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THE EPR IN CRISIS

Much has been written in the Nuclear Monitor in the past few years about the European Pressurised water Reactor. Now a new study by Professor Steve Thomas (Business School, University of Greenwich, London) describes the history, failure, and outlook of this reactortype: 'The EPR in Crisis', published November 10. An important report, since the EPR is one of the most mentioned reactor types in the hype of the nuclear renaissance and is planned to be built in a number of countries. With kind permission of the Steve Thomas, we publish the entire report. Please note that this report is copyright material.

(719/720.6100) Steve Thomas - The European Pressurised water Reactor or EPR(*1) was to have been the demonstration of a new generation of nuclear reactors, so-called Generation III+, first talked about in the late 1990s. The difference between 'III+' and the earlier 'III' designs is that III+ designs are said to rely more on 'passive' rather than 'engineered' systems.(*2)

Introduction

The rationale for the Generation III+ plants was that they would be an evolution of existing designs but would be designed from the start with the lessons from the Three Mile Island and Chernobyl accidents fully incorporated. They would rely more on natural processes rather than engineered systems for their safety – so-called passive safety. As well as being safer, they would also be more 'buildable', cheaper to build and operate, and easier to decommission. In short, they would address the issues that had led to ordering of earlier designs to a near halt from about 1990 onwards.

The Olkiluoto order, placed in 2003, should have been on-line in 2009 and should have been a demonstration of the qualities of Generation III+ designs in general and the EPR in particular. However, by 2010, the EPR appeared to be in crisis. The two orders on which significant construction work had been completed had gone seriously wrong, obtaining safety approval from regulators in Europe and the USA was proving far more difficult than had been expected, estimated construction costs had increased by a factor of at least four in the past decade and the EPR had failed to win orders in bids for tender for nuclear capacity. Relations between the two state-controlled French companies at the heart of the development of the EPR, Areva, the vendor and Electricité de France (EDF), the utility appeared at breaking point. EDF was reportedly contemplating designing two new reactors in competition with those offered by Areva.(*3)

In this report, we examine the roots of the design, existing and potential orders for the reactor, experience with construction of the EPR, issues arising from the safety assessment of the design, and economic issues. We examine the report by the Roussely Commission, a report commissioned by the French government and headed by a former Chief Executive of the French utility, Electricité de France (EDF), and its implications for the EPR.

The roots of the EPR design

In 1989, Siemens, the main German nuclear vendor and Framatome, the French nuclear vendor formed a joint venture company, Nuclear Power International (NPI) to design a new Pressurised Water Reactor (PWR). Siemens and Framatome had both been

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licensees of Westinghouse for their PWR technology. Design work was partly funded by German utilities and Electricité de France. This design would be based on Siemens' and Framatome's most recent PWR designs, the 'Konvoi' design and the N4 respectively. By 1992, NPI was claiming that the conceptual design of the EPR was nearly complete,(*4) although the conceptual design was not actually completed until 1994. The EPR would have a thermal output of 4250MW giving an electrical output of about 1450MW. The containment was drawn mainly from the N4 design, while instrumentation was expected to be drawn from the Konvoi. A particular feature of the design was the inclusion of a 'core catcher' so that in the event of a core melt, the core would be retained within the containment. There was some uncertainty about what type of external hazards would be guarded against, with the French requiring protection only against a light aircraft, such as a Cessna, while the Germans required a military jet, like a Phantom.

In March 1995, the basic design phase was started with the expectation that EDF would order the first unit before 2000 and have it in service by 2006. However, there was then already so much nuclear capacity in France that EDF had more than enough nuclear power capacity to meet base-load. This meant that 'series' ordering, that is ordering at a predictable rate of several units per year, would not be needed before 2005.(*5) The French programme had always been premised on an assumption that a nuclear power programme only made sense if series ordering was expected. The issue of aircraft protection was not fully resolved but the French containment was approved by both the German and French regulators. By November 1995, there were concerns, especially amongst EDF officials, about the cost of the design, then expected to be more than US$2000/kW.(*6) The basic design work was not completed on time and in August 1997, after further concern about costs, the output of the plant was increased to 1800MW.(*7)

In September 1999, the head of DSIN (the French safety regulatory body later renamed DGSNR), Andre-Claude Lacoste, stated he expected to issue an interim safety verdict on the EPR within 'a few weeks to a few months' with a final design certification, reported to be equivalent to NRC's design certification for advanced reactors.(*8) The output of the reactor had been reduced back down to about 1500MW. However, by 2003, the final certification had not been issued and Andre-Claude Lacoste, the head of the French regulatory body,, stated the process carried out up till then did not correspond to US design certification and that to achieve this would take 2-3 years more.(*9)
In August 2000, Framatome and Siemens agreed to a new joint venture formally merging their nuclear activities into a new company called Framatome ANP, subsequently renamed Areva NP. Framatome would hold 66 per cent of the stock and Siemens the rest.(*10)

Marketing of the EPR
Continued delays to EDF's order led Areva NP to switch to Finland as the focus for its marketing. In May 2002, the Finnish Parliament approved the construction of a fifth nuclear unit in Finland. Three designs were short-listed from a list of seven for an order to be placed by the Finnish utility, Teollisuuden Voima Oy (TVO). The Finnish safety regulator, STUK, had already stated that it saw no difficulties in principle in licensing any of the seven initial candidates.(*11) The three short-listed reactors were the EPR, a Russian design and a Boiling Water Reactor design also offered by Areva NP. TVO was widely reported to be looking for a 'turnkey' (fixed price) contract. Westinghouse chose not to bid overtly on the grounds that a turnkey offer would not be profitable.(*12) However, there were also claims by Areva that Westinghouse's AP1000 would not have met the requirements on aircraft protection because its containment was not strong enough.(*13) The AP1000 does not have a core-catcher and the head of STUK, Jukka Laaksonen has stated that on these grounds, the AP1000 would not have been acceptable in Finland.(*14)

In December 2003, TVO signed a turnkey deal with Areva NP for a 1600MW EPR at a cost, including interest during construction and two fuel charges of €3bn. The Finnish regulator was by then in close contact with the French regulator, DGSNR, which was expecting that an order for France would be placed in 2004. STUK expected to complete its review of the design within a year of the placing of the order.

By December, STUK and DGSNR had agreed to opt for different approaches so that construction in Finland did not have to wait until demonstrations of safety features that were expected to reduce costs had been carried out.(*15)
In January 2005, STUK approved construction of Olkiluoto 3.(*16)
In September 2004, DGSNR completed its review of the EPR and in October, the French government issued design approval for it, claimed to be equivalent to NRC design certification.(*17) In December 2004, Areva NP wrote to the US NRC asking it to begin a review of the EPR design for the US market.(*18) It expected completion of the review in 2008.

Approval by the French regulator came just after the opening of a call for tender from China in October 2004 and with further delays in ordering in France, Areva NP's marketing efforts switched to China. China's decision on the tender was delayed several times and it was not until December 2006 that it was announced that it had been won by Toshiba/Westinghouse's offer of four AP1000s. One of the factors behind Areva NP's failure to win the initial tender was reported to be its reluctance to transfer the technology as quickly and as fully as the Chinese wanted.(*19) China wanted quickly to be in a position to be able to build reactors of the design it chose without any input from the original vendor and in 2010, it was planning to start placing orders for plants of the AP1000 design without major involvement from Westinghouse.(*20) There were reports that Areva NP had failed to match Westinghouse's offer to 'sell the Chinese the blueprints.'(*21) However, reportedly in the interests of relations with France, China subsequently ordered two EPRs in November 2007 for the Taishan site in a deal reportedly

worth €8bn. It is not clear what the terms of the contract were or what it covered so it is difficult to compare this deal with others. EDF took a 30 per cent stake in the company, Guangdong Nuclear Power Company (GNPC), building the reactors.

In the meantime, EDF finally ordered its first EPR to be built at its Flamanville site in 2005. At that time, EDF expected the reactor to cost €3.3bn, although the reactor would produce 1700MW, 100MW more than the Olkiluoto order. Construction of the reactor (first structural concrete) did not start until December 2007 and it was expected to take five years to build, a year more than Olkiluoto. Unlike Olkiluoto where Areva NP carried out the architect engineering, EDF itself carried out the architect engineering, as it has done with the 58 previous reactors it had bought from Framatome.

The next tender was for South Africa launched in January 2008 calling for 3200-3600MW of new capacity from Areva NP and Toshiba Westinghouse. The tender was in two parts: the first with specific proposals for the 3200-3600MW of capacity and the second the development of a 20,000MW nuclear fleet to be in place by 2025.. The first part of the bid would require either two EPRs of 1600MW or three AP1000s each about 1200MW.(*22) It was reported that the bids were in the order US$6000/kW(*23) and in November 2008, it was reported that Areva had won the contest, although the scale of 20,000MW programme was to be scaled back.(*24)However, in December 2008, Eskom cancelled the tender citing 'the magnitude of the investment.'(*25)

In February 2009, Areva NP bid for two reactors to be constructed in Ontario. (*26) Other bidders were Toshiba-Westinghouse (AP1000) and the Canadian vendor, AECL offering a new Candu design.(*27) The commissioning body was Infrastructure Ontario a state-owned agency. In June 2009, the Ontario government suspended the tender citing concerns about pricing. It was reported that Areva NP's bid for one EPR was US$21bn. This was denied by Areva NP but they did not reveal the actual figure.(*28)

In February 2009, the United Arab Emirates (UAE) began the assessment of bids for 5000MW of new nuclear capacity. In addition to a bid from Areva NP for three EPRs, it was reported that there were bids from General Electric-Hitachi and Toshiba/Westinghouse.(*29) The EPR bid initially involved Areva NP, GDF Suez, Bechtel and Total. Subsequently, at the request of the French government, EDF was persuaded to join the EPR bid. In July, three bids were selected for assessment including a bid from GE-Hitachi for a boiling water reactor (BWR) and one from a Korean group offering its Pressurised Water Reactor (PWR), the APR-1400.(*30) In December 2009, it was announced that the tender had been awarded to the Korean consortium for four APR-1400 units at a price of US$20bn. According to Korean media reports, the Korean bid was almost 30 per cent lower per kW than the EPR bid, while the GE Hitachi offer was said to be higher than the French bid. The failure to win this bid led to much criticism of the French nuclear industry, in particular the lack of unity in the French bid. EDF, which has acted as architect engineer for all the PWRs built in France, had been unwilling to act as architect engineer for foreign bids and had only been persuaded by the French government in December to lead the bid as the UAE utility, ENEC, had requested.(*31)

USA

The USA is potentially the largest nuclear market (along with China) in the world and Areva and EDF have made a major financial commitment to open up this market. EPR is one of five designs being assessed by the US safety authorities, the Nuclear Regulatory Commission (NRC), and is a candidate for Federal subsidies including Federal loan guarantees. Subsidies for new nuclear reactors were first mooted in 2002, when President Bush launched an initiative aimed at re-starting commercial ordering for nuclear reactors using the Generation III+ design in the USA, the Nuclear Power 2010 programme: no reactor order, not subsequently cancelled, had been placed since 1974 in the USA. The Bush government believed that nuclear technology was competitive and that a handful of subsidised demonstration plants were needed to show that the new designs had overcome the problems of earlier designs.(*32) The publicity for the programme claimed: 'New Generation III+ designs ... have the advantage of combining technology familiar to operators of current plants with vastly improved safety features and significant simplification is expected to result in lower and more predictable construction and operating costs.'(*33)

This programme has evolved considerably since it was first announced and although nominally Nuclear Power 2010 is due to end at the end of fiscal year 2010, the effort by the Federal government to re-start nuclear reactor ordering will almost certainly continue. Nuclear Power 2010 originally had the goal of having new reactors online by 2010. Time-scales have slipped substantially – the first unit is unlikely to be on-line before about 2018 if there are no more delays.

The programme was to take advantage of new licensing procedures, already passed into law in the 1992 Energy Policy Act, so that a combined Construction and Operating License (COL) license would replace the existing procedure of separate construction and operating licenses. The proposed Energy Policy Act of 2003 (EPACT 2003) offered the prospect of Federal loan guarantees for new reactors covering up to 50 per cent of the cost of the projects. When the Congressional Budget Office (CBO)(*34)looked at the cost implications of this bill, it assumed that loan guarantees would be offered for six reactors. The CBO assumed that the reactors would be of 1100MW, each costing US$2.5bn (US$2300/kW) and that they would be financed by 50 per cent debt and 50 per cent equity. This meant that the guarantees required would be worth about US$7.5bn. It asserted the risk of default would be 'well above 50 percent' but that over the plant's expected operating lifetime, its creditors (which could be the federal government) could expect to recover a significant portion of the plant's construction loan so the net cost to

taxpayers would be about 25 per cent of the sum guaranteed.
EPACT 2003 was not passed, but a successor bill, the Energy Policy Act of 2005 (EPACT 2005) was passed and contained much more generous levels of support for new nuclear reactors. EPACT 2005 included provisions to cover cost overruns due to regulatory delays,(*35) and a production tax credit of 1.8 cents per kilowatt-hour for the first 6,000 megawatt-hours from new nuclear reactors for the first eight years of their operation, subject to a $125 million annual limit.(*36)

However, the biggest incentive was the provision of loan guarantees under Title XVII of that bill. While the loan guarantees would only be available for technologies that were not 'commercial', the number of units that would be eligible was not precisely specified. The US Department of Energy stated: 'DOE has defined "commercial technologies," which are not eligible for loan guarantees under this program, as "in general use if it has been installed in and is being used in three or more commercial projects in the United States in the same general application as in the proposed project, and has been in operation in each such commercial project for a period of at least five years." Given that new reactors will take at least five to ten years to build, a large amount of loan guarantees for the same design could be offered before the design is considered "commercial".(*37)

The potential scale of the loan guarantees programme has escalated dramatically since 2003. Let us assume that these were now available for only three units of each of the five designs being assessed by the US NRC and for up to 80 per cent of the total cost. Since the CBO made its estimate in 2003, the estimated cost of new reactors has increased to at least US$6000/kW and their average size has increased to 1200-1600MW making the cost (without finance costs) of an EPR nearly US$10bn.

Under these assumptions the programme would be able to provide loan guarantees worth more than US$100bn. In July 2008, the US DOE announced it was ready to accept applications for loan guarantees, but Congress authorized only up to US$18.5bn.(*38) Congress believed this might be sufficient to cover four projects (seven to eight reactors), but using more realistic cost assumptions, this seemed likely to be able to only allow three or four reactors at most. The Obama Administration asked for an additional US$36bn in loan guarantees in February 2010 , but the appropriations process was held up by election-year politics, so by November 2010, it was not clear how much the additional funds would be. There is also the issue of the fee that should be charged to borrowers for the loan guarantees. This should be an economic fee, in other words, one that reflects the risk involved. . The fees are assessed by the federal Office of Management and Budget and are supposed to reflect the risk of default for that project. As has become clear with the Calvert Cliffs project, discussed below, if the risk of a loan is assessed to be high, the fee could be more than the developers are prepared to pay.

The subsidies on offer under EPACT 2005 did stimulate utilities to announce plans for more than 30 new reactors, seven of which were for EPRs. However, a significant proportion of these never got beyond the early planning stage and by June 2010, only 27 had made applications to the NRC for COLs. Four of these were for EPRs (see Table 1) including two to be built by UniStar, a 50-50 joint venture created in 2005 between EDF and the US utility, Constellation. UniStar is a partner in the other two projects with PPL for the Bell Bend project and with Ameren UE for the Callaway reactor. By June 2010, of these 27 reactors, one application had been withdrawn and the owners of four others, two of which were for EPRs, had asked for the process to be suspended. Of the remaining 22, two were EPRs and the developer of one of these, PPL, stated that it was still 'several years from a final decision on whether to build Bell Bend.'(*39) The future of the EPR therefore seemed highly dependent on the one EPR project still being actively pursued, the UniStar Calvert Cliffs project.

Table 1 EPR's proposed in USA

Plant	Owner	COL application	Loan Guarantee
Calvert Cliffs 3	UniStar	COL 3/08	Shortlist
Callaway 2	AmerenUE	Suspended 4/09	Applied
Nine Mile Pt 3	UniStar	Suspended 1/09	Applied
Bell Bend	PPL	COL 10/08	Applied

Source: Author's research

The presence of EDF in the UniStar joint venture, with its vast experience of building and operating PWRs supplied by Areva – 58 units in service in France – was seen as a major advantage. Constellation owns about 3.9GW of existing nuclear power plants at three sites (Calvert Cliffs, Nine Mile Point and Ginna).(*40) In September 2008, EDF tried to take over Constellation but were outbid by MidAmerican Energy Holdings, a private company controlled by Warren Buffet. It was reported that the rival bid for Constellation could derail EDF's nuclear ambitions in the USA if MidAmerican did not support new nuclear build. In December 2008, EDF announced an agreement with Constellation to take a 49.99% holding in Constellation's nuclear subsidiary, Constellation Energy Nuclear Group. The deal was done through the EDF subsidiary, EDF Development Inc, and cost US$4.5bn.(*41) Mid American Holdings amicably withdrew its offer. The UniStar joint venture remains separate from this deal.

Whether the purchase of the stake in Constellation's nuclear assets made any sense without the new build reactors is far from clear. However, it is apparent that EDF regards it as part of its bid to build new reactors and expand the scope of its operations into plant design and construction.

Nucleonics Week reported: “EDF Chairman/CEO Pierre Gadonneix defended the decision to buy what some in France are calling ‘old’ US nuclear plants as a ticket to what will be ‘the world's largest nuclear market tomorrow’."(*42) In summer 2009, Gadonneix was replaced by Henri Proglio, who has been reportedly much less enthusiastic about EDF’s nuclear expansion outside France.

The Calvert Cliffs reactor was forecast to cost US$7.2bn in 2008.(*43) UniStar ordered forgings and other long lead-time reactor components for Calvert Cliffs in 2006 and 2007. A partial construction and operating license application (COLA), mainly the environmental report, was submitted in July 2007 and was docketed by the NRC in January 2008. The remainder of the COLA was submitted in March 2008 and was docketed on June 4, 2008. As of November 2010, there was no schedule for issue of the COL because of the problems with certifying the design.(*44) Part 1 of the application for federal loan guarantees was submitted in September 2008 and Part 2 in December 2008. In 2009, the US Department of Energy short-listed four projects for loan guarantees, including Calvert Cliffs. The first loan guarantee was offered to another project in February 2010 and an offer to Calvert Cliffs was widely expected to follow soon after. However, by August 2010, no commitment had been made and Constellation began to cut back drastically on expenditure on the Calvert Cliffs project. How far this was due to the delays in granting loan guarantees and how far it was due to deterioration in the economics of the new reactor is not clear.

The CEO of Constellation stated: ‘market signals to build a baseload plant of any kind, let alone nuclear, have suffered significantly since we started the project four years ago.’ He said Constellation will abandon the project if it does not receive a conditional loan guarantee for the project. The poor market signals included low natural gas prices and the short- and long-term power price outlooks.(*45) EDF, in its report for the first half of 2010 published in July 2010, made a provision of €1.06bn (about US$1.45bn) related to financing delays on nuclear projects in the United States.(*46)

By September, signs of strain between EDF and Constellation were clear. A particular issue was that under the terms of the purchase of the stake in Constellation’s nuclear assets, Constellation could require EDF to US$2bn worth of Constellation’s natural gas, coal and hydropower plants by end 2010.(*47) There was speculation in September 2010 that these problems could lead to EDF selling its stake in the nuclear assets and dissolving the UniStar joint venture.(*48) In October 2010, Constellation unilaterally withdrew from negotiations with the US Department of Energy for loan guarantees for the Calvert Cliffs project. It was reported that the fee to provide loan guarantees for 80 per cent of the forecast cost of the plant (US$9.6bn) was initially proposed at US$880m, or 11.6 per cent of the amount borrowed. (*49) When Constellation rejected that offer, DOE proposed a 5 per cent fee, but with conditions including that Constellation fully guarantee construction and commit to sell 75 per cent of the power through a Purchase Power Agreement (PPA), presumably through its subsidiary Baltimore Gas & Electric. The Maryland Public Service Commission (PSC) would have had to approve a PPA.

Subsequently Constellation sold its 50 per cent stake in UniStar to EDF for US$140m. In addition, Constellation transferred to UniStar potential new nuclear sites at Nine Mile Point and R.E. Ginna in New York as well as Calvert Cliffs. The agreement requires EDF to transfer 3.5 million of the shares it owns in Constellation and to give up its seat on Constellation's board and in exchange, Constellation gave up the option to require EDF to buy Constellation’s fossil fuel capacity.(*50)

EDF was reported to be keen to proceed with the Calvert Cliffs project but US law does not allow US nuclear reactors to be owned, controlled or dominated by foreign companies or governments, so EDF would need to find a new partner to proceed. It is not clear whether loan guarantees could be offered to UniStar in advance of a new US partner being agreed and whether the fee would be the same.

While the political wrangling about how much Congress will be prepared to allow the US DOE to offer in loan guarantees, the deteriorating prospective economics for new nuclear reactors and the economic risk they pose to their owners may mean that relatively few loan guarantees are granted. The projects most likely to go ahead are those with the ‘belt and braces’ of Federal loan guarantees and a state regulatory body that commits to allowing the utility to recover its costs from consumers. Calvert Cliffs and Bell Bend would be exposed to the PJM electricity market and therefore could expect no support from the state regulator. If the Calvert Cliffs project does collapse and an existing project, such as Bell Bend cannot be brought in to replace it, it is hard to see how the EPR could survive in the USA. This would be a severe blow to EDF and Areva, both of which have invested a large amount of cash and their credibility in opening up the US market to the EPR.

Future prospects

The EPR is competing in a number of other markets where Areva NP hopes it will be the basis for series ordering, in particular the UK and Italy.

UK

The UK government’s program is based on very different underlying assumptions than that of the United States. The UK government did not claim that nuclear power would be directly competitive with fossil fuels, but if a carbon price of €36/tonne was assumed, it would be competitive. Both the Labour government up to May 2010 and the successor Conservative/Liberal Democrat coalition seem heavily committed to reviving nuclear ordering in the United Kingdom. However, all three parties have stated that orders should only be placed if they do not involve public subsidies. Ordering would therefore take place without subsidy, provided a few non-financial enabling decisions were taken, particularly on planning processes and

certification of designs. In 2008, when the government revisited nuclear economics, it assumed the construction cost was £1,250/kW ($2,000/kW).

The government's nuclear regulator, the Nuclear Installations Inspectorate of the Health and Safety Executive (HSE), started to examine four separate designs in 2007 including the Areva NP EPR and the Toshiba/Westinghouse AP1000. The rationale was that up to three designs would be finally certificated, thus giving utilities a choice of designs. In fact, the other two designs were quickly withdrawn leaving just the EPR and AP1000.

Three utilities have made significant commitments to UK ordering: EDF, RWE, and E.ON – the latter two in a consortium called Horizon. EDF took over the UK nuclear generation company, British Energy, for about €15 billion in 2008, while RWE/E.ON have purchased sites in 2009 adjacent to existing nuclear power plants for several hundred million Euros. Both EDF and the RWE/E.ON consortium expect to order 4 units, for a total of 10 to 12 GW of capacity. EDF is expected to order the EPR, while the RWE/E.ON consortium has yet to choose its supplier.

EDF heavily committed itself to nuclear ordering in the United Kingdom with its purchase in 2009 of British Energy. The price seemed far above the value of the assets being acquired and only has any logic if new nuclear orders are placed. British Energy went bankrupt in 2002 because its operating costs, then about £16/MWh, were marginally higher than the price it received for electricity. Since then, operating costs have grown every year and by 2008/09, the operating costs had risen to £41.3/MWh. British Energy only remained solvent because of the extremely high wholesale electricity prices that prevailed in that period – British Energy received £47/MWh in that period. If operating costs continue to rise and/or wholesale electricity prices fall (by the end of 2009, they were well below the 2008 peak), British Energy will be at risk of collapse again.

The RWE/E.ON consortium had invested a few hundred million pounds in options to buy sites, but if it did not take up these options, it could walk away from a British nuclear program at little cost. By the start of 2010, the UK was still 3-4 years from completing safety assessment of the design and getting planning permission for specific sites – the point when a firm order could be placed.

Italy

In 1987, a referendum led to the closure of the four operating nuclear power plants in Italy and the abandonment of work on construction of another nuclear station. The Berlusconi government has introduced legislation that would pave the way for the reintroduction of nuclear power in Italy. Four 1650 MW EPRs could be built, with construction starting as early as 2013, under an agreement signed in February 2009 by the French utility, EDF, and the largest Italian utility, ENEL. ENEL has not selected the sites for these units yet. It has said the cost would be about €4-4.5 billion each or $3,600-4,000/kW.(*51) There has been speculation about other competing bids to build nuclear power plants – for example, a consortium led by A2A, the Milan-based utility offering AP1000s – but these projects are much less advanced than those of ENEL.(*52)

India

It has been reported that a memorandum of understanding (MOU), including the intention to build two EPRs, would be signed in February 2009 between Areva and the state-owned Nuclear Power Corporation of India Limited.(*53) Even if this MOU is signed, it is far from being a firm order and many MOUs come to nothing, for example, if financing cannot be arranged.

Other markets

President Sarkozy has announced that a second EPR in France will be ordered in 2011 for the Penly site. It is unlikely there will be scope for many further orders for France given that France already has more baseload electricity capacity than it can readily use and with plans to operate existing reactors for up to 60 years instead of the earlier expectations of 40 years, it will not be till after 2035 when the existing reactors begin to be retired. The Penly plant was to be built by EDF, which would have a 50 per cent stake in it, with the other stakes being held by the other major French utility, GDF Suez (25 per cent) and ENEL (the main Italian utility), E.ON (a large German utility and the oil company, Total, each with 8.33 per cent. However, in September 2010, GDF Suez, which was disappointed not to have been given the job of building the plant, announced their withdrawal from the project.(*54) There were reports that GDF Suez was hoping to lead construction of a reactor at another site, using the Areva 'Atmea' design (see below).(*55)

The Finnish Parliament has voted to allow construction of two additional nuclear reactors by two different consortia. Both consortia have named the EPR as one of three or four options they might choose. It is far from certain whether these orders will be placed, and if they are, whether the EPR will be chosen, especially given the poor performance of the EPR at the Olkiluoto site. In July 2010 in the Canadian province of New Brunswick, Areva, the New Brunswick government and New Brunswick Power announced that they would examine the feasibility of building a light-water nuclear reactor in the province by 2020. However, in September 2010, the incoming Premier for the province announced the agreement would go on the back-burner.(*56)

Construction experience

While utilities and governments will be interested in the theoretical attractions of new designs, it will be actual experience of building and operating these new designs that will be crucial in determining their success. By October 2010, no EPR was yet in service but four were under construction, one in Finland (Olkiluoto), one in France (Flamanville) and two in China (Taishan).

Olkiluoto

The Olkiluoto-3 reactor order of December 2003 was the first nuclear order in Western Europe and North America since the 1993 Civaux-2 order in France and the first order outside the Pacific Rim for a Generation III/III+

design. The Finnish electricity industry had been trying to get Parliamentary approval for a new nuclear unit since 1992. This was finally granted in 2002. The Olkiluoto-3 order was a huge boost for the nuclear industry in general and Areva NP in particular. Industry anticipated that, once complete, the plant would provide a demonstration and reference for other prospective buyers of the EPR.

The contract price for Olkiluoto-3 was reported in 2004 to be €3bn for a 1600 MW reactor.(*57) Subsequently, the price was reported to be €3.2bn(*58) or €3.3bn.(*59) Safety approval was given by the Finnish regulator, STUK, in March 2005 and substantive work on-site started in August 2005. At the time the contract was signed, the value was equivalent to about US$3.6-4.0bn (depending on the contract price) or about $2250-2475/kW (€1=US$1.2). This cost included financing and two reactor cores, so the cost per kW in overnight terms would have been somewhat lower, although given the very low rate of interest charged (2.6%), finance costs would be low.

Although the total cost was well above the nuclear industry‘s target of US$1000/kW of only a few years previously, it was still regarded by many critics as a ‘loss-leader’. Areva NP had been trying to persuade either EDF or one of the German utilities to place an order for an EPR since the late 1990s(*60) and there were fears that if an order for the EPR was not placed soon, AREVA NP would start to lose key staff(*61) and the design would become obsolete.(*62) Areva NP also needed a ‘shop window’ for EPR technology and Olkiluoto-3 would serve as a reference plant for other orders. As an additional incentive and at the request of the customer, Areva NP offered the plant on ‘turnkey’ or fixed price terms. It also took responsibility for the management of the site and for the architect engineering, not just the supply of the ‘nuclear island’. This was not a role it was accustomed to. For the 58 PWRs Areva NP’s predecessor, Framatome, had supplied for France, as well as for the foreign projects including those in China and South-Africa, it was EDF that had provided these services.

The Olkiluoto project has gone seriously wrong since construction started. By August 2010, Areva NP acknowledged that the estimated cost had reached €5.7bn (an additional €367m was acknowledged in the 2009 accounts), which at the prevailing exchange rate of €1=US$1.35 represented a cost of US$4800/kW.(*63) The contract is also the subject of an acrimonious dispute between Areva NP and the customer, Teollisuuden Voima Oy (TVO). Areva NP claims compensation of about €1bn for alleged failures of TVO. TVO, in a January 2009 counterclaim, is demanding €2.4bn in compensation from Areva NP for delays in the project. (*64)

Table 2 Timetable of problems at Olkiluoto 3

Date	Event
4/04	STUK: ‘We are getting the documents late. They (Areva) aren’t reserving enough time for our review and they don’t have all the information required by our guides.'(*65)
10/05	Pouring of base slab delayed by concerns about strength of concrete. Manufacturing of reactor pressure vessel and steam generators "a few weeks" behind the original schedule(*66)
2/06	Problems with qualifying pressure vessel welds and delays in detailed engineering design put construction more than six months behind schedule(*67)
3/06	STUK opened an investigation into manufacturing and construction problems(*68)
5/06	Despite measures including two shifts on site and three shifts at Areva's component manufacturing plant, work is eight to nine months behind schedule(*69)
7/06	TVO acknowledges delay now 1 year. STUK investigation: An extremely tight budget and time table, supplier inexperience, poor subcontractor control and regulators’ difficulty in assessing information have caused confusion and quality control problems that have delayed the Olkiluoto-3 project(*70)
10/06	Areva takes provision of ca €300m for Olkiluoto project71 3 out of 4 ‘hot legs’ not made to speci fication. 72 Project manager replaced(*73)
12/06	Delay estimated at 18 months(*74)
1/07	Areva NP: Areva-Siemens cannot accept 100 % compensation responsibility, because the pro ject is one of vast co-operation. The building site is joint so we absolutely deny 100 % compensation principle’ TVO: ‘I don’t believe that Areva says this. The site is in the contractor’s hands at the moment. Of course, in the end, TVO is responsible of what happens at the site. But the realisation of the project is Areva’s responsibility'(*75)
5/07	TVO and Areva agree design not complete enough when contract signed. STUK: ‘a complete de sign would be the ideal. But I don't think there's a vendor in the world who would do that before knowing they would get a contract. That's real life(*76)
8/07	Problems meeting requirements to withstand an airplane crash mean delay 2 years(*77)
9/07	Steel containment liner repaired in 12 places to fix deformations and weld problems(*78) Areva acknowledges further financial provisions for losses but does not quantify them. Indepen dent estimate €500-700m(*79)
6/08	TVO site manager replaced(*80)
10/08	Delay now estimated at 3 years.(*81) Manufacturer of containment liner failed to obey an order to stop welding after a STUK-TVO inspection discovered that an incorrect welding procedure was

	being used.(*82) Areva initiates arbitration proceedings in Arbitration Institute of the Stockholm Chamber of Commerce over 'a technical issue'(*83)
12/08	Areva announces further loss provisions. Independent estimates €1.3bn(*84)
12/08 and it is	Letter from STUK Director General top CEO Areva: 'I cannot see real progress being made in the design of the control and protection systems.' 'This would mean that the construction will come to a halt not possible to start commissioning tests.' 'the attitude or lack of professional knowledge of some persons who speak in the expert meetings on behalf of that organisation prevent to make progress in resol ving the concerns'(*85)
1/09	Delay acknowledged to be 3.5 years.(*86) Siemens announces withdrawal from Areva NP.(*87) Areva-Siemens file a second arbitration proceeding against TVO.(*88) Areva asking for €1bn in compensation. TVO counterclaiming for €2.4bn for 'gross negligence'.(*89) TVO expects arbitration to take several years(*90)
3/09	Areva admits cost over-run now €1.7bn(*91)
06/10	TVO reports further delay till 2013 to completion of the plant.(*92) Delay confirmed by Areva NP(*93)
07/10	Areva booked €367m in new charges on expected losses with Olkiluoto.(*94)

Sources: As per endnotes

It seems unlikely that all the problems that have contributed to the delays and cost-overruns have been solved (see Table 2); the final cost could be significantly higher. The result of the claim and counter-claim arbitration between Areva NP and TVO will determine how the cost over-run will be apportioned. It is far from clear that TVO could survive financially if it had to shoulder a significant proportion of these costs. Even Areva, despite it being controlled by the French government had its credit rating reduced to BBB+, partly because of these problems(*95) and it would hardly be good for business if its customer was put out of business by the purchase of an EPR.

Flamanville

EDF finally ordered an EPR reactor in January 2007, to be located at their Flamanville site. This reactor was rated at 1630 MW(*96) and construction commenced in December 2007.(*97) In May 2006, EDF estimated the cost would be €3.3bn.(*98) At that time (€1=US$1.28), this was equivalent to US$2590/kW. This cost however did not include the first fuel or finance costs, so the overnight cost, which conventionally includes fuel but not finance costs would have been somewhat higher.

EDF did not seek a turnkey contract and chose to manage the contracting, for example, letting contracts for the turbine generator and the architect engineering. How far these decisions were influenced by the poor experience at Olkiluoto and how far they were influenced by the need EDF saw to maintain in-house skills is not clear.

In May 2008, the French safety regulatory authorities temporarily halted construction at Flamanville because of quality issues in pouring the concrete base mat.(*99)Delays had led the vendor, Areva NP to forecast the reactor would not be completed until 2013, a year late, but in November 2008, EDF claimed the delays could be made up and the reactor finished by the original schedule of 2012.(*100) EDF did admit that the expected construction costs for Flamanville had increased from €3.3 billion to €4 billion. (*101) This was then equivalent to US$3,265/kW (€1=US$1.33), substantially more than the Olkiluoto contract price, but far below the levels being quoted in the USA and the current cost of Olkiluoto. An Areva official suggested that the cost of an EPR will now be at least €4.5bn, although it was not specified whether this was an overnight cost.(*102) In January 2010, French unions reported that the project was then running at least two years behind schedule.(*103) These reports, originally denied by EDF, were confirmed by them in July 2010, when it also acknowledged that costs were by then running at €1.7bn over the original €3.3bn budget.(*104) In October 2010, Le Figaro reported a further delay of a year at Flamanville citing 'several' sources. EDF have denied this report. (*105)

Table 3 Timetable of problems at Flamanville 3

Date	Event
5/06	EDF decides to proceed with Flamanville 3(*106)
7/06	Site work commenced. Target construction time 54 months, construction cost €3.3bn ex cluding finance and fuel(*107) (*108)
1/07	NSSS ordered from Areva NP(*109)
4/07	French government issues construction license(*110)
12/07	First concrete poured(*111)
3/08	ASN asks EDF to improve work in several areas involving in particular quality con trol and organization.(*112) Inspection had revealed several problems in the civil construction work, including errors in installation of steel reinforcing bar in the concrete and "inconsistency" between rebar blueprints and the concrete pouring plan. organization for preparing concrete pouring was "insufficient"(*113)
5/08	ASN requires EDF to stop concrete pouring on May 26 (ban lifted June 17). Problems 'show insufficient discipline on the part of the licensee and insufficient project organization'. Welding anomalies found in one of the four bottom pieces of the steel liner of the containment building (*114)
10/08	ASN told Areva to improve its oversight of forgings after procedures used by Italian sub contractor Societe della Fucine were found not to conform to standards(*115)
12/08	EDF acknowledges cost had increased to €4bn due mainly to inflation, and technical & regulatory changes.(*116) Construction schedule claimed still to be achievable
01/10	Unions claim construction is at least 2 years behind schedule(*117)
07/10	EDF confirms delay and announces expected costs are €1.7bn over budget(*118)
08/10	ASN asks EDF to modify the architecture of the non-safety instrumentation and control system(*119)
10/10	Le Figaro reports a further year delay(*120)

Sources: As per endnotes
Note: ASN = Autorité de sûreté nucléaire

Taishan

Under the terms of the contract Areva NP won to supply two EPRs to China, the company is only supplying the nuclear island and the contract is not turnkey. EDF is involved in the management of this project and has an equity stake in the reactors.(*121) Little reliable, independent information comes out of China on nuclear construction. The IAEA reported that work started on the first Taishan unit in November 2009 and on the second unit in April 2010. In July 2010, the South China Morning Post reported that work on the 'second phase' the Taishan units would not start in the third quarter of 2011 as expected.(*122) No reason for the delay was given by the plant owners, but there has been speculation that China was not comfortable with the fact that delays at Olkiluoto and Flamanville meant that the Taishan units would probably be the first EPRs to enter service.

Safety assessment

As mentioned previously, there was some confusion about the level of assessment of the EPR that had been carried out by the Finnish and the French regulators when construction started at the Olkiluoto and Flamanville plants respectively. It is now clear that neither had carried out a comprehensive generic safety review.

In August 2007, the UK safety regulator, the HSE launched its Generic Design Assessment (GDA) for the EPR (and three other designs). The timetable called for completion of the generic review in June 2011. There are three possible conclusions to this process: (*123) (1) if the regulators are fully content, they will issue an HSE Design Acceptance Confirmation (DAC); (2) if they are largely content, they will issue an HSE Interim Design Acceptance Confirmation (DAC) or Environment Agency Interim Statement of Design Acceptability and identify the unresolved GDA Issues; and (3) if the regulators are not content no Design Acceptance Confirmation (DAC) or Statement of Design Acceptability will be issued. By August 2010, the HSE had acknowledged the first and third outcomes were implausible.(*124) In the case of the second outcome, the proposer would have to submit a Resolution Plan. However, once an interim DAC has been given, issues not covered by the Resolution Plan would not be considered. The HSE has recognised that it will probably be the first regulator to complete a generic assessment of the EPR and this would leave it in an invidious position if its

requirements are seen as less stringent than those of other regulators. The HSE stated in July 2010:(*125)

> 'We had originally hoped that the safety assessment of AP1000 and EPR by their 'home' regulators would be complete well before we completed GDA Step 4 in June 2011 so that we could fully consider their conclusions during our own assessment. However, we now understand that there is significant ongoing safety assessment by the home regulators for both AP1000 and EPR. This is a significant regulatory process concern for us, the implications of which are being considered at present, together with ways of ensuring the best possible international cooperation on and harmonisation of assessment outcomes.'

The HSE claims it will complete the GDA in June 2011, but 'interim' approvals, which would not suffice for construction of the reactors to begin in the UK, appear at the moment to be 'more likely' than final approvals for both designs for the June 2011 timeline. (*126)

Areva submitted a Standard Design Certification Application to the NRC in December 2007 more than 3 years after Areva NP began discussions with the NRC. At that time, Areva expected that the NRC would complete its technical review in two years, and finish the rulemaking that certifies the design the following year, 2010.(*127) This proved over-optimistic and in March 2010, after a number of delays, the NRC stated the final certification would not be before June 2012.(*128)

Instrumentation and Control

Table 2 shows that there were conflicts between Areva and STUK, the Finnish regulator even before construction started. The extent of these was illustrated by a leaked letter from the head of STUK, Jukka Laaksonen, to the CEO of Areva, Anne Lauvergeon in December 2008 (see Annex 1). In April 2009, the HSE classified Instrumentation & Control (I&C) as a 'Regulatory Issue', a particular feature of the design that might not meet UK regulatory standards.(*129) In July 2010, the I&C issue remained a Regulatory Issue and while HSE stated in July 2010 that it anticipated that an acceptable solution could be found, it had not received details of the modification proposed. The specific issue raised here, the level of redundancy in the I&C systems was subsequently taken up in a joint statement by the UK, French and Finnish regulators in November 2009. (*130) In August 2010, the HSE reported that while they believe that an 'acceptable position can be reached for GDA', this would depend 'on timely and quality responses from EDF and AREVA and we have already noted difficulties with delivery on other C&I issues.'(*131)

The US and Chinese regulators were not party to this process, but in July 2010, it was reported that the US NRC had found that the I&C was too complex and interconnected to meet US regulations. The issue was described by an NRC spokesman as being 'a critical path issue that is going to have to be resolved'.(*132) Whether this resolution would delay completion of the review beyond June 2012 is not clear. However, the I&C systems for UK, France, Finland and the USA will now all differ from each other because it is too late to make some changes to the French and Finnish designs.(*133)

Core catchers

A particular bone of contention has been the need of a 'core-catcher'. In the event of a failure of the emergency core cooling system, this would 'catch' the core if it breached the reactor pressure vessel. There is no international agreement on the need for this feature: it is widely seen as essential for mainland Europe, but not the USA and other countries like Korea. However, this is an expensive system and Anne Lauvergeon blamed the extra cost of this as one of the factors behind the loss of the contract for UAE to a Korean design that does not have a core-catcher.(*134) Lauvergeon claimed that safety enhancements designed to prevent any offsite radiological impact — like the core catcher and the reinforced containment made the EPR 15 per cent more expensive than a Generation II PWR.(*135)

Economic issues

When a 'Nuclear Renaissance' was first mooted, a key element was the use of so-called Generation III+ designs, which would be safer, simpler, cheaper and easier to build than earlier designs. This, it was claimed, would overcome the problems that had led to the dramatic reduction in ordering from the mid-80s onwards. Particularly strong claims were made on costs with vendors claiming their new designs could be built for US$1000/kW. As noted above, cost was a particular issue from the start with the EPR and cost claims for it were not as aggressive as for some of the other designs. Nevertheless, in 1998, NPI claimed reactors could be built for US$1415/kW.(*136) In 2001, A US executive of Framatome claimed the EPR could be built in the USA for US$1320/kW.(*137) In 2003, TVO's studies for Olkiluoto envisaged that it would be able to buy a nuclear reactor for US$1800/kW or less. EDF's studies from the same year assumed a cost of €1275/kW, then about US$1450,(*138) while the French government was even more optimistic in September of that year, assuming €1043/kW.(*139) These forecasts were revealed to be hopelessly unrealistic when it emerged that the winning bid for Olkiluoto was actually €3bn equivalent to €1875/kW or US$2300/kW.

In May 2006, when EDF ordered Flamanville, the cost estimated by EDF was reported to be €3.3bn, essentially the same as for Olkiluoto given inflation and the higher expected output (1630MW).(*140)

Costs at the Olkiluoto and Flamanville plants escalated rapidly, but it was not clear how far this was due to an underlying underestimate of costs and how far it was due to specific errors. Initial cost estimates for US EPRs were no less unrealistic with Areva and Unistar claiming overnight costs of US$1600-2000/kW in 2005.(*141) By 2008, Unistar was still estimating only US$2400/kW (2005 dollars).(*142) However by August of that year, the Unistar CEO, Mayo Shattuck suggested that the cost would be at the mid- to upper-end of the range US$4500-6000/kW (US$7.2-9.6bn).(*143)

Reports of bids for international contests produced even higher projected costs. In South Africa, Eskom expected a construction cost of US$2,500/kW. In January 2008, Eskom received two bids in reply to its call for tenders from November of the previous year for 3200 to 3400 MW of new nuclear capacity in the near term and up to 20,000 MW by 2025. One bid was from Areva for two EPRs (plus 10 more for the long-term) and the other from Westinghouse for the three AP1000s (plus 17 more in the long term).(*144) Both claimed their bids were "turnkey," but whether they were really turnkey in the fixed price sense or whether they were simply for the whole plant is not clear. It was later reported that the bids were for around $6,000/kW – more than double the expected price.(*145)

In 2007, Ontario Power Authority (OPA), the public body responsible for planning the Ontario power system, had assumed nuclear power plants could be built for about C$2,900/kW.(*146) In June 2008, the Canadian government announced Darlington in Ontario as the site for a two-unit new build project and on May 20, 2009, information leaked that the Ontario government had chosen AECL as the leading bidder over Areva and Westinghouse to start building the first new nuclear plants in Canada in 25 years. Two new reactors were projected to start operating by 2018. However, the provincial government reportedly conditioned any go-ahead on financial guarantees by the federal government to cover the financial risks involved. Three bids were received, one from Areva and one from AECL, although only the AECL bid complied with the requirement that the vendor assume the construction risk. There was a press report on the size of the bids. This suggested that Areva's non-compliant bid was C$23.6 billion (US$21 billion) for two EPRs (1600 MW each) or C$7,375/kW (US$6,600/kW). AECL and Westinghouse's bids were higher. Ontario decided to suspend the tender. Subsequently, Areva disputed the published bid price, but they were not willing to supply the actual price they bid.

In December 2009, the UAE ordered four nuclear reactors from Korea using AP1400 technology, beating opposition from consortia led by EDF (including GDF Suez, Areva, and Total with the EPR) and GE-Hitachi.(*147) The contract is with Korean Electric to build and operate the reactors, the first coming on-line at an unspecified site in 2017 and the last by 2020. The terms of the deal and what is included are not clear, although the contract is reported to be worth $20.4 billion. The Korean bid was reported to be $16 billion lower than the French bid.(*148)

The response from Areva to this failure was particularly vitriolic. The CEO , Anne Lauvergeon, blamed the extra safety features required by the European market, particularly the core-catcher and a steel-lined double concrete containment that the EPR includes, whereas the winning bid, the Korean APR-1400 has no core-catcher and a single steel containment structure. She seemed to propose that Areva could offer previous generation models (for example, the 1000MW design sold to China in 1980) for export to third world countries.(*149)

The Roussely Report

The French government belatedly realised that commercialisation of the EPR was going badly and in October 2009 commissioned a former CEO of EDF, Francois Roussely, to examine the French nuclear industry. His report was given added point by the failure to win the tender for the UAE in December 2009. This failure was widely seen in France as due to the lack of an integrated offer including engineering, construction, fuel and waste, as well as equipment supply. The report, 'The Future of the French Civilian Nuclear Sector' was published in July 2010. (*150)

Roussely identified two major problems:
• The credibility of the EPR had been seriously damaged by problems at Olkiluoto and Flamanville;
• The capacity factors [reliability] of reactors in France have deteriorated sharply whereas elsewhere in the world, these have improved significantly.

He makes 15 recommendations, 12 described as 'structural' and 3 as 'emergency'. Most of the structural measures seem to be aimed at creating a 'Team France', which would ensure France could offer a unified and comprehensive package for export markets in emerging countries. He recommends that the extension of reactor operating life to 60 years is supported and that further optimisation of the EPR from the feedback of the four reactors under construction and of past achievements be carried out. This optimisation should be carried out jointly by EDF and Areva.

On the problems at Olkiluoto and Flamanville, he recommends only that these reactors be completed with a few delays and as little cost over-run as possible. Lessons from this should be fed back into the construction of the Penly unit and any units ordered for the UK. The issue of poor reliability does not appear to be addressed directly by any of the recommendations. He does recommend that a charter setting out the conditions of employment applicable to all employees of nuclear power in France be introduced and that the mission of the Agence Securité Nucleaire (ASN) be reviewed, but it is not clear how this would address the issue of poor availability.

Of most interest is his diagnosis of the problems with the EPR. He attributes the problems squarely to 'complexity':

> 'The complexity of the EPR comes from design choices, notably of the power level, containment, core catcher and redundancy of systems. It is certainly a handicap for its construction, and its cost. These elements can partly explain the difficulties encountered in Finland or Flamanville.'

He recommends:

> 'The EPR should therefore be further optimised based on feedback from reactors under construction and past achievements. This optimisation would be lead jointly by EDF and Areva, in conjunction with ASN, with a view to make the detailed design as safe [as the current design].'

This recommendation does not seem realistic. The EPR was designed over a long period with the specific objective

of rationalising the features of earlier designs. To assume that it would be a simple and quick process to just go through the design again to simplify it seems totally unrealistic. This is well illustrated by the issue of the I&C system noted above, which, ironically, was seen as not having enough redundancy. This problem was first identified in 2008; yet more than two years later, a detailed solution to the problem still has not been presented to the regulators. Any redesign that was comprehensive enough to significantly reduce complexity and costs would almost certainly be so extensive as to require the regulators to make a very full re-evaluation of the design.

This was the case with the problems with the AP1000 in the USA. This design received generic approval from the US regulator in 2006; yet in 2008, the supplier, Toshiba/Westinghouse, put in extensive design revisions that the US regulator is not expected to be able to approve before 2012. If we assume that this process of rationalization could be done in two years starting in 2011 and the regulators took a further four years to assess the design, this would mean that the design would not be ready to order before about 2017/18, after the Penly unit in France is expected to be on-line and at about the same time as EDF is claiming it will have the first UK EPR on-line.

Roussely recommends that the international French nuclear offering be 'diversified' with a smaller design, the Atmea, that could be brought to market quickly as a design more suitable for markets that would struggle to accommodate a reactor as large as the EPR. The Areva-Mitsubishi joint venture to develop Atmea was first announced in 2007.(*151) Atmea was described as being Generation III (rather than III+). A company spokesman said Atmea would be based on 'proven technologies' with 'no technical breakthroughs or revolutionary innovations'. The design was reportedly to be submitted to the French regulator, ASN, in June 2010. (*152) The target for ASN to complete its review by fall 2011 seems unrealistic. Designs of this size from Areva or Mitsubishi are now more than 30 years old and given new features such as a core catcher and aircraft crash protection, the design must be substantially new. This either suggests that a highly optimistic timetable has been adopted or that the ASN review will not be a full generic assessment. Realistically, the Atmea design is highly unlikely to be available to order for 4-5 years and it is far from clear who the customers might be. GDF-Suez has expressed interest in building one in France but given that France already has serious over-capacity in nuclear, this would make no sense. Other customers, such as Jordan, are still some way from placing an order and for a country with no nuclear experience to order a first-of-a-kind unproven design would be seen as a massive risk.

It is particularly interesting to note the things that Roussely is entirely silent on. He fails to mention the prohibitively high prices bid by Areva on Ontario and South Africa, about double what the relevant governments expected. He also says a great deal about the Atmea design but nothing about the Kerena design, a BWR design that Areva has been working on for about as long as it has been working on the Atmea. The Kerena design is one of the options if another nuclear reactor is built in Finland.

The question that Roussely should have but utterly fails to address is whether the EPR is salvageable. Given the difficulties at construction sites, dramatically soaring construction cost estimates and difficulties of getting generic safety approval, this is surely the question that begs to be asked. It may be that the consequences to France's nuclear strategy if the answer is that it is not are so severe that the question is politically impossible for an inquiry commissioned by the French government.

The fallout from the Roussely report seems set to continue with efforts by the French government to create a 'Team France' and the two key companies, EDF and Areva jockeying for position. It was reported in September that EDF was being pressed to increase its direct stake in Areva from 2.4 per cent to 15 per cent.(*153) EDF was making clear its dissatisfaction with Areva. It was reported in September 2010 that EDF was contemplating a partnership with a Chinese nuclear vendor or a Russian nuclear vendor to offer their designs to South Africa(*154) and that EDF was planning to develop nuclear reactors of its own design in competition with Areva.(*155) Neither proposal seems realistic: the Chinese design is essentially a 1970s design imported from France, which in turn imported it from the USA; the history of the EPR suggests that the time taken from start of conceptual design to the point when the reactor could be ordered is likely to be in the order 10-15 years. A more likely explanation is that EDF is trying to ensure that in any new configuration for the French nuclear industry, it is very much in the lead.

Conclusions

The EPR design is in crisis.

- Construction has gone dramatically wrong at the two sites in Europe where it is being built;
- The prices it is being offered at are so high that all contests where the EPR has been bid have either been abandoned (South Africa and Canada) or the contract has gone to a much lower bid from a competitor (UAE);
- Potential markets such as USA, UK and Italy all look problematic and reactor orders, if placed at all, will be much later than expected
- The process of obtaining safety approval in France, UK and USA is incomplete and, even if successful, the features needed to achieve regulatory approval may add significantly to costs.

The two sites in Europe where EPR is under construction, Olkiluoto and Flamanville, have gone dramatically wrong from the start of construction. It might have been argued that the problems at Olkiluoto were due to the lack of experience of the utility and the inexperience of Areva NP in carrying out the architect engineering. However, the fact that EDF, the most experienced nuclear utility in the world seems to be doing no better at Flamanville suggests the main problems are more related to the buildability of the design itself than to specific issues at Olkiluoto.

The promise for Generation III+ plants

that they would: ‘have the advantage of combining technology familiar to operators of current plants with vastly improved safety features and significant simplification is expected to result in lower and more predictable construction and operating costs’(*156) has clearly not been fulfilled. The Chief Executive of Areva, Anne Lauvergeon, acknowledges: ‘the cost of nuclear reactors has "always" gone up with each generation, because the safety requirements are ever higher. "Safety has a cost,"’(*157). Francois Roussely, former CEO of EDF stated: ‘The resulting complexity of the EPR, arising from the choice of design, specifically the level of power, the containment, the core catcher and the redundancy of the security systems is certainly a handicap for its construction and therefore its cost.’(*158)

The intuitively plausible notion that a new generation of nuclear reactors, starting without a blank sheet of paper could easily come up with a more rational and cheaper, yet safer design of reactor has been shown to be an illusion by the lengthy and still incomplete process of gaining safety approval. The Finnish and French authorities’ decision to allow construction to start before full generic approval had been given looks particularly ill-judged

As early as 1995 and again in 1997, there were concerns about the cost of the EPR then expected to be US$2000/kW but when other vendors began to claim they could build plants for US$1000/kW, Framatome seems to have felt obliged to follow suit. While it did not claim US$1000/kW was possible, it did claim reactors could be built for less than US$1500/kW in 1998 and 2001, less than a quarter of the prices it is now offering a decade later. At US$6000/kW or more, it seems unlikely that EPR will be affordable except where huge public subsidies are offered and/or there is a strong likelihood of full cost recovery from consumers, no matter what the cost is. As the reality of these high costs hits home, it is likely that even markets in which government support for new nuclear orders has been strongest, such as the USA and UK, will find it difficult to support the costs.

From a business point of view, the right course for EDF and Areva seems clear. They must cut their losses and abandon the EPR now. In the short-term this will require some painful write-offs, for example, of investments in the UK and the USA, but in the long-term, the losses will be much greater if they continue to try to make the EPR work. Areva’s main business is its reactor servicing and fuel activities and these would be little affected by the abandonment of the EPR. EDF already has too much nuclear generating capacity in France, so not ordering more reactors will save it from unnecessary capital expenditure at a time when it acknowledges its debts are too high.(*159)

However, from a political point of view, France has invested so much political and financial capital in being the world leader in nuclear technology, such a decision to abandon the design will be politically too painful until it becomes unavoidable. However, for the governments of countries like the USA and the UK, which have invested little political capital in the French nuclear dream, the sensible course is clear: stop all investment of public money in the doomed EPR technology.

Annex 1 Letter from Jukka Laaksonen to Anne Lauvergeon

December 9, 2008
Dear Mrs. Lauvergeon,

With this letter I want to express my great concern on the lack of progress in the design of Olkiluoto 3 NPP automation.

The construction of Olkiluoto 3 plant seems to proceed generally well but I cannot see real progress being made in the design of the control and protection systems. Without a proper design that meets the basic principles of nuclear safety, and is consistently and transparently derived from the concept presented as an annex to the construction license application, I see no possibility to approve these important systems for installation. This would mean that the construction will come to a halt and it is not possible to start commissioning tests.

I expressed my concern on this already in spring 2008, in a meeting with Mr. Xavier Jacob and TVO's management. After that Areva organised a workshop at professional level in Erlangen on April 23-25, 2008. The goal of the workshop was to clarify the open technical issues. I was told afterwards that it was a successful event where our concerns were conveyed to your experts and were well understood by them. It was especially encouraging to hear that after the workshop a group led by an expert of high repute, Dr. Graf, was given a task to make sure that the issues be addressed promptly.

Since then there have been several meetings among our experts but we have not seen expected progress in the work on Areva side. The systems with highest safety importance are to be designed by Areva NP SAS but unfortunately the attitude or lack of professional knowledge of some persons who speak in the expert meetings on behalf of that organisation prevent to make progress in resolving the concerns. Therefore, evident design errors are not corrected and we are not receiving design documentation with adequate information and verifiable design requirements. This is unfortunate because I am convinced that within your organisation there is enough competence to resolve all open issues. I wonder how this competence is actually being used in this project and whether an input by Dr. Graf and his group has been actually utilised.

I sincerely hope you could initiate some action in this area, in order to ensure bringing the construction of Olkiluoto 3 to a successful end.

With my best regards,
Jukka Laaksonen
Director General, STUK

Endnotes

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(*11) Nuclear News, 'Proposal for fifth reactor should fulfill licensing reqs' Apr 2001, p 46.
(*12) Nucleonics Week 'Westinghouse will sit out bid for single unit in Finland' Nov 14, 2002, p 1.
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(*14) Nucleonics Week 'ENEC says it considered designs with core catchers for new reactors' January 28, 2010, p 1.
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(*25) Nucleonics Week 'Eskom cancels tender for initial reactors' Dec 11, 2008, p 1.
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(*27) The Candu reactor uses heavy water as moderator rather than light water as in the PWR.
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PROPOSED EURATOM NUCLEAR WASTE DIRECTIVE

European Union Member States should be aware of significant and potentially costly omissions from the European Commission's proposed Euratom directive, delivered by Commissioner Oettinger on 3 November 2010. The risk is that a sub-standard Commission proposal leads member states to invest heavily in facilities which fail, with costly financial and environmental effects. However, Greenpeace welcomes some areas of increased transparency on the issue.

(719/720.6101) Greenpeace International - "This proposal is little more than a PR exercise to try and persuade Europeans that nuclear waste can be dealt with. What we need is a serious attempt to reduce the burden that radioactive waste is putting on future generations and the environment. It would take an engineering genius to safely bury white hot, highly-dangerous nuclear waste deep underground for longer than mankind has been on the planet. There are gaps in the science and no disposal site currently exists, yet the Commission is claiming this is a proven method. We fear a disposal facility could rupture high level nuclear waste into the water table for a hundreds of thousands of year," says Greenpeace EU dirty energy campaigner Jan Haverkamp

A PR exercise

A 2008 Eurobarometer poll ('Attitudes Towards Radioactive Waste') showed that nuclear waste is a major barrier to public acceptance of nuclear power. The nuclear industry wants to overcome public resistance to new nuclear power stations. Greenpeace believes this proposal as drafted with this aim in mind. Instead of being an honest attempt to improve waste management and lessen the burden of nuclear waste on society, it is a reckless attempt to paper over the hazards of waste disposal and achieve industry aims.

The nuclear industry has been searching for a long-term disposal method for 60 years. Deep disposal has dominated the research effort put into the management of highly radioactive nuclear waste for over 30 years and takes centre stage in the proposed directive. The Commission claims a scientific consensus has been reached and construction should proceed. However, it makes no reference to scientific studies and has not ordered a literature review of research (for more information see *Rock Solid? - A scientific review of geological disposal of high-level radioactive waste, Genewatch UK, 2010, see Nuclear Monitor 717, 8 October 2010).* The risk is that a sub-standard Commission proposal leads member states to invest heavily in facilities which fail with costly results, both financially and environmentally. The documents do not propose to shield deadly waste from future human interference and there are no measures to monitor and retrieve waste in case of leaks.

The proposal sets out to deal with an environmental issue, yet under its 'impact assessment' section rules out the need for any environmental impact assessment. It also underestimates the large potential costs of long-term radioactive waste management, masking the true cost of nuclear power. The document presents no 'plan B' in case the scientific/engineering uncertainties are not overcome.

The proposal fails to set standards for so-called 'authorised emissions' allowing harmful radioactive waste from reprocessing plants and power stations to be released into the environment. Additionally, both the newly proposed Euratom directive and the EU Directive 2006/21/EC (covering waste from extractive industries) point to each other for the management of waste from uranium mining, meaning that the sector falls between the gap and is in effect unregulated. Many regions and even human settlements are blighted by radioactive waste from uranium mining, such as in Australia, the Americas, Central Asia and Africa. Additionally, the proposal fails to safeguard against international disposal sites being created, exposing less developed parts of Europe to the possibility of becoming 'nuclear waste dumping grounds'.

Out of line with EU hazardous waste laws

The major omission in the Commission's proposal is any attempt to harmonise radioactive waste legislation with laws covering other hazardous wastes. The Commission should integrate basic principles from EU hazardous waste legislation into this new law. This would require the EU to implement the precautionary principle and oblige firms to only use the best available technologies for nuclear related infrastructure and phase-out processes that produce waste but are not essential. In effect, this omission creates a far less stringent policy for radioactive waste, despite it being one of the most hazardous waste categories.

Civil society marginalised

Input from outside the nuclear industry amounts to two out of 17 pages. Arguments from environmentalists, concerned citizens and local municipalities were marginalized as stemming from a "fundamental opposition towards nuclear energy" instead of being judged on their merits. That the logical consequence of many of those arguments may be a phase-out of nuclear energy should not be a reason to, in effect, exclude them from the public consultation.

Greenpeace welcomes areas of the proposal showing greater transparency, greater independence of nuclear waste authorities and an obligation to implement the polluter pays principle, though questions remain how the Commission wants to secure this. Greenpeace also welcomes the obligation placed on member states to work out radioactive waste policies and

implementation plans, but urges the Commission to guarantee that these are based on science and responsibility towards people and environment in this and future generations, and not, as seems to be the case now, on the short-term interests of the nuclear industry.

Retrievability
During his November 3, press conference, Energy Commissioner Guenther Oettinger declared repeatedly that he was of the opinion that waste would have to be reachable for inspection and oversight at all times. This could mean that the Commission is prepared to include retrievability in the conditions for radioactive waste management, a possibility that was welcomed by Greenpeace. His spokeswoman Marlene Holzner, however, retracted on that during a debate on BBC Newshour on the same day in which she limited oversight for the period in which a deep geological disposal site is filled up.

The proposal will now be forwarded to the European Parliament, where it will be discussed in the ITRE (Energy) and the ENVI (Environment) Committees for advisory comment. Parliament cannot take binding decisions under the Euratom Treaty. The proposal also will be tabled to the European Council, where it will first be discussed in the Atomic Questions Group (ATO), which consists of nuclear experts from the 27 EU Member States. The final version of the directive will then be adopted in a formal session of the General Affairs Council in about half a year from now.

Source: Greenpeace Briefing, 26 October 2010; personal mail Jan Haverkamp, 6 November 2010
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CASTOR TRANSPORT: FRENCH REPRESSION AGAINST NON-VIOLENT ACTIVISTS

Following a mobilization on an unprecedented scale, the transfer of eleven containers of highly radioactive waste from La Hague (France) to Gorleben (Germany) took twice as long than expected. In Germany, 50.000 people demonstrated on November 6 near Gorleben and thousands blocked railway-lines and streets in the following days. A blockade by 1500-2000 people on Saturday in Southern Germany forced the train to take another route. In France, state repression and police raged against seven militants from GANVA (Group of Anti-nuclear Non-Violent Actions) who were attached in arm tubes under the rails to stop the "train from hell" in Caen (Normandy).

(719/720.6102) WISE Amsterdam - All newspapers all around the world reported on the Castor-transports, so not much we can add about the convoy of German vitrified highly radioactive compound of 11 "Castor" containers, which left Valognes on November 5. Very shortly after departure, at 3:40pm, 5 GANVA activists attached themselves under the rails with arm tubes just before the Caen trainstation, forcing the train to stop. It remained stationary for 3 and a half hours. The philosophy of this action was peaceful and non-violent and not having to physically confront the poalice. The actual blocking of the train was based on physical barriers. Five militants were attached inside metal tubes passed under the tracks. It was the responsibility of the "gendarmes" and police to remove everyone safely!

Instead facing pressure from their superiors, the police lost their cool and injured three people by cutting the tubes. Even after the first person was injured, they continued in the same brutal manner. One of them had two severed tendons in his hand and had to undergo surgery, the other two were burned and must undergo a skin graft. Both directly burned were placed in custody and could not consult a doctor again until much later the next day. The militant who had two severed tendons was directly led into custody under police escort when leaving the hospital. In the end, six activists were kept in custody for 24 hours and seven are subject to bail before the case with 16 500 euros to pay before November 15. If they don't pay they will be incarcerated until their trial, to be held on 8 December 2pm at the Tribunal de Grande Instance (TGI) in Caen.

12th Castor-transport since April 1995
1 transport
11 containers
1,000 kilometers
5484 minutes duration
18,000 police officers
50,000 demonstrators
3000 people on road for 48 hours
80 million hits on www.castor-ticker.de
Estimated costs: 25 million Euro

Faced with this injustice, Network "Sortir du nucléaire", calls for financial solidarity and massive support for the GANVA activists in Caen on 8 December.
Our resistance knows no boundaries!

For more information and online donation: http://groupes.sortirdunucleaire.org/blogs/train-d-enfer-transport-la-hague/article/acction-de-blocage-du-ganva-a-caen

Source: Sortir du nucleaire
Contact: GANVA (Group of Anti-nuclear Non-Violent Actions)
Mail: ganva@riseup.net

CHERNOBYL: SARCOPHAGUS AND NEW SAFE CONFINEMENT

In the run up to the 25th commemoration of the Chernobyl accidents, April 2011, the Nuclear Monitor will publish articles on several aspects of the accident and the destroyed reactor. The first article is about the Sarcophagus and the New Safe Confinement, which has to replace it.

(719/720.6103) WISE Amsterdam - Following the explosion on April 26, 1986, a massive concrete 'sarcophagus' was constructed around the damaged Number 4 Reactor. This sarcophagus encases the damaged nuclear reactor and was designed to halt the release of further radiation into the atmosphere. However, hastily constructed this structure is now cracking open and leaking out lethal doses of radiation.

Chernobyl Sarcophagus – The end or just the beginning?
Since the accident, Central and Eastern Europe have undergone momentous political changes. The USSR no longer exists. Chernobyl is now the responsibility of the respective governments of each of the affected countries, but the fallout from Chernobyl continues to kill and mar the lives of millions. Despite all the words that have been written about the accident, little has changed for the better. In fact, in many ways the situation is getting worse.

The scientists admit that the sarcophagus which encases the damaged nuclear reactor is now cracking open and leaking out lethal doses of radiation. In 1988 Soviet scientists announced that the sarcophagus was only designed for a lifetime of 20 to 30 years. Holes and fissures in the structure now cover 100 square metres, some of which are large enough to drive a car through. These cracks and holes are further exacerbated by the intense heat inside the reactor, which is still over 200 degrees Celsius. The sarcophagus's hastily and poorly built concrete walls, which are steadily sinking, act as a lid on the grave of the shattered reactor.

Only 3% of the original nuclear material was expelled in 1986, leaving behind 216 tons of uranium and plutonium still buried inside the exploded reactor, is a chilling reminder that the explosion was not the end, but rather the beginning. Scientists now agree that this sarcophagus will eventually collapse, and when it does there will be an even great release of radioactivity than in the initial accident.

Inside the Sarcophagus
There are 740,000 cubic metres of lethally contaminated debris inside the sarcophagus, which is ten times more than was previously thought. Locked inside lies is 30 tons of highly contaminated dust, 16 tons of uranium and plutonium and 200 tons of radioactive lava. The rain pours through causing corrosion, the weight of 3,000 cubic meters of water lodging each year further adds to the possibility of the roof caving in.

The result of the water and dust mixing is a dangerous radioactive 'soup'. When the building became highly radioactive the engineers were unable to physically screw down the nuts and bolts or apply any direct welding of the Sarcophagus, this work was done by robotics, and unfortunately the result is that the seams of the building are not sealed thus allowing water to enter and radiation to escape on a daily basis. The problem of controlling the water and dust inside has never been resolved. This type of project has never been undertaken before and no one knows for sure if it will be effective enough to contain the radioactivity or what will happen in 100 years times.

Chernobyl's debris will be radioactive for hundreds of thousands of years and must be treated and buried in shallow graves as an urgent priority. In 1998, finally with the help of the European Bank for Reconstruction and Development, a stabilization programme was completed which included securing the roof beams from collapsing.

The New Safe Confinement structure
A Chernobyl Shelter Fund was established in 1997 at the Denver G8 Summit to finance the Shelter Implementation Plan (SIP). The plan calls for transforming the site into an ecologically safe condition by stabilising the Sarcophagus followed by construction of a New Safe Confinement (NSC).
Now, according to Igor Gramotkin, Director-General of the Chernobyl nuclear power plant, completion of the

The New Safe Confinement Time schedule
In 1992, the Ukraine Government held an International Competition for proposals to replace the hastily constructed sarcophagus. A pan-European study (the TACIS programme) re-examined the proposals of the top three finalists of the competition. The study selected the British Sliding Arch proposal as the best solution for their further investigations and recommendations.
The structure was originally intended to be completed in 2005, but has since been postponed. The following schedule was released in June 2003:
* 12 February 2004 - complete the NSC conceptual design.
* 13 March 2004 - Government of Ukraine to approve the conceptual design.
* 13 June 2004 through 13 September 2004 - conduct a tender and sign a contract with the winner to proceed with relevant engineering and construction work.
* 16 April 2006 through 20 May 2007 - lay foundations for the NSC.
* 20 February through 29 February 2008 - slide the arch structure in place over the existing Shelter.
But only on 17 September 2007, it was reported that the project contract was finally signed with French consortium Novarka, but not much has been heard from it since then

facility's New Safe Confinement (NSC) structure will not occur before 2013. Design delays have pushed back the structure's expected completion date. While the original cost estimate for the SIP was US$768 million, the 2006 estimate was US$1.2 billion, which in July 2009 had increased to US$1.6 billion. The SIP is being managed by a consortium of Bechtel, Battelle, and Electricité de France. The conceptual design for the NSC consists of a movable arch, constructed away from the shelter to avoid high radiation, to be slid over the sarcophagus.
If completed it may be the largest moveable structure ever built. After construction this structure will be the height of a 35 story building. Inside, robotic cranes and, where possible, live workers will then begin the delicate job of prying apart the wreckage and removing the radioactive materials.

Sources: www.chernobylee.com/blog/new-safe-confinement; www.chernobyl-international.com/chernobyl-sarcophagus.html

INDIA: THOUSANDS ARRESTED DURING JAITAPUR PROTESTS

World's largest nuclear park is planned in Jaitapur, in Ratnagiri district on the coast of southern Maharashtra, India. The park would comprise up to six large EPR nuclear reactors bought from the French nuclear giant- Areva. In addition to the inherent hazards of nuclear power, the project threatens the livelihoods of about 10 000 farmers and fishermen and their families.

(719/720.6104) WISE Amsterdam - On October 29, despite preventive arrests, prohibitory orders and road blocks more than 3000 villagers' courted arrests, as part of their 'Jail Bharo' agitation. By 6 pm, the police requested the leaders of the agitation to stop the flow of people. The agitation was primarily in response to the government claim that the villagers were quiet and only a handful of outsiders were leading the agitation against the proposed 10,000 MW Jaitapur nuclear power project in the village.

The agitation started peacefully at noon at Bhagwati temple in the village. Hundreds of women including the elderly queued up to be arrested, followed by the men folks. The police had arranged for four buses, but they failed awfully short, as villagers of Madban and the neighboring villages continued to pour in.

The 250-strong contingent of policemen came prepared with riot gear and rifles, but there was not even slogan shouting. "This is a show of strength and the government must now realise that we cannot be taken for granted," Pravin Davankar of the Janhit Seva Samiti, which has been opposing the project for the past five years.

The villagers were angry because the government was refusing to tell them the truth and releasing information in bits and pieces. "After all, we are the ones to be directly affected," said Sanjay Gavankar, a villager, who runs a cashew nut factory. The local people are against forced acquisition of their land by the government. They consider their land to be of much more value than a job at NPCIL and some money in lieu of the land. The local people have unanimously rejected the compensation package offered by the government and even lit bon fires with it.

Satyajit Chavan, an activist protesting in Jaitapur, said: “It seemed more like a police state, where emergency measures are evoked to apparently maintain law and order. The state seems to act against wishes of its own citizens.”

Retired High Court judge B G Kolse-Patil, who had being served orders preventing him from entering Ratnagiri District, flouted the ban and attended the rally. While the police were looking for him on the road, he took a different route and appeared dramatically in the temple at 3 pm. "I will oppose this sort of high-handedness by the state tooth and nail," he said. The police had to physically carry him off to arrest him.

Retired Admiral L Ramdas and retired Supreme Court Judge P B Samant, who were coming to the rally, were stopped by the police on the Highway.

The Jaitapur project is characterized by shocking neglect – from the choice of an earthquake-prone and ecologically valuable site, to a timetable that leaves insufficient time to review the risks of the nuclear reactor design, not yet in operation anywhere in the world. Because of these and many other flaws the reactors would entail unacceptable hazards.

A joint report by Greenpeace and European solar panel manufacturers showed earlier this week that solar power can deliver electricity at a competitive cost by 2015. This is 3 years before the first planned reactor could be in operation in Jaitapur. Wind power and biomass can do that already now. There is no need to import dangerous and destructive nuclear reactors.

Sources: Blogpost by Karuna Raina, Greenpeace India, 29 October / Times of India, 29 October 2010
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IN BRIEF

UK & US regulators: unresolved safety issues EPR and AP1000. On November 10, the UK nuclear regulator said it expects both the Areva EPR and the Westinghouse AP1000 reactors to have unresolved safety issues when the generic design assessment, or GDA, program completes next year. In a quarterly progress report, the NII said it has potential open issues in 10 out of 18 topical areas on the Areva EPR design review and in 16 out of the 18 topical areas on the Westinghouse AP1000 design. The GDA program was set up to issue design acceptance confirmations, or DACs, to the reactor vendors, which would see the regulator sign off on all but site specific licensing issues. The DAC could then be referenced in site license applications by utilities building the reactors. But the program has been plagued by delays resulting from NII Staff shortages and "a failure on the part of the reactor vendors to satisfy the regulator's queries", as Platts puts it.
A day earlier, World Nuclear News reported that Westinghouse has been told by the U.S. NRC that it's AP1000 aircraft impact study is not adequate. The Nuclear Regulatory Commission said that documents put to it in order to demonstrate a 2009 requirement did not include 'realistic' analyses and that this amounted to a violation of requirements that Westinghouse must explain and rectify. A rule introduced by NRC in 2009 states that new nuclear power plant buildings and safety systems must maintain containment, cooling of the reactor core and the integrity or cooling of used fuel facilities in the event of the impact of a large passenger jet. All reactor vendors must fulfill this requirement for their designs. For Westinghouse this regulatory work comes in addition to a 2007 design amendment to the original AP1000 design, which was certified by the NRC in 2006.
In February, UK regulators already criticized the "long delays" and "poor quality" of replies they received from Westinghouse and Areva following safety reviews of their reactor designs.
World Nuclear News, 9 November 2010 / Platts, 10 November 2010 / Nuclear Monitor 704, 26 February 2010

Update Belene, Bulgaria- The situation around the planned nuclear power station in Belene in Bulgaria has become unclear again. Under heavy Russian pressure (among others directly from Prime Minister Putin) and political pressure from a faction within his own party GERB around the Parliament Chair Tsetska Tsacheva, Bulgarian Prime Minister Boyko Borisov declared he is dedicated to the construction of the power plant on the shores of the Danube. Russian Atomstroyexport, a part of Rosatom, prolonged the construction contract with half a year under the condition of a price increase of maximally 2,5 billion Euro on top of the initial 4 Billion price tag. According former director of the Bulgarian Nuclear Regulatory Agency and current professor in risk analysis at the university of Vienna, Georghi Kashchiev, during a round table discussion on 18 October in Sofia, this does, however, not include the first load and large parts of the non-nuclear equipment. With that, the demand from Borisov that the total cost of the project remain under 7 billion Euro come under severe pressure. It is also unclear whether the 500 Million Euro already sunk into Belene are part of this budget. On 1 November, Bulgaria's finance minister Simeon Djankov once more confirmed that no state finances would flow into the project.
In a surprise move, Prime Minister Borisov declared on 25 October after a visit to Muenich a week earlier, that he had found a strategic investor from Bavaria for Belene. Bulgarian media speculate interest from Siemens, the engineering firm that recently broke its alliance with Areva and partnered instead with Rosatom. Siemens, however, refuses to comment on these speculations. An announcement from the Bulgarian Ministry of Economy, Energy and Tourism that the new strategic investor would be announced in the first week of November was not realised, however, and German media have remained suspiciously silent about a possible deal. On 5 November, Borisov announced an offer of up to 2% participation to each Serbia and Croatia in what he said was a pragmatic attempt to secure markets for the output of Belene.

… and Mochovce, Slovakia - Slovakia has asked and received an extension of the period of comment on the draft verdict of the Aarhus Convention Compliance Committee, that the Environmental Impact Assessment for the Mochovce 3,4 project has violated the rules of the Convention. The NGOs that originally filed the complaint, Za Matku Zem, Greenpeace Slovakia, Global2000 and the Oeko-buero Wien, did not object to an extension to 30 November. The ACCC is expected to come with a final verdict in December. A spokesperson of the Slovak nuclear regulator UJD, which was responsible for issuing construction licenses in spite of the fact that the EIA procedure had not been finalised, is currently looking for possibilities to implement a likely final verdict of the ACCC, but stated to Greenpeace that it has problems finding a proper legal pathway to do so.
An ACCC verdict is, however, binding and a breach of the Aarhus Convention is also a breach of EU legislation on Environmental Impact Assessments, which means that the European Commission would be obliged to start corrective procedures against Slovakia in case the ACCC verdict concludes a violation of the rules.

… and Temelin, Czech Republic - The submission date for the tender for five new nuclear power stations issued by the Czech utility CEZ has been extended with a year to 2013. CEZ argued that some of the contenders had asked for such an extension, though analysts are of the opinion that the lack of growth in electricity demand in the Czech Republic has bitten into the economic viability of the project. The tender for five blocks, two for Temelin and one for Dukovany in the Czech Republic, one for Jaslovske Bohunice in Slovakia and one for a still to be decided project is expected to cost around 500 billion Czech Crowns or 25 billion Euro. Each block is supposed to deliver between 1000 and 1600 MW capacity.
Source of these 3 Inbriefs: Jan Haverkamp, Greenpeace EU Unit, email, 6 November 2010

Another fiasco at Monju, Japan. A12-meter-long, 46-centimeter-wide, 3.3-metric-ton heavy fuel exchange component that lodged in the reactor vessel of the Monju fast-breeder reactor after being dropped on August 26, cannot be extracted using "usual methods," the Japan Atomic Energy Agency (JAEA) has stated. The JAEA made the announcement November 9, after examining the component -a cylinder now stuck in an opening in the reactor vessel cap- with a camera. The agency believes that to get the part out, equipment on the reactor vessel cap will have to be removed, and an entirely new structure built to prevent sodium now covering the cylinder from mixing with the outside air and igniting during the process. The agency is now considering ways to do this, but gave no hint when testing of the reactor may recommence.
Since Monju resumed test operations on May 6 after shut down since a 1995 sodium leak, it has undergone the first stage of testing. These core confirmation tests were completed on July 22. Preparations were being made for the next stage, which involves increasing power output to 40%, planned for July 2011. However, the jammed relay cylinder has made further long delays probable.
Nuke Info Tokyo 138, Sept/Oct 2010 / The Mainichi Daily News, 10 November 2010

UK: What 'no subsidies' means: more help will be given. Following lobbying by the nuclear industry the Government has accepted that it needs to give more financial incentives in order to ensure a new generation of reactors are built in the UK. Energy minister Charles Hendry said he now agreed with the industry that fixing a high minimum price for carbon emissions was not enough. Instead he thought other financial incentive measures would be need to encourage nuclear and other low-carbon energy sources.
N-Base Briefing 674, 10 November 2910

IEA: US$312 billion subsidy annually for fossil. On November 10, the International Energy Agency published its World Energy Outlook 2010. The IEA report clearly states that fossil fuels are heavily subsidized by more than US$312 billion per year globally! This leads obviously to unfair competition with clean and climate friendly renewable energies. IEA is increasingly recognizing the important role renewable energy can play to fight climate change and improve security of supply. However, it is failing to shift technology recommendations from unproven, dangerous and expensive technologies such as CCS and nuclear power plants.
Press release Greenpeace, 9 November 2010

WISE/NIRS NUCLEAR MONITOR

The Nuclear Information & Resource Service was founded in 1978 and is based in Washington, US. The World Information Service on Energy was set up in the same year and houses in Amsterdam, Netherlands. NIRS and WISE Amsterdam joined forces in 2000, creating a worldwide network of information and resource centers for citizens and environmental organizations concerned about nuclear power, radioactive waste, radiation, and sustainable energy issues.

The WISE/NIRS Nuclear Monitor publishes international information in English 20 times a year. A Spanish translation of this newsletter is available on the WISE Amsterdam website (www.antenna.nl/wise/esp). A Russian version is published by WISE Russia and a Ukrainian version is published by WISE Ukraine. The WISE/NIRS Nuclear Monitor can be obtained both on paper and in an email version (pdf format). Old issues are (after two months) available through the WISE Amsterdam homepage: www.antenna.nl/wise.

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