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Monitored this issue:

Paladin Energy puts second African uranium mine into care-and-maintenance

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Western Australia-based uranium mining company Paladin Energy announced on May 25 that it is winding down operations at the Langer Heinrich mine (LHM) in Namibia and placing it into care-and-maintenance.[1]

Perhaps the most striking aspect of the decision to mothball LHM is that Paladin claims it is the lowest cost open-pit uranium mine in the world.[2] Moreover, the company wasn't even paying to mine ore – mining ceased in November 2016 and since then medium-grade ore stockpiles have been processed.[3] Alex Molyneux describes LHM as "world-class"[2] … so evidently a low-cost, "world-class" mine can't even turn a profit processing mined stockpiles.

The cost of production was US$23.11/lb U3O8 in December 2017, and the average realized sale price in the second half of 2017 was $21.82.[4]

Paladin was faced with a choice between continuing to process medium-grade ore stockpiles (which would be exhausted in mid-2019) then shifting to low-grade stockpiles, resuming mining, or putting the mine into care-and-maintenance.

Anticipating the decision to mothball LHM, Paladin Energy CEO Alex Molyneux said in late-April: "The uranium market has failed to recover since the Fukushima incident in 2011, with the average spot price so far in 2018 the lowest in 15 years. It's deeply distressing to have to consider suspending operations at LHM because of the consequences for our employees, and the broader community. However, as there has yet to be a sustainable recovery in the uranium market, and with the aim of preserving maximum long-term value for all stakeholders, it is clearly prudent to consider these difficult actions."[5]

Paladin hopes to resume mining at LHM following "normalization" of the uranium market, which it anticipates in the next few years.[2] But with no operating mines, Paladin may not survive for long enough to witness a market upswing. The only other mine operated by Paladin – the Kayelekera uranium mine in Malawi – was put into care-and-maintenance in July 2014.[6] Paladin also owns a number of projects it describes as 'nonproducing assets', such as uranium projects in Australian states that ban uranium mining.

Paladin was placed into the hands of administrators in July 2017 as it was unable to pay EDF a US$277 million debt.[6] In January 2018, Paladin's administrator KPMG noted that an Independent Expert's Report found that the company's net debt materially exceeds the value of its assets, its shares have nil value, and if Paladin was placed into liquidation there would be no return to shareholders.[7] The company was restructured, with Deutsche Bank now the largest shareholder, and relisted on the Australian Securities Exchange in February 2018.[2]

Perhaps LHM will be sold for a song, either before or after Paladin goes bankrupt. A subsidiary of China National Nuclear Corporation (CNNC) has held a 25% stake in LHM since January 2014. Last year, the CNNC subsidiary considered exercising its contractual right to buy Paladin's 75% stake in LHM, but chose not to exercise that right following an independent valuation of US$162 million for Paladin's stake.[8]

Mine-site rehabilitation

Paladin hopes to restart both LHM and Kayelekera. But in 2016, Paladin's CEO Alexander Molyneux said that "it has never been a worse time for uranium miners"[9] and the situation has not improved since then – uranium prices have fallen further still, and the long-term contract price recently fell below US$30/lb for the first time since May 2005.[10]

Sooner or later, both the LHM and Kayelekera mine-sites will need to be rehabilitated. Yet it is extremely doubtful whether Paladin has set aside adequate funds for rehabilitation. Paladin's 2017 Annual Report lists a 'rehabilitation provision' of US$86.93 million to cover both LHM and Kayelekera.[11]

One problem is that the funds might not be available for rehabilitation if Paladin goes bankrupt. A second problem is that even if the funds are available, they are unlikely to be sufficient. For comparison, Energy Resources of Australia's provision for rehabilitation of the Ranger uranium mine in Australia – also an open-pit uranium mine – is US$403 million (A$526 million).[12] That figure is understood to be additional to US$346 million (A$452 million) already spent on water and rehabilitation activities

Uranium production at Paladin Energy's uranium mines in Africa (tonnes uranium):

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Langer Heinrich	919	1108	1419	1437	1960	2098	1947	1937	1893	1308	16,026
Kayelekera	–	104	670	846	1101	1132	369	–	–	–	4,222
Combined % world production	2.1%	2.4%	3.9%	4.3%	5.2%	5.4%	4.1%	3.2%	3.1%	2.2%*	

Source: Data compiled by World Nuclear Association data, www.world-nuclear.org

** Based on estimated world production of 60,000 tU.*

Paladin's Langer Heinrich uranium mine in Namibia.

since 2012[13] – thus total rehabilitation costs could amount to US$749 million (A$978 million) … and the current cost estimates could easily increase as they have in the past.

Rehabilitation of LHM and Kayelekera could be cheaper than rehabilitation of Ranger for several reasons, such as the relative size of the mine-sites. However it stretches credulity to believe that the cost of rehabilitating both LHM and Kayelekera would be an order of magnitude lower than the cost of rehabilitating one mine in Australia.

Paladin was required to lodge a US$10 million Environmental Performance Bond with Malawian banks and presumably that money can be tapped to rehabilitate Kayelekera.[14] But US$10 million won't scratch the surface. According to a Malawian NGO, the Kayelekera rehabilitation cost is estimated at US$100 million.[15]

Paladin has ignored repeated requests to provide information on the estimated cost of rehabilitating Kayelekera, but the figure will be multiples of the US$10 million bond and it is extremely unlikely that Paladin's provision of US$86.93 million for the rehabilitation of both LHM and Kayelekera is adequate.

If Paladin goes bankrupt, it seems likely that most of the costs associated with the rehabilitation of LHM and Kayelekera will be borne by the Namibian and Malawian governments (with a small fraction of the cost for Kayelekera coming from the bond) – or the mine-sites will not be rehabilitated at all. Even if Paladin is able to honor its US$86.93 million provision, additional costs necessary for rehabilitation will likely come from the Malawian and Namibian governments, or rehabilitation will be sub-standard.

Australia's responsibility

The problem of inadequate provisioning for rehabilitation is most acute for Kayelekera – it is a smaller deposit than LHM and more expensive to mine (Paladin has said that a uranium price of about US$75 per pound would be required for Kayelekera to become economically viable[16]). Thus the prospects for a restart of Kayelekera (and the accumulation of funds for rehabilitation) are especially grim.

Is it reasonable for Australia, a relatively wealthy country, to leave it to the overstretched, under-resourced government of an impoverished nation to clean up the mess left behind by an Australian mining company? Malawi is one of the poorest countries in the world.[17] According to a 2013 U.N. report, more than half of the population live below the poverty line.[17]

Australia's Foreign Minister Julie Bishop should intervene to sort out the situation at Kayelekera and to prevent a repetition of this looming fiasco. The conservative Minister's eyes might glaze over in response to a moral argument about the importance of Australia being a good global citizen. But there is also a hard-headed commercial argument for intervention to ensure that the Kayelekera mine-site is rehabilitated.

It does Australian companies investing in mining ventures abroad no good whatsoever to leave Kayelekera unrehabilitated, a permanent reminder of the untrustworthiness and unfulfilled promises of an Australian miner and the indifference of the Australian government. Australia is set to become the biggest international miner on the African continent according to the Australia-Africa Minerals & Energy Group.[18] But Australian companies can't expect to be welcomed if problems such as Kayelekera remain resolved.

Broader problems

Paladin exploited Malawi's poverty to secure numerous reductions and exemptions from payments normally required by foreign investors. United Nations' Special Rapporteur Olivier De Schutter noted in a 2013 report that "revenue losses from special incentives given to Australian mining company Paladin Energy, which manages the Kayelekera uranium mine, are estimated to amount to at least US$205 million (MWK 67 billion) and could be up to US$281 million (MWK 92 billion) over the 13-year lifespan of the mine."[17]

Paladin's environmental and social record has also been the source of ongoing controversy and the subject of numerous critical reports.[19] The WISE-Uranium website has a 'Hall of Infamy' page dedicated to the company.[20]

Standards at Kayelekera fall a long way short of Australian standards – and efforts to force Australian mining companies to meet Australian standards when operating abroad have been strongly resisted. Paladin's Kayelekera project would not be approved in Australia due to major flaws in the assessment and design proposals, independent consultants concluded.[21] The consultants' report covered baseline environmental studies, tailings management, water management, rehabilitation, failure to commit to respecting domestic laws, use of intimidation and threatening tactics against local civil society, improper community consultation and payments to local leaders, and destruction of cultural heritage.

Sadly, these are familiar problems. Julie Bishop told the Africa Down Under mining conference in Western Australia in September 2017 that many Australian mining projects in Africa are outposts of good governance.[18] The Australian government "encourages the people of Africa to see us as an open-cut mine for lessons-learned, for skills, for innovation and, I would like to think, inspiration," Bishop said.[18]

Such claims sit uneasily with the highly critical findings arising from a detailed investigation by the International Consortium of Independent Journalists (ICIJ).[22] The ICIJ noted in its 2015 report that since 2004, more than 380 people have died in mining accidents or in off-site skirmishes connected to Australian mining companies in Africa.[23] There have been six deaths at Kayelekera[19] and at least one death at LHM.[24]

The ICIJ report further stated: "Multiple Australian mining companies are accused of negligence, unfair dismissal, violence and environmental law-breaking across Africa, according to legal filings and community petitions gathered from South Africa, Botswana, Tanzania, Zambia, Madagascar, Malawi, Mali, Cote d'Ivoire, Senegal and Ghana."[23]

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Berkeley Energia uranium mining project in Spain – the EU's only new uranium mine?

Author: Richard Harkinson – research associate, London Mining Network

NM862.4727

Since early 2017, the mayor of Villavieja de Yeltes municipality in Salamanca, north-west Spain, has been instrumental in calling Australian-incorporated Berkeley Energia (formerly Berkeley Resources) to account and in calling local residents and people from neighbouring towns to monthly rallies against the company's proposed Retortillo uranium project.[1]

Retortillo is planned as an open-cast uranium mine, heap leaching and processing or 'milling' plant, said to be ready to begin production in late 2018 but lacking necessary permits and facing four public interest litigation suits from the municipality and from national non-governmental organisations.

The project has sparked a wave of opposition arising from concerns about potential impacts on the environment and local people. These risks include its location very near a school area, possible impacts on a protected ecological zone, and its permit to discharge waste-water five kilometres upstream of established drinking water extraction sites for Villavieja de Yeltes. The water discharge permit contradicts a European Commission-funded regional five-river biodiversity project because it has transboundary significance.[2,3] Close to 40 municipalities are opposed to the company's plan to develop the Retortillo project, which has potential impacts on the existing economy including spa tourism facilities.

Berkeley has renamed itself, changed some of its personnel, reduced its website information, changed its AIM nominated adviser (the AIM is a sub-market of the London Stock Exchange), and negotiated a potential 'take-off' contract with a commodity trader, which has 'phoenixed' itself; that is, one small company was liquidated and replaced by another (InterAlloys to Curzon Resources) run by the same individual. This has allowed Berkeley to raise capital, because it has obtained the support of Euratom to develop the European Union's only open-cast uranium mine.

European Commission involvement will not help provide sufficient environmental information in a timely manner to assist public participation in decision-making.[4] With the need for more transparency, the continued involvement of former Spanish state officials Cañete and Lamela creates at best unfavourable impressions.[5] While the Commission in its 2012 report on former uranium mining sites in Spain, some of which are under reclamation, had been informative about applicable costs, methods and requirements for treating toxic waste, it did however raise questions about the relationships between Berkeley and state uranium mining agency ENUSA.[6]

Potential radiation impacts are being identified by the growing social movement, who argue that the EIA process omitted consideration of ore processing. It is clear that a number of human rights are being abused or put at risk including the right to information[7], the right to health[8], the right to livelihood and an adequate standard of living[9], and the right to a safe and healthy natural environment.[10]

What the company says[11]

Berkeley Energia claims on its website to have developed 'a good neighbour and business partner relationship with the local community' and to have local and regional support and major community investment and environmental rehabilitation plans for the project area. The website makes no mention of community opposition, health risks from uranium or other potentially negative social or environmental impacts, apart from initial felling of trees.

Berkeley's 2017 Annual Report cites 'highly supportive' local municipalities and sizeable community investments to date, and commits Berkeley to improve the ecological and agricultural value of the area through a reforestation programme. There is no mention of environmental risks from, or public concerns about, uranium. The Annual Report notes in passing that 'various appeals' against the necessary licences have been unsuccessful. It is quoted on *Mining.com* as emphasizing the mine's job creation potential, adherence to 'the highest EU environmental and safety standards' and 'overwhelming support' from local and regional communities.

Berkeley is reported in the press as signing an agreement that 'will provide construction capital' with the Oman Sovereign Wealth Fund, an institution that has been evaluated as having a transparency rating of 4 out of 10.[12]

In 2016, Berkeley published a 'definitive feasibility study' on its website. As the International Atomic Energy Agency

Protest against the proposed Retortillo uranium mine. 'Out with the mine. We want field with oaks'

(IAEA) has stated, however, the best approach advised by the UN is to evaluate the full, clearly disaggregated costs of 'economic and social viability'.[13] Berkeley has not done this.

Listing on the London Stock Exchange

Berkeley Energia announced on May 2 its intention to delist from AIM and instead list on the full London Stock Exchange[14] and that it intends to seek investment only from institutions. It also said it plans to list on the Spanish Stock Exchange or bolsa.

In the UK, NGO London Mining Network wrote to the London Stock Exchange, a private company and regulator the Financial Conduct Authority, arguing that the listing should be frozen because of Berkeley's wrongful claims of strong community support and that challenges to its regional permits have failed.[15] In Spain, the Stop Uranio campaign protested to the bolsa and financial regulator, which avoided decision-making in deference to the London Stock Exchange.

The UK agencies declined to respond, and decided to accord full listing to Berkeley. In Spain a corruption crisis has engulfed the ruling Partida Popular[16] and the expected political upheaval is taking place with a new left coalition coming to power. The upheaval has contributed to the bolsa delaying Berkeley's listing[17], ostensibly on the basis of the incompleteness of its prospectus.

Existing parliamentary moves[18] to freeze the Retortillo project by congress committee members in Unidos-Podemos, now the main coalition partner in the new PSOE government led by President Pedro Sánchez, may well have changed the mine's prospects. Also, the Ombudsman has declared that Berkeley failed to give information about its water discharge permit[19], and again coalition partner Unidos-Podemos is seeking to block the permit, demanding transparency. June in Spain will be a busy month!

Berkeley hopes to attract German and Polish institutional investors, and the UK exchange's lack of insistence on rigorous risk assessments may mean that the project's risks are hidden. The UK has inadequately implemented the post financial crash 2013 Directive 34/EU on company reporting, so most mining companies like Berkeley avoid necessary non-financial reporting. The prospects for the project depend on political[20] *and* legal developments in Spain.

This article was originally written for London Mining Network's forthcoming report "AIM-traded mining companies and human rights", lead author Miles Litvinoff.

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Closure plan for Ranger U mine in Australia's tropical Top End

Author: Dave Sweeney – nuclear-free campaigner, Australian Conservation Foundation

NM862.4728

Traditional Aboriginal owners and civil society groups have welcomed the public release of a detailed Mine Closure Plan for the controversial Ranger uranium mine in the Kakadu World Heritage region of Australia's Northern Territory.

The Mine Closure Plan was released on June 5, World Environment Day – exactly 21 years since Traditional Owners positioned a massive banner on the Kakadu escarpment opposing the planned uranium mine at Jabiluka.

The plan to mine Jabiluka was defeated, and now the nearby Ranger mine is winding down. The Ranger mine, operated by Energy Resources of Australia (ERA) – a Rio Tinto subsidiary – has ceased mining uranium and is now processing stockpiled ore prior to a mandated end of operations in 2021.

The rehabilitation of the site has been a focus for Aboriginal landowners and environment groups in recent years with sustained advocacy highlighting Rio Tinto's responsibility and calling for increased transparency and effective action. The release of the Mine Closure Plan follows recent calls by civil society groups at Rio Tinto meetings in Darwin, London and Melbourne and marks a significant step towards to end of the uranium mining story in Kakadu.

Gundjeihmi Aboriginal Corporation, which represents the Mirarr Traditional Owners of the Ranger site, described the plan as 'decades overdue' and called on Rio Tinto to demonstrate they have sufficient resources to provide confidence that they can meet their rehabilitation obligations. A joint statement by the Gundjeihmi Aboriginal Corporation and the Northern Land Council said: "ERA and its parent company Rio Tinto must clearly demonstrate that they have sufficient resources devoted to mine closure to provide stakeholders with confidence that the objectives outlined in the closure plan can be met. The future of Aboriginal communities downstream of the mine and the World Heritage listed values of Australia's largest national park are at stake. ERA and Rio Tinto's rehabilitation obligations include remediation of the site such that it can be incorporated in the surrounding Kakadu National Park."

Concerns have been raised about the lack of formal feedback opportunities on the plan. Environment and other civil society groups joined Traditional Owners in calling for the need for the broader community to comment on the plan and the proposed clean-up works.

Environment groups are independently reviewing the plan to ensure it is fit for purpose and delivers the best possible rehabilitation outcomes. The Environmental Defenders Office has been engaged by the Australian Conservation Foundation and the Environment Centre Northern Territory to provide legal expertise and advice. Principal Lawyer of the Environmental Defenders Office Northern Territory, Gillian Duggin, said: "It's a unique site surrounded on all sides by the World Heritage listed Kakadu National Park. It's also of incredible cultural significance. So getting the rehabilitation right is critically important and will be a complex and time-consuming exercise."

Cleaning up the heavily impacted mine site after three decades of operation is set to be a complicated and costly process with estimates ranging around one billion Australian dollars (€650 million). The complexity is compounded by the properties of the product and the politics of the place. Large volumes of long lived radioactive mine tailings need to be contained for a period of 'not less than 10,000 years' while the Ranger site is located inside Kakadu, Australia's largest national park and World Heritage listed for both its natural and cultural value. The Ranger rehabilitation must be performed to a standard where the affected area can be accepted into the World Heritage region.

This is a very high bar and, as the Traditional Owners recently told Rio Tinto, 'the world is watching'.

The Mine Closure Plan is posted at www.energyres.com.au/sustainability/ClosurePlan

Ranger uranium mine. Photo by Dominic O›Brien.

REN21 Renewables 2018 Global Status Report

NM862.4729

REN21 – a large coalition of industry associations, international organizations, NGOs, 10 national governments, and scientists and academics – has released the *Renewables 2018 Global Status Report*.[1]

It was another record year with 178 gigawatts (GW) of renewable power generation capacity added in 2017. Non-hydro renewable capacity (1,081 GW) passed 1,000 GW for the first time and should overtake hydro capacity (1,114 GW) in 2018. Of the 178 GW added in 2017, 159 GW was non-hydro renewables and 19 GW hydro.

Year	Global Renewable Electricity Capacity (GW)	Annual Growth (GW)
2007	989	
2008	1,058	69
2009	1,133	75
2010	1,223	90
2011	1,326	103
2012	1,444	118
2013	1,563	119
2014	1,690	127
2015	1,845	155
2016	2,006	161
2017	2,195	178

Renewables accounted for 70% of net additions to global power generating capacity in 2017, the largest percentage in modern history.

Solar PV capacity was up 29% relative to 2016, with a record 98 GW added. More solar PV generating capacity was added to the electricity system than net capacity additions of coal, natural gas and nuclear power combined. Wind power also drove the uptake of renewables with 52 GW added globally.

Renewables accounted for 26.5% of total global electricity generation in 2017 (up from 24.5% a year earlier), comprising hydro 16.4%, wind 5.6%, bio-power 2.2%, solar PV 1.9%, and 0.4% combined for ocean power, concentrated solar, and geothermal. Nuclear power accounted for 10.5% of global electricity generation in 2016[2] and probably a little less in 2017. Thus renewables generate 2.5 times more electricity than nuclear power. Renewable capacity (2,195 GW) is 5.5 times greater than nuclear capacity (395 GW including idled reactors in Japan).

The renewable energy sector employed, directly and indirectly, approximately 10.3 million people in 2017.

Investment in new renewable power capacity was more than twice that of new fossil fuel and nuclear power capacity combined. More than two-thirds of investments in power generation were in renewables in 2017, thanks to their increasing cost-competitiveness – and the share of renewables in the power sector is expected to continue to rise.

Broader energy sector

While the growth in renewable electricity continues the transformation of the electricity sector, REN21 says it is concerned by the lack of change in transport, cooling and heating, which means the world is lagging behind its Paris climate goals.

“We may be racing down the pathway towards a 100 percent renewable electricity future but when it comes to heating, cooling and transport, we are coasting along as if we had all the time in the world. Sadly, we don’t,” said Randa Adib, executive secretary of REN21.

The REN21 report said of particular concern was that global energy demand and energy-related CO2 emissions rose for the first time in four years in 2017, by 2.1% and 1.4% respectively.

The contributions of different energy sources to total final energy demand in 2017 were: fossil fuels 79.5%, modern renewables 10.4%, traditional biomass 7.8%, and nuclear 2.2%.

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Reactor-grade plutonium and nuclear weapons: exploding the myths

NM862.4730

Many *Nuclear Monitor* readers will have heard the argument before: reactor-grade plutonium (RGPu) produced in the normal course of operation of a reactor cannot be used for weapons production and thus claims about the connections between peaceful and military nuclear programs amount to anti-nuclear scuttlebutt.

The premise is false − RGPu can be used in weapons, and has been used in weapons – and in any case the connections between peaceful and military nuclear programs are manifold.

The debate over the weapons-usability of RGPu has been going on for decades and has been covered in *Nuclear Monitor* (e.g. #787, 6 June 2014). It has essentially been solved: there is no doubt that RGPu can be used in weapons – yet some nuclear industry insiders and lobbyists persist with the fiction that it cannot.

Gregory S. Jones has written a 170-page on the book on the topic, published by the Nonproliferation Policy Education Center and available online at no cost. Jones is a defense policy analyst with 44 years experience. He was part of the research team whose findings prompted the US government in 1976 to reveal, for the first time, the weapons-usability of RGPu.

Jones' book ought to be the last word on the matter; but of course the nuclear lobby will keep lying. For example, Jones' detective work proved beyond any reasonable doubt that a much-debated 1962 US weapon test did indeed use RGPu. That research was published in 2013 yet it has been largely ignored and many still claim the 1962 test used weapon-grade or fuel-grade plutonium.

Likewise, one prominent advocate of the nuclear industry's line of argument claims that a British weapon test in South Australia in 1953 used RGPu and it must have been unsuccessful (or at least underwhelming) since the UK subsequently used weapon grade plutonium in its bombs. But in fact there is compelling evidence that weapon grade plutonium was used in the 1953 test.

The book covers the technical debates in detail, and Jones explains the issues in simple terms. Take for example the most glaringly stupid aspect of the pro-nuclear position – even if we accepted the fiction that RGPu cannot be used in weapons, reactors can nonetheless produce weapon-grade or near-weapon-grade plutonium simply by shortening the irradiation time. Jones writes:

"In late 2012, Iran abruptly discharged all of the fuel from its Bushehr PWR. After some months the fuel was reinserted, but the reason for this discharge was never explained. As I have written elsewhere, Iran (or any country with a LWR) has the option of producing near weapon-grade plutonium by simply discharging the fuel in the outermost part of the reactor core after just one irradiation cycle instead of the normal three. The country could cite safety concerns as the reason for the early discharge. Since countries such as Iran plan to produce their own reactor fuel, it would not be hard for them to deliberately introduce flaws into the fuel that they produce so that early discharge would be required.

"It is sometimes said that to use a power reactor in this manner would be uneconomical but there is no prohibition against operating a nuclear power reactor in an uneconomical fashion. After all, it is universally acknowledged that the use of plutonium containing fuels in LWRs (mixed oxide fuel, MOX) is uneconomic but the practice continues in countries such as France and Japan. Therefore, even if the International Atomic Energy Agency (IAEA) were to detect the production of low burnup fuel at a nuclear power reactor, it would have no basis for taking any action to prevent it."

The list of chapters gives some indication of the breadth of the book:

1. Why Countries Might Choose Reactor-Grade Plutonium for Their First Weapon
2. A Short History of Reactor-Grade Plutonium and Why the Nuclear Industry Is Wrong to Downplay Its Dangers
3. The Different Kinds of Plutonium
4. Predetonation and Reactor-Grade Plutonium: No Impediment to Powerful, Reliable Nuclear Weapons
5. Heat from Reactor-Grade Plutonium: An Outdated Worry
6. Radiation and Critical Mass: No Barriers to Reactor-Grade Plutonium Use in Nuclear Weapons
7. How Sweden and Pakistan Planned and India May Be Planning to Use Reactor-Grade Plutonium to Make Weapons
8. Did the U.S. and the British Test Reactor-Grade Plutonium in Nuclear Weapons?
9. Conclusions

Appendix: How Much Pu-240 Has the U.S. Used in Nuclear Weapons: A History

Jones' book concludes:

"All things being equal, weapon-grade plutonium is preferred over reactor-grade plutonium for the production of nuclear weapons. However, today, unlike the 1940s and 1950s, all things are not equal. A non-nuclear weapon state would find it difficult to build a plutonium production reactor without being subjected to enormous international pressure and, as Syria found out in 2007, the reactor could be bombed before it even began operation. In contrast, nuclear power reactors are readily available and, as part of the continuing legacy of the myth of denatured plutonium, half a dozen non-nuclear weapon states have large quantities of separated plutonium. Japan currently has several metric tons of plutonium in the form of pure plutonium nitrate solution or pure plutonium dioxide. In 13 years, after the Comprehensive Joint Plan of Action expires, Iran will be permitted to reprocess spent fuel to obtain pure plutonium nitrate.

"For countries today, the choice is not between weapon-grade plutonium and reactor-grade plutonium for nuclear weapons but rather between reactor-grade plutonium and no nuclear weapons at all. In the past, both Sweden and Pakistan at one time based their nuclear weapon programs on reactor-grade plutonium when weapon-grade plutonium was unavailable. That neither country would eventually produce reactor-grade based nuclear weapons does not change these facts. In the case of Pakistan, its failure to produce nuclear weapons using reactor-grade plutonium had nothing to do with the properties of such weapons. Rather, the United States recognized the dangers of reactor-grade plutonium and applied pressure to France to block the sale of the reprocessing plant needed to produce separated reactor-grade plutonium. Today, India may have deployed nuclear weapons using reactor-grade plutonium.

"It has been claimed that nuclear weapons manufactured using reactor-grade plutonium would be "unreliable," "unpredictable," "bulky," and "hazardous to bomb makers." None of this is true. The entire 270 metric ton current world stockpile of separated plutonium can be used to produce nuclear weapons by simply using a reduced amount of plutonium that is only 60% of a critical mass and coating the core with a half a centimeter of uranium. Employing early 1950s U.S. unboosted implosion technology and modern high explosives, these weapons would have the same predetonation probability as that of the same type of weapon using weapon-grade plutonium and a near critical core. The weapons would be the same exact size and weight as ones using weapon-grade plutonium, and they would require no special cooling. The gamma radiation from the core would be significantly less than that of an unshielded weapon-grade plutonium core. The only difference would be that while the weapon-grade plutonium weapon would produce a yield of 20 kilotons, the reactor-grade plutonium weapon would produce a yield of only 5 kilotons, though its destructive area would still be about 40% that of the 20 kiloton weapon. Further, boosting technology appears to be becoming more readily available to early nuclear weapon states. Boosted weapons produce the same yield regardless of whether weapon-grade or reactor-grade plutonium is used.

"Many claims about so-called denatured plutonium relate to reactor-grade plutonium produced by spiking reactor fuel with either neptunium or americium. However, this spiking has not been done nor is it likely to ever be done since this would greatly increase the costs and technical difficulty of using plutonium as nuclear reactor fuel. Even then, the plutonium could be used to produce nuclear weapons though in this case some special effort would be needed to cool the core by expanding the size of the core to improve heat dissipation and using thermal bridges to conduct the heat away from the core.

"The obvious solution to the nuclear weapon dangers posed by reactor-grade plutonium is to deny non-nuclear weapons states easy access to this material by banning all reprocessing and plutonium recycling, including unirradiated MOX fuel, from such countries. This was the conclusion of the analysis that I participated in at Pan Heuristics over 40 years ago. Our conclusion led to the Carter Administration to end commercial reprocessing in the United States and to try to prevent it in non-nuclear weapon states as well. The intervening years have only reinforced the wisdom of this recommendation. In the 1970s, those in the nuclear industry objected that such a policy would retard the growth of nuclear power which they believed was destined to be a major if not the main source of electricity generation. The nuclear industry expected that uranium resources would be insufficient to support such a large nuclear industry and only plutonium fuel in breeder reactors could power the large number of reactors that they expected.

"Today there are no commercial breeder reactors and none are in sight. Nuclear power did not grow to become anywhere as important as was predicted and uranium resources have proven to be no constraint on nuclear power. The use of plutonium based reactor fuels is universally acknowledged to be uneconomic. Nuclear energy faces stiff competition from natural gas and renewable energy sources.

"Though plutonium reprocessing in nuclear weapon states poses little proliferation risk, it is clearly uneconomic and unnecessary given the 270 metric ton stockpile of separated plutonium that already exists. Reprocessing should be ended in these countries as well to prevent this unnecessary plutonium stockpile from growing even larger."

Gregory S. Jones, April 2018, 'Reactor-Grade Plutonium and Nuclear Weapons: Exploding the Myths', Nonproliferation Policy Education Center, www.npolicy.org/thebook.php?bid=37

Full book (PDF):

http://npolicy.org/books/Reactor-Grade_Plutonium_and_Nuclear_Weapons/Greg%20Jones_Reactor-grade%20plutonium%20web.pdf

(Written by Nuclear Monitor editor Jim Green.)

Wylfa nuclear power project in Wales a definite maybe

Author: Jim Green – Nuclear Monitor editor

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The UK government is handing French and Chinese utilities tens of billions of pounds of taxpayers' money to build and operate the two Hinkley Point C reactors – lifetime subsidies are guess-work but could amount to around £50 billion.[1] In November 2017, the UK Parliament's Public Accounts Committee said Hinkley Point amounts to a "bad hand" and "the poorest consumers will be hit hardest"[2] while the UK National Audit Office said Hinkley Point is "a risky and expensive project with uncertain strategic and economic benefits."[3]

Now the UK government is engineering an equally mind-boggling set of subsidies to persuade Japanese conglomerate Hitachi to proceed with two Advanced Boiling Water Reactors at Wylfa Newydd on the island of Anglesey in north Wales. It seems likely that the Japanese and UK government's will both provide direct financing for the reactors, with the two governments and Hitachi stumping up roughly one-third of the cost each.[4] All sorts of other sweeteners are being offered to Hitachi by the UK government including loan guarantees and a guaranteed 'strike price' for electricity sold from Wylfa reactors (likely to be lower than the Hinkley strike price but still well above current wholesale rates, and significantly higher than the strike price for off-shore wind farms.[4])

Thus governments are jumping in where private enterprise fears to tread. Hitachi hasn't found any private-sector partners, and Hitachi itself wants to dramatically reduce its stake in the Wylfa project. You'd think alarm bells would be ringing within the halls of government about the viability and economic logic of the project. Even with all the sweeteners being thrown in its direction, Hitachi has yet to commit to the project.[5]

Hannah Martin from Greenpeace UK said: "No bank, hedge fund or insurer will touch the UK's new nuclear programme with a bargepole. So Hitachi has no option but to ask the government for a taxpayer bailout to keep their collapsing reactor programme afloat. This would leave the British public to carry much of the cost and all of the risk. Any prudent investor would laugh at this request. After the Hinkley debacle, it's vital that the government stops trying to keep our energy policy a secret and presents any offer of a deal to Parliament before the Hitachi board meeting at the end of May. Otherwise it's difficult to know where their generosity to the nuclear industry might end."[6]

The 2010 Conservative Party election manifesto stated that: "we agree with the nuclear industry that taxpayer and consumer subsidies should not and will not be provided – in particular there must be no public underwriting of construction cost overruns".[7] Now the Conservative government's position is that: "It remains the government's objective in the longer-term that new nuclear projects – like other energy infrastructure – should be financed by the private sector."[8]

Nick Butler noted in the *Financial Times* that a direct shareholding in the Wylfa project by the UK government will almost certainly be challenged in the courts on the grounds of competition policy and European state-aid rules. The UK is likely to be subject to EU rules at least until the end of the Brexit transition period.[9]

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Why nuclear power for African countries doesn't make sense

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NM862.4732

Over the last few years, reports have surfaced of a range of African countries planning nuclear power plants.[1] At the moment, the only nuclear plant in operation in Africa is South Africa's twin-reactor Koeberg, with a capacity of 1.86 GW.[2] This, according to some African leaders, is about to change. Ugandan President Yoweri Museveni recently made the astonishing statement that his country is planning 30 GW of nuclear power by 2026.[3] That equates to 16 times the current total of nuclear energy on the entire African continent.

Uganda is only one of a number of countries interested in nuclear power.[4] Russia's nuclear agency Rosatom has boasted[5] that it has concluded nuclear power memoranda of understanding with Egypt[6], Kenya[7], Nigeria[8], Sudan[9] and Zambia[10]. Uganda is also on the list.[11]

Most African countries suffer from severe electricity shortages.[12] The majority need to double their generating capacity to meet current needs.

According to International Energy Agency figures, Kenya, Sudan and Zambia are primarily dependent on hydroelectric power.[13] A 2.4 GW nuclear plant would double their electricity production. Nigeria's dominant energy source is gas, and here it would take a 4.8 GW nuclear plant to double its capacity.

Of the countries with Rosatom agreements, only Egypt has any concrete plans in place. A site for a 4.8 GW nuclear plant has been identified at El Dabaa, on the Mediterranean Sea, and building is understood to be imminent.[14] In the other countries, the location and scale of the projects have yet to be determined.

Elsewhere in the world, countries like Germany, Belgium and the US are downscaling their nuclear plans or exiting it altogether. The reasons include perceptions of increased risk following the Fukushima disaster in Japan as well as economic factors.[15]

The cost of electricity generation from solar photovoltaic and wind technologies has come down dramatically. It already costs less than power produced by nuclear plants and renewable energy is set to become even cheaper.[16]

Given that South Africa has shelved its nuclear plans on affordability grounds[17], surely less resourced African countries would find investments like this even more difficult?

The loan agreements

Nuclear power agreements are notoriously shrouded in secrecy.[18] But it's possible to get a sense of Rosatom's plans for African nuclear contracts by examining recent examples where details of mutual commitments have become public.

A deal struck with Bangladesh provides a useful benchmark against which to understand other deals that have been done with Russia. In the case of the 2.4 GW Rooppur nuclear plant, Rosatom is providing most of a US$12.65 billion loan.[19] This only covers the estimated construction costs. Interest accrual, possible cost overruns, operations and decommissioning are likely to amount to more than double of this initial outlay.[20] That makes a total cost of roughly US$30 billion likely.

Egypt's earlier mentioned El Dabaa project has a similar funding arrangement. Here Rosatom has given a loan of US$25 billion, which again is projected to only cover construction.[21]

For both Rooppur and El Dabaa[22], the annual interest for their loan is around 3%. In addition, the loan is structured in a way that ensures repayments only start 10-13 years after the loan is made, to continue in annual instalments for 22-28 years thereafter.

The country receiving the nuclear plant initially pays very little, but when the repayments kick in, the country's fiscus and electricity consumers are suddenly faced with a massive burden that most African economies will never be able to meet. By then the 3% annual interest could have increased the amount owed by as much as 40%.

The nuclear industry also has a history of cost overruns and construction delays.[23] A country may therefore face a situation where it needs to service a higher-than-expected debt while being unable to recoup funds from electricity sales.

What is equally concerning is that the debt then places Russia in a position where it is able to exert disproportionate influence over a country's affairs.[24]

Zambia is eyeing a nuclear plant on the scale of Bangladesh's Rooppur.[25] The plant is expected to cost US$30 billion. Given Zambia's total annual budget is US$7.2 billion this is clearly unaffordable.[26] If one were to scale the Rooppur cost from 2.4 GW to the 30 GW nuclear power plants proposed by Museveni, the figure would be 15 times Uganda's annual GDP of US$24 billion.[27]

Cheaper options

Are there cheaper alternatives to nuclear power to alleviate energy shortages in Africa?

A great deal of hope was placed on the 40 GW Grand Inga hydroelectric scheme on the Congo river.[28] But the project isn't going to come to fruition soon due to funding challenges.[29]

The most promising solution seems to be through multiple small-scale power production initiatives, typically in bio-energy, solar heaters and photovoltaic modules.[30] These provide cheaper electricity than nuclear and are in addition good job creators.[31] With its extensive agricultural sector, all of Africa has great bio-waste energy potential.[32]

Kenya has shown that there are excellent geothermal energy extraction possibilities along the Rift Valley.[33] Many countries, including Egypt and Kenya, enjoy ample sunshine, making them ideal for solar power generation.[34] With the right incentives, these could drive an African energy generation boom.

Hartmut Winkler is a member of Save South Africa and OUTA (Organisation Undoing Tax Abuse) but writes in his personal capacity.

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