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Editorial

Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor, we cover:

- A momentous campaign win in Taiwan, where work on a fourth nuclear power plant has been suspended following repeated mass mobilizations over the past three years. The battle over 'Nuke 4' will continue, but the decision to suspend construction is momentous nonetheless.
- Mary Olson from the Nuclear Information and Resource Service writes about plans to weaken radiation protection standards in the US.
- The uranium industry hoped that the post-Fukushima spot price would rebound after it fell to US\$50/pound ... but then it fell to US\$40 ... and now it has fallen below US\$30. We summarize an analysis by nuclear insider Steve Kidd who argues that "the case made by the uranium bulls is in reality full of holes" and he predicts "a long period of relatively low prices".
- As with the uranium bulls, promoters of 'Generation IV' reactor concepts also need a reality check. An updated 'Technology Roadmap' report by the Generation IV International Forum provides that reality check, with projected timelines for the development of new reactor types slipping considerably since the 2002 Technology Roadmap. We also look at proposals to use a Generation IV reactor type in the US to process plutonium stockpiles. A Department of Energy report finds that the Generation IV reactor option would cost over US\$50 billion – twice as much as the next most expensive option for plutonium management.

The Nuclear News section has reports on an attack on a uranium ore-laden truck in India; a report which finds that renewable energy provides 6.5 million jobs globally; waning support for nuclear power in Sweden; cuts to nuclear security funding in the US; the Global Day of Action on Military Spending; the latest Nuclear Resister E-Bulletin; a new campaign to clean up abandoned uranium mines in the US; legal action initiated by the Marshall Islands against nuclear weapons states; and a summary of the latest meeting of signatories to the Nuclear Non-Proliferation Treaty.

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.

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Taiwan halts fourth power plant

NM786.4389 Taiwan's government has halted construction of the country's fourth nuclear power plant as a result of sustained public opposition and protest. Premier Jiang Yi-huah from the governing Kuomintang Party (KMT) announced on Sunday April 27 that one of the two General Electric-Hitachi Advanced Boiling Water Reactors at the Lungmen plant will be 'sealed' once safety checks are complete and before loading fuel, and construction of the second reactor – now 90% complete – will be halted immediately. Almost US\$10 billion (€7.2b) has been spent on the plant so far.¹

There have been mass protests against nuclear power in Taiwan since the Fukushima disaster. In March 2013, around 200,000 Taiwanese people participated in anti-nuclear protests. In March 2014, about 80,000 people protested against the Lungmen plant (and nuclear power generally) around the time of the Fukushima anniversary. In the days before the Premier's April 27 announcement, tens of thousands of protesters (some reports say 30,000, some say 50,000) broke through a police cordon and staged a sit-in along a main street near the central train station in Taipei. Following the announcement, many protesters left but hundreds remained, and police used water cannon to disperse them on Monday morning. More than 40 people suffered minor injuries.

Five days before the April 27 announcement, former Taiwanese opposition leader Lin Yi-hsiung, who led the Democratic Progressive Party (DPP) from 1998–2000, began a hunger strike to protest against the Lungmen plant. On April 30, Lin ended his fast and said: "Over the past half month, the people of Taiwan's outstanding display has been unprecedented, which leaves one feeling moved, full of admiration and deeply appreciative. Nuclear opponents should take a step forward to ensuring the No. 1, No. 2 and No. 3 nuclear power plants are closed on schedule."¹²

The recent anti-nuclear protests followed other major mass campaigns, including a student-led occupation of Taiwan's parliament in March to oppose a controversial trade agreement with China; a campaign that successfully pressured the government to stop construction of a petrochemical plant; and a 100,000-strong protest over the death of a mistreated conscript.²

The greatest single reason for opposition to the nuclear plant is that Taiwan is located in the seismically active Pacific Ring of Fire. In September 1999, a 7.6-magnitude earthquake killed around 2,400 people. A 2011 report by the Natural Resources Defense Council found that all six of Taiwan's operating reactors are located in very high seismic hazard areas.¹⁰ The report states: "With respect to earthquake and tsunami hazards, and large nearby populations, Taiwan's six reactors represent outliers in terms of high risks and consequences from a nuclear reactor accident."

Last year, a consultant on the Lungmen plant's safety monitoring committee publicly released a report detailing a number of construction problems and safety concerns.³ A safety assessment carried out by the European

Commission and the European Nuclear Safety Regulators Group led to recommendations to use more modern techniques in identifying earthquake-related hazards that could affect nuclear power plants in Taiwan. The 2013 report suggested that Taiwanese assessments regarding earthquake hazards do not meet current international requirements and do not take into consideration new geological and geophysical data regarding "capable faults in the site vicinity of the Chinshan, Kuosheng and Maanshan plants." The report also recommended greater consideration of multi-reactor and multi-site risks, and the establishment of alternative emergency control rooms.⁴ The inadequacy of nuclear accident liability arrangements is another reason for concern.⁵

Radioactive waste

Radioactive waste management problems have also motivated opposition to nuclear power in Taiwan. Central Taiwan Antinuclear Action Alliance convener Tsai Chih-hao says that a group of citizens have discovered 54 sites across Taiwan with elevated radiation levels. There are concerns that the elevated readings may be connected to Taipower's practice of incinerating low-level radioactive waste.⁶

There is no prospect of finding a disposal site for high-level nuclear waste (spent fuel) in the foreseeable future, and the dense packing of spent fuel at operating nuclear plants is another concern. According to Taipower's Spent Nuclear Fuel Final Disposal Program Plan, a final disposal site for high-level waste is to be decided by 2038 and ready to use by 2055.⁷

Atomic Energy Council Deputy Minister Chou Yuan-ching told a May 5 hearing of the parliament's Social Welfare and Environmental Hygiene Committee that 16,671 spent fuel bundles produced by the three operating nuclear plants are being kept in the plants' spent fuel pools. Vice Minister of Economic Affairs Woody Duh told the Committee that because the pools at the first and second nuclear power plants are unable to store all the spent fuel bundles produced in the plants' lifespan of 40 years, the government hopes to move the bundles to dry cask storage facilities.⁷

Chou told the Committee that an estimated 740,000 barrels of low-level radioactive waste – including 292,048 barrels produced during the three plants' 40-year lifespan and 455,783 barrels produced during the decommissioning process – are to be created by the three plants. About 100,000 barrels are stored on Lanyu (Orchid Island) while others are in storage facilities at the three plants.¹¹ Chou said that in 2012 the ministry named Taitung County's Tajen Township and Kinmen's Wuchiu Township as potential sites for a low-level waste repository, but the two local governments have not agreed to hold local referendums.⁷

Yilan Charlei Chen Foundation president Chen Hsi-nan told the Committee that the design of Taiwan's dry cask storage does not allow spent fuel bundles to be removed or transported to other sites, because it lacks

sufficient vibration-proof and crash-proof material. He Li-wei, a nuclear expert who worked at the Institute of Nuclear Energy Research, said that seven hydrogen explosions occurred when the institute tried to remove fuel bundles from pools 26 years ago in Taoyuan County's Longtan Township.⁷

Over the decades various plans to send radioactive waste abroad have been advanced and then abandoned.¹³ On May 12 Kyodo News reported that Taipower has initiated discussions with French officials regarding the possibility of spent fuel reprocessing in France. This follows delays and opposition to the construction of an interim dry storage facility in New Taipei City. Taipower also told Kyodo News that discussions have been initiated with Beijing regarding the possibility of disposing of low-level radioactive waste in China given the obstacles to establishing a repository in either Wuchiu or Tajen Townships.

Referendum

Whether the fourth nuclear power plant will become operational in the future will be decided by a national referendum – though the timing is uncertain and the nature of any referendum will be contested. Ironically, the pro-nuclear KMT has supported a referendum despite widespread public opposition to the Lungmen plant (more than 70% of Taiwanese are opposed according to DPP Chairman Su Tseng-chang, and a March 2012 poll found 66% opposition among Taipei residents). The reason is that none of the six national referendums held in Taiwan since the Referendum Act came into effect in January 2004 has achieved the required 50% voter turnout, even when held in conjunction with national elections.

In August 2013, 40 politicians from the largest opposition party, the Democratic Progressive Party (DPP), barricaded themselves inside the legislative chamber and remained there overnight to prevent a parliamentary vote on whether to hold a referendum on the completion of the Lungmen plant. A physical brawl ensued the following morning and the parliamentary vote did not take place.³

The DPP has called for the Lungmen plant to be scrapped without holding a referendum. The DPP has also called for a referendum to require a majority vote for or against the Lungmen plant without a minimum turnout

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Protests against 'Nuke 4'
in Taipei in late April.



or with a minimum 25% turnout. The KMT opposes those proposals but may have to modify its position given the strength of public and political opposition.

DPP member and former Taiwanese Vice President Annette Lu has called for an amendment to the Nuclear Reactor Facilities Control Act to allow local referendums for residents to decide whether nuclear plants should be built within 50 kms of their homes. Lu said that according to Article 11 of the Act on Sites for the Establishment of Low-Level Radioactive Waste Final Disposal Facilities, sites for building nuclear waste final depositories must be approved by local residents through referendums. Lu said the law should be amended so that people living within 50km of plant sites can decide on the construction, installation of fuel rods and operation of reactors through local referendums.⁸

The government says that a national energy conference will be convened as soon as possible to ensure a steady supply of electricity in the future. The KMT and Taipower have warned of power shortages and steep price hikes to justify their support for the Lungmen plant. But even without the Lungmen plant, Taiwan has a 22% reserve margin according to Prof. Jeffrey Bor Yunchang from the Chinese Culture University, in part because factories have moved to China or south-east Asia. "If the government can invest more in other alternative energies like solar power, like wind power, like geothermal, then we can have more alternative power to our energy supply," Yunchang said.⁹

Construction began on the two 1350 MW Lungmen boiling water reactors in 1999, with the first originally scheduled to enter commercial operation in 2006 and the second in 2007. However, the project has been beset with political, legal and regulatory delays.

The DPP is calling for a phase-out of nuclear power, and even the KMT has pledged to make Taiwan nuclear-free by the middle of this century. Six reactors at three plants currently provide about 18% of Taiwan's electricity – well down from the peak of 41% in 1988.

Regulation of ionizing radiation – Prevention is the only real protection

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NM786.4390 A US federal agency has announced that it is considering an update to a regulation that has been on the books since 1977 intended to “protect” the public from radioactivity released by industries involved in the production of electricity from atomic fission. When one prods any institutional regulation of ionizing radiation, one can see that the function of the document is as much to *allow* the irradiation of the populace and the contamination of the biosphere, while limiting the liability of the corporations that would otherwise be “responsible” for harm, than it is to limit that exposure. If it is a limit, it is a “bag limit” for the nuclear industry; a license to kill, but, at least in theory only so many.

It is not at all clear why the U.S. Environmental Protection Agency (EPA) is raising the specter of a revival of nuclear energy and reprocessing in the US, as well as “new” nuclear technologies as the basis for its possible revision of the nation’s Environmental Radiation Protection Standards for Nuclear Power Operations, known in “the lingo” as 40CFR190.

As *Nuclear Monitor* readers know, the air has gone out of a nuclear power revival in the USA, and the so-called “new” technologies are previously failed things like high-temperature breeders and reprocessing that are anything but new. This opens the question: if this possible nuclear future is the basis for changing the applicable national radiation standards, is the change intended to protect the public from these industrial activities? Or is a revision of standards *required to enable* further nuclear development?

The Nuclear Information and Resource Service (NIRS) has posted a backgrounder on previous radiation standard updates that were advertised as “updated” but in fact allowed larger amounts of radioactivity in air, water and generally in our environment. See: www.nirs.org/radiation/radstds/radstdshome.htm

The EPA “advance notice of rulemaking,” background documents, and opportunity for you to comment on this advance notice by June 4, 2014 are posted at www.epa.gov/radiation/laws/190/

- EPA particularly wants public comments on these six issues:
- Should EPA express its limits for the purpose of this regulation in terms of radiation risk (x cancers per 1000 people exposed) or radiation dose (x millirem or millisieverts)?
- Should, and how should, EPA update the radiation dosimetry methodology incorporated in the standard?
- Should EPA retain radionuclide release limits in an updated rule and, if so, what should the Agency use as

the basis for any release limits?

- How should a revised rule protect water resources? The existing rule assumes that air is the primary exposure pathway with no consideration of ground water that could be a current or future source of drinking water. In the US, EPA’s existing drinking water standards are generally more protective than most other radiation regulations, and this regulation could be weakened by an “update” rather than providing greater protection.
- How, if at all, should a revised rule address storage of highly radioactive “spent” or irradiated nuclear fuel and high-level radioactive waste?
- What new technologies and practices have developed (or might develop) since 40CFR190 was issued, and how should any revised rule address these advances and changes?

The EPA regulation was published in 1977 but the US Nuclear Regulatory Commission (NRC) is supposed to enforce it. The NRC standards are quite different from EPA’s limits and in most cases allow higher radioactive releases. NRC assumes that the EPA’s more protective levels are being met if its own are being met. Neither can be directly measured or applied to any given individual and NIRS continues to seek any documentation that the regulations are actually enforced.

‘Key principles’

With candor EPA reveals in its notice that “protection” of the population is only part of the mandate it has for this regulation. The second “key principle” is “careful consideration” of the cost and effectiveness of measures available to reduce or eliminate radioactive releases. EPA states that it “found it necessary to balance the health risks associated with any level of exposure against the costs of achieving that level” (39 FR 16906, May 10, 1974). EPA affirms that this dichotomy, and commitment to keeping the nuclear industry viable will continue with what it terms “cost-effective health risk minimization.” In other words, the nuclear industry is allowed to kill some number of us, and it need not go to great expense to reduce that number.

The community of independent experts and concerned public tracking these issues in the USA do not have much hope for improving or strengthening the regulation; indeed it seems these days to be a pitched battle to preserve the existing terrible status quo. There are some who see a shift to a risk-based approach as the best hope for preserving the current level of protection, and perhaps shaming EPA into a more stringent level of protection by calling on it to drop the “privilege” that radioactivity as a regulated carcinogen has “enjoyed” up to now. Current NRC limits result in what NRC says

is a risk of 3.5 fatal cancers per 1000 people exposed over a lifetime of 70 years. NRC is likely assuming the 1000 people exposed are all “Standard Men” or perhaps with a small adjustment factor (insufficient to reflect the actual general population). A simplified number reflecting the current NRC regulatory limit of 100 millirems (1 millisievert) per year is 1 cancer death in every 286 exposed over a 70 year lifetime.

Overall EPA states that it has a goal from industrial contamination of one in a million people exposed getting cancer (only about one-half of cancers are fatal) and will “relax” this goal to as many as to 1 in 10,000 if the 1 in a million cannot be achieved. Obviously current risk levels from allowable radiation exposure lie far outside either 1 in 10,000 or 1 in a million. This has led to the characterization of radioactivity as a “privileged pollutant”.

Nonetheless, the only direct measurement that can be made (and therefore enforced or litigated) are concentrations of radioactivity in air, water, soil and flesh. EPA has developed documents that associate contamination levels and risk. Emission or release levels are a much more complex gambit. It would be nice for people to have direct information. A point of light for the future is the SAFecast effort to create a fleet of radiation detectors that have the same equipment, calibration and interface to a mapping program so that we can finally see radioactivity in our environment and share that information in a coherent way. See: <http://blog.safecast.org/>

Independent experts

Independent experts also see maintaining limits on doses to specific organs is, overall, key to maintaining the level of protection we have now, and are calling for “no backsliding,” that is no increasing allowable contaminations. If the method of calculating dose is changed from organ dose limits (limiting the radionuclides that concentrate in organs, as is the basis for ICRP-2) to the “effective dose” or “effective dose equivalent” method (ICRP 26, 60 and 103), the allowable concentrations of two-thirds of the regulated radionuclides in air and water go up, thus allowing more exposure to those radionuclides. For the other one-third some go down and some stay the same. EPA has resisted raising the allowable concentrations in its Safe Drinking Water regulations, and to be honest about a claim of protection, it is important that standards remain as protective, or

Resources:

Nuclear Information and Resource Service:
www.nirs.org/radiation/radstds/radstdshome.htm

US Environmental Protection Agency webpage on Advanced Notice of Proposed Rulemaking on 40cfr190 (US radiation standards that apply to the commercial nuclear fuel chain):
www.epa.gov/radiation/laws/190/

Federal Register notice:
www.gpo.gov/fdsys/pkg/FR-2014-02-04/pdf/2014-02307.pdf

Official Comment site:
www.regulations.gov/#!documentDetail;D=EPA_FRDOC_0001-15207

Radiation and Gender:
www.nirs.org/radiation/radhealth/radhealthhome.htm

<http://ieer.org/projects/healthy-from-the-start/>



Diane D'Arrigo and Mary Olson
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become more stringent, not less. A relaxation that allows a total body calculation (total effective dose equivalent or TEDE) would be less protective.

In “the weeds” of radiation regulation is still a deeper battle: in order to protect our viability as a species, it is vital that we protect the most vulnerable phases of our lifecycle (juvenile females in the data sets available today are at much greater risk of harm from radiation). It is also vital that we protect the great Tree of Life upon which our own survival depends. EPA does not see these issues as cost-effective; more work must be done for an integrated view that includes the true costs of illness in addition to the costs of the radioactive industry.

Despite claims of “updating” or “more sophisticated modeling”, EPA is not even considering the now-well-known non-cancer health effects. EPA claims cancer is the primary concern, but never gets around to mentioning or considering any others. EPA needs go beyond the International Commission on Radiological Protection “updates” to incorporate and explore further factoring in other radiation health damage. One way to do this would be to apply a Hazard Index (HI) as is done with other hazardous and toxic materials.

EPA should apply the precautionary principle and in considering new nuclear fuel chain facilities, require no backsliding on the current standards which should be strengthened, not relaxed.

Generation IV reactor R&D

NM786.4392 In January, the Generation IV International Forum (GIF) – comprising 12 countries plus Euratom – released its ‘Technology Roadmap Update for Generation IV Nuclear Energy Systems’. It updates the GIF 2002 Technology Roadmap.¹

The GIF has focused its efforts on six reactor concepts, and measures progress according to three (pre-commercialisation) phases:

- the viability phase, when basic concepts are tested under relevant conditions and all potential technical show-stoppers are identified and resolved;
- the performance phase, when engineering-scale processes, phenomena and materials capabilities are verified and optimised under prototypical conditions; and
- the demonstration phase, when detailed design is completed and licensing, construction and operation of the system are carried out, with the aim of bringing it to the commercial deployment stage.

The projections made in the 2002 Technology Roadmap have been revised as follows:

- *Gas-cooled fast reactor*: end of viability phase pushed back from 2012 to 2022; end of performance phase pushed back from 2020 to 2030
- *Molten salt reactor*: end of viability phase pushed back from 2013 to 2025; end of performance phase pushed back from 2020 to 2030
- *Sodium-cooled fast reactor*: end of viability phase pushed back from 2006 to 2012; end of performance phase pushed back from 2015 to 2022
- *Supercritical-water-cooled reactor*: end of viability phase pushed back from 2014 to 2015; end of performance phase pushed back from 2020 to 2025
- *Very-high-temperature reactor*: end of viability phase remains at 2010; end of performance phase pushed back from 2015 to 2025
- *Lead-cooled fast reactor*: end of viability phase brought forward from 2014 to 2013; end of performance phase pushed back from 2020 to 2021.

Averaging across the six reactor concepts: the end of the viability phase has been pushed back by an average of 4.7 years, and the end of the performance phase has been pushed back by an average of 7.2 years. That’s a lot of slippage in the 11 years since the 2002 Technology Roadmap. All the more so since the latest projections may prove to be as optimistic as those in the 2002 report.

The GIF website states: “It will take at least two or three decades before the deployment of commercial Gen IV systems. In the meantime, a number of prototypes will need to be built and operated. The Gen IV concepts currently under investigation are not all on the same timeline and some might not even reach the stage of commercial exploitation.”² The World Nuclear Association is also downbeat, noting that “progress is seen as slow, and several potential designs have been undergoing evaluation on paper for many years.”³

Metal-fuelled, sodium-cooled reactors

One of the Generation IV concepts is a metal-fuelled, sodium-cooled design called the ‘Integral Fast Reactor’ (IFR) or ‘Power Reactor Innovative Small Module’ (PRISM). These reactors might (or might not) operate in conjunction with pyroprocessing – recycling of nuclear fuel without the same proliferation risks as conventional reprocessing (i.e. without the separation of plutonium). IFR/PRISM reactors might (or might not) consume more high-level waste and weapons-useable material than they produce. Better still, they could be “up and running in 5 years – the PRISM is fully proven in engineering terms and basically ready to go” according to Mark Lynas.⁴ And it only gets better: these reactors will be dirt cheap. IFR cheerleader Steve Kirsch says the first 1 GWe IFR will probably cost around US\$1–2 billion.⁵

As discussed in Nuclear Monitor #777, those claims need to be treated with scepticism.⁶ The UK Nuclear Decommissioning Authority (NDA) is considering the use of PRISM technology to manage the UK’s stockpile of separated plutonium. But the NDA notes that the facilities required by the PRISM approach have not been industrially demonstrated. Internal 2011 emails, released under Freedom of Information laws, revealed that the NDA said it had carried out a “high-level assessment” of PRISM and “the technology maturity for the fuel, reactor and recycling plant are considered to all be low”. Disposal of the waste produced by PRISMs is another unresolved issue, which could be further complicated if it is deemed necessary to remove sodium from spent fuel to facilitate safe, long-term disposal. As for the economics, General Electric Hitachi refuses to release estimates of PRISM capital and operating costs, saying they are “commercially sensitive”.

The Plutonium Disposition Working Group of the US Department of Energy (DoE) released a report in April which considers the use of Advanced Disposition Reactors (ADR) to manage US plutonium stockpiles (mostly surplus weapons plutonium).⁷ The ADR concept is similar to General Electric Hitachi’s PRISM according to the DoE.

The DoE’s cost estimates for ADRs are as follows:

- ‘capital project point estimate’: US\$9.42 billion
- operating cost estimate US\$33.41 billion
- other program costs: US\$7.62 billion

Which gives a total of US\$50.45 billion (€36.8b), or “more than \$58 billion life cycle cost when sunk costs cost are included.” That is twice as much as the next most expensive option for plutonium management:

- immobilisation (ceramic or glass) with high-level waste: US\$28.65 billion
- irradiation of MOX in light-water reactors: US\$25.12 billion
- downblending and disposal: US\$8.78 billion
- deep borehole disposal: no estimate provided

Claims that IFR/PRISM technology could be operational in five years are as laughable as the cost estimates

provided by IFR/PRISM cheerleaders. The DoE report estimates that it would take 18 years to construct an ADR and associated facilities, with plutonium disposition beginning in 2033 and ending in 2075. Moreover, the DoE report states: “Final design of a commercial fast reactor would require significant engineering and licensing and as such carries uncertainties in being able to complete within the assumed duration.”

On the technical challenges, the DoE report states: “Irradiation of plutonium fuel in fast reactors ... faces two major technical challenges: the first involves the design, construction, start-up, and licensing of a multi-billion dollar prototype modular, pool-type advanced fast-spectrum burner reactor; and the second involves the design and construction of the metal fuel fabrication in an existing facility. As with any initial design and

construction of a first-of-a-kind prototype, significant challenges are endemic to the endeavor, however DoE has thirty years of experience with metal fuel fabrication and irradiation. The metal fuel fabrication facility challenges include: scale-up of the metal fuel fabrication process that has been operated only at a pilot scale, and performing modifications to an existing, aging, secure facility ... Potential new problems also may arise during the engineering and procurement of the fuel fabrication process to meet NRC’s stringent Quality Assurance requirements for Nuclear Power Plants and Fuel Reprocessing Plants.”

In short, the ADR option is associated with “significant technical risk”, and metal fuel fabrication faces “significant technical challenges” and has only been operated at the pilot scale.

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(Written by Nuclear Monitor editor Jim Green.)

A reality check for the uranium industry

NM786.4391 The uranium spot price fell to US\$29 / pound U3O8 on May 5. Not since mid-2005 has the price been so low. The price is less than one-half of the pre-Fukushima price, and less than one-quarter of the price at the peak of the 2007 price bubble.

FN Arena news provides this snapshot: “It is worth noting that prior to about 2005, the uranium spot market was a minor distraction, existing only for the purpose of producers to make up term contract shortfalls or reduce inventories, with traders standing in as intermediaries between producers and utilities. The real uranium market was in term delivery contracts. But then as the China super-cycle became apparent, speculators stampeded into the uranium spot market. The result was a subsequent bubble to 2007 and a spot price of nearly US\$140/lb before a 2008 bust back down to US\$50/lb. Utilities rested on their stockpiles during the madness. Speculators were severely burned but tried their luck again ahead the 2011 tsunami, before being burned again. The final throw of the dice was prompted late in 2013 when it appeared Japan was about to announce reactor restarts. But even that didn’t work. The two big intermediary players – Goldman Sachs and Deutsche Bank – have left the market and the only speculators left still playing, it would seem, are those still caught long. Those speculators are joined by producers stuck with product in an oversupplied market. No one is buying, at least in any quantity. ... If you went on holiday in 2005 and just returned, you would assume nothing much has changed in sport uranium, price or market volume wise. And perhaps that’s the way things are going to be.”¹

Uranium Investing News notes that “the phrase ‘uranium renaissance’ has been uttered so often that it has begun to feel like a bad joke.” Energy metals analyst Chris Berry points to excess supply, the high cost and lead time of nuclear reactor construction, and unease about nuclear energy as contributing to the malaise in the market. One little-mentioned reason for the malaise is that the US government is selling some of its uranium stockpile. Berry says the US Department of Energy has the authority to sell excess supply into the US domestic market and that according to his calculations the Department has about 25 years of supply for US power reactors and can sell an amount each year up to 10% of domestic demand.²

An April 22 FN Arena analysis states: “On the supply side, the Russian HEU agreement ended last year, existing producers have been limiting or mothballing production, new production plans have been shelved, and there remains a risk sanctions will be imposed on exports of Russian enriched uranium. On the demand side, Japan is close to restarting its nuclear reactors and China is ramping up its reactor construction a-pace. After three years in the post Fukushima doldrums, everything has been pointing to a long awaited rebound in price and liquidity. But the opposite has been true. ... What doesn’t make a lot of sense is why utilities are not in there buying at these bargain basement prices. The answer may lie in the fact utilities maintain sufficient stockpiles in case of future supply shocks and hence are not about to run out of fuel, and had already picked up excess Japanese supply, but at some point a restocking phase must begin. That liquidity in the spot market should wane is of no great surprise. Typically the

“real” players – producers and utilities – only enter the spot market on occasion to top up short falls or let go some excess supply. ... Yet there’s been little activity in the term market of late as well.”³

As FN Arena notes, progress towards reactor restarts in Japan “has been glacial and anti-nuclear protest has been powerful”.⁴ Japan’s uranium inventories probably amount to around 100 million pounds (45,400 tonnes) according to David Sadowski, a Raymond James analyst. Sadowski added that many utilities around the world “are sitting on near-record piles” of uranium.⁵ In any plausible reactor restart scenario, it will be a decade or more before Japanese utilities exhaust existing inventories.

The uranium price would be weaker still if not for Chinese purchases and stockpiling. In 2013, China’s total imports reached a record level of 18,968 tonnes of uranium – three times its requirements for operating reactors. Imports in January 2014 were 22% higher than the 2013 monthly average. Since 2006, China has amassed enough uranium to meet current annual consumption eight times over. FN Arena states: “So while there is presently no end in sight to China’s voracious uranium demand, as January imports would attest, at some point China is going to decide it has enough. If this occurs before demand from other major consumers starts picking up, Macquarie warns (and presumably this is a nod to Japan), look out.”⁶

David Talbot, senior mining analyst with Dundee Capital Markets, noted in February that further mergers and acquisitions can be expected: “We do expect further consolidation. Financing is more difficult than ever. Project timelines are lengthy and costly. With some companies unable to secure supplies to advance projects, we expect further delays and/or corporate insolvencies. What often happens is the predator comes in and takes out its prey at pennies on the dollar relative to its underlying net asset value.”⁷

French state-controlled nuclear group Areva’s first-quarter revenue from its uranium mining unit fell 63%.⁸ One of Areva’s problems is stalled negotiations with the Nigerien government over uranium mining operations in the African country. As previously reported in Nuclear Monitor, the mining arm of Russia’s Rosatom has frozen uranium expansion projects in Russia and elsewhere, and Cameco has abandoned its earlier uranium production growth targets. “The next 18 months we see as being a very difficult period for the market,” said Cameco President and CEO Tim Gitzel in a May 9 interview. “We continue to look to the future, the future is bright for nuclear energy.”⁹

A nuclear insider’s view

Just about everyone in and around the uranium industry consoles themselves with the thought that uranium prices will have to rebound sooner or later to stimulate new production which will be required even if global nuclear power capacity continues to stagnate. A contrary view comes from Steve Kidd, an independent consultant and economist with 17 years of work at the World Nuclear Association and its predecessor, the Uranium Institute.¹⁰

Writing in the Nuclear Engineering International Magazine on May 6, Kidd states that “the case made

by the uranium bulls is in reality full of holes” and he predicts “a long period of relatively low prices, in which uranium producers will find it hard to make a living.”

Kidd argues that the replacement of inefficient gaseous diffusion enrichment plants with centrifuge enrichment plants is a “crucial” factor: “Enrichment is now expected to remain cheap and abundant as centrifuge plants are modular and capacity can be expanded relatively easily to meet demand, so this substitution of enrichment for uranium will continue to be important.” Huge stockpiles of depleted uranium represent “an attractive resource while there is overcapacity in enrichment and cheaper prices”.

Kidd notes that despite all the hype about nuclear growth plans, uranium demand did not rise from 2003–2010 as shutdowns of ageing reactors were balanced by the commissioning of new units (mostly in China). Yet uranium production increased by 50% (mostly in Kazakhstan). Hence the over-supply in the world uranium market, lower prices, and an upsurge in uranium inventory levels in the US, Europe and Japan.

Kidd states that most nuclear growth to 2030 will be concentrated in China and Russia. But “uranium demand will almost certainly fall in the key markets in Western Europe and North America”, and in Japan it will take a “long time to unwind the inventory accumulation”.

In short: “Those who believe in higher uranium prices take an over-optimistic demand scenario.”

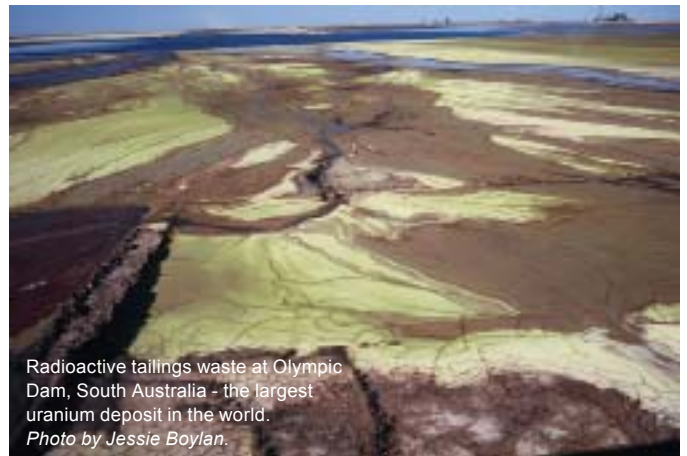
Kidd argues that we are entering a new era, where the uranium market is split into three:

- The Chinese will favour investing directly in mines to satisfy their requirements; they are not going to ‘play ball’ with the established uranium market.
- The Russians will continue to be significant nuclear fuel exporters but their own market will remain essentially closed to outsiders. They still have secondary supplies to tap into (plenty of surplus highly-enriched uranium remains to be down-blended) and they will follow the Chinese and invest directly in uranium assets if their own domestic production remains constrained.
- The established uranium producers will have the remainder of the market to satisfy and that will likely be declining in magnitude. In the US, the number of operating reactors will fall by 2030 and the overall European situation will be one of “gentle decline”.

Kidd pulls the threads of his argument together: “This market segmentation and the way the Chinese and Russians will operate means that the two prime analytical devices utilised in the uranium market are both now useless. First, calculated annual world supply-demand balances (miraculously often showing a shortage after 3-5 years) are irrelevant in a segmented market, where key actors with expanding demand choose to go it alone. For a time in the early 2000s, it looked as if a globalised world nuclear fuel market could emerge, but this has not happened and it is arguably now going into reverse. Secondly, uranium supply curves (based on mine cost data), demonstrating the need for higher prices as demand expands, are also

invalidated. China and Russia (and probably India too, if it eventually gets its nuclear act together) will develop uranium assets wherever it best suits them. They have the confidence to bypass the conventional market, which could increasingly become merely a sideshow.”

Kidd concludes: “In this fifth age of uranium, prices will essentially be determined by the cash costs of production of operating mines (and not by the full costs of future mines). This means a reversion to the long period of low (but relatively stable) uranium prices of the late 1980s and 1990s (the third age), but at a higher level to reflect the greater level of production now, the escalation of mining costs and the movements in currency exchange rates. The shortages predicted by many analysts (leading to rapid price increases to provide good rates of return on their favourite projects) are purely a mirage. The outlook is therefore not favourable for either current or prospective uranium



Radioactive tailings waste at Olympic Dam, South Australia - the largest uranium deposit in the world.
Photo by Jessie Boylan.

producers. Only those with low-cost operations will prosper. Others will struggle to stay in business and further mine closures ... are definitely on the horizon.”

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(Written by Nuclear Monitor editor Jim Green.)

NUCLEAR NEWS

Global Day of Action on Military Spending

Once again the worldwide Global Day of Action on Military Spending (GDAMS) has shown the strength of public feeling about excessive military spending, and the urgent need to re-allocate the money to different priorities. The 2014 GDAMS on April 14 featured around 125 actions in 25 countries and an extraordinary range of creative events: from parliamentary symposiums, petitions and street theatre to ‘Penny Polls’ and die-ins. There were events in Paraguay and the Philippines, in villages in Rajasthan and on the Peace Boat at the Suez Canal. In California, two dozen organisations distributed 15,000 pieces of literature at 34 rapid transit stations. In addition, the International Peace Bureau coordinated a bigger presence than ever on social media, including a ‘selfie’ campaign, a ‘Thunderclap’ and lively networking via Facebook and Twitter.

– International Peace Bureau

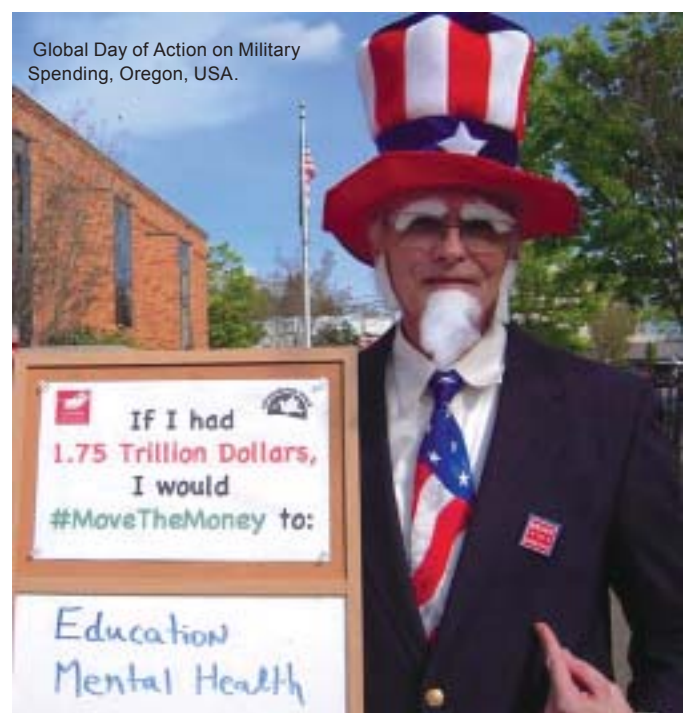
<http://demilitarize.org/>

www.facebook.com/globaldayofactiononmilitaryspending
twitter.com/@demilitarizeday

The SIPRI Arms Transfers Database now contains information on all international transfers of major conventional weapons from 1950 to the end of 2013. A new Fact Sheet describes trends in international arms transfers that are revealed by the new data. It lists the main suppliers and recipients for the period 2009–13 and

describes the changes in regional trends. The SIPRI data reveal that global military expenditure at 2.4% of global GDP totalled US\$1.75 trillion (€1.28t) in 2013.

www.sipri.org/media/pressreleases/2014/AT_march_2014



Global Day of Action on Military Spending, Oregon, USA.

India: Uranium ore truck set ablaze

Transport of uranium ore from the Bagjata mine to the Uranium Corporation of India Limited (UCIL) processing plant was suspended after an ore-laden truck was torched by Maoists on May 7. Fifteen armed people pulled the driver down from the vehicle and then set it ablaze. The Maoists have reportedly been demanding permanent jobs for locals as compensation for acquisition of their land in Bagjata. About 150 families were displaced to make way for the Bagjata mine and have not been compensated. "If such violent activities continue to recur time and again, we apprehend it wouldn't be easy for us to function here," a senior UCIL official said.

www.dnaindia.com/india/report-maoists-set-truck-carrying-uranium-for-ucil-ablaze-1986317

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Renewable energy provides 6.5 million jobs globally

In 2013, approximately 6.5 million people were employed in the renewable energy industry worldwide, according to the 'Renewable Energy and Jobs - Annual Review 2014' report of the International Renewable Energy Agency. The figure is up from 5.7 million jobs in 2012. The largest employers by country are China, Brazil, the US, India, Germany, Spain and Bangladesh; while the largest employers by sector are solar photovoltaic, biofuels, wind, modern biomass and biogas.

The report is posted at www.irena.org/REjobs

Meanwhile, Sub-Saharan Africa's lack of electricity is hindering development but this can be reversed if countries turn to large-scale renewable energy projects, according to a report by the Green Alliance with the support of Christian Aid, Greenpeace, RSPB and WWF. The region – home to 41% of the world's energy-poor people – faces an energy crisis that development models are not addressing. Laura Taylor, head of Christian Aid, said: "Sub-Saharan Africa suffers from an acute energy crisis, with 70% of the population lacking access to electricity. Low-carbon, off-grid energy can address this faster and cheaper than high-carbon options – alleviating poverty in the process."

The report, 'The low carbon energy lift: powering faster development in sub-Saharan Africa', is posted at www.green-alliance.org.uk/grea_p.aspx?id=7400

Sweden: support for nuclear power wanes

A new survey has revealed that 50% of Swedes want nuclear power to be phased out, up from 44% in 2011 and 31% in 2007. But the figure is still well short of the 75% who supported nuclear phase-out in 1986, in the aftermath of the Fukushima disaster.

www.thelocal.se/20140503/swedish-support-for-nuclear-power-wanes

US: Cuts to nuclear security funding

A group of 100 former government officials, peace advocates and experts have criticised the White House for planning to cut nuclear security funding next year. Cuts are planned to the Global Threat Reduction Initiative, International Nuclear Materials Protection Program, and the Cooperative Threat Reduction program.

The joint letter is posted at: http://livableworld.org/nonpro_letter_fy15/

Nuclear Resister E-Bulletin

The latest Nuclear Resister E-Bulletin is available and includes reports on:

- four people arrested for blocking a cement truck to Jeju Island naval base construction site, South Korea
- NATO 3 sentenced to 5–8 years in prison
- Good Friday actions at nuclear and drone-related sites throughout the US
- two Veterans for Peace actions at Beale air force base
- a protester arrested during a drone protest at Whiteman air force base
- nine anti-drone activists arrested at Creech air force base
- Israeli nuclear whistleblower Mordechai Vanunu.

To read more and to subscribe to the Nuclear Resister E-Bulletin or the print edition, visit: www.nukeresister.org

US: National campaign to clean up abandoned uranium mines

Organisations from throughout the US held an Earth Day ceremony to launch a nation-wide campaign to clean up hazardous abandoned uranium mines (AUMs). *Clean Up The Mines!* calls for effective and complete eradication of the contamination caused by the estimated 10,000 abandoned uranium mines that are silently poisoning extensive areas of the US. *Clean Up The Mines!* volunteers from across the country toured abandoned mines in late April.

Organisations involved in the campaign include Defenders of Black Hills, Clean Water Alliance, Dakota Rural Action, Peace Pagoda, Veterans for Peace, Popular Resistance and others. Charmaine White Face, a scientist and coordinator of Defenders of the Black Hills, said: "For the American public to be exposed to radioactive pollution and not be warned by federal and state governments is unconscionable. ... Currently no laws require clean up of these dangerous abandoned Uranium mines. We are letting Congress know: It is time to clean up the mines! We value persistence. We will employ a variety of tactics including legislative and judicial avenues to hold the government and corporations accountable for their negligence and community-based actions to raise awareness and clean up the mines."

More information:

Clean Up The Mines – www.cleanupthemin.es.org, cleanupthemin.es@gmail.com

Defenders of Black Hills – www.defendblackhills.org, Charmaine White Face bhdefenders@msn.com

Marshall Islands legal challenge to nuclear weapons states

A small Pacific nation, the Republic of the Marshall Islands, has decided to take legal action against the nine nuclear-armed countries. The Marshall Islands is taking its case to the International Court of Justice in The Hague and also filing against the US separately in Federal District Court in San Francisco. The lawsuits argue that the nuclear disarmament obligations apply to all nine nuclear-armed states as a matter of customary international law. The courts are being asked to declare that the nuclear weapon states are in breach of their obligations under international law and order them to begin negotiating in good faith to achieve a cessation of the nuclear arms race and a world with zero nuclear weapons. The Marshall Islands were used for 12 years as a nuclear testing ground by the US.

At the www.nuclearzero.org website, you can sign a petition and learn more about the Marshall Islands and the lawsuits. Other resources are posted at: www.wagingpeace.org/nuclearzero

Intransigence from weapons states at NPT PrepCom

Ray Acheson from WILPF's Reaching Critical Will program summarises the recently-completed Nuclear Non-Proliferation Treaty Preparatory Committee (NPT PrepCom):

After two weeks of discussion, the NPT PrepCom closed without adopting the Chair's draft recommendations to the Review Conference. There were some positive outcomes, however. There is clarity on where things stand with the nuclear-armed states and an emerging vision and determination about what to do about it. The logic of prohibiting nuclear weapons as a means to facilitate their elimination is hard to dismiss. Against the background of growing frustration with protracted deadlock and the continued refusal by the nuclear-armed states to meet their obligations, it is becoming an increasingly compelling way forward for many delegations.

It became clearer than ever during the course of this PrepCom that the nuclear-armed states have failed to meet their obligations from 2010; that they and some of their allies intend to push for an indefinite extension of the action plan containing those obligations; and that the nuclear-armed states will refuse to take on any new commitments related to nuclear disarmament. The nuclear-armed and nuclear-dependent countries continue to see value in nuclear weapons. This value stems from these states' dogmatic commitment to outmoded, irresponsibly risky, and obviously unsustainable, notions of "nuclear deterrence". These states' efforts at this PrepCom have chiefly been oriented toward preserving their dominance over the possession and status of these weapons. Putting forward a set of hollow commitments as "practical next steps," these countries have tried to close the space for pursuing effective measures for nuclear disarmament. ...

By pushing back against any and all forward movement, nuclear-armed and nuclear-dependent states have created opportunity and incentive for non-nuclear-armed states to take the lead on nuclear disarmament. These states have the space now to build on the humanitarian reframing of nuclear weapons by working to prohibit them through an international treaty. This is a step that they can take, even in the face of continued stalling from the nuclear-armed states. Indeed it is a step that they must take. It is an approach will help bridge the gap between the aspirations for nuclear disarmament and the seemingly intractable legal and political landscape that exists today. And while the nuclear-armed states should be encouraged to come along, such a course of action need not rely on overcoming their intransigence. Instead, a ban treaty might be just the thing to unlock it.

Ray Acheson's full report is posted at: www.reachingcriticalwill.org/disarmament-fora/npt/2014/nir/8790-final-edition-vol-12-no-11

Detailed resources on the 2014 NPT PrepCom are posted at: www.reachingcriticalwill.org/disarmament-fora/npt/2014

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

Subscriptions:

US and Canada based readers should contact NIRS for details on how to receive the Nuclear Monitor (nirsnet@nirs.org).

All others receive the Nuclear Monitor through WISE.

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