply reduce investment in mPower followed the purchase of Babcock & Wilcox shares by Wall Street investment funds. Those investment funds purchased enough stock to impose a restructuring plan that directed spending away from mPower. Their motives, according to Adams, were to prioritize short-term profits over medium-term investments, and to protect their investments in fossil fuels by killing off a potential competitor. And their statements about a lack of customer and investor interest were a concocted cover story.

So mPower was wedged between aggressive anti-nuclear marketeers and fossil-fueled corporate interests. Perhaps. Adams also offers a tendentious conspiracy theory about a "sabotage effort from within the nuclear industry".[4]

A future for SMRs?

SMRs continue to be the subject of endless hype. There's quite a bit of R&D – in the US, the UK, South Korea, China and elsewhere. But only a few SMRs are under construction: one in Argentina, a twin-reactor floating nuclear power plant in Russia, and three SMRs in China (including two high-temperature gas-cooled reactors).[2]

The broad picture for SMRs is much the same as that for fast neutron reactors: lots of hot air, some R&D, but few concrete plans and even fewer concrete pours.[7] Michael McGough from NuScale, a US SMR company, said: "It's one thing to talk about it. It's another thing to actually build it and do it."[8]

A February 2017 Lloyd's Register report surveyed almost 600 energy industry professionals and experts and the dominant view was that SMRs have a "low likelihood of eventual take-up, and will have a minimal impact when they do arrive".[9,10] Likewise, a 2014 *Nuclear Energy Insider* report, drawing on interviews with more than 50 "leading specialists and decision makers", pointed to a "pervasive sense of pessimism" resulting from abandoned and scaled-back SMR programs.[11]

No company or country is seriously considering building the massive supply chain that is at the very essence of the concept of SMRs – mass, modular construction. Yet without that supply chain, SMRs will be expensive curiosities. As pro-nuclear commentator Dan Yurman noted in January 2016, "the real challenge will be to book enough orders to bring investors to the table to build factories to turn out SMRs on a cost effective production line basis."[12]

Thomas W. Overton, associate editor of POWER magazine, wrote in a September 2014 article: "At the graveyard wherein resides the "nuclear renaissance" of the 2000s, a new occupant appears to be moving in: the small modular reactor (SMR). ... The SMR concept disdains ... economies of scale in favor of others: large-scale standardized manufacturing that will churn out dozens, if not hundreds, of identical plants, each of which would ultimately produce cheaper kilowatt-hours than large one-off designs. It's an attractive idea. But it's also one that depends on someone building that massive supply chain, since none of it currently exists. ... That money would presumably come from customer orders − if there were any."[13]

So how many orders would a manufacturer need to go the financial markets to get funding to build a supply chain to make lots of SMRs? Dan Yurman writes: "The answer, according to David Orr, head of nuclear business development for Rolls-Royce in the UK, ... is a minimum of about four dozen units and six dozen would be better. Those are high numbers which make some proponents of SMRs unhappy. The reason is this estimate means that turning out the first 50 or so SMRs for any firm in the business could be a high wire act."[12]

A recent article from two pro-nuclear lobby groups, Third Way and Breakthrough Institute, argues that with small reactor concepts, "there is ample opportunity for learning by doing and economies of multiples for several reactor classes and designs".[14] But the mPower project cost close to US$500 million. That sort of expensive failure can't be repeated indefinitely.

NuScale has progressed further than mPower – it recently submitted an application to the NRC for design certification. To get to this point has cost US$500 million and taken two million labor-hours over eight years.[15] NRC certification will likely take an additional three years.[15] NuScale estimates that by the time it gets through the NRC licensing process, it will have spent US$1 billion overall (including a significant DOE contribution for R&D).[16]

And then NuScale will face the problem that there is a long way from NRC certification to the completion of its first SMR, and further still from the first reactor to mass production for a mass market.

NuScale says the aim is to replace "economy-of-scale with economy-of-the-assembly-line".[17] But the risk is that SMR developers will end up with neither. In the absence of a mass supply chain, costs will be exorbitant.

The construction cost of Argentina's 25 MWe CAREM reactor is estimated at US$446 million, which equates to a whopping US$17.8 billion / gigawatt (GW).[18] Estimated construction costs for the Russian floating SMR have increased more than four-fold and now equate to over US$10 billion / GW.[19] For comparison, the estimated cost of the planned Hinkley Point EPR reactors in the UK is US$7 billion / GW or US$9.5 billion / GW including finance.

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One step forward, one step back for Fukushima evacuees

Author: *Jim Green – Nuclear Monitor editor*

NM840.4629 On March 17, the Maebashi District Court in Gunma Prefecture awarded ¥38.6m (US$342,000) to 62 Fukushima evacuees, far below the ¥1.5 billion the group had sought.[1,2]

The court ruled that negligence by the state contributed to the nuclear disaster and that the government should have used its regulatory powers to force TEPCO, who were also held liable in the court ruling, to take adequate preventive measures.[2]

The plaintiffs based their claim on a 2002 report by the government's Headquarters for Earthquake Research Promotion, which estimated that there was a 20% chance of a magnitude-8 earthquake occurring and triggering a powerful tsunami within the next 30 years. Citing the 2002 report, the Maebashi Court said "TEPCO was capable of foreseeing … that a large tsunami posed a risk to the facility and could possibly flood its premises and damage safety equipment, such as the backup power generators."[3] The Court said TEPCO had put economic expediency ahead of safety.[4]

The plaintiffs further argued that TEPCO should have taken precautionary measures, including the building of breakwaters, based on calculations in a 2008 internal TEPCO report 'Tsunami Measures Unavoidable' that showed waves of over 10 meters could hit the Fukushima Daiichi plant.[3]

The suit was filed in the Maebashi District Court on behalf of 137 evacuees, including both forced and 'voluntary' evacuees. Only 62 were awarded damages, and they were awarded only a small fraction of the damages sought.[1]

Takehiro Matsuta, 38, one of the plaintiffs, said: "The ruling was one big step for my family, for those who evacuated from Fukushima to Gunma, and for tens of thousands of earthquake victims nationwide." But he

called the payout "disappointing" as his child, who was three years old at the time of the nuclear disaster, was not granted compensation. "My wife and I are struggling every day, but it's my child who suffers the most."[3]

Koichi Muramatsu, a plaintiff in another suit, said: "The money is not a problem. Even if it's ¥1,000 or ¥2,000, it's fine. We just want the government to admit their responsibility. Our ultimate goal is to make the government admit their responsibility and remind them not to repeat the same accident."[1]

A TEPCO spokesperson said: "We again apologize from the bottom of our hearts for giving great troubles and concerns to the residents of Fukushima and other people in society by causing the accident of the nuclear power station of our company. Regarding today's judgment given at the Maebashi local court today, we would like to consider how to respond to this after examining the content of the judgment."[1]

Japan's Nuclear Regulation Authority said it will hold an emergency meeting and will "weigh a response after having read the ruling closely".[4]

Azby Brown from the Kanazawa Institute of Technology, and a volunteer with the independent radiation-monitoring group Safecast, said he expected the government and TEPCO to appeal the court ruling "and for this to drag on for years."[1]

The court ruling sets an important precedent. It is the first of about 30 lawsuits to be brought by close to 12,000 former Fukushima residents in 18 prefectures.[1,2]

Efforts to restore community life failing

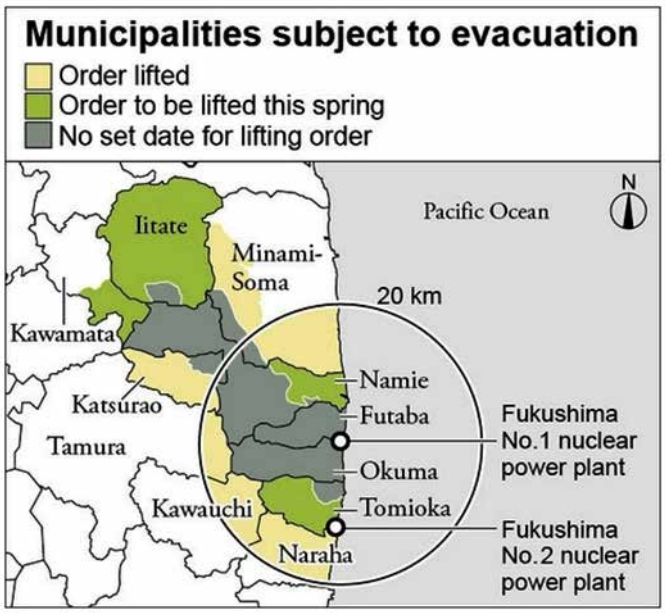
The number of evacuees (forced and 'voluntary') from the Fukushima nuclear disaster peaked at 164,865 in May 2012. By May 2016, the number was 84,289.[5]

In early March 2017, officials said about 80,000 people were still dislocated. But the number is greater if including those who have permanently settled elsewhere. Japanese public broadcaster *NHK* noted that the estimate of 80,000 evacuees includes 17,781 residents of five municipalities near the Fukushima plant – but that number swells to 42,030 if including people who moved into public housing or acquired new homes in other areas.[7]

A total of 35,503 evacuees from the prefectures of Iwate, Miyagi and Fukushima were still living in temporary makeshift homes as of January 2017.[8]

Efforts to restore community life in numerous towns are failing. In five municipalities in Fukushima Prefecture – Tamura, Minamisoma, Kawauchi, Katsurao, and Naraha – only 13% of evacuees have returned home after evacuation orders were lifted partly or entirely from April 2014 through July 2016.[9] As of January 2017, only about 2,500 people out of a combined population of around 19,460 had returned.[9]

Of the 11 municipalities within the originally designated evacuation area, five have seen evacuation orders fully or partially lifted since April 2014.[10] Evacuation orders will soon be lifted for four more municipalities in Fukushima Prefecture – Namie, Kawamata, Iitate, and Tomioka.



About 32,000 residents will be affected but the same pattern is likely to be repeated: only a small percentage will return.[11] Reasons cited for the reluctance to return to these municipalities include concerns over the lack of medical services, safety concerns regarding nuclear power and radiation, and the lack of shops, public transportation and other services essential to everyday life.[10]

Mainichi Japan reported in September 2016 that only 28% of school-children are attending their original schools in five towns and villages in Fukushima Prefecture following the lifting of evacuation orders – and some of those children face long commutes to travel from their current accommodation to their old schools.[12] The children attended temporary schools at evacuation sites after the March 2011 triple-disaster. With the closure of the temporary schools, the three options are returning to their hometowns, commuting to their former schools, or attending schools at evacuation sites.

'Difficult to return' zones

Areas still subject to restrictions are divided into three zones: 'difficult to return' zones (annual radiation doses exceeding 50 millisieverts / year), 'restricted residency' zones (20–50 mSv/year) and 'evacuation order cancellation preparation' zones (<20 mSv/year). The national government aims to end all restrictions in the latter two categories as soon as possible.

About 24,000 people were evacuated from zones now classified as 'difficult to return'. The government intends to pay for the decontamination of certain areas within these zones (perhaps as little as 5% of the area) so former residents can return.[11] *Mainichi Japan* reported in December 2016 that the government planned to allocated ¥30 billion (US$267m; €248m) to partially decontaminate these zones, once again transferring TEPCO's responsibilities onto taxpayers.[13] The Citizens Nuclear Information Center noted that the policy runs against the basic law that demands that decontamination be performed at the expense of the entity that caused the contamination.[14]

Restrictions will likely remain in the difficult-to-return zones for another five years or so[13] – and presumably for longer in areas where no attempt is made at decontamination.

Housing assistance gap and gender gap

Fukushima Prefecture is set to terminate its free housing service to thousands of voluntary evacuees at the end of March 2017. As of October 2016, 26,600 people were receiving Fukushima Prefecture's free housing service under the Disaster Relief Act after they voluntarily evacuated from the nuclear disaster.[15] A little more than half of them are now living outside the Prefecture.

Nine of Japan's 47 prefectures are planning to provide some assistance to support voluntary evacuees.[15] However the level of assistance will vary greatly; some will be generously supported, some will receive little and others none at all. Evacuees faced dislocation after the Fukushima disaster, they face dislocation as the Fukushima Prefecture's support comes to an end at the end of March, and they will face further dislocation as support from other prefectures is wound down.

Voluntary isn't really the word: none of the 'voluntary' evacuees wanted to evacuate. In many cases, they were parents – usually mothers – who weren't prepared to allow their children to be exposed to Fukushima radiation. As Kendra Ulrich from Greenpeace Japan notes:[16]

"Fukushima-impacted women were faced with significantly greater obstacles in coping with the impacts of the disaster according to their own wishes due to a yawning gender gap in Japanese society. In fact, in the most recent ranking of the 34 OECD countries on gender wage gap, Japan was one of the bottom three with only South Korea and Estonia ranking lower.

"Despite these financial and social barriers, many women separated from or even divorced husbands who chose

to stay in the contaminated region. They evacuated with only their children, in an effort to protect them.

"But they continue to face a greater risk of poverty and are more vulnerable to financial pressures. And it is just these financial vulnerabilities that the Abe Government is exploiting now. Thousands of Fukushima survivors from outside the designated zones will be stripped of their housing support in March 2017.

"The government is also moving forward with lifting evacuation orders in some of the more heavily contaminated areas in March and April of this year, even though radiation levels still far exceed long-term decontamination targets. Those from areas where orders are lifted will lose compensation payments next year.

"According to the most recent government data from October 2016, thousands of those losing housing support this month had nowhere else to go. They are at risk of homelessness. This means that some people may be forced to return to contaminated areas, even though they do not want to."

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Nuclear economics: Critical responses to Breakthrough Institute propaganda

NM840.4630 The Breakthrough Institute, a US-based pro-nuclear lobby group, has been in the middle of a debate about the economics of nuclear power. The origin of this debate was an article by the Institute's Jessica Lovering, Arthur Yip and Ted Nordhaus, published in the *Energy Policy* journal last year.[1]

They compiled overnight construction cost data from a number of countries and concluded:[1]

"In contrast to the rapid cost escalation that characterized nuclear construction in the United States, we find evidence of much milder cost escalation in many countries, including absolute cost declines in some countries and specific eras. Our new findings suggest that there is no inherent cost escalation trend associated with nuclear technology."

The article attracted scepticism even from nuclear advocates, with former World Nuclear Association executive Steve Kidd writing:[2]

"The article tries too hard to refute the general contention – based on US and French experience – that the costs of nuclear power stations have risen substantially over time. It incorporates new evidence on the costs of early demonstration reactors in the US and France, and data from a wider number of countries (including Canada, Germany, Japan, India and South Korea), that show a variety of more favourable trends. With the exception of South Korea, these apply only in particular time periods.

"Full data from the UK was conveniently unavailable – the cost escalation record of the 14 AGRs [Advanced Gas-cooled Reactors] was even worse than the US experience in the 1980s – while the escalating costs of the two EPRs under construction in Europe and the four AP1000s in the US are also ignored."

Energy Policy has recently published two detailed responses[3,4] to the Lovering et al. article and a rejoinder by Lovering et al.[5] US academics Jonathan Koomey, Nathan Hultman, Arnulf Grubler argue that Lovering et al. "use analytical methods that mask nuclear power's real construction costs, cherry pick data, and include misleading data on early experimental and demonstration reactors."[3]

Koomey et al. take issue with the use of overnight costs – omitting financing and other time-related costs – by Lovering et al.:

"While overnight costs do have a long history, there is simply no economic basis for comparing the costs of reactors without including the cost of capital and the construction duration. A key aspect of nuclear reactors that makes them such high-risk investments are that they are large scale, complex, and predominantly site-built. Hence construction takes years (even in the best case) and can extend over a decade or more. Almost all modern reactor programs analyzed in detail to date have experienced significantly lengthened construction times, which is ignored in the use of overnight construction costs by Lovering et al.

"Given that financing constitutes a significant part of nuclear costs in the real world, and that the very nature of nuclear power as a large scale, capital-intensive technology makes it particularly sensitive to financial risks, a study that ignores return on capital cannot give a true picture of the costs of nuclear power."

Koomey et al. note the overnight cost data presented by Lovering et al. do not even support their conclusions:[3]

"Analyzing the costs of electricity generation technologies is an exercise fraught with pitfalls. Unfortunately, Lovering et al.'s assessment of nuclear costs made several consequential errors. Their analysis incorrectly omits interest during construction, and thus substantially underestimates the effect of cost escalation over time. ...

"We note that the authors cherry pick data to suit their conclusions. Nevertheless, the presented data itself don't even support their stated conclusions, which is deeply puzzling. While Lovering et al. claim that their data show a more nuanced picture, suggesting that cost escalation for nuclear reactors is not a real problem, their own data for the modern era show the contrary. …

"The article presents graphs for nuclear construction costs in the US, France, Canada, West Germany, Japan, India, and South Korea, but the only country where overnight costs appear to decline over time in the modern era is South Korea. In that case the data do not come from an independent source but from the country's nuclear utility, have not been independently audited, and are not disclosed (and of course do not include interest during construction, as discussed above). As a result, they do not meet the critical scientific criteria of reproducibility and thus utmost caution is advisable in drawing strong conclusions from those numbers.

"Lovering et al.'s results suggest one example of overnight costs decreasing in the modern era, but the most sensible interpretation of their data is that almost all countries showed cost escalation from the 1970s onwards. This effect would be even more dramatic if the authors had included the costs of financing for a full accounting of nuclear construction costs and their historical evolution."

In a separate response, Alexander Gilbert, Benjamin K. Sovacool, Phil Johnstone, and Andy Stirling accuse Lovering et al. of being selective with their choice of data, unbalanced analysis, and biased interpretation.[4] They write:

"In conclusion, several methodological decisions limit the applicability of Lovering et al.'s analysis to overall nuclear construction costs. Difficulties concerning

the impact of interest rates on total installed costs, the role of time overruns, accounting for independent cost variables, the normalizing of global data, and comparisons with existing energy sources all serve to blunt Lovering et al.'s implied critique of earlier studies. Indeed, severalconclusions in the existing literature remain unrefuted:

- *Nuclear energy displays serious cost escalations both in the form of rising capital costs over time and in cost overruns at individual plants;*
- *There are regional and temporal variations in these trends, but similar patterns nonetheless persist across countries and timeframes;*
- *Compared to other technologies, the intensity of these cost escalations is highly distinctive of nuclear reactors;*
- *Policymakers and energy modelers addressing nuclear energy need to be aware of elevated capital costs, the critical role of interest rates, and the near certainty of cost and time overruns."*

Gilbert et al. also write:

"Our own work on the role of cost overruns in nuclear economics yields several points that deserve highlighting. One of them is that almost all nuclear reactors suffer from cost overruns. Another is that nuclear cost overruns occur in all countries. Yet another is that cost overruns are much greater for nuclear than for other energy sources. A final one is that nuclear cost overruns are heavily influenced by interest costs and time overruns. Lovering, et al. do not challenge this picture from the existing literature. Indeed, by failing to addressthe roles of interest costs or construction delays, their study effectively ignores some of the most important issues in understanding historical nuclear construction cost trends."

Gilbert et al. also take issue with the public statements made by Lovering et al., which have been even more inaccurate than their quasi-academic article in *Energy Policy*:

"Lovering and colleagues have repeatedly referred to their data or analysis publicly as reflecting the "real costs of nuclear power", as offering a "complete construction cost history" of the industry, or proving that "nuclear plants can be built quickly, safely, and cheaply". In light of both Lovering et al.'s actual results and our previous criticisms, these characterizations of their study are misleading and inaccurate."[4]

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NUCLEAR NEWS

The Assassination of Alexander Litvinenko and Putin's War with the West

A Very Expensive Poison: The Assassination of Alexander Litvinenko and Putin's War with the West

Luke Harding

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A true story of murder and conspiracy that points directly to Vladimir Putin, *A Very Expensive Poison* is written by Luke Harding, *The Guardian's* former Moscow bureau chief. Harding is the author of books such as *Mafia State* and co-author of *WikiLeaks: Inside Julian Assange's War on Secrecy*.

In November 2006, journalist and Russian dissident Alexander Litvinenko was poisoned in London. He died 22 days later. The cause of death? Polonium – a rare, lethal, radioactive substance. Harding details this assassination story – complete with KGB, CIA, MI6, and Russian mobsters. He shows how Litvinenko's murder foreshadowed the killings of other Kremlin critics, from Washington DC to Moscow, and how these are tied to Russia's current misadventures in Ukraine and Syria.

In so doing, Harding becomes a target himself and unearths a chain of corruption and death leading straight to Vladimir Putin. From his investigations of the downing of flight MH17 to the Panama Papers, Harding sheds a terrifying light on Russia's fracturing relationship with the West.

From the prologue:

Passport control, Gatwick Airport, Sussex – 16 October 2006:

That morning, [Andrei] Lugovoi and [Dmitry] Kovtun were bringing something into Britain that customs had failed to detect. Not drugs, or large sums of cash. Something so rare and strange and otherworldly, it had never been seen before in this form in Europe or

America. It was, as Kovtun put it, talking in confidence to a friend in Hamburg, 'a very expensive poison'. A toxin which had started its surreptitious journey to London from a secret nuclear complex in south-west Siberia. An invisible hi-tech murder weapon.

Lugovoi and Kovtun were to use it to kill a man named Alexander Litvinenko. Litvinenko was a Russian émigré who had fled to Britain six years previously. He'd become a persistent pain for the Russian government. He was a remorseless critic of Vladimir Putin, Russia's secret policeman turned president. By 2006, Litvinenko was increasingly anomalous: back in Russia many sources of opposition has been squashed.

There was a particular reason why Putin might want Litvinenko dead. Before escaping in 2000, Litvinenko had worked for the FSB, Russia's intelligence service, and the main successor agency to the KGB. Putin himself had been, briefly, his boss. But Litvinenko now had another employer: Britain's secret intelligence service, MI6.

Her Majesty's Government had given Litvinenko a fake British passport, an encrypted phone and a salary of £2,000 a month, paid anonymously into his HSBC account and appearing on his bank statement incongruously next to his groceries from Waitrose. He had an MI6 case officer, codenamed 'Martin'.

Litvinenko wasn't exactly James Bond. But he was passing to British intelligence sensitive information about the links between Russian mafia gangs active in Europe and powerful people at the very top of Russian power – including Putin. According to Litvinenko, Russian ministers and their mobster friends were, in effect, part of the same sprawling crime syndicate. A mafia state. It was his contention that a criminal code had replaced the defunct ideology of communism.

Litvinenko knew about this mafia's activities in Spain; he was, in the words of one friend, a walking encyclopedia on organised crime. So much so that MI6 loaned him out to colleagues from Spanish intelligence in Madrid. All of this made Litvinenko a traitor, and the KGB's punishment for spies who betrayed their country was understood. ...

Russia's poisoning project, when finally accomplished, would prompt a British public inquiry costing millions of pounds. One that examined the masses of evidence collected by the Metropolitan Police, from hotels, restaurants, car seats – even from a bronze phallus at a nightclub visited by the assassins in Soho. Scotland Yard was able to reconstruct minute by minute the events leading up to the murder. Its investigation – made public more than eight years later – was one of the most extensive in criminal history.

Yet despite this exposure there were soon to be other victims – opponents felled in murky circumstances abroad or, like the opposition leader Boris Nemtsov, killed outside the very gates of the Kremlin. Moscow would send tanks across borders, start a war in Europe, and annex a large chunk of neighbouring territory. Its proxies – or possibly Russian servicemen – would blow a civilian plane out of the sky.

The common theme here was contempt: a poisonous disregard for human life. For Vladimir Putin's critics have an uncanny habit of turning up dead.

Uraniumgate scandal in Niger

Niger's lower house of parliament voted unanimously on March 17 to investigate accusations that President Mahamadou Issoufou's former chief of staff improperly participated in the state mining company's purchase of 5.5 million pounds of uranium. Local media have dubbed the affair uraniumgate.

A Nigerien newspaper published documents in February showing a bank transfer in November 2011 for US$320 million from an account belonging to state miner Sopamin to an account controlled by an offshore company called Optima Energy. The bank transfer was signed by Issoufou's chief of staff at the time and current finance minister, Hassoumi Massaoudou, who lawmakers have said had no authority to do so.

At a news conference in February, Massaoudou acknowledged signing the bank transfer but said his involvement in a series of transactions involving the uranium rights, ending in its sale by Sopamin to French state-owned nuclear company Areva, ultimately earned the state a profit. He also denied suggestions by some lawmakers that some uranium could have been clandestinely sold in the process. The commission of inquiry will have 45 days to conduct its investigation and will be composed of 10 deputies, lawmakers said.

Niger is one of the world's top producers of uranium but ranks at the bottom of the U.N. Human Development Index out of 188 countries.

Reuters, 17 March 2017, 'Niger's parliament to investigate 'uraniumgate' sale', www.reuters.com/article/us-niger-uranium-idUSKBN16O2U5

US: $600 million to clean up abandoned uranium mines on Navajo land

Mining companies and the US government will pay to clean up 94 abandoned uranium mines on Navajo Nation. A US$600 million settlement was reached by the Navajo Nation, the US government and two subsidiaries of the mining company Freeport-McMoRan. The settlement calls for Cyprus Amax Minerals Co. and Western Nuclear Inc. to clean up 94 abandoned uranium mines. The US government will contribute US$335 million of the US$600 million total.

According to data from the Navajo Nation, a total of 523 abandoned uranium mines exist on the 27,000-square-mile reservation. With this settlement, cleanup efforts are taking place at about 200 of them.

The settlement – one of two reached in the past three years – addresses mining operations that started with the high demand of atomic weapons at the end of World War II. Private entities swarmed to the uranium-rich Navajo Nation, where they extracted about 30 million tons of uranium between 1944 and 1986, when the last uranium mine shut down. The federal government, through the Atomic Energy Commission, was the sole purchaser of uranium until commercial sales began in 1966.

Many Navajo people worked in or near the mines, often raising their families in close proximity to radioactive substances.

Alysa Landry, 14 Feb 2017, 'Navajo Nation Abandoned Uranium Mines Cleanup Gets $600 Million', https://indiancountrymedianetwork.com/news/environment/navajo-abandoned-uranium-mines-600-million/

Spain: widespread opposition to planned Salamanca uranium mine

Australian company Berkeley Resources' Retortillo open-pit uranium mine and mill project in Salamanca Province, Spain, has sparked a string of protests. The company plans to complete construction of the ore processing plant by the end of the first quarter of 2017.

On 5 March 2017, several hundred people protested against massive felling of oaks for the Retortillo project. The protest was convened by the Salamanca Antinuclear Collective and the Stop Uranium Platform.

On 10 November 2016, a protest was held at the Retortillo spa against the uranium project. 156 users gathered outside to voice their opposition.

On 30 October 2016, 500 people demonstrated at Berkeley's facilities in Retortillo. The protest was attended by representatives from different political parties plus inhabitants of nearby towns such as Villavieja de Yeltes, Villares de Yeltes, Boada and Yecla de Yeltes. They were joined by several property owners opposed to the project, who refuse to sell their land to the mining company.

On 9 October 2016, more than 1,000 people protested at a demonstration held in Zamora against the neglect of the provinces of Salamanca, Zamora, and León, and against the Retortillo uranium project.

On 20 August 2016, the Platform Stop Uranium organized a road blockade to protest the uranium mine, cutting off the N-620 highway.

In February 2017, WWF sent a report to the European Commission denouncing the environmental impacts of what would be the largest uranium mine and mill in Europe. Among the most serious impacts of the Retortillo uranium project is the probable extinction of the Salmon sardine, a protected fish species. The WWF report said the project will lead to the destruction of a Red Natura 2000 area with unique habitats, and will also put the local economy at risk, ending traditional activities such as cattle farming or rural and thermal tourism.

www.wise-uranium.org/upes.html#SALAMANCA1

www.facebook.com/StopUranioCampoCharro

http://www.ecologistasenaccion.org/

US: Companies file for bankruptcy after radioactive waste fines

A business owner and his two firms that were fined millions of dollars after being accused of illegally dumping low-level nuclear waste have all filed for bankruptcy in federal court.[1] Advanced TENORM Services, BES and Cory David Hoskins filed separate voluntary petitions for Chapter 7 bankruptcy on March 10.

Advanced TENORM and Hoskins were each fined US$2.65 million by the Kentucky Cabinet for Health and Family Services in November 2016 for dumping out-of-state radioactive waste in landfills in Estill and Greenup counties in Kentucky. Officials say the waste was a by-product of fracking and had been transported from Ohio, West Virginia and Pennsylvania in 2015.

Last November, the US Justice Department announced that Bechtel, URS Corp. and URS Energy and Construction (now known as AECOM Energy and Construction) agreed to pay US$125 million to resolve allegations that they made false statements and claims to the Department of Energy (DOE) by charging for deficient nuclear quality materials, services, and testing that was provided at the Waste Treatment Plant (WTP) at DOE's Hanford Site near Richland, Washington.[2] The allegations were initially brought in a lawsuit filed under the whistleblower provisions of the False Claims Act by WTP employees.

The settlement also resolved allegations that Bechtel improperly used federal contract funds to pay for a comprehensive, multi-year lobbying campaign of Congress and other federal officials for continued funding at the WTP. Since 2002, DOE has paid billions of dollars to the defendants to design and build the WTP, which will be used to treat dangerous radioactive wastes that are currently stored at Hanford.

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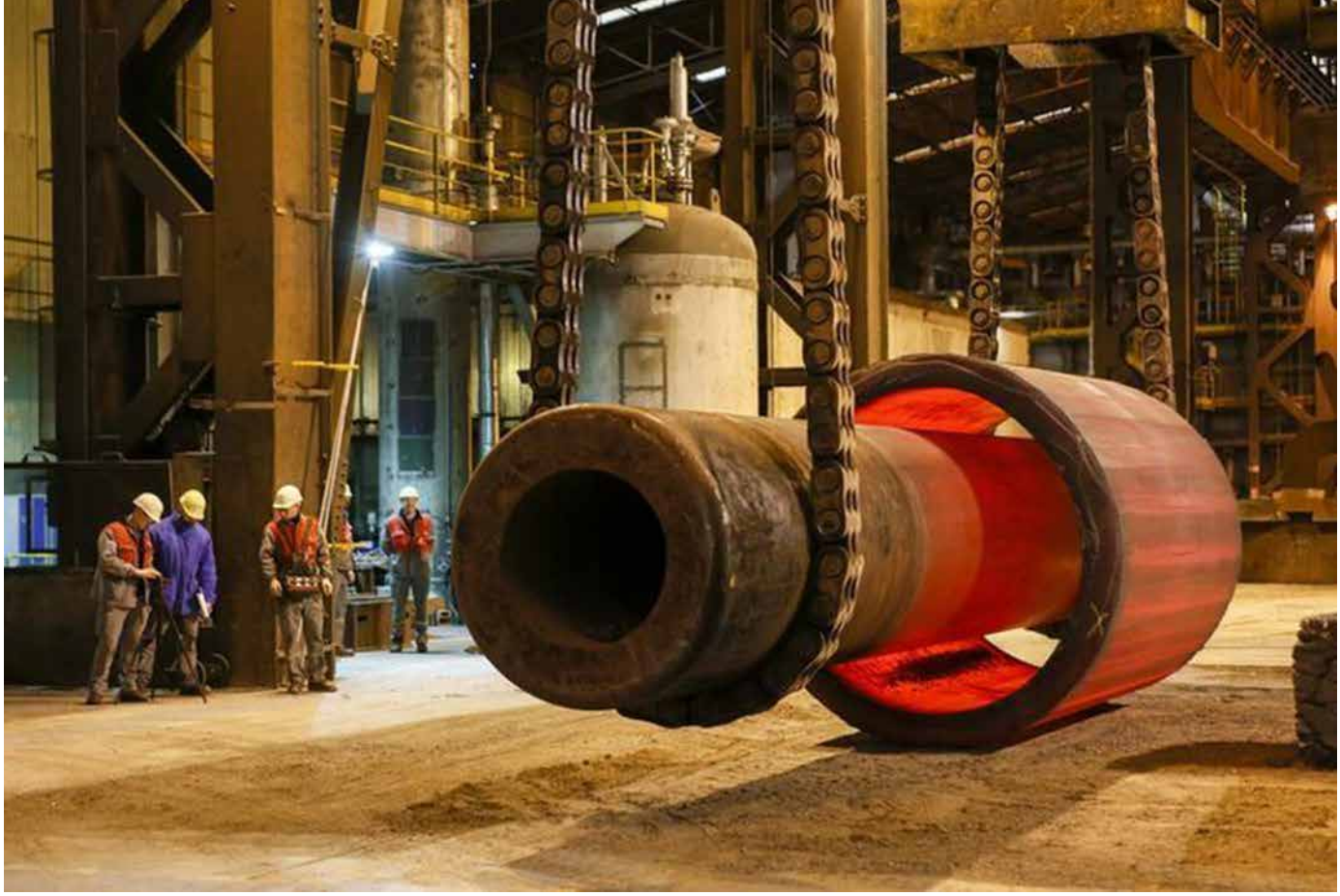
Areva factory ill-equipped to make nuclear parts – watchdog

Creusot Forge, a supplier of nuclear plants around the world owned by France's Areva, is under investigation for making substandard parts and falsifying documents. Now, France's nuclear regulator says machinery at the plant, which was shut for commercial production last year, is not up to the job. In an interview, Remy Catteau, the head of nuclear equipment at the ASN (Nuclear Safety Authority), said that an inspection of the plant late last year showed that it did not have the right equipment to produce the parts for the nuclear reactors.

Catteau told Reuters: "Creusot Forge is at the limit of its technical capacity. The tools at its disposal are not adequate to manufacture such huge components. In such a situation, errors are made. The inspection brought to light the fact that the safety culture in the plant is not sufficient to produce nuclear components."

Areva shut the factory after it found that manufacturing documents at the plant may have been falsified over some 40 years and parts made by the foundry did not meet specifications. The investigation by the regulator is ongoing but Areva hopes to restart production at the factory this summer, if ASN allows it.

Creusot Forge made the vessel lid and bottom for the Flamanville 3 EPR reactor under construction in western France. But at the end of 2014, Areva discovered



Workers in Areva's Creusot Forge foundry.
Source: Reuters.

excessive carbon concentrations in those components, which weaken the steel. Flamanville's future is now uncertain. The ASN will decide mid-year whether the new reactor can go into operation by 2018, despite those weak spots.
A red light would lead to years of further delays.

Regulators from the US, Britain, China and other countries are also looking into quality and manufacturing issues at the Creusot Forge foundry after Areva unearthed the false manufacturing documentation from the 1965–2013 period.

The ASN has long warned that the financial difficulties of France's nuclear industry pose a safety risk, and Catteau said this could also partly explain Creusot's quality breakdowns.

Geert De Clercq / Reuters, 16 March 2017, 'Areva factory ill-equipped to make nuclear parts – French watchdog', http://uk.reuters.com/article/uk-areva-safety-creusot-idUKKBN16N1SL

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

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WISE International
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Web: www.wiseinternational.org
Email: info@wiseinternational.org
Phone: +31 20 6126368
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