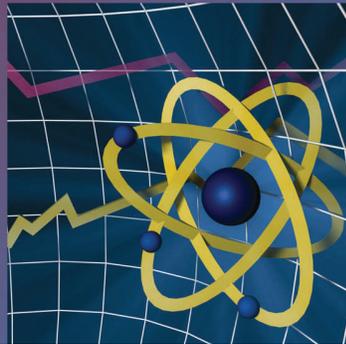


July 2010

# Status Report



## Status and Outlook for Nuclear Energy In the United States

### Executive Summary

The U.S. nuclear power industry continues to make progress toward the construction of new nuclear power plants in the United States. Currently, 13 license applications are under active review by the Nuclear Regulatory Commission (NRC) for up to 22 new reactors. The Department of Energy has awarded conditional commitments for loan guarantees to the partners in the Vogtle project and is negotiating terms for loan guarantees with several new nuclear projects.

The 104 operating plants continue to perform well, turning in sustained performance for output and capacity factor — an estimated 798.7 billion kilowatt-hours and 90.5 percent respectively in 2009.

### Nuclear Plant Performance Continues at a Sustained High Level

The U.S. nuclear fleet for electric generation in 2009 came in at its third highest year for production, 798.7 bKWh, with electricity generation of 806.2 bKWh in 2008.

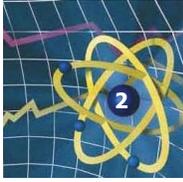
The industry's average capacity factor for the 104 operating units was 90.5 percent for 2009. It is the highest capacity factor of any source of electric power.

Year-to-year fluctuations in output and capacity factor should be expected, given normal variations in outage scheduling and length.

The industry continues to uprate the capacity of its nuclear units. An uprate increases the flow of steam from the nuclear reactor to the turbine-generator so the plant

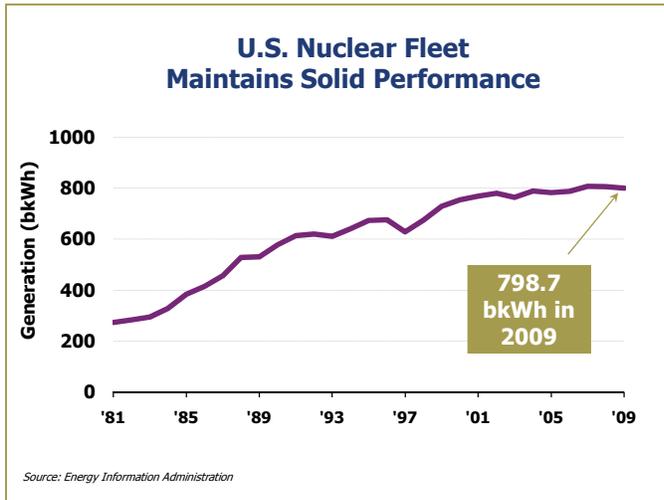


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can produce more electricity. Upgrades can increase a plant's capacity by 2-20 percent, depending on plant design.

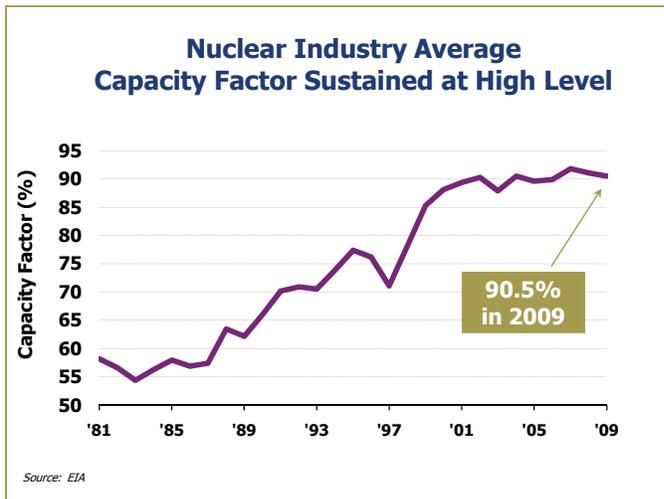
Since 2000, the NRC has authorized 82 power upgrades, yielding a cumulative capacity increase of 3,760 megawatts. The NRC is currently reviewing 16 applications for upgrades, totaling approximately 1,145 megawatts of capacity. Over the next five years, the NRC anticipates that companies will apply for power upgrades that could represent an additional 2,419 megawatts of new capacity.



The industry also continues to improve the reliability and performance of its nuclear units by replacing and upgrading major plant components. Steam generators, components of pressurized water reactors (PWRs), typically require replacement once over a plant's operating life. Each PWR has two to four steam generators; each costs between \$40 million to \$50 million to replace.

Reactor vessel heads are typically replaced as a precaution to ensure nuclear plants can safely and reliably produce electricity for years to come. Vessel head replacements cost \$20 million or more.

Steam generator and vessel head replacements are important for safe operation and can improve reactor performance by reducing downtime for inspection and repair and thus increasing electrical output.

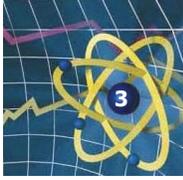


### ***Nuclear Plants: The Low-Cost Producers***

Sustained high levels of output and reliability also mean solid economic performance.

On average, U.S. nuclear power plants had an estimated production cost of 2.03 cents per kilowatt-hour in 2009. (Production cost includes operating and maintenance costs, fuel, and the federal government's one mill-per-kilowatt-hour fee for used fuel management.)

To obtain a total operating (busbar) cost, nuclear companies add, as a rule of thumb, about half a cent per kilowatt-hour to production cost (for ongoing capital expenditures, general and administrative costs, taxes and other costs) to obtain a total operating (busbar) cost. On average, therefore, U.S. nuclear plants have a total operating cost of approximately 2.5 cents per kilowatt-hour (or \$25 per megawatt-hour), making nuclear the lowest cost baseload generation after hydro.

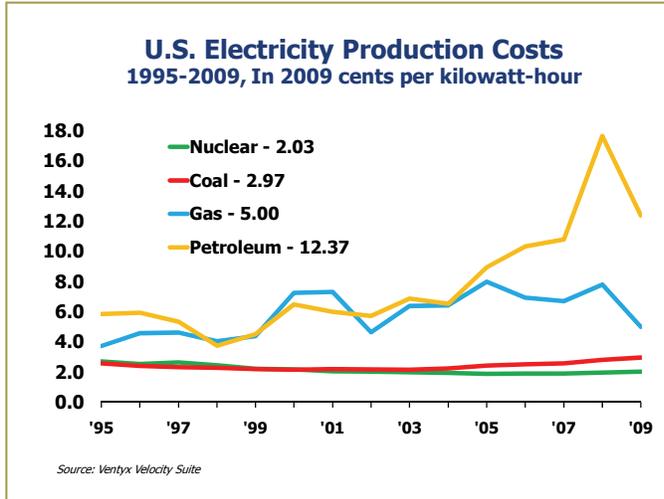


### Industry Consolidation

Consolidation, which began in 1999 with the first nuclear power plant sale, is a major factor in improved plant performance. The number of owners and operators has declined as some companies exit the business and others grow the size of their fleets.

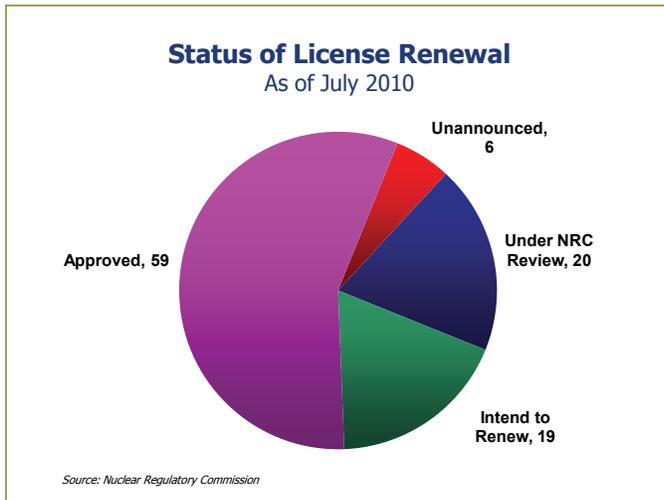
Consolidation of ownership and operating responsibility in the hands of large generating companies that operate a fleet of plants has significant benefits.

These large companies have the management strength, financial resources and scale necessary to achieve higher efficiencies.



### License Renewal: All Plants Expected To Renew, Operate For 60 Years

In March 2000, the NRC began to approve 20-year renewals of nuclear power plants' 40-year operating licenses. This allows those plants that have compiled detailed applications and undergone rigorous review to operate for a total of 60 years. Since then, the NRC has approved license renewals for 59 nuclear reactors. To date, the owners of 98 nuclear units have decided to pursue license renewal, and more are expected to follow suit.

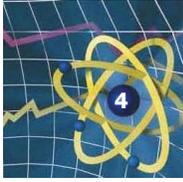


License renewal enjoys strong public support. In a recent public opinion survey, 87 percent of Americans agreed that "we should renew the licenses of nuclear power plants that continue to meet federal safety standards."<sup>1</sup>

The license renewal process costs between \$10 million and \$15 million to prepare the necessary regulatory filings and navigate the NRC's license renewal process. This cost does not include any major capital expenditures necessary to upgrade the plant (steam generator replacement, for example) to ensure safe, reliable operation during the additional 20 years after the original 40-year license term expires. Even with such capital expenditures, however, analysis shows

that license renewal of an existing nuclear plant is easily the least costly source of future electricity supply.

<sup>1</sup> Source: March 2010 poll of 1,000 U.S. adults by Bisconti Research Inc.



## Used Nuclear Fuel Management: An Integrated Long-Term Strategy

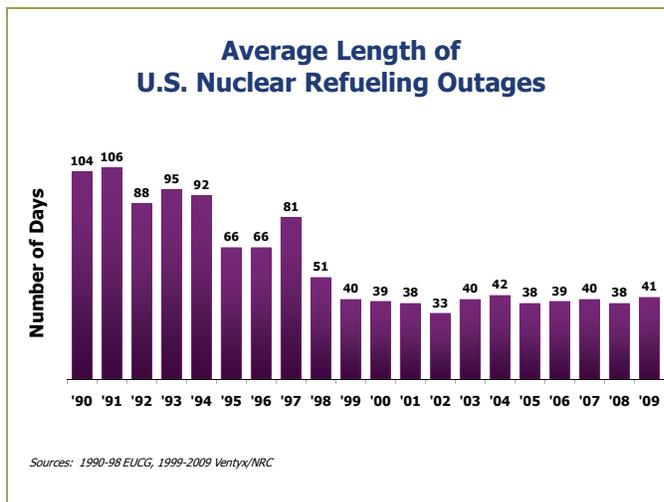
### *Federal Statutory Mandate*

Under the Nuclear Waste Policy Act of 1982, and the 1987 amendments to that legislation, the federal government is responsible for building storage and disposal facilities for used nuclear fuel. This program is funded by a one-mill-per-kilowatt-hour charge on electricity produced at nuclear power plants. Funds committed to the Nuclear Waste Fund now total over \$30 billion.

The federal government was supposed to start removing used nuclear fuel from nuclear plant sites in January 1998. The government did not meet that commitment because of delays, mostly but not exclusively political in nature, in developing the proposed disposal facility at Yucca Mountain, Nevada.

In June 2008, the Department of Energy (DOE) submitted an application to the NRC for a license to construct the Yucca Mountain repository. The Obama Administration has determined that the Yucca Mountain site is no longer an option for a repository, however.

On March 3, 2010, DOE filed a motion with the NRC to withdraw the license application and terminate the Yucca Mountain proceeding. The nuclear energy industry is opposing the withdrawal. If it happens, however, project termination should be done in an orderly manner so the Yucca Mountain project can be restarted, if political conditions change.



From a technical standpoint, \$8-billion of scientific investigation shows that Yucca Mountain is a suitable site for long-term storage and disposal of used nuclear fuel, and any residual by-products from advanced recycling technologies.

Given the evidence, it is clear that the Obama Administration's decision to terminate the project has no scientific or technical basis.

In March 2010, a bipartisan blue-ribbon commission of experts appointed by the Administration started a reassessment of the federal government's program to manage used nuclear fuel, and to make recommendations for policies and programs for a sustainable long-term program. The nuclear industry fully supports this initiative. The commission is required to make an interim report to the Secretary of Energy within 18 months. The interim report will be available for public comment with a final report due six months later.

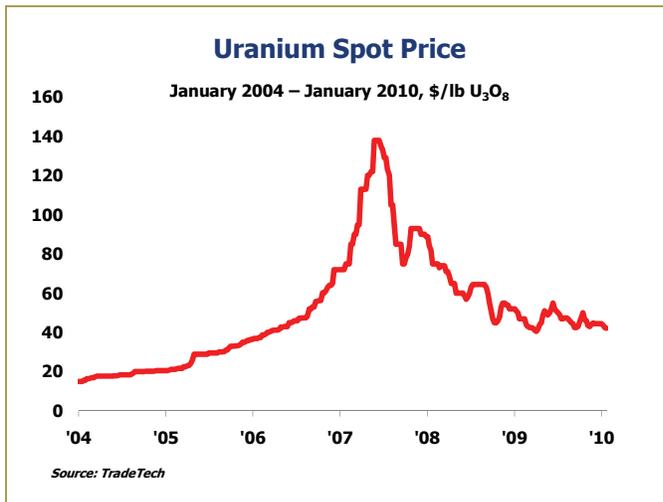
### *Industry Strategy*

Although the government's delay in moving used nuclear fuel from power plant sites in 1998 is a source of frustration, the nuclear industry is coping well with



the delay by expanding on-site storage of used nuclear fuel. Regardless of the future of federal programs, the industry believes that it is time for the development of central, interim, long-term storage as part of an integrated system for used fuel management.

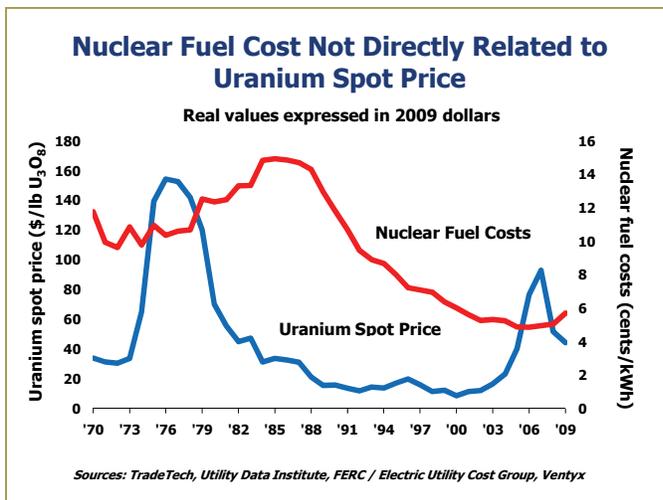
There is renewed interest in “closing” the nuclear fuel cycle—developing advanced technologies to reprocess and recycle as much of the used fuel as possible. If successful, this would extract additional energy from today’s used nuclear fuel, and significantly reduce the volume, toxicity, and heat of the waste by-product, but not eliminate it entirely.



Commercial deployment of these new technologies is several decades in the future. Even then, the United States will need a permanent disposal facility to isolate the remaining residual by-products, and centralized storage facilities in the meantime to store spent nuclear fuel until recycling technologies and the permanent disposal facility are ready.

### Expansion of Fuel Cycle Facilities Will Support Worldwide Construction of New Plants

Supply of nuclear fuel is a global business. In response to increasing demand for fuel due to new nuclear construction and a desire to replace older, energy-intensive technology, several new projects are underway worldwide.



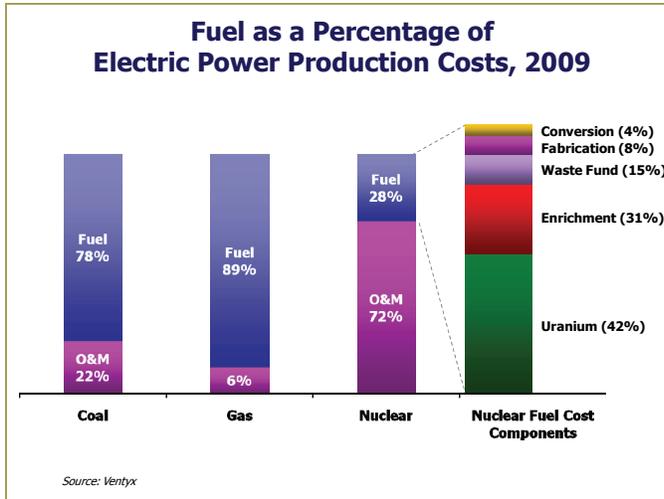
In the U.S., four new uranium enrichment projects are in various stages of development to support domestic and global markets. Urenco USA recently began initial production at a new centrifuge enrichment facility in New Mexico. When the \$3 billion facility reaches full capacity, it could supply up to 50 percent of the current domestic enrichment requirements. A similar facility has been proposed by AREVA for the

Eagle Rock site in Idaho. The Eagle Rock facility received a conditional commitment for a DOE loan guarantee in June 2010 and will commence construction upon receipt of an NRC license in mid-2011. USEC is pursuing a DOE loan guarantee for its American Centrifuge Facility located in Piketon, Ohio. USEC has already received an NRC license and is working with DOE on terms for the loan guarantee. Once the details of financing are finalized, USEC will begin construction on the facility. GE-Hitachi is pursuing a new laser enrichment technology at its nuclear headquarters campus in Wilmington, NC. The Global



Laser Enrichment facility has a test loop approved and running and has a license application for the full facility under NRC review.

In response to increasing demand, uranium mining and recovery operations are also expanding globally. In the U.S., current mining activities provide less than 10% of the requirements for the domestic fleet of 104 reactors. However, plans for expansion are underway. There are five NRC-licensed uranium recovery facilities in operation with six additional license applications under NRC review and an additional 16 applications expected to be sent to the NRC for review by 2013. The growth in these activities will support energy independence for the U.S. and provide additional diversity of supply.



Like other commodities, spot market prices for uranium are cyclical and historically have experienced three significant price escalations. The first occurred during the early 1950s due to government demand to fulfill military requirements. The second occurred during the 1970s from anticipated demand for the first expansion of U.S. commercial nuclear power.

The spot market has just experienced the third, beginning with a low of \$7 per pound at the end of 2000, undergoing a steep rise from \$36 per pound at the beginning of 2006 to a high of \$136 per pound at the end of the second quarter 2007, and settling back down to a range of \$40-\$50 per pound since January 2009.

The reasons for this most recent escalation include anticipation of the end in 2013 of the U.S.-Russian agreement to import downblended weapons-grade uranium; depletion of existing utility and producer inventories; and the participation of the financial sector, attracted by a potential investment opportunity as prices began to increase to historic highs. Factors contributing to the precipitous decline include announced expansion plans by the major uranium producers; small producers entering the market; and construction, started or planned, of new enrichment facilities with the potential to extend uranium use.

Nonetheless, participants do not anticipate a return to pre-2006 pricing, partly due to increased demand as plants under construction overseas start operating, and partly due to expected new plant construction in the United States and elsewhere.

The nuclear industry has multiple strategies to mitigate the effect of rising uranium prices on fuel costs. Historically, there has been no direct correlation between spot uranium prices and nuclear fuel costs for operating plants. This is partly because the spot market only accounts for 17 percent of the uranium market, and U.S. nuclear generating companies represent only 20 percent of spot market purchases.



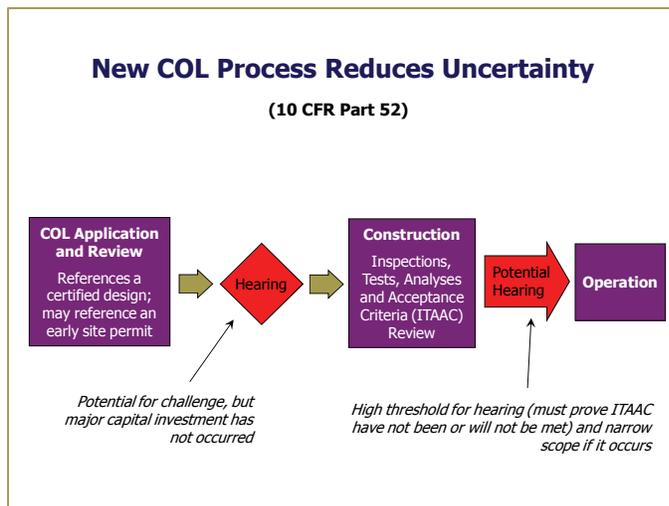
The price of uranium does not pose the kind of challenge for nuclear energy as fuel costs do for other sources of baseload generation. For example, 78 percent of the cost of generating electricity at a coal plant is the cost of the coal. At combined cycle gas plants, fuel is 89 percent of the production cost. At nuclear plants, fuel is only 28 percent of production costs, and only half of that is the cost of uranium. Conversion, fabrication and enrichment are also part of the cost of fuel at a nuclear plant, as well as the contribution to the federal Nuclear Waste Fund.

Finally, there are benefits to higher uranium prices. As in any commodity market, rising prices have stimulated development of new primary uranium production, which will be required to meet the anticipated rise in demand. The new production and enrichment capacity that will enter the market over the next several years will stabilize prices.

### New Nuclear Power Plant Development

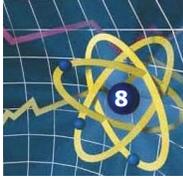
The last several years have seen renewed interest in new nuclear plant construction from the electric power industry and political leaders at the national, state and local levels. This renewed interest is the product of several converging factors:

- ▶ continued growth in electricity demand and tightening reserve margins are driving the need for new baseload generating capacity. According to government forecasts, the United States will need about 250,000 megawatts of new generating capacity by 2035.
- ▶ increasing fossil fuel prices, which have led to large rate increases in the cost of electricity in some states. This has reinforced the need for a diversified portfolio of generation sources.



- ▶ growing concerns about the risks associated with other major sources of electricity, notably clean air issues and climate change (coal-fired generation) and fuel supply/price volatility (gas-fired generation).
- ▶ implementation of federal and state policies that help stimulate the construction of new nuclear power plants, and provide assurance of investment recovery.
- ▶ increased public and political support. A poll of 1,000 adults in March 2010 by Bisconti Research, Inc./Gfk Roper indicates that 84 percent of Americans think nuclear energy is important for our energy future and 77 percent think that building a new plant at the existing plant site nearest them is acceptable.

Sixteen license applications have been submitted to the NRC. Those applications (COLAs) could encompass as many as 25 new nuclear reactors. (See table, page 16, for a complete list of new nuclear projects that have filed, or plan to file, COL applications.) NRC currently has 13 license applications, represent-



ing 22 new reactors, under active review. Two sites, Vogtle in Georgia and V.C. Summer in South Carolina, have already started pre-construction activities. Over 700 construction workers are at work at each site.

The process of licensing and building the first few new nuclear power facilities is expected to take 9-10 years: approximately two years to prepare an application to the NRC for a COL, approximately three and a half years for NRC review and approval of the COL, and 4-5 years for construction. After the first plants are built and operating, it should be possible to reduce licensing and construction time to approximately six years.

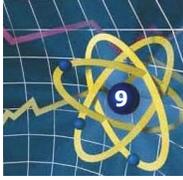
Site preparation activities started last year at a few new nuclear power plant sites. These first plants will start commercial operation around 2016 - 2017. Construction of significant numbers of new nuclear units is expected after the new licensing process is proven to work as intended and the first new plants have been successfully built and commissioned.

Nuclear Plant Construction: "Then and Now"	
Then	Now
Changing regulatory standards and requirements	More stable process: NRC approves site and design, single license to build and operate, before construction begins and significant capital is placed at risk
Design as you build	Plant fully designed before construction begins
No design standardization	Standard NRC-certified designs
Inefficient management construction practices	Lessons learned from nuclear construction projects overseas incorporated, and modular construction practices
Multiple opportunities to intervene, cause delay	Opportunities to intervene limited to well-defined points in process, must be based on objective evidence that ITAAC have not been, and will not be, met

***The New Licensing Process***

The next generation of nuclear plants will benefit from an improved licensing process, which was completely overhauled by the Energy Policy Act of 1992. The new process allows the NRC to: 1) pre-approve a prospective site for a new nuclear plant, 2) certify a new reactor design, and 3) issue a single license to build and operate a new nuclear plant. The new licensing process moves all major regulatory and licensing approvals to the front end of the process, before significant capital expenditures are made, thereby reducing licensing risk significantly.

This is a significant change from the old licensing process, under which all of today's nuclear plants were licensed. The old process required two licenses—one to build the plant, and another to operate it. In many instances, companies received a construction permit and started construction with only a conceptual design. The old process—"design-construct-inspect as you go"—invariably resulted in significant rework. Redesign and field modifications also resulted from a maturing regulatory process when the number and extent of regulations were expanding.



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**ITAAC are a key risk-management tool. When the ITAAC are met, the NRC and the public know that the plant has been built according to its design and hence will operate safely.**

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Under the old process, after the plant was built, it had to receive a second license to operate. In some cases, a multi-billion-dollar facility stood idle while the licensing proceeding progressed. In some cases, what should have cost \$500 million and taken six years to build cost several billion dollars and took 10-plus years to reach commercial operation.

The new licensing process requires designs to be substantially complete before a COL is granted. Furthermore, companies will not put capital at risk by beginning major construction until the plant design is complete.

The COL will also allow the plant to begin operating immediately when construction and testing are complete provided there is evidence that the plant has been built to design specifications.

### ***Risk Management: The ITAAC Process***

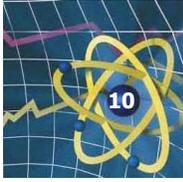
In any construction project, inspections, tests and confirmatory analyses are performed to ensure the facility has been built in accordance with the approved design. The same is true for new nuclear plants. Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) are included in the plant's combined construction and operating license. They provide objective criteria for determining that the completed plant has been built in accordance with the design.

ITAAC are a key risk-management tool. When the ITAAC are met, the NRC and the public know that the plant has been built according to its design and hence will operate safely. ITAAC allow the project developer to prove that the plant has been built according to design and, provided other conditions of the license are met, should be allowed to operate.

If a member of the public wishes to intervene in the process after the license has been issued and the plant constructed, the intervenor must provide objective evidence that (1) an ITAAC has not been met, or will not be met prior to plant operation, and (2) the specific adverse safety consequences of the non-conformance. The objective evidence must be based on specific facts, not subjective or general concerns. Absent such information, there is no basis for intervention and no grounds for a post-construction hearing that could delay operations.

This is a significant improvement over the previous licensing process, under which intervenors could raise subjective or generalized contentions towards the end of construction that sometimes prolonged the licensing process and delayed the start of power operations. The industry expects that the ITAAC regime will significantly reduce the potential for post-construction delays.

NRC will review post-construction ITAAC hearing requests, if any, grant or deny hearings after considering input from the NRC staff and licensee, hold any granted hearings, and render decisions before the fuel load date. If hearing issues cannot be resolved before fuel load, the Commission can allow interim operation provided there is reasonable assurance that the plant will operate safely during the interim period.

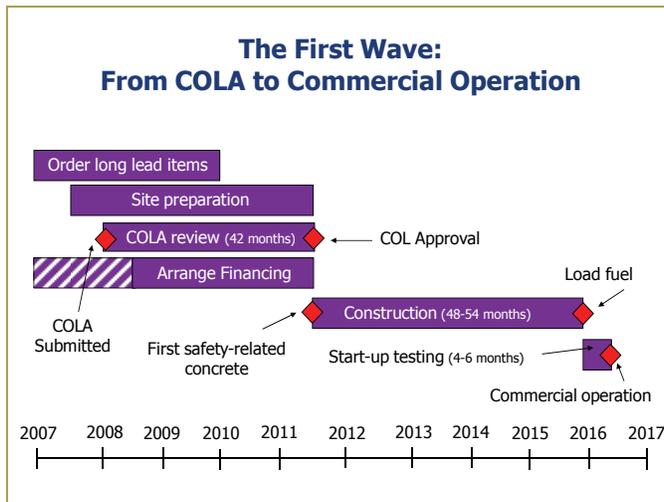


NRC rules require the licensee to complete each ITAAC and the NRC to verify that all ITAAC are met. Throughout the construction period, as ITAAC are completed, ITAAC completion notifications are provided to the NRC, enabling the NRC to verify completion of specific ITAAC during construction. In this way, the process provides a sound basis to prove ITAAC have been met, and reduces the likelihood that proposed contentions will contain the required threshold of evidence to be admitted.

### *Technology Readiness*

The new nuclear power projects now being developed employ advanced versions of the light water reactor technology used in the 104 operating plants, optimized for improved safety and reliability and lower operating and maintenance (O&M) costs. Unlike the advanced coal-based systems, which are growing more complex as plant designers grapple with more stringent environmental requirements, the advanced nuclear plants are moving in the direction of

greater simplicity, as plant designers take advantage of 30 years of operating experience to improve safety performance while reducing the number and complexity of engineered safety systems.



Because these new designs are evolutionary improvements on today's plants, and because several of these designs have already been deployed overseas, technology and operational risk is low. These designs are expected to achieve the O&M performance achieved by the top quartile of today's operating plants (i.e., below \$10 per megawatt-hour). Although precise estimates of capital cost must await the completion of detailed design and engineering work now underway, the advanced nuclear power plants are expected to

be competitive with advanced coal-based generating capacity, particularly if carbon capture and sequestration is required.

(For additional discussion of the cost of new nuclear plants, please see "The Cost of New Generating Capacity in Perspective," an NEI white paper that can be found at [www.nei.org/financialcenter/](http://www.nei.org/financialcenter/).)

### *Financing New Nuclear Generating Capacity*

Consensus estimates suggest that the U.S. electric power industry must invest at least \$1.5-2.0 trillion by 2030 in new generating capacity, new transmission and distribution infrastructure, and environmental controls. This new capital spending represents a major challenge to the electric power industry.

The Energy Policy Act of 2005 recognized this financing challenge and provided limited investment stimulus for construction of new baseload power plants. In the case of nuclear power, that stimulus includes:



- ▶ a production tax credit of \$18 per megawatt-hour for 6,000 megawatts of new nuclear capacity for the first 8 years of operation.
- ▶ a form of insurance (called standby support) under which the federal government will cover debt service for the first few plants if commercial operation is delayed. This coverage is capped at \$500 million for the first two reactors, and \$250 million for the next four reactors. The delays covered include NRC failure to meet schedules and litigation.
- ▶ federal loan guarantees for up to 80 percent of total project cost.

Of the three major incentives for new nuclear power plant development provided by the Energy Policy Act, the loan guarantee program is the most effective in addressing the major challenge facing new nuclear power plant deployment – construction financing.

#### **Energy Policy Act of 2005: Investment Stimulus for New Plants**

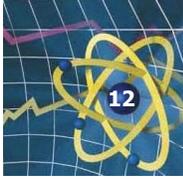
- ▶ Federal Loan Guarantees
  - Covers up to 80% of project cost
  - Allows project financing, more highly leveraged capital structure, reduces cost of electricity
- ▶ Production Tax Credits
  - \$18/MWh for up to 6,000 MW
  - Worth up to \$125 million in tax credits per year for 8 years for 1,000 MW of capacity
- ▶ Federal Standby Support
  - \$2 billion of risk coverage for first six plants
  - Covers delays resulting from licensing or litigation

A properly priced loan guarantee program would enable companies to employ project financing on a non-recourse basis. The ability to use non-recourse project finance structures offsets one of the most significant financing challenges facing new nuclear power plant construction – the cost of these projects relative to the size, market value and financing capability of the companies that will build them. A new nuclear plant is estimated to be a \$6-8 billion project (including interest during construction). Although \$6-8 billion projects are not unique in the energy business, such projects are typically built by consortia of major oil companies with market values many times larger than the largest electric companies.

Project financing, supported by loan guarantees, also allows a more efficient, leveraged capital structure, which reduces the weighted average cost of capital and thus provides a substantial consumer benefit in the form of lower electricity prices. Loan guarantees also mitigate the impact on the balance sheet of these large capital projects which would otherwise place stress on credit quality and bond ratings.

Loan guarantees are important to new nuclear plant financing for both unregulated and regulated companies. Unregulated generating companies will be hard-pressed to build nuclear power plants and other large capital-intensive baseload projects except on a project finance basis with the debt financing secured by the federal government. Unregulated companies do not have the capacity to finance these projects on balance sheet. Many regulated electric companies, especially those pursuing multiple generating and transmission projects at the same time, may also be limited in their ability to finance projects without project finance capability because of substantial pressure on credit quality and debt ratings.

The Department of Energy finalized the rules for the loan guarantee program in October 2007. According to the final rule, a guarantee may cover 100 percent of the project debt, provided that the debt does not exceed 80 percent of the



project's cost. In December 2007, Congress authorized DOE to grant \$18.5 billion of loan guarantees (called "loan volume") to new nuclear projects.

A rule change promulgated in December 2009 allows sharing of collateral and reverses DOE's prior insistence that it must have a first lien on the entire project. The revised rule provided the changes necessary to allow nuclear project sponsors to participate in the program. The revisions to the rule also facilitate the use of export credit agency financing, which will help extend loan volume and diversify risk to lenders including the federal government.

DOE issued a solicitation for loan guarantee applications from nuclear energy projects in June 2008. In October 2008, DOE announced it had received 19 Part I applications<sup>2</sup> from 17 electric companies for 14 nuclear power projects. The requested loan guarantees totaled \$122 billion, far exceeding the authorized \$18.5 billion. Ten nuclear power projects submitted Part II loan guarantee applications in December 2008, which represented \$93.2 billion in loan volume. In May 2009, DOE identified four lead projects for detailed due diligence and term sheet negotiations. Conditional commitments for up to \$8.33 billion in loan volume have been offered to the sponsors of the Vogtle project. The other three projects are still undergoing due diligence and/or final term sheet negotiations. The President's FY 2011 budget proposes an additional \$36 billion in funding for nuclear reactor projects, which would bring the total available for nuclear power projects to \$54.5 billion.

For regulated utilities, the most effective financial tool to lower construction costs is for the state regulator to permit the collection of interest costs and return on equity during construction. This policy is commonly known as Construction Work in Progress, or CWIP. The cost savings from CWIP, which will be passed on to consumers, amount to billions of dollars over the life of a project.

By paying carrying costs as they are incurred, the utilities and their customers benefit from:

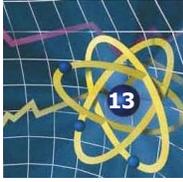
- ▶ *Reduced financing costs*—Carrying costs are not accumulated and capitalized over the life of the asset. The utility avoids paying "interest on interest" when the carrying costs are rolled into the long term project.
- ▶ *Reduced rate shock for consumers*—Financing costs are minimized and small rate increases are gradually introduced during construction.
- ▶ *Improved utility cash flows*—Carrying costs are included in the rate base as they are incurred. Improved cash flows support stronger financial ratings which result in lower interest costs for the project and all other utility investments long term.

### ***Project Development Process for New Nuclear Plants***

The process of building a nuclear power plant involves a number of successive decisions, with opportunities to pause between each decision, and three differ-

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<sup>2</sup> A Part I application is a high-level description of the project. The Part II application provides much more detailed information about all project characteristics.

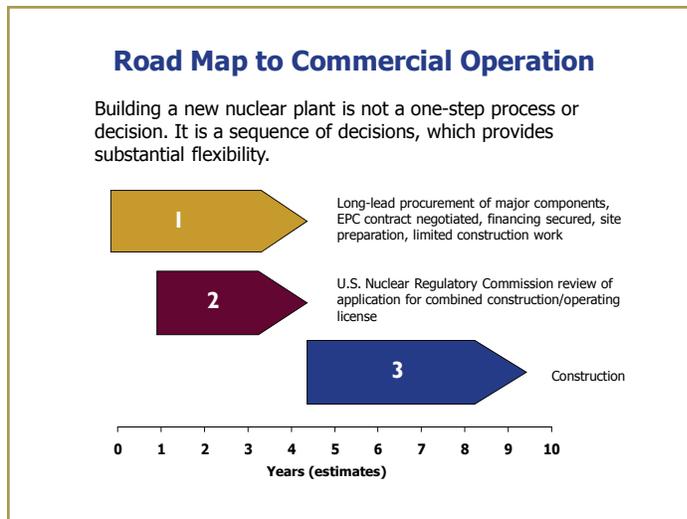


ing levels of financial commitment. The timeline shown is for the construction of the first reactors. Efficiencies gained through experience with licensing reviews and construction should reduce the overall timeline by as much as three years.

As they are preparing their COL applications, companies may start long-lead procurement of major components and commodities. Some companies planning new plants have ordered and are making progress payments for long-lead items like reactor pressure vessels and steam turbine generators. This step

secures a place in the manufacturing queue: it does not commit a company to build.

Those long-lead items are fungible assets that can, if necessary, be traded to other companies pursuing a more aggressive build schedule, as was the case with gas turbines in the 1999 - 2001 period.



The second step is filing an application for a COL. Preparing a COL application costs \$40-\$80 million, and obtaining NRC approval is currently a 42-month process. Once a company has a COL, it is not required to build a plant. A license is an asset, with a 40-year life. It can be exercised when granted or at some later time.

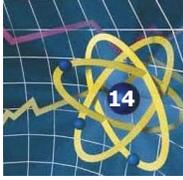
The third decision is proceeding with construction. This is the time when the COL has been granted, EPC (engineering-procurement-construction) contracts have been finalized, and financing, purchased power agreements, ownership and operational considerations are in place and resolved.

Companies pursuing aggressive schedules may elect to start construction before approval of their COL under a Limited Work Authorization (LWA). An LWA allows companies to begin some parts of the construction project like site preparation and road construction. This reduces the time between a decision to proceed with a combined license application and the start of commercial operation, and could save companies up to 18 months on their construction schedules.

The process of building a nuclear plant thus has great flexibility: There is no single irretrievable decision to build until all the pieces are in place, and all the risks identified and hedged.

### ***Timing and Pace of New Nuclear Plant Development***

Sixteen applications for COLs for up to 25 new reactors have been filed at the NRC. Thirteen of these applications, representing 22 new reactors, are under active review.

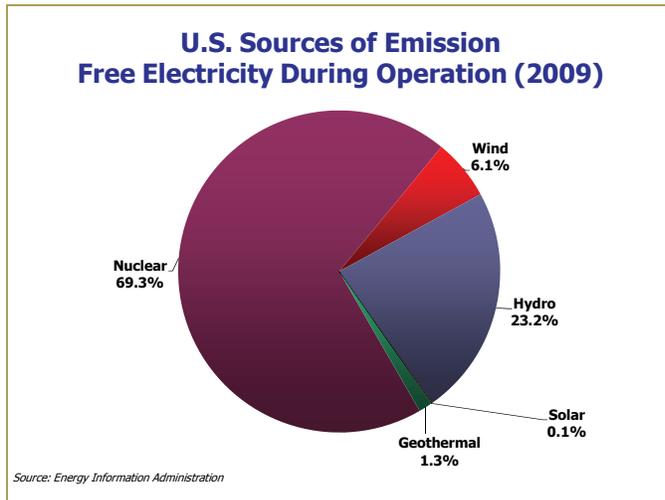


The industry does not expect that 25 new nuclear reactors will start construction in the near future. The licenses should be regarded as “options,” which position companies to build if and when business conditions justify.

Business conditions today are difficult. The economic downturn has depressed demand for electricity and natural gas. Natural gas prices have declined sharply and, as a result, forward power prices are well below levels expected 12-18 months ago. Many electric power companies have made significant cuts in capital spending and plans for new generating capacity — particularly large capital projects — have been delayed.

Given this business environment, a reasoned perspective on new nuclear plant build suggests that it will unfold slowly over time. A successful start to new plant construction will likely see four to eight new reactors in commercial operation between 2016 and 2020. The exact number will, of course, depend on many factors – electricity market conditions, capital costs of nuclear and other baseload technologies, commodity costs, environmental compliance costs for fossil-fueled generating capacity, natural gas prices, customer growth, cus-

tomer usage patterns (which would be heavily influenced by economic growth), availability of federal and state support for financing and investment recovery, and more.

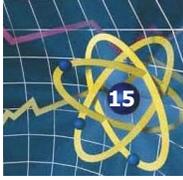


If those first plants are completed on schedule, within budget estimates, and without licensing difficulties, a second wave could be under construction as the first wave reaches commercial operation. The confidence gained by completing the first projects on time and within budget estimates will support the decision-making process for the follow-on projects, and provide incentive for supply-chain companies to continue investing in the expansion of the U.S. nuclear component manufacturing capacity.

### Future Economic Importance of a Clean-Air, Carbon-Free Technology

Nuclear energy is the only major source of baseload electricity generation that does not emit regulated air pollutants or greenhouse gases. As discussions of both tighter pollution controls and greenhouse gas reductions continue at the national, state, and regional levels and carbon emissions regimes are implemented, nuclear energy’s environmental benefits assume potential economic significance as well.

In 2009 alone, operating nuclear power plants prevented the emissions of almost 2 million tons of SO<sub>2</sub> and 600,000 tons of NO<sub>x</sub>. Nuclear energy is perhaps even more important when considering CO<sub>2</sub> emissions. The 647 million metric tons prevented by nuclear energy in 2009 is equal to the annual emissions from



124 million passenger cars. (There are only 137 million passenger cars registered in the United States.)

Construction of new nuclear plants will further help to reduce emissions. Florida Power and Light's filing with the Florida Public Service Commission for two new nuclear units at its Turkey Point Station states: "Compared with natural gas or IGCC generation that might otherwise be installed, over a 40-year period of operation, Turkey Point 6 and 7 will displace between 21,300 to 49,200 tons of NO<sub>x</sub>, approximately 14,200 to 75,400 tons of SO<sub>2</sub>, and about 266 million to 700 million tons of CO<sub>2</sub>."

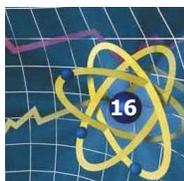
The new reactors will also help reduce costs to consumers: "for possible CO<sub>2</sub> compliance costs alone, the cumulative 40-year cost for alternative generation could range from \$6 billion to \$28 billion or more for combined cycle generation, and \$17 billion to \$73 billion or more for IGCC generation."

All mainstream analyses of the climate change issue by independent organizations show that reducing carbon emissions will require a portfolio of technologies, that nuclear energy must be part of the portfolio, and that major expansion of nuclear generating capacity over the next 30-50 years is essential.

Analyses of H.R. 2454, the American Clean Energy and Security Act, which passed the House in 2009, by the Environmental Protection Agency (EPA) and the Energy Information Administration (EIA) demonstrate that substantial increases in nuclear generating capacity will be essential to meet the legislation's carbon-reduction goals.

In the EPA analysis, nuclear generation increases by 150 percent, from 782 billion kilowatt-hours (kWh) in 2005 to 2,081 billion kWh in 2050. If all existing U.S. nuclear power plants retire after 60 years of operation, 187 new nuclear plants must be built by 2050. In EIA's analysis, in the "Basic" scenario, the U.S. would need to build 96 gigawatts of new nuclear generation by 2030 (69 new nuclear plants). This would result in nuclear energy supplying 33 percent of U.S. electricity generation, more than any other source of electric power. To the extent the United States cannot deploy new nuclear power plants in these numbers, the cost of electricity, natural gas and carbon allowances will be higher.

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### New Nuclear Plants Under Consideration<sup>1</sup>

Company	Site	Design	Number of Reactors	Date for Filing COL <sup>2</sup> Application
Alternate Energy Holdings	Payette County, ID	TBD	1	TBD
Amarillo Power	Amarillo, TX vicinity	EPR	1	TBD
Blue Castle Holdings	Green River, UT	TBD	TBD	TBD
Detroit Edison	Fermi (MI)	ESBWR	1	September 2008
Dominion	North Anna (VA)	APWR	1	November 2007
Duke Energy	William States Lee (SC)	AP1000	2	December 2007
Entergy <sup>3</sup>	River Bend (LA)	TBD	TBD	September 2008
Entergy <sup>3</sup> (NuStart Energy <sup>4</sup> )	Grand Gulf (MS)	TBD	TBD	February 2008
Exelon	Clinton (IL)	TBD	TBD	TBD
Exelon	Victoria County, TX	TBD	TBD	ESP filed March 2010
Florida Power & Light	Turkey Point (FL)	AP1000	2	June 2009
Luminant	Comanche Peak (TX)	APWR	2	September 2008
NRG Energy/STPNOC	South Texas Project (TX)	ABWR	2	September 2007
PPL Corporation	Susquehanna (PA)	EPR	1	October 2008
Progress Energy	Harris (NC)	AP1000	2	February 2008
Progress Energy	Levy County, FL	AP1000	2	July 2008
PSEG	Hope Creek/Salem (NJ)	TBD	TBD	ESP filed May 2010
South Carolina Electric & Gas	V. C. Summer (SC)	AP1000	2	March 2008
Southern Company	Vogtle (GA)	AP1000	2	March 2008
Southern Company	TBD	TBD	TBD	2011
Southern Ohio Clean Energy Park Alliance	Piketon, OH	TBD	TBD	TBD
TVA (NuStart Energy <sup>4</sup> )	Bellefonte (AL)	AP1000	2	October 2007
UniStar Nuclear <sup>5</sup>	Calvert Cliffs (MD)	EPR	1	March 2008
UniStar Nuclear <sup>5</sup>	Nine Mile Point (NY)	EPR	1	October 2008

<sup>1</sup> This compendium is based on public announcements as of August 2010.

<sup>2</sup> Construction/Operating License

<sup>3</sup> Entergy has requested suspension of NRC review of its application while it evaluates technology options.

<sup>4</sup> NuStart Energy includes Constellation, Duke, EDF International North America, Entergy, Exelon, FPL Group, General Electric-Hitachi, Progress, SCANA, Southern, Tennessee Valley Authority, Westinghouse.

<sup>5</sup> UniStar Nuclear is a joint venture of Constellation Energy and AREVA. The review of the Nine Mile Point application was suspended at Unistar's request, but is expected to resume in 2010.



## Status Of Advanced Nuclear Power Plant Designs<sup>1</sup>

Design	Supplier	Background and Current Status
Advanced Boiling Water Reactor	GE-Hitachi/ Toshiba	This large (1,350 MWe) boiling water reactor is an evolutionary improvement on the boiling water reactors that make up approximately one-third of the U.S. nuclear power plant fleet. The first models of this design were deployed commercially by Tokyo Electric Power Co. at its Kashiwazaki-Kariwa generating station in Japan. TEPCO and other Japanese utilities continue to build ABWRs. In the United States, the Tennessee Valley Authority has completed an assessment of the economic feasibility of building an ABWR at its Bellefonte site, but has no firm plans to move forward. This design was certified by the NRC in 1997, and GE-Hitachi has announced plans to renew the 15-year certification. An amendment to the design to address the aircraft impact rule is currently under NRC review.
AP1000	Westinghouse	The AP1000 is a larger (1,100 MWe) version of the AP600, a mid-sized (600 MW) reactor and the first approved by the NRC to employ so-called "passive" safety features. The passive designs substitute natural forces like gravity to deliver cooling water to the reactor. The improved design eliminates a number of the pumps, valves, piping and other components that increase the complexity and the capital cost of today's nuclear plants. The AP600 was certified by the NRC in 1999. Westinghouse found that the AP600 was not large enough to be competitive in today's electricity markets, and has increased the size of the plant and changed the name to the AP1000. The AP1000 also employs "passive" safety features. The AP1000 is the design being offered by Westinghouse for new reactor construction in the United States and is also the basis for Westinghouse's bid to build four reactors in China. The AP1000 received its Final Design Approval (FDA) from the NRC in late 2004, and the final certification rule became effective in January 2006. Amendments to the design to address the aircraft impact rule, and additional details, are currently under NRC review.
ESBWR	GE-Hitachi	The ESBWR is GEH's new design incorporating "passive" safety features. By simplifying the design of the ESBWR compared to the ABWR, GEH expects to reduce the capital cost of the plant by approximately 20 percent. The ESBWR (1,550 MWe) is being considered by the consortium led by Dominion Resources, which would build the plant at its North Anna site in Virginia, and Detroit Edison, which would build the plant at its Fermi site in Michigan. GEH filed its application for design certification with the NRC in August 2005. The application has been accepted and is currently under review.



### Status Of Advanced Nuclear Power Plant Designs<sup>1</sup> (continued)

Design	Supplier	Background and Current Status
EPR	Areva (in the U.S. market: UniStar, a joint venture of Areva and Constellation)	The EPR is a large (1,600 MWe) design developed by Areva, the reactor supplier formed by Framatome (France) and Siemens (Germany). Areva has formed a joint venture with Constellation Energy Group called UniStar Nuclear to deploy the EPR technology in the United States. The first EPR is now being built in Finland, and it will be the next generation of nuclear plants built in France by Electricité de France (Flamanville Unit 3, an EPR, is currently under construction). The EPR is an advanced light water reactor. The EPR design includes additional safety features not in today's light water reactors, including four safety trains instead of two, bunkered safety systems, double containments, and additional severe accident management features. Areva made a design certification submittal to the NRC for the EPR in December 2007.
US-APWR	Mitsubishi	The Mitsubishi US-APWR (1,700 MWe) is the largest PWR design available. The US-APWR is an evolutionary design incorporating features of the existing Mitsubishi fleet of 23 Japanese PWRs and the advanced features incorporated in the APWRs to be built at Tsuruga. The US-APWR planned design includes a lower power density, thermal efficiency of 39%, and a four-train safe guard system to increase redundancy, safety, and reliability. The combination of a 20% reduction in plant building volume, the proven advanced construction techniques of steel concrete structures, and large modules is projected to reduce the construction cost of the US-APWR. The application for a US-APWR design certification was submitted to the NRC in January 2008.

<sup>1</sup> As of July 2010.