FACT SHEET

Licensing New Nuclear Power Plants

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Key Facts

■ The vast majority of today's 104 U.S. nuclear power plants were licensed during the 1960s and 1970s. Commercial nuclear energy was new, and the regulatory process evolved along with the new industry. Plants were issued a construction permit based on a preliminary design. Safety issues were not fully resolved until the plant was essentially complete—a process flaw that had substantial financial implications. This flaw also meant that the public did not have access to the details of the design until construction was nearly complete.

■ To address this process flaw, the U.S. Nuclear Regulatory Commission in 1989 established a new licensing process: 10 CFR Part 52. Congress affirmed and strengthened the new licensing process as part of the 1992 Energy Policy Act.

■ The new approach to licensing nuclear power plants moves the licensing and safety issues to the front of three processes: approval of standard designs, early site permits, and combined construction permits and operating licenses. In addition, it provides greater opportunity for the public to be involved in the process. To ensure a company builds a new plant according to its license, the NRC introduced a process that determines which kinds of inspections, tests, analyses and acceptance criteria (ITAAC) it will use to ensure the plant is built according to the design approved in the licensing proceedings.

New Licensing Process

The new NRC licensing process provides for design certification, early site approval and combined licensing for construction and operation.

Design Certification

Design certification allows plant designers to secure advance NRC approval of standard plant designs. Later, these plant designs can be ordered, licensed for a particular site and built.

Following an exhaustive NRC safety review, agency approval of standard designs is formalized via a specific design certification rulemaking. This process allows the public to review and comment on the designs up front—before any construction begins. NRC design certification fully resolves safety issues associated with the design. The NRC approves the design for 15 years.

Once a design certification application has been submitted, the NRC takes between 36 and 60-plus months to complete the review and rulemaking, depending on whether the agency previously has reviewed and approved the technology.

To date, the NRC has certified four advanced-plant designs, including GE Hitachi Nuclear Energy's (GEH) Advanced Boiling Water Reactor and Westinghouse's AP1000. One additional design, GEH's ESBWR, is under NRC review. In 2007, two companies submitted designs to the NRC for certification review: AREVA submitted its U.S. EPR design, and Mitsubishi Heavy Industries Ltd. submitted its U.S.-APWR design. The NRC is performing an acceptance review on the submittals. If the agency deems the applications complete, the NRC will begin its safety review. In addition, the NRC expects to receive several more applications for design certification over the next few years.

Design standardization offers significant benefits. The approach anticipates that reactors will be built in families of the same design, except for a limited number of site-specific differences. Standardization will reduce construction and operat-

ing cost, and lead to greater efficiencies and simplicity in nuclear plant operations, including safety, maintenance, training and spare-parts procurement. Standardization is a major departure from the first generation of U.S. nuclear reactors, which are nearly one-of-a-kind.

International experience demonstrates the benefits of standardization. The French nuclear program is based on standardized nuclear plant designs. France's 59 reactors provide 78 percent of the nation's electricity.

Early Site Approval

The early site permit (ESP) process enables companies to obtain approval from the NRC for a nuclear power plant site before deciding to build a plant. The process resolves any site suitability issues before companies commit funds to a project. Companies can "bank" sites approved by the NRC for up to 20 years and build when the time is right. Having a pre-approved site can dramatically shorten the time to bring a new plant to market. However, the NRC does not require an applicant for a new-plant license to obtain an ESP.

ESP applications consist of three components: a site safety analysis, an environmental report and emergency planning information. Federal, state and local government officials and the public have opportunities to participate in each of these at various stages during the NRC review.

An ESP review process that encompasses a range of reactor designs enables companies to select the best design when they proceed with a decision to build. Through the use of the "plant parameters envelope" concept, the NRC can assess the suitability of a site based on a generalized plant description that takes into account the characteristics of several designs—for example, the height of the tallest building and the greatest cooling water requirement for any design under consideration. Using this approach, the NRC has the information it needs to assess site suitability, and companies can choose the best technology when they proceed with a new plant.

It takes between 12 and 24 months to develop an ESP application, depending on whether it is a "greenfield" site or a site adjacent to an existing facility. Once the applicant submits the application, the process of NRC review and approval—including the public hearing—takes approximately 33 months. The industry and NRC staff are looking at ways to improve the effectiveness of the review and reduce the review and approval schedules.

The Combined License

10 CFR Part 52 of NRC regulations provides for issuance of a combined construction permit and operating license, also known as a combined operating license (COL). A COL may reference a certified design, an ESP or both.

All issues resolved in connection with earlier proceedings associated with a standard design or site will be considered resolved for purposes of the COL proceeding. This makes the process more effective and efficient by allowing the NRC review and a public COL hearing to focus on remaining issues related to plant ownership, design issues not resolved earlier, and organization and operational programs.

Granting a COL signifies resolution of all safety issues associated with the plant.

The one issue that cannot be addressed up front is whether the plant, once built, conforms to the requirements of the license and is ready to operate. For this, Part 52 provides the ITAAC process, which specifies the inspections, tests, analyses and acceptance criteria that will be used to assess the completed plant. Under this process, the ITAAC elements are agreed upon during the design certification process and in the combined license. They then will be used during construction to determine that the constructed plant conforms to its licensing requirements.

No applicant has yet been through the entire COL process. The NRC currently estimates that the review and approval of the first set of

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COLs could take as long as 42 months.

Testing the New Reactor Licensing Process

Through its Nuclear Power 2010 initiative, the U.S. Department of Energy funded a portion of the costs to support applications for early site permits for the Clinton, Grand Gulf and North Anna nuclear power plant sites. The NRC approved ESPs for all three sites.

In addition, DOE is partially funding efforts to test the NRC's new COL process. The objective is to demonstrate the new processes so that a COL can be issued and construction can begin in 2010. Completing the detailed design for two reactor designs is an essential part of the testing because it will help ensure that applications for COLs are complete and meet NRC standards for license applications.

Applying the NRC Licensing Process

Two of the companies proposing to build reactors had sites approved by the NRC through the ESP process prior to submitting their COL applications. Because they "banked" these approved sites, when they submitted their COL applications—North Anna in November 2007 and Grand Gulf in February 2008—that part of the approval process was behind them.

The other companies that plan to apply for COLs in the next few years are preparing applications for site approval simultaneously with their COL applications. They will request site approval as part of the COL process.

Currently, 17 companies and consortia are pursuing plans to build more than 30 reactors in the United States based on five standard designs.

Energy Policy Act of 2005

The Energy Policy Act of 2005 includes a wide range of incentives to encourage new-reactor construction. These include:

- loan guarantees for various forms of innovative and new, low-emission generation
- nuclear energy production tax credits for the first 6,000 megawatts of electricity from new advanced reactors at 1.8 cents per kilowatt-hour—a tax credit comparable to that provided to wind energy
- a new assistant secretary for nuclear energy position within DOE
- standby insurance, underwritten by the federal government, to protect those companies building new reactors from the risk of regulatory delays and other unforeseen setbacks in advancing first-of-a-kind reactor technology
- authorization of almost $3 billion in nuclear research and development to support such efforts as testing of new licensing processes and the demonstration of nuclear energy to produce hydrogen.

What Is Driving Interest In New Nuclear Plants?

Several factors are contributing to the growing interest in new nuclear power plants: rising electricity demand, clean-air concerns, the performance and reliability of existing plants, and the tight supply—and price volatility—of natural gas. These factors, along with excellent nuclear plant safety and reliability, have contributed to increasing public and policymaker support for nuclear energy.

- ***Electricity Demand.*** DOE projects that the United States will need 30 percent more electricity by 2030.
- ***Clean Air.*** Concern about air pollution is leading to increasingly tight restrictions on emissions of sulfur dioxide, nitrogen oxide and mercury. The federal government also may decide to regulate emissions of carbon dioxide, the principal greenhouse gas. Nuclear energy accounts for nearly three-quarters of the U.S. electric generation with none of these emissions.
- ***Excellent Performance.*** The nation's 104 nuclear power plants operate at high levels of safety, reliability and affordability. Results from the NRC's reactor oversight

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process, posted on the agency's Web site, show consistently high safety performance across the industry. The average capacity factor for nuclear plants—a measure of reliability—has remained about 90 percent since 2000. And nuclear plants are the lowest-cost electricity providers, producing electricity for about 1.7 cents per kilowatt-hour.

- ***Price Volatility.*** Natural gas fuels nearly all the electric generating capacity built in the past 10 years. The nation has placed unsustainable demand on the natural gas supply, and that means continuing volatility in prices.

- ***Support for Nuclear Energy.*** A national survey conducted in October 2007 found a high level of support among the public for nuclear energy, with 64 percent saying they favor it as one way to produce electricity. Of those who had heard about the clean-air role of emission-free nuclear energy, 69 percent said they favor its use. Support among policymakers also is very high, as evidenced by passage of the Energy Policy Act of 2005.

The United States needs a diversified portfolio of electricity sources that includes nuclear energy, renewables (wind, solar and biomass), and clean-coal and natural gas-fired generation. The nuclear energy industry and the federal government are working to ensure that electric companies will have the option of building new nuclear reactors when they need large new power plants.

To learn the status of new-plant activities in the United States, see the "New Nuclear Plant Status" table on the NEI Web site. To locate the table, paste this URL into your browser: *www.nei.org/resourcesandstats/documentlibrary/newplants/graphicsandcharts/newnuclearplantstatus/*

This fact sheet also is available at www.nei.org.