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Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- Pete Roche summarizes the latest developments with the Hinkley Point reactor project in the UK.
- We report on the latest round of bad news for the uranium industry: the spot price fell to an 11-year low a couple of months ago, and it has fallen further since then.
- We report on the aftermath of the Fukushima disaster – the plight of evacuees, a controversy over proposals to 'recycle' contaminated waste, and also some good news: powerful business interests have turned against nuclear power and are now lobbying for policies to promote renewables.
- Tim Judson from the Nuclear Information & Resource Service writes about plans to subsidize aging reactors in New York.
- Nick Meynen writes about the outsourcing of uranium mining to "underpolluted" countries.

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:

Hinkley: A dramatic turn of events

Author – *Pete Roche*

NM828.4574 On July 28 the UK Government stunned the energy industry when it announced a further review of the proposed Hinkley Point nuclear power station just a few hours after EDF's Board meeting in Paris agreed to approve the 'Final Investment Decision'. Executives at EDF had been expecting the Government to sign a subsidy deal for the £18 billion (US$23.4b) plant the following day. Greg Clark, the UK Business and Energy secretary, said that he needed until September to study the subsidy contract.

150 VIPs had been invited to Hinkley Point in Somerset in the West of England on Friday to celebrate the go-ahead for a third nuclear power station on the site. But on Friday morning the marquee was being packed away and the guests were nowhere to be seen. A delegation from the China General Nuclear Power Corporation (CGN) which had already flown into Britain expecting to sign the finalised documents to allow them to invest around one third of the project's cost, turned around and went straight back to China.

We may never know exactly what has gone on behind the scenes but it is clear that EDF had moved its final investment decision forward from September in order to bounce the new UK Government into giving its approval quickly before mounting problems become even more obvious to everyone.[1]

Stop Hinkley spokesperson Roy Pumfrey said: "Much of the media seems to think this is just a temporary pause and that Hinkley Point C will eventually go ahead, but if Theresa May gives this scheme just a cursory glance she will see that we are being asked to buy a pig in a poke."

According to the *Financial Times*[2] the head of EDF, Jean-Bernard Lévy gave his fellow board members only two days to read 2,500 pages of contracts for a deal which one investment analyst described as "verging on insanity".[3]

The decision to review the project has been attributed by some to security concerns about Chinese involvement in the sector expressed by Mrs May's chief of staff, Nick Timothy. The Stop Hinkley Campaign has itself expressed concerns in the past about making nuclear deals with a country with such a poor health and safety record.[4]

Writing on the *Conservative Home* website last October, Timothy said the Hinkley deal could lead to the Chinese designing and constructing a third nuclear reactor at Bradwell in Essex. Security experts – reportedly inside as well as outside government – are worried that the Chinese could use their role to build weaknesses into computer systems which will allow them to shut down Britain's energy production at will.[5] For those who believe that such an eventuality is unlikely, the Chinese National Nuclear Corporation – one of the state-owned companies involved in the plans for the British nuclear plants – says on its website that it is responsible not just for "increasing the value of state assets and developing the society" but the "building of national defence." MI5 believes that "the intelligence services of … China … continue to work against UK interests at home and abroad."

Mandiant, a US company that investigates computer security breaches around the world, looked into the operations of just one Chinese cyber espionage group, believed to be the Second Bureau of the People's Liberation Army of China, or 'Unit 61398'. Mandiant found that Unit 61398 has compromised 141 different companies in 20 major industries. There were 115 victims in the United States and five in the UK. The intellectual property stolen included technology blueprints, manufacturing processes, test results, business plans, pricing documents, partnership agreements, and emails and contact information.[6]

Timothy said "evidence like this makes it all the more baffling that the British Government has been so welcoming to Chinese state-owned companies in sensitive sectors. The Government, however, seems intent on ignoring the evidence and presumably the advice of the security and intelligence agencies. But no amount of trade and investment should justify allowing a hostile state easy access to the country's critical national infrastructure. Of course we should seek to trade with countries right across the world – but not when doing business comes at the expense of Britain's own national security."[6]

EDF's future threatened

Perhaps of more immediate concern is that a go-ahead for Hinkley could threaten the future of the company itself. EDF is a company in a very precarious financial situation. The ratings agency, S&P, postponed a decision to downgrade its credit rating when the UK Government announced the review.[7] EDF has €37 billion (US$41b) of debt. The collapse in energy prices pushed earnings down 68% in 2015. The company needs to spend €50 billion (US$55.4b) upgrading its network of 58 aging reactors by 2025. It is scrambling to sell €4 billion (US$4.4b) of new shares and €10 billion (US$11.1b) of assets to strengthen its balance sheet. EDF is also expected to participate in the €5 billion (US$5.5b) bailout of Areva, the bankrupt developer of EPR technology, by taking a 75% stake.[8] About the last thing it needs is a new €15 billion (US$16.6b) millstone around its neck.[9]

Roy Pumfrey said: "The EDF Board should take the opportunity presented by this pause to see that its Nuclear SatNav has taken the Company down a dead end; it's only a matter of time before we hear that voice saying "At the next opportunity, turn around!"'

He continues: "Perhaps most disappointing if not unexpected has been the reaction of the big UK Union leaders. Whilst confessing themselves 'baffled' by the government's 'bonkers' decision, they should ask why the French union leaders representing EDF's own workers were (and are) solidly and vocally opposed to HPC. This project involves a reactor which many of EDF's own staff regard as unconstructable, selling off the family silver to fund it and putting EDF and therefore their own livelihoods at risk."

Over recent months several different alternatives to building Hinkley Point C have been detailed.[10] Most recently consultancy firm Utilitywise has described the proposed nuclear station as an "unnecessary expense". Energy efficiency measures could save the equivalent amount of electricity along with £12bn.[11]

Roy Pumfrey said: "This Government review of Hinkley Point C provides us with a wonderful opportunity to turn Somerset into a sustainable energy hub for England. The alternatives would be better for jobs, better for consumers, would reduce the mountain of dangerous waste we don't know how to deal with and save Somerset from a decade of disruption caused by one of the biggest construction projects in the world. The sooner EDF and the UK Government come to their senses the better."

Anti-Hinkley Tories

Perhaps most interesting amongst recent events has been the emergence of Conservative figures calling on the government to call time on the Hinkley proposals. The think-tank Bright Blue, whose advisory board includes former ministers Francis Maude and Nicky Morgan and former energy minister Greg Barker, has said the government needs a new "plan A". The group stresses that its position is not necessarily endorsed by all members of the organisation, which includes more than 100 parliamentarians. "The Government should abandon Hinkley C – pursuing it in light of all the evidence of cost reductions in other technologies would be deeply irresponsible," said Ben Caldecott, associate fellow, Bright Blue. "We need a new 'Plan A'. This must be focused on bringing forward sufficient renewables, electricity storage, and energy efficiency to more than close any gap left in the late 2020s by Hinkley not proceeding. This would be sensible, achievable, and cheap." Zac Goldsmith, also a Bright Blue member, has welcomed the government's rethink.[12]

Caldecott, writing on the *Conservative Home* website, said "we seem to be re-entering reality, there is an opportunity to develop a new 'Plan A' … A range of technologies can easily fill the envisioned capacity that Hinkley would have provided in the late 2020s had it been successfully delivered on the current (and already significantly delayed) construction schedule. They can also do this much more cheaply. Cancelling Hinkley would provide greater certainty for investors in other technologies thereby encouraging investment in new capacity today."[13]

He said the price of onshore wind is already much cheaper than nuclear (£85/MWh today and expected to fall to £60/MWh by 2020), with large-scale PV (expected to fall to £80/MWh by 2020) and offshore wind (expected to fall to £80/MWh by 2025) set to do the same – all well before Hinkley would start to receive its staggeringly high guaranteed and index-linked £92.50/MWh.

He goes on to say that Bright Blue will be publishing specific recommendations on energy efficiency soon, and that small modular nuclear reactors are very unlikely to be commercially available at all, let alone before the 2030s in any scalable, cost-competitive or politically acceptable way. They are too uncertain in terms of likelihood and cost for us to place too much faith in them yet, apart from perhaps investing in more R&D. "Blind faith in new nuclear and shale gas have yielded precisely zero for UK security of supply, despite constant rhetoric to the contrary, and yet more punts in high risk areas would not be prudent."

Take action

Friends of the Earth – Scotland is asking people to write to Theresa May to express opposition to Hinkley Point C going ahead: http://act.foe-scotland.org.uk/lobby/StopHinkley

Greenpeace UK is asking supporters to sign a petition to Chancellor Philip Hammond to help convince him to abandon the project and back renewable energy instead: https://secure.greenpeace.org.uk/page/s/osborne-dont-waste-billions-nuclear

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Uranium: the world's worst mined commodity

Author: *Jim Green – Nuclear Monitor editor*

NM828.4575 We noted in *Nuclear Monitor* in May 2016 that the uranium price had fallen to an 11-year low, just under US$26/lb U3O8.[1] Since then, the price has fallen further, to $25 in late July.

Uranium was the best performing mined commodity of 2015 according to Macquarie Bank[2] – the uranium price held firm, albeit at a low level, while other commodity prices tumbled. But that was then and this is now. On June 8, Bloomberg reported that of the 80 commodities it tracked, only one – carbon credits – has fared worse than uranium this year.[3] The spot uranium price has fallen by more than 20% since the start of 2016.[4]

A 31 July 2016 article in the *Wall Street Journal* summed up the situation:[5]

"The price of uranium has slumped to $25 a pound, its lowest level since April 2005, according to the Ux Consulting Co., a nuclear-fuel research firm that publishes weekly market prices. The fuel's value is down 27% since the start of this year and is a fraction of the $136 a pound it traded for at its 2007 peak. It is the worst-performing mined commodity this year. Other natural resources such as copper, coal and iron ore have gained year to date.

"There is plenty to fret about. In the U.S., a market awash with cheap natural gas, nuclear reactors have been closing. A few years ago, France said it would start reducing its reliance on atomic energy. China, while rolling out a broad expansion of its nuclear fleet, has built up inventories of uranium that could last more than a decade.

"In Japan, a long-awaited revival hasn't happened. The Fukushima Daiichi meltdowns in 2011 sparked protests and the shutdown of its fleet of 50-plus nuclear plants, and tarnished uranium's image globally. The government had planned to restart more than 30 reactors by 2030, and analysts had expected as many as 10 back online by 2017. Now, it isn't certain the two reactors that are operating will remain running and that the dozens of other reactors not slated for decommissioning will ever be restarted."

Nick Carter from Ux Consulting said in April that the spot uranium price could stay in the low $30s/lb "for quite some time" because supply is expected to exceed demand by 25–30 million lb U3O8 each year from 2016 to 2019. Carter does not see a supply deficit in the market until "the late 2020s".[6]

Likewise, Jonathan Hinze from Ux Consulting told the *Wall Street Journal* that the global uranium glut is deepening with annual supply of about 200 million pounds of uranium oxide exceeding annual demand of 170 million pounds.[5]

Stockpiles have climbed from virtually nothing before the Fukushima disaster to more than 1.4 billion pounds now, according to Hinze.[5] Thus stockpiles alone would suffice to keep the entire global reactor fleet operating for 8.3 years. China's stockpile of about 300 million pounds[5] would suffice to operate its existing reactor fleet for around 20 years.

Macquarie said on July 26 that it "is increasingly difficult to see what drives uranium materially higher from here."[5] According to UBS analysts, a turnaround in the market could be years off due to the slow reactor restart process in Japan and the slow pace of global nuclear expansion.[7] UBS recently revised its spot uranium price forecasts, and all the revisions were downward. For 2016 the forecast is now $30/lb, down from $37/lb; for 2017, the new $32 forecast is down from $55; for 2018, the new $42 forecast is down from $60; and for 2019, the new $55 forecast is down from $60.

Seller's remorse

Commodities analyst Donald Levit notes that the average marginal cost of production is around $30/lb, higher than the current spot price, and thus "many uranium miners are currently underwater".[7]

Uranium producers typically sell most of their output through long-term contracts rather than the spot market, which only makes up about 20% of the whole market. However Patersons Securities analyst Simon Tonkin says he believes a number of producers have been forced to sell into the spot market recently to improve dwindling cash positions.[4]

This is 'seller's remorse' according to analyst and investor Marin Katusa: "I've spoken to many producers who wish they weren't depleting their resources but they aren't in a position to do otherwise. It may be because they signed contracts to finance their projects into production and had no alternatives, or they may have conventional mines where it's not feasible to decrease the labor force. ... They know they are depleting their best resources in a low-price environment. They don't like it, but can't help it. This is what I call seller's remorse."[8]

Enrichment underfeeding

Just as the uranium mining sector is oversupplied, so too is the enrichment sector. Platts noted in April 2016:[6]

"Further complicating the supply picture, uranium enrichment companies are using their extra enrichment capacity to bring an estimated 15 million lb U3O8 equivalent to the market annually by driving down their operational tails assay, according to Ruthanne Neely, UxC senior vice president of enrichment and general counsel.

"When enrichers are in overcapacity, they can "underfeed" – that is, use less uranium for the same resulting enriched uranium product [EUP] – and sell the excess uranium back into the market. Neely estimated that there is "over 60 million SWU in excess inventories" in the form of EUP that can be sold on the market. There is so much EUP material that finding storage space is difficult, she said. Given current requirements, she said the inventory would only be drawn down by 2028."

Kazakhstan – the elephant in the room?

Reactor restarts in Japan were meant to stimulate the uranium industry ... but didn't. The end of the US–Russia 'megatons to megawatts' program was meant to stimulate the industry ... but didn't. The global 'nuclear renaissance' was meant to stimulate the uranium industry ... but it didn't materialize. Now, some are anticipating (or hoping) that uranium production in Kazakhstan will collapse and stimulate investment and production elsewhere. Marin Katusa writes:[8]

"It's all about Kazakhstan, which went from virtually no uranium production 15 years ago to becoming the world's largest producer, contributing 40% of global primary uranium production. Zero to hero in less than 20 years. ...

"But what nobody is asking is this: What happens to a nation's resource production when reinvestments into the sector – such as replacing wells and past production – never come about because the state uses the cash proceeds to fund social programs instead? ...

"I've been writing about this phenomenon for years, and I call it the pinch point of national resource production. ... The pinch point is coming to Kazakhstan, and it will happen faster than most expect. Uranium prices have been low, and the government has been using the funds from production to subsidize its political agenda. Once again, reinvestment has been sacrificed as a result. ...

"One American executive ... stated to me he spent years in Kazakhstan working in the uranium mines, and he couldn't emphasize enough how bad the coming decline to their production will be. I like to remind people that it also happened in the US. In the 1960's, the US was the world's largest producer of uranium, and produced over 35 million pounds of uranium annually. Last year, the US produced less than 5 million pounds. That is more than an 85% decrease in production."

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Fukushima Fallout: Updates from Japan

Business lobby turning against nuclear, in favor of renewables

NM828.4576 The Japan Association of Corporate Executives (JACE), with a membership of about 1,400 executives from around 950 companies, has issued a statement urging Tokyo to remove hurdles holding back the expansion of renewable power.[1]

JACE vice chair Teruo Asada said: "We have a sense of crisis that Japan will become a laughing stock if we do not encourage renewable power."

Japan has promoted renewables but most investment has been in solar and in recent years incentives have been cut. "There are too many hurdles for other sources of renewable power," Asada said.[1]

Renewables supplied 14.3% percent of power in Japan in the year to March 2016.[1]

The statement released by JACE – titled 'Towards the World's Leading Zero-Emissions Society: Measures for an Increased Deployment of Renewable Energy' – says: "Japan should be removing hurdles to renewables development beyond solar, by cutting environmental assessment periods, reducing land restrictions and clarifying the roles of stakeholders in development zones as well as invest in transmission lines. Municipal and central governments should streamline lengthy approval processes, which have led to delays in introducing renewables. Government should create a one-stop advisory body to deal with these issues and expand subsidies or financing through government lenders and other measures beyond the current feed-in-tariff program."[2]

The JACE statement calls for Japan to aim for "much more" than the current target of a 42-46% contribution from low-carbon power sources (20–22% nuclear and 22–24% renewables) by 2030. The statement notes that the outlook for nuclear is "uncertain" and that the 20–22% target could not be met without an improbably high number of restarts of idled reactors along with numerous reactor lifespan extensions beyond 40 years.[2]

"In the very long term, we have to lower our dependence on nuclear. Based on current progress, nuclear power reliance may not reach even 10%," Asada said.[1]

Andrew DeWit, a professor at Rikkyo University in Tokyo, said the push signaled "a profound change in thinking among blue-chip business executives." DeWit added: "Many business leaders have clearly thrown in the towel on nuclear and are instead openly lobbying for Japan to vault to global leadership in renewables, efficiency and smart infrastructure."[1]

United Nations University report on the aftermath of Fukushima

The United Nations University (UNU) has released a detailed report on the aftermath of the Fukushima disaster.[3] The report is a product of the three-year Fukushima Global Communication Programme, funded by Japan's Nuclear Regulation Authority. The report summarizes research in three areas: disaster risk reduction, displacement and livelihoods, and risk communication and nuclear accidents.

On-site decontamination work at the Fukushima nuclear plant will continue for decades, and off-site clean-up work is a long way from being finished. Around 100,000 people remain displaced because of the nuclear disaster. And a bad situation is about to become worse due to government policies – in particular, housing and employment policies.

The winding back of housing subsidies is putting many people in an impossible situation: returning to contaminated areas with limited services and employment opportunities, or abandoning any hope of returning to their homes and doing their best to survive elsewhere despite the looming termination of compensation payments including housing subsidies.

The UNU report states: "Five years have passed since the disaster, and the evacuees are finding themselves in increasingly diverse and rapidly changing situations. Given the persistent uncertainty and instability that characterised these years, many ended up resorting to living arrangements that fall somewhere between return, local integration and resettlement. In the context of policy reorientation that is taking place as the government is trying to shift gears from the immediate response to longer-term recovery, many are now facing the need to reconsider the viability of such makeshift arrangements. This also means that the challenge of livelihood recovery involves not only restoring or formulating an alternative strategy for making a living, but also navigating and integrating into a new environment. Such a challenge is also faced by those who opt to return to their community of origin, where the environment has inevitably changed in the years following the disaster."

The report states that "discussions with both mandatory and voluntary evacuees revealed that many feel trapped in uncertainty: being unable to plan their future in a context where communities have become dispersed and divided, livelihoods have been disrupted, and the prospects for regaining normality continue to dwindle. ... The affected people are not only facing challenges related to radiation, but also unemployment with declining occupational options; adjusting to an unfamiliar environment; disruption of family ties, social networks and community life; and uncertainty about the future."

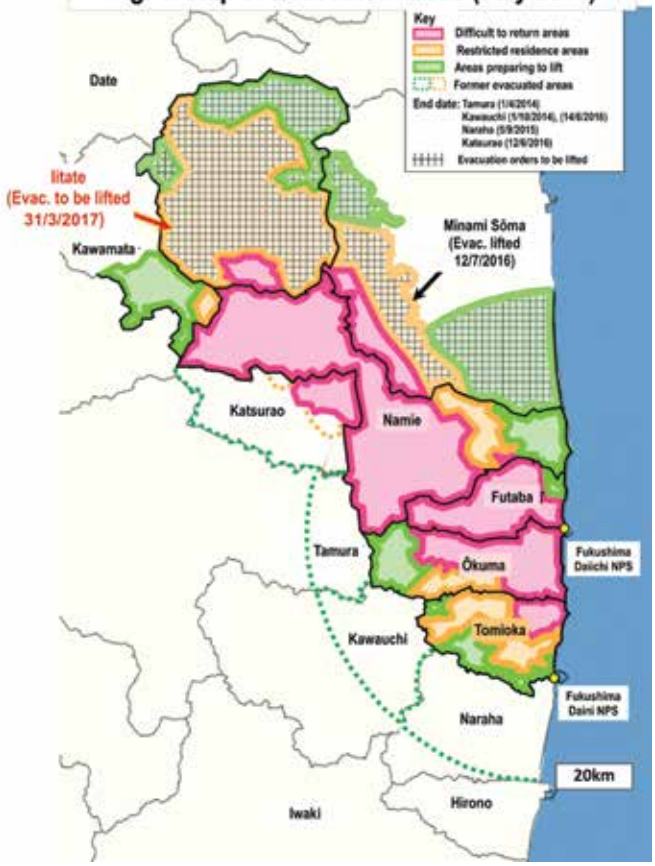
The employment situation facing evacuees is bleak, all the more so due to the termination of job creation schemes. The report states:

"The 3.11 disasters have had a tremendous impact on livelihoods. The disasters negatively impacted 25.9% of jobs in Fukushima prefecture alone. In a survey conducted in February 2016, 25% of respondents from Fukushima stated that they had lost their jobs, while 67% reported a decrease or loss of income in the years following the disaster.

"The nuclear accident has devastated the reputation of agricultural and fisheries products from the entire prefecture of Fukushima, and prices and sales are yet to recover. The number of tourists visiting the prefecture has also dropped, leading to significant losses in the tourism industry and related service industries. Many businesses and public enterprises were forced to close, and only a few reopened, either in other locations or in their original locations following adjustments to the evacuation zones.

"Most of the emergency job creation schemes were initially planned for 3 years, and then extended several times in recognition of the long-lasting effect of the disaster on the labour market, but most of these schemes were terminated in April 2016."

Fig. 1: Map of Evacuated Areas (July 2016)



The report argues that "evacuee situations, and especially their self-reliance capacity, have to be systematically assessed before terminating existing relief measures to avoid further socio-economic marginalisation."

Fukushima evacuees

The latest newsletter from the Citizens Nuclear Information Center details the housing situation facing Fukushima evacuees.[4] Well over five years after the Fukushima disaster, some 100,000 people are still living as evacuees. In June 2015, the Japanese government announced plans to lift evacuation orders for the 'restricted residence areas' (23,000 people) and the 'zone under preparation for lifting the evacuation order' (31,800 people), by March 2017 at the latest. Authorities also plan to uniformly terminate compensation for psychological suffering to residents in these regions by March 2018.

However, these decisions have completely disregarded the will of evacuees. According to a survey conducted by the Reconstruction Agency, most residents in the evacuated regions have no intention to return or they have not yet decided whether to return or not. Younger people are the least likely to return. Reasons include concerns about the safety of the Fukushima nuclear plant and anxiety about radiation, concerns about the provision of health care, the living environment, and the decaying of homes.

Many evacuees are renting accommodation provided under the Disaster Relief Act. Under this system, local municipalities hosting evacuees provide government-funded housing through leasing blocks of private apartments. The majority of these funds (90% in this case) are provided by the central government, and

the municipalities that the evacuee originally came from (in this case, Fukushima Prefecture) provide the remainder. Yet, Fukushima Prefecture announced plans to stop providing support for evacuees from outside the designated evacuation areas in March 2017.

According to a Fukushima Prefecture survey, 59.2% of all evacuees currently use this publicly leased housing. The attitude of prefectural authorities in terminating subsidies has been the focus of much criticism. Many evacuees and citizen groups organized petitions and submitted these demands to Fukushima Prefecture and the Cabinet Office, which is responsible for the leased housing program. However, neither Fukushima Prefecture nor the central government reversed its decision to terminate support.

In a small gesture, in August 2015 Fukushima Prefecture announced "support measures" for the voluntary evacuees after the free housing program is terminated in March 2017. For low income households, the prefecture will rank financial need and reduce housing assistance gradually, eventually terminating aid in 2019.

Controversy over reuse of contaminated waste

The Japanese government is pursuing controversial plans to recycle contaminated soil collected during off-site clean-up operations in Fukushima Prefecture.[5] Soil and other wastes resulting from decontamination in the prefecture are estimated to amount to 22 million cubic meters (as of January 2015). The Japanese government plans to build an interim storage facility straddling the towns of Okuma and Futaba, Fukushima Prefecture, with the waste to be relocated out of the prefecture to a final disposal site before May 2045. But establishing an interim storage facility is proving to be slow and complicated.

Thus the government wants to 'recycle' soil whose total cesium-134 and cesium-137 concentration is 8,000 becquerels per kilogram (Bq/kg) or less. Proposals include use of soil for road construction, ground elevation, coastal windbreaks, seawalls, earth dikes, and land development.

The recycling proposal has sparked criticism as it runs counter to the safety standards of 100 Bq/kg or less for recycling metals generated from the decommissioning of nuclear reactors under the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors.

The government says that if the recycled soil is covered and shielded, radioactivity will be controlled and cause no harm. However as Ryohei Kataoka from the Tokyo-based Citizens Nuclear Information Center points out, all sorts of things could go wrong. After the recent serious earthquake in Kumamoto and Oita in southwest Japan, roads collapsed and cracked at many locations. Coastal windbreaks and seawalls may be destroyed if a tsunami occurs, causing the soil to spread into inland areas and the sea.

The recycling of rubble generated by the March 2011 triple-disaster has already proved problematic. 230,000 tons of rubble of 3,000 Bq/kg or lower, gathered from the Fukushima Prefecture evacuation zones, has been used in a construction project along the seashores of the evacuation zone, to elevate the ground to create coastal windbreaks. But the government does not know how and where private construction companies have used the material, and it made no effort to ensure compliance with a requirement for a shield of at least 30 cm in thickness.

The Mainichi newspaper reported on 3 August 2016 that weakening standards for soil disposal vs. recycling – from 100 Bq/kg to 8,000 Bq/kg – could save over 1.5 trillion yen (US$14.7 billion; €13.3 billion). The estimated cost of 2.9 trillion yen could be reduced to 1.35 trillion yen.[6]

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New York just proved why bailing out nuclear power is a bad idea

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NM828.4577 On August 1, New York became the first state to adopt a policy to subsidize aging, uncompetitive nuclear reactors. The state's Public Service Commission (PSC), which regulates utility companies, passed a Clean Energy Standard that combines a 50% renewable energy standard by 2030 with massive subsidies to prop up uneconomical reactors.[1]

Prepare yourself for loud celebrations from the nuclear industry, heaping praise on New York Governor Andrew Cuomo and calling for other states to emulate the Empire State with lucrative incentives to insulate the nuclear industry from competition and to postpone closures of uneconomical reactors.

We hate to throw water on the parade, but the move actually proves what a bad idea it is to throw subsidies at nuclear power. Let's jump to the punch line, then we can fill in the blanks: New York just committed to spending twice as much money propping up old nuclear reactors than on new renewable energy, to get 2–3 times less energy from nuclear as renewables in the end.

Basically all of the US$7.6 billion[2] in nuclear subsidies will leave New Yorkers' bank accounts and go to companies headquartered in Chicago and Paris: Exelon and Electricite de France, which jointly own the company that will own all of the bailed-out reactors. The money will produce not one more job for unemployed New Yorkers, put not one more solar panel on a roof, provide not one more dollar of economic development. And by soaking up so much of New Yorkers' energy dollars, the subsidies could prevent them from investing in energy efficiency and renewables.

A precedent for other states?

Nuclear boosters will argue that New York is setting a precedent for other states to prop up the industry by "valuing" nuclear power's role in combating climate change. But to those close paying attention, it proves just the opposite: bailing out aging, uneconomical reactors is a massive diversion of time and money needed to invest in renewable energy, energy efficiency, and other strategies for reducing emissions.

Here's why. Other states won't all be able to replicate the unique circumstances that enabled New York to ram through such a massive bailout in just a few months. In most other states, nuclear subsidy proposals have been proposed legislatively or through an adjudicated process where there has been a full, transparent review. In Ohio, a massive "black box" subsidy[3] for FirstEnergy's nuclear and coal plants has been challenged by extensive litigation, resulting in the company closing several coal units[4], and still may not survive a federal legal challenge.[5]

In New York, Governor Cuomo ordered the PSC to create the nuclear subsidies through a fast-tracked proceeding, in which there was no transparency and the public had limited time to participate. The governor has a reputation for overstepping his authority[6] to get the commission to do what he wants.[7] Both the governor's office and the PSC are under investigation[8] by the US Attorney's office[9] and the New York Attorney General[10] in similar cases, none of which involve anywhere close to the amount of money the nuclear subsidies would direct to a single corporation: Exelon.

The amount of support needed to reverse nuclear energy's fortunes dwarfs what is needed to expand renewables, and actually requires states to prioritize nuclear over clean energy solutions. The New York PSC approved a US$7.6 billion subsidy to nuclear power plants as part of a Clean Energy Standard that also sets a goal of generating 50% of the state's electricity from renewable energy by 2030. The policy will lock in subsidies for 12 years (into 2029), for four reactors in one region of the state – Ginna, FitzPatrick, and Nine Mile Point 1 and 2 – by declaring them a "public necessity."

Subsidies for nuclear would be priced according to a measure the EPA uses to evaluate the social and environmental impacts of carbon emissions – the Social Cost of Carbon. The subsidies will increase over time, from 1.75 cents per kilowatt-hour (kWh) in 2017 to 2.92 cents per kWh by 2027. The cost of subsidizing nuclear would go up from US$480 million per year in the first two years to around US$800 million per year in the final two years – assuming all of the reactors last that long, which is not a good bet given that no reactor in the world has run for more than 47 years and the PSC wants to push two of them all the way to 60 years.

By the end of the 12-year subsidy period, New York will end up spending twice as much money propping up old nuclear power plants as on developing renewable energy[11] – for what will turn out to be half as much energy, at the most. In addition the nuclear subsidy program could expand to include the two reactors at Indian Point under the same "public necessity" designation within the next couple of years, increasing the total cost to more than US$10 billion and reversing the state's longstanding policy of closing those reactors.[12]

The subsidies are intended to keep the four upstate reactors operating, since Ginna and FitzPatrick are now too expensive to operate without a lot of subsidies. Together, the four reactors can generate at most 27 million megawatt-hours (MWh) of electricity per year. To meet the 50% renewable energy goal, the PSC estimates it will develop at least enough new wind, solar, and other renewable energy sources to generate about 34 million MWh per year. That is 25% more renewable energy than nuclear, at half the cost of the nuclear subsidies.

And here's the kicker: the state will still have to replace almost all of the aging reactors by 2030, anyway. And if 25% more renewables can be built for half the cost of the nuclear subsidies, then the state could reduce emissions even more by implementing lower cost renewable energy. In fact, just by following the examples of other states that are growing renewables and improving efficiency faster than New York, the state could easily exceed its targets for renewables and greenhouse emissions. A study commissioned by environmental groups found that just expanding energy efficiency in New York – which would not require subsidies and would actually save consumers money – could reduce electricity demand by as much as the bailed-out nuclear reactors can generate by 2030.[13] So why even bother with a bailout?

Governor Cuomo and the PSC had to ignore all of these facts in order to justify subsidizing the nuclear industry. The PSC didn't do any studies to see if the closure of reactors would actually affect the state's emissions goals, and it considered no alternatives to propping up nuclear reactors – such as investing more in renewables and efficiency – and only considered different methods for delivering enough subsidies to prevent reactors from closing next year.

FitzPatrick, Entergy and Exelon

The policy the PSC adopted lacks any way out of the subsidies: no plan to phase reactors out, no back-up plans in case reactors close anyway. In fact, it's actually

an all-or-nothing policy. The whole 12-year commitment is tied to just one reactor: FitzPatrick. The current owner, Entergy, decided last year that it will close FitzPatrick in January 2017 and has been making the necessary preparations: notifying all of the relevant agencies, withdrawing applications for license amendments needed to continue operating, and canceling plans to refuel in September (next month). Entergy's plan to run FitzPatrick until January 2017 was made to "burn up" more of the unused fuel in the reactor before the final shutdown.[14]

Before announcing the final nuclear subsidy proposal less than a month ago, the governor brokered a negotiation for Entergy to sell FitzPatrick to Exelon. Entergy has stood firm in its plan to close FitzPatrick regardless of what subsidies the state provides, so the only possible option to keep the reactor operating is for another company to take it over, for which Exelon is the only candidate. The decision by the PSC actually requires Exelon to do it or else the 12-year subsidy commitment will be cancelled. So, in fact, it appears that the whole nuclear subsidy plan is really about preventing one reactor from closing – FitzPatrick, which will probably shut down before 2030 anyway, even with the subsidies.

One has to ask, if the money on the table is not enough to convince Entergy to keep operating FitzPatrick, then why on earth would Exelon agree to take it over and run it for 12 more years? One simple answer: it's the price of a precedent. Exelon has become increasingly desperate to get someone, somewhere to provide the bailout necessary to restore increasingly uncompetitive nuclear reactors to profitability, and the other watering holes in the desert have been drying up. Illinois has not come through for going on three years, and even potential compromise legislation is not likely to include the game-changing subsidies Exelon really wants. The massive subsidies approved by New York are large enough to do that, and the price for Exelon appears to be taking on the risk of owning and operating FitzPatrick.

Unfortunately for New Yorkers, a deal good enough to be worth Exelon's while is going to be a terrible deal for the state. US$7.6 billion in subsidies, all to be paid by electricity customers, is going to strain everyone, but especially low-income consumers, businesses, local governments and school districts.

Finally, the PSC's Clean Energy Standard Policy sets an enforceable requirement that New York obtain 50% of its electricity from renewables by 2030. But the policy is less ambitious than it seems, because the definition of renewables includes old, large-scale hydropower facilities that generate about 15% of the state's electricity. Other leading states[15] on renewables, including California[16], Oregon[17], and Washington[18], do not include large hydro as renewable. So New York's Renewable Portfolio Standard is only 35%, by comparison.

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Uranium from Russia, with love

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NM828.4578 Amidst all the fuss about Hinkley C and other planned nuclear power plants in the EU and US, does anyone knows where the stuff that keeps these reactors buzzing comes from? Here's a fun fact: no other country supplies so much uranium to the EU than ... Russia. Putin has more than the gas valve if he wants to play games with Europe. And the degree to which the US has become dependent on non-stable foreign sources of uranium is also unprecedented.

Let's churn on a couple of numbers first. The US now depends on imports of uranium for 94% of their total demand.[1] For the EU it's 97%.[2] More than a quarter of all uranium used in the EU comes from Russia, up from 10% in 2005 – when more befriended countries like Australia and Canada used to supply 46% of all uranium to the EU. Their combined share of exports to the EU has dropped to under 30%. These trends have geopolitical implications.

One issue is security. Reciprocal sanctions between Russia and the EU are now in place for over two years. If some recent polls[3] in the US become reality and Trump becomes the new US president, things will get worse for the EU. Trump already hinted[4] that a grim scenario (or much worse[5]) could play out in Latvia or Estonia, EU countries with a Russian minority of over a quarter of the whole population.[6] How hard can the EU bite the hand that feeds it with the gas and uranium it so desperately needs? Putin will answer: not that hard.

Another issue is the future supply risk. Any power plant envisaged today will need uranium in 40 years from now. But both Russia and Kazakhstan, the two biggest uranium exporters to the EU have plans to build new nuclear power plants for themselves. Kazakhstan has gone from zero to hero: in 20 years it went from no production to supplying 40% of the world's uranium. But aside from their own future needs, and those of nearby befriended Russia, analysts fear that mismanagement is likely to lead to a collapse in exports.[1]

The great outsourcing to the "underpolluted" countries

But the bigger issue should be that uranium mining is a very dirty business that we didn't clean up but source out. France used to have 200+ uranium mines but thanks to better care for environment and workers the last one closed in 2001. Instead, new ones were opened in places like Niger[7], Namibia[8] and Malawi. In short: places where we can shift the real costs from uranium mining to the people and environment. As a matter of fact, CEOs in the business are quite frank about that. The former CEO of Paladin, John Borshoff, an Australian uranium producer who opened mines in Namibia, said that Canadian and Australian environmental norms are "over-sophisticated".[9] What he actually means is that in African countries you don't need to pay much or anything at all to "protect" either your workers or the people living in the vicinity from dying from cancer due to exposure to uranium.

He's just implementing the Lawrence Summers Principle.[10] This 'principle' originates from a 1991 memo written or dictated by Summers whilst he was the World Bank's chief economist. In this memo, he promoted dumping toxic waste in the Third World for economic reasons: *"Just between you and me, shouldn't the World Bank be encouraging more migration of the dirty industries to the LDCs [Least Developed Countries]? ... A given amount of health impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages. I think the economic logic behind dumping a load of toxic waste in the lowest wage country is impeccable and we should face up to that."*

The uranium sector squared up to that. But for how much longer will it get away with that?

Last time rebels in Mali came too close to the AREVA mines in Niger for comfort, France suddenly sent in their army. Under some humanitarian pretext. And if rebels don't succeed in capturing these remote mines, the global environmental justice movement might just succeed in closing a couple of them down.

The legacy from uranium mining

Being part of that movement, I've had the 'pleasure' of making a toxic tour around a now closed uranium mine in Bulgaria.[11] Massive amounts of toxic sludge were stored behind a weak dam that showed signs of distress after heavy rains caused a spill in 2009. Old EU money was still keeping the dam up but as we're talking about radioactive waste, money will need to keep flowing to dam repairs for millennia to come.

Since 1992, when the mines closed, and for time immemorial, that will be public money. And that's how it goes with uranium mines in places with weak or no legislation: short-term private profits followed by perpetual public losses. In Bulgaria the people are still lucky enough to be in the EU with at least some environmental regulations and EU money for environmental protections. The same goes for other EU countries like France, which has dozens of zombie mines: dead but still active.[12] The US also has plenty more zombie mines. The lands of the Navajo Nation include over 500 abandoned uranium mines as well as homes and drinking water sources with elevated levels of radiation.[13] Despite the fact that they stopped operating in 1986, new and related lung cancers, bone cancers and impaired kidney functions keep appearing.

But while EU and US now have enough safeguards to keep their own uranium safe under the ground, there's nothing of that in Niger[7] or Namibia[8]. These two countries are rising players on the uranium market, both exporting their uranium to the EU. Niger has now produced more uranium than France ever did in its whole history. It's here that UK-Australian and French companies are doing the dirty digging that destroys local environment and populace.

Three reports from the EU-funded EJOLT project deal with the environmental and social issues related to uranium mining. One deals with the impacts[14], one concentrates on a mine in Malawi[15] and the third dwells on the examples of successful resistance to big mining in general.[16]

Bruno Chareyron, a French nuclear engineer who authored most of these reports, has been carrying out toxic tours along uranium mines for the past two decades. That's not always an easy job, with for example the police confiscating most of your measuring equipment upon arrival in Niger. Nevertheless, Bruno was able to measure that radioactive scrap metal from the mines and mills is sold on the market. Waste rocks from the mines were used to pave roads, build homes and even at the local hospital where the radiation was 100 times above normal. Piles of radioactive waste were left in open air, unprotected, next to two cities with a total population of 120,000.

The missing piece of the puzzle

Where is uranium in the whole debate about nuclear energy? It's usually only mentioned when the industry says: uranium is only a tiny part of the total cost of our energy model, unlike the situation in the gas and oil industry.

Well, there's a reason why it's only a tiny part of the total cost and it's called cost shifting.

Ecological economists have given names to processes witnessed in the uranium sector: accumulation by contamination[17], ecologically unequal exchange[18] and ecological debt.[19] More and more, people all over the world are coming together to resist against environmental justice.[20]

Our EU and US based nuclear power is currently coming at the cost of poisoning people in Africa. But it begs the question: are we ready to face that reality?

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