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Editorial

Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- We discuss nuclear security concerns in Belgium including a serious sabotage incident at a nuclear power plant in 2014, surveillance of a nuclear worker by terrorists in 2015, and inadequate security at military bases housing U.S. nuclear weapons.
- Independent consultant Luc Barbé writes about trade union concerns with Belgium's nuclear power program.
- Michael Mariotte writes about the intervention of James Hansen and Michael Shellenberger in support of Exelon's aging nuclear reactors in Illinois.
- We summarize the European Commission's 'PINC' report, which looks at Europe's nuclear power industry through rose-colored glasses yet still predicts steady decline.

The Nuclear News section has reports on the Nuclear Energy Conference 2016 held in Prague; events in the UK to commemorate the Chernobyl and Fukushima anniversaries and to build the UK anti-nuclear movement; a new report on intergenerational costs and benefits of different energy choices; and a Platts review on the cost of global post-Fukushima safety enhancements.

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

Monitored this issue:

Belgium's nuclear security scares

Author: *Jim Green – Nuclear Monitor editor*

NM822.4552 A number of nuclear security issues have emerged in Belgium in recent months, and long-standing problems have been exposed. Here we pull together some of the most illuminating commentary.

Academics Robert Downes and Daniel Salisbury summarize recent problems and provide some context:[1]

"Belgium's counter-terrorism efforts are once again being called into question following the recent tragedies in Brussels. The attacks were carried out against soft targets – the public check-in area of Brussels Airport and Maelbeek metro station – but a series of unusual and suspicious occurrences were also reported at nuclear facilities in the country. Occurring a week before a major international summit[2] on nuclear security, these events highlight the very real threat to nuclear facilities. For Belgium, this recent episode is one item on a long list of security concerns.

"The US repeatedly has voiced concerns about Belgium's nuclear security arrangements since 2003. That year, Nizar Trabelsi, a Tunisian national and former professional footballer, planned to bomb the Belgian Kleine-Brogel airbase under the aegis of Al-Qaeda.[3] The airbase, which holds US nuclear weapons, has seen multiple incursions by anti-nuclear activists who have gained access to the site's "protected area", which

surrounds hardened weapons storage bunkers.[4] *Yet, Belgium only started using armed guards at its nuclear facilities weeks before the March 2016 attacks.*[5]

"Beyond incursions, so-called "insider threats" have also cost Belgium dearly. The nation's nuclear industry comprises two ageing power stations first commissioned in the 1970s (Doel and Tihange), and two research facilities, a research reactor facility in Mol, and a radioisotope production facility in Fleurus.

"In 2014, an unidentified worker sabotaged a turbine at the Doel nuclear power station by draining its coolant.[6] *The plant had to be partially shut down, at a loss of €40 million per month. Based on this history, the Belgian authorities should be primed to take nuclear security especially seriously. But there are serious questions about whether they are.*[7]

"Islamic State is believed to have taken possession of radiological materials, including 40kg of uranium compounds in Iraq.[8] *This suggests a possible interest in fabricating a radiological dispersal device – or "dirty bomb" – that would spread dangerous radioactive materials over a wide area.*

"It had been assumed that IS was concentrating this activity in the Middle East. But that all changed in late 2015. A senior nuclear worker at the Mol research facility was found to have been placed under "hostile surveillance" by individuals linked to the Islamic State-sanctioned attacks in Paris.[7] *Reports suggested that the terrorist cell may have planned to blackmail or co-opt the worker to gain access to either the facility or radiological materials.*

"Alongside the 2014 Doel sabotage incident, this raises the spectre of an "insider threat". A worker could use their access, authority and knowledge to sabotage a nuclear plant or remove material for malicious purposes.

"This concern is furthered by reports of a worker at the Doel plant, who was associated with the radical Salafist organisation Sharia4Belgium, joining Al-Qaeda-inspired militants in Syria in late 2012.[6] *Following his death in Syria, the Belgian nuclear regulator reported that "several people have ... been refused access to a nuclear facility or removed from nuclear sites because they showed signs of extremism"."*

Before and after the March 22 terrorist attacks in Brussels, authorities revoked the security clearances of 11 workers at the Tihange nuclear power plant.[9,10] After the March 22 attacks, all non-essential staff were sent home from the Tihange and Doel nuclear power plants to reduce the risk of unauthorized access, and military presence was increased at the sites.[11,12]

Patchy record

A February 29 analysis by the Center for Public Integrity outlines Belgium's patchy record on nuclear security:[7]

"In 2004, then-Secretary of State Colin Powell raised the reactor security issue with Belgian Foreign Minister Louis Michel, according to a February 2005 U.S. diplomatic cable released by Wikileaks.[13] *U.S. nuclear authorities also asked their counterparts in France – which arms guards at its own nuclear sites – to help persuade the Belgians to take the issue seriously.*

"Three years later, many of the security upgrades urged by Washington were still not in place, due to what Belgian officials termed "unforeseen technical, budgetary, and management issues," according to a March 2007 U.S. cable disclosed by Wikileaks.[14] *But by late 2009, Belgian security authorities had completed some of the work and invited American officials to witness a security drill there.*

"In the drill, 13 armed police units from the surrounding area responded to a mock attack on the reactor site by five supposed terrorists equipped with rifles and small explosives, who pretended to be trying to gain access to dangerous radioactive materials. U.S. officials on the scene termed the exercise a sign of progress, but said room for improvement remained, and urged the Belgians to take lessons from more robust "force-on-force" exercises conducted at similar facilities in the United States.

"It wasn't until 2013, nine years after Powell's complaint, that Belgium enacted laws strengthening its security clearance procedures and providing serious criminal penalties for both improper handling of radioisotopes and for attempted break-ins at the high-security areas of nuclear sites. An inspection team sent to SCK-CEN and other nuclear sites by the International Atomic Energy Agency in December 2014 concluded that "the physical protection system ... is robust" but also recommended additional measures to improve security. ...

"Scheerlinck, the nuclear regulatory spokeswoman, responded that although the government recently decided to create a "Nuclear Quick Response Team" within the federal police, arming the guards stationed on-site at such facilities is not currently being considered. Doing so "would give people a false sense of security and ... weapons should only be used by people who are properly trained to deal with the kind of situations that require an armed intervention (i.e. the police and military)," she said in an emailed comment.

"Even after taking some of the security precautions urged by Washington, Belgium – which has seven operating nuclear reactors – was embarrassed by several 2014 incidents[15] *that suggest important gaps remain."*

Video surveillance and armed guards at nuclear plants

Last November, 10 hours of video footage of an employee of Belgium's nuclear research reactor centre SCK-CEN was discovered in a house being rented by Mohamed Bakkali, who was arrested on suspicion of helping to plot the November 2015 terrorist siege on Paris that killed 130 people.[16,17,18] Belgian authorities believe the video camera was picked up from outside the employee's house by Ibrahim and Khalid el-Bakraoui, the suicide bombers in the March 22 Brussels attacks. The existence of the video footage became public knowledge on February 18. The Belgian interior minister initially rejected a proposal to deploy troops at nuclear plants but changed his mind a fortnight later and deployed 140 soldiers to guard five nuclear sites. Until then, Belgium had no armed troops or armed guards at its nuclear facilities.

In the absence of any concrete evidence, the motives for the video surveillance have been the subject of speculation. A spokesperson for Belgium's nuclear

regulator said: “We can imagine that the terrorists might want to kidnap someone or kidnap his family.”[18] Another spokesperson for the nuclear regulator raised the possibility of “an accident in which someone explodes a bomb inside the plant”.[19] Others have speculated that the plan was to kidnap the employee “potentially to gain access to the facility and acquire enough radioactive material to create a dirty bomb.”[20]

Nuclear security expert Prof. Matthew Bunn from Harvard University questions whether the motivation was to acquire material for a dirty bomb since radiological materials are available in many locations where they would be much easier to steal, such as hospitals and industrial sites.[21] He argues that the possibility that terrorists were (and are) seeking fissile material for nuclear weapons has been too quickly dismissed. The SCK-CEN site at Mol contains enough highly enriched uranium [HEU] for several nuclear bombs.

Bunn writes:[21]

“The Times story[19] largely dismissed – wrongly, in my view – the idea that the HEU at SCK-CEN might have been the terrorists’ ultimate objective, saying that the idea that terrorists could get such material and make a crude nuclear bomb “seems far-fetched to many experts.” Unfortunately, as we document in detail in our recent report[22], repeated government studies, in the United States and elsewhere, have concluded that this is not far-fetched – that it is quite plausible that a sophisticated terrorist group could make a nuclear bomb if they got the needed nuclear material. ...

“Of course, just because the terrorists could find and monitor a nuclear official’s home does not mean they could have broken in to SCK-CEN and gotten HEU or anything else. What did they think they could accomplish with this monitoring? One obvious possibility is that they envisioned either kidnapping the official or kidnapping his family to coerce him into helping them carry out whatever plot they had in mind. Such coercion is a frequent criminal and terrorist tactic. Breaking into a nuclear facility is not as simple as kidnapping someone. But a kidnapping might well contribute to a more complex plot.

“If the Belgian suicide bombers were the ones monitoring the nuclear official, it’s possible they first planned to attack the country’s nuclear infrastructure.[23] They may have shifted to the airport when their plans were accelerated by the arrests of co-conspirators, or because of Belgium’s deployment of armed troops to guard its nuclear facilities. But a spokesman at the Belgian Federal Agency for Nuclear Control told the Washington Post that they “knew nothing” of any such a plot[24], and Belgian federal prosecutors have not confirmed any such plot.

“Press accounts of the possibility the terrorists were planning some kind of an attack on nuclear facilities have unduly played down the potential dangers of reactor sabotage. A story[19] in The New York Times, for example, quotes an argument that the TATP explosive the terrorists were using would not get through the steel pressure vessel of a nuclear reactor. It is certainly true that to cause a major radioactive release, terrorists would have to understand how to overcome a number of different safety and security systems. Getting into a power plant with a suicide vest of explosives would not be enough. But as Fukushima made clear, cutting off a reactor’s electricity and cooling water can cause a disaster that can provoke widespread panic and cause devastating disruption and economic losses.”

US nuclear weapons in Belgium

Jeffrey Lewis from the James Martin Center for Nonproliferation Studies writes about the security risks associated with U.S. nuclear weapons stationed in Belgium:[25]

“If you were a Belgian terrorist, why settle for a dirty bomb, when you have the option of stealing an honest-to-goodness nuclear bomb? The United States “forward deploys” about 180 B61 nuclear bombs at bases in Europe – including a small number at a Belgian air base known as Kleine Brogel, about an hour outside of Brussels. These weapons are the sole remaining tactical nuclear weapon systems that the United States deploys abroad. ...

“The security of these nuclear weapons is terrible. Yeah, yeah, yeah. The U.S. Defense Department will trot out a spokesbot to tell you everything is fine. Let me tell you a story or two. In an earlier job, I ran a project that tried to outline options for what would become the 2009 Nuclear Posture Review. One of the better parts was the travel. I made a lovely visit to Brussels, where my team had a series of very high-level meetings at the European Union and NATO headquarters. There were some steak frites, a little lambic beer, and a lot of talk about nuclear weapons. And at the time, senior U.S. military officers made one thing very clear to us: The security at the bases stunk.

“One commander noted that the upgrades necessary to meet security requirements would run into the hundreds of millions of dollars. Another said his worst fear was that a group of activists would be able to get inside the shelters where the nuclear weapons are stored and use a cell phone to publish a picture of the vaults. And then it happened. In January 2010, a group of protesters who call themselves “Bombspotters” entered Kleine Brogel.4 Apparently the plan was to hang around on the tarmac of the runway and get arrested. But no one came to arrest them. ...

“It’s true that the Bombspotters haven’t been back to Kleine Brogel in a few years. But that’s because they’ve been breaking into other locations. And, a couple of years ago, there was yet another incursion, by another group of activists, at Volkel Air Base in the Netherlands.

“Security still stinks, as far as I can tell. Which brings us back to the terrorist attacks in Brussels. Do we really want to keep these weapons in Belgium, in light of what we now know are very large and organized jihadi networks in that country and France? Or in light of these security failings? The rationale for keeping nuclear weapons in Belgium and other NATO countries is the idea of burden-sharing – the notion that Belgium and other European governments should share political responsibility for defending this contribution to their national defense. Yet, what contribution are U.S. nuclear weapons making, precisely, to European security? At present, they seem to pose more of a threat, a temptation for local terrorist networks.”

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Belgium's nuclear power program: Trade unions take action

Belgium's nuclear program has featured prominently in the media in recent months, and not just because of the security scares. There were the thousands of cracks in the pressure vessels of two reactors, and a fierce public debate over the lifetime extension of the oldest nuclear reactors. Last week, trade unions blocked access to the Tihange nuclear power plant for several days. Only the operators could enter the plant. The trade unions complain about bad relations with the Executive Board, which would not respect an agreement between the board and the trade unions. Trade unions also claim that working conditions have deteriorated. The discontent of the trade unions also has to do with their dissatisfaction with government policy. According to them, government is far too friendly to businesses. On Friday April 15, the trade unions and the managing director came to an agreement and the blockade was removed. During the action, electricity supply was not disrupted.

Belgian law provides for the closure of Belgium's seven reactors within 10 years. What will be the future for the staff of the two Belgian nuclear power plants? Will they be able to find another job within owner Engie Electrabel? With the same job quality and wage conditions? There is another important question. In recent years traditional utilities such as EDF, Eon and Engie have experienced hard times. Their business model is faltering. Will Engie Electrabel be sufficiently profitable to maintain the current wage policy? If not, employees could risk worse salary conditions. Will employees accept that, or will there be strikes and blockades of nuclear power plants? These are major issues but there is little discussion or debate about them in Belgium at the moment. Last week's action at the Tihange nuclear plant might be the harbinger of a long and important social struggle.

– Luc Barbé, independent consultant on energy issues

How low can they go? Hansen, Shellenberger shilling for Exelon

Author: *Michael Mariotte − President of the Nuclear Information & Resource Service*

NM822.4553 While some potential legal challenges remain, the approval of the Exelon-Pepco merger by the Washington, D.C. Public Service Commission means that Exelon is now not only the largest nuclear powered utility in the U.S., it is the largest electric utility period. And with that steady stream of regulated, and non-nuclear, Pepco money filling its coffers, you'd think that Exelon's continuing "threats" to close up to three of its Illinois reactor sites unless it obtains more bailouts from beleaguered Illinois taxpayers and ratepayers would fall on deaf ears. Or maybe Exelon is now trying to achieve "too big to fail" status?

That Exelon's "threats" to close these reactors are considered by the utility – and its backers – threats at all is an indication of how perverse the discussion in Illinois is (and really, wherever Exelon operates, where such threats to close reactors without bailouts are commonplace). After all, these reactors (the single reactor at Clinton and the two-unit Quad Cities) are demonstrably uneconomic – they just can't compete with gas or wind, or solar for that matter. They also are aging and increasingly unsafe; the two Fukushima-clones at Quad Cities especially so, although Clinton too has a weak GE pressure suppression containment system.

And, given the large amount of wind power available to the region, and the potential for large amounts of solar power if Exelon didn't keep trying to shoot it down, they aren't needed for power supply reasons, nor to ensure low carbon emissions. Whatever of their power actually needs to be replaced, and it's not like Illinois is facing imminent power shortages, can be done so economically and quickly with renewables, efficiency and storage.

Enter the pro-nuke "environmentalists"

Enter the pro-nuke "environmentalists". Specifically, renowned climate scientist Dr. James Hansen and industry-oriented Michael Shellenberger of the Breakthrough Institute came to Illinois in early April to weigh in on the Exelon bailout debate.[1] And no, they didn't support renewables or other clean energy technologies. They didn't question whether the nation's largest electric utility really needs to gouge Illinoisans for another $300 million to keep aging, money-losing reactors open. Their message was pretty simple: in an open letter to Illinois legislators they, and several dozen others (most of whom are long-standing nuclear advocates) urged them to "do everything in your power to keep all of Illinois's nuclear power plants running for their full lifetimes."

Sometimes Dr. Hansen just makes you wonder if he isn't undertaking some bizarre experiment to see how far he can undermine his own credibility before it all blows up in his face. Back in November 2013 he and three colleagues wrote an open letter to us nuclear opponents urging us to reconsider nuclear power.[2] It's worth going back and reading some of that letter:

"As climate and energy scientists concerned with global climate change, we are writing to urge you to advocate the development and deployment of safer nuclear energy systems," the letter began. It added, "We call on your organization to support the development and deployment of safer nuclear power systems as a practical means of addressing the climate change problem."

And this: "We understand that today's nuclear plants are far from perfect. Fortunately, passive safety systems and other advances can make new plants much safer."

Note the emphasis: Hansen is clearly talking about "safer" nuclear reactors. To be precise, he was seeking environmentalist support for development and deployment of Generation IV reactors. Which, to date, do not exist.

NIRS and Civil Society Institute organized a response, signed by 300+ organizations, to Hansen's letter explaining our continued opposition to nuclear power as a climate response and calling for a public debate on the issue.[3] We never received a reply.

Now jump ahead to December 2015, just four months ago. Shortly before the Paris COP-21 climate talks, Hansen et. al. issued a new missive:

"Nuclear power, particularly next-generation nuclear power with a closed fuel cycle (where spent fuel is reprocessed), is uniquely scalable, and environmentally advantageous. Over the past 50 years, nuclear power stations – by offsetting fossil fuel combustion – have avoided the emission of an estimated 60bn tonnes of carbon dioxide. Nuclear energy can power whole civilizations, and produce waste streams that are trivial compared to the waste produced by fossil fuel combustion. There are technical means to dispose of this small amount of waste safely. However, nuclear does pose unique safety and proliferation concerns that must be addressed with strong and binding international standards and safeguards. Most importantly for climate, nuclear produces no CO2 during power generation."

While there is much to dispute in this paragraph, again note the emphasis on safety and "next-generation nuclear power" and continued acknowledgement of nuclear's "unique safety and proliferation concerns."

Fukushima-clone Quad Cities, which began operation in 1972, and Clinton, which began operation in 1987, clearly do not fall under the "safer" or "next-generation" nuclear memes. By endorsing not only their continued operation, but their continued operation enabled by forcing the people of Illinois to further line Exelon's pockets, Hansen has made a mockery of his earlier safety concerns and exposed himself as no different than any other Exelon-paid-for Nuclear Matters spokesperson.

Over the credibility cliff

But it gets worse, because by allying himself with the Breakthrough Institute's Shellenberger, Hansen has gone a step even further, a step right over the credibility cliff. Because as Midwest Energy News reported: "Shellenberger described next-generation technology as farther away from viability than he had previously hoped, and urged more focus on the nation's existing reactors. "How much safer could they be?" he said. "If you have nuclear plants that don't hurt anyone, keep running them."[4]

In other words, Shellenberger dismisses Hansen's support of Generation IV reactors in one phrase and argues in essence that because Fukushima hasn't happened yet at Quad Cities, well, hell, it never will; keep them running. But Fukushima did, in fact, happen. And there were supposed to have been lessons learned from that disaster. One of those is to be highly skeptical of GE Mark I nuclear reactor designs that are essentially identical to Fukushima, and that have been highly controversial even since their inception in the 1960s.

Thus, Hansen and Shellenberger (and the rest of the letter's signers, most of whom probably know little about the actual situation in Illinois) are now dismissing any pretense of caring about nuclear safety. For what? To enable Exelon, the largest electric utility in the nation, to gouge Illinoisans for another $300 million to keep open three aging, uneconomic and unsafe nuclear reactors, because of their low carbon emissions.

Arguing for environmentalists to consider Generation IV reactor technology was one thing. For many reasons, we rejected that approach and explained in detail why we did so, but at least it was a fair challenge. But actively working to prevent the shutdown of three reactors of 1960s nuclear technology under the pretense that it would matter for the climate is a leap too far. I hate to say it, but it is a leap so far that it brings into question Hansen's credibility on the far more important issues of his climate science generally. I have long trusted Hansen on climate issues; now, I am nervous about that. If he can be so wrong in Illinois, and so far removed from his own previous statements on nuclear safety, and seems willing to sell himself to the nation's largest, and quite possibly greediest, electric utility, well, how can I trust his other work?

I have been telling myself – and others – as Hansen's pro-nuclear statements have become more and more strident and outlandish over the past few years that, well, Hansen is a climate expert, not an energy expert, and there is a big difference between the two. That's still true, of course. But I'm having my doubts. Could some of his climate statements – that I'm not expert enough to evaluate the way I am expert enough to evaluate his nuclear statements – be as far removed from reality as his Illinois positions? Fortunately, there are a lot of other climate experts out there. I'll start listening more closely to them. And there are lots of real energy experts out there, but I already know them and I'll continue to listen to them. As for Hansen, I probably won't listen to him anymore on either subject.

As for Illinois, closing Clinton and Quad Cities would not only save its citizens' money and reduce the daily risk these dangerous reactors pose, it would help usher in substantial new clean energy investment, something the state desperately could use. That would be the kind of win-win situation – for the state and the climate, if not for Exelon – that the legislature hopefully will recognize.

Michael Mariotte regularly writes at the GreenWorld blog, www.safeenergy.org

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The steady decline of nuclear power in Europe

Author: *Jim Green – Nuclear Monitor editor*

NM822.4554 The European Commission (EC) released its 'Communication on a Nuclear Illustrative Programme' (PINC) in early April, along with a 'Staff Working Document' which informs the main report.[1,2] The report covers all aspects of civil nuclear programs in the EU, with an emphasis on required investments. Periodic publication of PINC reports is a requirement under Article 40 of the Euratom Treaty.

The report states that nuclear power produces 27% of electricity averaged across EU countries, the same amount as renewables. There are 129 nuclear power reactors in operation in 14 EU countries, with a total capacity of 120 gigawatts (GW).

The report predicts a decline in EU nuclear capacity up to 2025, followed by a slight increase, but nuclear capacity of 95–105 GW in 2050 is still projected to be below the current level of 120 GW. Nuclear power's contribution to total EU electricity generation is expected to fall from 27% now to 17–21% in 2050.

Thus the EC anticipates a continuation of a pattern of decline that is already underway in the EU: since the PINC 2007 report, no new reactor has come online, no reactor construction has begun, no new reactor has been ordered since Flamanville-3 in 2007, no new reactor has been connected to the grid since Cernavoda-2 in Romania in 2007, and 21 fewer reactors are operating (a 14% decline).

New build projects are "envisaged" in 10 EU countries:

- Four reactors are under construction – in Finland, France and Slovakia.
- Reactor projects in Finland, Hungary and the UK are undergoing licensing processes.
- Reactors projects are at a "preparatory stage" in Bulgaria, the Czech Republic, Lithuania, Poland and Romania.

EU reactors are, on average, 29 years old. The PINC report notes that without lifetime extension programs, 90% of the existing reactors would be shut down by 2030. The EC anticipates that there will be many reactor lifetime extensions and that by 2030 the majority of the fleet will be operating beyond its original design life. The EC also anticipates 80 GW of new capacity added by 2050, with France and the UK accounting for about two-thirds of the 80 GW.

The closure of a large majority of existing EU reactors by 2050 is beyond dispute, whereas the predictions regarding lifetime extensions and new build are highly uncertain. The PINC report notes that "there is of course a high degree of uncertainty as regards long term projected nuclear capacity" and that "only a small share of investments" in lifetime extensions or new build have already been approved by national authorities.

Thus the PINC report is highly speculative regarding lifetime extensions and new build, yet it still projects a decline in nuclear capacity.

Safety

The PINC report is quite superficial for an analysis of civil nuclear programs in Europe. It ignores a raft of issues that ought to be addressed and it deals in generalizations and euphemisms. On safety, for example, the PINC report states that nuclear reactor safety standards in the EU are "high" but "further improvements" are required, it is "crucial to ensure the swift and thorough implementation of the legislation adopted post-Fukushima", and the reactor fleet "is aging and significant investments are needed where Member States opt for a lifetime extension of some reactors (and related safety improvements)".

In a detailed review of a draft of the PINC report, WISE Paris corrects the EC's errors and fills in the gaps.[3] PINC congratulates the EU for its role in ensuring the adoption of the 'Vienna declaration', by which Contracting Parties to the IAEA Convention on Nuclear Safety committed to improve safety standards. WISE Paris points out that the IAEA Convention meeting was a flop, with the abandonment of proposed changes that would mandate upgrades to post-Fukushima safety standards.

WISE Paris notes that the PINC report is silent on uneven and inadequate emergency plans. And the PINC report is silent on the related issue of cross-border concerns and the need to address them. For example France has several aging nuclear plants that are unsettling its neighbors.[4] Luxembourg has offered to help finance the closure of an aging French nuclear plant near its border. Luxembourg's Prime Minister Xavier Bettel said on April 11 that an accident at the Cattenom plant could "wipe the duchy off the map". In March, Germany demanded the closure of France's oldest nuclear plant, Fessenheim, near the German and Swiss borders.

Whereas the PINC 2008 report recommended that "a more coherent and harmonised liability scheme should be developed to ensure a comparable level of protection for citizens", PINC 2016 is silent on the issue of liability arrangements.

Generation IV reactors and small modular reactors

The PINC report acknowledges that fast reactors and other Generation IV concepts are going nowhere fast, but instead of saying that directly it says that some Generation IV research programs "may already advance significantly by 2050."

The PINC Staff Working Document states: "Full recycling remains for the moment a long term prospect and is in principle only feasible with the use of fast neutron reactors, which can be optimised to consume the plutonium and uranium efficiently and/or to incinerate long-lived minor actinides. Due to several uncertainties around the deployment of this type of reactors, including their high capital costs, the possibility of closing the fuel cycle has not been foreseen in this Staff Working Document."

The Staff Working Document notes that the nuclear industry has been considering the deployment of commercial small modular reactors (SMRs) since the 1950s, but little has come of it and only four SMRs are under construction in the world – three water-cooled reactors (CAREM-25 in Argentina, KLT-40S and ABV-6M61 in Russia) and one gas-cooled reactor (HTR-PM in China). The absence of a licensed SMR design in the market "is a major challenge", the Staff Working Document notes.

The Staff Working Document notes that the cost of investment per kW is likely to be higher for SMRs compared to larger reactors. It drily notes that claims supporting SMR economics – which emphasize standardization, learning effects, cost sharing and modularization – "are difficult to quantify due to the lack of existing examples".

The Staff Working Document further states: "Due to the loss of economies of scale, the decommissioning and waste management unit costs of SMR will probably be higher than those of a large reactor (some analyses state that between two and three times higher)."

Nuclear economics

The PINC report notes that "new build projects in Europe are experiencing significant delays and cost overruns." The report points to broader problems with nuclear economics:

"The ongoing constructions of European Pressurized Reactor (EPR) in Finland and France have experienced significant cost overruns (more than 3 times over original budget each). Even though these are first-of-a-kind models with expectedly higher unit costs, they are also consistent

Decommissioning of the cooling tower of the Trojan nuclear power plant, Oregon, USA, May 2006.

with the industry's historical trend of cost escalation. In France, for example, and in spite of some favorable conditions that include centralized decision making, high degree of standardization and regulatory stability, construction costs per MWe in 1974 were 3 times lower than those of the units connected to the grid after 1990."

But the PINC report blends that sober reflection with wishful thinking such as this:

"Some new, first of a kind projects in the EU have experienced delays and cost overruns. Future projects using the same technology should benefit from the experience gained and cost-reduction opportunities, provided that an appropriate policy is established."

WISE Paris notes that current new build figures are far greater than the figures provided in the PINC 2007 report. PINC 2007 said that "a new nuclear plant involves an investment in the range of €2 to 3.5 billion (for 1000 MWe to 1600 MWe respectively)".

WISE Paris also notes that the latest PINC report envisages a reduction in average construction times, but historical data provided in the PINC report itself shows that the average reactor construction times in Europe have increased from one decade to the next since the 1950s.

Waste management and decommissioning

The PINC report states that Europe is "moving to a phase" where the back end of the fuel cycle – i.e. waste management and decommissioning – "will receive much greater attention". The report states:

"The back-end of the fuel cycle will need increasing levels of attention. It is estimated that more than 50 of the 129 reactors currently in operation in the EU are to be shut down by 2025. Careful planning and enhanced cooperation among Member States will be needed. Politically sensitive decisions will have to be taken by all EU Member States operating nuclear power plants regarding geological disposal and long-term management of radioactive waste. It is important not to postpone actions and investment decisions on these issues."

The report notes that there is little experience with decommissioning: 89 power reactors have been permanently shut down in Europe as of October 2015, but only three have been completely decommissioned (all in Germany).

The report states that, based on information provided by EU Member States, €253 billion (US$287b) will be needed for nuclear decommissioning and radioactive waste management until 2050, comprising €123 billion for decommissioning and €130 billion for spent fuel and radioactive waste management including deep geological disposal. Barely half of the required back-end investments have been set aside to date – €133 billion of €253 billion.

WISE Paris notes that the true costs are likely to far exceed the EC's figure of €253 billion. The PINC report provides a very low estimate for reactor decommissioning and waste management costs, and it completely ignores other nuclear facilities (enrichment, reprocessing etc.) such as those at Sellafield in the UK, and La Hague and Marcoule in France. WISE Paris estimates costs of over €480 billion (US$545b), comprising €110 billion for geological disposal, €300 billion for decommissioning of reactors and other nuclear facilities, and €73.9 billion for other waste management costs.

WISE Paris summarizes: "The investment needs presented by PINC 2016 are a groundless mix of underestimated costs applied to overestimated projections. Investment needs in new reactors and

LTO [lifetime extensions] could be underestimated by one third and at least half respectively, making it even less likely that these investments are made. The Commission also appears to underestimate by more than half the possible costs for decommissioning and waste disposal, through a mix of low assumptions and omissions."

Green Member of the European Parliament Claude Turmes told *Energy Post* that the wide gap between committed funds and required funds for decommissioning and waste management amounts to an unfair advantage for nuclear power and should be investigated: "The European Commission now has a duty under the EU Treaty to follow up on the polluter pays principle. ... I think the PINC provides enough ground for a state aid investigation. If the money is missing, then the question is, 'who steps in?'"[5]

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NUCLEAR NEWS

NEC2016 Conference: 'Nuclear Energy – Expensive Gamble'

There were eight main and three opening speeches at the Nuclear Energy Conference 2016 held in Prague on April 5. The conference website (www.nec2016.eu) includes the presentations, profiles of the speakers, photos and audio recordings of all three sections in three languages.

Speakers expressed their surprise at how there is still a need to talk about the unresolved safety problems 30 years after Chernobyl and five years after Fukushima. It was highlighted that energy economics has changed: today we need flexible electricity systems and small units such as renewable energy sources. These are getting cheaper, with almost zero operating costs and negligible costs of disposal in comparison to nuclear power plants. A pressing need to reduce risks associated with radioactive releases to the environment was mentioned and how the associated risks increase with a plant lifetime extension. In connection with this there were serious concerns raised about an indefinite license to operate the first block of the Dukovany nuclear power plant which was issued in March 2016.

On the accidents at Three Mile Island and Chernobyl (the Jaslovské Bohunice accident in 1977 was also discussed briefly) it was concluded that until now nuclear accident modelling approaches have always failed because they were not able to incorporate the human factor. It was made clear that high standards for nuclear energy exist, but only on paper with no implementation in practice. Safety culture of operators and their control by the state authorities are lacking. Furthermore, operators are trying to save money on safety measures. The audience discussed these topics in relation to the presentations on the EU's new Nuclear Safety Directive and limited liability. It has been pronounced that civil society participation is indispensable in order to improve safety culture and to prevent disasters such as Chernobyl, the consequences of which have become more obvious nowadays. The TORCH study has shown that radioactive fallout after Chernobyl will result in at least 40,000 cancer deaths in Europe (see Nuclear Monitor #820).

As was said in the opening speech, the coming two years should indicate the future direction of the European energy industry. Whether billions will be invested to subsidize new and current nuclear projects, whether a legal action against the Hinkley Point C project in the UK will succeed and whether subsidies for nuclear energy will be banned, based on a legal – not political – decision. We can only hope that by then no nuclear accident caused by aging nuclear power plants will occur. There are serious concerns with aging reactors, as stated in the presentations devoted to technological parameters of the Belgian, Slovakian and French plants. Serious shortcomings of nuclear power plants in Hungary, Romania, Bulgaria and the Czech Republic were also commented upon in the presentation on safety 'stress tests'.

– Olga Kališová, Calla – Association for Preservation of the Environment, Czech Republic

UK groups consider how to go 'Beyond Nuclear' and deliver on renewables

As part of commemorating the 30th Chernobyl and 5th Fukushima anniversaries, a number of UK anti-nuclear groups came together to organise events in London and Manchester under the title of 'Beyond Nuclear'. The aim of the events was to commemorate Chernobyl and Fukushima by understanding their ongoing effects in Belarus, Ukraine, in places around Europe and Japan and the Pacific Ocean. It was also important to consider, if we were to go to 'beyond nuclear', could renewable energy provide the low-carbon energy that is required?

The organising group included the UK and Ireland Nuclear Free Local Authorities (NFLA), the Low Level Radiation and Health Conference, the Campaign for Nuclear Disarmament (CND), the Chernobyl Children's Project - UK (CCP), the Socialist Environmental Resource Association (SERA), Kick Nuclear and Japanese Citizens Against Nuclear – UK (JAN).

The events were spread over four days – March 17–20 – and commenced with a Parliamentary seminar in Portcullis House, Westminster. The keynote speaker was Alexander Likhotal, the President and CEO of Green Cross International, who gave an address on behalf of its patron, Mikhail Gorbachev. The speech noted how the terrible effects of the Chernobyl disaster had been a pivotal moment in Gorbachev's career and raised for him real issues over the safety of nuclear power. A key part of the work of Green Cross is to push for promoting the benefits of energy efficiency and a wide renewable energy mix whilst directly supporting evacuated communities in both Chernobyl and Fukushima.

Many of the speakers in London also spoke at a special Nuclear Free Local Authorities seminar and the main 'Beyond Nuclear' conference in Manchester. They included radiation and health specialists Professor Tim Mousseau, Dr Ian Fairlie and Dr Keith Baverstock. They highlighted the huge environmental dislocation following the Chernobyl and Fukushima disasters and the ongoing health problems on human and animal health. They called for a real challenge to UN and international health organisations, who they felt continue to downplay the health and environmental effects of both disasters.

Yayoi Hitomi gave a moving overview of the problems that exist for those evacuated from Fukushima. Working with many local groups, there are huge radioactive waste issues in the area, as well as concerted pressure from the Japanese Government to encouraged local people to return back to 'decontaminated' areas, creating great stress amongst affected communities.

A key part of the events was to bring an international flavour to a UK audience. David Reinberger of Vienna City Council's Ombuds-Office / Cities for a Nuclear Free Europe Secretariat explained why Austria had issued a legal challenge to the Hinkley Point C development in Somerset, and why Vienna was working with UK local authorities and Councils in 10 European countries to oppose new nuclear and advocate decentralised energy solutions.

Reinhard Uhrig of Global 2000 Austria, Angelika Claussen of IPPNW Germany and Linda Pentz Gunter of Beyond Nuclear USA gave overviews of the challenges made to nuclear power in their countries and how renewable energy projects were developing. They also provided guidance and solidarity to UK groups challenging new nuclear. Professor Keith Barnham provided the conference with a UK based energy solution – drawing from his book 'The Burning Answer'. This centred on combining wind and solar as the key components of energy policy; with biogas and energy efficiency as back-ups when and where required. He urged local authorities and community energy cooperatives to take up this vision.

The final day of the events brought campaigners together from around the UK to focus on improving campaigns, working more closely together and benefiting from international experience. It was agreed that there is a need to develop a network of groups together and seek new resources to enhance its effectiveness. Reports are going back to funding sponsors the Joseph Rowntree Reform Trust, Lush Charitable Trust and WISE International to get this process moving forward; and further discussions are taking place with all the groups who were involved. With 2016 such a pivotal year in UK nuclear policy – as the Hinkley Point project 'wobbles' and discussion is made over UK radioactive waste strategy – it is important to continue with the excellent momentum from the 'Beyond Nuclear' events.

Some of the presentations are already available on the NFLA website. The full list of presentations and a link to filmed presentations will go on the weblink www.nuclearpolicy.info/category/presentations on Chernobyl Day, April 26, along with an article from Professor Keith Barnham advocating for a new, alternative, renewables-centred UK energy policy.

– Sean Morris, Nuclear Free Local Authorities Secretary, s.morris4@manchester.gov.uk

Nuclear energy – an intergenerational issue

A new report – 'Toxic Time Capsule: Why nuclear energy is an intergenerational issue' – has been released by the New Weather Institute. Commissioned by the Intergenerational Foundation, a British charity, the 47-page report compares the intergenerational costs and benefits of different energy choices in the UK. It argues that doubts growing over the viability of building new nuclear power stations create an important and timely opportunity to rethink the UK's energy strategy and get a better deal for the nation. It argues there will be significant and often hidden costs that would be passed on to future generations in the event of a significant expansion in nuclear power, and that renewable options offer a better intergenerational contract.

The costs of the nuclear option include: higher prices paid per KWh for generating electricity; high and long-term costs for managing radioactive waste; complex and long-term security requirements; missed opportunities for capturing greater economic value from our energy system; undermining effective action on global warming that includes the development of better alternatives; and the locking-in of a less flexible, less secure and more vulnerable energy infrastructure, subject to unsolved problems and a lasting toxic legacy.

The greatest danger is that an expansion of nuclear power, justified on the grounds that it is a significant solution for global warming, in fact represents a major obstacle to more effective action, making runaway climate change more likely, whilst at the same time leaving an unwelcome environmental toxic time capsule for future generations to handle.

Fukushima Daiichi

The report states that a highly conservative estimate puts the additional cost of power from the proposed Hinkley Point C reactor project for its 35-year initial contract period, compared to onshore wind and solar power, at £31.2 billion and £39.9 billion respectively. If similar costs applied to other currently planned or proposed reactors for the UK, the nuclear premium would be between £175 billion and £220 billion compared to the renewable options.

The report concludes that intergenerational concerns should be designed into the process for making energy choices, and suggests guiding principles and minimum criteria to achieve those ends. The report also finds that, if applied, such criteria point to an energy system in transition to renewable energy which would serve both current and future generations equally well.

New Weather Institute / Intergenerational Foundation, April 2016, 'Toxic Time Capsule: Why nuclear energy is an intergenerational issue', www.newweather.org/wp-content/uploads/2016/04/Toxic-Time-Capsule.pdf, www.if.org.uk/wp-content/uploads/2016/04/Toxic-Time-Capsule_Final_28-Mar.pdf

Post-Fukushima safety upgrades cost $47 billion

A Platts review finds that the global nuclear industry is spending US$47 billion (€41.4b) on safety enhancements. Platts found that in nine of the 13 countries with the largest nuclear fleets, costs to comply with post-Fukushima requirements will total more than US$40 billion, mostly before 2020. Those countries accounted for 289, or two-thirds, of the power reactors in operation worldwide. The median of the costs was $46.9 million/reactor. If the remaining reactors not covered in the Platts survey spent the median amount to meet post-Fukushima regulatory requirements, the global cost to make post-Fukushima enhancements would be $47.2 billion.

William Freebairn / Platts, 29 March 2016, 'Nuclear safety upgrades post-Fukushima cost $47 billion', http://blogs.platts.com/2016/03/29/nuclear-safety-upgrades-post-fukushima/

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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