NRC000062
05/31/2011

May 31, 2011

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

PREFILED REBUTTAL TESTIMONY OF DANIEL C. MUSSATTI AND DR. MICHAEL J. SCOTT REGARDING CONTENTION DEIS-1

Q1. Please state your names.

A1a. [DCM][1] My name is Daniel C. Mussatti.

A1b. [MJS] My name is Dr. Michael J. Scott.

Q2. Have you previously submitted testimony concerning Contention DEIS-1 in this proceeding?

A2. [DCM, MJS] Yes. Our direct testimony was provided in the "Prefiled Direct Testimony of Daniel C. Mussatti and Dr. Michael J. Scott Regarding Contention DEIS-1" (May 9, 2011) (Ex. NRC000031) ("Staff DEIS-1 Direct Testimony"). Statements of our professional qualifications were included as Exs. NRC000032 and NRC000033.

Q3. Are you familiar with the direct testimony submitted by the Intervenors concerning Contention DEIS-1, "Direct Testimony of Philip H. Mosenthal on Behalf of Sustainable Energy and Economic Development (SEED) Coalition, Public Citizen, and South Texas Association for Responsible Energy (Intervenors)" (May 16, 2011) (INT000001) ("Mosenthal Direct Testimony")?

A3. [DCM, MJS] Yes.

[1] In this testimony, the identity of the witness who supports each numbered paragraph is indicated by the notation of his initials in brackets.

Q4. Did the Intervenors' expert, Mr. Mosenthal, reach a conclusion about the need for power that would be provided by proposed STP units 3 and 4?

A4. [DCM, MJS] Mr. Mosenthal concluded that, after he accounted for the effects of the new building energy codes, in the year 2020, there would be a net need for 1,828 MW with no retirements and a net need for 14,265 MW with retirements of units older than 50 years. *See* Mosenthal Direct Testimony at Table 1 (Ex. INT000001). Mr. Mosenthal determined that the need for power would begin around 2017 or 2018. *Id.* at 10.

Q5. How do Mr. Mosenthal's estimates of the need for power, taking into account the new building energy codes in Texas, compare to the NRC staff's estimates in the Staff DEIS-1 Direct Testimony?

A5. [MJS] In the Staff DEIS-1 Direct Testimony, we concluded that, after accounting for the new building energy codes in Texas, in the year 2020, there would be a need for 748 MW of baseload power with no retirements and 5,598 MW of baseload power with retirements of units older than 50 years. *See* Staff DEIS-1 Direct Testimony at Table 5 & A57 (Ex. NRC000031). Table 1 compares the results of the Staff DEIS-1 Direct Testimony (Ex. NRC000031) with my interpretation of Mr. Mosenthal's estimates. There is virtually no difference in the need for power.

Table 1. Summary of Building Energy Code Impacts on Demand in Staff DEIS-1 and Mosenthal Direct Testimonies

Forecasts	**Firm Load, Less Additional Efficiency, plus 13.75% (MW)**		**Need for Generation at Peak (MW) Without and With Retirements of Plants >50 Years Old**		**Need for Baseload (MW) Without and With Retirements of Plants >50 Years Old**	
	2015	2020	2015	2020	2015	2020
ERCOT/Review Team Sensitivity Forecast Resource Needs[(a)]	77,510	82,818	(734) to 5,389	3,233 to 15,669	(286) to 2,102	1,261 to 6,111
Staff DEIS-1 Direct Testimony: After Savings from New Building Energy Codes[(b)]	76,854	81,491	(1,389) to 4,734	1,906 to 14,342	(539) to 1,849	748 to 5,598
Mosenthal Direct Testimony: After Savings from New Building Energy Codes[(c)]	77,016	81,414	(1,229) to 4,894	1,828 to 14,265	(479) to 1,909	713 to 5,563

(a) Values taken from FEIS at Table 8-6 (Ex. NRC00003C).
(b) Total Savings from Staff DEIS-1 Direct Testimony, Table 4 (Ex. NRC000031) subtracted from the ERCOT/Review Team Sensitivity forecast. (Table 4 peak demand savings values adjusted in first four columns above to include a 13.75% target reserve margin. Last two columns did not require addition of a reserve margin.)
(c) First four columns: Mosenthal Direct Testimony at Table 1 (Ex. INT000001). Mr. Mosenthal's adjustments to demand due to building energy code savings were -494 MW in 2015 and -1,404 MW in 2020. *Id.* Last two columns were calculated by multiplying columns 3 and 4 by 39%.
*Parentheses indicate that the value is negative.

Q6. In his testimony, did the Intervenors' expert, Mr. Mosenthal, make any adjustments to the ACEEE analysis (Ex. STP000008)?

A6. [MJS] Yes. Mr. Mosenthal modified the ACEEE analysis in five ways. First, he began his analysis with the 2010 ERCOT forecast rather than the 2006 forecast that was used in the ACEEE study. Mosenthal Direct Testimony at 7 (Ex. INT000001). Second, he delayed the starting point for savings from 2009 until 2011. *Id.* at 6. Third, he adjusted the initial percentages of improvement from the existing building energy codes in Texas to the new building energy codes, which he estimated at 20.0% for residential and 11.4% for commercial. *Id.* at 7. Fourth, he assumed that that the residential and commercial standards savings rates would be further increased in the future every 3 years. *Id.* at 9. Fifth, he assumed that initial compliance would be below 100% (80% for commercial buildings and 60% for single-family residential, increasing to 90% by 2017). *Id.* at 8.

Q7. What is your opinion on the five adjustments that Mr. Mosenthal made to the ACEEE analysis?

A7. [MJS] I agree with his first two adjustments: use of the 2010 ERCOT forecast and delaying savings until 2011. These adjustments make the analysis more relevant because Mr. Mosenthal uses more current data and delays in compliance are highly probable. I disagree with his third and fourth adjustments: using percentages of improvement from the existing codes to the new codes of 20.0% for residential and 11.4% for commercial and assuming that these rates would increase every three years. His choice of initial savings rates (20% and 11.4%) and his assumptions about future improvements in these rates are too speculative. With respect to the fifth adjustment, although I agree that achieving 100% compliance as assumed in the Staff DEIS-1 Direct Testimony (Ex. NRC000031) is unlikely, it maximizes the potential savings from building energy codes.

Q8. In adjusting the percentage of savings from the existing building energy codes in Texas to the new building energy codes, what assumptions did Mr. Mosenthal make regarding the existing codes used as a baseline for comparison to the new codes?

A8. [MJS] Mr. Mosenthal assumed that the 2001 International Energy Conservation Code (IECC) building energy code would be a reasonable baseline. Mosenthal Direct Testimony at 7 n.6 (Ex. INT000001). He noted "that a few municipalities have had somewhat stricter codes in place in recent years, however, we assume 2000 IECC with 2001 supplement represents a reasonable baseline practice prior to 2011 in Texas…." *Id*.

Q9. What is your opinion on using the 2001 IECC as the baseline for comparison?

A9. [MJS] Available evidence suggests that early adoption occurred in far more than just a few municipalities. In the Staff DEIS-1 Direct Testimony (Ex. NRC000031), I provided Attachment 2, which shows that, due to early local adoption of the 2003, 2006, and 2009 IECC codes, the Texas average baseline practice by early 2010 was actually closer to the IECC 2006 standard than to the IECC 2001 standard. Local jurisdictions with either the 2006 or 2009 IECC standard represented 78% of the population surveyed. *Id.* The assumption that 2000 IECC with the 2001 supplement represents a reasonable baseline prior to 2011 in Texas is not supported by the available evidence.

Q10. What is your opinion on using 20% and 11.4% as the initial improvement rates from the existing building energy codes to the new ones?

A10. [MJS] I do not believe that they are correct values to use, since I do not believe that the average Texas baseline building practice was guided by the 2001 IECC code at the time that the State adopted the 2009 IECC code.

Q11. What impact would the change in baseline from the 2001 IECC to the 2006 IECC have on the analysis, assuming you used the savings rates that Mr. Mosenthal used?

A11. [MJS] Based on a Pacific Northwest National Laboratory (PNNL) study (Ex. INT000015), Mr. Mosenthal assumes an initial decrease in electric usage for the 2009 IECC compared to the 2001 IECC of 11.4% for the non-residential sector. Mosenthal Direct Testimony at 7 & n.8 (Ex. INT000001). Savings for the residential sector is assumed to be 20%, based on an analysis done by Energy Systems Laboratory (ESL) at Texas A&M University (Ex. INT000016). *Id.* at 7 & n.8. Exhibits INT000003 and INT000004 show these factors. *Id.* at 7.

The average of savings in electricity intensity in Texas non-residential buildings at five locations (Austin, Houston, El Paso, Fort Worth and Amarillo) as computed by Mr. Mosenthal from PNNL 2009 at 151 (Ex. INT000015) is indeed 11.4% if the baseline energy use is IECC 2001. However, a later report for PNNL (Halverson et al. 2010 at 11.3 (Ex. NRC000053)) shows an overall average non-residential savings of 3% between the 2006 and 2009 versions of the code, and in Texas for the specific non-residential building type used in PNNL 2009 (Ex. INT000015), a medium-sized office building, the average of the electricity savings in the relevant climate zones, Zones 2A, 2B, 3A, 3B, and 4B, equals 3.71%.[2] The average of the ESL values cited by Mr. Mosenthal for residential buildings is 19.97% if the baseline is 2001, but from the same source the average value when the baseline is 2006 rather than 2001 is 8.35%. The actual new building practice in Texas was closer to complying with the 2006 IECC standard, as noted in the answer to Q9 above. Therefore, Mr. Mosenthal's estimates for electricity savings for the commercial building sector are over three times too high, and for the residential sector about 2.4 times too high. Correcting this would reduce savings considerably.

Q12. Did Mr. Mosenthal make any assumptions about future changes to the building energy codes?

A12. [MJS] Yes. He assumed that, in 2014, commercial saving rates would approximately double from 11.4% to 22% and that residential savings rates would increase to 39% in 2015. Mosenthal Direct Testimony at 9 (Ex. INT000001). Thereafter, at three-year intervals, based on Ex. INT000004, residential and commercial savings rates would increase by 4%, declining to 3% for commercial buildings in 2020 and increase by 6%, declining to 4% in 2024 for residential buildings.

Q13. What is your opinion on the assumption that every three years the building energy codes will be upgraded and result in a considerable energy savings increase?

A13. [MJS] As noted in the Staff DEIS-1 Direct Testimony at A52 n.19 (Ex. NRC000031) and Mosenthal Direct Testimony at 7 n.7 (Ex. INT000001), the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1-2007 is treated as roughly equivalent to the IECC 2009. ASHRAE does update its model building energy codes periodically, but beyond the update currently in process we do not have an estimate of how much electricity these codes are likely to save. In addition, the ASHRAE codes take about two years to be analyzed and adopted (in whole or in part) as IECC codes.

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[2] *See* Ex. NRC000063 for the spreadsheet displaying the calculation of the 3.71% average savings, which is based on data from U.S. Department of Energy (DOE). 2011. Building Energy Codes Program. 90.1 Prototype Building Models. Available at: http://www.energycodes.gov/commercial/901models/ (Ex. NRC000064).

The IECC (or other code updates) are often adopted with a considerable lag by states, and effective implementation lags behind that. Texas did adopt the 2009 IECC standard, for example, but declined to adopt the 2003 and 2006 standards. The impacts in my view are speculative, since none of the future codes has been adopted. ERCOT takes a similar view in that it does not include in its forecasts the effects of regulations that do not yet exist.

Q14. Does Mr. Mosenthal discuss how improved efficiency due to building energy codes would affect peak load and demand for baseload power?

A.14. [DCM, MJS] Yes. He gave quantitative estimates for demand reduction at peak demand and its effect on the need for resources. Mosenthal Direct Testimony at Table 1 (Ex. INT000001). He argued that, because baseload demand can be addressed by peaking units and intermediate units, the reduction in total loads (demand at peak) translates directly into an equal reduction in demand for baseload power. *Id.* at 11. He argued that energy conservation is load-following and that the savings would be larger at peak than at baseload, flattening the load duration curve. *Id.*

Q15. Do you agree that reducing peak load will result in an equal reduction in the demand for baseload power, and that flattening of the load curve would reduce the need for baseload power?

A15. [DCM, MJS] Building electricity consumption varies as a result of variation in building occupancy and energy-use habits of the occupants; weather; and other factors. Many of the changes included in building energy code improvements address end uses such as ventilation, hot water, and lighting, which contribute to daily peak electricity consumption, but primarily depend on building occupancy and energy-use habits and are not climate-sensitive. This is especially true of commercial buildings. Some building energy code improvements, including improved insulation practices and windows, are likely to make building energy demand less climate-sensitive. The lowest hours for electricity consumption occur when buildings are neither heating nor cooling due to mild weather and buildings either are not occupied (commercial buildings) or the occupants are asleep and not using much electricity (residential).

Building energy codes would do relatively little to address these minimum demand hours. Consequently, we believe it unlikely that savings would be as large at baseload demand as at either intermediate demand or peak demand and think that many of the largest proportional electricity savings may well occur during intermediate demand hours. Because energy code improvements load follow (*i.e.,* produce more or less savings as demand increases or decreases) but address both climate-sensitive and climate-insensitive loads, we do not know whether the overall impact of building energy codes would be proportionately greater, the same, or less at the annual peak. In the Staff DEIS-1 Direct Testimony (Ex. NRC000031), we assumed that impacts of improved energy building codes are roughly proportional among the hours of the year. If Mr. Mosenthal's argument that the load duration curve would be flattened due to greater proportional savings at peak is correct, then the reduction in demand for baseload resources due to building energy codes as computed in the Staff DEIS-1 Direct Testimony (Ex. NRC000031) would not necessarily be affected for the reasons stated above concerning lowest demand hours. What would be affected would be the relationship between the peak and baseload demand, with baseload demand representing a greater percentage of peak demand but a largely unchanged absolute demand. Therefore, to assume as we did in the Staff DEIS-1 Direct Testimony (Ex. NRC000031) that baseload demand is reduced proportionately whenever peak demand is reduced by adoption of new building energy codes likely overstates the impact on baseload demand.

In addition, Mr. Mosenthal argues that reduction in peak demand would reduce the demand for baseload power because any peaking resource that could help meet the peak load also is available to compete in ERCOT's competitive electricity market during baseload demand hours. Mosenthal Direct Testimony at 11. However, as Mr. Mosenthal notes, baseload demand is typically served by nuclear, hydroelectric, and coal power plants because they have relatively low variable fuel and operations and maintenance costs and are reliably available nearly all of the time, while other resources are dispatched more sporadically because they either have high variable costs (*e.g.*, combustion turbines) or because they cannot be counted on as available (*e.g.*, wind and solar). *Id.*; *see also* Staff DEIS-1 Direct Testimony at A14 (Ex. NRC000031). The plants that are available are dispatched roughly in order of lowest to highest variable costs. While we understand that peaking resources would be available during baseload demand hours, they would provide relatively high-cost power, while baseload power resources would be less expensive and more reliably available. Relying more extensively on peak load plants to supply baseload power would increase the cost of the power. Therefore, even if the availability of peaking units increases during baseload demand hours, we conclude that there would still be a need for the baseload power represented by STP Units 3 and 4.

Q16. After reviewing Mr. Mosenthal's testimony, did you reach any conclusions about whether his calculations of savings from the new building energy codes in Texas accurately reflect the energy savings that can be expected?

A16. [DCM, MJS] We do believe Mr. Mosenthal's adjustments, taken as a whole, overestimate the energy savings available from the promulgation of new building codes in the ERCOT region. We think that he started appropriately by using the 2010 ERCOT forecast and beginning the savings in 2011. However, we believe that the use of IECC 2001 as the baseline building practice makes his savings estimates higher than they should be by a factor of 2.4 for residential buildings and by a factor of 3 for commercial buildings. He compounds this by adopting speculative future improvements in these standards, which approximately doubled the already high annual savings by 2015 and increases the savings by another third by 2020. The effect of these adjustments is to make the annual impacts of building energy codes higher than they should be. Mr. Mosenthal's assumed delay in compliance offsets this effect to some extent, but his estimate of the net effect of building codes is still too high.

May 31, 2011

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AMERICA LLC	)	Docket Nos. 52-012 & 52-013
	)	
(South Texas Project, Units 3 & 4)	)	

AFFIDAVIT OF DANIEL C. MUSSATTI CONCERNING
PREFILED REBUTTAL TESTIMONY REGARDING CONTENTION DEIS-1

I, Daniel C. Mussatti, do declare under penalty of perjury that my statements in the "Prefiled Rebuttal Testimony of Daniel C. Mussatti and Dr. Michael J. Scott Regarding Contention DEIS-1" are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
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Executed at Rockville, MD
this 31st day of May, 2011

May 31, 2011

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NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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NUCLEAR INNOVATION NORTH AMERICA LLC	)	Docket Nos. 52-012 & 52-013
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(South Texas Project, Units 3 & 4)	)	

AFFIDAVIT OF DR. MICHAEL J. SCOTT CONCERNING
PREFILED REBUTTAL TESTIMONY REGARDING CONTENTION DEIS-1

I, Michael J. Scott, do declare under penalty of perjury that my statements in the "Prefiled Rebuttal Testimony of Daniel C. Mussatti and Dr. Michael J. Scott Regarding Contention DEIS-1" are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

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Executed at Richland, WA
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