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Editorial

Dear readers of the WISE/NIRS Nuclear Monitor,

In this issue of the Monitor:

- M. V. Ramana and Ali Ahmad from Princeton University write about Saudi Arabia's expensive quest for nuclear power.
- Nuclear Radiologist Peter Karamoskos writes about the nuclear power / climate change debates.
- Michael Mariotte writes about the ongoing debate over the proposed nuclear waste dump at Yucca Mountain, Nevada.
- Jim Green writes about Albert Einstein's views on nuclear weapons.
- We summarize critical responses to a uranium supply contract between Canada and India.
- We summarize a report by Nuclear Transparency Watch on inadequate emergency planning and response measures in Europe.

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

World Uranium Symposium

The World Uranium Symposium took place in Quebec City, Canada, from April 14−16. Over 200 people participated, from 25 countries. The Symposium addressed a range of issues including uranium mining, radioactive waste, aboriginal rights and nuclear weapons proliferation.

Chief Richard Shecapio of the Cree Nation of Mistissini said:

"The Cree Nation has been devoted to this cause for many years now. We have fought tirelessly, and have been vocal in our opposition to uranium development on our territory. Events like the International Uranium Film Festival and the World Uranium Symposium serve to tell the stories of other people – both aboriginal and non-aboriginal – who have been affected by all phases of the nuclear cycle. It has never been more clear that the legacy of uranium development is unacceptable, and we must all do our part to put an end to it."

Monitored this issue:

Saudi Arabia's expensive quest for nuclear power	**2**
Fukushima and beyond: nuclear power in a low-carbon world	**4**
Yucca Mountain opposition: it's not just Harry	**6**
Albert Einstein on nuclear weapons	**7**
Cameco signs uranium contract with India	**9**
Europe is ill-prepared for a Fukushima-level accident	**10**

Peter Watts and Barb Shaw from Australia, at the World Uranium Symposium in Quebec.

Peer de Rijk from WISE Amsterdam said:

"The Symposium brought together a good mix of experts and activists, and people from countries involved in all aspects of the nuclear fuel chain from uranium mining to nuclear power and waste management, as well as those affected by the nuclear weapons industry. Almost all participants were already critical of the nuclear industry so in hindsight it may have been more productive to spend more time strategizing and less time on information sessions."

More information, including the Symposium Declaration, is posted at www.uranium2015.com/en

Saudi Arabia's expensive quest for nuclear power

Authors: *M. V. Ramana and Ali Ahmad − Program on Science and Global Security, Princeton University*

NM802.4461 In the midst of all the news in recent weeks over the deal with Iran, it would have been easy to miss the news that another Middle Eastern state is moving towards acquiring its own nuclear reactors − Saudi Arabia.

In March 2015, following a meeting in Riyadh between South Korean president Park Guenhye and Saudi's newlycrowned King Salman bin Abdulaziz al Saud, the Korea Atomic Energy Research Institute and Saudi Arabia's King Abdullah City for Atomic and Renewable Energy (KACARE) signed a memorandum of understanding to, *inter alia*, carry out a preliminary study to review the feasibility of constructing Korean Small Modular Reactors in Saudi Arabia.[1] Later the same month, along with Argentina this time, Saudi Arabia set up a joint venture company to develop nuclear technology for Saudi Arabia's nuclear power program.[2]

Saudi Arabia has had a long-standing, although limited, interest in nuclear technology and these agreements are just the latest developments in that history. Other countries that have signed agreements with Saudi Arabia include France and China. Many more in the nuclear industry are hopeful of profiting from the Gulf country's interest. As Westinghouse chief executive Danny Roderick remarked in 2013, "We see Saudi Arabia as a good market for us."[3]

The stated arguments for nuclear construction are mostly familiar. As a royal decree from April 2010 put it in the case of Saudi Arabia: "The development of atomic energy is essential to meet the Kingdom's growing requirements for energy to generate electricity, produce desalinated water and reduce reliance on depleting hydrocarbon resources."[4]

Economic comparison

One further argument that is sometimes offered is economic competitiveness: as the President of KA-CARE stated in 2012, "nuclear energy is in many respects competitive with fossil fuels for electricity generation though the initial capital expenditure might be high."[5]

This is a somewhat strange argument to be making. Nuclear power has been struggling to compete in electricity markets around the world and it is hardly likely that in a country with no experience in building nuclear reactors, this world wide trend will suddenly be broken. Therefore, we decided to evaluate these arguments by examining the economics of nuclear power in the case of Saudi Arabia.[6] Here we summarize our results.

We compared the electricity generation cost from nuclear reactors with three alternatives: natural gas based power plants, solar energy from photovoltaic cells and concentrated solar power stations. What we found was that unless natural gas prices rise dramatically, that would remain the cheapest source of electricity generation − nuclear electricity would be more than twice as expensive than that produced by gas. The reason is simple: the very high capital cost of constructing a nuclear reactor, typically running into several billions of dollars. For example, the latest estimate for one of the three ongoing projects in the United States, in which two new 1,117-MW reactors are being built near Jenkinsville, S.C., is $11 billion.[7] Electricity from gas would continue to be cheaper even if a relatively high carbon cost (even above $150/ton-CO2 in some scenarios) were imposed.

This large cost difference also negates the oft-made point about the foregone opportunity cost that is said to result from Middle Eastern countries consuming their natural gas resources instead of exporting these. It turns out that when the costs of liquefying and shipping of natural gas are taken into account, a country like Saudi Arabia should be assured of prices well above the current and historical global average for decades before replacing a natural gas plant with a nuclear reactor becomes an economically sound choice. The downward pressure caused by U.S. shale gas expansion and the volatility of the natural gas market does not allow for reasonable confidence in such a high gas price − certainly not enough to sink in billions of dollars into nuclear reactors and natural gas liquefaction facilities.

But in the case of oil, our analysis showed that it does make economic sense to shut down oil based power plants and replace those with nuclear reactors − or natural gas. But Saudi policy makers may have already realized that and nearly 100 percent of installed capacity in recent years is based on natural gas.

Solar power

The surprising result that came out of our analysis was that solar technologies are very competitive with nuclear reactors. The key point is that it would take at least a decade, quite possibly more, for a country like Saudi Arabia to generate its first unit of nuclear electricity, even if the decision were to be made tomorrow, and solar photovoltaic and concentrated solar technologies have both been experiencing dramatic declines in prices.[8] Based on current trends, the cost of electricity from solar plants would become cheaper than from nuclear plants around the end of this decade or soon after in areas like the Middle East with ample sunshine.

Nuclear reactors, in contrast, are not becoming cheaper. Some studies[9] find evidence of "negative learning" wherein nuclear costs rise as more reactors are constructed.[10] Past reactor construction projects have often taken longer and have cost more than initially projected; indeed, significant escalation can be taken as inevitable given the nuclear industry's tendency to under-estimate costs and construction times. The best recent example comes from Olkiluoto in Finland, where

just the losses that Areva has accrued when compared to the initial contract price exceeds 5 billion euros.[11] Commissioning of the reactor has been delayed by nearly a decade compared to initial projections.

The thirteen years or more that it could take to get the Olkiluoto plant to generate electricity is exceptionally long, but the average period it takes to construct a nuclear reactor anywhere in the world is about eight years. This does not include the time spent before construction on building infrastructure, regulatory activities, and so on. In general, one can assume that it would take a decade or even two for a nuclear plant to go from planning to commissioning.

Small modular reactors

The specific reactor design that was the subject of the recent agreement between Saudi Arabia and South Korea is called the SMART, one of the many designs that are called small modular reactors (SMRs). SMRs, with power outputs of less than 300 MWe, are being promoted by nuclear establishments in many countries.

The term small is used to indicate that the power level is much lower than the average power delivered by currently operating reactors. Modular means that the reactor is assembled from factory-fabricated parts or "modules". Each module represents a portion of the finished plant built in a factory and shipped to the reactor site. Modularity is also used to indicate the idea that rather than constructing one large reactor, the equivalent power output will be generated using multiple smaller reactors that allow for greater tailoring of generation capacity to demand.

SMRs such as the SMART are likely to be even more expensive ways of generating electricity than the large nuclear reactors being built today. Small nuclear reactors are cheaper in absolute terms, but they also generate less electricity. When the two factors − smaller overall cost and smaller generation capacity − are taken together, the cost per unit of electricity for small reactors generated turns out to be higher that for large reactors. This is why reactors became larger and larger over the 1960s to the 1980s/1990s. Thus, it seems likely that SMRs will lose out on the economies of scale that standard sized (roughly 1000 MW) reactors benefit from.

SMR proponents claim that because new reactor designs are different, the comparison with traditional reactor costs is invalid and the scaling law does not hold. They also claim that even if there are diseconomies of scale, these can be compensated by the economic advantages accruing from modular and factory construction, learning from replication, and co-siting of multiple reactors.[12]

Despite these claims, detailed and carefully conducted interviews showed that even experts drawn from, or closely associated with, the nuclear industry expect these reactors to cost more per kW of capacity than currently operating reactors.[13] Therefore, if nuclear power based on large reactors is likely to be expensive, then electricity from the SMART project in Saudi Arabia will be even more non-competitive.

Unless, of course, there are large subsidies involved. In the case of South Korea's deal with the United Arab Emirates, South Korea seems to have subsidized the project substantially; some have estimated the deal with the UAE at being about 20 per cent beneath the industry average.[14] Not surprisingly, the deal was criticized within South Korea as commercially weak and that future customers will demand similar terms.[15]

While there is a long history of systematic under-bidding in nuclear projects, especially in the case of countries with ambitious nuclear programs, this sort of subsidization can be done only for the first one or two projects, and cannot be the basis of a large-scale expansion of nuclear power in Saudi Arabia.

In addition to all the problems of nuclear power, solar power is also very appropriate to Saudi Arabia. There is substantial overlap between the electricity demand and solar insolation patterns[16], and there will be little or no need for constructing expensive storage facilities to deal with the fact that the Sun doesn't shine at night.

In summary, the economic case for Saudi Arabia to build nuclear reactors is non-existent unless natural gas prices shoot up or there is some climate agreement that introduces very high carbon costs. To the extent that countries desire to move away from fossil fuels, switching to solar power makes much more financial sense, and one that might seem naturally suited to local conditions.

Now, if only some other Prime Minister or President were to make a visit to Saudi Arabia to meet with King Salman bin Abdulaziz al Saud and explain why solar power might be a better bet than nuclear reactors, small or large.

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Fukushima and beyond: nuclear power in a low-carbon world

Author: *Peter Karamoskos − Nuclear Radiologist, member of the National Council of the Medical Association for Prevention of War (Australia).*

Review of: Christopher Hubbard, 2014, 'Fukushima and beyond: nuclear power in a low-carbon world', Ashgate Publishing, ISBN 978-1-4094-5491-5

NM802.4462 When Tony Benn was Britain's Energy Secretary, he warned about people who came to you with a problem in one hand, and a solution in their back pocket. He learned this from Britain's nuclear industry. One should keep this in mind when considering climate change as the latest rationale for expansion of the nuclear industry.

This book, authored by a lecturer in International Relations and International Security at Edith Cowan University in Perth, Australia, is rooted in the premise that nuclear power is essential to climate change mitigation.

The Fukushima nuclear disaster is used as a contextual leverage point to argue the counterfactual that this event, and more particularly the response to it, has made nuclear power more desirable than he contends it previously was. As the author states, rather blithely, on the issue of safety, "... simply put, the nuclear energy sector is extremely safe because it must be."

The foundational premise of the book, that nuclear power is *essential* to climate change mitigation is axiomatic to all arguments which follow. If it is not, then nuclear power becomes nothing more than a 'climate choice'.

The problem with this premise, which the author does not challenge, is that if we only address greenhouse gas emissions from electricity generation, then we can't avert climate change. Indeed, an important point not stated until the last chapter is that electricity does *not* account for the majority of greenhouse gas emissions, yet, this is the only sector that nuclear power can influence.

The latest IPCC Report[1] states that the latest global greenhouse gas emissions were 49 gigatonnes (Gt) CO2-eq/yr as of 2010. Electricity and heating accounted for 12 Gt, with electricity alone about 9 Gt. Agriculture, forestry and other land use account for 12 Gt, transport 7 Gt, industry 10 Gt. Other energy sources account for the balance. So, approximately 80% of greenhouse gases (GHG) have nothing to do with electricity.

We need to reduce our GHG emissions by 40–70% of 2010 emissions by 2050 and near-zero emissions by the end of this century if we are to maintain a global temperature rise of <2 °C and thus avoid distressing climate change impacts in ecological and socio-economic systems.

If we assume the (incorrect) argument that nuclear power produces no CO2 emissions and that every kW produced avoids 500 g of CO2-e/kWh being released into the atmosphere (the average carbon intensity of global electricity generation), nuclear power currently abates 1.5 Gt per annum of GHG.

The IAEA in a report advocating nuclear power as a solution to climate change, forecasts two scenarios for the future of nuclear power: a 'low' scenario (435 GW), and a 'high' scenario (722 GW) generation capacity by 2030. However, the claim that the nuclear industry will more than double its capacity over the next few decades (in the 'high scenario') is pure fantasy.

We currently commission about one new reactor a year somewhere in the world. If under the most optimistic conditions we raise that to 8 a year for the next 10 years and 15 a year for the 10 years after that, we simply have replaced the reactors that will be de-commissioned by then. And for every year we do not meet this rate of build, the hill to be climbed gets steeper.

However, assuming that the nuclear industry pulled the proverbial rabbit out of a hat and was able to double its capacity over this time period, and (falsely) assuming that it generates no greenhouse gases itself, it would only abate an additional 2 billion tonnes of greenhouse gases per annum over the existing 1.5 Gt it already abates, i.e. 4% abatement on 2010 emissions. Therefore, how can a 3.6 Gt abatement (assuming it replaces mainly fossil fuels for electricity generation and it does not generate GHG in its life cycle – clearly not the case) be considered indispensable?

Surely it can be readily and quickly replaced with renewables, which can also address several of the other non-electricity GHG-emitting sectors. In 2013 alone, the world brought online 69 GW of solar PV and wind capacity.

If simple arithmetic escapes Hubbard's sanguine assertions as to the desirability and indispensability of nuclear power, also missing from his treatise is consideration of the blatant evidence of nuclear power being in long-term decline – long before Fukushima. The nuclear share of the world's electricity generation has declined steadily from a historic peak of 17.6% in 1996 to 10.8% in 2013.

Nuclear power and renewables in China

Even in China, which has the most ambitious nuclear power program in the world and is the poster child for nuclear boosters, including Prof. Hubbard, more renewable electricity capacity was brought online than nuclear and fossil fuels combined in 2013. This is also reflected in a new assessment by the OECD's International Energy Agency. During 2000–2013, *global* investment in power plants was split between renewables (57%), fossil fuels (40%) and nuclear power (3%).

China set the world record for solar PV implementation in one year at 12 GW (compared with 3 GW for nuclear)

and as of the end of 2013 has more solar PV capacity than nuclear, and five times more wind power than nuclear – and the gap between renewables and nuclear in China keeps increasing. China sees electricity generation capacity as a portfolio enterprise and is clearly putting vastly more bets on renewables than nuclear – as is the rest of the world. China's plan is for 58 GW of nuclear capacity by 2020, but wind alone already exceeded this capacity last year.

Hubbard uses optimistic projections of 300–500 GW nuclear capacity in China by 2050, but doesn't divulge that these have been promoted by the industry itself and have not been approved by the government and are certainly not government policy.

Furthermore, rapid technological advances are also making low-carbon alternatives to nuclear power appear more attractive. Bloomberg New Energy Finance, an industry publisher, forecasts that onshore wind will be the cheapest way to make electricity in China by 2030.

Nuclear output accounts for only 4.4% of global energy consumption, the smallest share since 1984. Renewable energy, on the other hand, provided an estimated 19% of global final energy consumption in 2012 (electricity, heating, transport) and continued to grow in 2013. Of this total share in 2012, modern renewables accounted for approximately 10%, with the remainder (estimated at just over 9%) coming from traditional biomass. Heat energy from modern renewable sources accounted for an estimated 4.2% of total final energy use; hydropower made up about 3.8% and an estimated 2% was provided by power from wind, solar, geothermal and biomass, as well as by biofuels.

Nuclear safety

Hubbard writes off concerns of nuclear safety in the industry with the circular assertion 'safe because it must be' (although the Fukushima disaster, which he analyses in detail using the excellent independent report of the Japanese Diet which declared the 'myth of nuclear safety', actually contradicts his assertion).

Hubbard insists on using China as an exemplar of nuclear safety, yet his research is wanting. Philippe Jamet, a French nuclear safety commissioner, told his country's parliament earlier last year that Chinese counterparts were 'overwhelmed'. Wang Yi of the Chinese Academy of Social Sciences, an expert body, has warned that there are indeed 'uncertainties' in China's approach to nuclear safety.

Hubbard doesn't even touch on the proliferation hazards of an expansion of the nuclear industry (Iran is clearly an inconvenient truth); waves away nuclear waste disposal problems (science will fix it); and fudges the (increasingly deteriorating) economics of nuclear power (conveniently absent is the fact that private investors haven't put a cent into nuclear power for decades, unlike renewables).

Furthermore, Hubbard's description of new Generation IV and small modular reactors (these apparently will solve all major problems, e.g. waste, proliferation, accidents) might as well be no more than a cut and paste from a nuclear reactor sales brochure, in its lack of any critical appraisal of these fantasy claims. These designs are literally still only on paper with no track record, and won't be implemented for decades – if at all (too bad for GHG abatement).

The UK Government's Nuclear National Laboratories have released several reports stating that purported benefits of these new-generation reactors are at best overstated. Furthermore, proliferation hazards abound from proposals to use up existing plutonium stocks in these reactors (it needs to be converted to the bomb-ready metallic form first). Their safety is also questionable despite claims to the contrary, as their designs contravene the 'Defence in Depth' principles of nuclear safety of most nuclear regulators (most lack proper secondary containment, especially small modular reactors). In other words, they might never be licensed because they are not safe.

The author's forte is not radiation science and it shows. He lacks an understanding of the various world bodies involved in nuclear power and radiation science. This is disappointing for someone who claims expertise in the nuclear sector. For example, the IAEA is not a global regulatory body, as he claims, but an advisory body that member states join to provide guidance on implementation of nuclear activities. It has no legal jurisdiction to investigate or advise any member state without an invitation by the relevant member state.

The IAEA *does* have teeth to investigate suspected clandestine-prohibited proliferation-sensitive nuclear-cycle activities, but cannot impose itself (Iran is a case in point) without permission – hardly the global cop the author seems to think it is.

It is the member states themselves which regulate their own nuclear activities. This distinction is critical because it means nuclear safety is dependent on member states willingly implementing international best practice, and furthermore, not engaging in clandestine weapons development. However, where there is a lack of transparency and accountability − the two main principles of nuclear safety − safety is compromised. It is noteworthy that the main countries expanding their nuclear industries are those which rank low on Transparency International's Corruption Perceptions Index.

It is difficult to reconcile the author's views with the real world. The author engages in wishful, uncritical, almost magical thinking on a grand scale in its blandishments of the nuclear power industry.

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Yucca Mountain opposition: it's not just Harry

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

NM802.4463 The conventional wisdom scribes have been falling all over themselves since US Senate Minority Leader Harry Reid announced last month that he won't run for re-election to spout what is obvious to all of them: Reid's exit means Yucca Mountain will finally open.

After all, Super Harry has been single-handedly preventing Yucca from becoming the nation's single most lethal plot of land.

If you've never seen conventional wisdom in action, then you're in for a treat. Here it is, in all its shining glory, in *The Hill: 'Reid's exit removes obstacle to Yucca nuclear waste site'.*[1]

Ignore the 880, mostly inane, comments to the piece and focus on the intro: Reid's retirement "is removing one of the biggest obstacles" to Yucca. Find an anonymous Hill staffer to quote, preferably a Republican:

"There's no question that people are looking around and saying, 'Yeah, this news is good for solving the nuclear stalemate and having Yucca be part of that solution,' a Senate GOP aide said of Reid's planned departure in 2017. There's no reason to oppose Yucca beyond a political calculation, and the math on that just changed."

And make sure to get a quote from Yucca's biggest booster, Illinois Republican Rep. John Shimkus and add the tantalizing possibility that some Democrats support Yucca Mountain (as a few always have).

Bury the actual facts late in the story, after the ads. Like, the fact that likely Democratic presidential nominee Hillary Clinton also opposes Yucca Mountain. As does the state's other Senator Dean Heller, a Republican. And the Republican Governor, Brian Sandoval, as well. Oh, wait, the article does forget to mention that one.

Oh, and some environmental groups also oppose Yucca Mountain.

Actually, it's not just some; it's essentially all environmental and clean energy organizations across the country. When we tallied it up in 2002, more than 50 national organizations and 700+ regional, state and local organizations from across the nation had publicly stated their opposition to Yucca.[2]

So it's not just Nevadans either. And it's not like the number has gone down since 2002; if anything, the number has gone up.

Why is there such widespread opposition to Yucca? It's not because Harry Reid doesn't want the project. It's not blind support for President Obama, who began ending the project as soon as he came into office in 2009. It's because as one of the most studied places on Earth, it's the one place on Earth we know will leak if it becomes a radioactive waste dump − a fact NIRS and other environmental groups have been pointing out, with greater and greater scientific backing, for decades.

I mean no disrespect for Senator Reid here. He's done a terrific job on Yucca Mountain, on renewable energy and on a lot of other things. In fact, I have tremendous respect for Senator Reid.

But I remember when he was the junior senator from Nevada, and Senator Richard Bryan was the senior senator, and very effectively led the Congressional opposition to Yucca which culminated in the 2000 veto by President Clinton of a Yucca/Mobile Chernobyl bill − a veto that was sustained by one vote.

It was Bryan who spoke from the stage at our 1997 anti-Yucca concerts in Washington with Bonnie Raitt, Jackson Browne, Indigo Girls and more. Not Reid.

During the debate on that 2000 legislation, I watched C-Span on my computer and fed Reid's office with information every few minutes to counter the pro-Yucca statements. Reid wasn't as ready then to effectively take on Yucca; Bryan, nearing the end of his political career, didn't need any help.

Indeed, it wasn't until after Bryan retired, and Reid and I had a private meeting in his office, that we became fully comfortable with him in his new role as the lead anti-Yucca spokesperson on the Hill. And he went on to far surpass all of our expectations.

But the opposition to Yucca isn't − despite the conventional wisdom − about Harry Reid. It's about the fundamental fact that putting the nation's lethal high-level radioactive waste in a highly seismically-active zone, where radioactive materials from weapons tests that went into the mountain in the 1950s have since leaked back out of the mountain, makes no sense.

It's about the fundamental fact that even the Department of Energy admits that the mountain provides essentially none of the required prevention of leakage of the waste; the casks − which will rust and decay and the unbuilt and quite possibly unbuildable titanium shields the DOE now says are essential − provide 95% of that protection. If that's the case, and it is, then the waste could go anywhere. Like underneath any of the nuclear reactor sites in the country.

That would be a stupid idea, of course; but it's no less stupid at Yucca Mountain. If we're going to have a permanent waste repository, and we need one sooner or later − sooner if we can end radioactive waste generation sooner − it should at least offer some measure of protection. We know it won't at Yucca Mountain.

The opposition to Yucca Mountain is deep, broad and national. It also has proven its effectiveness over the years. And it's not going away. Senator Reid knows that. That's why he can confidently say, as he did the day after his announcement, that "Yucca Mountain is dead."

The Las Vegas Sun knows that too; that's why their front page article last month on the opposition didn't focus on

Reid, it focused on the grassroots.[3] By the way, the Sun also put a kind article about me and the NIRS' Legacy Fund as a sidebar on the front page too.[4]

Heck, even the Nuclear Regulatory Commission staff know it. They won't even recommend that the project be pursued any longer.

The nuclear industry and its backers are persistent. That's why some battles have to be fought over and over again. But we're just as persistent. Yucca was named as the nation's only high-level radioactive waste site by an ignorant Congress in 1987, to be operational by 1998. It didn't happen, and it won't happen in 2018 or 2028 or any other date either.

We all owe Senator Harry Reid a lot for his efforts over the years. We owe each other a round of thanks too.

For some background on why Yucca Mountain is scientifically unsuitable as a high-level radioactive waste site, and a bit of history on the opposition, visit the NIRS Yucca Mountain page.[5]

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Albert Einstein on nuclear weapons

Author: *Jim Green − Nuclear Monitor editor*

NM802.4464 The world lost Albert Einstein 60 years ago, on 18 April 1955. Einstein was declared "Person of the Century" in a December 1999 edition of *Time* magazine. His accomplishments in the field of theoretical physics were stressed; he was "unfathomably profound − the genius among geniuses."

Time's managing editor Walter Isaacson put Einstein's scientific accomplishments in a social context. For Isaacson: "If you had to describe the century's geopolitics in one sentence, it could be a short one: Freedom won. Free minds and free markets prevailed over fascism and communism."

The explosion of science and technology, Isaacson argued, "helped secure the triumph of freedom by unleashing the power of free minds and free markets." As the most famous scientist of the century, Einstein helped secure the triumph of freedom and thus deserved the "Person of the Century" accolade. QED.

There is a major flaw in Isaacson's line of reasoning, though we might still agree with his conclusion. Einstein was an outspoken critic of the triumphalism implicit in the rhetoric of "free minds and free markets." Far from celebrating capitalism's alleged freeing of the mind, Einstein argued in that the "crippling of individuals" is "the worst evil of capitalism" and that the "economic anarchy of capitalist society as it exists today is, in my opinion, the real source of the evil."

The only hint of Einstein's radicalism in *Time* is a reference to its sister magazine, *Life*, which in 1949 listed Einstein as one of 50 prominent US "dupes and fellow travelers" used as "weapons" by communists. *Time's* Frederic Golden deals with Einstein's politics by patronizing him as "well meaning if naive" and "a soft touch for almost any worthy cause."

There is no mention in *Time* of the fact that after World War II, Einstein became a prominent target of the anticommunist crusades in the US, or that he was an "enemy of America," according to no less an authority than US politician and inquisitor Joseph McCarthy.

The real Albert Einstein − "an anti-Nazi, anti-Franco, antiracist, freethinking, foreign, Jewish scientist" according to author of *The Einstein File,* Fred Jerome − is far more interesting than the airbrushed image of a brilliant, absent-minded scientist. Einstein was an agitator, more than willing to challenge authority and to support a range of progressive causes − indeed he felt duty bound to do so.

Nuclear weapons

In August 1939, just prior to the outbreak of war in Europe, Einstein sent a letter to US President Roosevelt. It was conceivable, he wrote, that uranium could be fashioned into "extremely powerful bombs of a new type." He expressed his fear that the Nazi regime may be working on an atomic weapons' program, and urged a speeding up of experimental work on nuclear fission.

In October 1939, partly due to Einstein's prompting, the President's Advisory Committee on Uranium was formed. Though it is possible that the serious pursuit of an atomic weapons' program in the US might have been delayed if not for Einstein's urgings, his impact has often been overstated. The Manhattan Project − large-scale, coordinated work on atomic weapons − did not begin until late 1941, and Einstein was not involved in it.

Science historian Alex Wellerstein writes:

"Something like the Uranium Committee might have been started up anyway (contrary to popular understanding, the letter was not the first time Roosevelt had been told about the possibility of nuclear fission), and even if it hadn't, it isn't clear that the Uranium Committee was necessary to end up with a Manhattan Project. ...

"The "push" came from an external source: the British program. Their MAUD Committee (an equivalent of

the Uranium Committee) had concluded that a nuclear weapon would be much easier to build than the United States had concluded, and sent an emissary (Mark Oliphant) to the United States to make sure this conclusion was understood."

There is no truth to the widespread view that Einstein's scientific research led to, or provided the foundations for, the development of atomic weapons. Wellerstein states: *"E=mc² tells you that on some very deep level, energy and mass are equivalent, and the amount of energy that mass is equivalent is gigantic. But it says nothing about the mechanism of converting mass into energy ... or whether it can be scaled up to industrial or military scales. It gives no hints as to even where to look for such energy releases."*

Einstein said:

"I do not consider myself the father of the release of atomic energy. My part in it was quite indirect. I did not, in fact, foresee that it would be released in my time. I believed only that it was theoretically possible. It became practical through the accidental discovery of chain reaction, and this was not something I could have predicted."

At the end of the war, Einstein spoke out against the nuclear strikes on Japan, arguing that they were unjustified and motivated by US−Soviet politicking. With the benefit of hindsight, he regretted having urged an atomic weapons program in the US.

Following the war, Einstein gave strong support to organisations fighting against militarism and atomic weapons in particular. In May 1946, he became chair of the newly-formed Emergency Committee of Atomic Scientists, which was primarily concerned with education on the dangers of atomic weapons. Funds raised by the Committee assisted other organisations such as the Federation of American Scientists and activities like the publication of the Bulletin of the Atomic Scientists.

In 1955, scientist-philosopher Bertrand Russell approached Einstein, suggesting that a group of scientists be convened to discuss nuclear disarmament and ways in which war could be abolished. The first such meeting was held in July 1957, in Pugwash, Nova Scotia. Shortly before his death in 1955, Einstein was one of 11 scientists, nine of them Nobel laureates, to sign an initial statement − the Russell-Einstein Manifesto − calling for the abolition not only of atomic weapons but also of war itself, regardless of the necessary "distasteful limitations of national sovereignty."

For Einstein, the issue of atomic weapons was subordinate to the broader issues of militarism and nationalism. He wrote:

"As long as there are sovereign nations possessing great power, war is inevitable. That is not an attempt to say when it will come, but only that it is sure to come. That was true before the atomic bomb was made. What has changed is the destructiveness of war."

Einstein hoped that the added threat of atomic weapons might facilitate his broader objective of establishing a supranational authority, and he wanted the "secret"

of the atomic bomb to be monopolised by such an authority. He wanted the US to renounce the use of atomic weapons pending the creation of a supranational authority or if supranational control was not achieved.

In 1950, Einstein appeared on an NBC network program called "Today With Mrs. Roosevelt," discussing the US government's plans to build hydrogen bombs far more powerful than the fission bombs dropped on Hiroshima and Nagasaki.

Einstein's speech on the NBC program was typically punchy, warning that the "idea of achieving security through national armament is… a disastrous illusion," that the arms race between the US and the Soviet Union had assumed a "hysterical character," and that with the advent of hydrogen bombs, "radioactive poisoning of the atmosphere and hence annihilation of any life on Earth has been brought within the range of technical possibilities."

His comments on the NBC program attracted not only newspaper headlines but also the attention of FBI Director J. Edgar Hoover, who promptly issued a memo to FBI offices across the country seeking all available "derogatory information" on Einstein.

What did Einstein have to say about the peaceful uses of atomic energy? Not much. During his lifetime, there was a modest degree of R&D into possible peaceful uses of atomic energy, and a great deal of speculation and propaganda. He wrote in 1945:

"To give any estimate when atomic energy can be applied to constructive purposes is impossible. ... Since I do not foresee that atomic energy is to be a great boon for a long time, I have to say that for the present it is a menace."

Jim Green is the editor of an anthology of Einstein's writing on politics, 'Albert Einstein − a Rebel Life', published by Ocean Press.

Cameco signs uranium contract with India

NM802.4465 A uranium supply contract was signed by Cameco and India's Department of Atomic Energy on April 15. Under the contract Cameco will supply 7.1 million pounds of uranium concentrate (about 2,730 tonnes of uranium) from 2015−2020, all of it sourced from Cameco's Canadian mines. The contract is worth around US$286 million at current spot prices.[1] The two countries signed a Nuclear Cooperation Agreement in 2010 and it entered into force in September 2013.

The uranium supply agreement, and the bilateral nuclear cooperation agreement, have attracted widespread criticism.

Cameco's uranium operations in Saskatchewan are facing opposition from the Clearwater Dene First Nation. A group called Holding the Line Northern Trappers Alliance has been camping in the area to block companies from further exploratory drilling in their territory. The group set up camp in November 2014 and plans to remain until mining companies leave. Spokesperson Candyce Paul said she was opposed to Cameco's uranium deal with India and that "scientific evidence is building towards proving that the uranium mining industry is killing the Indigenous people of northern Saskatchewan."[2]

The uranium supply contract was criticised by delegates to the World Uranium Symposium held in Quebec City from April 14−16. Shri Prakash, one of several participants from India at the Symposium, said: "India's nuclear weapons program is very active, as demonstrated by a series of nuclear test explosions. Moreover tensions between India and Pakistan, a country with its own nuclear arsenal, are running very high. The attitude of Canada is irresponsible and alarming."[3]

Just hours after the uranium supply contract was signed, India test-fired a nuclear-capable Agni-III ballistic missile.[4]

Paul Meyer, a former Canadian representative to the UN Disarmament Conference, said: "All of this flows from decisions where we essentially sold the shop some years back, sacrificing our nuclear non-proliferation principles and objectives for some other considerations, and I think it's been a very poor deal for us in terms of the risks of nuclear proliferation. ... There was a capitulation in 2008 to essentially give India all of the benefits of membership in the Nuclear Non-Proliferation Treaty, without any of its obligations or responsibilities."[4]

Meyer summarised Canada's capitulation on safeguards tracking standards in a November 2012 article: "India bristled at the suggestion that this little, non-nuclear weapon state should presume to exercise any form of oversight over its nuclear activity. After a few rounds of talks failed to produce an agreement and as the dates for the prime minister's trip approached, it would appear the CNSC [Canadian Nuclear Safety Commission] team was instructed to cut a deal."[5]

Trevor Findlay, a senior research fellow at Harvard University's Belfer Center for Science and International Affairs, and a member of the UN Secretary-General's Advisory Board on Disarmament Matters, said: "Normally there's some sort of tracking and accounting system so that Canada would be receiving information from India very specifically about what Canada-sourced material is being used for. In this case, because the agreement is secret, we have no idea whether that's in place, and it probably isn't because the Indians have been pushing against that."[4]

Australian nuclear arms control expert Crispin Rovere noted in a 2014 paper: "As with the proposed Australia–India nuclear agreement, the text of the Canadian deal likewise abrogates the widely accepted principle that the nuclear recipient is accountable to the supplier. This is ironic given it was nuclear material diverted from a Canadian-supplied reactor that led to the India's break-out in the first place. It would be like the citizens of Hiroshima deciding it would be a good idea to host American nuclear weapons within the city – the absurdity is quite astonishing. The good news is that Canada's deal has earned the Harper government pariah status with regard to nuclear safeguards."[6]

Assoc. Prof. Greg Koblentz from the School of Policy Government and International Affairs at George Mason University said that even if Canadian uranium is used only for civilian purposes, "whatever uranium India produces domestically will now be freed up for a military program." He added: "There's been a tremendous amount of effort invested in preventing Iran from obtaining one nuclear weapon, but this has really left the arms race in South Asia unchecked."[4]

Asked if he shares concerns about the potential for Canadian uranium to free up India's domestic uranium for weapons production, Malcolm Bernard from the Canadian Nuclear Association said: "Those concerns are legitimate and we share them. Everybody should."[7]

Trevor Findlay commented on the broader implications of the inadequate provisions of the bilateral nuclear cooperation agreement: "Countries with existing agreements will say, 'We want the same deal as India. Why should we be supplying all this information to Canada when India doesn't.' And India is a nuclear weapons states. Most of the other receivers are non-nuclear weapons states and they're being treated less favourably than India."[7]

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Europe is ill-prepared for a Fukushima-level accident

NM802.4466 Nuclear Transparency Watch (NTW), composed of activists and experts from across the European continent, has released the results of a year-long investigation into the preparedness of European governments and nuclear utilities for a nuclear accident. The study collected information on Emergency Preparedness and Response (EP&R) measures in 10 EU countries.

Michèle Rivasi, chair of NTW and Member of the European Parliament, said:

"The disaster of Fukushima has shed light on a number of very serious dysfunctions: in one of the evacuated city, Futaba, patients of the hospital have been left on their own for three days because the medical staff had run away. The panic made all plans useless, despite the famous "Japanese discipline". Besides the unforeseeable reactions (which will lead in any way to chaos), the theoretical plans revealed totally inefficient. There are numerous shocking facts. Some patients were transported to places without any care facilities and the evacuation zone was ill defined and too small (it jumped arbitrarily from 2km to 3km and then to 10 and 20km, whereas the US authorities ordered their expats to leave from the 80km zone)."

Despite the Fukushima experience, EP&R measures in Europe vary considerably and are generally inadequate. The European Commission and European Nuclear Safety Regulators Group initiated a process of stress tests for all operating nuclear power plants in Europe in the aftermath of Fukushima, but this process did not include off-site EP&R. Later attempts by the European Commission to take action on this issue seem to have come to a virtual halt. EP&R plans in Europe are mostly based on INES Level 5 nuclear accidents and they generally cannot cope with an INES 7 accident, which is the level of the Chernobyl and Fukushima accidents.

Specific problems include:

Emergency drills – Many regional and local authorities are not properly prepared for a nuclear accident. Sufficient dedicated staff, accurate evacuation plans and full scope exercises involving the local population are missing. Lessons learned from exercises and drills are not taken into account in new versions of plans, nor are they communicated to stakeholders.

Updating plans – The report notes inadequate updating of EP&R plans regarding spatial changes (new residential neighborhoods, medical centers, schools, roads, etc.) and recent changes in technology (internet, mobile phones, new social media, etc.). EP&R plans inadequately address cross-border issues and the multi-lingual, multi-national and multi-cultural character of contemporary European societies.

Communication – Even during exercises and drills, the communication and notification lines for responsible institutions exhibit deficiencies. Contact details of involved personnel are sometimes wrong or out-dated. Some concerned administration services do not communicate between themselves, and for others, their communication is inadequate or delayed, or even both.

For example, in Germany, the crisis teams of the Federal Ministry for the Environment and the federal states Environmental Ministries failed in a communication exercise in September 2014. The outcomes show that more than one million inhabitants would have been affected by radioactive releases before any public warning by the authorities and some regions would have received instructions (to close the windows, doors, etc.) five hours too late. How are the communication lines supposed to work between two neighboring countries if it is so chaotic already on a national level?

Distribution of iodine tablets – The heterogeneity of measures in different countries (like the distribution of iodine, evacuation perimeters and zoning) is a crucial transboundary issue.

As an example, in Austria and Luxembourg, iodine tablets can be collected in any pharmacy to be stored at home in the whole territory.

In the Czech Republic, iodine tablets are pre-distributed and stored in houses only in an emergency zone up to 13 km around the Temelín NPP and 20 km around the Dukovany NPP. Today, not all parts of the population in the emergency zone have iodine tablets.

In Belgium and France, iodine tablet pre-distribution zones are established within 20 km and 10 km around the nuclear power plants respectively. For residents living outside the pre-distribution zone, there are centralized stocks, which need to be distributed after the nuclear accident happens.

In Germany, iodine tablets have to be collected by the public itself after the accident. The question is how will the iodine tablets reach the affected population in time?

In Japan, stocks existed locally before the Fukushima disaster. But given the fact that the authorities failed to give appropriate instructions to the public, iodine tablets could be distributed only for a very small number of residents in the area surrounding the damaged plant.

Food standards – There is a need for clarification of food standards and their harmonization especially in the post-accident context. There are several different food standards imposing radioactivity limits per mass or volume. A repetition of the chaos in food standards after the Fukushima catastrophe has to be prevented at all cost.

NTW calls for systematic involvement of civil society in the development of EP&R plans. NTW's assessment makes it clear that the usual top-down approach in EP&R should be changed and that local populations and interested civil society organisations should be actively involved and supported in this participation.

The full report is posted on the NTW website.

www.nuclear-transparency-watch.eu/

www.facebook.com/nucleartransparencywatch

https://twitter.com/NTWeurope

Artists impression of the four-reactor Akkuyu nuclear plant.

Mediterranean at risk from nuclear projects

The Mediterranean is at risk from nuclear power projects with their nuclear waste legacy, risks of accidents, and their huge water consumption and destructive effect on marine ecology. Spearheading this trend is Turkey, with its Russian nuclear deal and power plant construction in Akkuyu, on the Mediterranean coast.

The Turkish public is overwhelmingly against nuclear power, and the Environmental Impact Assessment is not satisfactory and is being challenged in the courts even as preparatory site work has begun. One of the controversies surrounding the Akkuyu project concerns allegations that engineers' signatures were forged in the Environmental Impact Assessment.[1]

Organisations aiming to protect the Mediterranean and it surrounding countries from nuclear threats are holding a meeting in Cyprus on May 9 and are seeking organisational sign-ons to a declaration. For more information on the meeting and the declaration, visit www.unitedcyprusplatform.org/activities.php or email nuclearfreemed@gmail.com

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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:

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