**Statement of**

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**on the**

# Environmental, Safety, and Economic Implications of Nuclear Power

**Before the**
**Science and Technology Committee**
**House of Representatives**
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**Introduction.** Mr. Chairman and members of the Committee, thank you for providing the Natural Resources Defense Council (NRDC) the opportunity to present its views on the "opportunities and challenges for nuclear power" and its role in mitigating climate change. NRDC is a national, non-profit organization of scientists, lawyers, and environmental specialists, dedicated to protecting public health and the environment. Founded in 1970, NRDC serves more than 1.2 million members and supporters with offices in New York, Washington, Los Angeles, San Francisco, Chicago and Beijing.

**Summary of recommendations**. Congress should:

- Pass a climate bill that puts stringent limits on $CO_2$ and other greenhouse gas emissions—"cap carbon." This is not only the best and most economically efficient way to mitigate climate change, but it is the single policy that would provide the greatest benefit to the domestic nuclear power industry.
- Stop subsidizing the construction of new nuclear power plants, and reject further subsidies for new nuclear plants in climate mitigation legislation. The economically *inefficient* way to mitigate climate change is to continue to subsidize new nuclear power plants. This will penalize and slow investment in improved energy efficiency and energy supply technologies that can mitigate climate change in less time, with less cost and risk.
- Terminate DOE's misguided 100+ year effort to close the nuclear fuel cycle and introduce fast burner reactors in the United States, and stop funding research on advanced nuclear fuel reprocessing.
- Establish an unbiased outside commission to report on ways to improve the NRC's safety culture. The biggest barrier to significant improvement of U.S. nuclear plant safety is the poor safety culture of the NRC.
- Initiate a search for a second geologic repository for disposal of spent fuel.

**Nuclear power has both benefits and costs.**

On the benefit side, nuclear power:

- is a low-carbon emitter,
- is a reliable generator of electricity,
- provides low cost electricity from <u>existing</u> power plants,
- has a reliable and plentiful supply of fuel, and
- has low health impacts from routine power plant emissions.

On the other side of the ledger, nuclear power:

- increases the risk of nuclear weapons proliferation,
- runs the risk of another catastrophic nuclear reactor accident,
- has significant unresolved waste disposal problems,
- has significant unresolved health and environmental problems associated with uranium mining, and
- new nuclear plants will <u>not</u> be economical in the United States until competing fossil generation is required to pay a significant financial penalty for its carbon emissions, on the order of \$40 to \$60 per ton of $CO_2$.

Commercial nuclear power has unique risks and the liability for these risks has been transferred to the government:

- Nuclear is the only existing energy technology that requires special international safeguards and export control regimes to prevent countries from making nuclear weapons from fuel cycle facilities and materials.
- In the United States and some other countries nuclear is the only energy technology where the government has to assume the liability for catastrophic accidents.
- Nuclear power is the only energy technology whose waste is so dangerous that the government has to assume responsibility for its disposal.

**The Contribution of Nuclear Power To Climate Change Mitigation.**
Nuclear power plants worldwide will continue to make a modest contribution to climate change mitigation. Based on data in the World Nuclear Association data (www.world-nuclear.org/info/reactors.html), in Figure 1 we show a potential for worldwide growth in nuclear capacity out to about 2030.

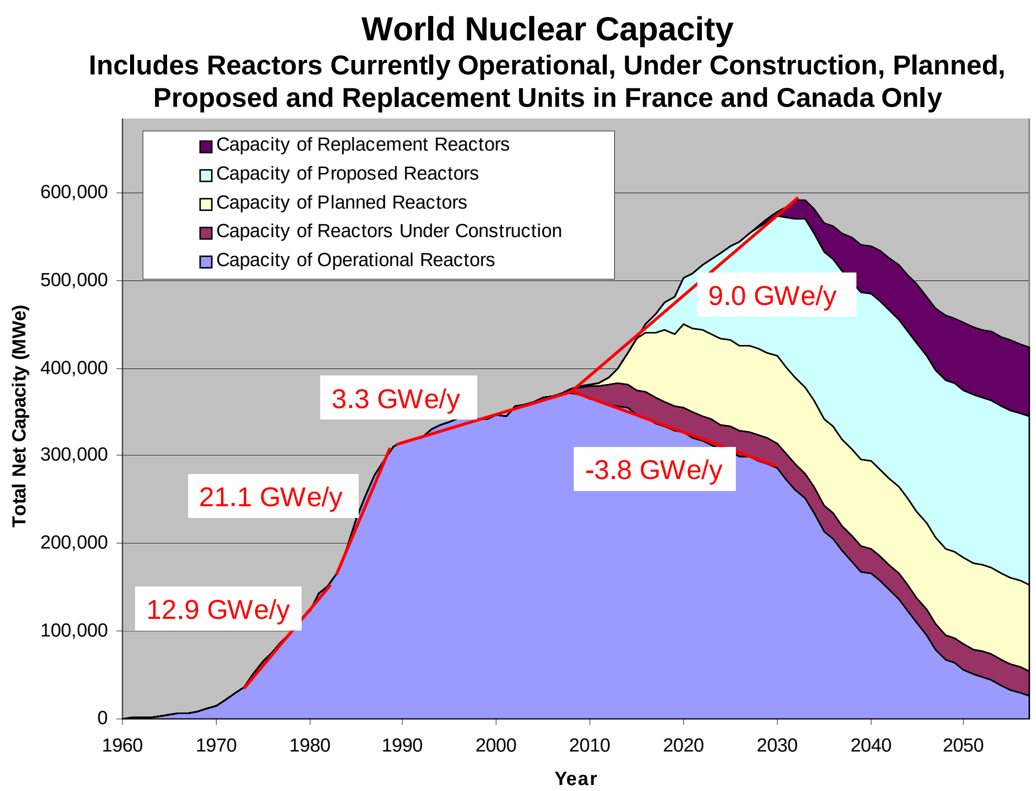


Figure 1. Global nuclear capacity based on the NRDC's data set of nuclear power plants in operation, under construction, planned and proposed, and projected replacement plants in France and Canada only, with growth rates as shown.

This is a snapshot based on current plans—not a highly accurate projection of the future. While it is adequate for the purposes of this hearing, the Subcommittee should understand that there are uncertainties in the projected data in Figure 1. Most of the operating reactors are assumed to have 60 year lifetimes. Actual lifetimes could be longer or shorter. Commercial operation dates for some reactors in the "under construction" and "planned" categories will surely slip. The plants in the "proposed" category do not have associated dates for the start of commercial operations, so we have assumed these plants may come on line between the years 2016 and 2032. Assuredly, some of these reactors will never be built, and others, not yet proposed, will be built in the future. And while we have extended the projection for 50 years, it is important to note that industry planning horizons do not stretch beyond about 20-25 years, so the shape of the "proposed' plant category cannot reasonably be calculated beyond about 2030. Nevertheless, this snapshot is probably more realistic that projections based on country specific and regional economic models.

In Figure 2, NRDC estimates the projected carbon emissions avoided by these same projected nuclear power plants displayed in Figure 1.

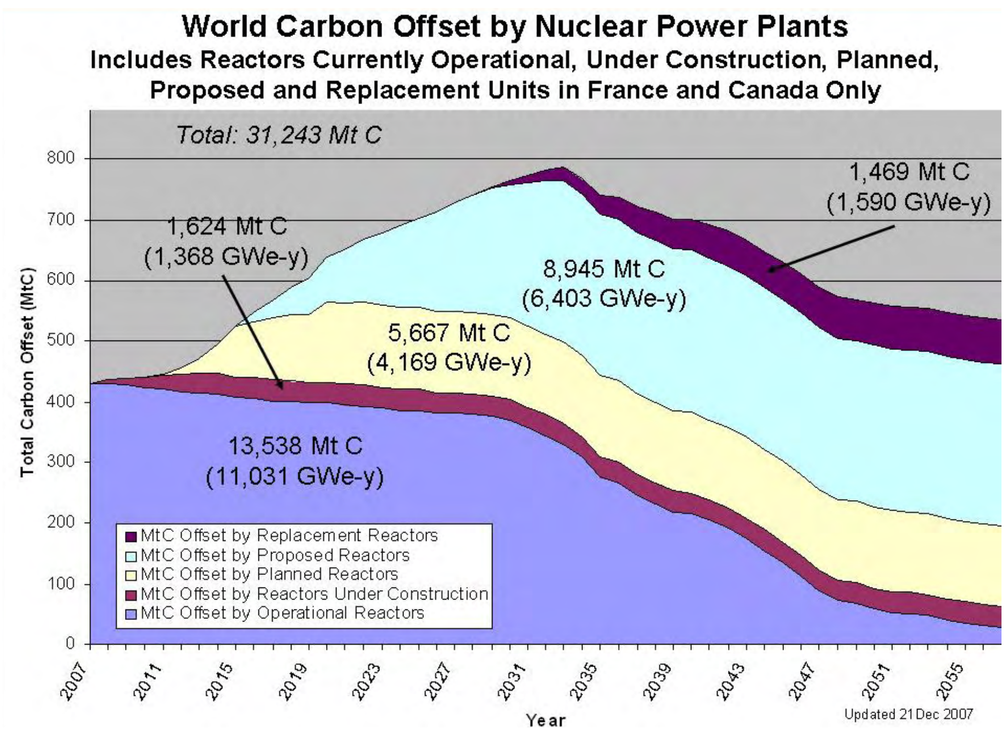


Figure 2. Projected global nuclear capacity and carbon emissions avoided based on the NRDC's data set of nuclear power plants in operation, under construction, planned and proposed, and projected replacement plants in France and Canada only.

These projections are summarized in the following table:

| | Gt C | Percent of Needed Emission Reductions |
|---|---|---|
| **Existing Plants** | **13.5** | |
| **New Plants** | **17.7** | |
| **Nuclear Total** | **31.2** | |
| **Maintain nuclear capacity at 2007 levels** | **21.5** | |
| **Difference** | **9.7** | **6** |

Table 1. Estimated world nuclear carbon emissions avoided, 2008-2057, based on nuclear plants in operation, under construction, planned and proposed, and projected replacement plants in France and Canada only.

The percentage of needed carbon emission reductions is based on an assumption that approximately 175 GtC of reductions over a fifty year period would be necessary to stabilize global atmospheric $CO_2$ concentrations, where stabilization is defined as a reduction of atmospheric concentrations of carbon dioxide to two times the pre-industrial level. (Pacala and Socolow, "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies," *Science*, 13 August 2004, Vol. 305, No. 5686, pp. 968-972)

What conclusions does NRDC draw from these projections? First, statements such as, "nuclear must be part of the mix," "I don't see how we can mitigate climate change without nuclear," "I support [or do not support] nuclear power," are largely irrelevant. Nuclear is part of the current mix of power generation, and it will continue to be part of the mix for the foreseeable future. Existing nuclear power plants are contributing to climate change mitigation and will continue to do so.

The real issue for the Congress is not whether one is for or against nuclear power per se. The crucial question for Congress is whether to continue, curtail, or increase federal taxpayer subsidies to a mature, polluting industry in order to spur building new U.S. nuclear plants. As NRDC demonstrates below, the answer to this question is a resounding "no."

**Why Congress should cease subsidizing the construction of new nuclear power plants.**

**1. New-build nuclear power plants are not economical in the absence of strong carbon controls, and even with such controls they may not compete effectively against electricity supplied by renewable sources and energy efficiency programs.** Existing nuclear plants that have been largely or fully depreciated, or that acquired a new cost basis via a change in ownership at a deep discount to their original cost, are now economical to operate. The forward cost (fuel and operating and maintenance costs) average less than 2 cents per kilowatt-hour (c/kWh), and thus these plants produce some of the lowest cost electricity.

In strong contrast to existing plants, new plants are uneconomical due to their high cost of construction. In late-2003, the MIT study, "The Future of Nuclear Power" estimated that the cost of electricity generated by a new merchant nuclear plant would be some 60 percent higher than the cost of energy generated by a fossil-fueled plant. *See* MIT, "The Future of Nuclear Power," 2003, Table 5.1, p. 42. Since that report was published in 2003, the cost of fossil fuels and the capital cost of electricity generating plants have both increased significantly. In June 2007, the joint industry and non-profit Keystone Center report found that the levelized cost of electricity from new nuclear power plants was estimated to be in the range 8.3-11.1 c/kwh, up from the 6.7 to 7.0 c/kwh estimate in the 2003 MIT study. *See* the Keystone Report, "Nuclear Power Joint Fact-Finding," at 11.

Based on more recent data supplied by utilities and energy generating companies pursuing new nuclear plants, the low end of the Keystone estimate is no longer valid. Current cost estimates for several new reactors are in the range of 14 to 18 c/kwh (in 2007 dollars).

Electricity from new nuclear power plants in this cost range is not competitive with fossil-fueled baseload generation in today's marketplace, nor even with electricity supplied by waste heat co-generation, wind turbines, or freed-up by continuing pursuit of end-use efficiency programs. By the time the earliest of these new nuclear plants begin delivering power to the grid, several forms of solar power are also likely to be cheaper on a retail delivered-cost basis, and concentrating solar thermal plants will likely be competitive in the wholesale power market as well.

Implementation of a carbon cap that internalizes the true cost of burning fossil fuels is the single policy that would most benefit the nuclear industry, not because new-build nuclear power will necessarily be cheaper than other sources, but rather because it will make polluting fossil-fueled power more expensive. EPA has modeled the effect of the current version of the Lieberman-Warner climate bill to predict $CO_2$ prices using two different models. One model forecasts prices starting at \$22/ton $CO_2$ in 2015, rising to \$28 in 2020 and \$46 in 2030 and continuing up from there; the other model's prices start at \$35/ton in 2015 and hit \$45 and \$73/ton in 2020 and 2030 respectively. *See* http://www.epa.gov/climatechange/economics/economicanalyses.html
In short, enacting a carbon cap could increase the value of generating electricity from nuclear plants by 2.2 -3.4 c/kwh in the near term and more in later years.

Subsidizing new nuclear plants through direct federal cost sharing, a production tax credit, and tens of billions in federally subsidized and guaranteed debt will not remove new-build nuclear's cost disadvantage vis-à-vis other energy sources. Rather it will tend to disguise and even prolong these cost disadvantages, thereby penalizing and slowing investments in less costly demand–side energy management programs energy efficiency, and an array of electricity supply options that can provide carbon offsets more quickly, cheaply and safely than nuclear power. Unlike the wind and solar industries, after fifty years of operations, the nuclear reactor industry displays no consistent trend toward lower unit costs in manufacturing and construction, so it seems unlikely that further subsidies at this late date will serve to catalyze major cost reductions.

Given their high capital costs, and all the other non-carbon environmental liabilities and risks that attend reliance on the nuclear fuel cycle, new nuclear plants are obviously not the first, second, or even third option this body should turn to stem the buildup of carbon dioxide in the atmosphere. Put bluntly, anyone or any organization pushing for more taxpayer-funded largesse for nuclear power plants in a climate bill is either seeking inappropriate windfalls for their clients, or is pursuing a poison pill strategy to protect carbon polluters by trying to kill the bill.

**2. International safeguards are inadequate.**

As evidenced by events in Iran and North Korea, the current international safeguards regime has major vulnerabilities. Under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), International Atomic Energy Agency (IAEA) safeguards agreements, and other elements, a non-weapon state can develop sensitive dual-purpose technologies, such as gas centrifuge enrichment plants, bring them within days or weeks of producing nuclear weapons.

Moreover, "[T]he objective of safeguards is the **timely detection of diversion of significant quantities of nuclear material** from peaceful activities to the manufacture of nuclear weapons or of other explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection." (IAEA), INFCIRC/153; emphasis added).

In non-nuclear weapon states today, this objective cannot be met at several types of facilities used by the nuclear power industry, including commercial gas centrifuge plants, nuclear fuel reprocessing plants, mixed-oxide fuel fabrication plants, and storage facilities for separated plutonium and highly-enriched uranium. The "timely warning criteria" —detecting a diversion in time to bring diplomatic pressure to reverse the course of action—simply cannot be met if these plants are located in non-weapon states such as Iran or North Korea.

There are a number of reasons for this, including for example, IAEA "Significant Quantities" for direct use nuclear materials are technically erroneous, and in the case of plutonium are too large by roughly a factor of eight. Also, at large commercial-size bulk handling facilities—e.g., uranium enrichment plants, reprocessing plants and plutonium fuel fabrication plants (MOX plants)—inventory differences exceed the amount of material required for a nuclear explosive device.

Countries that have recently announced their intent to build large nuclear power reactors include:

| | |
|---|---|
| Albania | Nigeria |
| Algeria | Qatar |
| Bangladesh | Saudi Arabia |

| | |
|---|---|
| Belarus | Syria |
| Egypt | Thailand |
| Indonesia | Tunisia |
| Israel | Turkey |
| Jordon | United Arab Emirates |
| Libya | Vietnam |
| Morocco | Yemen |

Israel already has nuclear weapons, but is not a signatory of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Presumably, most of the remaining countries, should they build nuclear plants, will do so without harboring an explicit contemporaneous objective of obtaining a nuclear weapon capability. Nevertheless, there is a significant risk that one or more of these countries will represent a future proliferation threat as Iran does today.

**3. The Administration's current program for a "Global Nuclear Energy Partnership" (GNEP), built around the reprocessing and the international recycling of spent nuclear fuel, would be a disaster for international security and a multinational economic boondoggle of staggering proportions.**

Even if by some miracle in thirty years GNEP's development managed to succeed on a technical level—an outcome that we do not believe is at all likely—it would still drain vital capital away from more timely and practical clean energy investments that are desperately needed *now* to avert pollution and foster human development around the world.

The Administration originally proposed GNEP to allegedly reduce the proliferation risk posed by the future spread of conventional methods of reprocessing, and to reduce the amount of waste required for disposal by closing the nuclear fuel cycle. The center piece of the GNEP vision is an elaborate scheme involving as yet unproven techniques for spent fuel reprocessing and fabricating new types of transuranic fuels, and the "transmutation" of the long-lived transuranic isotopes in this fuel using a new class of costly fast reactors.

Of course, a simpler and cheaper way to avert the proliferation risks posed by reprocessing is not to engage in it, and strongly discourage others from doing so.

GNEP is a far more elaborate scheme than the approach currently used by France , which involves reprocessing using the conventional PUREX process and burning the recovered plutonium only once in existing thermal reactors. The French approach is already a bad idea. Implementing the grandiose GNEP vision would require a century long multinational state enterprise that would cost US and foreign taxpayers hundreds of billions of dollars, and result in the importation of thousands of tons of foreign nuclear waste into the United States. By mid-century, when the best available science says we must have stabilized global $CO_2$ levels at no more than twice their pre-industrial levels -- we would just be wrapping up the GNEP pilot projects, having already misallocated precious tens of billions of dollars merely to get GNEP to the starting line.

In reality, the whole concept is flawed technically, economically, and politically: the proposed mixture of transuranic isotopes in the transmutation fuel would still be usable in nuclear weapons; the resulting fuel cycle would not be remotely cost-competitive with conventional nuclear power, much less other modes of electric power generation; and the rest of the world is highly unlikely to sanction another shared nuclear monopoly over the civil nuclear fuel cycle to match the one currently controlled by the select group of nuclear weapon-states under the Nuclear Nonproliferation Treaty.

Both the current French and proposed GNEP approaches to closing the fuel cycle increase nuclear proliferation risks relative to—and neither is preferable to—the "once-through" fuel cycle currently used in the United States.

Compared to the once-through fuel cycle, the French fuel cycle costs more, has greater associated nuclear proliferation risks when replicated in non-weapon states, results in larger inventories of separated weapon-usable plutonium, is less safe, results in greater releases of routine radioactive emissions, produces greater quantities of radioactive waste when low-level and intermediate-level waste is included, provides no significant benefits in interim spent fuel and HLW storage requirements, and does not reduce the geologic repository requirements.

As noted in the recent Keystone Center report:

> No commercial reprocessing of nuclear fuel is currently undertaken in the U.S. The NJFF [Nuclear Joint Fact Finding] group agrees that **while reprocessing of commercial spent fuel has been pursued for several decades in Europe, overall fuel cycle economics have not supported a change in the U.S. from a "once through" fuel cycle.** Furthermore, the long-term availability of uranium at reasonable cost suggests reprocessing of spent fuel will not be cost-effective in the foreseeable future. A closed fuel cycle with any type of separations program will still require a geologic repository for long-term management of waste streams. (The Keystone Center, "Nuclear Power Joint Fact-Finding," June 2007, emphasis added)

GNEP represents the marriage of two failed technologies—reprocessing and fast reactors. Reprocessing and closed fuel cycles have resulted in the accumulation of about 250 tonnes of separated plutonium in civil nuclear programs in Europe, Japan, Russia and India. In theory the GNEP vision reduces geologic repository requirements by substituting costly reprocessing plants and costly MOX fabrication plants for costly geologic repositories.

For the GNEP vision to work an estimated 40 to 75 gigawatts (GW) of fast reactor capacity would be required for every 100 GW of thermal reactor capacity. But we already know from <u>decades</u> of experience with fast reactors and failed efforts to develop commercial fast breeder reactors that fast reactors are uneconomical and unreliable—far more costly and far less reliable than existing thermal reactors. No energy company is going to order a fast reactor when it can purchase a less-costly, more-reliable light water reactor. GNEP is a recipe for further federalizing and increasing the cost of the nuclear fuel cycle.

Despite decades of research costing many tens of billions of dollars, the effort to develop fast breeder reactors has been a failure in the United States, France, United Kingdom, Germany, Italy, Japan and the Soviet Union. The flagship fast reactors in each these countries have been failures. The effort to develop fast reactors for naval propulsion was a failure in the United States and the Soviet Union, the only two navies that tried to introduce fast reactors into their respective submarine fleets. After investing tens of billions and decades of effort in fast breeder R&D, the Congress should ask itself why there is only one commercial-size fast reactor operating in the world today—one out of approximately 440 reactors. NRDC knows why. Fast reactors are uneconomical and unreliable.

The history of fast reactors was best summed up by the "father" of the nation's Nuclear Navy, Admiral Hyman Rickover, when he decided in 1956 to abandon the sodium-cooled fast reactor and replace it by a pressurized water reactor in the *USS Seawolf* (SSN 575). "In Rickover's words they were 'expensive to build, complex to operate, susceptible to prolonged shutdown as a result of even minor malfunctions, and difficult and time-consuming to repair.'" (Richard G. Hewlett and Francis Duncan, *Nuclear Navy: 1946-1962*, (Chicago and London: The University of Chicago Press, 1974), pp. 272-273.) A 1995 sodium coolant leak and fire in Japan's Monju prototype fast breeder reactor has kept the facility shut-down *for the last twelve years.*

To our dismay and despite the decades of evidence to the contrary, the DOE is actively signing up countries to the GNEP vision and promoting GNEP research and development worldwide. But as the Keystone Center report noted, "The GNEP program could encourage the development of hot cells and reprocessing R&D centers in non-weapon states, as well as the training of cadres of experts in plutonium chemistry and metallurgy, all of which pose a grave proliferation risk." (The Keystone Center, "Nuclear Power Joint Fact-Finding," June 2007, p. 91). "Could encourage" can now be changed to "is encouraging" as we are already witnessing the promotion under GNEP of closed fuel cycle R&D in South Korea.

Professor Frank von Hippel, in the most recent issue of *Scientific American*, has summarized the reasons "it makes no sense to rush into [this] expensive and potentially catastrophic undertaking." (Frank N. von Hippel, "Rethinking Nuclear Fuel Recycling," *Scientific American*, May 2008, pp. 88-93.)

In sum, Congress should pull the plug on DOE's effort to close the close the fuel cycle and stop funding research on advanced nuclear fuel reprocessing.

**4. Reactor safety is a significant concern and, to a degree not matched by any other power source, continued nuclear power generation is hostage to its worst practitioners.**

The most important factor affecting the safety of nuclear power plants is the safety culture at the plant. In the United States and some OECD countries the safety culture at operating plants has improved over the past two decades. While new reactor designs have improved safety and security features, over the next two to three decades, the safety and security of nuclear plants in the United States and the rest of the world will largely be determined by the safety and security of existing reactors. Several countries that already have nuclear plants, *e.g*., Russia, Ukraine, China, India, and Bulgaria, have notably weaker safety cultures than the nuclear enterprise merits. This is not a situation that the United States government as a whole or this Congress can control or resolve.

Compounding the problem, expansion of nuclear power is projected to occur primarily in countries that currently have significant weaknesses in legal structure (rule of law), construction practice, operating safety and security cultures, and regulatory oversight, *e.g*. China and India. Securing commercial sales and "nuclear renaissance" exuberance have taken precedence over nuclear safety and non-proliferation concerns. This is evidenced by the fact that since his election in May 2007, President Nicolas Sarkozy has offered French reactors to such authoritarian, unaccountable, nontransparent, and corrupt governments as Georgia, Libya, the UAE, Saudi Arabia, Egypt, Morocco, and Algeria (*Nucleonics Week* Vol.49. No. 7, Feb. 14, 2008). Consequently, if another catastrophic nuclear reactor accident occurs during the next couple of decades, it is more likely to occur in Russia, Ukraine, China, India, or another country with a poor safety culture, than in the United States. Several countries recently expressing an interest in acquiring nuclear reactors also have very high indices of industrial accidents and official corruption.

We concur with the findings and recommendations in the excellent report by the Union of Concerned Scientists (UCS), "Nuclear Power in a Warming World" (December 2007). As noted by UCS, "The United States has strong nuclear power safety standards, but serious safety problems continue to arise at U.S. nuclear power plants because the Nuclear Regulatory Commission (NRC) is not adequately enforcing the existing standards." (p. 3) Since the United States will continue to rely on nuclear power for substantial base load electricity generation into the foreseeable future, it is essential that the safety of U.S. nuclear plants be improved.

The biggest barrier to significant improvement of U.S. nuclear plant safety is the poor safety culture of the NRC. The Congress should establish an unbiased outside commission, similar to the Kemeny Commission, to report on ways to improve the NRC's safety culture. This commission should investigate failures to enforce regulations, staff deferral of safety inspections and upgrades so as not to impinge upon reactor operating schedules, pro-nuclear bias in the selection of Commissioners, senior NRC staff management and advisory committee members, the revolving door practice of NRC staff being hired from the industry it regulates and industry hiring of NRC staff, the curtailment of public's ability to engage in discovery and cross-examination during reactor licensing hearings, and other issues identified in the UCS report.

**5. After more than fifty years of nuclear power use there is no operational spent fuel or high-level waste disposal facility anywhere in the world.**

The proposed Yucca Mountain geologic repository site selection process has been severely damaged by its premature politicized designation as the sole site for detailed investigation. This error has been compounded by unsupportable manipulation of the licensing criteria for the site, and the credibility of the technical site investigation has been seriously undermined by charges of fraudulent data. In light of this record, the project either should be terminated, or the amount of wastes destined to the facility should be severely restricted, for example, by limiting its use to the disposal of defense high-level waste and R&D on spent fuel disposal. In either case, Congress should initiate a search for a second repository.

For fifty years, since the National Academy of Sciences first addressed this issue, the scientific consensus has been that high-level nuclear waste, and by implication spent fuel, should be permanently sequestered in deep underground geologic repositories, and by implication the primary barrier to prevent the release of the radioactivity into the biosphere should be the geology of the site. In this regard, some amount of spent fuel can be disposed of safely in Yucca Mountain. At this time we do not know whether this is greater or smaller than the statutory limit of 70,000 tons of spent fuel and high-level nuclear waste, and for reasons highlighted below, we may never know because the site selection process and the criteria for judging its long term safety have been thoroughly corrupted.

In a separate paper I have reviewed how the Federal government has thoroughly corrupted the geologic repository site selection and site licensing processes (See http://docs.nrdc.org/nuclear/nuc_08010701A.pdf). Here I will focus on a few points.

The Environmental Protection Agency (EPA) has the statutory responsibility to establish criteria for judging the adequacy of the proposed Yucca Mountain repository. The objective of these criteria of course is to protect future generations from potential releases of radioactive materials. The criteria are based on three key considerations: 1) what is the highest radiation exposure dose that will be permitted to the maximally exposed individual; 2) where will this dose limit be imposed, i.e., where will the maximally exposed individual be assumed to reside; and 3) over what period of time is the dose limit imposed. The licensing criteria being established EPA (in collusion with the NRC and the DOE through secret White House reviews overseen by the Office of Management and Budget) are far from being adequately protective of future generations. In developing the licensing criteria for Yucca Mountain it appears that the highest priority has been to ensure the licensability of the Yucca Mountain site.

First, EPA "gerrymandered" the control boundary, extending it from 5 to 18 kilometers in the direction that the radioactive materials is projected to leak from the repository. EPA also cut off the time period for compliance at 10,000 years. When a Federal Court ruled that the 10,000 year cut off was unlawful because it was inconsistent with the recommendations of the National Academy of Sciences as required by law, EPA proposed to eviscerate the Court ruling by proposing a two-tiered dose limit—retaining the pre-10,000 year *mean* dose limit of 25 mrem and proposing a post-10,000 year *median* dose limit of 350 mrem. The mean dose is projected to be approximately three times higher than the median dose. Thus, EPA has proposed to allow the estimated mean exposure to the maximally exposed individual during the peak exposure period to be on the order of one rem per year. According to cancer risk estimates in the National Research Council's BEIR VII report, a lifetime exposure at this dose rate today would result in one in 12 such exposed persons getting cancer from this exposure with half of the cancers being fatal.

Some would argue that 10,000 year is a sufficient compliance period. It should be noted, however, that extending the compliance period beyond the projected life of the engineered spent fuel canisters is one way to ensure that the geology of the site will be the primary barrier preventing the release of the radioactivity into the biosphere.

DOE is required to submit its Yucca Mountain license application to the NRC. In its attempt to demonstrate that the repository will meet the EPA criteria, DOE plans to run a series of calculations to predict the release and transport of radioactivity from the site. The computer code that DOE plans to use for this purpose is so large that NRC will not be able to independently run it, and neither will any potential intervenor in the licensing process. Consequently, the NRC will be unable to confirm the validity of the DOE calculations. Instead, NRC plans to run its own transport code, but only for the purpose of developing a set of questions to be answered by DOE.

The Yucca Mountain project has repeatedly failed to meet its schedule and there is a possibility that the project will be terminated by Congress. If this occurs it would represent the third failed attempt by the Federal government to solve the high-level waste/spent fuel disposal problem—the first failure being the salt vault project at Lyons, Kansas followed by the failed Retrievable Surface Storage Facility (RSSF).

So where does all this leave us. We have a proposed geologic repository for spent fuel and high-level waste that was selected through a corrupted site selection process, that cannot meet the original site selection criteria, that will be judged against thoroughly corrupted licensing criteria developed in collusion with DOE, the licensee, and judged with the aid of a computer simulation model that cannot be independently checked or run by the regulators or outside experts.

The Congress should require that DOE resume a search for a second repository site. Aged spent fuel can be stored safely in dry casks until a safe geologic disposal site is identified and licensed for use. However, it has been a policy of the Federal government that we should not rely on administrative controls for more than 100 years for the management and disposal of nuclear wastes.

The Congress also should approve consolidation of spent fuel from shut down reactors, but should not support consolidation of spent fuel from operational reactors since these sites will require the on-site management of spent fuel in any case.