NUCLEAR MONITOR

September 23, 2015 | No. 811

A PUBLICATION OF WORLD INFORMATION SERVICE ON ENERGY (WISE) AND THE NUCLEAR INFORMATION &RESOURCE SERVICE (NIRS)

Editorial

Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- The latest initiative of the international *Don't Nuke the Climate* campaign.
- Brazil's nuclear power program is in crisis due to funding shortfalls and a major corruption scandal.
- Academic Dave Elliott writes about the incompatibility of nuclear power and renewables?
- We deconstruct the latest nuclear power growth projections from the World Nuclear Association and the IAEA.
- Michael Mariotte writes about the decision of the US Nuclear Regulatory Commission to abandon a study to determine whether cancer rates near nuclear reactors are higher than elsewhere.
- M.V. Ramana writes about the plan to export uranium from Australia to India, and we reprint a short, critical statement by a former Chair of the IAEA's Board of Governors.

The Nuclear News section discusses a Citigroup study on renewable energy and climate change mitigation, and the Global Apollo Program − a call from a coalition of prominent ecologists, scientists and others for the world's governments to invest US$15 billion annually dedicated to the goal of making renewable energy cheaper than coal within 10 years.

Monitored this issue:

Feel free to contact us if you have feedback on this issue of the Monitor, or if there are topics you would like to see covered in future issues.

Regards from the editorial team.

Email: monitor@wiseinternational.org

Join the 'Don't Nuke the Climate' Thunderclap!

On Saturday, September 26, 2015, the *Don't Nuke the Climate* campaign will be putting out some noise that will be heard around the world! If you've got a Facebook, Twitter, and/or Tumblr account, we ask you to join our Thunderclap and help amplify that noise.
It's easy to do, just sign up at: http://thndr.it/1ipFw1C or www.thunderclap.it/projects/31410-edf-nuclear-the-solution

When you do, the Thunderclap will automatically post a message to your Facebook friends, Twitter followers, and/or Tumblr list on Saturday, September 26.
We're sending out this message: *Tell EDF: nuclear can't save the climate: too dirty, too dangerous, too expensive, too slow #exposeEDF #EDFMenteur*
EDF is, of course, Electricite de France, the largest nuclear power utility in the world. EDF wants to have a big influence at December's COP-21 UN climate negotiations in Paris; their future depends on a nuclear-powered future. But our future, and our planet's future, depends on just the opposite: we want and need a nuclear-free, carbon-free energy system that will power our planet cleanly, safely, affordably and sustainably.
That's the message the *Don't Nuke the Climate* campaign is taking to Paris. We hope you'll help us reach millions of people across the globe.
You can find our more about the *Don't Nuke the Climate* campaign at the international campaign page (www.wiseinternational.org/campaign) and the U.S. campaign page (www.nirs.org/cop21/dontnuketheclimate.htm).

And if you haven't done so yet, don't forget to sign the *Don't Nuke the Climate* petition to be presented to global leaders at COP 21 in December.

Organizations, sign at: www.wiseinternational.org/campaign/sign-petition

Individuals, sign at: http://org2.salsalabs.com/o/5502/p/dia/action3/common/public/?action_KEY=20658

− *Michael Mariotte*
President, Nuclear Information and Resource Service

Brazil's nuclear power program in crisis

Author: *Jim Green − Nuclear Monitor editor*

NM811.4496 Othon Luiz Pinheiro da Silva, the former CEO of Brazil's nuclear power company Eletronuclear was formally charged on September 1 with accepting bribes. Reuters reported that Pinheiro allegedly took bribes totaling 4.5 million reais (US$1.1m; €1m) from construction and engineering firms involved in the construction of the Angra 3 nuclear power plant.[1] The figure could be as high as US$10 million according to Associated Press.[2]

The payments were allegedly made to fix the bidding process and increase prices for work on the Angra 3 reactor under construction 100 km west of Rio de Janeiro. Pinheiro has been in jail since July 28, and in early August he resigned as CEO of Eletronuclear, the nuclear subsidiary of state-run utility Eletrobras. Eletronuclear operates Brazil's two nuclear power reactors and is building Angra 3 with the help of French nuclear utility Areva and numerous smaller construction firms.

Pinheiro, a retired navy admiral and nuclear engineer, has for decades been at the forefront of Brazil's programs to develop nuclear power, an aborted nuclear weapons program when Brazil was under military rule, and ongoing plans to build submarines including one nuclear-powered submarine. The submarine tendering process is under investigation.[3]

Fourteen other people, including Pinheiro's daughter Ana Cristina Toniolo and six construction firm executives, were also charged with crimes such as money-laundering and offering or receiving bribes.[1] In addition to the arrests, 'Operation Radioactivity' involved the execution of 23 search and seizure warrants according to a federal police statement.[14]

"The arrest is a tragedy for the industry," said Luiz Pinguelli Rosa, a nuclear physicist and Eletrobras' chief executive from 2003 to 2005. "The industry was already in crisis, but now the corruption concerns are bound to delay Angra 3 further and cause costs to rise even more."[4]

The Angra 3 project has descended into farce:

- Areva announced in June that it had temporarily reduced its activities at Angra 3 due to "delays encountered in securing financing for the remainder of the project's activities".[5]
- At least four Brazilian construction firms halted work in mid-August due to lack of payment from Eletronuclear.
- Eletronuclear said on September 2 that it planned to suspend for 60 days a contract with the consortium building the reactor plant. Some constructions firms have pulled out of the project altogether.[6] Eletronuclear is considering whether the remaining construction firms are financially and technically capable of carrying out the work.

Eletronuclear reported a loss of 1.36 billion reals (US$340 million) in the June quarter, with the largest contributor to the loss being a provision for contingencies on lawsuits against the utility.

Corruption pervasive in the energy sector and beyond

The scandal extends beyond the nuclear industry to the entire power sector and the oil and gas industries ... and beyond. The prosecutors' charging document states: "The cartel naturally expanded using the same modus operandi and the same companies (as in the case of Petrobras) to take part in Eletronuclear tenders."[1]

Petrobras has written off more than US$2 billion in corruption-related losses.[3]

In addition to executives from the oil, construction and electricity industries, some politicians face charges including the leader of the lower house of Congress and a former president.[1]

A public opinion poll found that 60% of respondents want Brazilian President Dilma Rousseff impeached over the widespread corruption. Standard & Poors said the arrest of Pinheiro was another "political uncertainty" that caused the agency to change Brazil's credit outlook to negative.[7]

Alexandre Barros, a political risk consultant with the Brasilia-based firm Early Warning, said the Eletronuclear scandal was indicative of broader patterns of corruption in state-run companies, and raised the spectre of a return to military rule: "Schemes like these have long been part of our culture and I think other similar schemes start emerging all over the place. My big fear is that the armed forces may start feeling uneasy."[2]

History of underachievement

Brazil's nuclear power industry has a history of underachievement. The decision to develop nuclear power was taken by the 1964−1985 military dictatorship. A covert nuclear weapons program was also pursued. Public debate was not tolerated. "Protesting against nuclear energy was like protesting against the government, which meant prison, torture or death," said ecologist Vilmar Berna.[8]

The Angra 1 reactor suffered ongoing problems with its steam supply system and its load factor over the first 15 years was only 25%.[9] The most recent problem with Angra 1 occurred in February 2015, when the reactor was temporarily shut down after a failure of the capacitors used to cool steam.[10]

Work on Angra 2 began in 1976 but the reactor did not commence operation until the year 2000.

Work started on Angra 3 in 1984. Around 70% of the equipment was delivered, but full construction did not begin and work on the project was suspended in 1986. In November 2006 the government announced plans to complete Angra 3 and construction began in June 2010. Operation was anticipated in 2015, but now there is considerable doubt as to whether the new 2019 start-up date can be met (or if the project will be completed at all). The total estimated cost for the project is US$7.59 billion, substantially greater than earlier estimates.[9]

Angra 3 reactor site.

"The goal of 2019 will be very hard to meet. And the other plants, who knows?" said Claudio Salles, president of Instituto Acende, a Brazilian energy-research group in Sao Paulo. "These plants take 10−15 years to build and as time goes on they become less viable."[4]

Ildo Sauer, a nuclear physicist who worked under Pinheiro in the late 1980s and a former head of Petrobras natural gas' division, says Brazil's nuclear program is too expensive and has been co-opted by politicians and construction and engineering firms. "The problem is the lobbyists who see nuclear as a chance to build expensive megaprojects with little regard for cost. It's no longer about science or energy. It's about politics and money, and that brings corruption."[4]

Private sector

No private investment in nuclear power is allowed in Brazil, though this is under review. In May 2015 the government said that Angra 3 would be the last nuclear power plant built as a public project, opening the way for private equity in future reactors.[9]

In early 2015 energy minister Eduardo Braga said that he was looking for private sector investment for another four reactors. The government plans to allow private companies to bid for the construction of reactors with financing guarantees of future revenues.[11]

Pro-nuclear commentator Dan Yurman wrote: "Any private sector vendor that planned to step up to financing and building four new nuclear reactors, worth [US]$25−30 billion, might find a steep challenge in keeping the construction venues free of people with real or imagined influence coming out of the woodwork with their palms stretched out. U.S firms, which face potential prosecution under laws that prohibit giving bribes for contracts, would need to spend serious time with their legal advisors before venturing into the Brazilian market. Where Brazil is going to get private sector vendors to take on $5−10 billion projects is anybody's guess."[12]

In any case the commitment to build more reactors is half-hearted. In May 2012 the government said that construction of any new plants would not commence until after 2020.[9] The government's 'Decennial Energy Plan 2022', released in late 2013, made no mention of nuclear power plans other than Angra 3.[13]

In 2012, gross electricity production in Brazil was 553 billion TWh, with 75% from hydro; 14.5% from gas, coal and oil; 6% from biomass and wastes; 3% from nuclear; and 1% from wind and solar.[9]

Pinheiro said in 2013 that nuclear power's share should not grow much beyond 4%, because hydropower and other renewable sources will meet rising demand.[8]

Power from Angra 1 and 2 at about US $75/MWh is about 1.5 times more expensive than that from hydro, and power from Angra 3 is expected to be slightly over twice as expensive as hydropower.[9]

References:

1. Reuters, 1 Sept 2015, 'Brazil charges ex-CEO of nuclear power company with taking bribes', www.reuters.com/article/2015/09/01/brazil-corruption-eletronuclear-idUSL1N1171KW20150901
2. Associated Press, 28 Aug 2015, 'Police ask that charges be filed against former head of Brazil's nuclear power company', www.foxbusiness.com/markets/2015/08/28/police-ask-that-charges-be-filed-against-former-head-brazil-nuclear-power/
3. Reuters, 29 July 2015, 'Brazilian police probe nuclear submarine program - Folha', www.reuters.com/article/2015/07/29/brazil-petrobras-submarines-idUSL1N1092CA20150729
4. Reuters, 30 July 2015, 'Brazil Nuclear Leader's Arrest May Stymie Atomic Ambitions', www.voanews.com/content/brazil-nuclear-leader-arrest-may-stymie-atomic-ambitions/2887115.html
5. WNN, 29 June 2015, http://us1.campaign-archive2.com/?u=140c559a3b34d23ff7c6b48b9&id=7b66592e5d
6. Reuters, 3 Sept 2015, 'Eletrobras suspends Angra nuclear contract as contractors quit', www.trust.org/item/20150903004211-npgl2/
7. Dan Yurman, 2 Aug 2015, 'Rocky times for nuclear executives in Japan, Finland, & Brazil', http://neutronbytes.com/2015/08/02/rocky-times-for-nuclear-executives-in-japan-finland-brazil/
8. Fabiola Ortiz, Dec 2013, 'Nuclear Energy Small but Strategic in Brazil', www.ipsnews.net/2013/12/nuclear-energy-small-strategic-brazil/
9. World Nuclear Association, Sept 2015, 'Nuclear Power in Brazil', www.world-nuclear.org/info/Country-Profiles/Countries-A-F/Brazil/
10. 20 Feb 2015, 'Brazil's Nuclear Power Plant Angra 1 is Shut Down After Failure', www1.folha.uol.com.br/internacional/en/business/2015/02/1592284-brazils-nuclear-power-plant-angra-1-is-shut-down-after-failure.shtml
11. Reuters, 27 May 2015, 'Brazil sees expanded private role in nuclear power - minister', www.reuters.com/article/2015/05/27/brazil-energy-nuclear-idUSL5N0YI4DU20150527
12. Dan Yurman, 7 June 2015, 'Four major nuclear deals with a lot of waiting ahead', http://neutronbytes.com/2015/06/07/four-major-nuclear-deals-with-a-lot-of-waiting-ahead/
13. Togzhan Kassenova, 2014, 'Brazil's Nuclear Kaleidoscope: An Evolving Identity', http://carnegieendowment.org/files/brazil_nuclear_kaleidoscope_lo_res.pdf
14. Reuters, 28 July 2015, 'Update 4 − Two Brazilian executives arrested as Petrobras probe hits utility', www.reuters.com/article/2015/07/28/brazil-petrobras-eletrobras-idUSL1N1080ON201507

Why not nuclear and renewables?

Author: *Dave Elliott − Professor of Technology Policy at the Open University, UK*

NM811.4497 Nuclear plants do not generate carbon dioxide, so why can't we have nuclear AND renewables, supporting each other, as a response to climate change? In evidence to the UK Energy and Climate Change Select Committee in July, Amber Rudd MP, DECC Secretary of State, suggested that despite its high cost nuclear baseload 'enables us to support more renewables' and was needed since, 'as we all know, until we get storage right, renewables are unreliable'. Can nuclear really support renewables, and is it really low carbon?

The first point to make is that although nuclear plants themselves do not generate CO2, producing the fuel they use does. The mining and fabrication of nuclear fuel is an energy-intense, and hence (at present) carbon-intense, activity and, as demand for this fuel rises, the energy (and carbon) debt will rise since lower grade uranium ores will have to be used, undermining the carbon saving benefits of using nuclear plants.

In theory, nuclear energy or even (perversely) renewables, could be used to power nuclear fuel production so as to avoid this problem but there would still be diminishing returns – there are finite reserves of uranium. Overall, if we attempted to expand the use of nuclear dramatically to deal with climate change, we would exhaust the reserves rapidly unless new more fuel-efficient nuclear plants were developed e.g. fast breeders, and even that would not extend the life of the uranium resource indefinitely.

Nor would it deal with the other problems of nuclear power – safety, security, weapons proliferation and terrorist attack risks, rising costs, inflexible operation and active waste disposal. Indeed it could make them worse. There may be some technical options for limiting some of these problems (e.g. the development of smaller plants, plants using thorium and perhaps recycling some nuclear wastes) but, although there are (strong!) disagreements, some say nuclear fission may not be a significant energy supply option for the future.

Even so, it might be argued that nuclear plants can still prove useful in the interim, before the fuel scarcity problem kicks in, for example to backup variable renewables, as Rudd suggested. For good or ill, in fact it does not seem so. Nuclear plants can't vary their output rapidly or regularly without safety problems. It takes time for the activated xenon gas that is produced when reaction levels are changed to dissipate – it can interfere with proper/safe reactor performance.

In any case nuclear plants need to be run 24/7/365 to recoup their large capital cost. So nuclear plants can just about deal with some of the daily energy demand cycles (demand peaks in the evening, low demand at night) but not with the fast irregular variations likely with wind etc. on the grid – they can't be used to back up the short-term variable output from renewables. It is conceivable that they could be used to cover the occasional longer periods when wind etc. is at minimum. This seems to be what is offered as one option in a new report from the Energy Research Partnership.[1] However, that would mean running the plants at lower levels at other times, ready to ramp up slowly to meet the lull periods, which would undermine their economics.

Moreover, if there is a large nuclear contribution and also a large renewables contribution, there can be head-to-head operational conflicts when energy demand is low e.g. at night in summer, when in the UK demand is around 20 GW. The UK is aiming for 16 GW of nuclear by around 2030 and more later (there is talk of 75 GW by 2050) and maybe 30 GW of renewables by around 2020, perhaps more later. Assuming you can't export all the excess, or store it all, which do you turn off when demand is low? The nuclear operators do not want nuclear output to be "curtailed". Neither do the renewable plant operators – they would lose money. It would be a waste either way.

Basically the two technologies are incompatible at large scale on the grid. What you need is one or the other: large, essentially inflexible, nuclear plants with large (very expensive) energy stores to take excess output at low energy demand times, coupled possibly with exporting any excess (as France does) OR a renewables-based system, with a flexible smart grid that balances the variations, using back-up plants (small cheap-to-run gas-fired plants initially, but biomass-fired increasingly), some energy storage (but not much – it is expensive) and demand-side management to reduce/delay peak demand until later. Surplus power at times of low demand can be exported (as with nuclear) and balanced with power imported from overseas if available – the time difference in demand and local variations in wind availability, e.g. across the EU, would help. Having a large inflexible nuclear base-load component on the grid, in such a system, just gets in the way, though a small nuclear component might just about be accommodated.

Basically, in the new system, unless you have a vast energy storage capacity (which would be very expensive), having large base-load plants is a PROBLEM not a solution. The old system, with base-load plus top-up, was OK with large inflexible plant, although wasteful (with huge thermal conversion losses), but if we are to use variable renewables on a large scale we need a more flexible system.

There are some other angles: the surplus power from renewables can be converted into hydrogen gas by electrolysis of water and stored, ready for use in a gas turbine plant to make power when demand is high. Or for use as a vehicle fuel. Germany is already doing this via several wind-to-gas/power-to-gas plants, some of them converting the hydrogen to methane gas, using CO2 captured from the air or from power station exhausts, to feed into the national gas main. It has been argued that if you do happen to have a large, already

built, nuclear component (as in France) you could do the same with the excess power from that at night, but that seems to be just a way to sustain the over large nuclear fleet for a bit longer! It would not be economic to build large numbers of new nuclear plants to do this, even if their fuel supply could be guaranteed and low carbon long term. On that last point, interestingly, a new study suggests that using thorium could lead to higher net carbon emissions.[2]

It is conceivable that nuclear fusion may be viable in the longer term (possibly post 2050). Some say that, rather than being used for base-load, fusion might be used for hydrogen production, in which case it might offer a way to balance variable renewables. However that is very speculative, and fusion is still some way off. Certainly, even if all goes well with the current research work, fusion won't be available in time to deal with the urgent problem of climate change, or to help renewables to do that in the near term.

In terms of the main focus for energy supply, both now and long term, it seems that we really do need to make a choice between nuclear and renewables.

[Reprinted from http://blog.environmentalresearchweb.org/2015/08/22/why-not-nuclear-and-renewables/]

References:
1. http://erpuk.org/wp-content/uploads/2015/08/ERP-Flex-Man-Full-Report.pdf
2. www.sciencedirect.com/science/article/pii/S0196890415003957

Fanciful growth projections from the World Nuclear Association and the IAEA

Author: *Jim Green − Nuclear Monitor editor*

NM811.4498 The 17th edition of the World Nuclear Association's biennial 'Nuclear Fuel Report' has been released.[1] According to the WNA, the report is "definitive reference source of the world industry" and is available for £870 (US$1340, €1200). Some would say the annual World Nuclear Industry Status Report is the definitive source − and it's free![2]

"Nuclear electricity output is set to increase at a faster rate over the next five years than we have seen for more than two decades," said WNA director general Agneta Rising.[3] The claim is disingenuous given that growth over the past two decades has been negligible − there was 438 operational reactors at the end of 2014 compared to 434 in 1995.[4]

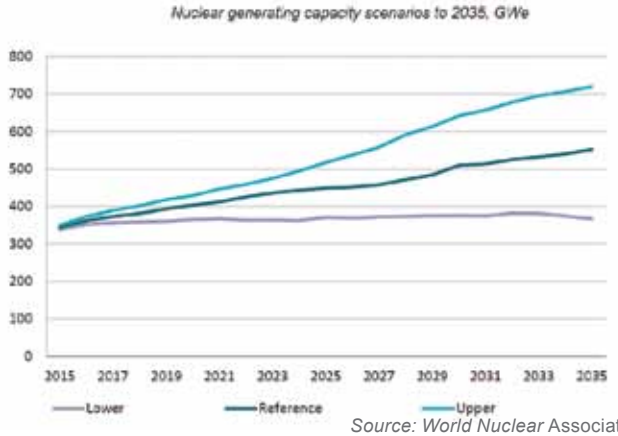
The WNA provides three scenarios for nuclear power from 2015 (379 gigawatts capacity) to 2035. In the 'reference' and 'upper' scenarios, nuclear reaches 552 GW and 720 GW respectively − growth of 46−90% over 20 years. In the 'lower' scenario, nuclear capacity stagnates until 2030 and then declines with "many" reactor closures in the period to 2035.

The middle 'reference' scenario in such reports is typically promoted as being the most credible − by industry bodies themselves and by the mainstream media. Thus Reuters reported: "The World Nuclear Association Nuclear Fuel report forecasts global nuclear capacity will grow to 552 gigawatts equivalent (GWe) by 2035 from 379 GWe currently, as many countries build new plants as a lower-carbon option and for energy security."[3]

However, based on long experience, a rule of thumb to apply to projections from nuclear promotional bodies is to ignore the upper and middle/reference scenarios but give some credence to the low scenario. Even the WNA's reference scenario of 46% nuclear capacity growth in 20 years − a compound annual growth rate of 1.9% − is modest and falls well short of matching industry rhetoric about a nuclear 'renaissance'.

The WNA states:

"In both established and potential markets, nuclear power faces an increased competitive challenge from other modes of generation especially in deregulated markets, while continuing to face regulatory and political hurdles. Electricity demand growth is low in most of the countries where nuclear power is well-established, but remains strong in many developing countries and it is in these countries that the great majority of nuclear capacity growth is to be expected."[1]



Source: World Nuclear Association

The WNA's wishful thinking is at odds with a recent assessment by Steve Kidd, an independent consultant and economist who worked for the WNA for 17 years. Kidd writes:

"Looking forward, despite the many forecasts that point to sustained growth of nuclear, there will be a substantial number of reactor closures. ... Closures for economic reasons are increasingly worrying. Electricity markets are changing rapidly and grids are getting

integrated. The incursion of cheap shale gas and lots of renewable power is beginning to cause acute problems for today's operating nuclear units. Loadfollowing, which is economically sub-optimal, will become essential for some reactors to continue. Even where production costs are maintained at low levels, revenues become unstable and reactors can start losing money. Incentives for zero-carbon and reliable operation are found to be insufficient. It is almost certain that further units in the US will close for these reasons. In Europe, the same is likely to happen as the renewable power input surges upwards. ...

"We have learned one thing for certain: it's a lot easier to shut a reactor down than to build a new one. There are alternatives to nuclear for power generation and the competition is getting continuously stiffer. Hence well-researched and articulate critiques against the concept of any nuclear growth ... such as the annual World Nuclear Industry Status Report, are becoming increasingly difficult to ignore. The combination of aging operating reactors, delayed construction plans combined with escalating costs of new units and competition from renewable power technologies is becoming a compelling story to any lay reader. ...
"Whether the number of reactor start-ups exceeds the number of closures depends on China. Over the next few years, the number of start-ups (five to six per annum) combined with Japanese reactors returning to service should certainly outweigh the number of closures. But in the 2020s things get more unpredictable for both closures and start-ups. Most people's expectations of Chinese growth in nuclear have been cut back substantially. ... Russia's domestic program has also slowed, while many of the claimed reactor export deals are little more than statements of intent. India remains something of an enigma, but it shows few signs of overcoming general problems in completing major infrastructure projects, including local land rights and volatile public opinion."

"The optimistic view that nuclear will eventually take up the substantial place allocated for it in energy scenarios that mitigate climate change (e.g. some of the scenarios in the International Energy Agency's World Energy Outlook or the main case in the IEA/ OECD-NEA Technology Roadmap − Nuclear Energy) holds increasingly little water."

IAEA report

The International Atomic Energy Agency (IAEA) has produced the 35th edition of its publication, 'Energy, Electricity and Nuclear Power Estimates for the Period up to 2050'.[5] The report provides estimates of energy, electricity and nuclear power trends up to the years 2030 and 2050. The IAEA has yet again downwardly revised its projections of nuclear power growth, and now projects capacity growth by between 2.4% and 68% from 2014 to 2030 (average annual capacity growth of 0.1−3.3%). Uncertainty related to energy policy, license renewals, shutdowns and future constructions accounts for the wide range, the IAEA states.

The IAEA notes numerous "challenges":

"Over the short term, several factors are weighing on the growth prospects of nuclear power, leading to temporary delays in deployment of some plants, according to the report. These factors include low prices for natural gas, subsidized renewable energy sources, and the global financial crisis, which presents hurdles for capital-intensive projects. Heightened safety requirements as a result of stress tests introduced in the wake of the Fukushima accident and the deployment of advanced technologies have also contributed to delays."[6]

Effects of the Fukushima accident include "earlier than anticipated retirements, delayed or possibly cancelled new construction, and increased costs owing to changing regulatory requirements".[5]

For many years the IAEA has indulged in the subterfuge of talking about 'operable' reactors, including those that are not operating but might one day be restarted. In its latest report the IAEA is even more disingenuous − all 'operable' reactors are now described as being 'in operation' even though a good number are not (in particular, 42 reactors in Japan).

The IAEA notes that more than half of the world's 438 power reactors 'in operation' are over 30 years old. Despite the need to replace "scores" of retiring reactors, the IAEA claims that nuclear power is still set to maintain − and possibly increase − its role in electricity generation. "In order to maintain such a role, each retiring reactor would need to be replaced," said David Shropshire, the mathematically-challenged head of the IAEA's Planning and Economic Studies Section.[6]

In fact, nuclear power accounted for 17.6% of world electricity generation in 1996 but just 11.1% in 2014, and it will not maintain that share unless fanciful growth projections are realized and/or total electricity generation and demand stagnate. According to the IAEA report, nuclear accounted for 11.1% of total world electricity generation in 2014 (in terrawatt-hours) and will account for 8.6−11.3% in 2030 and 4.2−10.8% in 2050.

The report provides regional projections:

- Middle East and South Asia: current capacity of 6.9 GW projected to reach 25.9−43.8 GW by 2030.
- Eastern Europe: current capacity of 49.7 GW projected to reach 64.1−93.5 GW by 2030.
- 'Far East' (including China and South Korea): current capacity of 87.1 GW projected to reach 131.8−219 GW by 2030.
- Western Europe: current capacity of 113.7 GW to fall to 62.7−112 GW by 2030.
- North America: current capacity of 112.1 GW, projected capacity in 2030 of 92−139.7 GW.

The IAEA notes that its projections out to 2050 are all but meaningless given the high degree of uncertainty: "Given all the uncertainties, these estimates should be considered as suggestive of the potential outcomes."[5]

The report states that that nuclear power accounted for 4.6% of the world's total energy requirement in 2014, and estimates that nuclear's contribution will be 4.1−5.3% in 2030 and 2.3−4.8% in 2050.

The IAEA's 'low' scenario − negligible 2.4% growth of global nuclear capacity from 2014−2030 (0.1% annual growth) − is designed to produce "conservative but plausible" estimates, the IAEA states, and assumes a continuation of current market, technology and resource trends with few changes to policies affecting nuclear power.

To its credit, the IAEA has published data demonstrating its habit of overestimating nuclear power growth.[7] The IAEA's 'high' forecasts have consistently proven to be ridiculous. For example:

- In 1985, the IAEA's high estimate was 702 GW capacity in the year 2000, but actual capacity in 2000 was 350 GW (50% of the estimate).
- In 1990, the IAEA's high estimate was 528 GW capacity in the year 2005, but actual capacity in 2005 was 368 GW (70% of the estimate).

Even the IAEA's 'low' forecasts are too high − by 13% on average. For example:

- In 1985, the IAEA's 'low' estimate was 502 GW capacity in the year 2000, but actual capacity in 2000 was 350 GW (70% of the estimate).
- In 1990, the IAEA's 'low' estimate was 450 GW capacity in the year 2005, but actual capacity in 2005 was 368 GW (82% of the estimate).

The data compiled by the IAEA shows that only one of the IAEA's forecasts has proven to be accurate − and that was just a five-year 'low' forecast of growth from 2000 to 2005.

The IAEA's forecasts have been sharply reduced since 2010 as the following table shows.

IAEA series: 'Energy, Electricity and Nuclear Power Estimates' (iaea.org)

	2010	2011	2013	2015
Low estimate 2030 nuclear capacity (GWe)	546	501	435	385
High estimate 2030 nuclear capacity (GWe)	803	746	722	632
Estimate 2030 nuclear share of elec. generation capacity (%)(6.2% in 2014)	8.5−10.4	5.2−6.2	4.5−6.2	3.8−5.1
Estimate 2050 nuclear share of elec. generation capacity (%)	5.0−11.9	2.7−6.0	2.2−5.6	1.8−4.8

The IAEA's current 'low' estimate for 2030 (385 GWe) is down 29.5% from the pre-Fukushima, 2010 'low' estimate of 546 GWe. The high estimate (632 GWe) is down 21% from the pre-Fukushima, 2010 high estimate of 803 GWe.

References:

1. WNA, 2015, 'The Nuclear Fuel Report: Global Scenarios for Demand and Supply Availability 2015-2035', 17th edition, http://world-nuclear.org/World-Nuclear-Association/Publications/Publications-for-Sale/Nuclear-Fuel-Report/
2. www.worldnuclearreport.org/
3. Nina Chestney, 10 Sept 2015, 'World nuclear capacity set to grow by 45 percent by 2035', www.reuters.com/article/2015/09/10/us-energy-nuclear-idUSKCN0RA14220150910
4. IAEA, 'Nuclear Power Capacity Trend', https://www.iaea.org/PRIS/WorldStatistics/WorldTrendNuclearPowerCapacity.aspx
5. IAEA, 2015, 'Energy, Electricity and Nuclear Power Estimates for the Period up to 2050', www-pub.iaea.org/books/IAEABooks/10939/Energy-Electricity-and-Nuclear-Power-Estimates-for-the-Period-up-to-2050-2015-Edition www-pub.iaea.org/MTCD/Publications/PDF/rds1-35web.pdf
6. Jeffrey Donovan / IAEA, 8 Sept 2015, 'IAEA Sees Global Nuclear Power Capacity Expanding in Decades to Come', www.iaea.org/newscenter/news/iaea-sees-global-nuclear-power-capacity-expanding-decades-come
7. IAEA, 2007, Energy, Electricity and Nuclear Power: Developments and Projections − 25 Years Past and Future', tables 33 and 34, p.56, www-pub.iaea.org/mtcd/publications/pdf/pub1304_web.pdf

US NRC drops cancer study. Does it matter?

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

NM811.4499 The Nuclear Regulatory Commission (NRC) has abruptly ended a study[1] that it had commissioned from the National Academy of Sciences (NAS) that was purportedly being set up to determine whether cancer rates near nuclear reactors are higher than elsewhere and thus, supposedly, whether there is reason to be concerned about routine reactor operation.

Well, we actually already know the answer to that question. Studies from Europe show that cancer rates, especially among children, are definitely higher near nuclear power facilities.[2] The biggest culprit appears to be refueling of reactors − an operation necessary every 12-18 months depending on the particular reactor's cycle. When the top is taken off the reactor vessel to allow access to the core, and extraordinarily radioactive fuel rods are taken out of the core and moved to fuel pools, extremely high levels of radiation are freed from the reactor vessel. And some of that radiation does manage to get out into the environment.

Reactor containments are robust buildings, but they're not as solid as perhaps they look. There are large numbers of penetrations − places where pipes and electrical wires come in and out of the building − that provide a much easier escape route for radiation than through several feet of concrete. That radiation is, of course, toxic. And the European studies show that it kills.

Reaction to the NRC's announcement, even among clean energy groups, has been widely varied. Beyond

Nuclear was outraged. The Radiation and Public Health Project said it was a good thing, since any study by the NRC would be set up to show nothing.

And indeed, the NRC certainly prefers studies designed to show nothing. With the cancellation of the NAS study, the NRC says it is back to relying on a 1990 study that was deliberately designed to show nothing. For instance, that study looked only at cancer fatalities, not incidence, thus potentially downplaying real health effects.

That study also looked at county-wide data, rather than focusing on areas closest to the reactor and areas where the predominant winds blow. And it counted the cancers based on where they were treated, rather than where they occurred. All of which was, deliberately I'd argue, intended to bury actual effects under many layers of statistical white noise and static.

The question is whether the new study would have been any better. And the involvement of NAS does lead to some skepticism in that regard. While NAS' BEIR-VII study on radiation did confirm, as radiation researchers had long averred, that there is no "safe" level of radiation exposure, the nuclear industry has been able to stack other NAS panels on nuclear issues with its own cherry-picked apologists. And there was little evidence, despite the efforts of Beyond Nuclear and others to help choose participants and define study parameters, that this study was going to be set up − as the European studies were to a larger degree − to get past statistical noise and find anything if it's there.

And, if it were, it seemed likely to us that the NRC would either a) disavow it or b) end it before completion. Seriously, did anyone really think the NRC would pay for and release a study showing health effects from nuclear power?

Since b) is exactly what happened, however, it's hard not to suspect that even the preliminary results (the study had completed Phase I of three phases) were so explosive that the NRC felt it had to end the study before it really even got off the ground.

That suspicion is only amplified by the NRC's pathetic rationale for ending the study: that it was too expensive and would take too long.

Too expensive? It would have cost only US$8 million to complete Phase 2 of the study[3], which was to entail a detailed examination of the areas around seven reactor sites. Phase 3, involving all of the remaining 50 or so sites, would have cost about US$60 million and taken 8-10 years. So, that's US$6 million/year for an agency with a budget of about US$1 billion.

Too expensive? That excuse is simply laughable. And too long? Well, yes, 8-10 years for full completion is a long time. On the other hand, it's been 25 years since the last, hysterically-deficient study; another few years doesn't seem like such a terrible burden, especially since it could have been conducted faster with more money spent per year. Even US$12 million/year doesn't seem far-fetched considering the NRC's budget. Moreover, the seven-site Phase 2 of the study might have done the job on its own. Especially to answer a question that is rather fundamental: are the facilities the NRC is spending that US$1 billion/year regulating killing Americans?

Even though we already know the answer to the question; which, again, is yes, these facilities are killing Americans. We know that because of European studies that were properly conducted. The problem, and the real reason the NRC killed the study, is that most Americans − including their elected officials − don't know that the question already has been answered affirmatively. European studies of cancer around nuclear power plants don't get much media attention in the U.S. But a U.S. study, paid for by a U.S. government agency and conducted by the U.S. National Academy of Sciences? A study like that, that found anything at all, would be big news.

That would be news too big for the NRC to handle. So the agency once again chose the interests of its real constituents − nuclear power utilities − above the interests of the public it is supposed to serve. The NRC felt that this time it couldn't take the chance that it could ensure the study would be designed intentionally to find nothing, and thus − afraid the study might find something − the NRC decided some bad publicity now (as in an excellent editorial[4] from the Asbury Park Press) over killing the study beat a lot of potentially worse publicity later if the public learned that yes, they and their children are in danger of dying because they live near nuclear facilities.

After all, the public outcry from that kind of publicity might lead to the NRC quickly having nothing left to regulate.

Still, it has to be said that no study at all would be preferable to the kind of study the NRC wanted. Another deliberately-designed whitewash would be even worse than the status quo. The danger is that if the backlash now causes the NRC to reconsider, but demand its own changes to the parameters, whitewash is exactly what we'd get. Caveat emptor: be careful what you ask for. Especially from an agency, like the NRC, that has powerful reasons not to uncover the truth.

References:

1. www.ocregister.com/articles/nuclear-682289-nrc-cancer.html
2. http://safeenergy.org/2015/07/02/powerful-new-study-shows-radiogenic-risks/
3. http://nas-sites.org/cancerriskstudy/analysis-of-cancer-risks-in-populations-near-nuclear-facilities-phase-2-pilot-planning/
4. www.app.com/story/opinion/editorials/2015/09/09/editorial-let-nrc-halt-cancer-study/71963938/

Plans to export uranium from Australia to India hit a hurdle

Author: *M.V. Ramana − Program on Science and Global Security at Princeton University*

NM811.4500 Plans to export uranium from Australia to India may have hit their most significant hurdle so far in the form of Report 151 of the federal Parliament's influential Joint Standing Committee on Treaties (JSCOT). After much deliberation and expert testimony, the Committee has put forward a number of recommendations that India has to abide by before Australian uranium is sold to India. The history of India's nuclear programme and the country's stand in various diplomatic fora suggest that there is little chance of India agreeing to these conditions.

The first three recommendations laid out in the JSCOT report are particularly important. The first and second recommendations pertain to India acceding to the Comprehensive Test Ban Treaty (CTBT) and negotiating a fissile material cut-off treaty as well as a nuclear arms limitation treaty for the Indian subcontinent region. The third recommendation is focused on the safety and efficacy of the safeguards and standards of nuclear facilities in India arguing that a series of key checks and balances must be put into practice and proven to work before any uranium sales. If taken seriously, these recommendations will make it all but impossible for the Australian government to sell any uranium to India.

Diplomatically, for nearly two decades successive Indian governments have opposed India signing the CTBT, offering only a unilateral moratorium on nuclear testing. By definition such an arrangement can also be unilaterally reversed. As noted in the JSCOT report, the Indian government is unlikely to change this position. There has been a long-standing demand from several quarters – strategists, former defense personnel and even some retired chairmen of the Atomic Energy Commission – to conduct one or more nuclear weapon tests. In 2009 a senior member of India's Defense Research and Development Organization revealed that the yield of the thermonuclear device tested in 1998 was "much lower than what was claimed" and argued that this meant, "India should not rush into signing the CTBT".

United Nations Security Council Resolution 1172 calls "upon India and Pakistan immediately to stop their nuclear weapon development programmes, to refrain from weaponisation or from the deployment of nuclear weapons, to cease development of ballistic missiles capable of delivering nuclear weapons and any further production of fissile material for nuclear weapons". Nevertheless, both countries continue to pursue all of these activities and have resisted calls for limiting their nuclear and missile programs.

Of particular relevance to the question of uranium exports is the continued production of fissile material for nuclear weapons by both India and Pakistan; cessation of these activities in the near term seems politically infeasible. In India, an important source of demand for fissile material is the expanding naval wing of India's nuclear triad. India is in the process of deploying its first nuclear submarine, Arihant; a second nuclear submarine is reportedly ready and a third vessel under construction. These submarines are said to be designed to carry up to 12 ballistic missiles, with a range of 700 to 750 kilometers, each armed with one nuclear warhead. Naval planners have called for ballistic missiles of at least intermediate range (3,000 - 5,500 km). The first test of a 3000 km range submarine-launched ballistic missile was carried out last year. This February, the government approved the construction of six nuclear powered attack submarines. To fuel all these submarines, India is setting up a new uranium centrifuge plant (expelling villagers who live in the area in the process) in order to significantly expand its enrichment capacity. Implementing these plans will require substantial quantities of plutonium and enriched uranium; it is hard to imagine the Indian government negotiating-in good faith-a treaty to ban their production.

There are also good reasons to be worried about the risk of severe accidents at Indian nuclear facilities. Most nuclear facilities in the country have experienced small or large accidents. Fortunately none of these has been catastrophic. Many were caused by inattention to recurring problems or other warnings and, to the extent that those responsible for safety have tried to fix them, they have not always been successful. Disturbingly, the latest reactor to be commissioned, Koodankulam-I, a Russian designed light water reactor, has had a spotty operating record since it became critical. Safety concerns have been at the heart of intense local opposition in various parts of India to nuclear power plants.

An added concern, highlighted by the JSCOT report, is the absence of an independent regulator. In the last few years, two government bodies in India, the parliamentary Public Accounts Committee and the Auditor General, have recommended that the government effect a true separation, but to date this has not been done. The lack of separation between the regulator and the regulated industry is not an accident, but a choice made and preserved by the nuclear establishment over decades. The attempt to restructure the regulatory system in response to widespread concern following the Fukushima accident has been marred by various weaknesses, including that the planned process calls upon the head of the nuclear establishment to play a part in appointing members.

Given the catastrophic consequences of a nuclear accident in India, let alone the use of nuclear weapons, the need to end nuclear fissile material production and significantly improve the safety and regulation of nuclear facilities is urgent. JSCOT's recommendations are the minimum precautions required before any Australian uranium is exported. The question now is will the Australian government meet its responsibilities?

The Joint Standing Committee on Treaties report is posted at: www.aph.gov.au/Parliamentary_Business/Committees/Joint/Treaties/28_October_2014/Report_151

Former IAEA Chair takes aim at Australia-India nuclear deal

Ron Walker, a former Australian diplomat and former Chairman of the Board of Governors of the International Atomic Energy Agency, writes:

Besides its collateral damage to Australia's security, commercial and diplomatic interests, the soon-to-be ratified Australia-India nuclear cooperation agreement notably fails to meet its objectives.

The aim was to give a green light to Australian uranium exports to India. Two objectives were to be served, one commercial, the other diplomatic. A vast new market was to be opened for Australian uranium exporters and India was to be convinced Australia was a reliable partner, worthy of a closer relationship.

Instead, as has been exposed in the Joint Parliamentary Committee, the Australian side gave away so much in the course of the negotiations on safeguards against nuclear proliferation and left open such loopholes for Australian uranium to end up in bombs or otherwise help their manufacture, that this proposed treaty does not do what Australia's 23 existing nuclear safeguards treaties do.

Unlike them, it does not give Australian exporters legally watertight guarantees that the trade will be subject to effective controls against misuse of the uranium in ways Australian companies neither want nor could afford. So many deficiencies in the proposed treaty have been exposed it amounts at best, not to a greenlight but to a blinking yellow one. Not 'all is guaranteed safe' but 'proceed carefully at your own peril'. And JSCOT's main recommendation is a red light: no uranium exports to be permitted for the foreseeable future.

How Australian companies will respond and what risks they will be prepared to take remains to be seen, but no responsible government would have placed them in this situation.

The Indian Government has every reason to feel it too has been dudded. Instead of a reliable supply, there is a big element of precariousness. As for a demonstration of the Australian Government's trustworthiness as a close partner, the contrary impression is conveyed of a bumbling inability to manage our own end of the deal.

[Reprinted from www.lowyinterpreter.org/post/2015/09/14/Reader-riposte-Australia-India-nuclear-deal.aspx]

NUCLEAR NEWS

Climate change: Citigroup shows the way?

Sometimes confirmation comes from the most unexpected quarters. For example, consider a 132-page report from Citigroup: 'Energy Darwinism II; Why a Low Carbon Future Doesn't Have to Cost the Earth'.

The authors ask the question: Can we afford not to take effective action on climate change in Paris this coming December? And they answer: No. "Paris offers a generational opportunity; one that we believe should be firmly grasped with both hands."

The path of action Citigroup recommends is based heavily on investments in renewables and energy-saving technology. Nuclear power receives little attention. The report states: "One of the key theories from the original energy Darwin report was highlighting these differing rates of cost evolution of different generation technologies. Solar in particular was exhibiting learning rates in excess of 20% (i.e. the cost of a panel would fall by >20% for every doubling of installed capacity), wind at 7.4%, gas was evolving via the shale revolution in the US, while nuclear was becoming more expensive, and liquefied natural gas (LNG) had also increased in cost by around 10% per annum over the last decade."

In Citigroup's 'Action' scenario, renewables would account for 29.4% of global electricity generation in 2020 (hydro 17.0% and other renewables 12.4%), nuclear 12.4% and fossil fuels 58.3%.

The gap in actual outlays for the two alternatives over the next 25 years turns out to favor taking action now: "Citi's 'Action' scenario implies a total spend on energy of [US]$190.2 trillion while our 'inaction' scenario is actually marginally larger at $192 trillion. While in the Action scenario we spend considerably more on renewables (reducing in cost over time) and energy efficiency (effective negative energy usage), the resulting lower use of fossil fuels lowers the total cost in later years."

The up-front costs are entirely defensible *investments,* the authors argue; they help to prevent "profound impacts on countries, industries and companies" worldwide. The incremental costs are limited, they write, and ultimately lead to savings; they offer reasonable returns on investment and should not impact too harshly on global growth.

Calculated over the longer term, non-action will be far more costly to the business world – not to mention humanity.

The authors' treatment of the concept 'stranded assets' is interesting. Oil companies frequently point to the 'costs' (to them) of not pumping up every last drop of identified reserves. The authors turn the argument around: Acknowledging the companies' "pain", they point out that low commodity prices have already 'stranded' some of these resources, and are likely to continue to do so: "Over time, impacts may spread further to lower cost or lower emissions fuels, including currently producing projects."

Energy sources that require high investment with long-term payback, the report underlines, are especially vulnerable to subsiding demand and lower prices. Shale oil and developing entirely new coal provinces, as Australia is considering, are the examples offered. (Although unmentioned, nuclear new build springs to mind.)

One of the report's principal recommendations is that world credit institutions and market actors be engaged to help cover the initial costs. The report points to the emergence of international coalitions of investors that have taken pro-active stands on climate change, with a view to faciltate the transition to a low-carbon economy,

and some innovative financing schemes to enable consumer-level investments in energy efficiency that have been implemented in various parts of the USA. It would seem that some parts of 'the market' are already taking positive measures spontaneously – that is, without demanding costly publicly financed enticements.

Citi Global Perspectives & Solutions, 14 Aug 2015, 'Energy Darwinism II: Why a Low Carbon Future Doesn't Have to Cost the Earth',

www.citivelocity.com/citigps/ReportSeries.action

www.citivelocity.com/citigps/ReportSeriesPrint.action?recordid=44.

− Charly Hulten, WISE Sweden

Global Apollo Program

An coalition of prominent people has come together to ask the world's governments to find US$15 billion per annum to invest in scientific research and development dedicated to the goal of making renewable energy cheaper than coal within 10 years.

The coalition includes

- a former chief executive of oil company BP,
- BBC documentary maker and naturalist David Attenborough,
- a former UK minister for energy,
- one of the world's leading economists on the study of what determines our happiness,
- a leading climate scientist,
- the former head of the UK's major business lobby group
- the chief executive of consumer products company Unilever,
- former World Bank chief economist Nicholas Stern
- and other prominent scientists and economists

The coalition draws its inspiration from President John Kennedy's Apollo Program which targeted putting a man on the moon and returning him safely to earth within the decade. They note that publicly-funded renewable energy R&D has been "starved" of funding, making up under 2% of the total of publicly funded research and development.

The coalition statement reads as follows:

We the undersigned believe that global warming can be addressed without adding significant economic costs or burdening taxpayers with more debt.

A sensible approach to tackling climate change will not only pay for itself but provide economic benefits to the nations of the world.

The aspiration of the Global Apollo Program is to make renewable energy cheaper than coal within 10 years. We urge the leading nations of the world to commit to this positive, practical initiative by the Paris climate conference in December.

The plan requires leading governments to invest a total of $15 billion a year in research, development and demonstration of clean energy.

That compares to the $100 billion currently invested in defence R&D globally each year.

Public investment now will save governments huge sums in the future.

What is more, a coordinated R&D plan can help bring energy bills down for billions of consumers.

Renewable energy gets less than 2% of publicly funded R&D. The private sector spends relatively small sums on clean energy research and development.

Just as with the Apollo space missions of the 1960s, great scientific minds must now be assembled to find a solution to one of the biggest challenges we face.

Please support the Global Apollo Program – the world's 10 year plan for cheaper, cleaner energy.

www.globalapolloprogram.org

WISE/NIRS Nuclear Monitor

The World Information Service on Energy (WISE) was founded in 1978 and is based in Amsterdam, the Netherlands.

The Nuclear Information & Resource Service (NIRS) was set up in the same year and is based in Washington D.C., US.

WISE and NIRS joined forces in the year 2000, creating a worldwide network of information and resource centers for citizens and environmental organizations concerned about nuclear power, radioactive waste, proliferation, uranium, and sustainable energy issues.

The WISE / NIRS Nuclear Monitor publishes information in English 20 times a year. The magazine can be obtained both on paper and as an email (pdf format) version. Old issues are (after 2 months) available through the WISE homepage: www.wiseinternational.org

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Paper 20x	100 Euro	350 Euro
Email/Pdf 20x	50 Euro	200 Euro

Contact us via:

WISE International
PO Box 59636, 1040 LC Amsterdam, The Netherlands

Web: www.wiseinternational.org

Email: info@wiseinternational.org

Phone: +31 20 6126368

ISSN: 1570-4629

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