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August 5, 2008

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Response to Environmental Audit Information Needs

Reference: Dolan to NRC Document Control Desk, *Application for Combined License for William States Lee III Nuclear Station Units 1 and 2,* December 12, 2007

From April 29, 2008 through May 2, 2008, the U.S. Nuclear Regulatory Commission (NRC) Staff performed a site audit of the William States Lee III Nuclear Station regarding the Environmental Report, Part 3 of the referenced application. During the audit, the NRC Staff identified the need for additional information on a number of topics.

This letter contains, as separate enclosures, information to address specific information needs related to the following audit topics: Cultural Resources, Hydrology and Meteorology. Each enclosure corresponds to an individual information need.

If you have any questions or need any additional information, please contact Peter Hastings at 704-373-7820.

Bryan J. Dolan
Vice President
Nuclear Plant Development

D079
NRO

Enclosures:

1. WLS Environmental Audit Information Need CR-4c
2. WLS Environmental Audit Information Need H-64
3. WLS Environmental Audit Information Need MET-11

AFFIDAVIT OF BRYAN J. DOLAN

Bryan J. Dolan, being duly sworn, states that he is Vice President, Nuclear Plant Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

Bryan J. Dolan

Bryan J. Dolan

Subscribed and sworn to me on August 5, 2008

Phoebe P. Elliott

Notary Public

My commission expires: June 26, 2011

SEAL

xc (wo/enclosures)

Michael Johnson, Director, Office of New Reactors
Gary Holahan, Deputy Director, Office of New Reactors
David Matthews, Director, Division of New Reactor Licensing
Scott Flanders, Director, Division of Site and Environmental Reviews
Glenn Tracy, Director, Division of Construction Inspection and Operational Programs
Luis Reyes, Regional Administrator, Region II
Loren Plisco, Deputy Regional Administrator, Region II
Thomas Bergman, Deputy Division Director, DNRL
Stephanie Coffin, Branch Chief, DNRL

xc (w/enclosures)

Linda Tello, Project Manager, DSER
Brian Hughes, Senior Project Manager, DNRL

NRC Environmental Audit of Lee Nuclear Station Regarding ER 2.5, "Socioeconomics"

Reference Environmental Audit Question Number(s): CR-4c

NRC Information Need:

During the Lee Nuclear Station Environmental Audit exit meeting on May 2, 2008, the NRC staff requested information of the following items related to cultural resources:

Provide a White Paper on cultural resource issues that addresses the following items:

1) Description of the Area of Potential Effect (APE) discussion with the State Historic Preservation Office (SHPO) and the considerations made for the laydown area and parking lot. This discussion should also identify the organization that defined the APE and provided the associated assumptions.
2) Description of the consultation process with SHPO and how local tribes and other interested parties are notified.
3) Description of the historians' methods for performing historical research for the Brockington 2007 Cultural Resource Study.
4) Description of the process used to establish the extent of previous ground disturbance including original construction and periods of time which Duke Energy was not the owner and other site usage.
5) Description of the future consultation with SHPO on undetermined APEs and how Section 106 will be addressed.
6) Description of the informal agreement with Duke and SHPO regarding the monitoring of future work.
7) Description of the level of effort to determine if there could be traditional cultural properties (TCPs) and the methodology for determining that there are no TCPs if applicable.
8) Discussion on how cemetery access to interested parties will be provided.
9) Description of the cumulative affects of plant operation on cultural resources and how inadvertent discoveries will be addressed.
10) Description of how the conclusion was reached regarding the effects of construction and operational impacts being determined as SMALL with respect to cultural resources.

Duke Energy Response to Information Need:

The attached white paper addresses the 10 cultural resource issues listed above.

Associated Revision to the Lee Nuclear Station Combined License Application: None

Attachments:

The requested white paper is provided as Attachment CR-4c-1:

CR-4c-1. White Paper for the Cultural Resources Survey of the Proposed Lee Nuclear Station Cherokee County, South Carolina

White Paper for the Cultural Resources Survey of the Proposed Lee Nuclear Station, Cherokee County, South Carolina

Introduction

This document was prepared in response to U.S. Nuclear Regulatory Commission (NRC) requests for clarification or additional information related to the Section 106 process for Duke Energy's Construction and Operating License application for the Lee Nuclear Station. The requests follow a formal NRC audit of the project that took place at the Lee Nuclear Site and at the Duke Energy offices in Charlotte April 28-31, 2008, and at the State Historic Preservation Office (SHPO) on May 1, 2008.

1. Establishment of the APE

Staff from Enercon Services, Inc. and Brockington and Associates conducted a thorough review of the previously conducted cultural resources investigations on and near the Lee Nuclear Site during the summer of 2006. This research involved several visits to the state site files at the South Carolina Institute of Archaeology and Anthropology in Columbia, South Carolina, and the Cultural Resource Information System (CRIS) at the South Carolina Department of Archives and History in Columbia.

The Project Manager from Brockington and Associates met on-site on September 21, 2006, with Mr. Ted Bowling of Duke Energy to review topographic maps, aerial photographs, and plans from the former Cherokee project. The current Lee Nuclear Site was visually inspected with respect to the former Cherokee Site to assess current conditions.

Following the background research and field reconnaissance, Brockington staff employed geographic information systems (GIS) to digitally analyze and compare the previous land disturbance at the site with the current plans for the Lee Nuclear Station.

Duke Energy then requested a meeting with the SHPO to introduce them to the project. That meeting was held at the SHPO on December 7, 2006, and was attended by Ted Bowling (Duke Energy); Rebekah Dobrasko (Review and Compliance Coordinator, SHPO); Chuck Cantley (Staff Archaeologist, SHPO); and Ralph Bailey (Project Manager, Brockington and Associates). Mr. Bowling began with an introduction to the project using a PowerPoint presentation. Mr. Bailey followed with a summary of the previous investigations in the project area and how they relate to the proposed project. This investigation was conducted through aerial photographs and USGS maps provided in the PowerPoint presentation. A printed version of the presentation, large-scale maps showing known sites, and a copy of the previous survey conducted for the Cherokee Site by Bianchi (1974) were provided to the SHPO. Mr. Bowling then presented the SHPO with a review of the NRC process and tribal consultation efforts to date. He provided the SHPO with copies of the invitation letters that had been sent and all of the responses that were received. Finally, Mr. Bowling provided the SHPO with an outline and schedule for completing the National Environmental Policy Act (NEPA)/Section 106 process. The cultural resources work is being completed in phases as plans are developed. The phases include the main plant site and water intake area, the railroad spur, the water discharge area, and finally the transmission line corridors.

Based on the initial consultation meeting with the SHPO, Brockington and Associates developed a Scope of Work that defined the APE for the main plant site, including all access improvements, parking, and laydown areas, and described in detail the level of effort that would be employed to complete the cultural resources survey for the site. The archaeological APE was defined as the original Cherokee Site, plus a 5-acre bluff overlooking the Broad River that is the site of a proposed water intake, and a 100-foot-wide corridor for an improved overlook road along McKown's Mountain ridge. The two areas were outside the original Cherokee Site and therefore not subjected to the extensive land disturbance as the primary 750-acre plant site. The area of potential effect (APE) for historic aboveground resources was defined as a 1-mile radius from the proposed cooling towers and meteorological tower (Met Tower 3).

The Scope of Work for the main plant site was submitted by Ralph Bailey to the SHPO and the Eastern Band of Cherokee Indians for review on January 25, 2007. The Scope of Work and defined limits of the APE were accepted by the SHPO on February 26, 2007. Tyler Howe of the Eastern Band of Cherokee Indians did not comment on the Scope of Work.

For the railroad spur, Duke Energy provided Brockington and Associates with the grading plans and profiles for the original Cherokee line. With one exception, a small alignment shift to avoid an operating business, the proposed line follows the same path as the previously constructed line. It is anticipated that very little, if any, improvements to the graded corridor will be required to make the line serviceable again. Andrew Agha, Project Archaeologist, conducted a visual inspection of approximately 2 miles of accessible areas along the corridor to assess current conditions in the corridor.

Brockington and Associates developed a Scope of Work for the railroad spur. The archaeological APE was defined as the limits of the proposed new right-of-way for the one section of realignment in the area of the operating business. It was proposed that a visual inspection of the section of existing corridor that passes through the former Ellen Furnace (site 38CK68) be conducted. This site is eligible for the National Register of Historic Places (NRHP). The Scope of Work was submitted to the SHPO and Eastern Band of Cherokee Indians on August 6, 2007. The SHPO approved the archaeological APE on October 9, 2007, via email. Tyler Howe, Tribal Historic Preservation Officer (THPO) of the Eastern Band of Cherokee Indians, did not comment. In her October 9th email, Ms. Dobrasko requested that an architectural survey of the corridor be included as well because that survey did not appear to have been done as part of the original Cherokee Site project. Ed Salo, Project Architectural Historian, followed up with Ms. Dobrasko via telephone in early November 2007 to establish the architectural APE, which was defined as 300 feet to either side of the existing and proposed new corridors.

2. The SHPO and Tribal Consultation Process

At the beginning of the consultation process, Duke Energy asked the SHPO to provide them with the contact information for all Native American tribes and organizations that needed to be invited to participate in the process. Duke Energy subsequently wrote letters to each of those invitees in June 2006. Responses were received throughout that summer. The Eastern Band of Cherokee Indians requested a cultural resource survey and that they be permitted to review and comment on all formal documents, including scopes of work, technical reports, etc. related to the project.

This request has been followed throughout the project. The Eastern Shawnee Tribe of Oklahoma and Catawba Nation declined to participate in the process unless human remains or other Native American Graves Protection and Repatriation Act-related items were encountered during the project. No such findings have taken place to date. No other tribes or organizations responded. In the December 7, 2006, meeting with the SHPO (See Section 1), Mr. Bowling presented a review of the NRC process and tribal consultation efforts to date. In addition, he provided the SHPO with copies of the invitation letters that had been sent and all of the responses that were received.

3. Historian Methodology

Background Research

The project began with brief background research regarding the historical development of the proposed Lee Nuclear Station and railroad corridor. This research helped to identify, assess, and interpret the aboveground historic resources within the study area, as well as to develop the various historic contexts for the region. Background research was performed to locate any known NRHP properties or previously recorded cultural resources within or near the study area. Additional background research consisted primarily of archival research. The survey team placed particular emphasis on sources that documented the new areas of the proposed Lee Nuclear Station and railroad corridor, with a special focus on maps and plats, as well as research that has already been conducted regarding historic properties within the proposed Lee Nuclear Station and railroad corridor study area. Additionally, because of the study area's proximity to the Battle of King's Mountain, one of Brockington's Senior Historians identified all potential Revolutionary War sites in the study area to determine if any would be affected by the proposed undertaking.

This background research led to completion of a historical overview that identifies important themes and patterns in the proposed Lee Nuclear Station and railroad corridor's historical development. The overview served two important ends. First, it is an introduction to county and regional history for the general reader. Second, the overview provides a context within which to identify and assess the significance of the proposed Lee Nuclear Station and railroad corridor's historic architectural resources and their eligibility for inclusion in the NRHP, and for local designation, which rests, to a large extent, on the relationship between a historic architectural resource and its historical context. This historical context also allowed the field surveyors to predict and be alert to the presence of certain types of historic resources, and to understand their significance in the field.

To identify historic themes for the context, the Senior Historian first examined Kovacik and Winberry (1987) and Edgar (2006) to identify major historic themes for the area. He also researched previous NRHP nominations and Multiple Property cover forms for Cherokee and York counties to assist in the preparation of the historic context. One of the topics of focus was an examination of the iron industry in the area (Ferguson and Cowan 1997). Finally, the Senior Historian utilized the York County Architectural Survey (Jaeger Co. 1993) and previous studies in the area. The approach was to provide a context for the major themes, iron and hydroelectricity production for example, with the understanding that if resources were identified

during fieldwork, additional specific research on those resources would be conducted. Brockington historians used Harvey (2001) as the basis for the context.

Based on the research, the Senior Historian identified several historical themes related to the proposed Lee Nuclear Station and railroad corridor. These themes emerged after a review of secondary sources relating to the history of the area and the state as a whole. Themes that were explored include:

ARCHITECTURE
- Development of rural housing
- Religious institutions

ETHNIC HERITAGE/SOCIAL HISTORY
- African-American history
- European-American history

INDUSTRY
- Iron Industry
- Hydroelectric production

TRANSPORTATION/ENGINEERING
- Development patterns
- Railroad construction

AGRICULTURE
- Development of agriculture, especially tobacco and cotton

Architectural Survey Methodology

Using the context developed before the fieldwork, the architectural historian conducted two intensive architectural surveys of all aboveground cultural resources within the project tract and of the railroad corridor. Both of the surveys included a buffer that was prepared with SHPO concurrence to take into account any possible visual effects of the proposed undertaking. This area is the architectural survey universe. The survey was designed to identify, record, and evaluate all historic architectural resources (buildings, structures, objects, designed landscapes, and/or sites with aboveground components) in the project area. Field survey methods complied with the *Survey Manual: South Carolina Statewide Survey of Historic Places* (SCDAH 2007) and National Register Bulletin 24, *Guidelines for Local Surveys: A Basis for Preservation Planning* (Parker 1985). In accordance with the scope of work and standard SCDAH statewide survey practice, the project architectural historian drove every street and road in the architectural survey universe, and conducted a pedestrian inspection of all potential historic architectural resources.

Before the fieldwork began, the architectural historian examined the USGS topographical maps of the project area to identify any potential resources that would need to be inventoried. He also examined the 1930s and 1970s-era country highway maps for Cherokee and York counties as a means to identify other potential aboveground resources. The principal criterion used by SCDAH

to define historic architectural resources is a 50-year minimum age. However, that rule does not always allow for the recordation of all historically significant resources that could include resources related to the civil rights movement, the Cold War, or the development of tourism in South Carolina. In addition, certain other classes of architectural resources may be recorded (SCDAH 2007:9):

- Architectural resources representative of a particular style, form of craftsmanship, method of construction, or building type.
- Properties associated with significant events or broad patterns in local, state, or national history.
- Properties that convey evidence of the community's historical patterns of development.
- Historic cemeteries and burial grounds.
- Historic landscapes such as parks, gardens, and agricultural fields.
- Properties that convey evidence of significant "recent past" history (i.e., civil rights movement, Cold War, etc.).
- Properties associated with the lives or activities of persons significant in local, state, or national history.
- Sites where ruins, foundations, or remnants of historically significant structures are present.

All historic architectural resources in the survey universe that retained sufficient integrity to be included in the South Carolina Statewide Survey (SCSS) were recorded on SCSS site forms in digital format using the Survey database in *Microsoft Access*. At least one black-and-white photograph, preferably showing the main and side elevations, was taken of each resource. The location of each historic architectural resource was recorded on USGS topographic maps. The completed forms, including the various maps and photographs, were prepared for SCDAH for review. Photography for this project included digital images produced by methods demonstrated to meet the 75-year permanence standard required by the SHPO and the National Park Service (NPS 2005; SCDAH 2007:3 1). While in the field, the historian conducted informal interviews with several local residents to determine the age of resources and if any significant individuals lived in any of the resources. The local informants did not identify any significant resources. Because no resources appeared to be eligible for the NRHP, the historian did not have to conduct any further research regarding the resources.

4. Determination of Previous Ground Disturbance

The Lee Nuclear Site is in a region with high topographic relief. This topography allowed the project archaeologists to interpret early aerial photographs, topographic maps, and Cherokee Site construction plans using GIS to determine the extent of the past land disturbance on the site. In addition, the Project Manager performed a field reconnaissance in which he visually inspected the tract using Mr. Ted Bowling of Duke Energy and the early maps and photographs to field-verify the disturbance.

5. Future Consideration of Undetermined APEs

The archaeological and historic architectural APEs have not been determined for the transmission line corridors and the water discharge location. A siting study has been conducted for the transmission line corridors. After a preferred corridor is selected and a location for the water discharge is selected, a detailed Scope of Work will be submitted for each undertaking to the SHPO and Eastern Band of Cherokee Indians prior to fieldwork. The scope will provide clearly labeled maps, and will clearly define the APEs for the undertakings and the level of effort that will be employed to complete the surveys. Any comments will be addressed as received in the final Scope of Work for each undertaking. If any additional on-site or off-site undertakings are planned in the future, this procedure will be followed for them as well.

6. Management Agreement with the SHPO

Duke Energy has established a long working relationship with the SHPO in South Carolina. Throughout the history of this relationship, Duke Energy has taken a proactive approach to the consultation process in general and towards the appropriate management of inadvertent discoveries. Duke understands that the management of cultural resources requires an on-going, long-term approach and will continue to work closely with the SHPO.

The SHPO recently stated that, "a programmatic agreement or some other formal agreement may be the best way to handle historic properties and cultural resources at the Lee Nuclear Plant Site" (email form Rebakah Dobrasko [SHPO] to Linda Tello [NRC] on May 30, 2008). Duke Energy will continue to work with the SHPO and NRC to establish such an agreement.

7. Assessing the Potential for TCPs

Due to the limited amount of tribal land in the Southeast and specifically in South Carolina, very few traditional cultural properties (TCP) have been identified in this state. The assessment of TCP potential for the Lee Nuclear Site was made by the Eastern Band of Cherokee Indians, as requested, through a review of the draft reports that were provided for the plant site survey, Met Tower 3 addendum, and railroad corridor survey. No comments concerning TCPs have been received from the Eastern Band of Cherokee Indians for this project.

8. Unassessed Sites and Cemeteries

All of the cemeteries within the greater Lee Nuclear Site are located outside of the security perimeter, and Duke Energy has no plans to prevent access to these cemeteries by interested parties. No land disturbance will occur in these areas; therefore, there is no future threat to the cemeteries or unassessed archaeological sites. Land outside the security perimeter but within the overall Lee Nuclear Site will be monitored by security personnel to ensure that these sites are not damaged by vandals or artifact collectors. Should the limits of the project need to be extended for any reason in the future, Duke Energy will coordinate with the SHPO and Eastern Band of Cherokee Indians to perform an intensive survey.

9. Assessment of Cumulative Impacts on Historic Properties

According to regulations (36 CFR 800.16 [i]) promulgated by the President's Advisory Council on Historic Preservation, the term *effect* (or impact): "...means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register.". A *cumulative impact* is defined in the Council on Environmental Quality (CEQ) regulations at 40 CFR 1508.7. This definition is as follows:

> ...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Therefore, based on the foregoing definitions, any analysis of cumulative impacts from construction and operation of the Lee Nuclear Station is necessarily limited to assessing the additive impacts among properties that are potentially eligible for listing, are known to be eligible for listing, or are already listed on the NRHP. In addition, the cumulative impacts are considered to involve only the sum of those incremental impacts that would degrade the characteristics that make a historic property significant or degrade its integrity, which is its ability to convey its significance to an interested observer.

With regard to construction and operation of the Lee Nuclear Station, a number of federal requirements and guidance documents were used as the principal bases for the assessment of cumulative impacts on historic properties. These requirements are the NRC regulations at 10 CFR 51.14 (b) and the CEQ regulations at 40 CFR 1508.7. Several guidance documents were used, including *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997), *Guidance on the Consideration of Past Actions in Cumulative Effects Analyses* (Connaughton 2005), and *Preparation of Environmental Reports for Nuclear Power Stations* (NRC 1976). All of these foregoing federal regulations and guidance documents feed into the most recent draft version of NUREG-1555, *Standard Review Plans for Environmental Review for Nuclear Power Plants* (NRC 2007). This more recent document provides specific guidance for the assessment of cumulative impacts involving the construction and operation of new nuclear power plants such as the Lee Nuclear Station.

The process for assessing the cumulative impacts resulting from construction and operation of the Lee Nuclear Station involved three steps:

1. **Identification of the geographic area to be considered in evaluating cumulative impacts.** The project-specific analysis of impacts in the Lee Nuclear Station Environmental Report (ER) focuses primarily on the APEs on the Lee Nuclear Site, within 1 mile of the proposed cooling towers and meteorological tower (MET Tower 3), the zone of railroad realignment and a narrow swath along the sides of the proposed railroad spur, and the area within the two transmission line corridors. For assessment of cumulative impacts, the *geographic area* was expanded to include all nonsite land within an approximate 10-mile radius of an arbitrary point near the geographic center of the Lee

Nuclear Site. This is a large area of approximately 400 square miles in which other projects could impact historic properties. This intercepts most of the known Historic Period ironworks sites, which are among the most important historic properties in the region.

2. **Identification of past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts with those from the Lee Nuclear Station.** The on-line Environmental Impact Statement (EIS) Database indicated that there are no present or reasonably foreseeable "major federal actions" (projects) within the selected geographic area for the cumulative impacts assessment (EPA 2008). A consultation with Mr. Jim Cook, Executive Director of the Cherokee County Development Board, indicated that no other substantial federal undertakings (apart from typical highway modification work) or private sector projects are present or planned for the foreseeable future within the selected geographic area (Enercon 2008a). However, Subsection 2.5.2.2.4 of the Lee ER states that several highway modification projects are scheduled within the geographic area from 2007 to 2012. These projects are the Interstate-85 (I-85) interchange modifications west of the Lee Nuclear Site, widening of South Carolina 5 (SC 5) east of I-85 to east of U.S. 29 (Phase I), and upgrading of SC 5 from the Cherokee County line to the SC 5 Bypass. From 1977-1982, the largest past project within the geographic area was construction of the Cherokee Nuclear Station on the current Lee Nuclear Site. Past construction of this station and the three planned highway modification efforts were the selected projects for the cumulative impacts analysis.

3. **Assessment of Cumulative Impacts.** The impacts to historic properties from construction and operation of the Lee Nuclear Station were compared to those from the selected past, present, and reasonably foreseeable future projects to determine whether they contribute incrementally to cumulative impacts on particular types of historic properties. The nature of each identified cumulative impact is discussed, and its intensity is rated according to the standard NRC rating system as SMALL, MODERATE, or LARGE.

The South Carolina Department of Transportation (SCDOT) has assessed the potential environmental impacts from the three highway construction projects mentioned above. One NRHP-eligible historic property was identified in one of the highway construction APEs. The SCDOT took action to ensure that this site would be avoided by the proposed construction (Enercon 2008b). As a result, these three highway construction projects will have no impact on historic properties. Therefore, impacts from construction and operation of the Lee Nuclear Station cannot combine with those impacts from the three highway projects to create cumulative impacts on any type of historic property.

As noted in the ER, past earthmoving and construction activities for the Cherokee Nuclear Station resulted in heavy disturbance or destruction of six archaeological sites (3 8CK1 0, 38CK11, 38CK12, 38CK13, 38CK17, and 38CK18) on the current Lee Nuclear Site. These sites had prehistoric and/or Historic Period components. As noted in the ER, the SHPO determined that none of these archaeological sites were eligible for listing on the NRHP, which means that these sites were not historic properties. There is no documentary evidence that on-site aboveground historic sites, cemeteries, or TCPs were impacted by construction of this early

nuclear station. Duke Energy has proposed construction of the Lee Nuclear Station on the same site as the old Cherokee Nuclear Station. Recent Phase I intensive surveys in previously undisturbed portions of the on-site APE (road to the overlook on McKowns Mountain, MET Tower 3, and cooling water intake structure) resulted in the conclusion that no historic properties are present in these APEs. The same conclusion was true of the APE for a small off-site railroad spur realignment area near East Gaffney and the rest of the railroad spur right-of-way from East Gaffney to the Lee Nuclear Site (Bailey 2007). Because no historic properties are present in these surveyed portions of the on-site and off-site APEs, and because none were present anywhere on the site during construction of the Cherokee Nuclear Station, the impacts from construction and operation of the Lee Nuclear Station in these specific areas cannot combine with historic property impacts from construction of the Cherokee Nuclear Station to create cumulative impacts on any type of historic property.

In the ER, the areas within 1 -mi. of the cooling towers and MET Tower 3 were defined as the visual/aesthetic APE for the Lee Nuclear Site. An architectural inventory showed that the only two historic properties within this APE are the Ninety-Nine Islands Dam and the adjacent Ninety-Nine Islands Hydroelectric Plant. Both properties represent early twentieth century industrial facilities. Because the Lee Nuclear Station will represent an early twenty-first century industrial facility, there are no anticipated cumulative visual/aesthetic effects on these two NRHP-eligible historic properties. Construction and operation of the railroad spur will have no visual/aesthetic impact on historic properties (Bailey 2007); therefore, these activities cannot contribute to cumulative impacts on any type of historic property.

In summary, the preceding assessments show that impacts on historic properties from construction and operation of the Lee Nuclear Station would not combine incrementally with those impacts from other projects in the 10-mile geographic area to create cumulative impacts that would alter or destabilize any type of historic properties. Therefore, at this time, cumulative impacts on historic properties are characterized as SMALL. However, Duke Energy has plans to continue the assessment of cumulative impacts when the remaining portions of the on-site and off-site APEs are surveyed and assessed for direct and indirect impacts on historic properties.

The cooling water discharge area and the two proposed transmission line corridors have not been subjected to a Phase I intensive survey for historic properties. Therefore, the assessment of cumulative impacts will continue in accordance with the basis references and assessment process laid out earlier in this white paper. If selection and surveying of the final two transmission line corridors require a number of out years to accomplish, new projects that arise within the 10-mile geographic area may need to be considered as part of the cumulative impacts assessment.

Although considered unlikely because of the rigorous Phase I survey efforts applied to the on-site and off-site APEs for the Lee Nuclear Station, it is at least marginally possible that remains indicative of an archaeological site might be discovered inadvertently during the anticipated long-term operational period for the station. If such a site is ever discovered and it is potentially eligible for listing on the National Register, the direct impacts on this site from the immediate action will be considered along with possible cumulative impacts with other projects in the 10-mile geographic area. This analysis of cumulative impacts will be done in accordance with the

most recent basis references and acceptable cumulative impacts assessment process considered current for that future time.

10. Assessment of Operation Impacts

There are no historic properties within the security perimeter of the Lee Nuclear Site. The Ninety-Nine Islands Hydroelectric Dam and its powerhouse located near the Lee Nuclear Site are eligible for the NRHP. In addition, the railroad corridor passes through the Ellen Furnace Site (38CK68). The corridor has been graded, and the rail bed has been constructed. The SHPO has determined that effects to these resources are SMALL and will not be detectable, or are so minor that they will not destabilize or significantly alter any important attributes of the resource. Potential effects to historic properties that may be caused by the water discharge facility or transmission line corridors will not be known until the locations of the APEs for each of those undertakings is established and assessed.

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NRC Environmental Audit of Lee Nuclear Station Regarding ER 10.2, "Irreversible and Irretrievable Commitment of Resources"

Reference NRC Audit Question Number(s): H-64

NRC Information Need:

During the Lee Nuclear Station Environmental audit exit meeting on May 2, 2008, the NRC staff identified the following information need:

Please provide the information in ER 10.2.2 in table form.

Duke Energy Response to Information Need:

The requested table has been prepared and will be inserted into the Lee ER as Table 10.2-1. Conforming changes to ER Chapters 4 and 10 are provided below.

Associated Revision to the Lee Nuclear Station Combined License Application:

1. Revise COLA Part 3, ER Chapter 4, Subsection 4.4.2.2, page 4.4-10, as follows:

   In the year 2004, there were 2253 people unemployed in Cherokee County, and 6735 people unemployed in York County. Some or all of the indirect jobs created by the construction workforce are expected to be filled by unemployed workers in these counties. The money spent in the local area by these new workers, their families, and the newly employed persons in each county add to the economy of the area.

   <u>According to the Nuclear Energy Institute, the following quantities of bulk materials are required to construct an average nuclear power plant: 460,000 cubic yards of concrete; 46,000 tons (T.) of reinforcing steel and embedded parts; 25,000 T. of structural steel, miscellaneous steel, and decking; 26,000 feet (ft.) of large-bore pipe and 43,000 ft. of small-bore pipe; 220,000 ft. of cable tray; and 1.2 million ft. of conduit (Reference 15). Other materials for construction of the Lee Nuclear Station would include asphalt for paving, lumber, quarried rock, gravel, fencing, electrical supplies, plumbing supplies, and roofing. Some of these materials are expected to be purchased locally.</u>

   At this time, annual expenditures within the region for materials and services during construction of Lee Nuclear Site are not known.

2. Revise COLA Part 3, ER Chapter 4, Subsection 4.4.4, page 4.4-17, as follows:

   13. U.S. Department of Labor, Bureau of Labor Statistics, Metropolitan Area Occupational Employment Estimates as Reported May 2006 for Spartanburg, SC, Greenville, SC, and

Charlotte, NC/SC, Website, http://www.bls.gov/oes/current/oessrcma.htm, accessed August 31, 2007.

14. United States Army, Military Review, July-August, 2007, pages 110-112.

15. Nuclear Energy Institute, "What's Needed to Build a Reactor," *Nuclear Energy Insight*, August-September Issue, page 5, 2007.

3. Revise COLA Part 3, ER Chapter 10, Section 10.2, paragraph 1, as follows:

This section describes the expected irreversible and irretrievable environmental resource commitments to construction and operation of the Lee Nuclear Station. The term "irreversible commitments of resources" describes environmental resources that would be potentially changed by construction or operation of the station and that could not be restored at some later time to their respective states prior to construction or operations. Irretrievable resources are generally materials that are expected to be used for the station in such a way that they could not, by practical means, be recycled or restored for other uses. These irreversible and irretrievable commitments of resources are summarized in Table 10.2-1.

4. Revise COLA Part 3, ER Chapter 10, Subsection 10.2.2, paragraph 1, as follows:

The irreversible and irretrievable commitment of material resources during construction of the Lee Nuclear Station would be generally similar to that of any major construction project. These materials and the quantities that would be irretrievably committed are listed in Table 10.2-1. ~~TheU.S. Department of Energy's 2004 report on new reactor construction estimates 12,239 cubic yards of concrete and 3107 tons of rebar for a reactor building; 2,500,000 linear feet (ft.) of cable for a reactor building and 6,500,000 linear ft. of cable for a single unit; and up to 275,000 ft. of piping greater than 2.5 inches (in.) in diameter for a single 1300 megawatts electric (MW[e]) reactor (Reference 1).~~ While the required amounts of these materials are large, they are not atypical of hydroelectric and coal-fired power plants that are constructed throughout the United States. Use of construction materials in the quantities expected for a nuclear power plant, while irretrievable unless they are recycled at decommissioning, would have a SMALL effect with respect to the availability of such resources.

5. Revise COLA Part 3, ER Chapter 10, Subsection 10.2.3, Reference 1, as follows:

1. Nuclear Energy Institute, "What's Needed to Build a Reactor," *Nuclear Energy Insight*, August-September Issue, page 5, 2007. ~~U.S. Department of Energy (DOE), *Study of Construction Technologies and Schedules, O&M Staffing and Cost, Decommissioning Costs and Funding Requirements for Advanced Reactor Designs*, Volume 2 MPR 2610, Prepared by Dominion Energy Inc., Bechtel Power Corporation, TLG Inc., and MPR Associates under Contract DE-AT01-020NE23476, Washington, DC, May 27, 2004.~~

2. World Nuclear Association, Supply of Uranium, March, 2007, Website, http://www.worldnuclear.org/info/inf75.html, accessed June 19, 2007.

3. Westinghouse Electric Co., LLC, AP1000 Siting Guide: Site Information for an Early Site Permit Application, 2003.

Attachments:

The following table and reference are provided as Attachments H-64-1 and H-64-2:

H-64-1. Table 10.2-1. Irreversible and Irretrievable Commitments of Resources for Construction and Operation of the Lee Nuclear Station

H-64-2. Nuclear Energy Institute, "What's Needed to Build a Reactor," *Nuclear Energy Insight*, August-September Issue, page 5, 2007.

TABLE 10.2-1 (Sheet 1 of 2)
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES FOR CONSTRUCTION AND OPERATION OF THE LEE NUCLEAR STATION

Resource	Irretrievable Commitments	Irreversible Commitments	Notes
ENVIRONMENTAL RESOURCES			
Land	Waste disposal space		Total area of land required for disposal of radioactive and nonradioactive waste is unknown.
Prime farmland		2 ac.	This area of soil on the Lee Nuclear Site would likely not be restorable to its current agricultural productivity potential.
Surface water	33,030 gpm		Most of this water would be used for the cooling towers (converted to water vapor at 24,638 gpm).
Flora and fauna	Loss and displacement of individual organisms		This would be temporary in construction areas, but floral and faunal populations would recover afterwards in areas not affected by operations. No extirpation or extinction of species is predicted.
MATERIAL RESOURCES [a]			
Concrete	460,000 cu. yd.		Assumes no recycling upon decommissioning.
Reinforcing steel and imbedded parts	46,000 T.		Assumes no recycling upon decommissioning.
Structural steel, miscellaneous steel, and decking	25,000 T.		Assumes no recycling upon decommissioning.
Large-bore pipe	26,000 ft.		Assumes no recycling upon decommissioning.
Small-bore pipe	43,000 ft.		Assumes no recycling upon decommissioning.
Cable tray	220,000 ft.		Assumes no recycling upon decommissioning.
Conduit	1.2 million ft.		Assumes no recycling upon decommissioning.
Uranium fuel	169 MTU		Combined initial core loading for two AP1000 reactors. This is roughly 0.004 percent of the worldwide supply and 0.25 percent of worldwide annual usage.
	24.4 MTU/yr		Combined annual average fuel loading for two AP1000

TABLE 10.2-1 (Sheet 2 of 2)
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES FOR CONSTRUCTION AND OPERATION OF THE LEE NUCLEAR STATION

			reactors. This is 0.0005 percent of the current worldwide supply and 0.07 percent of current worldwide annual usage.
Other Materials	Unknown		Materials used for normal industrial operations that could not be recovered or recycled or that would be consumed or reduced to unrecoverable forms, including elemental materials that would become radioactive.

[a] The listed quantities of bulk materials are for the average modern nuclear power plant and are based upon the following four current reactor designs: AP 1000, European Pressurized Reactor, Advanced Boiling Water Reactor, and Economic Simplified Boiling Water Reactor.

ac	acres
cu. yd.	cubic yard
ft.	feet
gpm	gallons per minute
in.	inches
MTU	metric tons of uranium
T.	tons
yr	year

References 1, 2, and 3

NUCLEAR ENERGY
Insight
AUGUST/SEPTEMBER 2007

Nuclear Energy Revival Enters New-Plant Licensing Phase

Revitalized interest in building new nuclear power plants in the United States has reached a new phase: the submission of license applications to federal authorities.

In July, UniStar Nuclear became the first company to submit a portion of its combined construction and operating license (COL) application to the U.S. Nuclear Regulatory Commission. UniStar submitted the environmental section of its application.

Although the joint Constellation Energy-AREVA consortium is the first to submit a partial license application, companies could send COL applications for as many as four new reactors by year's end. Altogether, 17 companies and consortia have announced plans to submit license applications for up to 31 reactors in the next few years.

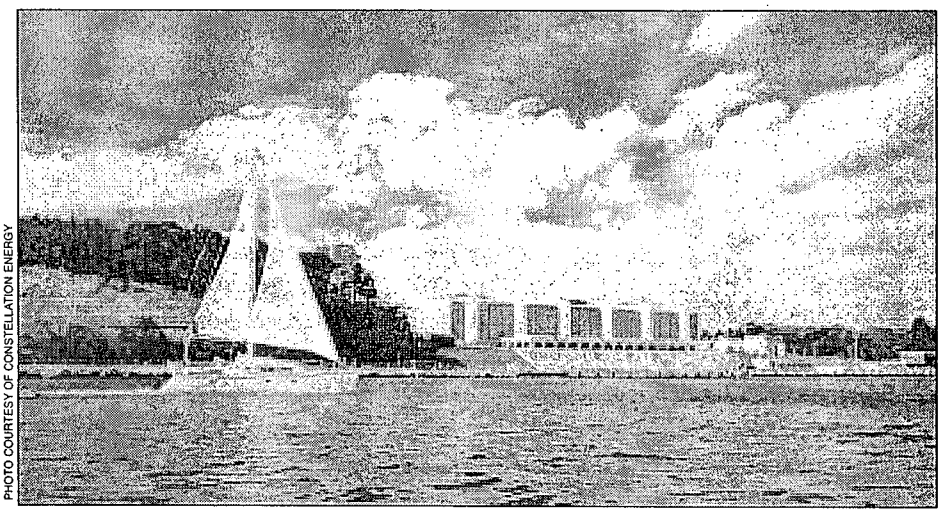


PHOTO COURTESY OF CONSTELLATION ENERGY

UniStar Nuclear became the first company to submit a partial license application for a new reactor at Constellation Energy's Calvert Cliffs plant in Maryland.

> *"The carbon footprint for a nuclear power plant ... is less than every other electric generating source except hydro."*
>
> —Adrian Heymer
> Nuclear Energy Institute

The licensing phase is one of the first steps in nuclear plant construction. Interest in building new reactors has found support among policymakers at the local, state and national levels. That renewed interest is the product of several converging factors, according to Adrian Heymer, senior director of new-plant development at the Nuclear Energy Institute.

"There is a need for more power as we see continuing electricity demand and tightening supply," Heymer said. "We also see a need for power that emits little or no greenhouse gases. In fact, the carbon footprint for a nuclear power plant, based on the amount of carbon dioxide emitted through the entire power-generation cycle, is less than every other electric generating source except hydro."

An International Energy Agency analysis found that nuclear power's life-cycle emissions range from 2 to 59 gram-equivalents of carbon dioxide per kilowatt-hour, while hydropower's range from 2 to 48 gram-equivalents of carbon dioxide per kilowatt-hour. Nuclear energy life-cycle emissions include emissions associated with construction of the plant, mining and processing the fuel, routine operation of the plant, disposal of used fuel and other waste byproducts, and decommissioning. Nuclear plants do not generate greenhouse gases during operation.

Nuclear energy's life-cycle greenhouse gas emissions are generally lower than wind (7 to 124 gram- equivalents) and solar photovoltaic (13 to 731 gram-equivalents), according to the agency. The life-cycle emissions from natural gas-fired plants range from 389 to 511 gram-equivalents of carbon dioxide per kilowatt-hour.

Policymakers from the statehouse to the White House are touting nuclear energy's benefits. "For Democrats and nuclear energy, the landscape has changed rather significantly," Iowa State Rep. Phil Wise, a Democrat, wrote in a July 6 op-ed in the Des Moines Register. "This brings with it the possibility of a fresh, bipartisan consensus on nuclear power. Why? Because nuclear power works. It is safe. It is environmentally benign. And because the 'times they have changed.' "

New Plants *on page 5*

NEI Launches Redesigned Web Site

Change is the only constant, and nowhere is that more evident than on the Internet. The Nuclear Energy Institute (NEI) is the latest to embrace the ever-changing nature of the online community with a redesigned, retooled and updated Web site.

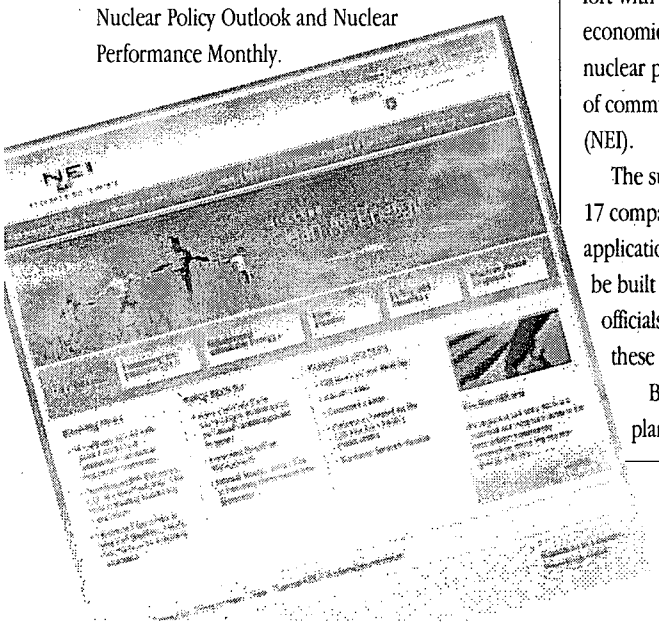
The site, *www.nei.org*, serves as the information hub and news resource for nuclear energy and technology. The site discusses how nuclear power plants work, nuclear energy policy, plans for new reactors and the environmental benefits of clean-air nuclear power.

The site features a refreshed design, easier navigation, improved organization and brand-new content.

The online News & Events page offers the industry's top stories and NEI news releases. Users also will find links to in-depth resources and statistics, including fact sheets about nuclear energy and briefs detailing the industry's policy positions.

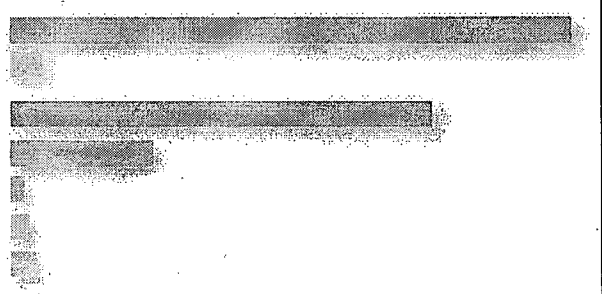
The site also offers information on a wide range of key issues, including environmental protection, reliable and affordable energy, plant safety and security, and integrated used fuel management. Other sections are devoted to public policy, careers and education in the industry, and nuclear technology.

Numerous NEI online publications are also available, including Nuclear Energy Insight, Nuclear Policy Outlook and Nuclear Performance Monthly.



Plant Neighbors Count on Nuclear Power to Meet Energy Needs

***Q:** How important do you think nuclear energy will be in meeting this nation's electricity needs in the years ahead? Do you think nuclear energy will be very important, somewhat important, not too important or not important at all?*



SOURCE: BISCONTI RESEARCH INC./QUEST GLOBAL RESEARCH GROUP

Nuclear Plant Neighbors Put Out Welcome Mat for New Reactors

Eighty-two percent of Americans living in close proximity to nuclear power plants favor nuclear energy, and 71 percent are willing to see a new reactor built near them, according to a new public opinion survey of more than 1,100 adults nationwide.

Favorability was even higher in communities where steps are under way to build new reactors. Three-quarters of respondents in these areas would find a new reactor at the nearest site acceptable, with only 20 percent saying it would not be acceptable.

"It's obvious that people living near nuclear plants have a high degree of familiarity and comfort with nuclear energy and would welcome the economic and environmental benefits of new nuclear plants," said Scott Peterson, vice president of communications at the Nuclear Energy Institute (NEI).

The survey's findings come at a time when 17 companies have announced plans to file license applications for as many as 31 reactors that could be built over the next 10 to 15 years. Industry officials expect companies to file a handful of these applications by the end of this year.

By a margin of 82 percent to 16 percent, plant neighbors said they favor the use of nuclear energy as one of the ways to provide electricity in the United States. By a margin of 86 percent to 11 percent, they said they have a favorable impression of the nearby nuclear power plant and the way it has operated recently.

When asked about the company that operates the nearest nuclear power plant, three-quarters agreed that "this company is involved in the community," and 81 percent agreed that "this company is doing a good job of protecting the environment." Eighty-seven percent are confident that the company can operate the plant safely.

NEI commissioned the telephone survey of 1,152 adults living within 10 miles of each of the nation's 65 nuclear plants sites, excluding electric company employees. Bisconti Research Inc., with Quest Global Research Group, conducted the poll, which has a margin of error of plus or minus three percentage points.

Seventy-nine percent of plant neighbors said they are "very well-informed" or "somewhat well-informed" about the nearest nuclear power plant. Slightly more than three-quarters of the respondents have lived in the area for more than 10 years.

This is the second time NEI has surveyed plant neighbors about their attitudes on nuclear energy. The first was in August 2005.

Safety by Design

'Defense in Depth' Helps Nuclear Power Plants Withstand Earthquakes

When a major earthquake struck the northern coast of Japan in July, the Kashiwazaki-Kariwa nuclear power plant responded as designed, shutting down its operating reactors safely.

A "defense in depth" philosophy employed by nuclear plants in Japan, the United States and other nations uses robust plant design and construction and redundant, physically separated safety systems to ensure public health and safety even in severe circumstances like earthquakes.

Nuclear plant seismic design must meet national codes , standards and regulations. Compliance with these standards and regulations ensures there is a substantial safety margin with respect to earthquakes.

Nuclear plants are designed to withstand earthquake-induced ground motions, focusing on systems and components most important to safety, such as critical buildings and systems involved in safely shutting down the plant and keeping it secured. The design of noncritical buildings, such as offices, uses safety standards closer to typical commercial facilities.

This commitment to safe plant operation begins with a detailed evaluation of potential earthquake-induced ground motion at the site, followed by a thorough analysis and testing of plant structures, systems and equipment, using simulated earthquake-induced vibrations. If a tremor above a specified level affects a plant, officials must perform extensive inspections before a company can restart a reactor.

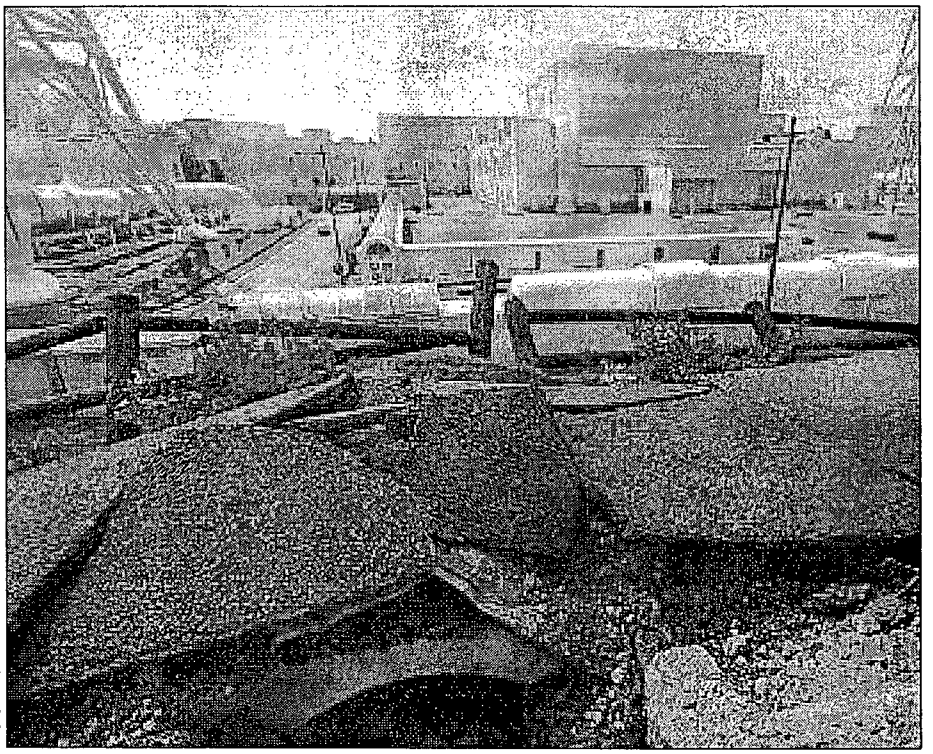


PHOTO BY KOICHI KAMOSHI/DAVGETTY IMAGES

The Kashiwazaki-Kariwa nuclear plant in Japan shut down safely as required during a July earthquake and sustained little damage, the International Atomic Energy Agency concluded after an on-site inspection by its team of seismic experts.

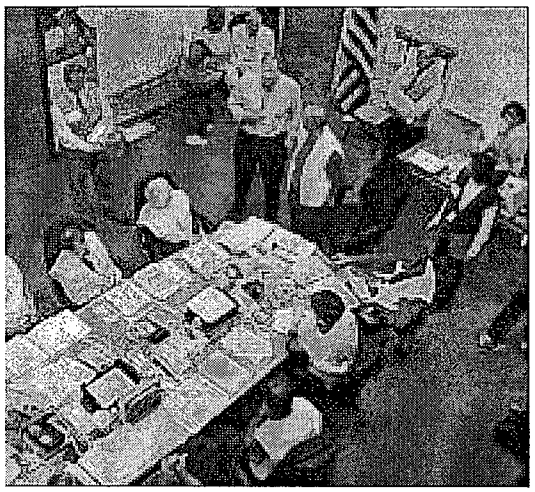


PHOTO COURTESY OF PACIFIC GAS & ELECTRIC CO.

In the event of an emergency, such as an earthquake, nuclear plants' personnel and community emergency response organizations work together to ensure public health and safety.

All U.S. nuclear plants are designed to withstand earthquakes of a magnitude that is equivalent to or greater than the largest known tremor for the region where it is built. Plant operators will shut down the reactor even if the seismic event is well within levels the design can accommodate.

Operators then perform extensive inspections prior to restarting the plant. If an earthquake exceeds the maximum level, the plant cannot restart without U.S. Nuclear Regulatory Commission approval, following extensive inspections to determine if it is safe to resume power production.

Each nuclear plant has seismic instrumentation to record earthquake-induced motions at the site. For instance, Kashiwazaki-Kariwa has 97 seismographs on its site. Plant operators use the recordings to evaluate the level of earthquake vibrations at the site and determine if it must shut down. Detailed physical inspections supplement the recordings to evaluate the impact of an earthquake at the site and the condition of the plant structures, systems and equipment. In the event of an earthquake, employees analyze the recordings and the inspection results before restarting the reactor.

Engineers and scientists calculate the potential for earthquake-induced ground motion for a site using a wide range of data. They also review the impacts of historical earthquakes up to 200 miles, with careful study given to those within 25 miles. They use this research to determine the maximum potential earthquake that could affect the site.

New Licensing Process Allows More Public Input

The next generation of nuclear power plants will benefit from an improved licensing process that gives the public opportunities for early participation and ensures safety is foremost throughout the process.

The federal government licensed most of today's 104 nuclear power plants during the 1960s and 1970s. Commercial nuclear energy was in its early stages, and the regulatory process evolved with the new industry. The regulatory agency issued a construction permit for a plant based on a preliminary design. Safety issues were not fully resolved until the plant was essentially complete—a process that had substantial financial ramifications.

"Some construction projects went really well and were completed in four to four and a half years; others took 14 to 20 years," said Adrian Heymer, senior director of new-plant development at the Nuclear Energy Institute.

The U.S. Nuclear Regulatory Commission in 1989 established a new, more efficient process for licensing nuclear power plants, and Congress strengthened the new licensing process as part of the 1992 Energy Policy Act.

The process consists of four parts:

- Design certification allows plant designers to secure advance NRC approval of standard nuclear plant designs. Later, companies can order the reactor design, license it for a particular site and build a reactor.
- Early site permitting enables companies to obtain NRC approval for a nuclear power plant site before deciding to build a plant. The process resolves site suitability and environmental issues and allows companies to "bank" sites approved by the NRC for up to 20 years and build when the time is right.
- Combined construction and operating licenses (COLs) focus on ensuring safety during construction and startup of the plant.
- Finally, the NRC uses a series of inspections, tests, analyses and acceptance criteria to assess the new plant. It determines whether the constructed plant conforms to all license requirements and is ready to operate.

Status of New-Plant License Applications

Company	Site(s)	Design (# of units)	Construction / Operating License Submittal
Alternate Energy Holdings	Bruneau, ID	EPR	FY 2009
Amarillo Power	Vicinity of Amarillo, TX	EPR	FY 2009
AmerenUE	Callaway, MO	EPR	FY 2008
Constellation (UniStar)	Calvert Cliffs, MD, plus two other sites	EPR (3)	First submittal-FY 2008
Detroit Edison	Fermi, MI	Not yet determined	FY 2008
Dominion	North Anna, VA	ESBWR (1)	FY 2008
Duke	William States Lee, Cherokee County, SC	AP1000 (2)	FY 2008
Duke	Davie County, NC	Not yet determined	Not yet determined
Duke	Oconee County, SC	Not yet determined	Not yet determined
Entergy	River Bend, LA	ESBWR (1)	FY 2008
Entergy (NuStart)	Grand Gulf, MS	ESBWR (1)	FY 2008
Exelon	Clinton, IL	Not yet determined	Not yet determined
Exelon	Matagorda and Victoria County, TX	Not yet determined	FY 2009
Florida Power & Light	Turkey Point, FL	Not yet determined (2)	FY 2009
NRG Energy / STPNOC	Bay City, TX	ABWE (2)	FY 2008
PPL Corp.	Susquehanna, PA	Not yet determined	Not yet determined
Progress Energy	Harris, NC; Levy County, FL	AP1000 (2); AP1000(2)	FY 2008; FY 2008
South Carolina Electric & Gas	Summer, SC	AP1000 (2)	FY 2008
Southern Company	Vogtle, GA	AP1000 (2)	FY 2008
Texas Utilities	Comanche Peak, TX	APWR (2)	FY 2008
TVA (NuStart)	Bellefonte, AL	AP1000 (2)	FY 2008

To improve the process of preparing applications and NRC review, the industry is using templates based on specific plant designs, Heymer explained. Here's how it will work:
Five companies and consortia have chosen Westinghouse's AP1000 as the preferred design for 12 reactors. The Tennessee Valley Authority expects to submit a COL to the NRC, most likely in October, for its Bellefonte plant in Alabama. This would serve as the reference application for other companies preparing AP1000 COL submittals.

"After the NRC's review of the first application, subsequent reviews will look for inconsistencies and focus on unique site-specific issues," Heymer said. "At least 70 percent of the applications should be the same, and that figure may be as high as 80 percent."

As a result, COL preparation and review time could be reduced substantially, he said. Heymer predicted that companies using this approach could reduce license preparation time from 24 to 12 months. The NRC review and approval process could decrease from 42 to 24 months, if the NRC already has granted an early site permit. Construction of safety systems and structures would likely take four years.

Another shortcoming of the previous process was that the public did not have access to the details of the design until construction was almost finished. The new process offers more opportunity for public involvement earlier in the process. "Before, there were two public comment periods, and now there are four," Heymer noted. "Also, the public has more information earlier in the process."

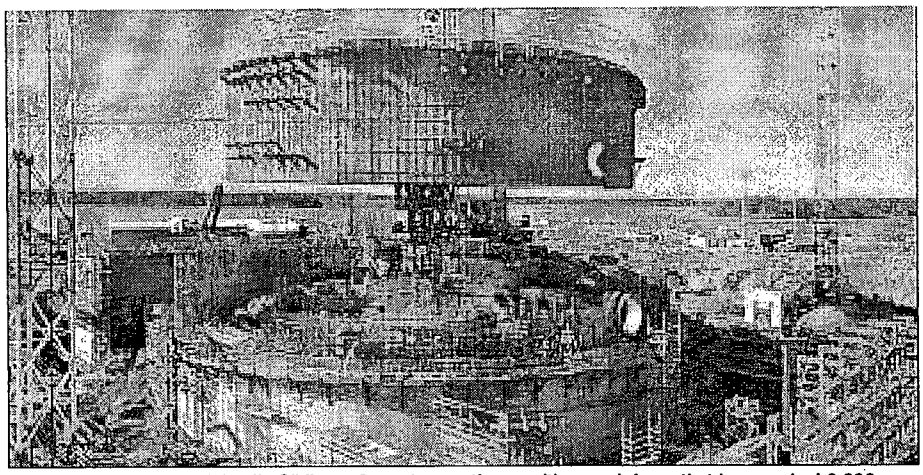


PHOTO COURTESY OF TEOLISUUDEN VOIMA OY/AREVA

Construction work at Finland's Olkiluoto 3 reactor continues with a work force that has reached 2,000.

What's Needed to Build a Reactor

When it comes to building new nuclear power plants, ordering materials at the neighborhood hardware store is out of the question. These concrete-and-steel behemoths require an extensive and substantial inventory of materials that must meet exacting safety standards.

The chart below describes the bulk materials needed for construction of an average nuclear power plant based on four designs: AREVA's U.S. EPR, Westinghouse Electric Co.'s AP1000, and General Electric's ESBWR and ABWR. To put these figures into perspective, the Empire State Building contains 60,000 tons of steel and 62,000 cubic yards of concrete.

These figures may seem large, but they represent a significant reduction in materials when compared to today's nuclear power plants, said Carol Berrigan, director of industry infrastructure at the Nuclear Energy Institute.

There are more than 2,000 miles of cabling in the average nuclear power plant built in the 1960s and 1970s. Today's new designs require 80 percent less cabling.

"As license applications go to the Nuclear Regulatory Commission, utilities will start ordering equipment that in turn will provide opportunities for other U.S. companies," Berrigan added. Such companies would provide high-quality products like pumps, cables, turbines and other equipment.

Companies will need about 1,500 to 2,000 construction workers to build each new plant, according to industry estimates. Those workers will need products and services that will attract additional economic activity to an area. Moreover, if two reactors are being built at one plant, those workers could be on site for five years or longer.

Once construction is complete, the plant would require 400 to 500 new permanent workers.

"The industry is working with Congress, educational institutions, suppliers, and local and state policymakers to build a work force for the future and retool and upgrade facilities to provide the materials and equipment we will need to build new plants," Berrigan said.

Nuclear Plants Require Extensive Construction Materials

Item	Amount
Concrete	460,000 cubic yards
Reinforcing steel and embedded parts	46,000 tons
Structural steel, misc. steel, decking	25,000 tons
Large-bore pipe	26,000 feet
Small-bore pipe	43,000 feet
Cable tray	220,000 feet
Conduit	1.2 million feet

New Plants *from page 1*

After touring the Browns Ferry nuclear plant in Alabama this June, President Bush said, "If you are interested in cleaning up the air, then you ought to be an advocate for nuclear power. There is no single solution to climate change, but there can be no solution without nuclear power."

The pace toward new-reactor development is quickening. In August, the Tennessee Valley Authority's board of directors unanimously approved completion of a second reactor at the Watts Bar nuclear power plant in Tennessee.

TVA estimates it will take five years and $2.5 billion to complete construction on the reactor, which will provide 1,180 megawatts of electricity. The project will require about 2,300 workers during construction. Design and engineering work will begin by October, TVA said.

The plant was 60 percent complete when work stopped in 1985. "Completing Watts Bar Unit 2 puts an existing asset to work for TVA customers and provides a clean, safe and reliable source of affordable power," said TVA Chairman Bill Sansom.

BILL SANSOM

In May, TVA completed a five-year restart project at the Browns Ferry 1 reactor in Alabama, staying within its five-year schedule and projected $1.8 billion cost. TVA said it would apply lessons learned at Browns Ferry to the Watts Bar project.

Residents within 10 miles of Watts Bar strongly support the expansion, according to a telephone survey of 300 randomly selected adults conducted by Bisconti Research Inc. with Quest Global Research Group. Eighty-eight percent support TVA's decision, and an overwhelming majority—90 percent—rated the plant's safety high.

Also this summer, Entergy Nuclear signed a new nuclear project development agreement with GE-Hitachi Nuclear Energy to ensure timely delivery of critical parts for a reactor proposed at its Grand Gulf nuclear plant in Mississippi.

NRG Energy Inc. and STP Nuclear Operating Co. have signed a project services agreement with Toshiba Corp. regarding two reactors planned for the South Texas Project location.

State Lawmakers Support Building New Nuclear Plants

Legislators around the country are voicing support for new nuclear plant construction to help ease climate change concerns and meet increasing demand for energy.

In some instances, that support has translated into resolutions that embrace nuclear power as a crucial part of the nation's energy mix. Meanwhile, individual states are approving legislation and regulations encouraging new-plant construction within their borders.

State-level support among policymakers is nationwide, as evidenced by a resolution from the American Legislative Exchange Council that embraces building new nuclear plants. The resolution urges Congress and the president to "encourage development of safe new nuclear plants as a key component of American fuel portfolio diversity and energy security."

The resolution acknowledged that the nuclear industry would need to bring on line an additional 50 gigawatts by 2030 just to maintain nuclear energy's present 19.4 percent share of electricity generation. "Many communities and regions have expressed strong support for hosting a new nuclear reactor for the clean, safe and affordable electricity; energy security; employment opportunities; and other economic benefits it could provide," it stated.

In the South, a regional group of 16 legislatures passed two resolutions supporting nuclear energy. The 16 member states of the Southern Legislative Conference (SLC) noted that a large majority of expected applications for new-reactor licenses would be for sites in the southern United States. Nearly half of the nation's existing nuclear plants—45 reactors at 26 sites—produce electricity in SLC member states.

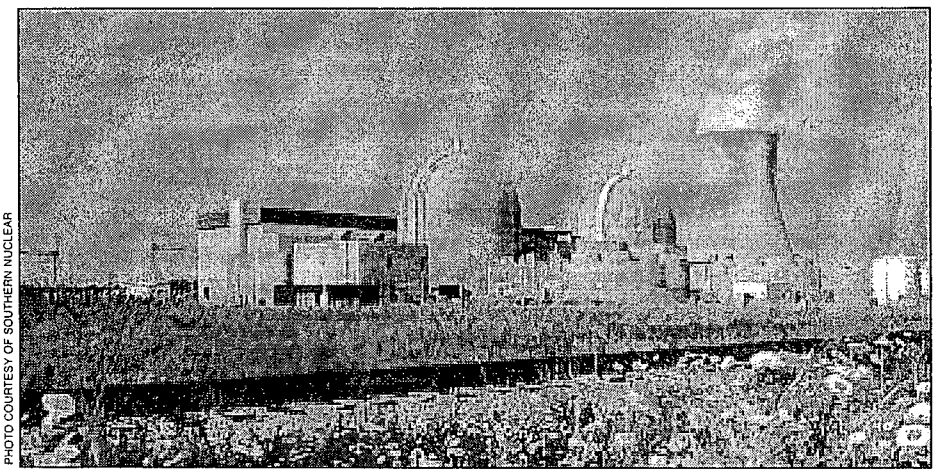


PHOTO COURTESY OF SOUTHERN NUCLEAR

State regulators have given Georgia Power permission to explore building new nuclear plants, including two reactors at its Vogtle site.

To increase that number, the SLC encouraged policymakers to fund nuclear energy research and development, including engineering and design work for advanced reactors. Policymakers also must help reduce the regulatory risks associated with construction of advanced reactors, and implement investment stimulus to support nuclear plant construction, the resolutions said.

In one SLC member state, Georgia, the Public Service Commission has given a company permission to explore building new nuclear plants. In July, the commission approved Georgia Power's integrated resource plan for providing economical, reliable electricity to its customers.

The plan included two potential new reactors at Georgia Power's Vogtle site. In its approval, the commission found "that it is reasonable for the company to investigate the opportunity to build nuclear resources."

The U.S. Nuclear Regulatory Commission is reviewing an early site permit application for Vogtle. Georgia Power is a subsidiary of Southern Nuclear, which filed the application in 2006 and plans to submit a combined license application next year. Construction could begin in 2011, with the plant going on line in 2016.

Lawmakers in Utah have taken notice of other states' actions regarding nuclear power. As a result, the state legislature's Public Utilities and Technology Interim Committee has instructed its staff to draft nuclear energy-related legislation.

The lawmakers were responding to eight other states' 2006 laws and resolutions that encouraged consideration of new nuclear plants, particularly the Florida Energy Diversity and Efficiency Act, which provided guidance on nuclear power plant permitting and cost recovery.

The Utah legislature also decided to draft legislation about new plants because of the state's membership in the recently signed Western Climate Initiative. Utah—along with five other western states and two Canadian provinces—will identify, evaluate and implement methods to reduce greenhouse gas emissions. The new legislation could help determine if nuclear energy will be one such method.

Now Hear This ...

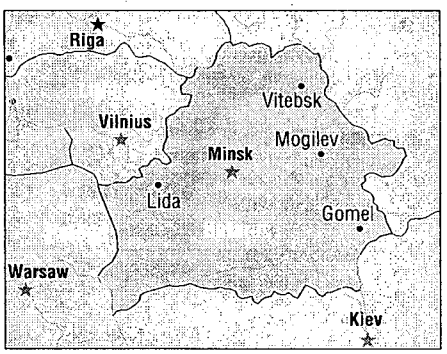
Minnesota currently generates 15 percent of its energy from the Monticello and Prairie Island nuclear facilities, and I believe nuclear energy can and should play a much stronger role in meeting our energy demand."

—State Rep. Joyce Peppin (R)
Minneapolis Star Tribune, Aug. 7

Belarusian Children Learn ABCs of Nuclear Energy During Visit

Warmth from the summer sun, the smell of hotdogs on the grill and faint cheers from a fishing boat created the perfect backdrop for an American barbeque.

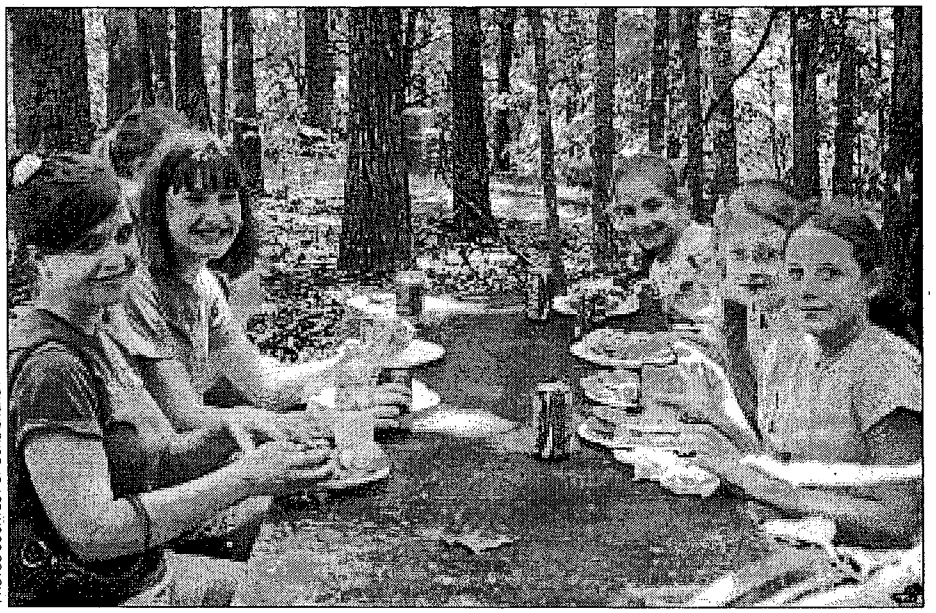
But this time, the picnickers, who enjoyed such a setting at a U.S. nuclear power plant, live thousands of miles away. This summer more than a dozen children from Belarus visited the World of Energy, Oconee Nuclear Station's visitor center. Besides a picnic and boat tour of Lake Keowee, they learned about the operation of the nuclear plant at the Duke Energy site. This marked the second year that many of these children visited the United States.



The children lived with host families for six weeks. The families sponsored the cost of bringing the children from Belarus and coordinated their visit through the American Belarusian Relief Organization (ABRO). While in America, the children received free medical, dental and vision care.

For some Belarusian youngsters, a visit to a nuclear power plant causes a mixture of emotions, from fascination to anxiety. In 1986, a safety experiment at the Chernobyl nuclear power plant, conducted in violation of the plant's technical specifications, went wrong. A resulting fire released a large amount of radiation into the atmosphere, affecting the people of Belarus, Russia and Ukraine.

Michael Cousar, an insurance agent from Anderson, S.C., and host parent, shared his Belarusian child's reaction upon arriving at the plant. "As we pulled up to the main security entrance of the station, with the three reactor buildings towering off in the distance, Vlad, the Belarusian child living with my family, motioned with his hands an explosion and yelled, 'no go, no don't go.' "



PHOTOS COURTESY OF DUKE ENERGY

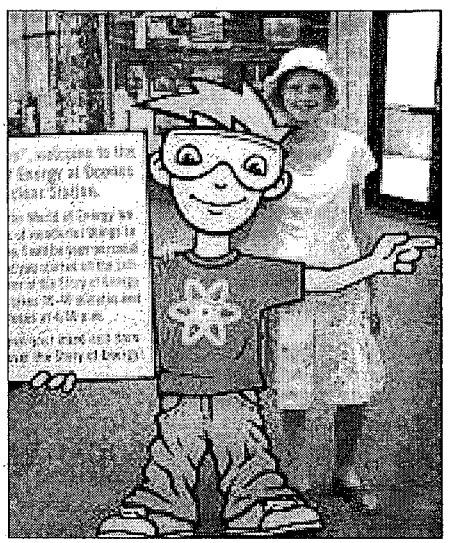
A picnic at Duke Energy's Oconee Nuclear Station drew smiles from the Belarusian children who participated in this summer's visit to South Carolina.

Belarusian children learn about the Chernobyl accident, and photographs of what happened are displayed around their country. "Once Vlad arrived at the World of Energy, he relaxed and quickly realized he was safe and had a wonderful day," Cousar added.

Jason Walls of Duke Energy community affairs hosted the children at the World of Energy. "This event provides a first-hand opportunity for these children to see the safe operation of a nuclear plant and enjoy the natural beauty of Lake Keowee in the mountains of South Carolina," Walls said.

Bert Spear, an engineer at Oconee, and his family have served as hosts for their Belarusian child, Anastasiya Liavonenka, for the past two years. "ABRO is a great program and provides the Belarusian children with an opportunity to improve their health and to enjoy some of the South Carolina summer activities with host families," Spear said.

"Anastasiya is a part of our family while she's here and became close friends with my youngest daughter, Katie. Katie is learning Russian, and the two girls plan to keep in touch by telephone after Anastasiya returns to Belarus. Our family benefits from this experience by learning about the country, people and culture of Belarus," Spear added.



Anastasiya Liavonenka from Mogilev, Belarus, toured the Duke Energy plant's visitor center during the exchange program.

Women in Nuclear Focuses on Building Future Work Force

The nuclear energy industry has a lot of building to do. However, before it can build any of the dozens of new plants under consideration, the industry must build up a diverse work force to staff those plants. That effort is at the heart of U.S. Women in Nuclear's (U.S. WIN) mission.

More than 300 attendees at the organization's annual conference in Anaheim, Calif., discussed this industrywide imperative with an array of speakers that included U.S. Nuclear Regulatory Commission Chairman Dale Klein. He spoke about the agency's need to attract more women to its staff.

"For us to succeed as a regulator, we need to attract more women, because there is a changing face in the nuclear industry," Klein said. "Many regulators around the world are and will be women."

Industry executives also discussed the imperative of a growing, diverse work force.

"We need to let people know our industry is expanding and we have the jobs and the careers waiting for them," said Joe Sheppard, president and chief executive officer of STP Nuclear Operating Co. He said his company likely would hire 1,400 new employees by 2015. STP is considering building two new reactors in Texas.

"Nuclear companies are addressing the technological, regulatory and market challenges that lie ahead. However, the industry needs to increase its focus on assuring that there are sufficient nuclear-trained professionals to staff the rebuilding of America's nuclear industrial base," said John Welch, president and chief executive officer of USEC Inc., which supplies uranium fuel for nuclear reactors.

Each year, U.S. WIN recognizes a member's significant contributions and leadership in the nuclear industry with the Patricia Bryant Leadership Award. This year's recipient, Michele DeWitt, said the award is especially meaningful.

"I think that the objectives and the mission of WIN are ones that are so important to our industry right now," said DeWitt, vice president at Westinghouse Electric Co.

U.S. WIN attendees listen attentively as speakers urge the industry to build a work force of nuclear professionals for the future.

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IN THIS SPECIAL NEW-PLANT ISSUE

Environmental Benefits Statement

This publication is printed using waterless press with soy-based inks on New Leaf Reincarnation Matte, made with 100% recycled fiber, 50% post-consumer waste, processed chlorine-free.

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trees	water	energy	solid waste	greenhouse gases
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NRC Environmental Audit of Lee Nuclear Station Regarding ER 4.4, "Socioeconomic Impacts"

Reference NRC Audit Question Number(s): MET-11

NRC Information Need:

During the Lee Nuclear Station Environmental Audit exit meeting on May 2, 2008, the NRC staff identified the following information need:

Additional air quality impacts would be expected from a concrete batch plant operating during construction. Because Duke Energy intends to operate a concrete batch plant on-site, during construction, the environmental impacts of the operation of a concrete plant should be addressed in the ER.

Duke Energy Response to Information Need:

Duke Energy will revise the ER to include the impacts of operation of a concrete batch plant during construction. The text provided below includes the proposed changes which will be incorporated into a subsequent revision of the ER.

Associated Revision to the Lee Nuclear Station Combined License Application:

Revise COLA Part 3, ER Chapter 4, Subsection 4.4.1.6 by inserting the following paragraph between the existing paragraphs 2 and 3:

Additional air quality impacts would be expected from a concrete batch plant operating during construction. A concrete batch plant requires an air permit to operate, and normally the operator or contractor is required to provide that permit. The air quality concern from the concrete batch plant would be particulates. Particulates are a concern when loading dry concrete and aggregate into the system, but once the water is added into the drum mix, particulates are no longer emitted. Air quality issues from the concrete batch plant operation would be minimal using particulate controls that are required by the state of South Carolina Department of Health and Environmental Control (SCDHEC), General Conditional Major Operating Permit (GCMP-04). The Nuclear Energy Institute estimates an average of 460,000 cu. yd. of concrete is necessary for nuclear power plant construction. This number was derived based on four different reactor models including AP1000. Based on this number, an estimated potential to emit for particulate at 10 microns (PM10) would be 53 tons, which would qualify the concrete batch plant as a Minor Source under the SDCHEC regulations. Because a concrete batch plant qualifies as a Minor Source of particulate emissions under both the U.S. Environmental Protection Agency and SCDHEC regulations, the offsite air quality impact is projected to be SMALL.

Attachments:

MET-11-1 Nuclear Energy Institute, "What's Needed to Build a Reactor." Nuclear Energy Insight, August-September Issue, page 5, 2007

NUCLEAR ENERGY
insight
AUGUST/SEPTEMBER 2007

Nuclear Energy Revival Enters New-Plant Licensing Phase

Revitalized interest in building new nuclear power plants in the United States has reached a new phase: the submission of license applications to federal authorities.

In July, UniStar Nuclear became the first company to submit a portion of its combined construction and operating license (COL) application to the U.S. Nuclear Regulatory Commission. UniStar submitted the environmental section of its application.

Although the joint Constellation Energy-AREVA consortium is the first to submit a partial license application, companies could send COL applications for as many as four new reactors by year's end. Altogether, 17 companies and consortia have announced plans to submit license applications for up to 31 reactors in the next few years.

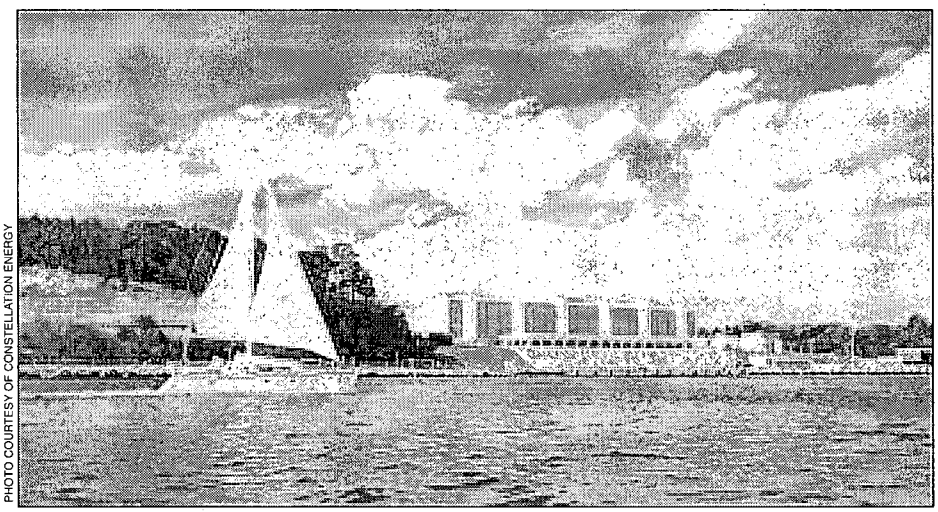


PHOTO COURTESY OF CONSTELLATION ENERGY

UniStar Nuclear became the first company to submit a partial license application for a new reactor at Constellation Energy's Calvert Cliffs plant in Maryland.

> *"The carbon footprint for a nuclear power plant ... is less than every other electric generating source except hydro."*
>
> —Adrian Heymer
> Nuclear Energy Institute

The licensing phase is one of the first steps in nuclear plant construction. Interest in building new reactors has found support among policymakers at the local, state and national levels. That renewed interest is the product of several converging factors, according to Adrian Heymer, senior director of new-plant development at the Nuclear Energy Institute.

"There is a need for more power as we see continuing electricity demand and tightening supply," Heymer said. "We also see a need for power that emits little or no greenhouse gases. In fact, the carbon footprint for a nuclear power plant, based on the amount of carbon dioxide emitted through the entire power-generation cycle, is less than every other electric generating source except hydro."

An International Energy Agency analysis found that nuclear power's life-cycle emissions range from 2 to 59 gram-equivalents of carbon dioxide per kilowatt-hour, while hydropower's range from 2 to 48 gram-equivalents of carbon dioxide per kilowatt-hour. Nuclear energy life-cycle emissions include emissions associated with construction of the plant, mining and processing the fuel, routine operation of the plant, disposal of used fuel and other waste byproducts, and decommissioning. Nuclear plants do not generate greenhouse gases during operation.

Nuclear energy's life-cycle greenhouse gas emissions are generally lower than wind (7 to 124 gram- equivalents) and solar photovoltaic (13 to 731 gram-equivalents), according to the agency. The life-cycle emissions from natural gas-fired plants range from 389 to 511 gram-equivalents of carbon dioxide per kilowatt-hour.

Policymakers from the statehouse to the White House are touting nuclear energy's benefits. "For Democrats and nuclear energy, the landscape has changed rather significantly," Iowa State Rep. Phil Wise, a Democrat, wrote in a July 6 op-ed in the Des Moines Register. "This brings with it the possibility of a fresh, bipartisan consensus on nuclear power. Why? Because nuclear power works. It is safe. It is environmentally benign. And because the 'times they have changed.' "

New Plants *on page 5*

NEI Launches Redesigned Web Site

Change is the only constant, and nowhere is that more evident than on the Internet. The Nuclear Energy Institute (NEI) is the latest to embrace the ever-changing nature of the online community with a redesigned, retooled and updated Web site.

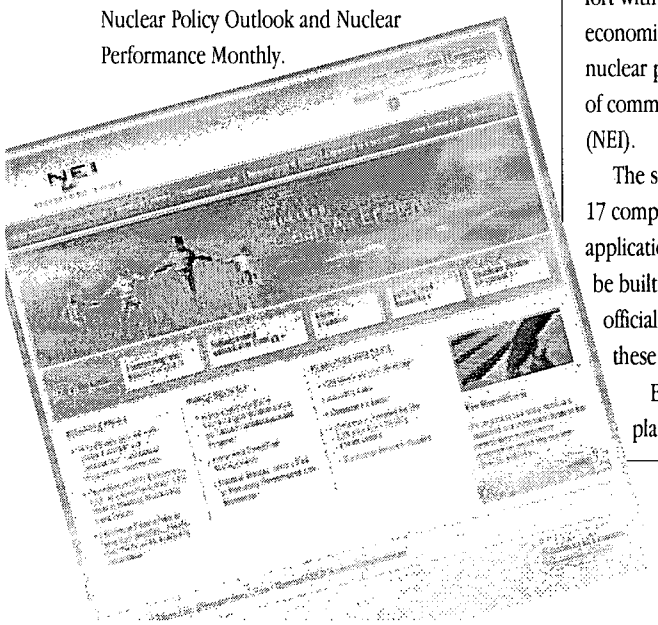
The site, *www.nei.org*, serves as the information hub and news resource for nuclear energy and technology. The site discusses how nuclear power plants work, nuclear energy policy, plans for new reactors and the environmental benefits of clean-air nuclear power.

The site features a refreshed design, easier navigation, improved organization and brand-new content.

The online News & Events page offers the industry's top stories and NEI news releases. Users also will find links to in-depth resources and statistics, including fact sheets about nuclear energy and briefs detailing the industry's policy positions.

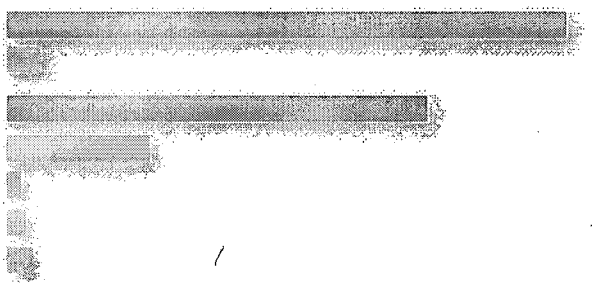
The site also offers information on a wide range of key issues, including environmental protection, reliable and affordable energy, plant safety and security, and integrated used fuel management. Other sections are devoted to public policy, careers and education in the industry, and nuclear technology.

Numerous NEI online publications are also available, including Nuclear Energy Insight, Nuclear Policy Outlook and Nuclear Performance Monthly.



Plant Neighbors Count on Nuclear Power to Meet Energy Needs

Q: *How important do you think nuclear energy will be in meeting this nation's electricity needs in the years ahead? Do you think nuclear energy will be very important, somewhat important, not too important or not important at all?*



SOURCE: BISCONTI RESEARCH INC./QUEST GLOBAL RESEARCH GROUP

Nuclear Plant Neighbors Put Out Welcome Mat for New Reactors

Eighty-two percent of Americans living in close proximity to nuclear power plants favor nuclear energy, and 71 percent are willing to see a new reactor built near them, according to a new public opinion survey of more than 1,100 adults nationwide.

Favorability was even higher in communities where steps are under way to build new reactors. Three-quarters of respondents in these areas would find a new reactor at the nearest site acceptable, with only 20 percent saying it would not be acceptable.

"It's obvious that people living near nuclear plants have a high degree of familiarity and comfort with nuclear energy and would welcome the economic and environmental benefits of new nuclear plants," said Scott Peterson, vice president of communications at the Nuclear Energy Institute (NEI).

The survey's findings come at a time when 17 companies have announced plans to file license applications for as many as 31 reactors that could be built over the next 10 to 15 years. Industry officials expect companies to file a handful of these applications by the end of this year.

By a margin of 82 percent to 16 percent, plant neighbors said they favor the use of nuclear energy as one of the ways to provide electricity in the United States. By a margin of 86 percent to 11 percent, they said they have a favorable impression of the nearby nuclear power plant and the way it has operated recently.

When asked about the company that operates the nearest nuclear power plant, three-quarters agreed that "this company is involved in the community," and 81 percent agreed that "this company is doing a good job of protecting the environment." Eighty-seven percent are confident that the company can operate the plant safely.

NEI commissioned the telephone survey of 1,152 adults living within 10 miles of each of the nation's 65 nuclear plants sites, excluding electric company employees. Bisconti Research Inc., with Quest Global Research Group, conducted the poll, which has a margin of error of plus or minus three percentage points.

Seventy-nine percent of plant neighbors said they are "very well-informed" or "somewhat well-informed" about the nearest nuclear power plant. Slightly more than three-quarters of the respondents have lived in the area for more than 10 years.

This is the second time NEI has surveyed plant neighbors about their attitudes on nuclear energy. The first was in August 2005.

Safety by Design

'Defense in Depth' Helps Nuclear Power Plants Withstand Earthquakes

When a major earthquake struck the northern coast of Japan in July, the Kashiwazaki-Kariwa nuclear power plant responded as designed, shutting down its operating reactors safely.

A "defense in depth" philosophy employed by nuclear plants in Japan, the United States and other nations uses robust plant design and construction and redundant, physically separated safety systems to ensure public health and safety even in severe circumstances like earthquakes.

Nuclear plant seismic design must meet national codes , standards and regulations. Compliance with these standards and regulations ensures there is a substantial safety margin with respect to earthquakes.

Nuclear plants are designed to withstand earthquake-induced ground motions, focusing on systems and components most important to safety, such as critical buildings and systems involved in safely shutting down the plant and keeping it secured. The design of noncritical buildings, such as offices, uses safety standards closer to typical commercial facilities.

This commitment to safe plant operation begins with a detailed evaluation of potential earthquake-induced ground motion at the site, followed by a thorough analysis and testing of plant structures, systems and equipment, using simulated earthquake-induced vibrations. If a tremor above a specified level affects a plant, officials must perform extensive inspections before a company can restart a reactor.

PHOTO BY KOICHI KAMOSHIDA/GETTY IMAGES

The Kashiwazaki-Kariwa nuclear plant in Japan shut down safely as required during a July earthquake and sustained little damage, the International Atomic Energy Agency concluded after an on-site inspection by its team of seismic experts.

PHOTO COURTESY OF PACIFIC GAS & ELECTRIC CO.

In the event of an emergency, such as an earthquake, nuclear plants' personnel and community emergency response organizations work together to ensure public health and safety.

All U.S. nuclear plants are designed to withstand earthquakes of a magnitude that is equivalent to or greater than the largest known tremor for the region where it is built. Plant operators will shut down the reactor even if the seismic event is well within levels the design can accommodate.

Operators then perform extensive inspections prior to restarting the plant. If an earthquake exceeds the maximum level, the plant cannot restart without U.S. Nuclear Regulatory Commission approval, following extensive inspections to determine if it is safe to resume power production.

Each nuclear plant has seismic instrumentation to record earthquake-induced motions at the site. For instance, Kashiwazaki-Kariwa has 97 seismographs on its site. Plant operators use the recordings to evaluate the level of earthquake vibrations at the site and determine if it must shut down. Detailed physical inspections supplement the recordings to evaluate the impact of an earthquake at the site and the condition of the plant structures, systems and equipment. In the event of an earthquake, employees analyze the recordings and the inspection results before restarting the reactor.

Engineers and scientists calculate the potential for earthquake-induced ground motion for a site using a wide range of data. They also review the impacts of historical earthquakes up to 200 miles, with careful study given to those within 25 miles. They use this research to determine the maximum potential earthquake that could affect the site.

New Licensing Process Allows More Public Input

The next generation of nuclear power plants will benefit from an improved licensing process that gives the public opportunities for early participation and ensures safety is foremost throughout the process.

The federal government licensed most of today's 104 nuclear power plants during the 1960s and 1970s. Commercial nuclear energy was in its early stages, and the regulatory process evolved with the new industry. The regulatory agency issued a construction permit for a plant based on a preliminary design. Safety issues were not fully resolved until the plant was essentially complete—a process that had substantial financial ramifications.

"Some construction projects went really well and were completed in four to four and a half years; others took 14 to 20 years," said Adrian Heymer, senior director of new-plant development at the Nuclear Energy Institute.

The U.S. Nuclear Regulatory Commission in 1989 established a new, more efficient process for licensing nuclear power plants, and Congress strengthened the new licensing process as part of the 1992 Energy Policy Act.

The process consists of four parts:

- Design certification allows plant designers to secure advance NRC approval of standard nuclear plant designs. Later, companies can order the reactor design, license it for a particular site and build a reactor.
- Early site permitting enables companies to obtain NRC approval for a nuclear power plant site before deciding to build a plant. The process resolves site suitability and environmental issues and allows companies to "bank" sites approved by the NRC for up to 20 years and build when the time is right.
- Combined construction and operating licenses (COLs) focus on ensuring safety during construction and startup of the plant.
- Finally, the NRC uses a series of inspections, tests, analyses and acceptance criteria to assess the new plant. It determines whether the constructed plant conforms to all license requirements and is ready to operate.

Status of New-Plant License Applications

Company	Site(s)	Design (# of units)	Construction / Operating License Submittal
Alternate Energy Holdings	Bruneau, ID	EPR	FY 2009
Amarillo Power	Vicinity of Amarillo, TX	EPR	FY 2009
AmerenUE	Callaway, MO	EPR	FY 2008
Constellation (UniStar)	Calvert Cliffs, MD, plus two other sites	EPR (3)	First submittal-FY 2008
Detroit Edison	Fermi, MI	Not yet determined	FY 2008
Dominion	North Anna, VA	ESBWR (1)	FY 2008
Duke	William States Lee, Cherokee County, SC	AP1000 (2)	FY 2008
Duke	Davie County, NC	Not yet determined	Not yet determined
Duke	Oconee County, SC	Not yet determined	Not yet determined
Entergy	River Bend, LA	ESBWR (1)	FY 2008
Entergy (NuStart)	Grand Gulf, MS	ESBWR (1)	FY 2008
Exelon	Clinton, IL	Not yet determined	Not yet determined
Exelon	Matagorda and Victoria County, TX	Not yet determined	FY 2009
Florida Power & Light	Turkey Point, FL	Not yet determined (2)	FY 2009
NRG Energy / STPNOC	Bay City, TX	ABWE (2)	FY 2008
PPL Corp.	Susquehanna, PA	Not yet determined	Not yet determined
Progress Energy	Harris, NC; Levy County, FL	AP1000 (2); AP1000(2)	FY 2008; FY 2008
South Carolina Electric & Gas	Summer, SC	AP1000 (2)	FY 2008
Southern Company	Vogtle, GA	AP1000 (2)	FY 2008
Texas Utilities	Comanche Peak, TX	APWR (2)	FY 2008
TVA (NuStart)	Bellefonte, AL	AP1000 (2)	FY 2008

To improve the process of preparing applications and NRC review, the industry is using templates based on specific plant designs, Heymer explained. Here's how it will work:
Five companies and consortia have chosen Westinghouse's AP1000 as the preferred design for 12 reactors. The Tennessee Valley Authority expects to submit a COL to the NRC, most likely in October, for its Bellefonte plant in Alabama. This would serve as the reference application for other companies preparing AP1000 COL submittals.

"After the NRC's review of the first application, subsequent reviews will look for inconsistencies and focus on unique site-specific issues," Heymer said. "At least 70 percent of the applications should be the same, and that figure may be as high as 80 percent."

As a result, COL preparation and review time could be reduced substantially, he said. Heymer predicted that companies using this approach could reduce license preparation time from 24 to 12 months. The NRC review and approval process could decrease from 42 to 24 months, if the NRC already has granted an early site permit. Construction of safety systems and structures would likely take four years.

Another shortcoming of the previous process was that the public did not have access to the details of the design until construction was almost finished. The new process offers more opportunity for public involvement earlier in the process. "Before, there were two public comment periods, and now there are four," Heymer noted. "Also, the public has more information earlier in the process."

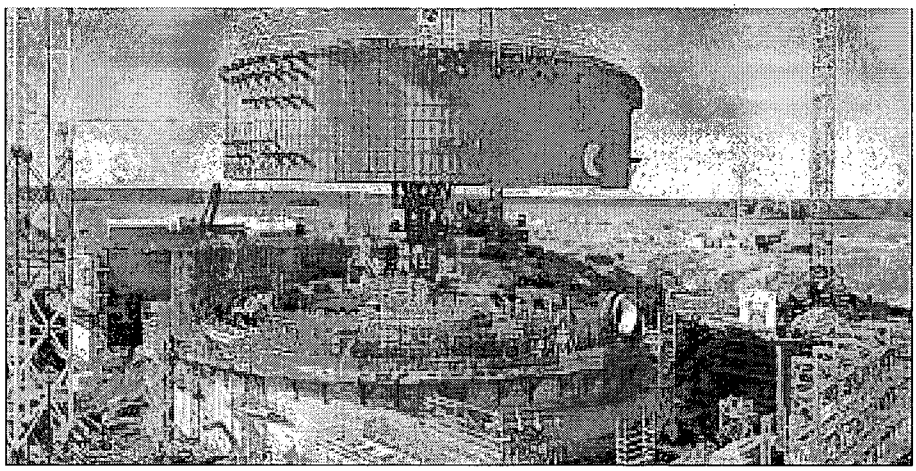


PHOTO COURTESY OF TEOLLISUUDEN VOIMA OY/AREVA

Construction work at Finland's Olkiluoto 3 reactor continues with a work force that has reached 2,000.

What's Needed to Build a Reactor

When it comes to building new nuclear power plants, ordering materials at the neighborhood hardware store is out of the question. These concrete-and-steel behemoths require an extensive and substantial inventory of materials that must meet exacting safety standards.

The chart below describes the bulk materials needed for construction of an average nuclear power plant based on four designs: AREVA's U.S. EPR, Westinghouse Electric Co.'s AP1000, and General Electric's ESBWR and ABWR. To put these figures into perspective, the Empire State Building contains 60,000 tons of steel and 62,000 cubic yards of concrete.

These figures may seem large, but they represent a significant reduction in materials when compared to today's nuclear power plants, said Carol Berrigan, director of industry infrastructure at the Nuclear Energy Institute.

There are more than 2,000 miles of cabling in the average nuclear power plant built in the 1960s and 1970s. Today's new designs require 80 percent less cabling.

"As license applications go to the Nuclear Regulatory Commission, utilities will start ordering equipment that in turn will provide opportunities for other U.S. companies," Berrigan added. Such companies would provide high-quality products like pumps, cables, turbines and other equipment.

Companies will need about 1,500 to 2,000 construction workers to build each new plant, according to industry estimates. Those workers will need products and services that will attract additional economic activity to an area. Moreover, if two reactors are being built at one plant, those workers could be on site for five years or longer.

Once construction is complete, the plant would require 400 to 500 new permanent workers.

"The industry is working with Congress, educational institutions, suppliers, and local and state policymakers to build a work force for the future and retool and upgrade facilities to provide the materials and equipment we will need to build new plants," Berrigan said.

Nuclear Plants Require Extensive Construction Materials

Item	Amount
Concrete	460,000 cubic yards
Reinforcing steel and embedded parts	46,000 tons
Structural steel, misc. steel, decking	25,000 tons
Large-bore pipe	26,000 feet
Small-bore pipe	43,000 feet
Cable tray	220,000 feet
Conduit	1.2 million feet

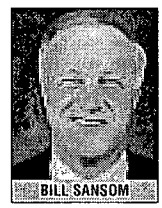
New Plants *from page 1*

After touring the Browns Ferry nuclear plant in Alabama this June, President Bush said, "If you are interested in cleaning up the air, then you ought to be an advocate for nuclear power. There is no single solution to climate change, but there can be no solution without nuclear power."

The pace toward new-reactor development is quickening. In August, the Tennessee Valley Authority's board of directors unanimously approved completion of a second reactor at the Watts Bar nuclear power plant in Tennessee.

TVA estimates it will take five years and $2.5 billion to complete construction on the reactor, which will provide 1,180 megawatts of electricity. The project will require about 2,300 workers during construction. Design and engineering work will begin by October, TVA said.

The plant was 60 percent complete when work stopped in 1985. "Completing Watts Bar Unit 2 puts an existing asset to work for TVA customers and provides a clean, safe and reliable source of affordable power," said TVA Chairman Bill Sansom.



BILL SANSOM

In May, TVA completed a five-year restart project at the Browns Ferry 1 reactor in Alabama, staying within its five-year schedule and projected $1.8 billion cost. TVA said it would apply lessons learned at Browns Ferry to the Watts Bar project.

Residents within 10 miles of Watts Bar strongly support the expansion, according to a telephone survey of 300 randomly selected adults conducted by Bisconti Research Inc. with Quest Global Research Group. Eighty-eight percent support TVA's decision, and an overwhelming majority—90 percent—rated the plant's safety high.

Also this summer, Entergy Nuclear signed a new nuclear project development agreement with GE-Hitachi Nuclear Energy to ensure timely delivery of critical parts for a reactor proposed at its Grand Gulf nuclear plant in Mississippi.

NRG Energy Inc. and STP Nuclear Operating Co. have signed a project services agreement with Toshiba Corp. regarding two reactors planned for the South Texas Project location.

State Lawmakers Support Building New Nuclear Plants

Legislators around the country are voicing support for new nuclear plant construction to help ease climate change concerns and meet increasing demand for energy.

In some instances, that support has translated into resolutions that embrace nuclear power as a crucial part of the nation's energy mix. Meanwhile, individual states are approving legislation and regulations encouraging new-plant construction within their borders.

State-level support among policymakers is nationwide, as evidenced by a resolution from the American Legislative Exchange Council that embraces building new nuclear plants. The resolution urges Congress and the president to "encourage development of safe new nuclear plants as a key component of American fuel portfolio diversity and energy security."

The resolution acknowledged that the nuclear industry would need to bring on line an additional 50 gigawatts by 2030 just to maintain nuclear energy's present 19.4 percent share of electricity generation. "Many communities and regions have expressed strong support for hosting a new nuclear reactor for the clean, safe and affordable electricity; energy security; employment opportunities; and other economic benefits it could provide," it stated.

In the South, a regional group of 16 legislatures passed two resolutions supporting nuclear energy. The 16 member states of the Southern Legislative Conference (SLC) noted that a large majority of expected applications for new-reactor licenses would be for sites in the southern United States. Nearly half of the nation's existing nuclear plants—45 reactors at 26 sites—produce electricity in SLC member states.

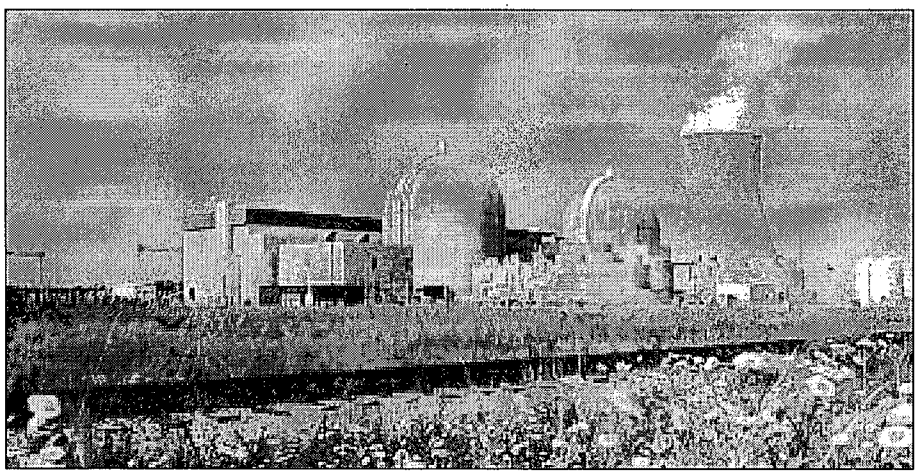


PHOTO COURTESY OF SOUTHERN NUCLEAR

State regulators have given Georgia Power permission to explore building new nuclear plants, including two reactors at its Vogtle site.

To increase that number, the SLC encouraged policymakers to fund nuclear energy research and development, including engineering and design work for advanced reactors. Policymakers also must help reduce the regulatory risks associated with construction of advanced reactors, and implement investment stimulus to support nuclear plant construction, the resolutions said.

In one SLC member state, Georgia, the Public Service Commission has given a company permission to explore building new nuclear plants. In July, the commission approved Georgia Power's integrated resource plan for providing economical, reliable electricity to its customers.

The plan included two potential new reactors at Georgia Power's Vogtle site. In its approval, the commission found "that it is reasonable for the company to investigate the opportunity to build nuclear resources."

The U.S. Nuclear Regulatory Commission is reviewing an early site permit application for Vogtle. Georgia Power is a subsidiary of Southern Nuclear, which filed the application in 2006 and plans to submit a combined license application next year. Construction could begin in 2011, with the plant going on line in 2016.

Lawmakers in Utah have taken notice of other states' actions regarding nuclear power. As a result, the state legislature's Public Utilities and Technology Interim Committee has instructed its staff to draft nuclear energy-related legislation.

The lawmakers were responding to eight other states' 2006 laws and resolutions that encouraged consideration of new nuclear plants, particularly the Florida Energy Diversity and Efficiency Act, which provided guidance on nuclear power plant permitting and cost recovery.

The Utah legislature also decided to draft legislation about new plants because of the state's membership in the recently signed Western Climate Initiative. Utah—along with five other western states and two Canadian provinces—will identify, evaluate and implement methods to reduce greenhouse gas emissions. The new legislation could help determine if nuclear energy will be one such method.

Now Hear This ...

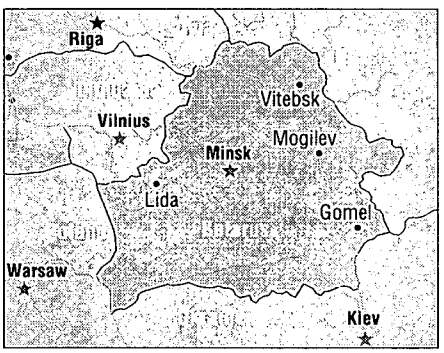
Minnesota currently generates 15 percent of its energy from the Monticello and Prairie Island nuclear facilities, and I believe nuclear energy can and should play a much stronger role in meeting our energy demand."

— State Rep. Joyce Peppin (R)
Minneapolis Star Tribune, Aug. 7

Belarusian Children Learn ABCs of Nuclear Energy During Visit

Warmth from the summer sun, the smell of hotdogs on the grill and faint cheers from a fishing boat created the perfect backdrop for an American barbeque.

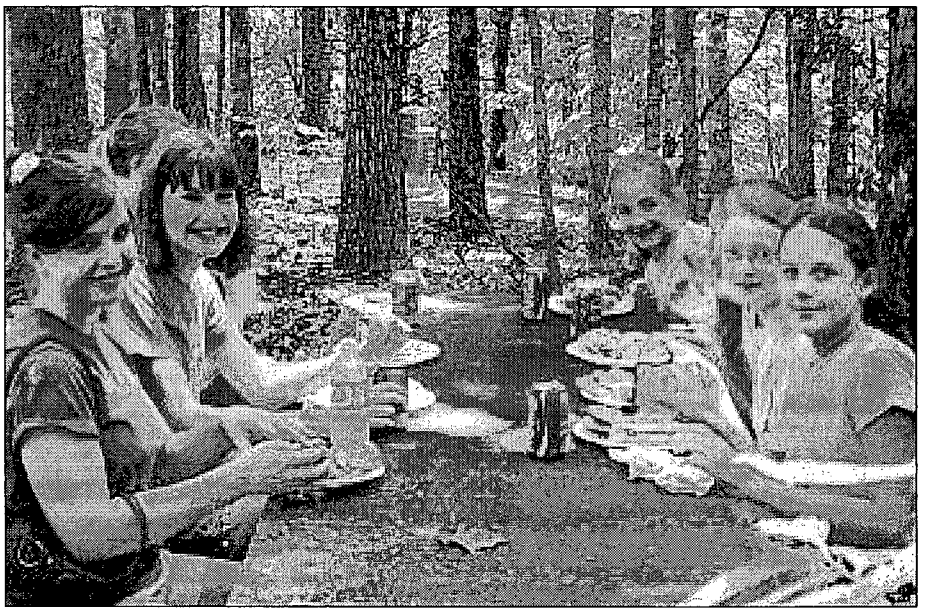
But this time, the picnickers, who enjoyed such a setting at a U.S. nuclear power plant, live thousands of miles away. This summer more than a dozen children from Belarus visited the World of Energy, Oconee Nuclear Station's visitor center. Besides a picnic and boat tour of Lake Keowee, they learned about the operation of the nuclear plant at the Duke Energy site. This marked the second year that many of these children visited the United States.



The children lived with host families for six weeks. The families sponsored the cost of bringing the children from Belarus and coordinated their visit through the American Belarusian Relief Organization (ABRO). While in America, the children received free medical, dental and vision care.

For some Belarusian youngsters, a visit to a nuclear power plant causes a mixture of emotions, from fascination to anxiety. In 1986, a safety experiment at the Chernobyl nuclear power plant, conducted in violation of the plant's technical specifications, went wrong. A resulting fire released a large amount of radiation into the atmosphere, affecting the people of Belarus, Russia and Ukraine.

Michael Cousar, an insurance agent from Anderson, S.C., and host parent, shared his Belarusian child's reaction upon arriving at the plant. "As we pulled up to the main security entrance of the station, with the three reactor buildings towering off in the distance, Vlad, the Belarusian child living with my family, motioned with his hands an explosion and yelled, 'no go, no don't go.' "



PHOTOS COURTESY OF DUKE ENERGY

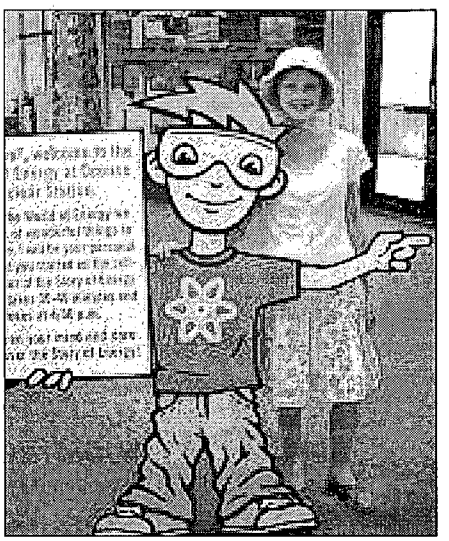
A picnic at Duke Energy's Oconee Nuclear Station drew smiles from the Belarusian children who participated in this summer's visit to South Carolina.

Belarusian children learn about the Chernobyl accident, and photographs of what happened are displayed around their country. "Once Vlad arrived at the World of Energy, he relaxed and quickly realized he was safe and had a wonderful day," Cousar added.

Jason Walls of Duke Energy community affairs hosted the children at the World of Energy. "This event provides a first-hand opportunity for these children to see the safe operation of a nuclear plant and enjoy the natural beauty of Lake Keowee in the mountains of South Carolina," Walls said.

Bert Spear, an engineer at Oconee, and his family have served as hosts for their Belarusian child, Anastasiya Liavonenka, for the past two years. "ABRO is a great program and provides the Belarusian children with an opportunity to improve their health and to enjoy some of the South Carolina summer activities with host families," Spear said.

"Anastasiya is a part of our family while she's here and became close friends with my youngest daughter, Katie. Katie is learning Russian, and the two girls plan to keep in touch by telephone after Anastasiya returns to Belarus. Our family benefits from this experience by learning about the country, people and culture of Belarus," Spear added.



Anastasiya Liavonenka from Mogilev, Belarus, toured the Duke Energy plant's visitor center during the exchange program.

Women in Nuclear Focuses on Building Future Work Force

The nuclear energy industry has a lot of building to do. However, before it can build any of the dozens of new plants under consideration, the industry must build up a diverse work force to staff those plants. That effort is at the heart of U.S. Women in Nuclear's (U.S. WIN) mission.

More than 300 attendees at the organization's annual conference in Anaheim, Calif., discussed this industrywide imperative with an array of speakers that included U.S. Nuclear Regulatory Commission Chairman Dale Klein. He spoke about the agency's need to attract more women to its staff.

"For us to succeed as a regulator, we need to attract more women, because there is a changing face in the nuclear industry," Klein said. "Many regulators around the world are and will be women."

Industry executives also discussed the imperative of a growing, diverse work force.

"We need to let people know our industry is expanding and we have the jobs and the careers waiting for them," said Joe Sheppard, president and chief executive officer of STP Nuclear Operating Co. He said his company likely would hire 1,400 new employees by 2015. STP is considering building two new reactors in Texas.

"Nuclear companies are addressing the technological, regulatory and market challenges that lie ahead. However, the industry needs to increase its focus on assuring that there are sufficient nuclear-trained professionals to staff the rebuilding of America's nuclear industrial base," said John Welch, president and chief executive officer of USEC Inc., which supplies uranium fuel for nuclear reactors.

Each year, U.S. WIN recognizes a member's significant contributions and leadership in the nuclear industry with the Patricia Bryant Leadership Award. This year's recipient, Michele DeWitt, said the award is especially meaningful.

"I think that the objectives and the mission of WIN are ones that are so important to our industry right now," said DeWitt, vice president at Westinghouse Electric Co.

U.S. WIN attendees listen attentively as speakers urge the industry to build a work force of nuclear professionals for the future.

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IN THIS SPECIAL NEW-PLANT ISSUE

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