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CALIFORNIA: NUCLEAR REVIVAL DIES IN COMMITTEE

On April 16, a controversial bill that would have allowed the construction of nuclear power plants to resume in California died in committee before reaching the floor of the State Assembly. This means that the attempt to lift the 30 year state ban died.

(655.5795) Alliance For Nuclear Responsibility - The bill, AB 719 (Devore), would have struck down California's 1976 Nuclear Safeguards Act, a moratorium on building nuclear power plants until a permanent solution to the storage of high-level radioactive waste is developed. The Assembly's Natural Resources Committee, chaired by Assemblywoman Loni Hancock, voted - 4 to 2 to uphold the ban. Several members who expressed concern about lifting the ban were not there when the vote was counted as they had conflicting bills in other Committees.

The California legislature enacted the Nuclear Safeguards legislation to prohibit new plant construction because of the federal government's failure to create a central nuclear waste repository. Thirty-one years later, no such solution exists and approximately 75,000 tons of radioactive byproducts of nuclear power generation have accumulated and are stored adjacent to the nation's rivers, lakes and oceans awaiting disposal.

According to the Resources Committee's analysis of the Devore bill, "the federal waste disposal program has been plagued with technical and legal challenges, managerial problems, licensing delays, persistent weaknesses in quality assurance for the program, and increasing costs."

The Devore bill claimed to address the need to reduce carbon dioxide emissions to curb global warming. According to the California Energy Commission, the most significant reductions in CO₂ emissions

from electricity generation can be achieved through energy efficiency programs and integrating renewable energy resources -- solar, wind, thermal, biomass and hydropower-- into electricity supplies.

"The so-called nuclear renaissance and the idea the nuclear power is the way to combat climate change is based on a tall stack of fallacies, unsupported by past experience or future promises," said Rochelle Becker, Executive Director of the Alliance for Nuclear Responsibility, which spearheaded opposition to the Devore bill. "Just because nuclear power proponents call their technology green, doesn't make it so,"

"The Alliance for Nuclear Responsibility welcomes every opportunity to discuss issues of nuclear power and waste versus solutions to global warming that focus on efficiency and renewable energy with Assemblyman Devore and all members of our state legislature. We anticipate the results of an upcoming study by the California Energy Commission that will analyze the costs, benefits and risks of continuing down a nuclear energy path will lead us to a clearer understanding of where to invest our energy dollars," Becker said.

The Alliance for Nuclear Responsibility is an educational and advocacy organization that works with other environmental and policy groups to stop nuclear power development and relicensing of aging nuclear facilities in California and promote create clean, renewable and economic energy sources

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that will create jobs, provide energy independence and serve as a model for other states and countries.

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STATUS OF THE PBMR DEVELOPMENT PROGRAM

Much has been written about the construction of the PBMR in South Africa. However, many of those articles, including those in the Nuclear Monitor, focused on particular steps in the process and did not give an overview of the status of the project. And since South-Africa is often mentioned by the pro-nuclear lobbyists as the place where the new generation nuclear reactors are actually being built, we now take the opportunity to give an update on the status of the project, using the April 2007 report "*The status of the Pebble Bed Modular reactor development programme*" by Steve Thomas.

(655.5796) WISE Amsterdam - The Pebble Bed Modular Reactor (PBMR) is a new design developed from two German designs, developed separately by Siemens and ABB. The nearest plant in design to the PBMR to be built was a demonstration plant in Germany, THTR 300, which was in service from 1983-1989.

The PBMR has been under development in South Africa since about 1993, although it was not until 1998 that these efforts were publicized. Eskom formally took a license with a German company, HTR, for pebble bed technology in 1999. The terms of this technology license have not been made public and the technology license is not discussed in the FEIR (Final Environment Impact Report) or the DFS (Detailed Feasibility Study). However, typically, a technology license would give the licensor a fee based on units sold, some rights over the new technology, and over the markets in which it could be sold.

It was expected in 1998 that work on construction of a demonstration plant would begin in 1999 and be complete before 2003 to allow commercial orders soon after. Eskom projected that the market would be about 30 units per year, about 20 of which would be exported. In April 2000, the South African Cabinet approved Eskom's continuation and completion of a Detailed Feasibility Study (DFS) on the proposed PBMR. Subsequently, Eskom formed a company, PBMR (Pty) Ltd to develop and market the technology. PBMR (Pty) Ltd foresaw four phases: research and development (already then completed), feasibility study (then underway), demonstration, and commercial application.

Possible time scales

In March 2007, a PBMR (Pty) Ltd spokesman admitted that construction

on the demonstration plant could not start before late 2008 or early 2009.

However, this still seems a highly optimistic estimate. There has been no indication that the design of the demonstration plant is nearly complete. Given also that no commercial agreement to fund the demonstration phase has been concluded, it seems highly unlikely that a final design can be submitted to the NNR (the South African National Nuclear Regulator) before the end of 2007. If we allow two years as the minimum time NNR could take before it allows construction to begin, this places start of construction at the start of 2010. A PBMR (Pty) Ltd spokesman has said that fuel load for the demonstration plant would take place 48 months after construction start. Allowing time for fuel load and other tests, first power might take place about 6 months later, at about mid-2014. This is now more than 10 years later than was forecast when the PBMR program was announced in 1998. So despite nearly 10 years of work, completion of a demonstration plant is further away than it was when the program was announced.

The original plan was that commercial orders would follow immediately on from the completion of the demonstration plant. This begs the question, what will have been demonstrated at that point? Clearly there will be some evidence on the design process, the constructability of the design, and the cost of construction. However, there will have been no demonstration of the operation of the plant. Given that the PBMR's nearest relative, the THTR-300 plant in Germany failed after the demonstration plant had started, this is an unjustifiable decision.

This issue was belatedly taken up in the Revised Final Environmental Scoping Report (RFESR) published in January 2007. It divides 'demonstration'

into demonstration of functional integrity and demonstration of commercial performance. It lists 13 separate attributes that should be demonstrated. Three of these will take at least three years to be partially demonstrated (plant availability, plant efficiency and sustainability, operational and maintenance cost, and first outage). 11 of them will take at least 7 years to be fully demonstrated (e.g., main power system integrity and helium leakage verification). Even if operation goes entirely to plan and no problems emerge and we assume partial demonstration is a sufficient basis for commercial orders to be placed, this means commercial orders could not be placed before mid-2017, with first power from the first commercial plant in 2021.

Conclusion

The record of the PBMR venture in meeting time and cost deadlines is appalling. The estimated cost of the demonstration phase had escalated by a factor of more than seven by 2005. It seems unlikely that when an updated version of this cost is produced, the cost will not have risen again.

The estimated time when commercial orders could be placed has slipped from 2004 to probably no earlier than 2020.

There have been continual promises that new foreign partners would be brought in to the project to add expertise and share the risk but five years after Exelon withdrew, no new partners have been recruited. Indeed, all the original partners have either withdrawn or reduced their stake: Exelon withdrew in 2002; BNFL contributed only 15 per cent of the costs instead of the 22.5 per cent it was contracted to contribute; IDC reduced its stake from 25 per cent to 13 per cent. It has now emerged that even Eskom, usually seen as a committed supporter of the program was, as early as 2002,

concerned about the riskiness of the venture and was looking for politically viable ways to withdraw from the project.

The program was launched on the basis of it being an export project that would bring a stream of income to South Africa from export sales. This promise has also not been fulfilled and the any reasonably likely export orders disappeared when Exelon withdrew in 2002.

The risk is that the longer the project continues, the more politically difficult it will be for the project to be abandoned and the pressure on Eskom to order plants will increase, regardless of how expensive these orders will be. As a fully state-owned company, it will be difficult for Eskom to resist this pressure.

The proposal for a 'conventional' nuclear plant

Due to the fact that the BPMPR-project is not living up to its expectations (to put it mildly) and in the wake of severe power shortages in the Cape area following a serious error in the maintenance of the existing Koeberg nuclear power plant, Minister Alec Erwin announced in April 2006, that he had asked Eskom to examine the possibility of building a 'conventional nuclear power station'. By February 2007, these plans had been firmed up sufficiently that it was forecast that a large plant would be on line by 2014 with a total of 2000-3000MW to be completed in the 'near-term'.

The clear implication from the use by Erwin and Eskom of the word 'conventional' is that there are well-proven, off-the-peg nuclear designs that

South Africa could order with confidence. This is far from the case. Of the reactor designs being developed and which are currently on offer, there are only two obvious candidates: the European Pressurized Water Reactor (EPR) offered by Areva; and the AP-1000 offered by Westinghouse

The EPR (1700MW) has been under development by Areva since 1991, but only two orders had been placed by April 2007. One was placed in December 2003 for a plant to be built in Finland, while a second order for France is expected to be finalized in 2007. Experience with the Finnish reactor (Olkiluoto 3) has been appalling. After 18 months of construction, the plant was already 18 months late and the costs had escalated by about a third. While EPR has received safety approval from the French and Finnish authorities, it is not expected to complete its review by US authorities until about 2011. The EPR remains effectively unproven and experience to date is poor.

The AP-1000 (1200MW) has been under development since 1999 and was given regulatory approval in 2006 by the US authorities (NRC). It was based on a design, the AP-600, which, after more than a decade of development, was given safety approval in 1999. However, by that time, it was clear the AP-600 was uneconomic and it was abandoned without ever having been built. In December 2006, China placed the first orders for an AP-1000 with four units. The AP-1000 is unproven and is based on a design that is also unproven. It has received regulatory approval in the USA, but nowhere else.

So there is no such thing as a 'conventional nuclear power reactor'. But is such a time-scale (online in 2014) realistic? If Eskom were to proceed with the conventional nuclear option, it would have to identify a site and open a call for tenders. Identifying a site would be hugely controversial and probably the least controversial site would Koeberg, where the existing nuclear plants are sited and where the demonstration PBMR is expected to be built. An EIA would have to be completed to get approval for a site and it is unlikely this could be completed and approval given in less than three years. A call for tenders could also take up to three years to be completed. Finland expected to build its EPR in 54 months but it is already 18 months late, France expects to take about 5 years to build its order and the UK projects a construction time of six years. All three countries have far more recent nuclear experience with construction than South Africa so a construction time of less than six years seems optimistic. So the prospect of having a plant on-line by 2014 seems improbable and even an accelerated process, where everything went without a hitch would be unlikely to see a plant on-line before 2017.

Source: *"The status of the Pebble Bed Modular reactor development programme"* by Steve Thomas (published April 2007).

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CHERNOBYL DISEASE: STRESS OR RADIATION?

In the past decade there were jubilant stories in the media on the flourishing wildlife in the 30-kilometer (19-mile) "exclusion zone" around the nuclear disaster site of Chernobyl. The healthy looking animals in the zone, however, appear to be not that healthy. A new study on birds show a link to radiation . The new studies are among the first to measure empirically the long-term effects of massive radiation contamination over an almost 2,000-square-mile area.

(655.5797) Laka Foundation - A new study shows that birds in the vicinity of Chernobyl suffer from many more birth defects and abnormalities than would normally be expected. Furthermore the scientists found that many birds are not living as long and are not breeding as successfully as their counterparts outside the radioactive zone. The new findings, published in the peer-reviewed Proceedings of the Royal Society in Britain, also suggest that organisms can detect hazards to their long-term health

and species survival even when the hazard cannot be smelled, tasted or observed visually.

The studies by Tim Mousseau and Anders Moller are among the first to measure empirically the long-term effects of massive radiation contamination over an almost 2,000-square-mile area. Chernobyl is unique in the world in the amount of radiation spilled by the disaster over a broad land mass. But Mousseau and others say

there has been too little scientific research so far to measure the impact of the radiation on the environment and living organisms.

Moller and Mousseau examined more than 7,700 birds, from Chernobyl and from control areas in among others Spain and Denmark. Findings revealed that more than 13% of the Chernobyl birds had partial albinism tufts of white feathers compared to levels of around 4% in the control birds. Recapturing the

same birds year after year showed that birds with abnormalities were four times less likely to survive and that breeding success was reduced by over 50%.

The outcome directly contradicts a 2005 report prepared by the Chernobyl Forum, which is led by the International Atomic Energy Agency (IAEA) and the World Health Organization (WHO). According to this forum the causes of poor health in the Chernobyl region were mainly caused by stress, an unhealthy lifestyle and other factors, and they emphasized that the local population were exposed to radiation doses which are too low to cause damage to human health.

In the US daily *The State* former director of the Center for Risk Management at the Department of Energy's Oak Ridge National Laboratory Curtis Travis calls Mousseau's and Moller's research

important. "There have been very few studies on ecology effects (at Chernobyl)," he said. "Chernobyl is important because it represents low levels of contaminants over a long period of time, while Hiroshima represented high doses over a short period of time [...] While many official reports have downplayed the long-term impact of Chernobyl on humans, all of the data says radiation causes human health effects down to the lowest levels. There is no threshold," Travis said.

Moller and Mousseau think that the health impact of the Chernobyl disaster could be much worse. Co-author of the study Tim Mousseau, a biology professor at the University of South Carolina: "Birds don't drink, birds don't smoke, and they don't suffer the same kind of stresses as humans that can cause diseases such as cancers". The findings support the theory of Mousseau and his colleagues that the low-level

radiation in the Chernobyl zone is enough to cause the high rates of abnormalities and birth defects reported in humans living in the region. If they are right, then millions of people living in Belarus, Ukraine, and Russia are still at risk.

Look for more information on: <http://cricket.biol.sc.edu/Chernobyl.htm>

Sources: A.P. Moller and T.A. Mousseau (2007). *Birds prefer to breed in sites with low radioactivity in Chernobyl*. Proceedings of the Royal Society B: Biological Sciences: 27 March-3 April, 2007 / *Smart birds might teach lesson*, *The State*, 9 April 2007 <<http://www.thestate.com/154/story/30771.html>> / *National Geographic News*, 18 April 2007

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MOORE NUCLEAR SPIN

Although it's hardly reflected by reality the nuclear industry is doing very well in rhetoric's and nuke-speak. Not only have they managed to let people believe that new nuclear plants are being build all over the globe, more and more people also believe that we need nuclear energy to combat climate change. Patrick Moore is often mentioned as a Greenpeace founder who now believes in nuclear energy. But what about his credentials?

(655.5798) WISE Amsterdam - In this PR battle the nuclear industry has been organising help from former environmentalists like former Greenpeace activist Patrick Moore. They never tell that he is paid by a group bankrolled by the U.S. Nuclear Energy Institute (NEI). NEI represents nuclear power plant operators, plant designers, fuel suppliers and other sectors of the nuclear power industry. Hill & Knowlton is NEI's public relations firm, though it's not the only firm working to build support for nuclear power.

In January 2006, NEI signed an US\$ 8 million (Euro 5.5 million) contract with Hill & Knowlton. The objectives included developing "a national coalition that would 'activate and expand on' existing nuclear energy supporters, engaging employees, shareholders, academics, health experts, and environmental organizations," and "pre-empting and offsetting' criticism from opponents,"

Building the Nuclear CASE

With Hill & Knowlton's help, NEI launched what is possibly its greatest PR triumph. The Clean and Safe Energy

Coalition (CASEnergy) held its inaugural press conference on April 24, 2006, just two days before the 20th anniversary of the Chernobyl nuclear power plant disaster. CASEnergy is fully funded by NEI, and supported by Hill & Knowlton. CASEnergy is not the first business-funded coalition to support nuclear power, but the others never received the attention that CASEnergy is now enjoying.

That's due in large part to the choice of Patrick Moore as CASEnergy's co-chair and most public spokesperson. As he explained at the group's launch, Moore's role is to "speak and write to press the group's agenda, as well as to coordinate efforts," reported *Nucleonics Week*. His past work with Greenpeace has proved an irresistible hook for many reporters, even though his association with that group ended in 1986. Moore has now spent more time working as a PR consultant to the logging, mining, biotech, nuclear and other industries (since at least 1991, or 16 years) than he did as an environmental activist (from 1971 to 1986, or 15 years).

Part of the thinking, surely, was that the press would peg Moore as an

dedicated environmentalist who has turned into pro-nuke cheerleaders. And it works. From tiny local to influential national daily papers and television Moore is being referred to as either a Greenpeace founder or an environmentalist, without mentioning that he is also a paid spokesman for the nuclear industry.

Both NEI and Moore decline to say how much he's paid. Presumably, the nuclear industry feels it's getting its money's worth. A Nexis news database search on March 1, 2007 identified 302 news items about nuclear power that cite Moore, since April 2006. Only 37 of those pieces -- 12 percent of the total -- mention his financial relationship with NEI.

Industry representatives don't just showcase Moore to reporters. In response to a safety question at a public debate on nuclear power in Wisconsin (USA), on December 7, 2006, another NEI's spokesperson said, "Patrick Moore, the former co-founder of Greenpeace -- he's now very in favour of nuclear power -- often brings up an example of the Bhopal disaster in India, 1986 -- a huge chemical accident. ... It

was a disaster. But the response was not, 'We have to close down the chemical industry.' The response was, 'We have to make the chemical industry safer.' And that's exactly what nuclear has done, after Chernobyl and after Three Mile Island." She did not disclose Moore's paid position with NEI. When asked about it, the NEI spokesperson responded, "You can't change his mind with money."

Current Greenpeace leaders and other environmental activists have repeatedly distanced themselves from Moore and questioned his claims. According to Greenpeace advisor Harvey Wasserman "Moore exaggerates his role in Greenpeace and his credentials as a scientist to serve as a public relations hack." But these protestations have mostly been ignored. When they are raised, Moore dismisses them as

further proof of the irrationality of his former colleagues.

Source: extracted from a much more detailed article written by Diane Farsetta, Centre for Media and Democracy, March 14, 2007 and published at:
<http://www.prwatch.org/node/5833>

DEVELOPMENT OF CIVIL NUCLEAR POWER INDUSTRY IN CHINA

China's rapid economic development has been accompanied by a huge increase in energy demand. Since 1990, China's primary energy consumption has risen by more than 70%. In the first decade of the 21st century, China became the world's second largest energy consumer (after United States) and the third largest energy producer (after United States and Russia).

(655.5799) CESDRRC - Low energy efficiency and rising living standards contribute to a steady increase of consumption in China. On the one hand, according to estimates by the Asian Development Bank, China uses four times the amount of energy to produce a unit of GDP than the Group of Seven developed countries. On the other hand, compared to western countries the average per capita energy consumption is still low: the average Chinese citizen consumes only one eighth of a U.S citizen, but consumption is expected to grow fast. The ongoing trend of urbanization and motorization and the aim to quadruple the economy by 2020 will result in a further increase in energy, mainly coal, consumption. China plans to built more than 500 additional coal-fired power plants in the coming 15 years, for example (*1).

The dependence on conventional fossil fuels, namely coal and crude oil, have created severe environmental pollution problems and a rapid increase of greenhouse gas (GHG) emissions. As soon as in 2008 China is expected to overtake the United States as the world's largest emitter of CO₂. (*2) At present seventy percent of China's CO₂ emissions are derived from coal combustion.

China's energy resources are not well distributed with respect to economic development and demand. Coal and natural gas reserves are mainly concentrated in the western provinces, hydropower in the southwest. Energy demand, on the other hand is highest in the eastern coastal provinces of Guangdong, Zhejiang and Jiangsu, and especially in the mega-cities

Shanghai, Beijing and Tianjin, where in recent years power cuts during peak seasons have become a frequent problem.

In view of the mentioned problems related to fossil fuels, the Chinese government has in recent years shown serious commitment to improve energy efficiency and develop renewable and so-called "clean energies", including nuclear energy. For the first time, the present 11th Five-Year Plan (2006-2010) includes the goal to reduce energy consumption by 20% per unit GDP by 2010, and to increase the share of renewable energies in the energy portfolio to up to 15%. China is planning to invest US\$ 185 billion to meet this goal. (*3). Development plans also call for a considerable development of nuclear power. So the aimed increase of the share of nuclear energy to 4% from present 2% compared to some western nuclear nations remains relatively modest, the increase will equal the construction of 30 new nuclear plants by 2020, making China one of the last nations in the world where considerable development of nuclear industry is expected.

China's Nuclear Energy Programme

In China, it is often mentioned that nuclear energy is a CO₂ emission free energy resource (alongside renewable energies) and has to be considered as a form of "clean energy". In international negotiations China has been consequently a strong supporter for the proposal to include nuclear energy into the Clean Development Mechanism (CDM). China's civilian programme for nuclear power generation was initiated in the 1980s, with the indigenous design

and construction of a 300 MW pressurized water reactor (PWR). Construction of the Qinshan Unit 1 plant about 100 km southwest of Shanghai started in 1985, operation began in 1991. In the mid-1980s, the Daya Bay project near Hong Kong was started. Daya Bay Units 1 and 2 are equipped with PWR units of 984 MW, supplied by the French company Framatome. The two reactors began commercial operation in 1994. About 70% of their power is transmitted to Hong Kong and 30% to Guangdong Province. As a reaction, environmental activists in Hong Kong collected about one million signatures, protesting against Daya Bay, but their protests were ignored by Beijing authorities.

Since the beginning of the new millennium, another seven nuclear plants have been connected to the power grid: Qinshan Units 2A and B with Chinese designed reactors started operation in 2002 and 2004, respectively, Qinshan Units 3A and B began operating in 2003 using Canadian CANDU units, and in 2002, Lingao Units 1 and 2, also located in Guangdong Province, and equipped with 990 MW Framatome units similar to those in Daya Bay went into operation. In May 2006, the first unit of two Russian AES-91 power plants (equipped with 1060 MW VVER light water pressurized reactors) was connected to the grid in Tianwan (Lianyungang). In 2007, the both plants in Tianwan are expected to enter commercial operation. The total capacity of all operating nuclear power plants amounts to 7587 MW.

Tab. 1: Nuclear power reactors in operation and under construction

Name	Technology	Location (Province)	Capacity (MW)	Start of Commercial Operation
Operational				
Qinshan 1	PWR, China	Zhejiang	300	1994
Qinshan 2	PWR, China	Zhejiang	642	2002
AQinshan 2	PWR, China	Zhejiang	642	2004
BQinshan 3	PHWR, Canada	Zhejiang	728	2002
AQinshan 3	PHWR, Canada	Zhejiang	728	2003
BDaya Bay 1	PWR, France	Guangdong	984	1994
Daya Bay 2	PWR, France	Guangdong	984	1994
Lingao 1	PWR, France	Guangdong	990	2002
Lingao 2	PWR, France	Guangdong	990	2003
Tianwan 1	VVER, Russia	Jiangsu	1,060	2007
Under construction				
Tianwan 2	VVER, Russia	Jiangsu	1,060	2007
Shidaowan	HTR-PM China	Shandong	200	2010
Lingao 3	PWR, France	Guangdong	935	2010
Lingao 4	PWR France	Guangdong	935	2011
Qinshan 6	PWR	Zhejiang	610	2011
Qinshan 7	PWR	Zhejiang	610	2011

Source: World Nuclear Association (2007), www.world-nuclear.org/info/inf63.html

Organisation

A number of institutions are in charge of the civilian nuclear program. The National Development and Reform Commission (NRDC) sets the targets for energy development (and the share of nuclear energy) and approves nuclear projects. The China Atomic Energy Authority (CAEA) is in charge of civil nuclear programs and international cooperation in this field. The CAEA is also responsible for feasibility studies for planned nuclear power plants. The National Nuclear Safety Administration oversees safety regulations and their compatibility with international agreements, whereas the State Environmental Protection Administration (SEPA), the Chinese Environmental Ministry is in charge of environmental impact assessment and monitoring radioactive pollution.

Today there are several Chinese corporations active in the nuclear power sector. The China National Nuclear Corporation (CNNC) is involved in R & D, uranium exploration and mining, enrichment, fuel fabrication, reprocessing and waste disposal. CNNC's subsidiary China Nuclear Energy Industry Corp. (CNEIC) is in charge of uranium fuel trading. The China Nuclear Engineering and Construction (CNEC) group is responsible for plant construction. Another leading company in this field is the Guangdong Nuclear Power Group (CGNPG) that runs the Daya Bay plant and will be in charge of the Yangqiang project. The China Huaneng Group (CHNG) one of the five leading power companies in China is not involved in the nuclear business so far but holds a major share in a consortium for the Shidaowan demonstration plant for small scale high-temperature gas cooled reactors.

The Chinese nuclear industry has influential supporters in the Chinese government. Former premier Li Peng, an engineer and energy expert, was one of the strong promoters of the early nuclear power projects. He also managed to find some of his family members key positions in the nuclear power business and the power industry. For many years Mr. Li

Peng's wife Zhu Lin hold the position of a general manager of the Guangdong Nuclear Power Group. Today Mr. Li Peng's son Li Xiaopeng is the director general of the China Huaneng Group, a company that recently joined the nuclear club.

Front and back end of the fuel cycle

China has its own uranium resources, but also needs to import supplies from other countries. The current production of 840 t uranium from local mines in Western China (Xinjiang Autonomous Region, Shaanxi, Guangxi, Liaoning) supplies about half of the current demand, the remaining half having to be imported from Kazakhstan, Russia and Namibia. In April 2006, prime minister Wen Jiabao's state visit to Australia, which holds 40 percent of the world's uranium reserves, resulted in the Nuclear Transfer Agreement and Nuclear Co-operation Agreement that allows Australia to supply uranium to China (*4).

Chinese national uranium mines, most of them located in the less developed western regions, are reported to be causing environmental pollution and health risks to local residents. Cases of radiation poisoning affecting local residents have, for example, been reported from uranium mine No. 792 in Diebu County, Gansu

Province. The mine opened in 1967, run by the military, annually milled between 140 and 180 tons of uranium bearing rocks. In 2002, the mine officially was closed down due to ore exhaustion and outdated equipment. However, it continues operation as a private owned mine operated by Longjiang Nuclear Ltd. Since 1988, Sun Xiaodi, a former employee repeatedly travelled to Beijing and met with foreign journalists to make the case public. In early 2005, he was detained by public security forces. He was released later that year, but ever since remains under police surveillance. In 2006 Sun Xiaodi was awarded with the international Nuclear-Free Future Resistance Award. (*5).

Uranium enrichment is mainly undertaken either within China or by the company Urenco in Europe. Within China, facilities in Chengdu (Sichuan Province), Lanzhou (Gansu Province) and Hanzhong (Shanxi) provide uranium enrichment for civilian purposes. Fabrication of PWR fuel is done at a plant in Sichuan Province, another plant in Inner Mongolia will provide PHWR fuel to the CANDU type plants.

Planned spent fuel activities include at-reactor storage, away from reactor storage as well as reprocessing. A centralized storage facility with a capacity of 550 tons of fuel has been in operation since 2000 in Lanzhou (Gansu Province). A pilot (50 t/yr) reprocessing plant using the Purex process was opened in 2006 at Lanzhou. This is capable of expansion to 100 t/yr and will be fully operational in 2008. A large commercial reprocessing plant based on indigenous advanced technology is planned to follow and expected to begin operation about 2020.

As many other nuclear power nations China so far has not found a solution for permanent disposal of nuclear waste. In 2005, Chinese experts with German experts from the Technical University of Clausthal began assessing potential repository sites in the Gobi desert (Gansu Province) (*6). Repository sites are planned to be fully operational by around 2030. No information how the fuel will be transported to reprocessing and repository sites is available.

The future of nuclear power industries

Up to the late 1990s, China's nuclear industry saw only modest development. Starting in 1997 and for the following six years, as a result of the Asian crisis many potential projects were put on hold because of concerns of excess capacity, safety and the high costs of nuclear power. Nuclear plans were resumed with the 10th Five-Year Plan (2001-2005), which explicitly incorporated the development of nuclear energy as one major goal within China's energy strategy. Under pressure as a result of severe power shortages that have affected China's main industrial centres in the eastern coastal regions in recent years, the national authority responsible for China's energy policy, the National Development and Reform Commission (NDRC), has adjusted the nuclear development plans. The latest plan calls for China's nuclear power industry to provide 4% of overall power supply and an increase of installed capacities to 41-46 GW. This will require the construction of over 30 new nuclear power plants.

Tab. 2: Planned nuclear power stations in China
Source: World Nuclear Association 2007

Name	Technology	Location (Province/Municipality)	Capacity (MW)	Start of Commercial Operation
Approved for construction (included in 11th 5 year plan 2006 - 2010)				
Sanmen 1	AP 1000 USA	Zhejiang	1,000	
Sanmen 2	USA	Zhejiang	1,000	
Yangjiang 1	PWR France	Guangdong	1,650	
Yangjiang 1	PWR France	Guangdong	1,000	
Haiyang	AP 1000 USA	Shandong	1,000	
Haiyang	AP 1000 USA	Shandong	1,000	
Shidaowan	China	Shandong	200	
Huian/Fuqing		Fujian	2 x 1000	
Hongyanhe/Dalian		Liaoning	2x 1080	
Hongshiding		Shandong	2 x 1000	
Yaogu		Guangdong	2x 1080	
Bailong		Guangxi	2 x 1000	
Planned or proposed				
Heyuan				
Ningde	PWR	Guangdong	4 x 1000	
Tianwan -2	PWR	Fujian	2 x 1080	
Qinshan -5	PWR	Jiangsu	2 x 1060	
Hongyanhe-2	CNP- 1000	Zhejiang	2 x 1000	
Rongcheng or Weihai	PWR	Liaoning	2 x 1000	
Haiyang 2		Shandong	2 x 1000 ?	
Tianwei- 2	HTR	Shandong	8 x 200	
Bailong-2	PWR	Shandong	6 x 1000	
Hui'an/Fuqing-2	PWR	Guangdong	4 x 1000	
Yangjiang 2	PWR	Guangxi	4 x 1000	
Yangjiang 3	PWR	Fujian	4 x 1000	
Haijia	PWR	Guangdong	2 x 1000/1500	
Jinzhouwan	PWR	Guangdong	2 x 1000/1500	
	PWR	Guangdong	2 x 1000?	
	PWR	Liaoning	2 x 1000	
Taohuajiang		Jiangsu	2 x 300	
Taohua		Hainan	2 x 300	
Yiyang	CPI	Hunan	2 x 600	
Fuling	CNNC	Hunan	4 x 1000	
Bamaoshan		Chongqing	2 x 900	
	CGNPC	Anhui	4 x 1000	
		Jilin	4 x 1000	

Most of the proposed sites are located in the densely populated eastern coastal regions, but also include some interior location. As many as 16 provinces have announced intentions to built nuclear power plants during the twelfth 5 year plan (2011-2015).

According to EIA projections, in 2025, China will become one of the world's leading nuclear power nations:

See next page **Tab. 3:** Projected nuclear-generated electricity consumption 1990-2025 (in billion kilowatt hours)

International suppliers of nuclear technologies that have been suffering from a worldwide slowdown of nuclear development are now eagerly looking at China's ambitious nuclear power plans and for new business opportunities. This is especially the case for US American companies, which have only since 1997 been allowed to export civilian nuclear technologies to China as a result of previous American trade restrictions. At present, more than 300 international companies, including companies from Canada, Germany, Japan, Spain and the USA are supplying technologies or know-how to Chinese nuclear power projects. In September 2005, the Atomic Energy of Canada (AECL) signed a technology development agreement with the China National Nuclear Corporation (CNNC), which opened up new opportunities for supplying more Candu-6 reactors. Germany had talks on delivering a MOX uranium-plutonium plant (which had originally been built for Germany, but following public protests has never been operated in Germany). The talks came to a halt due to strong opposition within the government and public.

Since 2004, the bidding process for the Sanmen (Zhejiang) and Yanjiang (Guangdong) plants had the US Westinghouse, the French Areva and the Russian Atomstroyexport involved, with the US, French and Russian governments reported to having been giving support. The US Export-Import Bank approved 5 billion US\$ loan guarantees for the Westinghouse bid, and the French Coface gave similar guarantees for the support of Areva's bid. The US Nuclear Regulatory Commission gave approval for Westinghouse to export the respective equipment. The final decision was a kind of surprise. In December 2006 the Chinese announced a tentative agreement with Westinghouse. But after a strong intervention by France, the decision was altered and the projects divided between the two western competitors. Westinghouse Electric won a US\$ 6

billion worth contract to build four of its AP 1000 reactors in Sanmen and in Haiyang north of Shanghai (another projected plant, which was not part of original bidding). The French Areva won a US\$ 5 billion worth contract to build two plants in Yanjiang (Guangdong). Construction is planned to start in 2009, the first plants are expected to be completed in 2013. In addition Areva also agreed to supply uranium to China (*7).

Tab. 3: Projected nuclear-generated electricity consumption 1990-2025 (in billion kilowatt hours)

Source: Energy Information Administration (EIA)

Country	1990	2000	2001	2010	2015	2020	2025
USA	577	754	769	794	812	816	816
France	298	394	401	447	478	520	550
Germany	145	161	163	137	107	15	0
Japan	192	294	309	369	394	426	411
Canada	69	69	73	108	110	118	98
Russia	115	122	125	141	154	129	99
S. Korea	50	104	107	141	171	209	220
	6						
China	0	16	17	66	129	142	

In the long run, China aims to rely more on home-grown nuclear technologies. This will on the one hand include the duplication of imported technologies, but on the other hand also the development of its own technologies, such as the CNP (China Nuclear Power) 1000 and 1500 models. The CNP 1000 technology will be used for the two 1,000 MW reactors built in Fangjiashan, Zhejiang province (*8). China's nuclear research institutes and companies claim to have achieved high standards. Qinghua University's Institute of Nuclear Energy (INET) has developed a 10 MWt high-temperature gas-cooled reactor (HTR-10). In 2006, the China Huaneng Group, the country's largest power company launched the construction of a first nuclear power plant with using high temperature gas-cooled reactors (HTR-PM) developed in China. The demonstration plant Shidaowan is located in Rongcheng, Shandong province and will have an installed capacity of 200 MW. 18 further units are planned to be built either in Rongsheng or in Weihai, Shandong province. These smaller reactors are planned to supply energy for desalination plants. With Russian assistance China is also working on the development of fast reactors. The development of a domestic nuclear industry will enable China to export their technologies to other countries. China has already been involved in the construction of a smaller plant in Chasma in Pakistan, and in November 2006, during a state visit of president Hu Jintao to Pakistan talks were held to cooperate on more nuclear power projects in the future.

The Chinese public has been informed about the planned massive development of national nuclear industries, but Chinese media are quick to assure that nuclear power is a clean and safe energy source. Although China has seen a promising development of environmental NGOs in recent years, with countless groups mushrooming all over the country, none of them seems to have been able to openly address concerns related to nuclear issues. According to the China Atomic Energy Authority "China established a safety and supervision and management systems and nuclear safety standards in line with international standards. A three-level nuclear power plant related nuclear accident emergency management system is in place..." (*9) Details about this

system have not been made public. There are also regulations on the safety of radioactive isotope and radiation devices, which require immediate and accurate reports on accidents. However, as long as transparency and access to information is not given, and environmental NGOs are not able to address issues of nuclear safety, concerns remain about adequate handling of nuclear accidents, the handling of nuclear wastes and the safety in uranium mines, enrichment facilities and disposal sites, the majority of which are located in China's less developed western regions.

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China postpones climate report

China has postponed the release of its National Plan on Climate Change, amidst reports that the document for the first time discloses internal targets for carbon dioxide (CO2) emissions. According to one of the reports authors, Xu Huaqing, the document aims to discuss how China should deal with greenhouse gases over the next five years. Press reports on the National Plan suggest that, while recognizing that the country faces an average temperature increase of 1.2-2.1 degrees C and associated environmental and economic impacts, it is ready to take only limited action to curb its emissions. The main proposal, to reduce CO2 emissions per unit of gross domestic product (GDP) by 40% over the period 2000 to 2020, would be more than offset by Chinas plans to quadruple its GDP over the same period. China currently relies on coal for 70% of its energy needs, and, according to the International Energy Agency, is poised to overtake the USA as the worlds largest emitter of CO2 either this year or next.
 World Nuclear News, 24 April 2007

IN BRIEF

IPCC: "nuclear energy part of the solution". In the first report ever of the United Nations (UN) in which they lay out a detailed plan to save the planet from the catastrophic effects of rising temperatures the final text will probably have something for everyone, ie. GMO for bio fuels, nukes, coal capture and storage but also renewables, structural change, efficiency and the like. It's a 'pick as you wish'-list.

The report will be (is) published on May 4, the day after this issue is mailed out.

The UN study will (most likely) conclude that mankind has the know-how to reduce global greenhouse gas emissions more than enough to limit the expected temperature rise across the planet to 2-3 degrees Celsius. - but only if politicians do more to force businesses and individuals to take action. Such a move would cost the world economy billions of dollars over the next two decades, but this could be recouped by savings due to the health benefits of lower levels of air pollution.

The report, from the Intergovernmental Panel on Climate Change (IPCC), will say a range of measures can be introduced across the energy supply, transport, buildings, agriculture and forestry, industry and waste sectors. The best way to limit future emissions is to focus on clean development in developing countries.

The summary of the new report, a draft of which has been obtained by the Guardian (that is why we are able to write about it before it is published), says: "It is technically and economically feasible to stabilise greenhouse gas concentrations in the atmosphere ... provided that incentives are in place to further develop and implement a range of mitigation technologies." It would be for the first time that the IPCC/UN would actively say that nuclear energy should be part of the solution. If this is accepted it will certainly also open the doors for acceptance of nuclear in for instance support schemes to be developed for any post-Kyoto international agreement (such as the current Clean Development Mechanism) and thus receive massive subsidies again.

Guardian (UK), 28 April 2007

Most 2008 US President candidates support nuclear power. Each of the top contenders for the Republican nomination and all but one of the major Democratic hopefuls support nuclear power to some extent. Most cite the prospect that atomic energy could help reduce climate change by supplanting power produced by fossil fuel sources such as coal and natural gas. The two leading Democratic presidential candidates, Senators Hillary Clinton and Barack Obama, have joined one of the top Republicans in the race, Senator John McCain of Arizona, to sponsor the Climate Stewardship and Innovation Act of 2007. The measure includes more than \$3.6 billion (2.64 billion Euro) in funding and loan guarantees for the planning and construction of nuclear plants using new reactor designs.

The only major candidate opposed to increased reliance on nuclear power is a former senator from North Carolina, John Edwards. The *Las Vegas Review Journal* reported that during a visit to that city in February, Mr. Edwards declared that nuclear power had no future in America. One potential entrant in the Democratic field, Vice President Gore, also remains cool to nuclear power. Gore (in an interview with a Dutch daily) on nuclear power: "I'm not opposed to it, but skeptical. I think it will play only a marginal role in the future. It is extremely expensive, it takes a lot of time to built nuclear plants and besides that it is dangerous".

One critical part of the nuclear calculus for Democrats these days is the negative sentiment of Nevada residents to the federal government's plan to store high-level nuclear waste at Yucca Mountain. As a result all of the major Democratic candidates are now opposed to the plans for Yucca. The even appear to be in something of a competition to outdo one another on the issue.

But, as a US anti-nuclear activist stated: "If you're really concerned about the waste, how can you favor nuclear power if we have no way to deal with the waste?"

New York Sun, 20 April 2007 / Metro (NL), 4 April 2007

Australia: Labor Party changes uranium mining policy. On April 28, Australia's centre-left Labor Party (ALP) scrapped its 25-year ban on new uranium mines. But after a divisive debate at the party's national policy conference in Sydney, Labor maintained its opposition to nuclear power or nuclear enrichment industry in Australia. While Labor is in opposition nationally, the party holds power in all of Australia's six states and two territories, and the state governments continue to hold the powers to approve or veto mining. The new policy is not binding on state governments. The state premiers of Western Australia and Queensland, which hold most of the untapped uranium reserves, said they would continue to use their powers to stop new uranium mines. "The Western Australian Premier and I have made it clear ... and we are the resource states, we won't be mining uranium. We'll keep it exactly as it is," Queensland state Premier Peter Beattie told reporters..

Labor's new policy came as conservative Prime Minister John Howard announced plans to help expand Australia's uranium industry to make it easier for companies which might want to develop nuclear processing or nuclear power in Australia. Howard, a strong supporter of nuclear energy and increased uranium exports, said his government would soon overturn laws which prevent nuclear activities in Australia, and would introduce laws in 2008 to set up a nuclear regulatory regime. His move ensures nuclear power and enrichment will be key issue for voters at national elections, due in the second half of 2007. During the Labor conference environmentalists protested outside the conference, condemned Labor's new policy. Two days later,

a collaboration of community representatives locked down Victorian ALP headquarters to voice their disgust that the party is locking Australia into a dangerous nuclear future. "We are here locking the parliamentarians out of office as the Australian Labour Party (ALP) is locking us into a radioactive future."

Reuters, 28 April 2007 / Media Release Nuclear Free Australia, 30 April 2007

US: more problems for Yucca Mountain. The Walker River Paiute Tribe in Nevada, said in a statement April 17 that it no longer wanted DOE to include the proposed Mina rail corridor, which runs through tribal land, in an environmental impact study (EIS) for a rail route to Yucca Mountain. The Indian Tribe decided it doesn't want nuclear waste shipped by rail across its land on the way to the DOE repository. The Walker River Paiute Tribe said in a statement "the tribal council began the EIS process to allow the tribe to make an informed, educated decision on the likelihood of nuclear waste passing through our reservation." Tribal chairwoman Genia Williams said the tribe dropped out of the EIS process after reviewing information collected to date. "The tribe will not allow nuclear waste to be transported by rail through our reservation," she said.

Nuclear News Flashes, 18 April 2007

UK: Sellafield bodies had organs removed. The government has announced an inquiry after it was revealed that organs and body tissues were secretly removed from the bodies of dead Sellafield workers from 1962 through to 1992. The UKAEA, which ran Sellafield at the time, tested the body parts for radioactive contamination, despite its public protestations that working at Sellafield was completely safe. The tests revealed that there was strong evidence that both the workers and people living in the area had increased levels of plutonium in their bodies due to atmospheric discharges. The UKAEA has announced it will carry out a similar investigation at Dounreay.

N-Base Briefing 522, 21 April 2007

Japan: Toyochō votes against repository research

The mayor of Toyochō in Kochi Prefecture, Japan, has not been re-elected, losing to a candidate opposed to investigations towards a possible radioactive waste repository being sited near the town. In March 2006, mayor Yasuoki Tashima put Toyochō forward to the government as a possible site for the country's high-level radioactive waste storage facility. Toyochō was the first town to respond to a 2000 government invitation and would have received up to 2 billion yen (US\$16.8 million or 11 million Euro) in annual subsidies as long as the feasibility studies lasted. However, Tashima did not inform residents or the town council about his decision until January 2007. The mayoral election was called after Tashima announced his resignation on 4 April to seek a voter mandate for his move to check the suitability of the town as a potential repository site. However, Yasutaro Sawayama said during his campaign that he would immediately scrap the town's application for such research. The move means that the government must continue its search for a location volunteering to host a repository.

World Nuclear News, 23 April 2007

The Raging Grannies close Vermont Yankee gate. Many actions took place all over the world on April 26, to commemorate Chernobyl, of which one is very special we think. In the U.S. seven anti-nuclear activists were arrested after chaining themselves to a fence at Vermont Yankee nuclear power plant. The protesters, who call themselves the Raging Grannies, want the plant shut down and have engaged in at least 30 of similar actions at Entergy's corporate offices and at the gate of the power plant in Vernon, since December 2005. Vermont state's Attorney Davis has balked at prosecuting them, saying he doesn't want them using the justice system as a platform for attention. Why is this one so special?

The women arrested and cited for trespassing and disorderly conduct were 38, 59, 63, 66, 68, 78 and 88 years of age!

Personal email Kevin Kamps, 27 April 2007

France: occupation of pylon near Flamanville. According to a statement from Sortir du Nucleaire, the last two anti-nuclear activists climbed down from a pylon supporting a 400 kilovolt transmission line near Flamanville on April 16. The two were the last of four protesters who, on April 14, climbed up the pylon to protest the government's authorization April 11 of Electricite de France's EPR project at Flamanville, and its associated new 400-kV line. The pylon is about 500 meters outside the plant site boundary.

The protesters had hitched themselves to the metallic structure a few meters under the transmission cables, and spread out banners reading "Stop EPR" and "Stop THT," the latter the French acronym for very high voltage. The two other activist climbed down on April 14 and 15.

Nuclear News Flashes, 16 April 2007

Holiday? Walk towards a nuclear Free Future: UK, May 12 - August 6. On May 12, Footprints for peace will embark on an 86 day pilgrimage working with local communities to raise public awareness about the suffering and coercion that communities through out the world face by the nuclear industry. The walk will travel a route along the east coast of Ireland, beside the Irish Sea, one of the most nuclear contaminated seas in the world due to the operations at Sellafield nuclear facility, UK. We aim to connect with local communities who are affected daily, and hear from them about the devastating impact on both the people and environment.

From Belfast we will ferry to Glasgow and from here walk up to Faslane in solidarity with the local community opposed to Britain's Trident Submarine Base. The base is home to all 4 of Britain's operational intercontinental nuclear submarines,

consisting of nearly 200 warheads:

From Faslane we will continue to walk down to the Sellafield Nuclear Site in England. This site is the worlds largest nuclear facility which is responsible for reprocessing the majority of the worlds spent nuclear fuel.

From Sellafield the walk will participate in the annual July 4th gathering at Menwith Hill U.S Spy Base, before continuing onto Aldermaston Nuclear Research Facility. The Blair Government has recently increased funding for Aldermaston to build the Orion Laser System and expand the already existing nuclear weapons facility.

From Aldermaston the walk will go to London where it will arrive on August 6. Footprints for Peace is a grassroots, non-profit peace group and "we invite everyone to join us in Closing the Nuclear Industry Step by Step. Please walk with us for as long as you can - a single step or for the entire walk." Web: <http://www.footprintsforpeace.net/>

Contact: : ka@footprintsforpeace.net

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.The NUCLEAR MONITOR

The Nuclear Information & Resource Service was founded in 1978 and is based in Takoma Park, Maryland. The World Information Service on Energy was set up the same year and is housed 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.

The 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, a Ukrainian version is published by WISE Ukraine and a Japanese edition is published by WISE Japan (latter two available at www.nirs.org). Back issues are available through the WISE Amsterdam homepage: www.antenna.nl/wise and at www.nirs.org.

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