UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 52-012-COL
	)	52-013-COL
NUCLEAR INNOVATION NORTH AMERICA LLC	)	
	)	
(South Texas Project Units 3 and 4)	)	May 9, 2011
	)	

DIRECT TESTIMONY OF APPLICANT WITNESS ADRIAN PIENIAZEK REGARDING CONTENTION DEIS-1-G

I. WITNESS BACKGROUND

Q1. Please state your full name.

A1. My name is Adrian Pieniazek.

Q2. By whom are you employed and what is your position?

A2. I am currently the Director of Market Policy for NRG Energy, Inc. ("NRG Energy"). I have more than 27 years of experience in the energy industry and have been in my current position since 2003. My current responsibilities include representing NRG Energy's interests at the Electric Reliability Council of Texas ("ERCOT") and the Public Utility Commission of Texas ("PUCT"). Additionally, I provide analysis and policy recommendations to numerous NRG Energy business units, with a specific emphasis on wholesale electricity market design issues. NRG Energy is an owner of Nuclear Innovation North America LLC ("NINA"), the lead applicant for STP Units 3 and 4. The original lead applicant for STP Units 3 and 4 was the STP Nuclear Operating Company ("STPNOC"). NINA became the lead applicant in early 2011. My testimony refers to both NINA and STPNOC as the "Applicant."

Q3. Please describe your educational and professional qualifications, including relevant professional activities.

A3. My professional and educational qualifications are summarized in the attached *curriculum vitae* (Exh. STP000002). Briefly, I earned a B.S. degree in Mechanical Engineering from Texas A&M University and an M.B.A. from Our Lady of the Lake University in San Antonio, Texas. Upon graduation from college, I began my career serving in various engineering positions for TXU Energy (now Luminant Energy). Prior to my current position, I was the Director of Asset Management for Reliant Energy, Inc. Before that, I served as the Director of Generation Planning for City Public Service Board ("CPS Energy"), a municipal power utility. I am also a registered professional engineer in Texas.

Q4. Please describe the materials that you reviewed in preparation of this testimony.

A4. I reviewed various materials in preparing this testimony, including the parties' pleadings on Contention DEIS-1-G; the February 28, 2011 Memorandum and Order ("LBP-11-07") of the Atomic Safety and Licensing Board ("Board") admitting Contention DEIS-1-G; Environmental Report ("ER") Chapter 8 (Rev. 5, Nov. 2011) (Exh. STP000003); Chapter 8 of NUREG-1937, "Draft Environmental Impact Statement for the Combined Licenses (COLs) for STP Electric Generating Station Units 3 and 4, Draft Report for Comment, Vols. 1 & 2" (March 2010) ("DEIS"); Chapter 8 of the Nuclear Regulatory Commission's ("NRC's") "Final Environmental Impact Statement Regarding STP Units 3 and 4, Vols. 1 & 2" (Feb. 24, 2011) ("FEIS") (Exh. NRC00003C); Chapter 8 of NUREG-1555, "Environmental Standard Review Plan—Standard Review Plans for Environmental Reviews for Nuclear Power Plants" (Exh. STP000018); and various ERCOT reports, including the "Report on the Capacity, Demand, and

Reserves in the ERCOT Region" ("CDR Report") for 2006 (Exh. STP000005), May 2010 (Exh. STP000006), and December 2010 (Exh. STP000007). I also have reviewed the Intervenors' "Motion for Leave to File New Contentions Based on the Draft Environmental Impact Statement," dated May 19, 2010 ("Motion"); the associated comments on the DEIS from Mr. David Power, also dated May 19, 2010 ("Power Comments"); and "Intervenors' Consolidated Response to the Applicant's and Staff's Answers in Opposition to the Intervenors' Proposed Contentions Based on the Draft Environmental Impact Statement," dated June 21, 2010.

II. PURPOSE OF TESTIMONY

Q5. What is the purpose of your testimony?

A5. The purpose of my testimony is to address Contention DEIS-1-G.

Q6. Are you familiar with Contention DEIS-1-G, as originally proposed by the Intervenors?

A6. Yes. Contention DEIS-1-G stated that the "DEIS does not account for reduced demand caused by the adoption of the International Energy Conservation Code [(IECC)]." The Intervenors stated (Motion, page 4) that a proposed Texas energy efficient building code based on the IECC "has the potential to reduce peak demand by 2,362 MW annually by 2023 in the ERCOT region." The referenced Power Comments (page 4) cite to a March 2007 report by the American Council for an Energy-Efficient Economy ("ACEEE") entitled "Potential for Energy Efficiency, Demand Response, and Onsite Renewable Energy to Meet Texas' Growing Electricity Needs" ("ACEEE Report") (Exh. STP000008). According to the Intervenors, by failing to account for this potential reduction in peak demand, the DEIS understates the total available capacity in the ERCOT region.

Q7. Are you familiar with Contention DEIS-1-G, as admitted by the Board on February 28, 2011?

A7. Yes, I have reviewed the Board's February 28, 2011 Order, LBP-11-07. The Board concluded that Contention DEIS-1-G raises a genuine dispute of material fact as to whether the need for power assessment failed to consider that the new energy efficient building code could save 2,362 MW of peak power demand by 2023.

The Board admitted the contention as follows (LBP-11-07, page 48): "NRC Staff's DEIS analysis of the need for power is incomplete because it fails to account for reduced demand caused by the adoption of an energy efficient building code in Texas, the implementation of which could significantly reduce peak demand in the ERCOT region."

Q8. Please summarize your testimony.

A8. My testimony demonstrates that consideration of the new energy efficient building code does not change the conclusion that there is a need for power from STP Units 3 and 4. I first will provide a brief background on ERCOT's overall purpose and analyses. I will then evaluate the ACEEE Report cited by the Intervenors and discuss why that document does not indicate that 2,362 MW of peak load or baseload power can be saved in the ERCOT region by 2023. Finally, I will discuss the impact of the energy efficient building code on the need for power from STP Units 3 and 4. On this point, I conclude that even assuming an additional reduction in peak demand of 2,362 MW, a need for power from STP Units 3 and 4 remains.

III. BACKGROUND INFORMATION

A. Overview of STP Units 3 and 4

Q9. Please describe the STP Units 3 and 4 project.

A9. The STP site is located on the coastal plain of southeastern Texas in Matagorda County. NINA has applied for COLs to construct and operate STP Units 3 and 4, utilizing the Advanced Boiling Water Reactor ("ABWR") light water reactor design, each with an expected output of approximately 1,350 MW (gross) and a net electrical output of approximately 1,300 MW. Initial commercial operation for STP Units 3 and 4 could occur as early as 2018, but may occur later. Both STP Units 3 and 4 will be operated by STPNOC. The purpose of STP Units 3 and 4 is to provide baseload power generation for use by the owners and/or sale on the wholesale market.

STP Unit 3 will be owned by NINA Texas 3 LLC and the City of San Antonio, Texas, acting through CPS Energy, and STP Unit 4 will be owned by NINA Texas 4 LLC and CPS Energy. NINA Texas 3 and 4 LLC are indirectly majority-owned and controlled by NRG Energy, which is a wholesale merchant power generation company that will sell its share of the electricity generated at STP Units 3 and 4 on the wholesale market for the ERCOT region. As baseload power generating plants, STP Units 3 and 4 would produce power on average more than 90% of the time. NRG Energy does not have a specific service area. Unlike NRG Energy, CPS Energy is a municipal electric utility within the ERCOT region that has a specific service area for its retail power sales and it also sells any excess capacity to buyers in the ERCOT wholesale market. The ER defined the region of interest for evaluating need for power as the entire area served by ERCOT, and the FEIS used that same region.

Q10. Please describe the need for power evaluation in the ER.

A10. The Applicant's evaluation of the need for power for STP Units 3 and 4 is provided in ER Chapter 8 (STP000003), which, after an introductory section (8.0), is broken down into four additional sections.

ER Section 8.1 provides a description of the STP Unit 3 and 4 power system, including background information on the project and owners, ERCOT and the PUCT functions and deregulation in Texas, and the business activities of ERCOT's market participants. ER Section 8.2 provides a high-level overview of ERCOT's demand forecasts, and a description of ERCOT econometric forecasting methodology. ER Section 8.3 covers the present and forecasted generation capacity in the ERCOT region. Finally, ER Section 8.4 provides an assessment of the need for power. ER Section 8.4 concludes that by the time STP Units 3 and 4 enter commercial operation, there will be a substantial need for power from these units, as well as other new generating plants, in order to meet demand projections along with maintaining ERCOT's target reserve margin.

These sections are based largely on various ERCOT reports and forecasts, including: the Report on Existing and Potential Electric System Constraints and Needs, which analyzes existing constraints on the transmission system; the 2007 Long-Term Hourly Peak Demand and Energy Forecast, which uses the Long-Term Forecast Model ("LTFM") to predict peak hourly power demand and energy consumption for a ten year period; CDR Reports, which compare peak demand load forecasts to expected generation resources to calculate reserve margins; and the 2006 Long-Term System Assessment, which predicts new generation.

I attest to the truthfulness and accuracy of ER Chapter 8 (Exh. STP000003). ER Chapter 8 included the most recent ERCOT information when originally submitted on September 20, 2007. ER Chapter 8, however, does not reflect the most recent ERCOT analyses, because the ER Chapter 8 forecasts were not continually updated as new ERCOT reports were issued. FEIS Chapter 8 includes updated ERCOT information for 2010. Because the FEIS Chapter 8 (Exh. NRC00003C) utilizes updated ERCOT information, and because the information on need for power in the FEIS is not within the scope of Contention DEIS-1-G except for the impact of the new energy efficient building code, I use the FEIS as the baseline for my evaluation of the need for power for STP Units 3 and 4.

B. ERCOT's Function and Analysis

Q11. What is the function of ERCOT?

A11. ERCOT is a membership-based nonprofit corporation that is a neutral and independent source of information on electricity issues. ERCOT is the independent system operator for the electricity grid for most of Texas, and is therefore required to be sufficiently independent of any producer or seller of electricity such that its decisions will not be unduly influenced by any producer or seller. Under Texas law, ERCOT is responsible for central planning, analysis, and forecasts of the resources needed for the electrical system in the ERCOT region, which comprises about 75% of Texas land area. Other ERCOT responsibilities include ensuring the reliability and adequacy of the regional electrical network by managing the flow of approximately 85% of Texas' electric load to nearly 22 million residents on an electric grid encompassing approximately 40,000 miles and 550 generation units. Members of ERCOT range from retail consumers, investor-owned and municipally-owned utilities, to independent generators, power marketers, and retail electric power providers. ERCOT is governed by the Texas Legislature, the PUCT, and a Board of Directors.

Q12. What ERCOT reports and other documents does the NRC Staff reference in support of its need for power evaluation in the FEIS?

A12. The NRC Staff primarily references ERCOT's Long-Term Peak Demand and System Assessment studies, CDR Reports, ERCOT Board of Directors meeting minutes, and hourly load data.

Q13. What are your conclusions regarding this ERCOT information?

A13. After reviewing this ERCOT information, I conclude that ERCOT's analyses are: (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. For these reasons, I conclude that it is appropriate to use this information to determine the need for power from STP Units 3 and 4. Let me explain each of these four conclusions in turn.

First, ERCOT's analyses for load forecasting and reliability assessments are updated at least annually by an iterative and systematic process. As required by the PUCT, ERCOT provides extensive studies and reports, and makes recommendations for transmission system needs and resource adequacy. Stakeholders are involved throughout this process. ERCOT determines future system reliability and forecasts the need for increased generating capacity by using industry best practices and methodological approaches that incorporate load growth scenarios, industrial growth projections, regional transmission topology, sub-regional modeling, and new generation characteristics. The PUCT provides oversight of these analyses and conclusions. Therefore, ERCOT's analyses are systematic.

Second, utilizing best practices and methodological approaches, ERCOT conducts a comprehensive electricity supply analysis that looks forward ten years and accounts for various assumptions that include a variety of factors, including: changes in generation profile; new generating resources planned for construction in Texas; trends in electric power generation by fuel source; trends in consumption by class of consumer; forecasts of future electricity sales;

demand side management, demand response, and distributed generation; and electric reliability assessments. The resulting electricity supply forecasts are subject to an involved stakeholder participation process. Therefore, ERCOT's analyses are comprehensive.

Third, ERCOT's forecasts are independently prepared. These forecasts are then reviewed, confirmed, and consolidated by the PUCT and the North American Electric Reliability Corporation, the electric reliability organization responsible for ensuring the reliability of the North American bulk power system. The analyses and reports also benefit from extensive stakeholder input and scrutiny. ERCOT examines past forecasting performance in order to confirm these results. Therefore, ERCOT's analyses are subject to confirmation.

Fourth, in preparing its forecasts and assessments, ERCOT accounts for the fact that not all proposed new generating units will be built, and some currently operating units will be taken offline. Additionally, ERCOT's LTFM evaluates the uncertainty associated with extreme weather impacts on peak demand by utilizing a more extreme weather profile. Therefore, ERCOT's analyses are responsive to uncertainties and limitations in forecasting.

IV. FEIS ASSESSMENT OF ERCOT'S POWER DEMAND ANALYSIS

Q14. On what documents do you base your conclusion regarding need for power?

A14. Although my testimony relies upon the various documents that I have previously mentioned, my conclusions are based principally on the analyses in FEIS Chapter 8, which incorporates the most recent ERCOT reports and analyses on need for power in the region. I endorse the need for power analysis in FEIS Chapter 8 (Exh. NRC00003C).

Q15. Please summarize the need for power evaluation in FEIS Chapter 8 (Exh. NRC00003C).

A15. In general, FEIS Chapter 8 is organized the same as the ER, but relies on various updated ERCOT reports as a basis for comparison with the ER's need for power assessment. FEIS Section 8.1 provides a description of the STP Units 3 and 4 project and ERCOT's overall functions. FEIS Section 8.1 also concludes that the ERCOT studies and reports relied upon in the FEIS are systematic, comprehensive, subject to confirmation, and responsive to forecasting uncertainty.

FEIS Section 8.2 discusses power demand and ERCOT's forecasting models. The NRC Staff assessed ERCOT peak load forecasts and long-term demand studies, which include population and economic factors. A significant portion of FEIS Section 8.2 is devoted to a summary of the methodology used for calculating the reserve margin. The NRC Staff demand forecasts include consideration of the years from 2020 to 2025. FEIS Table 8-2 encapsulates ERCOT's 2010 forecast of demand and reserve margin.

FEIS Section 8.3 provides the forecasted power supply and calculations for the need for baseload power. This section concludes that even with reduced ERCOT forecasts for electricity demand, presumed successful implementation of various Texas energy efficiency programs, and a complete build-out of installed wind capacity in Texas, the combination of load growth and plant retirements shows a need for power from STP Units 3 and 4. FEIS Table 8-3 expands upon the information provided in Table 8-2 to account for retirement of generation sources. This section also discusses the NRC Staff's sensitivity tests that account for events that could affect the load forecast, including the impacts from some energy efficiency programs.

Finally, FEIS Section 8.4 assesses the need for power from STP Units 3 and 4. The NRC Staff concluded that there is an expected future shortage of baseload power in the ERCOT region that could at least be partially met by STP Units 3 and 4. Power from the two reactors could address growth in demand for baseload power and anticipated replacement of retiring generating units in the ERCOT region. The FEIS concludes that there is a need for the baseload capacity output of STP Units 3 and 4.

Q16. Please describe what a reserve margin is, along with how it is calculated.

A16. ERCOT emphasizes peak load demand because of its institutional responsibilities for maintaining grid reliability, which involves market participants meeting peak demand and maintaining adequate reserve margin. In contrast to baseload demand, peak power demand reflects short periods of high power demand, typically during daytime hours during the summer months (and to a lesser extent, the winter months). To ensure there will be sufficient generating resources available to meet the load and provide operating reserves, while providing allowance for generating facilities that may be unavailable due to planned or forced outages, ERCOT targets for more generating resources to be available than the peak demand. This extra generating capacity is referred to as "reserve margin." ERCOT has a target reserve margin above its peak hour demand to help ensure that adequate operating reserves are available to reliably meet ERCOT contingencies. The ERCOT board voted in November 2010 to increase the target reserve margin from 12.5% to 13.75%. The primary reason for this increase in target reserve margin is the increase in wind power in ERCOT. Wind power is an intermittent or variable power source. As the wind generating capacity relative to total capacity in ERCOT has increased, ERCOT has increased its target reserve margin to help ensure that sufficient generating resources will be available in light of wind power's intermittent operating characteristics.

The ERCOT reserve margin at the peak hour is a percent by which the generating capacity exceeds the peak demand, and is currently calculated as (Resources – Firm Load

Forecast)/(Firm Load Forecast). The firm load is determined by taking the LTFM for peak load demand (typically during the summer) and subtracting the following:

- Loads acting as resources ("LaaRs") serving as responsive reserve, which are maintained by ERCOT to restore the frequency of the system within the first few minutes of an event that causes a significant deviation from the standard frequency;
- LaaRs serving as non-spinning reserve service that are capable of running or being interrupted at a specified output level for at least 1 hour;
- Emergency interruptible load service;
- Balancing-up loads ("BULs"), or loads capable of reducing the need for electrical energy; and
- Energy efficiency programs that provide a reduction in the quantity of electricity consumed over the year.

In order to obtain the resources, the following are added to the installed net maximum sustainable rating of existing units (excluding wind generation):

- Capacity from private networks;
- Effective load carrying capability ("ELCC") of installed wind capacity;
- Reliability must run units under contract;
- 50% of non-synchronous ties (transmission interconnection between ERCOT and non-ERCOT electric power systems);
- Available "mothballed" generation, defined as the probability that a mothballed unit will return to service, as provided by its owner, multiplied by the unit's capacity;
- Maximum sustainable rating of available switchable capacity;
- Expected generation with a signed generation interconnection agreement ("SGIA") and an air permit; and
- ELCC of planned wind generation with a SGIA.

Q17. Please summarize peak loads and ERCOT reserve margins provided in FEIS Table 8-2 (Exh. NRC00003C).

A17. As shown in FEIS Table 8-2 (page 8-18), the peak summer demand estimates for the years 2015, 2020, and 2025 increases from 70,517 MW to 75,762 MW to 79,858 MW, respectively. The NRC Staff then subtracted LaaRs (responsive and non-spinning reserves), emergency interruptible load service, BULs, and energy efficiency programs, which totaled 1,845 MW (2015), 1,899 MW (2020), and 1,899 MW (2025), from the peak summer demand. The NRC Staff concluded that firm load values for 2015, 2020, and 2025 are 68,672 MW, 73,863 MW, and 77,959 MW, respectively.

The firm load was subtracted from the resources (not accounting for any plant retirements) and then divided by the firm load in order to obtain the reserve margin. For the year 2015 the reserve margin is 13.9%, for 2020 it is 6.8%, and for 2025 it is 1.21%. Based on these calculations, the target reserve margin is met in 2015, but the reserve margin falls short in years 2020 and 2025.

Q18. In order to meet ERCOT's target reserve margin in 2020 and 2025, what additional resources are necessary, not accounting for plant retirements?

A18. As stated in FEIS Table 8-3 (Exh. NRC00003C), an additional 5,115 MW of power is needed to achieve ERCOT's target reserve margin of 13.75% for the year 2020. The amount of additional power generation resources needed for the year 2025 nearly doubles to 9,744 MW.

Q19. What effect would there be on the total resources available if the retirement of power plants older than 50-years were considered?

A19. The effect would be significant. As discussed above, the ERCOT total resource requirements in FEIS Table 8-2 (Exh. NRC00003C) does not account for *any* forecasted retirements of power plants. ERCOT forecasts only account for retirements after it receives an official notice regarding retirement. Once ERCOT receives a notice, the lead time prior to retirement of the plants is typically short—only a few months.

Power companies make decisions regarding whether to retire power plants based on a host of factors, including the age of the plant. The reason for this is that older plants are generally less efficient and typically emit a greater amount of pollutants. Older plants consequently can be more costly to run and have a limited revenue generating capacity when compared to newer power plants. Thus, it is reasonable to account for retirement of older plants in performing need for power analyses.

Although not incorporated into the reserve margin values calculated in FEIS Table 8-2, ERCOT's most recent May 2010 CDR Report (Exh. STP000006) demonstrate that reserve margin forecasts in the ERCOT region would be *significantly* affected by power plant retirements. Based on values obtained from these ERCOT reports, the FEIS considered the impact of the retirement of plants over 50-years old by 2015. As shown on FEIS Table 8-3, after accounting for these retirements, the NRC Staff concluded that 5,993 MW of additional resources will be needed in 2015 to meet the target reserve margin. The additional resources needed increase substantially to 17,551 MW in 2020 and 30,158 MW in 2025. At the time STP Units 3 and 4 could be in commercial operation (2018), a linear interpolation shows that 12,928 MW will be needed to meet the target reserve margin. This further demonstrates a need for the approximately 2,600 MW of net electrical output provided by STP Units 3 and 4.

Additionally, after 50-year old plant retirements are factored into the total resources available, the reserve margins—already well below ERCOT target levels—fall even further. For example, FEIS Table 8-3 demonstrates that the total resources available fall from 78,245 MW to 72,122 MW in 2015 due to retirements, and thus the reserve margin drops from slightly above the ERCOT target (13.9%) to well below (5.0%). When considering the retirement of power plants over 50-years old in 2020, the total resources would decline from 78,905 MW to 66,468 MW, resulting in a drop in reserve margin from 6.8% to -10.0%. Similarly, the 2025 total resources drop from 78,905 MW to 58,520 MW, reflecting a drop in reserve margin from 1.21% to -24.9%.

Q20. Please discuss whether the FEIS (Exh. NRC00003C) considers reduction in demand from the new energy efficient building code identified by the Intervenors.

A20. As part of a sensitivity analysis, the FEIS (page 8-26) increased ERCOT's current energy efficiency adjustment (242 MW) by 5% of the change in cumulative growth from 2010 to 2012 in the ERCOT forecast for 2012 and by 10% in and after 2013. The FEIS states that the NRC Staff's adjustment accounts for energy efficiency programs associated with new PUCT and municipal utility goals not accounted for in ERCOT's econometric modeling. Therefore, the FEIS accounts for uncertainties in future demand reductions due to energy efficiency, which would include the energy efficient building code.

With respect to the energy efficient building code, the FEIS (page 8-26) states:

> Enhanced funding of energy conservation and regulatory actions, such as the new residential building codes adopted by the State and several municipalities within the State, may not be fully captured by the 2010 ERCOT forecast. However, new energy codes have been adopted continuously by Texas municipalities during the 2000-2010 period ahead of statewide actions in 2010 and much of their impact would have been included in the ERCOT forecast. For example, most of the large [cities] had adopted the 2006 or even the 2009 version of the International Energy Conservation Code before the State did (Energy Systems Laboratory 2010). The corresponding electricity savings would have been reflected in the trend in electricity consumption during the period that formed the basis for ERCOT's forecast. There is almost no currently available, reliable information that suggests the impacts of the latest statewide code adoption, ARRA-funded projects, or other

> very recent programs have been significant on a statewide basis or that they require a significant adjustment to the ERCOT forecasts.

Q21. What does the FEIS (Exh. NRC00003C) conclude regarding the ultimate effects of these energy efficiency programs?

A21. The FEIS (pages 8-18 and 8-19) states that despite the availability of various energy efficiency programs over the past decade, including the new energy efficient building code, many of the programs address the same end uses or represent the continuation of long-term program improvements whose effects are expected to be captured in the econometric modeling. Therefore, the FEIS (page 8-19) states that "there is almost no currently available, reliable information that suggests the impacts of these programs have been significant on a statewide basis or that they require a significant adjustment to the ERCOT forecasts."

Q22. What are your views on this topic?

A22. I agree with the FEIS. Only a few months have passed since the adoption of the new building code. There is not enough reliable performance information available to assess its potential quantitative effect on the most recent ERCOT forecast. Thus, absent reliable, current information, forecasting any future reduction in power demand is speculative. Despite these uncertainties, the FEIS includes potential effects of the energy efficient building code in its sensitivity tests.

Q23. Comments were submitted on the DEIS related to the energy efficient building code and the ACEEE Report. How does the FEIS address these comments?

A23. In addition to the consideration of the energy efficient building code in FEIS Chapter 8, the FEIS also considers comments on the DEIS alleging that the DEIS did not account for demand reductions due to the energy efficient building code and the ACEEE Report. In responding to these comments, the FEIS states (Exh. NRC00003D), pages E-76 to E-77):

Over the very long term (20 to 30 years), a new building code could be effective in reducing electricity consumption due to heating, cooling, and to some extent, lighting. Some of the potential savings would be in end uses such as lighting that are also being targeted by utility programs and municipal programs, so it is important not to double count. There are additional reasons to consider ACEEE projection speculative. The first is that in Texas, code adoption and enforcement occurs at a local level, and as noted by the commenter, many jurisdictions do so before the state updates its statewide standard. Many of the large metropolitan code-enforcing jurisdictions in Texas already had adopted the 2003, 2004, 2006, or 2009 model standards even though the statewide standard was the 2000 version (Energy Systems Laboratory 2010). Thus, the trend in energy savings from early adoption would have been embodied in the historical energy consumption data used to produce the ERCOT forecasts. The impact of imposing the 2009 standards would be significantly less than might otherwise be supposed, based on an engineering comparison of buildings with the new codes with the old codes. Second, because the codes would apply only to new structures, its effect depends on how many new structures are built under the new codes. Third, new codes would not address additional growth and electrification of household services (e.g., additional plug loads) in either new or existing homes. Finally, the codes must be enforced as well as adopted. Not all jurisdictions do this equally well, although the major metropolitan areas in Texas reportedly do a good job. In addition, the 15 percent savings figure discussed in the second comment must hold up in the field (there would have to be no take-back or rebound effects on energy use from lowered cost of household services due to the more efficient buildings). ERCOT did not publish the underlying economic data for their 2010 forecast and the review team was not able to locate either good estimates of future construction in Texas or estimates of building-code-sensitive electricity use in new buildings so it was not possible to perform a quantitative estimate of the near-term impact of the new building code. It is likely that many of the contemplated savings would be covered in the lower demand growth in the 2010 ERCOT forecast and in the sensitivity tests the review team conducted on the ERCOT forecast in Chapter 8.

Q24. Have you come to any conclusions regarding the NRC Staff's response to these DEIS comments on the energy efficient building code and the ACEEE Report?

A24. Yes. I conclude that the NRC Staff's response to these DEIS comments is correct. I agree that the ACEEE Report projections are speculative. Additionally, the ERCOT projections already reflect some demand reductions from energy efficiency programs, and many of the savings from the energy efficient building code would be covered by ERCOT's 2010 lower demand forecasts and the NRC Staff's sensitivity tests in FEIS Chapter 8.

Q25. Have you come to any conclusions regarding whether the FEIS appropriately addresses the potential reduction in demand due to energy efficiency programs?

A25. Yes. Based on my review of the FEIS and the underlying references to various ERCOT reports, I conclude that the FEIS adequately addresses the impacts of a reduction in power demand due to energy efficiency programs, including the implementation of the new energy efficient building code requirements.

V. REDUCTIONS IN DEMAND FROM NEW ENERGY EFFICIENT BUILDING CODE

A. Adoption of Texas Energy Efficient Building Code

Q26. Please provide an overview of the new energy efficient building code in Texas.

A26. On June 4, 2010, Texas adopted new energy efficient building code rules (34 Tex. Admin. Code § 19.53), titled "Building Energy Efficiency Performance Standards," which are based upon the International Residential Code ("IRC") and the IECC. The new rules state:

> (a) Single-family residential construction. Effective January 1, 2012, the energy efficiency provisions of the International Residential Code as they existed on May 1, 2009, are adopted as the energy code in this state for single-family residential construction as it is defined in Health and Safety Code, § 388.002(12).

> (b) All other residential, commercial, and industrial construction. Effective April 1, 2011, the International Energy Conservation Code as it existed on May 1, 2009, is adopted as the energy code for use in this state for all residential, commercial, and industrial construction that is not single-family residential construction under subsection (a) of this section.

The new rules apply only to new construction and modifications (*e.g.*, renovations, additions, alterations). Therefore, the new code may reduce the amount of future increases in power demand, but they do not reduce current demand.

Q27. Please provide an overview of the purpose of the IECC and IRC.

A27. The new Texas energy efficient building code rules are based upon the IRC and IECC; however, for over 10 years Texas has had energy efficient building codes based upon prior versions of these international codes. For example, in June 2001, Texas adopted as the statewide code the 2000 IECC, along with its 2001 supplement. Two years later, the state adopted the IECC for state-funded residential buildings. Additionally, various cities and jurisdictions have adopted more recent versions (*e.g.*, cities of Austin, Houston, Dallas) (Exh. STP000010).

The IRC is a comprehensive, residential code that creates minimum regulations for certain residential dwellings, bringing together building, plumbing, mechanical, fuel gas, energy, and electrical provisions. The IRC also provides a prescriptive approach (set of measures) and a performance approach (energy modeling) for determining compliance. Similar to the IRC, the IECC encourages energy conservation through efficiency in design, mechanical systems, lighting systems, and the use of new materials and techniques. Each state has its own energy code requirements, though it is worth noting that a few states have no requirements. Briefly, the difference between the IECC and IRC is that the IECC applies only to energy savings for residential and commercial buildings, and the IRC applies to all codes (*e.g.*, plumbing, structural) for certain dwellings.

B. <u>Assessment of the ACEEE Report</u>

Q28. What is the basis for the Intervenors' argument that adoption of the new energy efficient building code will reduce demand by 2,362 MW by 2023?

A28. The Intervenors conclude (Power Comments, page 4) that the adoption of the new energy efficient building code could save an estimated "10,533 kilowatt hours [sic] of electricity annually . . . by 2023," and result in a reduction in peak summer demand of 2,362 MW annually by 2023. The Power Comments cite to the ACEEE Report and also rely upon a one page written testimony of a representative from the Environmental Defense Fund that was submitted during legislative hearings in April 2009 on the proposed Texas energy efficient building code rules. This testimony simply recites the position that the code will reduce peak summer demand by 2,362 MW by 2023.

Q29. Please provide a brief overview of ACEEE and the ACEEE Report (Exh. STP000008).

A29. ACEEE is a non-profit group that is dedicated to promoting energy efficiency as a means for advancing economic prosperity and environmental protection. In order to achieve this stated purpose, ACEEE is heavily involved in advising policymakers and individual program managers, conducts technical and policy assessments, and publishes reports, such as the ACEEE Report.

The ACEEE Report was issued in 2007 and concluded (page 36) that Texas could reduce peak demand and avoid the pending "reserve margin crisis" forecasted for the state by implementing various energy efficiency, demand response, and renewable energy resource programs and policies. To achieve this goal, the ACEEE Report advocated that Texas carry out nine individual demand savings policies, including, for example, short-term public education and rate incentives, and appliance and equipment standards, as well as savings from "more stringent building codes."

Q30. What did the ACEEE Report (Exh. STP000008) mean by "more stringent codes?"

A30. The ACEEE Report (page 25) states that the Texas Legislature should adopt new energy efficient building codes that would reduce energy use by 15% relative to current codes. At the time, the Legislature had not proposed adoption of the new energy efficient building code (34 Tex. Admin. Code § 19.53). The yearly anticipated energy savings from more stringent building codes *assumes* the new codes would reduce energy use by 15% beginning in 2009, when compared to state building codes already in effect. Beginning in 2020, the savings are increased to 30% relative to the current code. The ACEEE Report does not discuss the feasibility of 15% and 30% energy savings based on the new energy efficient building code.

The ACEEE Report, Table A.2, provides the estimated annual peak demand savings for each of the nine individual policies, including more stringent building codes. From 2008 to 2023, Table A.2 offers the megawatt demand savings for each year. For 2023, the estimated peak demand savings for the more stringent building codes is 2,362 MW—the value relied upon by the Intervenors. This value is for the entire state of Texas, not just the ERCOT region.

Q31. What peak summer demand value does the ACEEE Report (Exh. STP000008) rely upon to arrive at 2,362 MW of savings?

A31. The ACEEE Report was published in 2007 and relies on reports based upon 2006 data, primarily ERCOT's 2006 CDR Report forecast for long-term peak summer demand. Because the ERCOT region covers 85% of the electric load in Texas, the ACEEE Report scaled up ERCOT's 2006 projected long-term peak summer demand values to account for the entire state. Based upon this methodology, the report determined (page 6) that the total peak summer demand for the entire state of Texas in 2023 will be 105,874 MW.

Q32. How does the peak demand forecast in the ACEEE Report compare to the most recent ERCOT projections?

A32. The ACEEE Report relies on ERCOT projections that are older than those used in the FEIS. The most recent ERCOT projected long-term peak summer demand values are provided in the May 2010 CDR Report (Exh. STP000006). As shown in the May 2010 CDR Report (page 33), ERCOT forecasts the peak summer demand to be 74,473 MW in 2020 and 79,858 MW in 2025. Based on a linear interpolation, the value for 2023 would be 77,704 MW. After adjusting this value to account for the entire state and not just the ERCOT region by multiplying it by the ratio 100/85, the resulting value (91,416 MW) is significantly lower (14,458 MW lower) than the 2006 projection used in the ACEEE Report for 2023.

Q33. How would use of the 2010 ERCOT forecast impact the ACEEE Report's conclusion that demand could be reduced 2,362 MW by 2023 from energy efficient building codes?

A33. If the ACEEE Report were to utilize the peak summer demand values from the May 2010 ERCOT CDR Report—instead of the 2006 values—its potential demand reduction savings tied to more stringent building codes (2,362 MW) would be reduced significantly.

The ACEEE Report (Exh. STP000008, page 6) relied upon information in the 2006 CDR report (Exh. STP000005) for peak summer demand. The 2006 CDR Report (page 6) states that the 2008 peak summer demand is 64,318 MW, which the ACEEE Report (page 6) scaled up to 75,668 MW for all of Texas. The ACEEE Report (page 6) projected that the peak summer demand would increase from 75,668 MW in 2008 to 105,874 MW in 2023, an increase of 30,206 MW. The reduction in peak demand due to the energy efficient building code projected in the ACEEE Report is based upon this projected increase.

The May 2010 CDR Report (Exh. STP000006, page 33) indicates through interpolation that the peak summer demand in the ERCOT region will be 77,704 MW in 2023, which equates to 91,416 MW for all of Texas. This is an increase of 15,748 MW from the 2008 peak summer demand of 75,668 MW projected in the ACEEE Report. Therefore, based on the May 2010 CDR Report, the current projected *increase* in peak summer demand in 2023 is 52.1% (15,748 MW/30,206 MW) of that projected in the ACEEE Report. After accounting for the lower projected peak summer demand in the May 2010 CDR Report, the Intervenors' assumed 2,362 MW reduction in peak demand associated with more stringent building codes is reduced to 1,231 MW (*i.e.*, 52.1% of 2,362 MW).

Q34. As you have testified, the need for power analysis for STP Units 3 and 4 uses the ERCOT region as the region of interest, which is smaller than the state of Texas. How would the 2,362 MW projected reduction in demand due to the new energy efficient building code change if only the ERCOT region is considered?

A34. The 2023 forecasted peak summer demand in the ACEEE Report (105,874 MW) covers the entire state of Texas (Exh. STP000008, page 6). Therefore, the 2,362 MW projected demand reduction in 2023 also applies to the entire state of Texas, and would need to be reduced by the ratio of 85/100 in order to cover only the ERCOT region, the defined region of interest (FEIS, page 8-2; Exh. NRC00003C) for evaluating need for power. After reducing the 2,362 MW value to 1,231 MW to account for more recent demand projections, and then reducing it by the ratio of 85/100 to cover only the ERCOT region, the resulting ACEEE Report demand reduction due to more stringent building codes is 1,046 MW in 2023.

Q35. How does this value compare with the value assumed in the FEIS (Exh. NRC00003C) sensitivity analysis for additional savings due to energy efficiency?

A35. The values are similar. The results of the FEIS sensitivity analysis are reported in FEIS Table 8-5, which shows a firm load forecast in 2025 of 76,494 MW (which includes an assumed additional reduction in demand due to energy efficiency beyond that already included in the ERCOT forecasts). In contrast, FEIS Table 8-3 shows a firm load forecast in 2025 of 77,959 MW based upon the ERCOT forecasts. The difference between those values is 1,465 MW in 2025, which is comparable to the value of 1,046 MW derived from the ACEEE Report for 2023.

Q36. How would the 2,362 MW projected reduction in peak demand due to the new energy efficient building code change if only baseload generation is considered?

A36. The ACEEE Report demand reduction is based on *peak* summer demand, not baseload demand. The FEIS (Exh. NRC00003C, page 8-26) assumes that baseload generation would account for approximately 39% of peak demand. Therefore, the 2,362 MW projected peak demand reduction in 2023 would need to be reduced to correlate with this amount in order to account for only baseload demand. After reducing the 2,362 MW value to 1,231 MW to account for more recent demand projections, and reducing that value to 1,046 MW to account for only the ERCOT region, and then reducing it to 39% to account for baseload demand, the resulting ACEEE Report baseload demand reduction due to more stringent building codes is 408

MW in 2023. This value is much less than the baseload generation that would be provided by STP Units 3 and 4.

Additionally, I would add that the energy efficient building codes are likely to affect peak demand more than baseload demand. In particular, the codes are likely to reduce demand for electricity due to air conditioning, which affects the daytime summer peak loads but has little effect on baseload power demand which accounts for the demands during the entire day. Thus, a value of 408 MW savings in baseload demand from the new energy efficient building codes is a conservative value.

Q37. How does the ACEEE Report (Exh. STP000008) characterize its underlying conclusion regarding reductions in demand due to energy efficiency?

A37. The ACEEE Report framed the discussion of its conclusions by stating early in the report (page 8) that "experience with actual [energy efficiency] programs suggests that only a *portion* of this [savings in peak energy demand] is realistically achievable in the real world from programs and policies." As stated in the ACEEE Report (page 52), the reduction in peak summer demand was based on the "total *potential* for cost-effective electricity savings in Texas." And while this total is large—when compared to other energy demand savings policies—the report reiterated (page 52) that "only a portion of these savings would be *realistically achievable* given market and policy limitations."

Q38. What effect does this qualification in the ACEEE Report have upon the total savings due to the new energy efficient building codes?

A38. This qualification by ACEEE would serve to reduce the amount of the savings. However, since ACEEE does not quantify the effect, I have conservatively not included that effect in my analysis.

VI. NEED FOR POWER FROM STP UNITS 3 AND 4 AFTER ACCOUNTING FOR INTERVENORS' DEMAND REDUCTION

Q39. Assuming the Intervenors' value of 2,362 MW is used, would there still be a need for power from STP Units 3 and 4?

A39. Yes. Even after accounting for the 2,362 MW demand reduction in 2023 assumed by the Intervenors, there still would be a need for STP Units 3 and 4.

To achieve the target reserve margin of 13.75%, the FEIS (Exh. NRC00003C, Table 8-3) states that there is a need for about 5,115 MW of additional power generation resources in 2020, and about 9,744 MW in 2025, without accounting for any unit retirements. By performing a linear interpolation of these values, there is a need for about 7,892 MW of additional power in 2023. Therefore, even reducing the 2023 value by 2,362 MW, there remains a need for the approximately 2,600 MW of power from STP Units 3 and 4. After accounting for the retirements of power plants over 50-years old, FEIS Table 8-3 shows that the need for power more than triples: in 2020 there is a need for about 17,551 MW, in 2023 (based on interpolation) there is a need for about 25,115 MW, and in 2025 there is a need for about 30,158 MW.

Q40. Does your conclusion change if only the need for baseload generation is considered?

A40. No. As stated in FEIS Table 8-6 (Exh. NRC00003C), there is a need for 6,111 MW, 8,952 MW (using linear interpolation), and 10,846 MW of baseload generation in the years 2020, 2023, and 2025, respectively, after accounting for potential retirements of plants greater than 50-years old. If these values were to be reduced by 2,362 MW, then there would still be a need for the baseload generation from STP Units 3 and 4.

This conclusion is very conservative because it assumes that the 2,362 MW demand reduction would apply entirely to baseload generation. The Intervenors' 2,362 MW demand reduction is for peak load. The FEIS assumes that baseload generation would account for approximately 39% of growth. Using this assumption, the 2,362 MW demand reduction is reduced to 921 MW. This demonstrates an even greater need for STP Units 3 and 4.

VII. SUMMARY AND CONCLUSIONS

Q41. Please summarize the various conservatisms in the estimated value of 408 MW reduction in baseload demand in 2023, based upon the ACEEE Report.

A41. That estimate includes the following conservatisms:

- It does not account for the fact that the new building codes are likely to affect peak demands but have less impact on demand for baseload power.
- It does not account for the fact that some municipalities had previously implemented the energy efficient building code, and therefore some of the savings are already included in the existing ERCOT power demand and its future need for power forecasts.
- The ACEEE Report states that its estimated demand reductions due to the new energy efficient building code are assumptions, with only a portion being realistically achievable.

Q42. Please summarize your testimony and the bases for your conclusions regarding Contention DEIS-1-G.

A42. In summary, even after accounting for the Intervenors' estimated reduction in peak demand of 2,362 MW by 2023 due to implementation of the new energy efficient building code, there is still a need for power from STP Units 3 and 4.

If the 2,362 MW peak demand savings for Texas from the 2007 ACEEE Report accounts for updated ERCOT demand projections, the fact that the ERCOT region does not encompass the entire state of Texas, and that baseload power demands are 39% of peak demands, the value of

2,362 MW in the ACEEE Report is equivalent to 408 MW of baseload demand savings. Furthermore, as I discussed previously, this value is conservative. The value of 408 MW is much less than the baseload generation from STP Units 3 and 4, and much less than the forecasted generation needs. Additionally, the ACEEE Report, the sole source relied upon by the Intervenors, admits that its estimated demand reductions due to energy efficiency are assumptions, with only a portion being realistically achievable. Moreover, the FEIS already accounts for demand reductions due to energy efficiency. Finally, even if the value of 2,362 MW is used to directly reduce the FEIS need projections, there is still a need for power from STP Units 3 and 4.

Q43. What is the impact on the need for power analysis in the FEIS (Exh. NRC00003C) from the savings from energy efficient building codes, as stated in the ACEEE Report and appropriately adjusted to account for the factors that you have discussed?

A43. It has very little impact on the numbers in the FEIS and no impact on the conclusion that there is a need for power from STP Units 3 and 4. As I previously discussed, the savings from the energy efficient building code, based upon the ACEEE Report, are bounded by the sensitivity study in the FEIS. Furthermore, the FEIS (page 8-31) contains the following analysis regarding the need for new generating capacity in ERCOT during the period from 2015 to 2020, when STP Units 3 and 4 are expected to enter commercial operation:

> [There is] a net need for new total generation in the 2015 to 2020 period ranging from 0 MW in 2015 to 3233 MW in 2020 without retirements and from 5389 MW in 2015 to 15,669 MW in 2020 with a conservative estimate of potential retirements. The corresponding ranges for baseload generation are 0 MW in 2015 to 1261 MW in 2020 and 2102 MW in 2015 to 6111 MW in 2020.

When a savings of 1,046 MW of peak load power in 2023, derived from the ACEEE Report, are converted into the equivalent value for 2015 and 2020 conservatively assuming a linear interpolation, the corresponding values are 488 MW for 2015 and 837 MW for 2020. Similarly, when a savings of 408 MW of baseload power for 2023, derived from the ACEEE Report, are converted into the equivalent value for 2015 and 2020 conservatively assuming a linear interpolation, the corresponding values are 190 MW for 2015 and 326 MW for 2020. Reducing the numbers quoted in the FEIS by the corresponding values from the ACEEE Report would have no impact on the conclusion in the FEIS that there is a need for power from STP Units 3 and 4.

Furthermore, as shown on FEIS Table 8-3, peak load in the ERCOT region is expected to grow at 1000 to 2000 MW per year. Even if the savings of 2,362 MW in peak load from the ACEEE Report were taken at face value, it would only defer the need for power by one to two years at most. Thus, there still would be a need for power from STP Units 3 and 4, just slightly later than predicted.

Q44. Are true, accurate and correct copies of each of the exhibits referenced in your testimony attached?

A44. Yes.

Q45. Does this conclude your testimony?

A45. Yes.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 9, 2011.

Executed in Accord with 10 C.F.R. § 2.304(d)

<u>*/s/ Adrian Pieniazek*</u>

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