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THE GHOST OF SOVIET NUCLEAR RETURNING

European Nuclear Energy Forum in Bratislava

On November 26 and 27, the European Nuclear Energy Forum (ENEF) will have its constituting meeting in the Slovak capital Bratislava. Where the gas sector has its European discussion forum in Madrid, coal in Berlin, and the renewable and efficiency sector it's Amsterdam forum, the nuclear industry was also looking for a platform to push its interests in the EU. The Slovak and Czech governments decided to host this forum, which means that it's meetings will be alternating between Prague and Bratislava. ENEF will also be the sound-board for the recently established High Level Group (HLG) on Nuclear Safety and Waste.

(662.5840) WISE Brno - This development mirrors the feverish push for more nuclear power, especially in traditionally nuclear-friendly Central and Eastern Europe - and it reflects the likewise feverish planning of new nuclear projects in the region, though after the near-completion of the Romanian Cernavoda 2 reactor no actual construction is happening anywhere currently.

EC opinion on Belene upcoming
Contrary to articles in the Bulgarian press on November 6, the European Commission did not issue an opinion yet on the construction of a nuclear power station in Belene. The Commission is to have talks with opponents of the project, including the Bulgarian BeleNE! coaltion, urgewald and Greenpeace, later this month on 23 November. There are rumors, however, that the Commission would issue its opinion earlier than that date. Greenpeace, urgewald and the BeleNE! coaltion therefore call for pressure on the Commission to assure that their opinions will be heard and taken up in any final Commission view.

In Bulgaria, the Belene NPP project currently still lies at the European Commission under Euratom article 41 to 44, waiting for an opinion. Environmental NGOs and several members of the European Parliament protested in the last weeks of October that the European Commission had broken its policy of transparency by not talking with critical NGOs. Urgewald from Germany, Greenpeace, WISE, Bankwatch and the Bulgarian BeleNE! Coalition argue towards the Commission that it should include the Environmental Impact Assessment in its assessment and not accept its low quality. They also point to the available information on seismic activity. They say that the European Commission's opinion on nuclear safety cannot be built on technical data of a design only. Until now, the European Union took its time to assess the new Russian design that is proposed for Belene, an AES-92 nuclear power plant

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with two VVER 1000/B466 reactors. EU Energy Commissioner Andris Piebalgs remarked on the question why this took the Commission so long, that "If we give a positive opinion, this automatically makes us also responsible for the safety of the power station. If someday something happens, I don't want people to say that we didn´t check carefully enough." Excluding the EIA and seismic arguments in the eyes of the NGOs does exactly that: lack of carefulness. A positive opinion by the Commission would open the way for a request for a Euratom loan, which in turn would give the possibility for an application for a loan from the European Investment Bank EIB. The Bulgarian government already reserved money for a government loan guarantee of 600 Million Euro (US$ 870 million) in its 2008 budget for this event.
In the mean time, BNP Paribas organised a 250 Million Euro general corporate loan for Belene project leader NEK. Although this loan originally was backed up by 16 banks, 8 of them withdrew their interest over summer. BNP Paribas and NEK keep the names of the remaining banks carefully secret out of fear for image- and rating-repercussions. Nevertheless, BNP Paribas argues that this money is not used for Belene construction and that it is in no way involved in possible further financing. Intelligence at urgewald and Greenpeace, however, shows that BNP Paribas has been shopping around for a larger loan. NEK also let know a few months ago that BNP Paribas requested permission to be able to advise more than one possible strategic investor in the ongoing tender for 49% of the Belene Power Company. In spite of its public denials, BNP Paribas in reality seems to push itself as *the* nuclear bank of Europe.

The Italian utility ENEL and its Slovak daughter Slovenske elektrarne (SE) filed last July the documentation for construction of the Mochovce reactors 3 and 4 to the European Commission under Euratom article 41 to 44. It became clear that the proposed project will not have a secondary containment, and ENEL already announced that it will not have to do a legal Environmental Impact Assessment because the Slovak government considers the building permit from 1986 still valid. This means that Europe will be confronted with the construction of two 1970s designed second generation reactors without any serious physical protection against attacks from outside. Greenpeace, Slovak and Italian NGOs as well as the Greens in the European parliament started a campaign to force ENEL to give up this Return of the Ghost of Soviet Nuclear programme. Demonstrations already started in neighbouring Austria, and protests are planned as well in Italy and Slovakia. Italy itself banned nuclear power after a referendum in 1987.
ENEL daughter Slovenske elektrarne late October announced it finalised negotiations for an 800 Million Euro loan from a group of banks including ING (NL), Calyon (F), Mizuho (JAP), Intesa (I), KBC (B) / CSOB (CZ), ERSTE (A) / Slovenske sporitelna (SK), Societe Generale (F) / Komercni Banka (SK and CZ) and Dexia (B / F). The loan is a general corporate loan for SE / ENEL's investment programme in Slovakia, but as almost 70% of that programme goes into Mochovce, the banks will not be able to deny that their loan brings outdated Soviet technology back on the table. Bankwatch, Banktrack, Friends of the Earth and Greenpeace are preparing campaigns to convince these banks to withdraw from the deal. Greenpeace prepares with several Slovak and Italian groups a court case against the Slovak nuclear authority for failing to request an Environmental Impact Assessment from SE / ENEL.
It is furthermore preparing a complaint at the European Commission against illegal State Aid for the project, because Slovakia gave SE a dividend holiday as well as passed a law that allows SE to pay a too low amount of money into the nuclear decommissioning and waste fund.

In Romania, the Cernavoda 2 reactor was brought on-line on 100% shortly after summer. At the same time the Environmental Impact Assessment for the blocks 3 and 4 is running. As part of that procedure, Greenpeace commissioned Dr. Ian Fairlie for a report on tritium emissions from the Cernavoda NPP, which was presented on October 31 in Bucharest and 1 November to the population of Cernavoda. Fairlie advises that the tritium emissions of Cernavoda are, based on the data from the power plant itself, so high - and growing - that pregnant women and small children up to four years of age should not live in the town of Cernavoda. Inhabitants are also advised not to use home grown products' (also including wild products that can be gathered like mushrooms and berries and products made from that). Greenpeace sent in the first November week a letter to Romania's Environmental Minister Attila Korodi to ask him to install a Committee to investigate tritium emissions of the Cernavoda NPP and wait with finalising the EIA procedure until the findings of such a Committee are known. It also called on the Romanian government to take more alternatives for nuclear power into consideration, including an alternative based on its efficiency and renewable focused Energy [R]evolution Scenario, that was presented early this year.
Romania already issued the documentation for a tender for participation in the construction of the two Canadian designed CANDU 6 reactors in Cernavoda, which resulted in interest from over 35 companies including ENEL, E.On, RWE, CEZ, but also Societe Generale, BNP Paribas, and the Canadian nuclear constructor AECL and Italian Ansaldo.

Around the plans for two new reactors in Ignalina, Lithuania, the negotiations between the three Baltic States on one side and Poland on the other are continuing. Poland wants to have a claim on at least 1000 MW of the final capacity, though mentions that 1200 MW would be even better, before it wants to embark on the project and the connected electricity link between Lithuania and Poland. Lithuania in the mean time is finishing the scoping for the Environmental Impact Assessment with public hearings in Lithuania, Latvia and Estonia. Especially in neighbouring Latvia, the project meets a lot more opposition than initially thought and the differences of opinion run right through the government.
Because of the bad performance of Areva NP at the Finnish EPR reactor in Olkiluoto, eyes in Lithuania are now also turning to other designs, including US and Japanese offers, but also the Russian AES-2006 twin-reactor.

The question of financing of this project may seem still a little preliminary, but Lithuania already had talks with Swedbank and probably with other Scandinavia banks.

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NEW CHALLENGES, OLD TRICKS; GENERATION IV REACTOR CONCEPTS

As preparation for both participants and speakers at the conference "*Science or Fiction - Is there a Future for Nuclear?*" a booklet was prepared. This international conference on fusion energy and new nuclear reactor models was organized by Global 2000/Friends of the Earth Austria and took place 8 November 2007 in Vienna, Austria. The nuclear industry is trying to secure its own future by reintroducing old concepts like nuclear fusion and updating old fission reactors in so-called Generation IV systems.

(662.5841) Austrian Institute of Ecology - We are currently witnessing the discussion whether and under which conditions to allow the large commercial reactors from the 1970's, 1980's and 1990's (Generation II) to operate longer than the customary life time span of 30 years. At the same time, new reactors (Generation III) are being introduced - evolutionary designs developed from Generation II, without drastic changes. Generation III nuclear power plants are already in operation in Japan, and in construction in the European Union. According to many scientists, the utilization of these reactors is limited in time because in their opinion uranium reserves will dry up within the next three decades.
Due to these dismal prospects, the Generation IV International Forum (GIF) was founded in 2000. Until recently, it was composed of 10 countries (Argentina, Brazil, Canada, France, Japan, South Africa, South Korea, Switzerland, the United Kingdom, and the United States) as well as the European Union via Euratom. At the end of 2006, China and Russia also joined the initiative. Membership in this international forum commits participating countries to support long-term research efforts. This includes - via Euratom - also countries which actually are opposed to nuclear power.
In 2001, the IAEA initiated the similar "International Projects on Innovative Nuclear Reactors and Fuel Cycles" (INPRO). It is funded through the IAEA budget. GIF and INPRO have agreed to formalize cooperation at the technical level. As of February 2007, 28 countries or entities are members of INPRO.
The message of GIF and INPRO to media, politicians and the population is as follows: Generation IV means a safe, economically competitive, and a proliferation-resistant power source without the problem of increasing greenhouse gas emissions. Generation IV is even presented as sustainable, a label which is usually - and with good reason - reserved for renewable energy sources and conservation. The fact that none of the six reactor concepts selected for development fulfils all Generation IV aims is usually not mentioned.

Generation IV and what the nuclear industry would rather not tell us
By all appearances, the main goal is to save the "sinking ship" by trying to win back trust into nuclear power with the population. Obviously, the facelift uses climate change as one of the most important arguments to demonstrate the need for nuclear power. The nuclear industry wants to give the new generation of reactors the image of being sustainable, economically viable, safe, reliable and terror resistant. Many respected institutions (e.g. the Massachusetts Institute of Technology MIT) consider GIF 's goals as unrealistic. The following chapter examines how realistic these ambitious GIF Technology Roadmap 2002 goals are.

Eight claims and eight nuclear daydreams
Sustainability is a concept that not only takes into account a comprehensive human-ecological context, but also a broader time horizon. According to the Brundtland Commission 1987, "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Sustainability could be defined as making use of the natural system in such a way that its primary features are maintained in the long-term and can be handed over to future generations as unchanged as possible.

"Generation IV" and Sustainability
Generation IV nuclear energy systems will provide sustainable energy generation that meets clean air objectives and promotes long-term availability of systems and effective fuel utilization is the first goal GIF is pursuing. But the Uranium extraction itself generates 80% of today 's radioactive waste (by mass; not by radioactivity). To produce one ton of nuclear fuel, which is used in light-water reactors, several thousands or tens of thousands of tons - depending on the uranium content - of uranium ore must be extracted. The amount of radioactive tailings left behind in the uranium mine area is of corresponding volume. For example, the affected regions of New Mexico (USA) and Wismut (former GDR) must cope with more than 100 million tons of radioactive waste from uranium extraction on the surface. Even if all other problems were solved, energy generation with nuclear energy systems could only be advantageous in the short term, and not in the longer term, because of the waste issue.
Radioactive waste, which is created by the "peaceful "use of nuclear power, represents an extraordinarily high long-term threat potential. It cannot be neglected for millions of years, which is unique in the industrialized society.

Many geologists warn against the waste management option highly regarded mainly in Europe: the deep underground repository, which will be made inaccessible with barriers of concrete. The main problem is that it is simply impossible to conduct a safety case for the necessary long time periods of millions of years. At this point, science reaches its limit to make predictions. The disposal site would have to be protected continuously against a variety of threats including water ingress, overheating, sabotage, and theft of the waste for abuse, which is clearly impossible. Not only earthquakes, distortions and volcanism, but also future ice ages might pose a threat because glaciers can dig up and remove enormous amounts of rock. Gradually, however, a shift away from nuclear power is taking place. The Generation IV initiative attempts to reverse this shift by making nuclear energy attractive and presenting it as sustainable and CO2-free,labels usually - and with justification - reserved for renewables. This strategy will help the nuclear industry and nuclear research institutions to survive.

"Generation IV" and Nuclear Waste

The second goal, *Generation IV nuclear energy systems will minimize and manage their nuclear waste and notably reduce the long-term stewardship burden, thereby improving protection for the public health and the environment*, is a high strung promise and would of course require a large amount of research funds. The announced reduction of nuclear waste has to be properly examined. According to GIF, the "closed fuel cycle" is celebrated as a major advantage of Generation IV concepts. A system with a "closed fuel cycle" is regarded as more effective and sustainable. A 2003 study by the U.S. Massachusetts Institute of Technology found that the fuel cost with a "closed fuel cycle" - including waste storage and disposal charges - to be about 4.5 times the cost of a once-through fuel concept. Therefore it is obviously not realistic to expect that there ever will be new reactor and fuel cycle technologies that simultaneously overcome the problems of cost, safe waste disposal and proliferation. The long-term waste management benefits of advanced "closed fuel cycles",involving reprocessing of spent fuel, are indeed not outweighed by the short term risks and costs, including proliferation risks.

To put reprocessing in a positive light, the nuclear industry has started to call it recycling. Reprocessing is not new, it has been practised for quite a long time. The wording might give the impression of a closed cycle which - in the name sustainability - does not use up resources or generate nuclear waste. However, this is a misperception. The fuel chain (a more appropriate wording than "fuel cycle")always requires fresh uranium, which is not renewable and can be produced merely at the high price of enormous environmental damage. And that is not the only inconvenient truth: during operation of the reactor, atomic nuclei with a high mass number (e.g.235U) are continuously split in the nuclear fuel into nuclei with low mass numbers with a high neutron surplus.

GENERATION IV REACTOR CONCEPTS

The Generation IV R&D programs promote the following reactor systems

I. Gas-Cooled Fast Reactor (GFR)
The GFR system is a helium-cooled reactor with fast-neutron spectrum and a "closed fuel cycle",which is primarily envisioned for electricity production and actinoide (=actinide) management. Using the breeder concept shall improve the use of the nuclear fuel by two orders of magnitude compared to current thermal reactors.

II. Lead-Cooled Fast Reactor (LFR)
The LFR systems are reactors cooled by liquid metal (lead or lead/bismuth)with a fast-neutron spectrum and a "closed fuel cycle" and a wide range of unit sizes from small "batteries" up to large single plants. The LFR battery option is a small factory-built turnkey plant with a very long core life (10 to 30 years).With fast neutrons and the "closed fuel cycle",an efficient conversion of fertile uranium and the use of actinoides shall be achieved.

III. Molten Salt Reactor (MSR)
The MSR system, primarily envisioned for electricity production and waste burn-down, is based on a thermal neutron spectrum and a "closed fuel cycle",where the uranium fuel is dissolved in the sodium fluoride salt coolant that circulates through graphite core channels. Fuel loading, reprocessing and separation of fission products during operation shall enable a high availability. The reactor also will serve to eliminate actinoides by simply adding them to the molten salt.

IV. Sodium-Cooled Fast Reactor (SFR)
The SFR system consists of a fast-neutron reactor and a "closed fuel cycle".This reactor type should mainly serve to eliminate highly radioactive waste, plutonium and other actinoides.

V. Supercritical-Water-Cooled Reactor (SCWR)
The SCWRs are high-temperature, high-pressure water-cooled reactors that operate at pressures and temperatures at which there is no difference between liquid and vapor phases (permitting to save expenses for components like heat exchangers).This reactor type was designed mainly to generate cheap electricity.

VI. Very-High-Temperature Reactor (VHTR)
The VHTR system uses a thermal neutron spectrum and a once-through uranium fuel concept. The main purpose of this gas-cooled reactor type is the generation of power, hydrogen and process heat.

In 2002, the *Technology Roadmap for Generation IV Nuclear Energy Systems* was published. All member states used it as basis to prepare and conduct their R&D programs. While research into the individual systems is being performed independently of each other, other problem areas are to be solved together for all six systems (e.g."closed fuel cycle", development of fissile material and material features, hydrogen production, safety and reliability, economic efficiency, physical protection and proliferation barriers).

The conversion of fissile material into fission products releases energy. The fission products are often instable and therefore radioactive. The gaseous fission products, like the radioactive isotopes of the noble gases argon, krypton and xenon (mainly the radiologically important isotopes 133Xe and 85Kr), and the volatile radioactive iodine isotope (131I) can partially escape - depending on the tightness of the fuel rod claddings - into the atmosphere and can be traced in the surrounding of nuclear installations. Solid fission products (e.g. radioactive isotopes of strontium and caesium) have to be stored as radioactive waste. However, even here a small share escapes in the form of radioactive aerosols (134Cs, 137Cs, 90Sr).

Not all fissile material in a fuel rod can be split during irradiation. To make use of the still usable share of the original fissile material - instead of storing it unused in the final repository - it has to be separated by reprocessing. At first, this complex and hazardous process appears to reduce the radioactivity of the waste. However, by making use of this additional fissile material from reprocessing in fission reactors, still more fission products are generated that have to be stored as waste in final repositories. Moreover, the end of the nuclear age is going to be deferred, since more nuclear facilities have to be built and finally have to be decommissioned (leading to the production of "decommissioning waste"). The "recycling" of spent fuel rods results in a dangerous concentration of radioactive fission products. This results in a larger volume of total waste, partly with a higher activity concentration, in the long-term.
In addition to the already discussed fission products, actinoides are also produced during reactor operation, among them plutonium, which can be used for nuclear weapons and nuclear fuel. The actinoides can be degraded by neutron bombardment, a fact that the systems of Generation IV are destined to make use of for the reduction of the amount of waste already inside the reactor.

Today around 10 000 tons of spent nuclear fuel is generated per year. Each ton not only contains fission products that have to be stored in some final repository, but also several kilograms of plutonium and other actinoides (=actinides). In a reprocessing plant these materials are separated. The plutonium is either mixed with non-enriched uranium to produce mixed oxide fuel (MOX fuel) and used again to fuel reactors (whereby the plutonium share is around 5%) or for building nuclear weapons. The separated uranium is enriched in the isotope 235 U in enrichment plants to reach enrichment up to 3-5%. This uranium can then also be re-used in nuclear reactors as LEU (low enriched uranium) reactor fuel, while enrichment to 20% and more provides HEU (highly enriched uranium) applicable for building nuclear weapons (for an advanced fission explosive device, uranium is usually enriched to 90% or more). The depleted uranium, unusable for reactors, is mainly used for the construction of airplanes and penetrating ammunition. The unusable radioactive fission products are "for the time being " put in interim storage since the question of final disposal has not yet been solved. What would be needed is practically the complete separation of all long-lived nuclides, so that the remaining waste needs to be stored safely for only a shorter time. A separation efficiency of 99% as achieved so far is not really sufficient, when taking into account the amount of waste that is actually generated!
Reprocessing also leads to high emissions in gaseous and liquid form, which still contain radioactive substances in spite of off-gas and waste water treatment procedures.
It would be necessary to develop some "super-reprocessing" technology (separation efficiency of 99,99%), which would, contrary to current methods, not damage the environment and not pose a catastrophic danger. As a measure to improve their image, the nuclear industry is now announcing the complete degradation of long-term toxic actinoides during reactor operation. For this purpose, fast neutrons are used in the reactor core. The Sodium-Cooled Fast Reactor should be able to reach the required 99,99% conditioning and reprocessing of the actinoides with the help of an adjusted reactor geometry and a "closed fuel cycle" approach. What is omitted here: the "unrecyclable" fission products are still left over. Generation IV reactors are far away from the goal to successfully minimize and manage their nuclear waste. This is where the story ends: the operation of nuclear installations is probably never possible without the creation of radioactive waste. It is our opinion that nuclear technology can not contribute to environmental protection.

"Generation IV" and Competitiveness
The third goal is that *Generation IV nuclear energy systems will have clear life-cycle cost advantage over other energy sources*. Nuclear energy can hardly be economically competitive in the long-term, since renewable energy resources will never dry up, as long as the sun shines. Fossil resources, however, are limited. The reserves of the currently most important primary energy sources (oil, gas and natural uranium) are scarce. A switch to sustainable (thus renewable!) energy sources is inevitable and has to take place sooner or later. It seems that any delay can only mean a benefit for those with a direct economic interest in nuclear energy, or for those interested in nuclear proliferation.
The Greenpeace report of 2005 says that the estimated costs for the development of the six Generation IV concepts are about US$6 billion. It is more than likely that overruns will occur both for costs and for the time required. According to one of the strongest supporters of the GIF program, the French government, Generation IV "will at best be ready for commercial deployment around 2045", and not 2030 as officially envisaged by GIF. This is to be seen against the background that nuclear energy is currently not cost competitive in a deregulated market; not with coal and natural gas, and also not with wind energy. There seems to be efforts made in France currently to speed up the development on Generation IV, with the first prototype in operation by 2020. It remains to be seen whether those plans will be implemented.

"Generation IV" and Financial Risks
The fourth goal says that *Generation IV nuclear energy systems will have a level of financial risk comparable to other*

energy projects. It seems that the nuclear industry or rather large energy utilities are currently trying to win over banks and investors to invest into nuclear energy projects. They are trying to give the impression that nuclear power plants are heading towards a comeback as a viable energy form, and therefore construction of several nuclear power plants should be in the pipeline. However, it is quite risky to conclude that an increased demand for electricity would lead to higher construction activity within the nuclear industry, especially since the technical feasibility of future systems has yet to be solved. The demand for electricity alone is not yet enough to build a new nuclear power plant; the acceptance of the population, the chosen site, safety etc. are key. Actually there is a growing need for electricity. However, there are only a few realistic plans for new nuclear power plants.

"Generation IV" and Safety

The fifth goal, *Generation IV...will excel in safety and reliability*, is probably where nuclear technology has mostly failed up until now. The negative image of the nuclear industry as unsafe and unreliable is to become a thing of the past. However, it is an error to think that any risk can be limited by one or the other measure. A certain risk will always prevail: earthquake, terror, sabotage, human or technical failure, usage of equipment exceeding the original life time design, adverse coincidence, unexpected physical and chemical phenomena, and war. In the near future, some important energy sources will be depleted: in July 2007 the IEA (International Energy Agency) warned that a new oil crisis will occur in the next five years and that Peak Oil will be reached within this decade. A response to scarcer fossil resources and a forecasted worldwide demand increase has to be found. However, nuclear power is not an adequate answer. Many more nuclear plants would have to be constructed than is currently possible. Also, the more plants, the higher is the accident risk. And finally, uranium resources would not last long enough to support reliable and long-term operations. It will in the foreseeable future - again due to shortage - be necessary to switch to currently available renewable technologies. Even though investments can increase the safety of nuclear installations, this is definitely not an argument to continue pursuing this technology. In our opinion, an immediate phase -out and a switch to alternative energy forms would be safer and more reliable.

Similar arguments are applicable for goals six and seven, *a very low likelihood and degree of reactor core damage and the elimination of need for offsite emergency response*. Due to the extreme operational conditions (higher temperatures, higher pressure, higher burn-up) Generation IV systems could even turn out to be more dangerous than currently operated installations, and therefore their design must be more sophisticated. These problems can be avoided altogether by switching to sustainable technologies, which do not pose these risks in the first place.

"Generation IV" and Proliferation

Focus has been put on research into goal eight, to *increase the assurance that they are a very unattractive and the least desirable route for diversion or theft of weapons-usable materials, and provide increased physical protection against acts of terrorism*. "Regarding proliferation, it is generally recognized that it is a practical impossibility to render civilian nuclear energy systems proliferation-proof. Thus, it cannot be expected that Generation IV will achieve a great leap forward in this respect."

To build a nuclear weapon, highly enriched uranium (HEU, consisting mostly of 235U or 233U) is needed, or the neptunium isotope 237Np or "weapon-grade" plutonium. In reactors operated with uranium fuel, several plutonium by-products are generated through neutron bombardment of the uranium isotope 238U. The plutonium isotope 239Pu is very well suited for building nuclear weapons because of its low critical mass. Only some 5 kg is considered sufficient in a well configured bomb geometry to initiate a nuclear explosion (with advanced technology, the amount could be smaller still). Whether plutonium is "weapon-grade" or only "reactor-grade" depends mainly on the content of the plutonium isotope 240Pu, which is also generated during the fission process. This isotope emits neutrons because of spontaneous fission and hence can lead to premature detonation of a nuclear device, with lower yield. Weapon-grade plutonium therefore has to have much lower share of 240Pu than reactor -grade plutonium. To prevent the development of weapon-grade plutonium, plutonium has to be kept inside the reactor as long as possible. The plutonium then has to be separated from the fission products in a reprocessing plant. The separation methods were originally developed for military reasons and can be used for the separation of weapon-grade as well as of reactor-grade plutonium. The complete control over the usage of all reprocessing plants concerning the production of weapon-grade plutonium is almost impossible. To win fissile material for reactor fuel purposes therefore poses a substantial proliferation risk. In order to exclude the abuse for military purposes, plutonium should not be produced in the first place.

"Generation IV" and Thorium

In the search for alternative fissile material, Generation IV research programs are also examining the potential of using thorium instead of uranium as fuel. The first experiences with thorium were made with High-Temperature Reactor types (HTR). This technology is now to serve as a basis for the Very-High-Temperature Reactor types (VHTR) of Generation IV. India, a country hosting only poor uranium deposits but large thorium sand deposits, and Possibly other countries, are considering establishing a thorium-based fuel chain. The argumentation used by the nuclear industry that using thorium reactors would reduce the production of plutonium and the stock piles of existing weapon grade plutonium has to be taken with a grain of salt: We believe that a thorium economy is not less dangerous than a plutonium economy. Neutron bombardment of the thorium isotope 232Th leads over detours to the development of the dangerous uranium isotope 233U. The 233U has similar features like 239Pu - low critical mass - and is usable both for nuclear reactors and nuclear weapons. Another by-product is 232U, whose short lived daughter products (e.g.208TI) are hard gamma emitters and make problems in

the handling, reprocessing and recycling of bred 233U. However, it is this feature that is now used as argument to make the thorium fuel chain more immune to proliferation risks. What a strange argumentation! The generation of a highly radioactive by-product is being sold as an advantage, which should justify using thorium instead of uranium.
The discussion about proliferation barriers puts a second problem on the backburner: the radiotoxicity of plutonium and uranium is not to be underestimated, be it weapon-grade or reactor-grade. The inhalation of a 40 billionth (!)gram 239Pu is enough to reach the limit for the annual dose of workers. A few kilograms of 239Pu (about the size of a tennis ball) is enough to kill - theoretically - all of human kind should everybody inhale a fraction. Due to its half-life of 24,000 years it has a high long-term toxicity. 233U also is highly toxic and has a half life of 159,000 years.
Another difficulty with using thorium is the delayed decay of the intermediate product 233Pa. After a longer shutdown of a thorium-fuelled plant, an unwanted excess of fissile 233U (and therefore an unwanted increase of the reactivity of the fuel)is produced due to the delayed activity of protactinium. In general, we consider the thorium fuel chain to be dangerous and difficult to control, it only causes new problems.

"Generation IV" and Fast Breeder
There are many strong indications that the eight goals of GIF cannot be reached. However, the question is why Generation IV systems have been researched for so many years. Only little is really new about Generation IV reactor systems. Half of the six "new" reactor concepts are based on the old concept of the Fast Breeder. However, hardly a dozen of them were ever built as commercial reactors. All but one, Belojarsk/Russia, were shut down by the operators, some after a very short time of operation, usually due to problems with reactor control, accidents and civil protests. The Fast Breeder concept as such is extremely dangerous. "Breeding" stands for the generation of a fissile material (e.g.239Pu) while using up other fissile material at the same time (e.g.238U).The term "fast" refers to the usage of fast neutrons, which are used to split the fissile uranium isotopes 238U, which cannot be split with the slowed-down (so called thermal) neutrons. The "bred" fissile material, 239Pu or 233U, can after extraction be reused as fresh reactor fuel. This reactor has to work without a moderator (which slows down neutrons). Fast neutrons initiate a fission reaction with a much lower probability compared to thermal neutrons. For this reason ,it is necessary to increase the concentration of fissile material in comparison to moderated reactor types. This high concentration of fissile material results in high thermal density. In this type of reactor, an adequate cooling medium has to be found, one that does not serve as a moderator, and therefore water is excluded. Breeder reactor cooled with liquid sodium have had continuous problems. Most of the reactors had to be shut down: sodium-caused corrosions and leakages, the creation of sodium hydroxide, the release of hydrogen and violent exothermal reactions due to the contact of sodium with air or water. These are only a few of the problems that have caused accidents in the past. The Japanese Fast Breeder in Monju was closed down after a severe accident (sodium fire) in 1995; a restart failed mainly due to resistance of the population. The French Fast Breeder Superphénix was closed down as the last Breeder in Europe used for electricity generation after numerous events such as sodium leaks, destroyed heat exchangers and dangerous power fluctuations. The French Breeder Phénix is still operating as a research reactor, mainly for irradiation purposes, and will be shut down in 2009.
Research institutions and R&D departments of nuclear companies hope to receive research funding for concepts they had developed, but which have not been applied successfully in the last 30 years. There is reason to believe that there are efforts to revive the old concepts of breeder reactors. Recent events and insecurities in energy supply are used to back up the research need: the 1990 oil crisis (Gulf war), the 2005 rapid oil price increase (Hurricane Katrina), the 2006 gas crisis (conflict between Ukraine and Russia), the 2006 adjustment of coal reserve (Germany revised the data downwards), the 2007 current peak-oil-warning within this decade by the IEA and the threat of climate change.
However, Generation IV Breeder systems are a new edition of the Fast Breeder concept. A switch to Fast Breeders is likely to be a continuation of the plutonium economy and thorium economy on a scale yet unseen. Vast quantities of highly toxic materials like plutonium and uranium isotopes would be transported around the world like oil or coal. This has to be prevented at all costs.

Generation Conflict?

Not all nuclear proponents are happy about Generation IV. Some supporters of Generation III do not want to abandon the "mature" LWR technology. Esp. Japan & South Korea emphasize the importance of Generation III reactors. USA prefers to go directly to Generation IV, which is seen to be closely linked to the US GNEP-project (the Global Nuclear Energy Partnership for "the safe expansion of clean, affordable nuclear power")

(H. Hirsch, Nov. 2007)

Conclusions
Generation IV reactor systems consist of reactors for energy production plus reprocessing facilities. Part of the systems are also plutonium breeders, which are designed to produce electricity and at the same time "breed" new plutonium. The reprocessing facilities separate fissile material from spent fuel to manufacture MOX fuel. This "recycling" of course generates new nuclear waste.
Vast quantities of highly toxic materials like plutonium and uranium isotopes would be transported around the world like oil or coal, and pose a considerable accident risk as well as become a target for sabotage and terror.
Moreover, Generation IV reactor systems will probably enhance the possibilities to stash away fissile material, since the amount needed for a nuclear explosion is small: between 10

kg - 50 kg Uranium (235U) or 5 kg Plutonium (239Pu), depending on the construction. The efforts of the nuclear industry to construct more and more nuclear facilities and provide fissile material for civil purposes will probably outweigh the non-proliferation efforts of the IAEA.

New reactors are expected to have simpler and cheaper designs. However, due to the extreme conditions under which those reactors are operating (extremely high temperatures, pressures etc.), Generation IV reactors need even more sophisticated safety systems.
It is widely assumed that Generation IV systems will not be commercially available before 2030 and there is no indication that these reactors will make nuclear power leave the league of the most expensive sources for electricity generation.

Source and contact: The Report "*Science or Fiction - Is there a future for nuclear?*" can be found at http://www.ecology.at/ecology/booklet.htm
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REBUILDING THE AREVA GROUP - END OF GERMAN REACTOR CONSTRUCTOR?

The Areva NP (Areva Nuclear Power) enterprise is a result of the process of concentration in the nuclear reactor construction sector. The decline of the nuclear power industry abandoned the hope for a lucrative nuclear business. Since the beginning of the '80s there was no order worth to mention for the construction of a new nuclear reactor. The former luxuriant state subsidies which made the building of new reactors to an economic success failed. The disaster of Chernobyl added to the failure.

(662.5842) AG Schacht KONRAD - The merging of nuclear construction capacities and the know-how of the two leading West European nuclear constructors Siemens and Framatome in 2001 was meant to help to survive economically and to push for a new generation of nuclear reactors. In 2001 Siemens houses its nuclear section, Siemens Nuclear Power (SNP) in the subsidiary of Areva, Framatome. Since the first of March 2006 this subsidiary trades under the name of Areva NP.
The Areva group is the international market leader with a 25% share of the world nuclear market. Areva is a player in the whole nuclear fuel cycle (from mining to reprocessing) and has 61.000 employees in 100 countries. In the first half year of 2007 Areva had a turnover of Euro 5.4 billion (US$ 7.8 billion) and made a profit of Euro 295 million (US$ 427 million). The French state ownes about 85% of the parent company Areva. Siemens holds a stake of 34% in the subsidiary Areva NP. At the time the Siemens nuclear section became part of the Areva company, it was agreed that the French state has the right to takeover the German shares in 2009 at the soonest and in 2011 at the latest. The legal effectiveness of the Areva/Siemens deal would thus be on January 1, 2012.
In June/July 2007 the rumours boiled up about the French president Mr. Sarkozy planing to create one large French energy group, which will unite the construction of nuclear and fossile power plants under one (French) roof. For that the shares of Siemens in Areva NP should be bought and Areva should be merge with French construction company Bouygues and the turbine constructor Alstom. This rumour is fed by the fact that Martin Bouygues, who expressed his interest in a share in Areva, is a very good friend of President Sarkozy.

Other rumours spoke about an international solution with a potential share of Mitsubishi Heavy Industries and Siemens in the parent company Areva but with a very strong influence of the French state. On October 30, 2007, the European Commission granted permission for a joint-venture between Areva and Mitsubishi Heavy Industries. The joint-venture shall develop and market nuclear reactors. The joint-venture (called ATEMA) will have its headquarter in Paris. The 1100MW pressurised water reactor ATEMA 1 shall be ready for licensing in three years.

The governmental ambitions to restructure the nuclear sector is no invention of the present president Mr. Sarkozy. Already in October 2005, Dominique de Villepin stopped the planned and already prepaired stock market flotation of the Areva group.

The success of the French industrial policy to create 'national champions' can be seen in the case of Suez. To prevent the takeover of Suez through the Italian supplier Enel, a merger of Suez with Gas de France was set up by the French government. With this deal a national energy giant was created which is now the fourth biggest energy group in the world.

In September 2007, the German chancellor Merkel and president Sarkozy pronounced that they want to continue the German-French nuclear co-operation. But this was not more then a momentary declaration for the press, concrete decisions have not been taken. And Mr. Sarkozy made clear what he expects from the German side: Germany should make a clear decision in favour of a pro-nuclear-policy.
In the United States, Russia and

France, there is a new willingness by the state to support the nuclear sector, by issuing extensive subsidies and by forging a state-owned nuclear complex accompanied by foreign policy activities. So the preconditions for the construction of nuclear power reactors are created, meanwhile spreading nuclear technology in many developing and emerging countries.
In Germany the political situation is quite different. Although there is a debate about the extension of the operational life-time of the existing power plants, the construction of new nuclear power plants is not part of any serious discussion. The German nuclear power stations have fixed and guaranteed operational life-times, some more than a decade from now. But the end of the operational life-time for each station is enacted in a law. The operators claim to make Euro 1 million a day with a tax written-off nuclear power station. No wonder they want to have them connected to the grid as long as possible. But for new construction there are neither enough subsidies nor any social acceptance.

Siemens on its part is not willing to surrender its shares in Areva NP without a fight. The state-owned engagement in the United States, Russia and France, the energy requirement of the rapid emerging markets e.g. India and China, and the wish of many countries to gain an easy access to nuclear technology, can produce a growing demand for nuclear technology. Unlike in 2001, Siemens currently sees a shining future in the construction and operation of nuclear power plants; an industry in which the group wants to continue to participate. Would Siemens lose its shares in Areva NP the group would be more or less without any nuclear know-how and any nuclear capacities. And the nuclear community in Germany would suddenly lose one of its main protagonists.

Although this would be a positive development for German policy because nuclear ambitions would be weakened; on the other side nuclear technology and radioactivity is not a national but a very international problem. And a state-run reconstruction and reinforcement of a larger and more powerful European nuclear group can only be looked upon as an alarming development under civil as well as military aspects.

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IN BRIEF

Vattenfall lost 200,000 customers. Swedish utility Vattenfall AB has lost almost 200,000 retail customers in Germany. According to president and chief executive Lars G. Josefsson, as "a result of the crisis in confidence that Vattenfall experienced mainly in the wake of the events at the Krummel and Brunsbuttel nuclear power plants." The Swedish state-owned company said it had seen "significant reductions" of retail customers in Germany's two largest cities, Hamburg and Berlin. In a move to restore the confidence, Vattenfall launched an "improved product offer with competitive prices" and by trying to attract new customers through intensified marketing in areas outside of Hamburg and Berlin.
After the fire at the Kruemmel nuclear power plant on June 28, Vattenfall had been quick to reassure the public that the fire only affected a transformer in the plant but not the reactor itself. But later, the news has been revealed that the fire did in fact have an effect on the reactor. No one was injured in the fire which started when coolant in a large electric power transformer substation ignited due to a short circuit.
A second nuclear power plant operated by Vattenfall at nearby Brunsbuettel was shut down only a few hours before the Kruemmel fire also after a short-circuit. The problem at Brunsbuettel caused the fire at Kruemmel due to a change in voltage in the network after Brunsbuettel was shut down. Top managers at Vattenfall stepped down after the accident and the attempts to play down the consequences..
Kruemmel and Brunsbuettel (situated in the north of Germany) will remain offline at least until the end of this year, the Hamburger Abendblatt reported on October 10.
Schleswig Holstein Social Minister Gitta Trauernicht told the newspaper that both plants were still undergoing checks after the fire "After the incidents in June at both reactors, many notifiable events have taken place which we are still investigating," Trauernicht was quoted as saying. "We expect the final results at the start of 2008 at the earliest. It could take much longer." Trauernicht is responsible for security at the state's nuclear power plants.
AP, 31 October 2007 / Reuters, 10 October 2007 / Nuclear Monitor 658, 13 July 2007

Pipe bomb intercepted at Palo Verde. A seven-hour security alert was triggered at the Palo Verde nuclear power plant on 2 November by the discovery of what appeared to be a pipe bomb. Plant owner APS notified the Nuclear Regulatory Commission of an 'unusual event' and initiated a security lockdown. The suspicious capped pipe was discovered in the bed of a contract worker's pick-up truck during normal screening of vehicles entering the site. It was then confirmed to contain explosives by a team from local police, before being safely removed from site. Reports have described the device as crude but credible. An AFP report said that the contract worker had been arrested and interviewed by police but released. Authorities felt the man did not know the device was in his truck.
World Nuclear News, 3 November 2007

Delhi hopes to revive the India-US nuclear deal. Since the Indian government has been confronted with internal opposition against the nuclear agreement with the US an international diplomatic force has been mobilized to save the nuclear deal. Top US officials have visited India for meetings with officials and politicians. Foreign states, among others Germany and France, have voiced support. The Netherlands was prepared to consider amending the rules of the Nuclear Suppliers Group (NSG) following a request from the US. Principally, the problem is that the deal says that the US may cancel cooperation if India tests a nuclear weapon. This caused problems when communist groups that support the ruling coalition UPA said the provision allowed the US too much influence on foreign policy and demanded a vote. Without their support, prime minister Singh could not be confident of beating the opposition Bharatiya Janata Party (BJP). The diplomatic effort could soften the stance of the Left and make it possible for the parliament to approve the text of the '123 Agreement' necessary for the US to do nuclear trade with India. The Indian daily The Economic Times (Indian Times) of November 4 reports: "It has been reliably learnt that a compromise on the issue was reached between the UPA and the Left on November 3. The formal announcement of the agreement between the two is likely to be made in the meeting scheduled on November 16." If right this means a major step back for the Left from its earlier stance that no negotiations should take place with the IAEA. For a moment it seemed as if the nuclear deal was dead. However, there is still a chance that the agreement will be revived. At least only after securing IAEA safeguards, the consent of the NSG members and the approval by the US Congress. Time to act!
The Economic Times (India), 4 November / World Nuclear News, 1 November / The Financial Times (UK), 1 November 2007

US, EU does not want a nuclear free Middle East. Egypt has sent a high-level protest to dozens of European nations expressing "astonishment and regret" at their refusal to endorse Cairo's call for a Middle East nuclear free zone at the IAEA general conference. European nations at past general conferences of the IAEA have voted in favor of establishing a zone free of such nuclear arms. But at this session, 25 of the 27 EU nations abstained on the resolution addressing the issue and introduced by Egypt, as did other countries hoping to join the union. In all, 47 nations abstained. Israel and the United States voted against, as they have at past sessions, while 53 countries - Muslim states and their supporters from the developing world - backed the proposal.
Up to last year, the resolution on "Application of IAEA Safeguards in the Middle East" had been adopted by consensus, but in 2006, and again this year, Israeli objections forced a vote.
Last year 98 nations approved the resolution, with three abstaining and the United States and Israel opposed. Egypt learned "with astonishment and regret ... that this support was no longer forthcoming at the General Conference's latest session," said the letter.
International Herald Tribune, 17 October 2007

New accident at "Mayak" reprocessing facility. On Thursday, October 25, a radiation leak occurred at Russia's only nuclear reprocessing plant "Mayak". During transportation of liquid radioactive waste between two facilities - from the chemical-metallurgic plant to the radio-chemical plant, both parts of "Mayak" - radioactive substances leaked from the container. The local branch of Emergencies Ministry insisted in its statement no one was injured. At the same time, Rossiyskaya newspaper reported there was some radioactive contamination on the ground on site. Emergency workers were notified at 4:30 p.m. local time on Oct. 25, and worked through the night to clear up the contaminated ground. Local prosecutors launched investigation into the causes of the accident the next day and already a few days later (Oct. 29) the Ural regional prosecutor stated the reason for the accident was violation of safety procedures at the plant.
"Mayak" is located about 2000 km east of Moscow, between two large cities Yekaterinburg and Chelyabinsk, in the Ural mountain region. It includes various facilities such as a reprocessing plant for spent nuclear fuel, isotopes production line and plutonium reactors.
Earlier this year (in mid-summer) another radioactive leak occurred at the plant. A pipeline for solid radioactive waste ruptured and 5 people were exposed to large doses of radiation. Investigation over this accident, found the director of the 235-facility, part of "Mayak" - guilty for lack of safety at the plant. He then was fired. Contrary to the summer accident, which was covered up by the management and reported in the media only thanks to local environmental activists, the latest accident was reported immediately by the Mayak management.
Nadezhda Kutepova, an activist for local branch of Russian anti-nuclear group Ecodefense, says. "This time everything was reported quickly but no one can guarantee it will happen the same way next time. The fact is that "Mayak" remains old and dangerous and this is sure not the last accident".
Ecodefense, 4 & 5 November 2007

U.S. Army explored using radioactive poisons to assassinate 'important individuals'. During the Cold War, the US Army explored the potential for using radioactive poisons to assassinate "important individuals" such as military or civilian leaders. Approved at the highest levels of the Army in 1948, the effort was a well-hidden part of the military's pursuit of a "new concept of warfare" using radioactive materials from atomic bombmaking to contaminate parts of enemy land or to target military bases, factories or troop formations.
The decades-old records were released recently to the AP, heavily censored by the US-government to remove specifics about radiological warfare agents and other details. The documents give no indication whether a radiological weapon for targeting high-ranking individuals was ever used or even developed by the United States. They leave unclear how far the Army project

went. One memo from December 1948 outlined the project and another memo that month indicated it was under way. The main sections of several subsequent progress reports in 1949 were removed by censors before release to the AP. The broader effort on offensive uses of radiological warfare apparently died by about 1954, at least in part because of the Defense Department's conviction that nuclear weapons were a better bet.
The 4th ranked priority in a December 16, 1948 memo, was "munitions for attack on individuals" using radioactive agents for which there is "no means of therapy." The memo said a lethal attack against individuals using radiological material should be done in a way that makes it impossible to trace the U.S. government's involvement, a concept known as "plausible deniability" that is central to U.S. covert actions.
Assassination of foreign figures by agents of the U.S. government was not explicitly outlawed until President Gerald R. Ford signed an executive order in 1976 in response to revelations that the CIA had plotted in the 1960s to kill Cuban President Fidel Castro, including by poisoning.
Global Research, October 10, 2007

UK: Leaked documents detail strategy for climate change U-turn. Ministers are planning a U-turn on Britain's pledges to combat climate change that "effectively abolishes" its targets to rapidly expand the use of renewable energy sources. Leaked documents show that prime-minister Gordon Brown will be advised that the target Tony Blair signed up to for 20% of all European energy to come from renewable sources by 2020 is expensive and faces "severe practical difficulties".
The leaked documents reveal different priorities across government departments about how to get renewables to 20% of the electricity mix. Although Germany has increased its renewable energy share to 9% in six years, Britain's share is only 2%, with its greenhouse gas emissions rising.
Note especially the quote saying: . "[Meeting the 20% renewables target] crucially undermines the [European emission trading] scheme's credibility ... and reduces the incentives to invest in other carbon technologies like nuclear power". Openly admitting that growth in renewables undermines expansion of nukes. (though there is obvious a nice typo mistake, when it says that nukes are a "carbon technology" instead of assumingly "low carbon technology"
Guardian (UK), 23 October 2007

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