NUCLEAR MONITOR

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MONITORED THIS ISSUE:

SOUTH CAROLINA SAYS NO TO COUNTRY'S RADIOACTIVE WASTE

A major blow to new nuclear reactors In the United States was dealt last month when determined activists in South Carolina, including the state chapter of the Sierra Club, successfully campaigned to block the Barnwell dump from continuing to accept "low" level radioactive wastes from across the country.

(656.5800) NIRS - In April, the South Carolina (SC) House of Representatives Committee on Agriculture and Environmental Affairs voted unanimously, 16 to 0 (with 2 abstentions, including the bill sponsor), against a bill that would have allowed the Barnwell dump to remain open to waste from all 50 states beyond the 2008 deadline that will close the site to all waste that does not originate in the "Atlantic Interstate Compact" of SC, New Jersey (NJ) and Connecticut (CT). Barnwell County officials, nuclear utilities, and dump owner EnergySolutions of Utah had pushed to keep the dump open to the entire country. This hard-won grassroots victory is a "barrel in the path" of new nuclear power plants being built, because it means that there is no dumpsite for Class B, Class C, and Greater-Than-Class-C "low" level radioactive wastes from atomic reactors in most states.

Barnwell has already accepted over 27 million cubic feet (765,000 cubic meters) of radioactive waste from across the U.S., mostly from nuclear power plants. Barnwell has been the "path of least resistance" for such wastes for 36 years. When SC considered closing or limiting access to the dump -- in 1986, 1992 and 1995 - state politicians relented and kept nationwide access open. The dump employees only 50 workers, but provides about $2 million (1.5 million euro) a year for economically-depressed Barnwell County, and about $10 million a year for SC schools, according to the State Budget and Control Board.(1) The local population is also largely African American, raising environmental justice concerns with the Barnwell dump.

When SC entered into its compact with NJ and CT in 2000, it agreed to reduce the volume of nuclear waste accepted at Barnwell each year, and to close the site to waste from outside the three-state region on July 1, 2008.

The quantity of waste accepted in 2005 was 43,000 cubic feet (over 1,200 cubic meters), down from 167,000 cubic feet (over 4,700 cubic meters) in 1999. The annual projection for 2009, after the compact is in force, is 10,000 cubic feet (over 283 cubic meters), with half coming from nuclear plants within SC itself.

In 2006, a new conglomerate, EnergySolutions, acquired Chem-Nuclear, operator of the Barnwell site, along with Barnwell's main competitor (Envirocare of Utah, a national dump for Class A wastes). EnergySolutions, which also absorbed the U.S. division of British Nuclear Fuels, Ltd. (BNFL), has also applied to the U.S. Department of Energy to establish a high-level radioactive waste reprocessing facility in Barnwell. A reprocessing facility in Barnwell built in the early 1970s was never operated due to "inordinately high operation and maintenance risks," and a federal ban on commercial waste reprocessing for nuclear weapons non-proliferation reasons.(2) However, the U.S. Dept. of Energy's Savannah River Site, near Barnwell, reprocessed military irradiated fuel for nuclear weapons plutonium production for decades on end, leaving behind a legacy of contamination and liquid and sludge high-level radioactive wastes that

threaten the Savannah River, groundwater, and Tuscaloosa Aquifer below.(3)

Barnwell accepts Class "B and C" radioactive wastes, which are more akin to "intermediate level" radioactive wastes under European classification systems, as opposed to their designation as "low" level wastes in the U.S. Wastes dumped at Barnwell include intensely radioactive nuclear reactor filter resins, as well decommissioned reactor vessels. In 2003, Big Rock nuclear plant in Michigan shipped what BNFL has called the most radioactive reactor vessel ever dumped to Barnwell for disposal.(4) Yankee Rowe and Connecticut Yankee's reactor vessels were also dumped there in recent years. But a collaboration between NIRS and Argentine activists resulted in an Argentine state judge's injunction against barge shipment along South America's coastline, effectively blocking California's intensely radioactive San Onofre Unit 1 reactor vessel from being dumped at Barnwell in 2004.

Radioactive wastes have not been safely contained at Barnwell, but rather placed in un-lined, open pits, which often collect rain water before they are filled and closed. There is already a documented underground plume of radioactive tritium flowing over a half mile towards Mary's Branch Creek, a tributary of the Savannah River. Thousands of cubic yards (thousands of cubic meters) of contaminated soil have been excavated from an adjacent church property.

(1) Sammy Fretwell, "Nuclear waste site might not be closed: Legislation would keep landfill open to all states beyond scheduled closing in 2008," *The State* (Columbia, SC), Feb. 16, 2007.
(2) David A. Lochbaum, Nuclear Waste Disposal Crisis, PennWell Publishing Company, Tulsa, OK, 1996, pages 72-3.
(3) *"Nuclear Dumps by the Riverside: Threats to the Savannah River from Radioactive Contamination at the Savannah River Site (SRS),"* by Arjun Makhijani, Ph.D. and Michele Boyd, IEER, March 11, 2004, at http://www.ieer.org/reports/srs/index.html
(4) See http://www.nirs.org/radwaste/hlwtransport/nukewatch122003.htm for more information.

For more information, see http://www.dontwastesc.com/content/blogcategory/0/42/

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CSD FIGHTS OVER NUCLEAR - NO RESULTS AT THE END

The United Nations Commission on Sustainable Development (CSD) was established to ensure effective follow-up of the Rio Earth Summit (1992). The Commission is responsible for reviewing progress in the implementation of international agreements on sustainable development. Energy plays a crucial role in the debates and negotiations.

(656.5801) WISE Russia - CSD-15, which took place in New York from April 29 till May 11, was to talk about the best way forward after the first Kyoto-period and to talk about setting clear goals and criteria for concrete energy-projects in the South.
As was the case in the past (see WISE News Communique # 545, 23 March 2001) the nuclear industry and some countries have been again working hard to try to get the CSD accept nuclear power as a sustainable energy source, ready to been given credits under schemes as the Clean Development Mechanism (CDM) in any post-Kyoto agreement.

The civil society -which traditionally has a relative strong position at the CSD talks- were alert and took action. Not only the environmental caucus but also women and youth platforms supported a strong statement against acceptance of nuclear energy.
Clear pro-nuclear language was taken out of a draft of the Chairman's Statement - but wording as "clean fossil fuel technologies" were replaced (where possible) with "modern energy technologies", which was taken by some nuclear critical countries as support for nukes. So they stood up and during so-called "high segment" sessions ministers from Austria and Latvia as well as NGO speakers made a strong statement against nuclear energy.

Mr. Josef Proell, Federal Minister of Agriculture, Forestry, Environment and Water Management of the Republic of Austria stated "Austria is also of the firm view that nuclear energy does not represent a form of sustainable energy and should not be used to meet growing energy demands. Instead we should build upon increased use of renewable energies, energy efficiency and saving as well as alternative fuels to meet our climate change goals".

And the Minister of Environment of the Republic of Latvia said "speaking of the energy as one of critical angles of Sustainable Development, I would like to emphasize, that nuclear energy does not comply with the criteria of Sustainable Development because it is neither safe nor reliable. It also doesn't meet the criteria of economic viability as it is not affordable without public subsidies. I fully support the statement about the need to phase out harmful subsidies in order to reflect environmental impacts of various energy sources".

The CSD-15 session ended without any agreement on any of the issues… Delegates left even before the chairman was able to come up with a final attempt to draw conclusions.
(see also related box on *"Nuclear and Carbon pricing"*)

Source:
http://www.un.org/esa/sustdev/csd/policy.htm and emails from Andrey Ozharovskiy, Ecodefense/WISE Russia
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Nuclear & Carbon pricing

The recognition of the environmental and economic consequences of climate change has increased the pressure to reduce CO_2 emissions. Through the Kyoto Protocol many countries have agreed to put a limit on their CO_2 emissions. However, the Protocol effectively excludes nuclear energy as an operation from its flexible mechanisms that Annex I parties to the Convention can use to meet their reductions targets. Specifically, nuclear power is excluded from the Clean Development Mechanisms (CDM, Article 12) and projects implemented jointly (Article 6). Nuclear power was not directly excluded from emissions trading schemes. In order to meet this target signatories have had to put in place mechanisms to reduce emissions in particularly from the power sector. In Europe this has resulted in the introduction of an Emissions Trading System (ETS) which puts a ceiling on the amount of CO_2 fixed sources can emit and has resulted in the establishment of a carbon market, as CO_2 producers trade their emissions permits.

Over the last two years, since the establishment of the European carbon market, the price has fluctuated in the range of Euro 2-30/tonne carbon, due to changes in energy prices, actual or anticipated availability of emissions permits and market speculations.

Nuclear power does not receive emissions permits within the framework of the European Emissions Trading Scheme (unlike existing fossil fuel electricity generators) as it does not produce CO_2 during electricity generation. However, despite the fact that during the first round of the ETS there was considerable over-allocation of emissions permits and these were largely given for free to the electricity utilities, the establishment of the scheme has resulted in the general increase in electricity prices. As a result it has been said that the main economic winners of the current scheme have been the coal and nuclear utilities.

Many see the introduction of a long term carbon price as an important future issue for the nuclear industry and absolutely necessary for the construction of nuclear reactors. The chief executive of EdF has stated 'To make a commitment of billions of pounds to a project with a time-scale of half a century, investors above all need predictability about price. They must know the value society will place on carbon reduction not just tomorrow, but 10, 20, 30, 40 years from now." This would require a significant change in the current emissions trading schemes.

Not only does there need to be a long term guarantee for the price of carbon, but, according to some, also a price which is significantly above the current market price. The MIT study calculated that 'With carbon taxes in the $50/tC range, nuclear is not economical under the base case assumptions '. The study went on to assess that nuclear will only break even under its base case assumptions, when carbon prices are in excess of S100/tC (Euro 73/tC). **Greenpeace: "The economics of nuclear power", April 2007**

NRC SETS OUT TO WHITEWASH ATOMIC REACTOR ACCIDENT RISK

March 2007 marked the 50th anniversary of the WASH-740 report. Commissioned by the U.S. Atomic Energy Commission (AEC), and also known as "The Brookhaven Report," it was the first official study of the *"Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Power Plants."* But "large" at the time meant only 100 to 200 megawatt-electric reactors, small by today's standards.

(656.5802) NIRS - The WASH-740 report looked at the health and economic impacts of a large-scale radioactivity release at a reactor 30 miles upwind of a major city. WASH-740 concluded that up to 3,400 deaths and 43,000 injuries could result; up to 150,000 square miles could be contaminated with radioactivity; and up to $7 billion (in 1957 U.S. dollars) in property could be damaged (over $51 billion -38 billion euro- in 2007, when adjusted for inflation by the Consumer Price Index).

Rather than proceed with caution in light of such catastrophic risks, AEC instead used WASH-740 to lobby for, and rush the passage of, the Price-Anderson Act just six months later. As originally enacted, the private liability for nuclear utilities and their insurance companies was capped at just $560 million (in 1957 dollars; $4 billion in 2007). But that amounted to less than 10% of the property damages estimated by WASH-740. It would take an act of Congress to compensate victims for the additional 90%+ of the damages, to be paid for by U.S. taxpayers. Price-Anderson paved the way for the opening of the first civilian U.S. atomic reactor at Shippingport, Pennsylvania in December, 1957, not to mention the 130 additional commercial reactors in the U.S. in the following decades.

To account for the increasing size of atomic reactors, AEC ordered an update on WASH-740's analysis from its Brookhaven National Lab. This was finished in1965, and found that a major accident at a large reactor could cause up to 45,000 deaths, and property damages many times worse than WASH-740 had predicted. However, AEC covered up these results for 8 years, fearful that their release would increase public opposition to new reactor licensing. The Union of Concerned Scientists (UCS) forced the update's publication through a Freedom of Information Act request in 1973.

While WASH-740, and its long concealed update, had focused on the consequences side of the risk equation, the 1975 AEC report "WASH-1400" focused on the probability of a major

reactor accident. Also known as the Reactor Safety Study, NUREG-75/014, or the Rasmussen Report (after Massachusetts Institute of Technology (MIT) professor Norman Rasmussen, the lead author), it applied "Probabilistic Risk Assessment" to just one pressurized water reactor and one boiling water reactor design, then extrapolated the results to the nearly 100 operating reactors in the U.S. Making unrealistic assumptions (such as all reactors are built as designed, with no flaws; components do not degrade with age; reactor vessels cannot fail, as by embrittled vessels failing under pressurized thermal shock), the analysis was significantly flawed. Absurdly, the Rasmussen Report's executive summary claimed that the probability of being hit by a meteorite was higher than being harmed by a nuclear reactor accident.

The Rasmussen Report was intensely criticized on a number of technical fronts. In 1977, Henry Kendall at UCS published "The Risks of Nuclear Power Reactors: A Review of the NRC Reactor Safety Study WASH-1400," which found that Rasmussen likely underestimated accident probability and consequences.

Also in 1977, due to the controversy swirling around the Rasmussen Report, the U.S. Nuclear Regulatory Commission (NRC, formed after the breakup of AEC) appointed a review panel, the Lewis Commission. It reported that Rasmussen significantly underestimated uncertainties.

The Lewis Commission issued strongly worded criticisms of Rasmussen's methodology: "The statistical analysis of WASH-1400 leaves much to be desired. It suffers from a spectrum of problems, ranging from lack of data on which to base input distributions to the invention and use of wrong statistical methods. Even when the analysis is done correctly, it is often presented in so murky a way as to be very hard to decipher.
For a report of this magnitude, confidence in the correctness of the results can only come from a systematic and deep peer review process. The peer review process of WASH-1400 was defective in many ways and the review was inadequate."

It also reported that the executive summary "is a poor description of the contents of the [Rasmussen] report, and should not be portrayed as such…[and] has lent itself to misuse in the discussion of reactor risks."

In response to the Lewis Commission, NRC officially disavowed the Rasmussen Report executive summary, and concluded "…in light of the Review Group conclusions on accident probabilities, the Commission does not regard as reliable the Reactor Safety Study's numerical estimate of the overall risk of reactor accidents." Despite this, the Rasmussen Report is still used today, as in a nuclear engineering textbook at MIT, an epicenter of the "nuclear renaissance."

The next, and last, federal report on risks of major reactor accidents was done over 25 years ago. NRC commissioned Sandia National Lab to prepare the CRAC-2 report (Calculation of Reactor Accident Consequences for U.S. Nuclear Power Plants), which was completed in 1981. However, like the WASH-1400 cover up, CRAC-2 was not initially released to the public. Yet again, UCS, working with U.S. Congressman Ed Markey and the House Committee on Oversight and Investigation, forced NRC to divulge the findings in 1982.

CRAC-2 revealed that a worst case nuclear accident (a maximum "credible" accident combined with worst possible meteorological conditions) could cause up to 100,000 peak early fatalities (a death resulting from radiation exposure that occurs within the first 9 years), and up to 40,000 latent cancer deaths (namely, at the Salem 1 and 2 reactors near Wilmington, Delaware). So many deaths would be comparable to the numbers killed at the Hiroshima or Nagasaki atomic bombings. The costs of a worst case accident (including "estimates of lost wages, relocation expenses, decontamination costs, lost property and the cost of interdiction for property and farmland") could top $657 billion (in year 2000 dollars, or $783.5 billion in 2007 dollars). Despite population growth and increased concentration near many nuclear power plants, as well as recent scientific findings that radioactivity is more harmful to human health than previously thought, a significant update on CRAC-2 has not been performed in over 25 years (NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," was published in 1991, however, using reactor-specific PRAs).

Until now, that is. On May 7, NRC issued a press release headlined "NRC Announces First Phase of State-of-the-Art reactor Consequences Analyses (SOARCA)." It seems clear that NRC intends to revise downward the estimates of casualties and costs from a major reactor accident. "We're undertaking this research to replace work that's almost 25 years old - studies that were so conservative that their predictions are not useful for characterizing results or guiding public policy. Those predictions have sometimes been misinterpreted and often misused," said Farouk Eltawila, Director of the Division of Risk Assessment and Special Projects in the NRC's Office of Nuclear Regulatory Research. "Today's computer-based analytical tools are much more capable of realistically evaluating potential nuclear power plant accidents, and this project should improve everyone's understanding of the realistic consequences of such potential accidents." The results of SOARCA will be published in 2009.

SOARCA resembles sorcery in more than spelling-the waving of a magic wand that makes atomic reactor risks disappear, on paper at least. Especially given the increased risks of aging reactors suffering breakdowns, and proposed new reactors whose bugs have not yet been worked out, nuclear watchdogs must remain vigilant against WHITEWASH-2007.

Source: Brice Smith's "Insurmountable Risks: The Dangers of Using Nuclear Power to Combat Global Climate Change," IEER Press, Takoma Park, MD, 2006, pages 188-195 and 205-214. This can be ordered at www.eggheadbooks.org/books/insurmount.htm; a summary of the book can be viewed at http://www.ieer.org/sdafiles/14-2.pdf.
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DECOMMISSIONING PROJECTS 'REGULARLY PRODUCE THE UNEXPECTED'

The European Council, Commission and Parliament have highlighted the importance of decommissioning funds in a joint statement, which noted that 'separated management of such funds is essential to secure both the availability of funds to pay for decommissioning and radioactive waste management and in order to prevent market distortion'. But while the EU institutions fully recognizes the importance of full compliance and accountability and a level playing field, member states almost all have different regimes for estimating, collecting and managing decommissioning costs and there are significant differences in the operation, governance, investment and accessibility of the existing funds across the EU.

(656.5803) WISE Amsterdam - In a report, written by a handful of well-recognized scientists and institutions on behalf of the European Commission it is stated that approximately one third of the 145 power reactors currently operating in the European Union will need to be shut down by 2025. This will result in the need to dismantle, decontaminate and demolish the facilities as well as to undertake processing, conditioning and disposal of nuclear waste and spent fuel ('decommissioning'). The Commission recognizes the importance that the funding of these activities will be adequate and available when needed in order to avoid negatively affecting the safety of EU citizens. Unfortunately it does not analyze how far the differences in decommissioning financing methodologies distort the single market for electricity nor does it assess the validity of the cost estimates given.

Nevertheless, the report, a must-read for anti-nuclear campaigners, has successfully assessed the different regimes and came up with the following conclusions and findings.

- The 'polluters pays' principle for decommissioning is in theory widely accepted and needs to be the fundamental basis of any granting of an operating license.
- The discussions on decommissioning funds have focused on nuclear power plants. Other facilities are so far often overlooked, in particular this is the case with high cost facilities, such as reprocessing plants or facilities having experienced incidents or accidents (e.g. the A1 unit at Bohunice, Slovak republic)
- Costs estimates are subject to high degree of risks and uncertainties; expected costs have risen significantly in a number of countries while many estimates still contain a considerable range of possible costs.
- Not all member states require that funds be managed externally and segregated from the operator.
- In most countries there are only limited rights for the public to access information on related costs and funds
- Many operating companies and governments are satisfied with the current situation and have concerns towards a EU harmonization process of nuclear decommissioning financing.

From a governance perspective the higher the potential conflict of interests within a particular methodology, the greater the need for additional checks and balances. Externally managed funds have a lower risk of conflict of interest. Given the many conflicts of interest embedded in decommissioning and the importance of health and safety aspects over a long time horizon a framework for best practice should be introduced, which goes beyond mere legal requirements. Therefore schemes should have a focus on the independence of the involved parties, avoid situations where the operator has power of authority to dispose of the decommissioning funds and aim at reducing any possible situation where financial funds obtained by the operator can be used for different purposes.

Sounds logic and reasonable? Not for many countries. There are many different schemes being deployed, including

* immediate dismantling after the operational period until no more regulatory control is required; this is proposed in a number of countries including France, Italy, Germany and Slovenia
* deferred dismantling requires that the facility is kept intact and placed in a protective storage state to enable the radionuclides to decay prior to eventual dismantlement. A number of countries have adopted this approach with the delay ranging from between 10- 40 years (Sweden) to around 100 years (UK)
* entombment involves encasing the radioactive structures, systems and components in long-lived substances, while ongoing monitoring is maintained. Currently, the approach is not proposed or undertaken by any member state.
* some member states have not chosen a strategy, e.g. Slovak Republic, Romania

The cost estimates are arrived at by either making an estimate based on a generic rule ('a percentage of the cost of construction is used to estimate dismantling costs') or by making a more detailed 'bottom up' assessment, taking into account expected material, labor, engineering costs, et cetera. Most EU member states have moved or are moving towards the latter approach. Nevertheless the cost estimate methodologies and scope vary from country to country and even within countries. In general, the accuracy of cost estimates is likely to increase over time as more facilities are decommissioned. However, currently, large risks and uncertainties remain, particularly with cost estimates for less standardized plants, such as reprocessing facilities (the estimated cost of decommissioning the Sellafield plant in the UK is Euro 58 billion or US$ 97 billion). And of course debates today can lead to different findings later. For example some material, which is not classified as waste today, may in the future have to be disposed of, e.g. plutonium or depleted uranium.

So, and this is also one of the main conclusions and recommendations of the report, additional guarantees to cover unplanned eventualities to ensure that under all circumstances the 'polluter pays' principle is adhered too

should be undertaken. This would require

* the relationship between mother and daughter companies has to be clarified, so that the corporate group will cover all liabilities of the limited company in any case of fi. bankruptcy of the daughter company.
* guarantees should be introduced that cover the financial risk of an early shut down
* guarantees to cover the eventuality of insufficient funds available after final shutdown, due to unexpected cost increases or fund mismanagement.

Most likely it will take years for the current EU to come to agreement about the way forward; harmonization and binding legislation or an agreement to disagree and leave it to individual member states. This would need acceptance of, amongst other issues, the fact that some countries are not (even close to) fulfilling the most basic principles of good governance.

Source: *"Comparison among different decommissioning funds methodologies for nuclear installations"*, May 2007, Wuppertal Institute for climate, environment and energy
The full report is hundreds of pages, including reports for each country separately. All to be found at http://www.wupperinst.org/en/projects/project_details/index.html?&beitrag_id=555&projekt_id=167&bid=42&searchart=

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AUSTRALIAN URANIUM EXPORTS SET TO LEAP UP

Australian uranium exports are set to leap up regardless of what government takes power in elections late this year. As mentioned very briefly in the latest issue of the Nuclear Monitor, Australia's opposition Labor Party (ALP) has just narrowly scrapped its 25-year-old opposition to development of new uranium mines.

(656.5804) Diet Simon - A motion from Kevin Rudd, the new ALP leader, supported by South Australian Premier Mike Rann, to lift the ban and allow more uranium mining passed 205 votes to 190. But Rudd told a national conference of his party that he's leaving it up to the states and the Northern Territory, all of which have Labour governments, to decide whether to license new mines. Most state governments are still opposed.

There are now three producing mines in Australia: BHP Billiton's enormous Olympic Dam in South Australia (the biggest uranium mine in the world); the Beverley mine, also in South Australia; and the Ranger mine in the Northern Territory.

The premiers of Queensland, Western Australia and NSW said their states would remain free of uranium mines, despite the policy change. Western Australia and Queensland have some of the most promising uranium prospects in the country and it's expected that ultimately there will be enough pressure on their governments to eventually force uranium mining in those states. But WA premier Alan Carpenter said uranium mining would not happen under his watch. His government could face pressure, though, from mining giant Rio Tinto which wants to develop its Kintyre deposit in the state's north. Carpenter said while he had concerns about the environmental impact of uranium mining, he also did not want to see WA become the world's dump site for atomic waste. "We are not going to take the world's nuclear waste even though there is strong lobbying and big financial incentives (that) are talked about for our state to do that," he said. Premier Peter Beattie of Queensland may find himself under pressure from his own party and although saying he personally doesn't want uranium mining in his state, he'll be mindful of countries like China and Japan, which buy Queensland's high quality coals and have a thirst for nuclear energy. Coal is still Australia's biggest export earner.

"Open for business"
So far the premier of South Australia, Mike Rann, is the odd man out, welcoming more uranium mining. Rann lobbied hard for the change and expects the expansion of uranium mining to create billions of dollars in revenue and tens of thousands of jobs in his state over the next few decades. SA already has two uranium mines, BHP Billiton's Olympic Dam and the Beverley mine, owned by Heathgate Resources, and the new Honeymoon mine will begin production next year. The Olympic Dam copper-uranium mine holds about one third of the world's uranium reserves. A mining license has also been granted to SXR Uranium One for an ISL (In Situ Leach) mine at Honeymoon. Rann called the policy change a great victory for his state. He said South Australia was now "totally and completely open for business" in the area of uranium mining and export. But he also opposes having a nuclear waste dump in his state.

Chief Minister of the Northern Territory, Clare Martin, is known for her anti-uranium stance, but Prime Minister John Howard's conservative national coalition government has pointedly reminded her that it's paying most of the NT's bills and she should allow more mines to open. Australia's third, and longest serving uranium mine, Energy Resources of Australia's Ranger, is in the NT, as are many advanced projects. The federal government has the power to approve new mines in the territory, leaving that option available for any future Rudd government, though the Howard government has not taken it up.

The uranium issue does not arise in Tasmania or Victoria while New South Wales has for decades banned exploration for uranium, and any change of heart would still see NSW out of contention in the race to develop new mines. NSW Premier Morris Iemma said his state would not change the ban, in place since 1980.

"More uranium into a dangerous world"
Both Iemma and Carpenter condemned Prime Minister Howard's announcement of a plan to develop a nuclear power industry in Australia. "The Prime Minister is determined to rush headlong into giving us a nuclear industry and the NSW government will oppose him all the way," Iemma said. However, a recent opinion poll found popular opposition to nuclear power in Australia had edged down from 51 to 50 percent.

The numerically insignificant Australian Greens have lambasted both the Howard government and the Labor opposition over their respective plans

for nuclear power and expanding uranium mining.
Greens Senator Christine Milne accused Howard and Rudd of "cozying up" to big business. "We are witnessing a new low in moral cowardice in Australia," Senator Milne said. "What Mr Rudd and the Prime Minister are doing is putting more uranium into a world market, driving the nuclear fuel cycle. History will judge them both for sending more uranium into a very dangerous world at a time when we don't need to be doing it."
The Australian Conservation Foundation (ACF) says Australians should be very worried by both government and opposition nuclear announcements. The ACF's Executive Director Don Henry says he is concerned that both parties are heading down the nuclear path. The Democrats, another small opposition party, also oppose expansion of the nuclear industry.

The ALP is still digesting its uranium decision, with some in the party angry at the nature of the two-hour debate and others determined to move on to attacking the government's nuclear industry plans.
Labor's environment spokesman, Peter Garrett (known to many as lead singer of rock band Midnight Oil), says despite voting against the decision, he accepts it. He says Labor should now challenge Howard over his plan for nuclear power plants. "He's taking us down a road and a path which I think is very dangerous," he said.

Labor argues that nuclear energy would be far more costly for Australia than clean coal or exploiting renewable energies. "Developing nuclear reactors, constructing them, is a generation-long endeavor, these are not quickly developed facilities let alone solving the issue of where are they going to go. "We have the ability to develop all of the technologies to make that energy useable, we can better invest in clean coal, we can better invest in renewables. Let's get on with that rather than having, what in some ways is, an unproductive debate about nuclear energy," ALP deputy leader, Julia Gillard said. Australia has abundant alternative energy resources - solar, wind, geothermal and coal.

Preparing for a boom
There's an enormous uranium boom in Australia where more than 140 listed explorers are operating, many in WA despite the highly publicized opposing stance by Premier Carpenter. Even before the Labor conference took its decision, uranium stocks generally rose, some explorers reaching new peaks. More than 100 companies are keen to mine uranium all around the country, particularly in Western Australia and Queensland, now that they don't face blanket rejection.

Australia holds around 25% of the world's known uranium reserves, and the price of the mineral has climbed consistently since the start of 2004. Exploration expenditure in Australia has increased tenfold in three years, and the Labor switch is expected to boost investment further.
The spot price of uranium climbed from $US41.50 a pound to $US120 in the past year and now it looks as if Australia's exports of the controversial product will be increasing whichever party wins the next national election. The value of listed uranium explorers in Australia surged 23 per cent in the first three months of the year.

Though Canada is now the dominant supplier, Australia is the second biggest exporter, with the largest and lowest-cost recoverable resources. It mines 19.1% of global uranium production compared with Canada's production of around 24.9%.
The hefty rise in uranium stocks this year is largely due to expectations of prolonged high demand.

More than enough uranium can be extracted from existing mines to satisfy all Australia's overseas customers for some time to come. New mines will simply increase the competition for existing markets.

Forty-eight new nuclear reactors are expected to be commissioned globally by 2013, including 13 in China and eight in India, these optimistic numbers seem to create strong demand for Australian uranium. A condition for allowing new mines under ALP policy will be that the buyer must be from a country that has signed the nuclear non-proliferation accord.
Although the federal government continues to claim that Australia strongly supports the Nuclear Non-Proliferation Treaty and will not sell uranium to non-adherents to it, it appears Australia now indirectly sells it to Taiwan through the United States, and is considering selling it to India.

Former diplomat, Professor Richard Broinowski at the University of Sydney, author of "Fact or Fission - the Truth about Australia's Nuclear Ambitions", commented in the "Canberra Times" newspaper: "Howard seems to be doing his utmost to weaken what remains of the treaty's credibility. If Australia sells uranium to India, it will tempt other states to walk away from their treaty obligations. If Howard joins the proposed nuclear fuel-making consortium led by the US, he will reduce the effectiveness of the International Atomic Energy Agency, and cut across its own plans to develop and control a nuclear enrichment and supply group."

Source: Diet Simon
Contact: Australian Conservation Foundation (ACF), Floor 1, 60 Leicester St, arlton, Vic 3053, Melbourne. Australia.
Web: www.acfonline.org.au

New law bans nuclear power in Queensland. Nuclear power stations, nuclear facilities and radioactive waste dumps are now banned in Queensland. Queensland Mines and Energy Minister Geoff Wilson said the Nuclear Facilities Prohibition Act 2006 came into effect on May 1 "There is no need for Queensland to go down the path of nuclear power plants or toxic waste dumps when we don't need to."
Mr Wilson said that under Queensland's new law, a plebiscite would have to be held if the federal government tried to override it to build a nuclear facility in Queensland. Banned nuclear facilities include reactors, uranium conversion and enrichment plants,
fuel fabrication plants, spent fuel processing plants and facilities used to store or dispose of material associated with the nuclear fuel cycle such as radioactive waste material. Facilities for research and medical purposes and the operation of a nuclear-powered vehicle are exempt.
The Age, 2 May 2007

RESIDUAL RISK: AN ACCOUNT OF EVENTS IN NUCLEAR POWER PLANTS SINCE THE 1986 CHERNOBYL ACCIDENT

Fifty years ago, on 25 March 1957, the EURATOM Treaty was signed. Article 1 stipulates that *"it shall be the task of the Community to contribute to the raising of the standard of living in the Member States and to the development of relations with the other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries"*. Half a year later, on 10 October 1957, the fire at a Windscale reactor in the United Kingdom released massive amounts of radioactivity with, as a direct consequence and for the first time in Europe, very large quantities of contaminated milk and vegetables having to be destroyed.

(656.5805) Residual Risk Project Team - Nevertheless, the October 1957 Windscale accident had surprisingly little effect on public opinion Europe wide. In the UK the then fledgling civil nuclear industry pressed on with its designs for the first nuclear power stations, Magnox, which like Windscale had no secondary containment whatsoever and the UK government maintained its military imperative of plutonium production, seemingly ignoring the risk of a second radioactive release with its continued operation of the second identical Windscale reactor.

By the mid 1960s nuclear power was firmly established in Europe and its expansion continued apace. However, in March 1979 with a total worldwide experience of more than 1,000 years reactor operation, the pressurized water reactor (PWR) at Three Mile Island (TMI) in the United States sustained a severe fuel core melt and the potential for a very significant release of radioactivity to the environment. Such was the impact of TMI and although the nuclear industry implemented substantial upgrading programs in reactors and reactor designs thereafter, no nuclear plant has been ordered in the United States since and over one hundred projects have been completely abandoned. In Europe the majority of nuclear power plants that had been ordered and/or were under construction at the time of TMI were continued with, in account of design modification delays and construction times, installed capacity continuing to rise until by the end of 1985 a total of 155 power reactors were installed and in operation in the European Union.

In fact by 1986 the European nuclear industry was generally quite buoyant because it had, after all, ridden out the TMI storm albeit having to implement some significant backfitted and expensive safety measures. But then Chernobyl occurred, the worst nuclear power plant accident to date, resulting in a massive and hitherto unimaginable radioactive release that spread contamination widely throughout Europe, with its food and agricultural bans preying on the collective conscious of the general public.

The inexplicable nature and very severity of Chernobyl necessitated significant re-examination of nuclear safety, public explanations were demanded from the industry and its regulators; it practically stopped construction of new nuclear power plants. In the 27 current Member States of the European Union a peak of 177 power reactors was reached within two years of the Chernobyl accident. Thereafter and although a number of pre-Chernobyl ordered reactors had been completed and commissioned, plant closures outweighed new commissionings and resulted in a steady decline of operational reactors in Europe down to the level of 145 units of today.

The lessons learned from TMI had not been sufficient to prevent the Chernobyl accident.
At first the worldwide nuclear industry response to the Chernobyl disaster was defensive: it arose because of defective Soviet technology, demoralized operatives, lack of secondary containment, and so on, so much so that Chernobyl was a peculiarly Soviet accident 'just waiting to happen' and that 'it could never happen here'. Away from public scrutiny, however, the nuclear regulatory authorities in the European Union and elsewhere have been implementing revised regulatory regimes. These have required the operators to incorporate numerous improvements in human factor and management procedural aspects of plant operation, enhanced training programs and, where practicable, backfitting modifications and revisions to existing plants.

Significantly, for new nuclear builds the regulatory philosophy has nudged the plant designers to increase the role of passive systems to hold or return the plant and its nuclear processes to a stable, safe state; the outcome of abnormal incidents is now more firmly related to the radiological consequence and individual risk of health detriment; incidents and projected radioactive releases have now to be quantified so that an effective off-site emergency response might be prepared in advance; and, perhaps, most of all, the nuclear industry had to be 'transparent' and demonstrate that for continuing operation of its nuclear plants the 'risks were acceptable and the consequences tolerable'.

Today, 21 years since Chernobyl with 8,000 reactor-years experience accumulated worldwide this post-Chernobyl period has passed without major accident, large-scale contamination and severe radiological consequences - is this an achievement or just simply luck?

To answer this question we have scrutinized the safety records of nuclear power plants in selected countries since Chernobyl, noting that large numbers of abnormal events continue to occur. We endeavor to analyze in depth a selection of these events although there are significant obstacles to a systematic and comparative analysis, including:

* Comparing severe events affecting different types of nuclear power plants worldwide is difficult because, first,

there are many terms and definitions describing what could be called a nuclear incident and, second, there is no objective, internationally agreed and recognized definition for particularly severe events, both internal and external, that bear the potential for severe radiological consequences.

* Systems evaluating such nuclear events and their potential are not harmonized and are varying markedly from country to country. The quantification or indices determined do not provide a comparable indication of either safety levels or safety achievement.
* Even in case of the International Atomic Energy Agency's INES (International Nuclear Event Scale) the values attributed to the events are those reported by the operators of the affected plants or of the national regulatory authorities. There is no system of independent evaluation to make comparisons meaningful and, moreover, in some states the nuclear safety regulator may not be entirely free of political persuasion.
* The INES definitions also exclude a large number of events from technically appropriate rating only because they do not involve any immediate radiological effect. On the whole, there seems to be a tendency towards underestimating the importance of events. Although the IAEA developed the INES from the basis of the former French national event scale, it is the national nuclear authorities of the IAEA member states that determine the final index of the event potential, particularly in that the IAEA gives no direction on how 'cliff edge' situations are to be evaluated in the INES.
* No reporting system has been devised that can unambiguously classify the events and accidents rooted in a huge variety of possible causes. For example was the Davis-Besse reactor pressure vessel head hole a (i) materials defect, (ii) management failure which arose from an inadequate, plant-wide safety culture, (iii) a cascade of human errors linking inspection and surveillance, and/or a (iv) quality assurance program failure, or yet some other cause?
* In general a caution approach is adopted when the possible progression of a pulled-up (arrested) event is postulated. Analysis is tending to be based on those remaining downstream safety systems and countermeasures coming into play promptly and effectively, qui in contrast to the fact that a number of upstream safety systems had already failed, which is portraying an optimistic view of what could have resulted into a much more serious event.
* Whilst reactor shutdowns are generally publicly known, the events that cause them are not always publicized. The international nuclear event database maintained by the IAEA is confidential to its members (the IAEA did not respond to repeated information requests by the coordinator of the present study), and some countries tend to keep details of nuclear event reporting as privileged information that is not subject to public disclosure. Furthermore, post 9/11 much more information relating to plant performance under abnormal operation situations is being held back.

The IAEA does not impose nor require that much discipline for signatory countries when evaluating and reporting incidents. In other words, since there are no clearly established internationally agreed benchmarks to describe, categorize and risk assess events from one country to another, it is not clear how useful statistics could be arrived at. Thus, any one country that reports a large number of events could be revealing a severe safety problem in that country or, on the other hand, it could also be the honest characterization of a specific reporting system with unusual openness in communicating events.
This opportunity for anomaly is revealed by comparing just three countries, France, Germany and the United States.
In recent years the French nuclear power plant operator, EDF, has reported annually between 600 and 800 'significant incidents' (increasing tendency) to the nuclear safety authorities. Of over 10,000 events that were reported between 1986 and 2006, most were considered below the INES scale or Level 0 while 1,615 incidents were rated INES Level 1 and 59 Level 2. One event has been given a Level 3 rating2. In comparison, since the implementation of INES in 1991 Germany reported over 2,200 events as Level 0 or below, while 72 events were rated Level 1 or higher. On its part, the US Nuclear Regulatory Commission, over the same time period, has only reported 22 events to the IAEA and rated them on the INES scale, of which 6 below scale, 7 Level 0, 3 Level 1, 5 Level 2 and 1 Level 3.

This apparent disharmony arises because there are simply no common criteria established to compare frequency and severity of nuclear events from country to country. In this respect, any reliance upon the present collage of INES rated events statistics to establish an international safety evaluation would be grossly misleading.

The first conclusion of this study is that many nuclear safety related events occur year after year, all over the world, in all types of nuclear plants and in all reactor designs and that there are very serious events that go either entirely unnoticed by the broader public or remain significantly under-evaluated when it comes to their potential risk

A recent joint IAEA/NEA (Nuclear Energy Agency of the OECD) Report on "Nuclear Power Plant Operating Experiences" covering the years 2002-2005 concluded:
"Almost all of the [200] events reported during that period have already occurred earlier in one form or another. It shows that despite the existing exchange mechanisms in place at both national and international levels, corrective measures, which are generally well-known, may not reach all end-users, or are not always rigorously or timely applied."

The widespread belief that nuclear safety will be actually enhanced because of a lessons-learned process turns out ill-conceived. It is an open question whether the actual discussions within the nuclear expert community can lead to an improvement of nuclear safety in the reality of nuclear power plant operation.

Abnormal events are triggered by a variety of reasons: some are directly a result of design errors, sometimes fundamental or sometimes apparently trivial; other events can be traced back to latent construction, manufacturing and materials faults and/or deficiencies that have remained hidden in the plant; and there are unforeseen and unprepared for external events that unexpectedly challenge the plants and their safety systems; and finally there is the human dimension, including simple slip ups, omissions and misunderstandings, or more complex and deeply rooted institutional errors and, of increasing concern following 9/11, the possibility of organized malicious acts against nuclear plants.

Some of these events and incidents that have occurred could have evolved

into serious accidents, had the defects, malfunctions, etc. not been discovered in time (near-misses); other incidents might be taken as early warnings or as precursors of serious accidents; and there are the so-called recurring events whereby a pattern of failures is repeated time after time at different plants. Sometimes, there develops an element of self-congratulation by the nuclear industry when an incident is brought to a 'successful' close, so much so that this overrides the various serious concerns that the incident should not have been triggered in the first place.

Not that those who lead the worldwide nuclear industry are complacent over these issues. During a biennial general meeting of the World Association of Nuclear Operators (WANO General Meeting, Berlin, October 2003), Chairman Hajimu Maeda warned of a creeping lethargy that begins with "loss of motivation to learn from others... overconfidence... (and) negligence in cultivating a safety culture due to severe pressure to reduce costs following the deregulation of the power market." Those troubles, if ignored, "are like a terrible disease that originates within the organization" and can, if not detected, lead to "a major accident" that will "destroy the whole organization".

Nuclear plants are complex, hazardous facilities. It follows that this very complexity spawns a multifaceted array of potential failure mechanisms and routes, so many in fact that it is seemingly impossible to marshal these into any semblance of order.

The second conclusion is that no great reliance should be placed on the International Nuclear Event Scale (INES), either for determining the absolute severity of one abnormal event from another nor, indeed, for determining the absolute safety achievements of any one country. However, in one respect the INES can be quite revealing: as three countries operating much the same type of nuclear power plant, under much the same regulatory and management systems in place, should not produce such disparencies in their respective nuclear safety achievements, the summarized data above are solely an indicator of their openness and/or reporting practices within INES.

The third conclusion of this research is that because the INES reporting system serves very little purpose there is need for its overhaul and modification - if at all possible - to provide a comprehensive reporting system that identifies not just the severity and potential impact of abnormal incidents, which the present INES barely achieves, but which sets out unifying rules of post-accident analysis and categorization so that existing trends may be monitored and emerging cause of failure identified. Such a revised INES reporting system should include facility to analyze and categorize human actions, including terrorist acts.

A selection of significant events that might assist in the framework development of a new INES reporting and analyzing system is annexed to this summary. These events illustrate the major categories of cause of failure in plants over the past 20 years but, that said, given the complexity of engineered systems and the ingenuity of mankind there are other causes of accidents that have yet to be discovered.

The present report should be seen as a precursor investigation into what should be a longer-term extensive study into the identification, notification, systematic analysis and evaluation, risk assessment, classification and lessons-learned action implementation of safety relevant events in all nuclear facilities in all countries.

So long as nuclear plants and facilities continue to operate there will remain a residual risk. Precursive events cannot be eliminated, the possibility of a future severe accident cannot be entirely excluded and it is unwise to dismiss the possibility of any undesirable incident occurring on the grounds of its remote probability alone. Finally, it is folly indeed to assume that all initiating events might be reasonably foreseen - after all, who foresaw the nature and mode of operandi of the 9/11 attacks?

Sixteen Selected Significant Events in Nuclear Power Plants in Nine Countries Since the Chernobyl Accident in 1986

The Residual Risk Project Team has selected 16 events from nine countries that illustrate that nuclear reactor safety remains far from perfect. This is not a ranking of the most significant events but rather a selection of known significant events that also reflect the specific knowledge and experience of the members of the Residual Risk Project Team. They were classified into nine categories

Advanced Material Degradation (before break)

3 April 1991 Shearon Harris (USA)

On 3 April 1991 workers at the Shearon Harris pressurized water reactor in New Hill, North Carolina discovered damaged piping and valves within the alternate minimum flow system provided for the pumps in the emergency core cooling system. The piping and valve damage was serious, had an accident occurred the water needed to cool the reactor core would have instead poured out onto the floor through the ends of broken components. The NRC calculated the severe core damage risk from this event to be 6 x 10^{-3} or 0.6% per reactor year. The event was not rated on the IAEA INES scale.

6 March 2002 Davis Besse (USA)

On 6 March 2002, workers discovered a pineapple-sized hole in the carbon steel reactor vessel head at the Davis-Besse pressurized water reactor in Oak Harbor, Ohio. The boric acid of the primary coolant had completely eaten through the 6-inch (15 cm) thick carbon steel wall to expose the 5 mm thin stainless steel liner. A government study estimated that the hole would have widened to the point where the liner ruptured in another 2 to 11 months of operation. Because Davis-Besse ran 18 months between refueling outages, had the damage been missed during the 2002 outage, it seems likely that a loss of coolant accident would have occurred. The NRC calculated the severe core damage risk from this event to be 6 x 10^{-3} or 0.6% per reactor year and rated it INES level 3.

Significant Primary Coolant Leaks

18 June 1988, Tihange-1 (Belgium)

On 18 June 1988, while the pressurized water reactor was operating, a sudden leak occurred in a short, unisolable section of emergency core cooling system (ECCS) piping. The leak rate was in the order of 1,300 liters per hour. The source of leakage was a crack - 9 cm long on the inside surface of the pipe and 4.5 cm long on the outside surface - extending through the wall of the piping. The risk of a pipe rupture in the emergency core cooling system is considerable if the emergency safety injection system is activated as large quantities of cooling water are injected in case of a loss of coolant accident in an already degraded safety situation.

12 May 1998, Civaux-1 (France)

The Civaux-1 pressurized water reactor was shut down for five days, when,

during start-up tests, a 25 cm diameter pipe of the main residual heat removal system cracked open and a large leak (30,000 liters per hour) occurred in the primary cooling circuit. The reactor core needs to be cooled permanently, even when it is shut down, in order to evacuate the significant amount of residual heat of the fuel. It took nine hours to isolate the leak and reach a stable situation. An 18 cm long crack on a weld was identified and 300 m3 of primary coolant had leaked into the reactor building. The unit had been operating for only six months at 50% power level maximum prior to the event. The operator, EDF, suggested rating this event at level 1 on the INES scale, but the safety authorities decided on level 2.

9 February 1991 Mihama-2 (Japan)
A steam generator tube rupture occurred at Mihama-2 pressurized water reactor. This was the first such incident in Japan where the emergency core cooling system was actuated. The utility investigated the rupture and found that it was a complete circumferential tube failure. The utility found that the failure due to high cycle fatigue caused by vibration. By design, all tubes in specific locations in the steam generator are supposed to be supported by anti-vibration bars. However, the subject tube was found not to be supported appropriately because of a reported "incorrect insertion" of the adjacent anti-vibration bars.

Reactivity Risks

12 August 2001, Philippsburg (Germany)
A deviation from the specified boron concentration - a neutron absorber needed to slow down or stop the nuclear reaction - in several flooding storage tanks during the restart of the plant was reported to the authorities. In addition, the liquid level had not reached the required value fixed in the operational instructions for the start-up and was only implemented with a delay. The emergency core cooling system will only work effectively if it is operated according to the design basis conditions. Subsequent investigations revealed that significant deviations from start-up requirements and violations from related instructions seemed to be common probably for several years and took place in other German nuclear plants.

1 March 2005 Kozloduy-5 (Bulgaria)
In the process of power reduction at the Russian designed pressurized water reactor (WWER) the operators identified that three control rod assemblies remained in the upper end position. The follow-up movement tests of the remaining control rod assemblies identified that 22 out of 61 could not be moved with the driving mechanisms. The exact number of control rod assemblies unable to scram (to drop due to the gravity only) remains unknown but it is thought to be between 22 and 55. The WWER-1000 scram system is designed to put the reactor in safe shutdown if one control rod assembly at the most is jammed in the upper position. The operator had originally rated the incident INES level 0, but the safety authorities finally admitted to a level 2 rating.

Fuel Degradation (outside reactor core)

Paks (Hungary) 2003
Design deficiencies of a chemical system built to clean 30 partially irradiated fuel assemblies from magnetic deposits in a special tank (outside of the vessel of the pressurized water reactor) caused insufficient cooling of all assemblies, which were heavily damaged. A subsequent IAEA investigation identified eight separate design errors. The system was developed, manufactured and delivered by Areva NP. During the accident radioactive releases were about four times the noble gases and almost 200 times the Iodine-131 and aerosols released by all 58 French pressurized water reactors during the whole of 2003. The event was reclassified as Level 3 on the INES scale after an initial Level 2 rating.

Fires and Explosions

14 December 2001, Brunsbüttel (Germany)
A hydrogen explosion caused a high degree of damage to the spray system piping of the boiling water reactor. The head spray line is used for cooling the inner surface of the reactor pressure vessel head and the flange area upon plant shutdown. Some parts of the 5.6 mm diameter pipes were ruptured. An approximately 2.7 m long piping section had burst and was completely destroyed. Some sections of the piping were missing. Prior to this event the possibility of severe explosions caused by radiolysis gas during normal operation was nearly excluded.

Station Blackout

18 March 2001 Maanshan (Taiwan)
The pressurized water reactor was affected by a total loss of external and internal power supply. Power supply is crucial to evacuate residual heat from the reactor core. The plant is situated

USA: Serious March 2006 event revealed

A recently published NRC report published in the US Federal Register, details the events from FiscalYear2006 which commissioners consider to be significant from the standpoint of public health and safety. One passage details the High Enriched Uranium pillage, which took place at Nuclear Fuel Services' (NFS's) fuel fabrication facility in Erwin, Tennessee, on 6 March 2006. The facility is used to make nuclear fuel for naval reactors.

The event occurred when 35 liters of HEU solution leaked into a glovebox while being transferred. The glovebox would normally have been sealed tightly, but workers had recently moved it and failed to reseal it correctly. The HEU solution was thus able to leak from the glovebox onto the floor and then into an elevator pit where it accumulated.

The NRC report states that criticality would have been possible both in the glovebox and in the elevator pit, but not that criticality ever occurred. It continues to say that "the total volume of the transfer would have been more than enough for criticality in the glovebox or the elevator pit."

Criticality is when a chain reaction releasing heat and large amounts of radiation is initiated within a body of material containing a critical mass of U-235 or another fissile element such as U-233, Pu-239, or Pu-241. This is normally made impossible by very strictly limiting amounts and locations of materials and also by the geometry of vessels made to contain them.

The report says that if a criticality accident had occurred in the glovebox or the pit "it is likely that at least one worker would have received an exposure high enough to cause acute health effects or death."

In response to the event, NFS stopped HEU processing in the area of the event and removed the processing enclosure and all its pipework. NFS also filled in the elevator pit with concrete and conducted an extensive review to identify any similar configuration issues.

World Nuclear News, 9 May 2007

near the sea. Salt deposit on insulators due to foggy weather caused instability of the high voltage grid. During a switch to the grid a short circuit in a power switch of the emergency power line occurred and caused a cable fire. A breaker and switchgear was totally destroyed by the fire and the diesel generators could not be started up manually because of heavy smoke. It took about two hours to restore power supply.

25 July 2006, Forsmark, Sweden

A short circuit in an outdoor switching station of the grid nearby the boiling water reactors caused the emergency shutdown (scram) of unit 1 and, in a complex scenario, led to a number of subsequent failures at the plant. Due to a design error, the disconnection of the plant from the grid and the switch to house load operation - where the power plant uses its own power to operate essential auxiliaries - did not function as planned. An inappropriate converter adjustment led to the failure of the attempt to connect safety related equipment to the emergency power supply. The start up of two of the four emergency diesel generators was aborted, which lead to a partial blackout even in the main control room. Due to the lack of information about the important parameters for a period of time the exact state of the plant and the consequences of potential actions to perform were unclear. The shift team decided nevertheless to try to reconnect the plant to the grid, which was performed successfully.

Generic Issues - Reactor Sump Plugging

28 July 1992, Barseback-2 (Sweden)

A leaking pilot valve in the boiling water reactor in Barsebäck initiated automatically safety functions like reactor scram, high-pressure safety injection, core spray and containment spray systems. The steam jet from an open safety valve was impinging on thermally insulated equipment. Insulating material was washed into the suppression pool and affected the emergency core cooling system, which is essential for heat removal in case of a leak the reactor coolant. Similar incidents occurred in several countries and the problem turned out to apply to many, if not most, of the light water reactors in the world.

Natural Events

27 December 1999, Blayais-2 (France)

The Blayais nuclear power plant site was flooded after heavy storms resulting in certain key safety equipments of the plant being under over 100,000 m^3 of water, for example safety injection pumps and the containment spray systems of units 1 and 2. The electrical system was also affected. Power supply was interrupted. Flying objects and debris rendered any intervention dangerous. All four units on the site were shut down. For the first time, the national level of the internal emergency plan (PUI) was triggered. The event was given an INES Level 2 rating.

Security Events and Malicious Act

7 February 1993, Three Mile Island (USA)

An unauthorized vehicle entered the owner-controlled area (OCA) of the Three Mile Island (TMI) nuclear power plant. No physical barriers were present to delay access. The vehicle continued to the protected area (PA) of the nuclear plant, smashed one of the entry gates, before crashing through a corrugated metal door and entering the turbine building of the Unit 1 reactor, which was operating at full power. The vehicle stopped 19 meters inside the turbine building, striking and damaging the insulation on an auxiliary steam line. A Site Area Emergency, the second highest emergency classification level, was declared. This was the second time this had occurred at the TMI plant (the first being the TMI Unit 2 meltdown in 1979). The intruder was not apprehended until four hours after he entered the site.

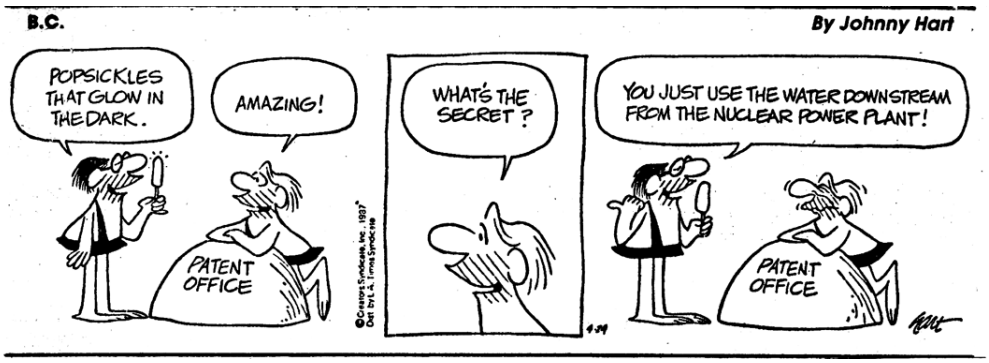
July 2000, Farley (USA)

During an "Operational Safeguards Response Evaluation," or OSRE - war-game-type exercise to evaluate whether nuclear power plant security forces could effectively defend against an adversary team - the security force at Farley could not prevent the mock adversary team from simulating the destruction of entire target sets in two out of four exercises (and therefore simulating a core meltdown); and simulating the destruction of "significant plant equipment" in a third exercise.

29 August 2002, 17 TEPCO Reactors (Japan)

The Tokyo Electric Power Company (TEPCO) operates 17 boiling water reactors and was also one of the most respected large companies in Japan. On 29 August 2002 the Japanese Nuclear Industrial Safety Agency (NISA), shocked the nation with the public revelation of a massive data falsification scandal at TEPCO. At that point 29 cases of "malpractice" had been identified, including the falsification of the operator's self-imposed inspection records at its nuclear power plants over many years. In the follow-up, all of the 17 TEPCO units had to be shut down for inspection and repair. It was reported later that these practices had gone on for as long as 25 years and the total number of events is put at nearly 200 so far. However, revelations of cover-ups and malpractice have extended to all major nuclear operators in Japan and continue to date. In the latest case, in early April 2007 Hokuriku Electric has admitted to a criticality incident at its Shika-1 boiling water reactor. The incident had been covered up for almost eight years.

The report *"Residual Risk: An Account of Events in Nuclear Power Plants Since the Chernobyl* Accident in 1986" May 2007. Project co-ordinator Mycle Schneider.
Written by: Kastchiev, Kromp, Kurth, Lochbaum, Lyman, Sailer, Schneider.
The report can be downloaded at:
http://www.greens-efa.org/cms/topics/dokbin/181/181995.residual_risk@en.pdf



IN BRIEF

BNP Paribas to finance start-up of Belene nuclear construction with 250 mln euro... The French Bank BNP Paribas has won the tender to provide a 250 million euro loan-financing for the construction of the new 2,000MW nuclear power plant at Belene, Bulgaria., Russian news agency ITAR-TASS reported on May 14. According to the news report, the bank will lead a group of partners in securing the credit of 250 mln euro (US$410 million) needed for the launch of construction. According to industry experts the sum is enough to cover the necessary expenses for the first year, including designing, equipment supply, and beginning of construction works.
The Bulgarian national electricity company NEK confirmed the selection of BNP Paribas but said the loan agreement has not been signed yet. The construction of the Belene NPP has been commissioned to Russia's AtomStroyExport. The final agreement for implementation of the project is expected to be signed before the end of 2007.
The construction contract with Atomstroyexport has a value of 3,997 billion euro and the total construction budget of Belene is estimated to pass 5 Billion Euro. BNP Paribas was the only one of 12 banks not to react on letters from Bulgarian NGOs, WISE and Greenpeace, exposing the risks to investments in the Belene nuclear power plant. All other banks withdrew their initial interest in the project or made their interest depending on strong sustainability conditions. These banks include amongst others leading banks in Central Europe as UniCredit / HVB / Bank Austria - Creditanstalt, Commerzbank, Deutsche Bank, Credit Suisse, Sociètè Gènerale, KBC and JP Morgan Chase. BNP Paribas employs former Bulgarian Energy Minister Milko Kovachev, the architect of the re-start of the Belene NPP project, as consultant. The tender result was two months delayed and coincides with a political crisis in Bulgaria, in which current Economy and Energy Minister Rumen Ovcharov is temporarily placed on non-active pending corruption charges.
Itar-Tass, 14 May 2007, WISE / NIRS Brno, 15 May 2007

US Browns Ferry reactor to reopen. The Tennessee Valley Authority (TVA) plans to reopen its Browns Ferry 1 nuclear reactor this month - 22 years after it was shut for safety reasons and 5 years after extensive renovations began. It will be the first nuclear reactor to come into service in this decade. The last one was Watts Bar 1, also a TVA plant, in Tennessee, in June 1996. Construction of Watts Bar 1 started in January 1973(!) and has been halted for years. The TVA is now studying whether to finish Watts Bar 2, where most work stopped in 1988, after construction started in 1972!
As for the Browns Ferry renovation, a TVA spokesman said that the exact cost would not be known for some months, but would "probably not be much more" than $1.8 billion.
The willingness to spend US$1.8 billion (1.3bn) on the overhaul also shows just how hard companies think it will be to build a new plant. Browns Ferry 1, despite being out of use for more than two decades, enjoys the advantage of already having a license. David Lochbaum, a nuclear safety engineer at the Union of Concerned Scientists who once worked at Browns Ferry, said the decision to put so much into old technology was noteworthy. "Most people," he said, "are going to buy the new iPod rather than an eight-track tape player." The decision to refurbish rather than start from scratch also saved time, with project completion anticipated in 60 months. The industry has tried hard to shorten the time needed to plan and build a new reactor, but still projects that it will be about 12 years. The Nuclear Regulatory Commission has made changes in its licensing procedure that it says will make the process faster and more predictable, but some utilities are nervous about being the first to try it out. The Browns Ferry project has a checkered history. The TVA set out to build two reactors there in 1966, predicting operation by 1970 at a construction cost of US$247 million, plus $66 million for the first load of fuel. Unit 1 opened in August 1974, and Unit 2 the following year, at a cost of more than $500 million, or about $2 billion in today's dollars.
In March 1975, an electrician was using a candle in a room full of cables, under the control room, to look for air leaks, a procedure that the authority described as normal. He set a fire that burned for hours and disabled the reactor's emergency core cooling system. The fire is still regarded as the second most serious commercial nuclear accident in the U.S., after the meltdown at Three Mile Island in March 1979. The reactor reopened, but 10 years later, in March 1985, the TVA shut all three of the reactors on the site because of numerous safety problems. Unit 2 reopened in May 1991, and Unit 3 in November 1995.
As the plant sat idle for 22 years, the clock was ticking on its 40-year operating license. But in May 2006, the Nuclear Regulatory Commission granted a 20-year extension on all three Browns Ferry plants.
New York Times, 11 May 2007 / World Nuclear Industry Handbook

Finnish town council refuses to sell land for nuclear plant. The city council of Finnish town Loviisa has nullified the town's preliminary agreement to sell land to Germany's E.ON for a nuclear power plant. The town council voted 16-11 against the deal. For Loviisa city head Olavi Kaleva the decision was "a bit of a surprise. Part of the nuclear power supporters turned against it." The town in southeastern Finland had agreed to sell the land, located north of an existing nuclear power plant owned by Fortum, to E.ON for 6.5 million (US$8.8 million) in April, but the council's vote overruled the agreement. Kaleva said the city had no alternative plans at this stage to pursue a land deal with E.ON, but it would still consider whether to proceed in some way. "But there is little choice for alternative plots. This area had been designed for energy generation use in terms of zoning. It was currently the only option we had to offer," Kaleva said. Utility Teollisuuden Voima (TVO) has two operation reactors in Olkiluoto (and that is building the fifth reactor Olkiluoto 3) and Fortum that has two operating reactors in Loviisa have both started environmental impact assessments for Olkiluoto and Loviisa (not at the same place E.ON wanted to buy).
PlanetArk, May 10, 2007, Ulla Klötzer.

Russia and Myanmar sign contract for nuclear research center. Russia has agreed to help build a nuclear research center in Myanmar, the Asian state run by a military that is under European and US economic sanctions. "The agreement foresees cooperation in the design and equipping of a center for nuclear research in Myanmar," including a small light-water nuclear reactor, Russia's atomic energy agency Rosatom said in a statement. Myanmar is under US and European economic sanctions imposed in response to rights abuses by the country's military dictatorship.
According to Rosatom the nuclear center in the current deal with Myanmar will be under the control of the International Atomic Energy Agency. The statement also said that the center will be operated by Atomstroiexport, a Rosatom subsidiary, without giving a date for when the project would be built. The center is to include a laboratory for the production of medical isotopes and a complex of buildings and equipment for the reprocessing and burial of nuclear waste, Rosatom said.
ChannelNews Asia, 16 May 2007

Germany: more money for nuclear research. The fact that the German government renounced nuclear energy in 2000 and pledged to take its last plant off the grid by 2020 might lead you to think that it would scale back its nuclear research programs. What, after all, is the point in spending money on developing a technology which is on its way out? However, the current administration seems reluctant to give up nuclear quite yet.
Early May German Research Minister Annette Schavan raised eyebrows with her announcement that she would increase research spending between 2008 and 2011 by up to 40 million Euro. Most of the money has been earmarked for young researchers working on nuclear waste storage and nuclear security issues. Up until now, the Education and Research Ministry funded nuclear research programs with 30 million Euro annually.
Der Spiegel online, 8 may 2007

U.K.: still Chernobyl restrictions
The Food Standards Agency has published its latest reports on the monitoring of farms and sheep for contamination following the 1986 Chernobyl accident. There remains 197,300 sheep on 371 holdings that are still subject to restrictions because of raised levels of radioactivity. There are 6,600 sheep in England under restrictions, 180,000 in Wales and 10,700 in Scotland. In June 1986 there were 4,225,000 sheep under restriction orders.
N-Base Briefing 525, 12 May 2007

Major Security Breach at U.S. Palisades Nuclear Plant. A story appearing in the June 2007 edition of Esquire magazine that reveals a major security lapse at the Palisades nuclear power plant in Covert, Michigan, confirms that reactor security around the country is grossly inadequate. NIRS/WISE has called on the U.S. Congress to investigate the security breach at Palisades. The Esquire story, entitled "Mercenary," details how the head of Palisades security - William E. Clark - had largely fabricated his background, experience and security credentials, presenting himself as an expert on armed deterrence. Clark has since resigned his position. "Mercenary" reveals that officials at the Palisades nuclear power plant failed to detect false assertions in Clark's resume that claimed he had high level security clearance from the U.S. Department of Defense . Clark also passed a Nuclear Regulatory Commission-regulated background check. He was hired by the plant's previous owner, Consumers Energy Company, and operator, Nuclear Management Company, but was kept on by the new owner and operator, Entergy, since it acquired Palisades one month ago.
Esquire,12 May 2007, at http://www.esquire.com/features/mercenary0607

Germany: no more CO2 after closure of nuclear reactors.
Closure of Stade and Obrigheim, two of the 19 nuclear power stations in Germany, and replacement of the capacity (in total 990 MW) with conventional coal-fired stations has not lead to more emissions of CO2. This whilst the economy grew with 3% and the replacing stations emitted 7 million ton more CO2 (of course the indirect CO2-emissions of the nuclear power stations were never accounted for)
According to the umbrella organization of the electricity producers this remarkable result is reached due to increased efficiency of the coal fired stations. A German coal fired station reaches an average efficiency of about 40% (new ones are at 45%) while global average is at 30%. Germany alone contributes to approx. 75% of the decline in emissions of CO2 of the 'old' (15 member states) EU. Compared to 1990 (benchmark date) Germany emits 19% less CO2.
These developments clearly prove that closing down nuclear power stations is possible without increasing the CO2-emissions. Of course the proof is in the pudding as the main pudding is still to be made in the coming twenty years when Germany will (as still planned) gradually close down its 17 remaining nuclear power stations.
With the fastest growing market for wind and other renewables (in BNP, in work, in percentage of the electricity production) in at least Europe, Germany seems to be on the right track (well, if nuclear power is continued to be phased-out.)
Energie Nederland, 2 May 2007

Brazil: environment minister opposes Lula's nuclear option. A week after the Brazilian president Lula said he would push for more reactors if enough hydroelectric plants cannot be built, Brazil's environment minister attacked proposals for new nuclear power plants.
Brazil relies on hydroelectric dams for more than 80 percent of its energy needs.
To address the prospect of looming power shortages in Latin America's largest economy, President Lula's government is

weighing a plan to build at least four new reactors with a total capacity of 4,000 megawatts by 2030. But Environment Minister Marina Silva defended the hydroelectric option as "clean and without risk" but said that environmental concerns should always be taken into account when authorizing new dam projects. "The ministry is against nuclear energy. We have a clean energy matrix, an advantage that no other country has," said Silva, a former activist in the Amazon rain forest. "Nuclear energy has a serious problem that is waste disposal." She advocates the use of hydroelectric, wind and biomass energy sources.
Brazil now has two nuclear reactors near the coastal resort of Angra, which account for about 3 percent of all power. The National Energy Policy Council will meet in June to discuss completion of the Angra 3 nuclear plant. Many officials expect the council's approval despite Silva's objections.
Reuters, 3 & 10 May 2007

U.K. Waste for Sweden. Radioactive waste metal from Sellafield and other nuclear sites will be shipped to Sweden for decontamination under a contract between the British Nuclear Group and Studsvik. The Swedish company plans to take scrap metal contaminated with low-levels of radioactivity to Sweden for treatment. The metal would be recycled for re-use, including in consumer goods. The recovered radioactivity will be shipped back to the UK for storage in the Drigg facility near Sellafield. The Liberal Democrats are raising the issue in Parliament, but the Nuclear Decommissioning Authority, which runs the UK's civil nuclear sites, has strongly defended the plan. The NDA said many European countries and the USA allow the re-use of contaminated metals and the proposal would help reduce the volume of low-level waste stored in the UK at a time when existing facilities were filling up.
N-Base Briefing 525, 12 May 2007

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WISE/NIRS NUCLEAR MONITOR

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