

**THE NUCLEAR RENAISSANCE**  
(What makes NOW the right time)  
—33 Arguments—

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Abstract

There is a unique opportunity now to expand the Nuclear option for generating electricity and build more nuclear power plants. Many pluses have aligned for a successful launch.

*“Nuclear power is the way to go if you’re worried about CO<sub>2</sub> contributing to global warming. But even if you’re not, there are other compelling reasons to replace fossil fuels with safe, clean nuclear power.”*

— George Stanford (2-14-2007)

As reported in 2009 by the U.S. press, Texas and the middle eastern seaboard are suffering an energy shortage. State governments have offered to pay a portion of the cost to build new nuclear power plants in their states.

The special concerns about the economy that continue into 2009, may not adversely affect building nuclear plants, due to many of the pluses (subsidies, and the like) noted herein.

*Geopolitics, technology, economics and the environment are all*

*changing in favor of nuclear power.*

1. Nuclear power plants account for 20% of the U.S. electricity supply and three-fourths of all electricity generation that emits no air pollutants or greenhouse gasses.
2. Nuclear expertise is rapidly being lost to retirement. In partial compensation, means are being developed to help preserve know-how in archives. (Reference 7)
3. Coal-fired power plants are major global-warming suspects and coal is now subject to massive “regulatory risk”, while wind turbines and solar panels have a way to go to become major sources of clean power.

Coal-fired plants, which have a working life of 40 years or more, spew out pollutants and CO<sub>2</sub>, whereas, nuclear plants produce almost no atmospheric pollutants and are demonstrating perhaps 60-year lifetimes.

4. The move to new energy sources and away from fossil fuels is reviving nuclear power. (Reference 1)
5. A streamlined Nuclear Regulatory Commission (NRC) permit process, government subsidies and advanced construction methods are helping.

The NRC is combining the build stage and operation stage applications: utilities can now apply for a single “combined construction and operating license.”

The NRC is allowing firms selling nuclear reactors to get “new generation” designs cleared in advance. Westinghouse has already gotten its Generation IV model AP-1000 cleared; the NRC is in process of certifying General Electric’s ESBWR design; and

AREVA is about to submit application for its new offering, the EPR.

Utilities can now ask NRC to approve a location (site) suitable for a nuclear-power station before they apply for the “combined” license.

NRC is hiring 200 new staff every year to meet expected licencing needs, and aims to issue its first new licenses in 2011.

6. Businesses see money in nuclear power.

IBM Corp. established a Global Center of Excellence for Nuclear Power in France to support “safe, reliable and efficient electricity generation.”

GE-Hitachi Nuclear Energy has signed an agreement with Entergy Nuclear to develop and provide components for nuclear plants for Mississippi and Louisiana.

Westinghouse Electric Co. and a partner have multi-billion-dollar contracts with China for four nuclear power plants there.

GE, Westinghouse, and AREVA plan to save time and money by using as many identical parts as possible for the different nuclear plants they build in America—unlike the one-of-a-kind designs of the past. All this should reduce the time required for construction to four years, allowing the first new reactors to enter service in 2015 or 2016.

7. Russia is building a fleet of (commercial) ships powered by nuclear reactors, and has a \$60-billion land-based nuclear program. Vietnam and Thailand recently announced plans to build nuclear plants.

8. More than 440 nuclear reactors exist in 38 countries. Twenty countries are considering initiation or expansion of nuclear power generation. In the U.S., over the next few months, the NRC expects to receive 12 applications to build new power reactors at seven different sites. It anticipates getting plans for another 15 at 11 more locations next year. If successful, the number of reactors in the country will increase by roughly a third. The output of nuclear electricity would grow even more sharply—the new reactors would be more powerful than older ones.
9. Western governments are concerned that most of the world's oil and gas is in the hands of hostile or shaky governments.
10. Much of the nuclear industry's raw material, uranium, by contrast, is conveniently located in friendly places such as Australia and Canada.
11. Simpler designs cut maintenance and repair costs. Nuclear plant builders, America's General Electric and Westinghouse, and foreign manufacturers like France's AREVA, maintain that their latest designs are safer than existing nuclear plants. This should make it easier to obtain operating permits, allowing them to be built faster and be cheaper to run—and therefore much less risky financially.

Contractors are said to be getting better at building nuclear plants, the NRC better at regulating them, and utilities better at running them.

12. Bigger firms have been able to acquire nuclear reactors, achieve economies of scale, and capitalise on experience. These nuclear specialists have been able to speed up the refueling process, keep shutdowns for maintenance to a minimum and so keep the reactors going more of the time. Shutdowns are now far less frequent, so that a typical station in America is now online 90% of the time, up

from less than 50% in the 1970s.

Utilities have found ways to improve the non-nuclear parts of the power station, such as the steam turbines. These so-called “uprates” have increased America’s nuclear capacity by almost 5,000 MW since 1977, the equivalent of about five new nuclear reactors, according to the Nuclear Energy Institute, an industry group. And the NRC has agreed to extend the working life of about half of America’s nuclear plants for an extra 20 years.

13. New “passive safety” features can shut a reactor down in an emergency without the need for human intervention.
- 14a. Handling waste may get easier. America plans to embrace a new approach in which almost all the very long-lived radioactive portions of the used fuel from conventional nuclear power stations are used in fuel for “fast” reactors.

The Department of Energy (DOE) requires utilities to set aside a tenth of a cent for each kilowatt-hour (kwh) of nuclear power they generate to help defray costs of transporting nuclear waste to a safe repository and storing it there permanently.

In June 2008, DOE submitted an application to the NRC to put into operation a repository at Yucca Mountain, Nevada. NRC thinks the application will take about three years to review. The facility could be open for business in 2017.

But in deference to Senator Harry Reid from Nevada, the Obama administration has declared that Yucca Mountain will not be licensed.

- 14b. On October 1, 2007, the Department of Energy awarded more than \$16 million for technology development to more than 28 companies in four consortia: six team members in the AREVA

consortium, eight in Energy Solutions, seven in GE-Hitachi, and six, plus a Russian group, in the General Atomics consortium. These contracts are part of \$60 million in announced funding opportunities engaging industry experts in conceptual design of the Global Nuclear Energy Partnership (GNEP) proposed by the U.S. government. (Reference 6)

15. The squeeze on fossil fuels has improved nuclear's economic competitiveness.
16. Nuclear power stations are expensive to build but very cheap to run. Gas-fired power stations—the bulk of new build in the 1980s and 1990s—are the reverse. Since gas provides the extra power needed when demand rises, the gas price sets the electricity price. Costly gas has therefore made existing nuclear plants tremendously profitable. (Reference 2)

Nuclear plants are a virtual mint—as long as the bill for construction has been paid down or written off.

Per the Energy Information Administration, a government agency, the average wholesale power price in 2005 was 5 cents per kilowatt-hour. The Nuclear Energy Institute, an industry group, reckons that the average operating cost of America's nuclear plants was 1.7 cents per kwh that year. So their margins were almost 200%.

17. Nuclear power offers the possibility of large quantities of “baseload” electricity that is cleaner than coal, more secure than gas, and more reliable than wind. Baseload is distinguished from “peak,” the extra power needed when there is an excessively great demand, as on a hot summer day when lots of air conditioning is needed.
18. If cars switch from oil to electricity, the demand for power

generated from carbon-free sources will increase still further.

19. Nuclear power's moral makeover has divided its enemies. Some environmentalists retain their antipathy to it, but green gurus such as James Lovelock, Stewart Brand, Patrick Moore, and James Hansen have changed their minds and embraced it.
20. Public opinion, confused about how best to save the planet, seems to be coming round. A recent British poll showed 30% of the population against nuclear power, compared with 60% three years ago. An American poll in March this year showed 50% in favour of expanding nuclear power, up from 44% in 2001.
21. Nuclear's green virtues do not show up in its relative costs, since fossil-fuel power does not pay for the environmental damage it does.
22. Nuclear combines large fixed costs with political risk. Companies fear that, after they have invested billions in a plant, the political tide will turn once more and bankrupt them.

Banks are not prepared to lend money to build nuclear plants in America without some extra surety. The Energy Policy Act of 2005 offers four types of subsidies for new reactors:

- Up to \$2 billion in insurance against regulatory delays and lawsuits to the first six reactors to receive licenses and start construction.
- Extending an older law, it limits a utility's liability to \$10 billion in event of a nuclear accident.
- A tax credit of 1.8 cents per kwh for the first 6,000 MW generated by new plants.
- And most important, guarantees for an indeterminate amount of loans to fund new nuclear reactors and other types of power plant using "innovative" technology.

23. Fears of nuclear power are overblown; after all, the UN figure of eventual deaths as a result of the Chernobyl accident is lower than the official annual death-rate in Chinese coal mines.
24. Voters will support nuclear power only if they believe that governments and the nuclear industry are doing their best to limit risks, and that risks are small enough to be worth taking in the interests of cheap, clean energy.
25. Nuclear is reliable, cost-effective, renewable (Reference 4), and sustainable. The new enthusiasm for building reactors means America's long-awaited "nuclear renaissance" is about to become reality.
26. Expansion of nuclear energy is now in motion and is unlikely to be slowed by concerns about what to do with the waste. The only thing to stop a nuclear renaissance now is a serious accident at an existing plant.

*But there are a number of hurdles to be overcome before the nuclear renaissance can pick up steam in the United States.*

27. In spite of the above issues, to date, no company has even committed to breaking ground for a new U.S. nuclear power plant.

Participants in the American Nuclear Society (ANS) 2007 Annual Meeting in Boston (summer) pointed out that the renaissance is far from a sure thing. Obstacles to be cleared before a new U.S. nuclear plant will be built include supply chain constraints, radioactive waste disposal, public policy, public support, and workforce shortage.

28. Supply chain

In 1980, more than 500 U.S. companies carried an N-stamp

(required to produce components acceptable for nuclear installation). Today there are about 100. Also today, competition and the supply chain are international.

BWX Technologies, a long time producer of nuclear components, reopened its forging facility in Indiana in 2005. It is the only facility in the U.S. certified by ASME (via N-stamp) to manufacture large nuclear components. G. E. is also expanding its manufacturing facility in North Carolina and will partner with Hitachi to compete in the global nuclear energy market. Many companies that had N-stamps and let them expire are still making the same components.

#### 29. Public and political support

The public and politicians need to realize that nuclear power represents not just 25% of generating capacity worldwide, but 75% of non-carbon generating capacity.

The nuclear industry must convince (the public and politicians) that nuclear is a viable, necessary energy form. Industry must show early progress once construction begins and address concerns and perceptions, especially about nuclear waste.

#### 30. Utility perception

Potential new plant owners must go out and talk about new nuclear with confidence, convince regulators, financiers, policy makers and the public that the new generation of units will be built in a much different culture than prevailed for the first generation of nuclear power plants.

#### 31. Workforce

One of the biggest challenges is finding qualified craft labor,

technicians, engineers and scientists to support construction and operation. While the number of technical and engineering college graduates is increasing, much competition exists from other industries for these graduates.

The nuclear industry is competing with fossil power plants, refineries, manufacturers and other industries for skilled labor.

It is important to encourage children as early as middle school to enter the construction industry.

The nuclear industry already has a skilled training infrastructure in place.

32. Most recently (2009)

As reported in the U.S. press, Texas and the middle eastern seaboard are suffering an energy shortage. State governments have offered to pay a portion of the cost to build new nuclear power plants in their states.

33. Nuclear power is the only technology available today that can supply the emissions-free “base load” power that the world will need. It is evident that wind, solar, geothermal and fuels made from biomass are not sufficient to meet the challenge. (8) “We have no time to experiment with visionary energy sources—civilization is in immediate danger and has to use nuclear—the one safe, available energy source, now.” (12)

Clean coal is often offered as an alternative to nuclear. But a clean coal plant with means to separate and safely store CO<sub>2</sub> will have to use technology not yet invented and require equipment that will add a huge cost burden to the plant. Therefore, clean coal is NOT an option. (11)

Nuclear power is both sustainable and inexhaustible. (9)(10)  
Nuclear reactors are safe, efficient, consistently reliable, and weather-independent. Without generating greenhouse gases or emitting pollutants, nuclear power plants safely and economically, provide more and more of the growing amounts of energy essential to the welfare of the world's people.

The deployment of a fast-fission technology with the general characteristics of the (Integral Fast Reactor) IFR is inevitable because the growing global demand for clean energy cannot be satisfied by today's thermal reactors. (13)

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Record of revision of FILE CFR200905 PAD RENAISSANCE: (was CFR070925)

- 9-19-2010 Published PDF to Folder <URL2009BETA(5-2)>
- 5-26 Started final revision of PAD “Renaissance” based on G. Stanford 5-22-2009 review of the 5-25 printout of the 5-6 version (E: with cover sheet “compare summary”)
- 5-21 Renamed <pad200905beatty> and started correcting <pad070925beatty> everywhere that old FN appears.
- 5-6-2009 Added markups in prep for CFRI pre-posting review; saved as <pad0905beatty> in CFRI folder <URL2009BETA(5-2)>: was File CFR070925 PAD RENAISSANCE
- 10-2 Added the #27-31 material (from the PE article?); copy to Bill Mego and JSK
- 9-25-2007 DRAFT; handed out at 9-28 CFRI meeting

Save as <**PAD200905BEATTY**>in <\URL2009BETA(5-2)>  
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