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2017 was supposed to be a good year for nuclear power – the peak of a mini-renaissance – but it turned out to be another flop for an industry in crisis. Meanwhile, renewables surged.

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Tim Judson from the Nuclear Information & Resource Service writes about the decision of the Georgia Public Service Commission to allow construction of the Vogtle nuclear plant to continue despite mounting costs and escalating scandals. Vogtle is the industry's last gasp: 28 of the 30 'Nuclear Renaissance' reactors in the US have now been formally abandoned or indefinitely shelved.

Swedish nuclear industry loses battle over repository but battle rages on 8

Miles Goldstick summarizes recent developments regarding the decision-making process for the planned spent fuel repository in Forsmark. A report by the Nuclear Safety Authority is largely positive while the Land and Environmental Court's report is more critical. The issue is now in the hands of the Swedish government and will not be resolved before the September 2018 national election.

"In practice, what the 'no' by the Land and Environment Court did was cause a delay of at least a year before the nuclear industry internationally has another chance to be able to claim there is a government-sanctioned solution to the spent fuel problem. In that sense, it is a victory for opponents of the nuclear industry's waste management plans and opponents of nuclear power in general. The main battle however rages on."

Sweden: Nuclear Waste Fund deficits prompt government action 10

Charly Hultén from WISE Sweden writes about the chronic deficit in the Swedish Nuclear Waste Fund:

"For decades, the nuclear establishment was a Swedish 'holy cow' and, as such, was not subjected to incisive scrutiny. Not so today. The debate on the deficit in the Nuclear Waste Fund these past two years cuts sharper and deeper than ever before."

Looking back, looking forward: Nuclear Monitor #1 – May 1978 13

Nuclear Monitor and the two organizations that produce it – WISE and NIRS – are all celebrating our 40th birthday this year. Over the course of the year we'll be looking back at early issues of Nuclear Monitor and presenting a potted history of the anti-nuclear movement, WISE and NIRS, and Nuclear Monitor itself. In this issue, we look back at Nuclear Monitor #1, published in May 1978. Heady times!

2017 in Review: Nuclear Power

Author: Jim Green – Nuclear Monitor editor

NM855.4700

2017 was supposed to be a good year for nuclear power – the peak of a mini-renaissance resulting from a large number of reactor construction starts in the years before the Fukushima disaster (38 construction starts from 2008–2010).

The World Nuclear Association (WNA) anticipated 19 reactor grid connections (start-ups) in 2017.¹ But there were only four start-ups (Chasnupp-4, Pakistan, 315 MW; Fuqing-4, China, 1000 MW; Yangjiang-4, China, 1000 MW; Tianwan-3, China, 990 MW).

Most of the expected start-ups were delayed while the V.C. Summer 2 and 3 reactors in the US were abandoned after at least US\$9 billion was spent on the project.

The four start-ups in 2017 were outnumbered by five permanent reactor shut-downs (Kori-1, South Korea, 576 MW; Oskashamn-1, Sweden, 473 MW; Gundremmingen-B, Germany, 1284 MW, Ohi 1 and 2, Japan, 2 x 1120 MW).

The four start-ups in 2017 fell well short of the 10 start-ups in both 2015 and 2016.

The WNA's estimate for reactor start-ups in 2017 was hopelessly wrong but, for what it's worth, here are the Association's projections for start-ups in the coming years:²

2018 – 14
2019 – 16
2020 – 7
2021 – 5

2022 – 5
2023 – 4
2024 – 1
2025 – 1

Thus – notwithstanding the low number of start-ups in 2017 – the mini-renaissance that gathered steam in the three years before the Fukushima disaster probably has two or three years to run. Beyond that, it's near-impossible to see start-ups outpacing closures.

New nuclear capacity of 3.3 gigawatts (GW) in 2017 was outweighed by lost capacity of 4.6 GW. Over the past 20 years, there has been modest growth (12.6%, 44 GW) in global nuclear power capacity if reactors currently in long-term outage are included. However, including those reactors – in particular idle reactors in Japan – in the count of 'operable' or 'operational' or 'operating' reactors is, as former WNA executive Steve Kidd states, "misleading" and "clearly ridiculous".³

The World Nuclear Industry Status Report (WNISR) excludes reactors in long-term outage – defined as reactors that produced zero power in the previous calendar year and in the first half of the current calendar year – from its count of operating reactors. Thirty-six reactors are currently in long-term outage, 31 of them in Japan.⁴

Excluding reactors in long-term outage, the number of reactors has declined by 29 over the past 20 years, while capacity has grown by a negligible

1.4% (5 GW). Over the past decade, the reactor count is down by 34 and capacity is down by 9.5% (19 GW).

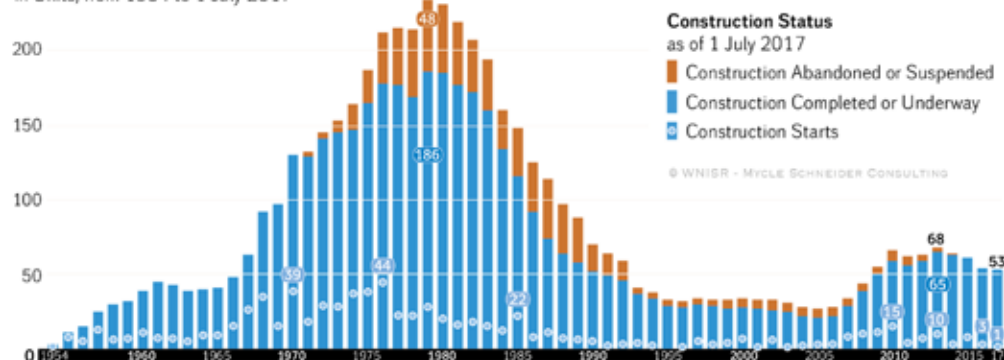
YEAR	GLOBAL NUCLEAR POWER CAPACITY	NUMBER OF REACTORS
31 Dec. 1997 ⁵	348 GW	434
31 Dec. 2007 ⁵	372 GW	439
31 Dec. 2017		
WNA (including reactors in long-term outage) ⁶	392 GW	447
WNISR (excluding reactors in long-term outage) ⁷	353 GW	405

The above figures suggest that the nuclear industry might at least maintain its 20-year pattern of stagnation over the next 20 years or so. But the industry faces severe problems. One is the aging of the global reactor fleet. The average age of the reactor fleet continues to rise, and by mid-2017 stood at 29.3 years; over half have operated for 31 years or more.⁸

The International Energy Agency expects a "wave of retirements of ageing nuclear reactors" and an "unprecedented rate of decommissioning" – almost 200 reactor shut-downs between 2014 and 2040.⁹ The International Atomic Energy Agency anticipates 320 GW of retirements by 2050¹⁰ – in other words, there would need to be an average of 10 reactor start-ups (10 GW) per year just to maintain current capacity. The industry will have to run hard just to stand still.

Reactors Under Construction in the World

in Units, from 1954 to 1 July 2017



WNISR – Mycle Schneider Consulting.

2008–2017 grid connections, construction starts and permanent reactor closures:¹¹

YEAR	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Reactor grid connections	0	2	5	7	3	4	5	10	10	4
Construction starts	10	12	16	4	7	10	3	8	3	4
Permanent shutdowns	2	3	1	13	5	6	1	7	3	5

Assuming the mini-renaissance doesn't continue to flop (as it did in 2017), an average of 10 or so start-ups from 2015–2020 is possible (there were 24 start-ups from 2015–17). But to maintain that level, the number of construction starts would need to increase sharply and there is no likelihood of that eventuating – there have only been seven construction starts in the past two years combined.

The number of reactors under construction is slowly dropping. Using WNA figures, 71 reactors were under construction in January 2014 compared to 58 in January 2018.⁶ According to WNISR figures, the number is down from 67 to 52 over the same period.⁴ That trend seems certain to continue because of a sharp drop in reactor construction starts: 38 from 2008–2010 compared to 39 in the seven years from 2011–2017.¹²

Nuclear power accounted for 10.5% of global electricity generation in 2016 (presumably a little less now), well down from the historic peak of 17.5% in 1996.⁸

Renewables (24.5% of global generation¹³) generate more than twice as much electricity as nuclear power (<10.5%) and the gap is growing rapidly. The International Energy Agency's (IEA) five-year forecast for renewables predicts capacity growth of 43% (920 GW) from 2017 to 2022.^{14,15} The forecast is a "significant upwards revision" from the 2016 forecast, the IEA states, largely driven by solar power growth in China and India. Overall, the share of renewables in power generation will reach 30% in 2022 (over 8,000 TWh) according to the IEA. By 2022, nuclear's share will be around 10% and renewables will be out-generating nuclear by a factor of three.

Non-hydro renewable electricity generation has grown rapidly over the past decade and will probably

surpass nuclear power by 2022, or shortly thereafter, then leave nuclear in its wake as renewables expand and the aging reactor fleet atrophies.

A disastrous year for the nuclear industry

Last year was "all in all a disastrous year" for the nuclear power industry according to *Energy Post Weekly* editor Karel Beckman.¹⁶ Lobbyists issued any number of warnings about nuclear power's "rapidly accelerating crisis" while others noted that "the industry is on life support in the United States and other developed economies".^{17,18}

Lobbyists engaged each other in heated arguments over possible solutions to nuclear power's crisis – in a nutshell, some favor industry consolidation while others think innovation is essential, all of them think that taxpayer subsidies need to be massively increased, and none of them are interested in the tedious work of building public support by strengthening nuclear safety and regulatory standards, strengthening the safeguards system, etc.¹⁹

One indication of the industry's desperation has been the recent willingness of industry bodies (such as the US Nuclear Energy Institute) and supporters (such as former US energy secretary Ernest Moniz) to openly acknowledge the connections between nuclear power and weapons, and using those connections as an argument for increased taxpayer subsidies for nuclear power and the broader 'civil' nuclear fuel cycle.²⁰ The power/weapons connections are also evident with Saudi Arabia's plan to introduce nuclear power and the regime's pursuit of a weapons capability.²¹

The biggest disaster for the nuclear industry in 2017 was the bankruptcy filing of Westinghouse – which also came close to bankrupting its parent company Toshiba – and the decision to abandon two partially built reactors in South Carolina.^{22,23} As of January

2018, both Westinghouse and Toshiba are still undergoing slow and painful restructuring processes, and both companies are firmly committed to exiting the reactor construction business (but not the nuclear industry altogether).

Another alarming development for the nuclear industry was the slow-down in China.^{24,25} China Nuclear Engineering Corp, the country's leading nuclear construction firm, noted in early 2017 that the "Chinese nuclear industry has stepped into a declining cycle" because the "State Council approved very few new-build projects in the past years".²⁶

There were no commercial reactor construction starts in China in 2017 (though work began on one demonstration fast neutron reactor) and only two in 2016. The pace will pick up but it seems less and less likely that growth in China will make up for the decline in the rest of the world.

The legislated plan to reduce France's reliance on nuclear from 75% of electricity generation to 50% by 2025 seems unlikely to be realized²⁷ but the government is resolved to steadily reduce reliance on nuclear in favor of renewables. French environment minister Nicolas Hulot said in November 2017 that the 50% figure will be reached between 2030 and 2035.²⁸

France's nuclear industry is in its "worst situation ever", a former EDF director said in November 2016²⁹, and the situation has worsened since then. The World Nuclear Industry Status Report summarized recent developments in a January 9 post:⁴

"The French state-owned nuclear builder and service company AREVA was bailed out by the government with a US\$5.3 billion cash injection and subsequently broken up. AREVA's reactor building and servicing branch AREVA NP was taken over by state utility EDF, effective from the end of 2017, and relaunched in a "back to the future" initiative as Framatome (EDF

75.5%, Mitsubishi Heavy Industry 19.5%, Assystem 5%). After a loss of over 90 percent of its stock value since 2007, AREVA was delisted in August 2017. The year has also seen the French Nuclear Safety Authority ASN granting exceptional permission to EDF to use a sub-standard reactor pressure vessel at the Flamanville EPR, which is still under construction. The pressure vessel has been found with a level of carbon significantly exceeding technical specifications and is part of an ongoing quality-control scandal pointing to decades of irregularities and forged documents, impacting tens of thousands of pieces in dozens of nuclear plants around the world.”

There were plenty of other serious problems for nuclear power around the world in 2017:³⁰

- Swiss voters supported a nuclear phase-out referendum.³¹
- South Korea’s new government will halt plans to build new nuclear power plants (though construction of two partially-built reactors will proceed, and South Korea will still bid for reactor projects overseas).³²
- Taiwan’s Cabinet reiterated the government’s resolve to phase out nuclear power by 2025³³ though a long battle looms.³⁴
- Japan’s nuclear industry has been decimated – just five reactors are operating (less than one-tenth of the pre-Fukushima fleet) and 14 reactors have been permanently shut-down since the Fukushima disaster (including the six Fukushima Daiichi reactors).
- India’s nuclear industry keeps promising the world and delivering very little – nuclear capacity is just 6.2 GW. In May 2017, India’s Cabinet approved a plan to build 10 indigenous pressurized heavy water reactors (PHWR). That decision can be read as an acknowledgement that plans for six Westinghouse AP1000 reactors and six French EPR reactors are unlikely to proceed. Most of the 10 PHWRs have been in the pipeline for years and it’s anyone’s guess how many (if any) will actually be built.³⁵
- The UK’s nuclear power program faces “something of a crisis” according to an industry lobbyist.³⁶

In November 2017, the UK Parliament’s Public Accounts Committee said the only current reactor construction project, Hinkley Point, amounts to a “bad hand” and “the poorest consumers will be hit hardest”.³⁷ In June 2017, the UK National Audit Office said Hinkley Point is “a risky and expensive project with uncertain strategic and economic benefits.”³⁸

- All of Germany’s reactors will be closed by the end of 2022 and all of Belgium’s will be closed by the end of 2025.
- Russia’s Rosatom began construction of the first nuclear power reactor in Bangladesh³⁹, signed agreements to build Egypt’s first power reactors⁴⁰, and is set to begin work on Turkey’s first reactors⁴¹ – but Rosatom deputy general director Vyacheslav Pershukov said in June 2017 that the world market for the construction of new nuclear power plants is shrinking, and the possibilities for building new large reactors abroad are almost exhausted.⁴² He said Rosatom expects to be able to find customers for new reactors until 2020–2025 but “it will be hard to continue.”⁴²
- A High Court judgement in South Africa in April 2017 ruled that much of the country’s nuclear new-build program is without legal foundation, and there is little likelihood that the program will be revived given that it is shrouded in corruption scandals and President Jacob Zuma’s hold on power is weakening.⁴³

The only nuclear industry that is booming is decommissioning – the World Nuclear Association anticipates US\$111 billion worth of decommissioning projects to 2035.⁴⁴

The Era of Nuclear Decommissioning

The aging of the global reactor fleet isn’t yet a crisis for the industry, but it is heading that way. In many countries with nuclear power, the prospects for new reactors are dim and rear-guard battles are being fought to extend the lifespans of aging reactors that are approaching or past their design date. Perhaps the best characterization of the global nuclear industry is that a new era is approaching – the Era of

Nuclear Decommissioning – following on from its growth spurt then 20 years of stagnation.

The Era of Nuclear Decommissioning will entail:

- A slow decline in the number of operating reactors.
- An increasingly unreliable and accident-prone reactor fleet as aging sets in.⁴⁵
- Countless battles over lifespan extensions for aging reactors.
- An internationalization of anti-nuclear opposition as neighboring countries object to the continued operation of aging reactors (international opposition to Belgium’s aging reactors is a case in point⁴⁶ – and there are numerous other examples).
- Battles over and problems with decommissioning projects (e.g. the UK government’s £100+ million settlement over a botched decommissioning tendering process⁴⁷).
- Battles over taxpayer bailout proposals for companies and utilities that haven’t set aside adequate funds for decommissioning and nuclear waste management and disposal. (According to *Nuclear Energy Insider*, European nuclear utilities face “significant and urgent challenges” with over a third of the continent’s nuclear plants to be shut down by 2025, and utilities facing a €118 billion shortfall in decommissioning and waste management funds.⁴⁸)
- Battles over proposals to impose nuclear waste repositories and stores on unwilling or divided communities.

The Era of Nuclear Decommissioning will be characterized by escalating battles (and escalating sticker shock) over lifespan extensions, decommissioning and nuclear waste management. In those circumstances, it will become even more difficult than it currently is for the industry to pursue new reactor projects. A feedback loop could take hold and then the nuclear industry will be well and truly in crisis, if it isn’t already.

That said, the situation is fluid – there are ferocious debates over the future of nuclear power in South Korea, Taiwan, Japan, the UK, the US ... everywhere!

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Georgia Public Service Commission continues Vogtle reactor boondoggle – but the project is probably still doomed

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In December 2017, the Georgia Public Service Commission (PSC), which regulates electric and gas utilities in the south-eastern US state, voted to approve continued construction of two AP1000 reactors at Georgia Power's Plant Vogtle.¹ This decision was unsurprising because of the Commission's utter failure to question the project throughout its ten-year history, but the decision is all the more ridiculous and unfortunate for it.

The vote flies in the face of the evidence about the project's likelihood for continued failure, the state's energy needs, and the PSC staff's own recommendation to cancel the Vogtle reactors if Georgia Power did not agree to swallow US\$4 billion of the cost.²

The PSC's decision is far from the end of the story – more of a momentary reprieve that helps the industry save face, but not for long. The nuclear industry and its political backers simply could not afford to lose this round over Vogtle – and it is likely that significant outside pressure came to bear on the PSC, not only from Southern Co. and its army of lobbyists, lawyers, and government cronies. In fact, the Commission truncated its review of Vogtle, originally scheduled for a PSC vote in early 2018.

Time is only working against this project, with more information coming out each week regarding engineering and project planning failures, and subsequent coverups and collusion between utilities, Westinghouse, and regulators. Vogtle's twin project in South Carolina – the V.C. Summer 2 and 3 reactors – was cancelled in July 2017, leading to investigations of the project that have revealed years-long coverups³ leading to the project's failure and cancellation, resignations of utility executives⁴, utility reform legislation⁵,

and a vote to deny the South Carolina utility's recovery of costs and reducing customers' bill by 18%.⁶

The PSC's vote to 'damn the torpedoes, full speed ahead' exempts the Commission from having to consider even more damning evidence that may well emerge in the coming weeks.

That said, the fight is not over, by any means. There are more days of reckoning to come in the years ahead. In 2014, the US Department of Energy issued US\$6.5 billion taxpayer-guaranteed loans to Vogtle partners Georgia Power and Oglethorpe Power with \$0 credit subsidy fee (similar to a down payment, to reduce the government's financial risk).⁷ Additional loan guarantees of US\$1.8 billion were granted in 2015 (to project partner Municipal Electric Authority of Georgia – MEAG Power), as well as an offer by the US Department of Energy to provide another US\$3.7 billion in loan guarantees in September 2017 (to Georgia Power, Oglethorpe and MEAG).⁸

In 2014, it seemed to many like that would be the last straw – zero risk to Georgia Power for repaying a massive loan that covered all of Georgia Power's share of the project. But then the utility continued asking for rate hike after rate hike as the costs of Vogtle continued to go up⁹ ... and then Westinghouse had to buy out the project's main contractor¹⁰, CB&I, to settle a mountain of legal disputes¹¹ ... then Westinghouse went bankrupt¹² after taking over CB&I and inheriting all of the project's problems ... then the V.C. Summer reactors were canceled¹³ ... then the scandals and coverups¹⁴ of engineering problems started to emerge ... and here we are today.

The PSC should have concluded the sorry saga and canceled Vogtle. Just don't be too quick to judge the vote a failure for those calling for Georgia to ditch the reactors. Environmental and consumer activists have mounted a heroic fight to stop Vogtle, in the face of monstrous political odds. And the foundation is starting to crack: Georgia PSC staff for the first time admitted not only that the Vogtle project has problems but recommended it be canceled if the utility didn't agree to swallow US\$4 billion of the cost.¹⁵ Now, there is a division in the ranks of the utility establishment – making it as likely as not that the PSC's vote is really the beginning of the end for Vogtle.

Recently, I was looking over old status reports on reactor construction from the 1980s, and was reminded that Vogtle 1 and 2 were the single most expensive nuclear project in the first generation of nukes in the US – costing US\$8.8 billion by the time the reactors were both completed in 1989 (that would be about US\$18 billion today).¹⁶ Now, 30 years later, Southern Co. / Georgia Power is doubling down for a two-fer, with Vogtle 3 and 4 projected to cost US\$25 billion. There is no doubt that Southern Co. has recouped massive profits on Vogtle 1 and 2, through the utility's guaranteed return on investment, and is desperate for even greater profits if Vogtle 3 and 4 ever come online.

The truth is, Southern Co. is not qualified to manage a reactor construction project (it operates six reactors, but doesn't design or build them)¹⁷; its new contractor, Bechtel, isn't going to assume any of the cost or risk to finish the reactors¹⁸; and the rotten underbelly of technical and financial problems¹⁹ plaguing the Vogtle reactors' construction means, at the very least, years more

in delays and billions more in costs should be expected. And probably more train wrecks along the way.

Had the PSC cancelled the project in December – or forced Southern Co. to do so by holding the company accountable for the massive cost overruns – they could have saved a lot of face and pinned the blame on Westinghouse and their own ‘bad apples’. Going forward, it will be a different story: Southern Co. and the Georgia PSC now have no one else to blame. And they could find themselves facing the same cleaning of the house now taking place across the border in South Carolina.

The US ‘nuclear renaissance’ is dead

It’s hard to overestimate how desperate the US nuclear industry is to keep Vogtle construction going. Rightly or wrongly (more likely the latter), the industry views the completion of Vogtle as vital to its future.

Vogtle 3 and 4 are now the only new reactors being built in the US, more than a decade after the proclamation of a ‘Nuclear Renaissance’ which led to license applications for 30 new reactors between 2007 and 2010. While many of the licenses were approved, only V.C. Summer and Vogtle started construction – twin projects, both using Westinghouse’s AP1000 reactor design. By early 2017, they had bankrupted Westinghouse – the largest nuclear designer/builder in the world, responsible for about 50% of reactors around the globe. Westinghouse now says it will not

undertake any new reactor projects, nor will it complete Vogtle and V.C. Summer. And with V.C. Summer 2 and 3 cancelled, it means 28 of the 30 ‘Nuclear Renaissance’ reactors have now been formally abandoned or indefinitely shelved.

The story of V.C. Summer is one of stark opportunity costs, one that looms over Georgia PSC’s decision to charge ahead with Vogtle: South Carolina utilities wasted ten years and US\$9 billion on the project. Ratepayers are paying 18% of their monthly bills for two reactors that will never generate a single watt of electricity. They were still 5–10 years and US\$16 billion from completion – a completely rational basis for cancelling the project.

But had the utilities eschewed the nuclear option in 2007 and invested in energy efficiency and renewables, not only would they have reduced carbon emissions and electricity usage significantly by now, South Carolina families and businesses would have lower electric bills today and the state could have built a strong, sustainable clean energy economy and created thousands of jobs.

If Georgia had cancelled Vogtle in December, the nuclear industry’s case that it has a meaningful role to play in the country’s energy future, addressing climate change, or anything else would be self-evidently false. With at least two reactors being built that could operate into the 2060s, there’s at least a chance that the US will still have some nuclear-generated electricity in the late 21st Century.



The Vogtle #4 reactor under construction in Georgia.

But the industry can’t keep itself going on the backs of just two over-budget, hopelessly delayed, unnecessary reactors. Georgia doesn’t need Vogtle 3 and 4, and it never did. But by the time the reactors are completed – if ever – that will be the world’s most expensive novelty item. Of course, the farce will quickly turn to tragedy if those nuclear mementos were ever to start splitting atoms – generating nuclear waste that will be hazardous for hundreds of thousands of years, and a multi-billion dollar bill for decommissioning the reactors and cleaning up their radioactive mess.

With or without Vogtle 3 and 4, the only future nuclear has left in the US is keeping increasingly old, dangerous, uneconomical, and uncompetitive reactors going for as long as it can – while solar, wind, energy efficiency, storage, electric vehicles, smart appliances, microgrids, and other modern, more environmentally sustainable, consumer-friendly, and increasingly affordable energy options take off.

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Swedish nuclear industry loses battle over repository but battle rages on

Author: Miles Goldstick - WISE Sweden

NM855.4702

On 23 January 2018, both the Swedish Land and Environmental Court (MMD) and the regulatory agency dealing with the nuclear industry, the Nuclear Safety Authority (SSM), submitted their reports to the government regarding the Swedish Nuclear Fuel and Waste Management Company's (SKB's) application to build a "final" storage facility for spent fuel.

As SSM had made public months ago, they said yes to the industry proposal. MMD said no. The industry application is however multifaceted and both the "yes" from SSM contains some elements of "no" and the "no" from MMD includes some elements of "yes".

Both MMD and SSM are in agreement on the need for an improved safety analysis. SSM wrote: "SKB may begin construction of the facilities only after SSM has examined and approved a preliminary safety report." MMD wrote in their press release: "The court cannot, based on the current safety assessment, find that the final repository is safe in the long-term".

MMD wrote that SKB's application can only be approved if two conditions are met:

- 1) "SKB can provide documentation that shows the final storage facility complies in the long-term with requirements of the Environmental Code despite the uncertainties remaining on how the canisters protective capability is effected by a) corrosion due to reaction in oxygen-free water" and four other issues regarding copper corrosion, including the influence of radiation on three additional variables. Amongst other things, SKB has not carried out corrosion tests with a canister containing spent fuel.

Research on copper corrosion was spearheaded by Associate Professor Gunnar Hultquist at KTH, The Royal Institute of Technology in Stockholm. He initiated an experiment in 1986 showing copper corrodes in oxygen-free water. His results were eventually confirmed internationally by independent methods. SKB has tried hard to prove the results

are incorrect. Tragically, Gunnar Hultquist died in February 2016. To honor him and his hard work, colleagues visited his grave on 23 January 2018 and left flowers with a note saying, "Congratulations Gunnar, you won in the end!"

- 2) "It is clarified who is responsible according to the Environmental Code for the final repository in the long-term." This brings the long-term costs to the foreground, and can be considered a victory for critics of nuclear power. SKB has stated in their application that their responsibility ends after a few decades – once the facility is sealed. Östhammar municipality, where the Forsmark site chosen by SKB is located, is especially concerned about the long-term financial liability.

MMD also wrote that the government should consider changing the law to allow SSM authority to require re-approval of SKB's application regarding some aspects of the Environmental Code. This is because SSM has pursued

The Forsmark nuclear power plant.



an approach of step-wise approval. Otherwise, the full 566-page report of MMD remains to be assessed.

MMD however also gave their approval to several other main parts of SKB's application, including the environmental impact statement, the public participation process, the location, the facility to build and load the copper canisters, as well as expansion of the current storage system called CLAB. At the same time, though approval was given for these parts, there was also criticism, and MMD pointed out questions that remain to be answered. One main example is in the area of geology, where MMD noted that geologic factors can influence safety.

The government now has to make a decision

According to the legal decision-making process in Sweden regarding projects considered to have an extensive environmental impact, the decision-making authority rests with the government alone. According to the process, the proponent submits an application to both SSM (when radioactive materials are involved) and MMD, who then each make a report to the government according to the respective laws they each are bound by (though there is some overlap).

In Swedish, the SSM and MMD make an "yttrande" to the government. In the official translation used by the

court system the word is translated as both "report" and "opinion". Thus, though both SSM and MMD make decisions in their reports, the decisions are not binding on the nuclear industry in the sense of a final yes or no. Only the government can give approval.

If the government does say yes, the industry application goes back to both SSM and MMD who must set conditions for implementation according to their respective laws. The nuclear industry is obligated to comply with these conditions. In theory, a condition can be so stringent that the industry is unable to comply.

Further, before making their decision, the government is obligated to ask the local municipalities concerned if they will permit the respective local activity. The law however allows the government to force a municipality to accept a facility if the answer is no. There are two municipalities concerned: Östhammar, where SKB wants to place the spent fuel, and Oskarshamn, where SKB wants to place the encapsulation facility (and where CLAB is located). Östhammar municipality had planned a non-binding referendum 4 March 2018. Only hours after the announcement of the MMD report on January 23, Östhammar municipality cancelled their referendum.

In other words, regardless of the outcome of the examinations by SSM and MMD, it was always known that

in the end that the government would have to say yes or no. Opponents and proponents of the nuclear industry's plans now have to deal with politicians who in general have no technical expertise in the subject matter. The lobbying began almost immediately after the reports of SSM and MMD were made public on January 23, and the government was ready. Reuters reported that Environment Minister Karolina Skog stated no decision would be made during 2018. That was expected as 2018 is an election year in Sweden, which occurs every four years in the beginning of September, this year on September 9. The government would have made the same public statement even if the Land and Environment Court had been fully positive.

In practice, what the "no" by the Land and Environment Court did was cause a delay of at least a year before the nuclear industry internationally has another chance to be able to claim there is a government-sanctioned solution to the spent fuel problem. In that sense, it is a victory for opponents of the nuclear industry's waste management plans and opponents of nuclear power in general. The main battle however rages on. "No rest for the wicked," as the saying goes.

More information:

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Sweden: Nuclear Waste Fund deficits prompt government action

Author: Charly Hultén – WISE Sweden

NM855.4703

Nuclear Monitor last reported on the chronic deficit in the Swedish Nuclear Waste Fund in 2014 (NM #796; see also #751 and #736).

In the interval since 2014 interwoven streams of events – among regulatory agencies, in government policy, in the energy market – and the declining vigor of nuclear power companies have combined to arouse a great deal of uncertainty about the ability of the Waste Fund to cover costs. Notable among these events are:

- the newly-appointed chair of the Fund sounded an 'SOS' in June 2015.
- in 2015, two power companies announced plans to shut down a total of four reactors.
- in June 2016, the Minister of Energy managed to secure a multiparty Energy Agreement, which included lifting a tax on nuclear power capacity.
- in 2017, frustration with a lack of transparency regarding the cost estimates and prognoses offered by the industry-owned nuclear waste management company, SKB AB, reached new heights – not only among environmentalists (as usual), but in central institutions like the National Debt Office and the National Audit Office.

In June 2017 the government proposed changes in the law and statute governing financing of the management of Swedish nuclear waste; in December the proposals were approved in the Riksdag. Although the dust is still settling, we now have something to report.

The fund

The Nuclear Waste Fund was founded in 1982. The accumulated funds are intended to cover all aspects of Swedish nuclear waste management, from storage of fuel waste to dismantling of reactors and storage of their components. All R&D for proposed waste management processes, and public vetting of the proposals (still under way) are financed out of the Fund, as well.

The fundament in the scheme for financing waste disposal in Sweden is the so-called 'polluter pays' principle. That is, the cost of waste disposal as outlined above is to be covered by the industry that generates the waste. (That the fees are immediately passed on to end consumers is not considered a problem; instead, it is seen as an incitement to economize on the use of electricity, while stimulating the market for more efficient electrical devices.)

Today, some call the presumption that power companies should act in the public interest "naïve", but one should recall that the situation was quite different back in the 1980s, when the scheme was set up. Then, all nuclear power companies were Swedish-owned and had a substantial element of public sector ownership, i.e., national or local government held controlling interest. Today, two of the three companies, Fortum and Uniper (formerly E.On), are foreign-owned; all, even state-owned Vattenfall, operate for profit. 'Corporate interest' is a relatively new factor in the equation.

The fee

The chief sources of financing are two: a per-kWh fee on nuclear energy generation, and securities (collateral) that are required of reactor operators to cover shortfalls in fee revenue should "unplanned events" impact on the amount of power generated. Most criticism concerns the fees. Estimates of the status of the Fund (the influx of assets in relation to estimated costs) are revised at three-year intervals. They are based on recommendations presented to the Government by the Swedish Radiation Safety Authority (SSM), after consultation with the National Audit Office and the National Institute of Economic Research, a body within the Ministry of Finance.

For many years the fee remained stationary at SEK 0.01/kWh. Estimates presented in 2011 showed a sizeable deficit, however, and in 2012 the fee was raised to SEK 0.02, then raised again to SEK 0.04 in late 2014. The current proposal for 2018-2020 is an average fee of SEK 0.05/kWh. (Average, because some operators will also be paying for the reactors they have shut down ahead of schedule. The actual lifetimes for OKGs two ex-reactors are short of their expected lifetimes by 2.1 and 21.5 years, respectively, so the remaining OKG reactor will now be charged a fee of SEK 0.064/kWh in 2018-2020.)

Payments into the fund will continue as long as nuclear power is generated. Costs will continue to be generated long after nuclear power has ceased to be, which means that

total cost estimates, too, need to extend maybe another 40-50 years beyond the theoretical 40- to 50-year lifetime that applies to the reactors. Calculating the status of the Fund that far into the future is difficult.

Chronic and growing deficits

The reasons for the deficit are a mixture of politics, macroeconomics, finance and 'corporate interest'. Some examples:

- *Politics*: Politics plays in when the Government sets the sums to be paid. These have most often been lower than SSM had proposed. As the National Audit Office recently pointed out, government decisions have meant "tens of billions less than what the regulator, SSM, considered necessary". (A kind of fiscal corporate interest may also play a part in this; Vattenfall's profits go straight into the Treasury.)
- *Macroeconomics*: Electricity prices have been low in recent years, which affects the companies' ability to pay.
- *Finance*: Low interest rates have impacted the market value of bonds in the Fund.
- *Corporate interest*: To date, SKB AB's production predictions and prospective cost estimates supplied by the industry – the basis for the regulator's proposals – have missed the mark. Historical analysis reveals that power generation has consistently been overestimated, future costs underestimated.

But another key factor now on the table is a less than penetrating analysis that patently inaccurate estimates and predictions from the industry have been subjected to over the years. More on this below.

There are two prime consequences of underfinancing. One is obvious – there will not be enough money in the fund on the Day of Reckoning, leaving taxpayers to foot the bill. But, secondly, setting the fee too low means a *de facto* state subsidy to nuclear power as long as the reactors are online. University economists second Greenpeace and other non-governmental groups in pointing this out.

Awareness, diagnosis ...

Fears of shortfalls and accusations of "hidden subsidies" in the system have been voiced for well over a decade now, but the latest round started in mid-2013, when SSM and the National Debt Office were unable to agree on a joint recommendation about a revision of the law and statute governing the Nuclear Waste Fund. These included a recommendation to raise the fee. The separate recommendations that they submitted to the Government lay, seemingly unattended to, until December 2014, when the Government announced an 85% hike in the fee, from SEK 0.022/kWh to SEK 0.04. Even this rise was not enough, according to SSM's analyst: "If an estimate for the coming period were to be made today, the figure would land at just under SEK 0.06," he commented to the press.

Crisis awareness regarding the deficit spread to broader circles in mid-2015 when Dan Barr, newly appointed chairman of the Waste Fund, sounded the alarm in Sweden's leading business daily: The Fund is an estimated 11 billion Swedish crowns short (US\$1.34 billion; €1.12 billion); something has to be done about it! Mr Barr's call came amidst the decisions of two reactor owners to shut down two reactors each.

Estimates of the shortfall vary widely, from the SEK 11 billion Dan Barr points to and upwards. One main 'X factor' is the cost of dismantling reactors. SKB estimates the cost of dismantling and removal of Sweden's 12 reactors at SEK 23.7 billion. The estimate is significantly lower than estimates in other countries, and lowest in all of Europe. Furthermore, the costs will be incurred late in the overall process, decades into the future, which amplifies the uncertainty.

The only party that seems not to have recognized the seriousness of the situation is industry-owned SKB AB, who as late as 2016 declared the system to be "robust". Although a full-fledged 'blame game' was under way at the time, everyone else agreed that the nub of the problem lay in the quality of the data the company has provided over the years. Even SSM, known to be sympathetic to the

waste management project in most respects, complained of a lack of clarity surrounding SKB's estimates.

SKB has refused to reveal the models they use to arrive at their calculations, despite the regulator's requests. Access to the models is important. An example: SKB's cost estimates in 2013 were 57% higher than the figure they presented in 2007. Without knowing how the figures are arrived at, it is impossible to evaluate them or to make any well-founded assumptions about future cost trends.

SSM itself has come under fire for not vetting the industry's estimates more rigorously. Some point to the fact that by statute SSM has the power to force SKB to reveal their methods, but has chosen not to use it. Government agencies like the National Debt Office and the National Audit Office and academics point out that SSM lacks the auditing competence required to deal with the long-term and complex projections involved.

Another area where the regulator is seen to have favored the industry concerns the presumed reactor lifetimes, which form the basis for calculating payback rates. The law has stipulated a maximum reactor lifetime of 40 years; SKB AB uses 60 years as their base. SSM itself now uses 50 years. SSM has never accepted SKB's use of 60 years, but even though the authority has had the law and statutory muscle on its side, it has not persuaded the company to change its ways.

This practice is questioned by environmentalists and economists alike. Partly as a hidden subsidy, partly because of doubts that Swedish reactors will remain online that long. As Sweden's largest environmental organization summed up its concerns in 2014: "Stricter safety requirements may render new investments unprofitable, measures to remedy operational problems may prove unaffordable, or a new reactor accident somewhere may cause continued operation of Swedish reactors to be called into question."

Then, we have the documented record of Swedish governments, regardless of political hue, further whittling down the fee proposed by the Authority. Most recently, for the period 2018-2020, by 19% in relation to the Authority's draft proposal. This prompted Auditor General Ingvar Mattson to comment in a December 2017 media release: "The Government has on repeated occasions set nuclear waste fees and economic guarantees at levels that are tens of millions [SEK] less than the amounts the Radiation Safety Authority deemed necessary, and [our] analysis shows that the financing system in all probability is underfinanced."

Government 'beneficence' toward power companies arises out of a combination of the returns state-owned Vattenfall produces and external factors. Lessons from the Fukushima disaster have entailed costly improvements in reactor cooling facilities. Meanwhile, electricity prices fell sharply early in the period and are still low. Some alternative, renewable sources of electrical power are now producing at prices nuclear power companies cannot beat. Because of these (and other) factors, Sweden's nuclear park has shrunk by 40%. At the same time, maintaining a sufficient volume of nuclear production is key to maintaining the balance in the Nuclear Waste Fund. In short, politicians' fear of squeezing the industry too hard is perhaps understandable. Yet, the fact remains that unless the Fund is in balance, taxpayers will end up having to fill the gap.

One external factor not related to either energy production or energy policy, but which has eaten into Fund's solidity, is a decline in the market value of the Fund's assets. To date, the Fund has been authorized to invest in bonds and certain other guaranteed interest-bearing securities. Several institutions have pointed to the Fund's vulnerability to trends in the finance market as a weakness in the system that needs to be corrected.

... and therapy?

The Government has responded to the crisis by taking several drastic (by Swedish standards) measures.

In August 2017 the Government transferred primary responsibility for the financing of the Nuclear Waste Fund from the Swedish Radiation Safety Authority to the National Debt Office.

In October 2017, the Riksdag approved a government bill that amends the pertinent law and ordinances in the following respects:

- The reactor lifetime to be used as the basis for waste fee calculations is extended to 50 years, in line with SSM's recommendation.
- Rules for estimating costs and prospective fee payments to the Fund have been specified more closely with a view to increasing transparency, in line with advice from the National Debt Office, the National Audit Office and the National Institute of Economic Research.
- The Nuclear Waste Fund may invest up to 40% of its holdings in common stocks, a request of the Fund. The increased risk that this change implies will be compensated by raising the amount of securities required of reactor owners. (Professor Göran Finnveden, a former board member of the Fund, offers two suggestions in this regard: that the Fund's investments should be long-term, which, he says, would both yield higher returns and reduce the risk to the Treasury; and long-term investments made in "green bonds and similar securities" would have the added advantage of enhancing the sustainability of the Swedish economy, one of the stated aims of government policy.)

No one can say with any certainty that these changes will be enough.

Two issues remain outstanding.

First, a proposal to transfer the responsibility to pledge securities from the reactor owners to their parent companies is under consideration. (Nuclear operators in Sweden may be likened to 'shell companies' in the sense that they are provided with only enough capital to keep their reactors in working order; profits are passed on to the parent company.) The Government has said it will present its conclusions in Spring 2018.

A second outstanding issue is the need for a comparative study of the costs of decommissioning reactors performed by a third party, i.e., a body that stands free of the waste management company and reactor owners; this issue is at least on the table.

For decades, the nuclear establishment was a Swedish 'holy cow' and, as such, was not subjected to incisive scrutiny. Not so today. The debate on the deficit in the Nuclear Waste Fund these past two years cuts sharper and deeper than ever before.

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Looking back, looking forward: Nuclear Monitor #1 – May 1978

Author: Jim Green – Nuclear Monitor editor

NM855.4704

Nuclear Monitor and the two organizations that produce it – the Amsterdam-based World Information Service on Energy (WISE) and the US-based Nuclear Information & Resource Service (NIRS) – are all celebrating our 40th birthday this year.

Over the course of the year we'll be looking back at early issues of the Monitor. On the European side, it was known as the WISE News Communiqué until WISE and NIRS joined forces to produce the Monitor in the year 2000. Early NIRS publications included Groundswell and the Nuclear Monitor (see box).

The very first issue of the WISE News Communiqué (actually it was called the WISE newspaper) was produced in May 1978. It was published in English, French and German (then as now, we couldn't decide whether to use English English or American English). Design and printing technology was pretty basic. Communication technology was pretty basic in general – apart from snail-mail and phones, the WISE network communicated via 'telex' machines, precursors to fax machines.

Sales of merchandise with the Smiling Sun emblem part-funded some of the early work of WISE including the establishment of the WISE newspaper. Issue #1 talks about the origins (in 1975) of the Smiling Sun logo. Issue #1 also discusses the origins of WISE and the founding meeting in Amsterdam in February 1978, attended by around 200 people.

The 'Declaration of Intent' in issue #1 begins: "Opposition to nuclear energy is becoming a world-wide trans-national movement. It is the most advanced manifestation so far of a broad movement of opinion against a technocratic, centralised, authoritarian, undemocratic form of society." It goes on to note that the forces driving the nuclear industry operate at an international level

and it "is therefore high time for the movement to organise a flow of information and experience that can enable its action to be more effective and better coordinated."

The front cover has a photo of a protest at the Seabrook nuclear plant in the US state of New Hampshire. Construction of Seabrook fell 10 years behind schedule, and the cost (US\$7 billion) bankrupted Seabrook's major utility owner, the Public Service Company of New Hampshire. Public opposition and protests delayed construction and drove up the cost.

Issue #1 has an article on plans for the fourth occupation of the Seabrook site, scheduled for June 1978. Protesters planned to occupy the site, plant gardens, and set up safe alternative energy exhibits ... but none of that meant the attempted occupation "would be a garden party". An earlier (April 1977) occupation involved about 2,500 protesters – over 1,400 were arrested and many were locked up for two weeks after refusing to pay fines. Their bravery and defiance "sparked the organization of similar direct action alliances around the United States".

The second of the two Westinghouse reactors proposed for Seabrook was canceled in 1978 when 22% complete – echoes of the 2017 cancellation of two partially-built Westinghouse reactors in South Carolina.

The front cover of issue #1 also has a photo of an anti-uranium protest organized by the Movement Against Uranium Mining in Australia. The Australian government was negotiating uranium sales with the Shah of Iran – a year before the revolution that deposed him.

Issue #1 also has a cover photo of the Tihange nuclear plant in Belgium, as well as an article on a January 1978 reactor scram at Tihange and a valve failure that led to 80 people

being exposed to iodine-131. Tihange would return to the pages of *Nuclear Monitor* many times over the years – last year alone, we reported on the 50,000-strong 'human chain' protest in Germany, the Netherlands and Belgium demanding the closure of Tihange 2 and Doel 3 (NM #846); the decision of the German city of Aachen to start issuing free iodine tablets to half a million people because of the risks posed by the Tihange plant (NM #850); and a report about a protest against the German government's willingness to allow the Lingen nuclear fuel plant in Germany to supply Tihange even as the German government calls for the closure of Tihange (NM #848).

Promoting 'soft' or 'safe' energy (renewables) was an important part of the movement's activities, as reflected in the WISE newspaper, and the movement self-described as an 'anti-nuclear and safe energy movement'. Up to 35 million US citizens were expected to take part in the pro-solar 'Sun Day' in May 1978, along with people in many other countries.

Mass actions

The late 1970s was a period of mass anti-nuclear action, with countless actions, plans and proposals discussed in the WISE newspaper. A protest in the Netherlands (with a great deal of support from German campaigners) against a Urenco enrichment plant attracted around 50,000 people. (The design blueprints from Urenco's enrichment plant in the Netherlands were stolen by the notorious Pakistani proliferator A.Q. Khan. This was not public knowledge at the time but the proliferation risks associated with enrichment are discussed in issue #1.) The WISE newspaper mentions the 'deal of the century' – Germany's plans to provide Brazil with reactors along with enrichment

and reprocessing technology, despite Brazil's obvious interest in pursuing nuclear weapons.

Over 150,000 people – “probably a record for single anti-nuke demo” – protested on 12 March 1978 against a nuclear power plant under construction at Lemonz, Basque country, northern Spain. Five days later, the militant Basque independence movement ETA claimed responsibility for a dynamite explosion that damaged the plant. “Because the authorities ignored precise advance warnings about the explosion,” an article in issue #1 states, “two workers were killed and several wounded.” A protester was shot during a December 1977 demonstration; a protester was killed in 1979; ETA planted a bomb inside the plant in 1979, killing one worker; in 1981, ETA kidnapped the chief engineer of the Lemonz plant and later killed him; and in 1983, construction of the Lemonz plant was abandoned after a change of government.

Issue #1 discusses plans for a mass anti-nuclear rally in Torness, Scotland on 6–7 May 1978, and a ‘no nukes week’ across Britain with numerous demonstrations including one against reprocessing at Windscale (Sellafield). The planned actions would be “the first massive citizen action against an atomic power plant in the country which was the first to build them”. Reprocessing and fast breeder reactors seem to have stirred public sentiment against the industry. According to Wikipedia, the May 6–7 protest at Torness involved 4,000 people marching from Dunbar to occupy the Torness site. Many signed a declaration to “take all nonviolent steps necessary to prevent the construction of a nuclear power station at Torness” ... but the plant was completed a decade later.

Issue #1 reports on a successful legal action against the Zwentendorf nuclear power plant in Austria. The plant was completed but never operated due to a national referendum in November 1978 which narrowly supported a resolution to stop Zwentendorf as well as the construction of two other nuclear plants. The Zwentendorf site is now used for various activities such as festivals.

Issue #1 reports on the Irish government's decision to build a nuclear power plant at Carnsore

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World Information Service on Energy



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Point in County Wexford, and notes that “an opposition front is already forming”. Opposition prevailed and the plant was never built.

In Switzerland, over 500 people took part in a hunger strike over the Easter period, 1978. The fast gave anti-nuclear campaigners “a chance to discuss basic issues, like the role of women in the movement, defence against repression and to plan future action”. On 1 April 1978, Swiss anti-nuclear groups met at Kaisersaugg to celebrate the third anniversary of the day they brought work on a reactor to a stop by occupying the site.

In July 1977, 60,000 people protested at Creys-Malville in France against the Super-Phenix fast breeder reactor. One protester was killed by police and two were “seriously mutilated”. By May 1978, morale amongst campaigners was low after

two years of intense campaigning. The WISE newspaper reported: “The local population are largely resigned to the plant's being built, or have a material interest in it. Those who say they are against are not prepared to act. The systematic police intimidation – house searches, police at all meetings, personal check-ups – has scared off lukewarm opponents. Faced with the French government's tough treatment of peaceful protest, there is a growing mood of violence among militant opponents.”

Nonetheless, local campaigners were planning an action at the Super-Phenix reactor site in mid-1978 and a Europe-wide week of solidarity action. The reactor operated intermittently from December 1986 to December 1996 – the first commercial fast reactor was a massive flop and a massive waste of money.

Issue #1 reports on R&D into a gas-cooled, thorium-fueled, high-temperature reactor with “bullet-shaped fuel elements”. Researchers had been working on the concept for a decade already, and they considered sodium-cooled breeders such as Super-Phenix to be an “out-of-date concept”. Forty years later, proponents of new reactor types are still promising much, delivering little, and slugging off at competing new-reactor concepts.

Issue #1 has an article on state repression of the anti-nuclear movement. In Australia, the planned Environment Protection (Nuclear Codes) Act would give the federal government power to fine anti-uranium activists or unionists up to A\$50,000 for breaching regulations, or to jail them for up to five years. In Germany, Gerd Schulz was given a 22-month jail sentence for his participation in an anti-nuclear occupation – he was one of 15,000 protesters who tried to occupy the Grohnde reactor site on 19 March 1977. Schulz was one of 14 protesters arbitrarily chosen for arrest and one of 11 finally brought to trial.

In the UK, a debate was unfolding over the restrictions on civil liberties that would be necessary to control terrorism if the country moved towards a ‘plutonium economy’ based on reprocessing and fast reactors. The WISE newspaper noted: “Britain’s Atomic Energy Constabulary, 400 strong, carry arms at all times, and have far-reaching powers of pursuit, entry, and arrest on suspicion, granted in 1976.”

Uranium

An article in issue #1 talks about many protests in Australia, including a national Stop Uranium Action Day that around 25,000 people participated in. Australian campaigners and unionists tried, sometimes successfully, to stop uranium being shipped out of the country.

The 8-member WISE Council (elected at the founding meeting in February 1978) decided to prioritize the struggle against uranium mining. As WISE explained in issue #1:

- uranium mining is vital to the nuclear industry;
- it is organised world-wide, and run by the multinationals; because of the military and economic implications, the governments work with them;
- the opposition is geographically dispersed: mining is going on or planned world-wide ...;
- in Australia, the trade unions are playing a leading role in the struggle; they will need the support of unions (especially dock-workers) the world over, if boycotts are to be successful.

Issue #1 had an article on unions and the nuclear industry, which began: “In several countries workers have started questioning the energy-growth jobs link. They are beginning to realize that they are effectively terrorized by governments and energy monopolies with threats of mass unemployment unless atomic plants get built. The nuclear lobby

may find this sort of blackmail less and less effective in the future. In some cases, links are starting to be established between the trade unions and the environmental and antinuke movement (previously regarded with suspicion), in an effort to find out the real relationship of energy to jobs.”

Reprocessing and waste management

A report to the US government by a nuclear waste management task-force noted that the earliest date for an operating permanent high-level waste repository had been pushed back from 1980 to 1985 (!). The task-force was “reasonably certain” that a repository could be established between 1988 and 1993.

The Swedish anti-nuclear movement was planning a critical experts’ conference on nuclear waste management to be held in June 1978 to discuss issues such as reprocessing, glassification, plutonium control, intermediate storage and storage in bedrock. The Swedish government had made further nuclear development contingent upon a satisfactory solution to waste management and storage, and decisions were looming as two applications to run nuclear power plants had been submitted. An Anti-Nuclear Parade was also being organized in Stockholm, as well as an activists’ camp after the parade.

Issue #1 has long articles on reprocessing – the state of play, divided opinions among nuclear nations (with the US opposing reprocessing after

the debacle of India's Smiling Buddha 'peaceful nuclear explosion' in 1974), the connections between reprocessing and fast-breeder fantasies, the weapons proliferation risks, and so on. The WISE newspaper reported: "The German authorities cleverly call re-processing Entsorgung (literally, removing worries!) and the planned Gorleben complex, with re-processing, intermediate waste storage and "final" waste disposal underground, a "worry removal area" (Entsorgungspark)!"

France, Britain and the German Federal Republic, according to issue #1, argued "that proliferation will happen anyway, so why should they accept empty sacrifices for the sake of Jimmy Carter's Puritan conscience."

A WISE commentary in issue #1 concluded: "Re-processing and waste disposal are the weakest link in the atomic establishment's defences. Dangerous waste is piling up (100 tonnes a month in the US alone), and it has to be either re-processed (which produces more waste anyway, plus stock-piles of plutonium!) or disposed of. There is no third possibility. And as a report to the Californian government has just rammed home, in neither case are the techniques ready, or even within sight of being ready. Ordinary citizens may still be sceptical about the dangers from atomic reactors (at least until one is planned where they live!), but there is a widespread fear

both of nuclear waste (one word the technocrats forgot to neutralize!) and of plutonium. Not only the coming demos against re-processing, but this year's world-wide mobilisation against the nuclear danger, will help bring home the facts. For the foreseeable future, we face a world-wide build-up of dangerous waste. To get us to accept this, we are being offered a "choice" between theoretically safe disposal, and "re-processing" that will usher in the plutonium era."

Nuclear Monitor (WISE newspaper) #1, May 1978, is online as a PDF at: www.wiseinternational.org/nuclear-monitor/1/1-may-1978

Early NIRS publications

The late Michael Mariotte's 31+ year tenure at the Nuclear Information & Resource Service (NIRS) was characterized by dedicated writing. He joined NIRS in February 1985 to write and edit Groundswell, the NIRS publication for the grassroots anti-nuclear movement which provided in-depth reporting and analysis.

NIRS had already established itself as the go-to source for information on reactor operations and capacity factors, which were calculated weekly by staff and published twice a month in The Nuclear Monitor. Prior to the internet, this publication was the only readily available source of good facts

on nuclear energy performance, and lack thereof, for the financial and policy worlds.

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

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