STATE OF NEW HAMPSHIRE

BEFORE THE

NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE
2010 LEAST COST INTEGRATED RESOURCE PLAN

DOCKET NO. DE 10-261

JOINT REBUTTAL TESTIMONY OF
RICHARD L. LEVITAN AND DR. RICHARD L. CARLSON
OF LEVITAN & ASSOCIATES, INC.

OCTOBER 26, 2011

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I. Introduction

Q. Please state your name, position, and business address.

A. My name is Richard L. Levitan. I am President of Levitan & Associates, Inc. (LAI). My business address is 100 Summer Street, Suite 3200, Boston, Massachusetts, 02110.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of Public Service Company of New Hampshire (PSNH).

Q. Please summarize your professional and educational background.

A. I have thirty-three years of management consultant experience in the energy industry. My specific analytic expertise includes electricity and natural gas procurement, asset valuation, wholesale market design, resource planning, energy contract administration, transmission pricing, transportation management, cost of service / rate design, and market simulation analysis. Prior to forming LAI in 1989, I was a consultant at Stone & Webster Management Consultants, Inc. where I performed many studies for utility and non-utility clients on diverse issues associated with pipeline management, valuation, and engineering economics. From 1978 to 1980, I was an Economist at Pacific Gas & Electric Company (PG&E) where I performed quantitative analysis to support standardized prices in long-term contracts with independent power producers, among other things.

I received my B.A. from Cornell University (Liberal Arts) and my Masters from Harvard University where I specialized in Energy Economics. I also attended

Stanford University's post-graduate Industrial Organizational Management Program. A copy of my resume is provided herewith as Exhibit LAI-1.

Q. Please summarize your responsibilities at LAI.

A. As Principal and President of LAI, I am actively involved in a number of consulting assignments undertaken for LAI's utility, investor, pipeline and state regulatory commission clients. Many of these engagements encompass valuation services for companies that are buying or selling generation, transmission or natural gas storage facilities. I also provide state regulatory commissions with wholesale power procurement oversight services. These services include the procurement of standard, load following services for electric distribution companies ("EDCs"), long term physical or financial contracts with conventional or renewable energy producers, as well as financial products designed to hedge exposure to uncertain natural gas and/or power prices. I have advised electric and gas utilities throughout the U.S. on resource planning problems, contract administration issues, and pipeline rate or certificate applications before the Federal Energy Regulatory Commission ("FERC"). I have represented generators, utilities, and/or private equity investors on the purchase or sale of generation assets in the U.S., including the administration of capacity markets or capacity requirements in PJM, New England, New York and/or the Midwest ISO. For ISO-NE and other ISOs throughout the greater Northeast, including Ontario, I have been responsible for pipeline adequacy studies where the resiliency of the integrated network of pipeline and storage facilities serving core and non-core load is tested under postulated gas-side and electric-side contingencies.

In my administrative capacity at LAI, I am responsible for decisions associated with non-disclosure agreements, confidentiality requirements, licensing obligations, and any sub-contractor arrangements entered into by LAI with other engineering or consulting firms to satisfy client work product requirements.

Q. Please summarize your testimony experience.

A. I have testified many dozens of times before state or provincial regulatory commissions throughout the U.S. and Canada, and FERC. In 1999, I testified before the New Hampshire Public Utilities Commission on behalf of Enron Energy Services on the matter of New England Power Company's *de facto* assignment of long term power purchase agreements ("PPAs") under a "back-to-back" sales arrangement with PG&E, the counterparty that acquired the divested generation assets and PPAs.

Q. Please state your name, position, and address.

A. My name is Richard L. Carlson. I am Managing Consultant at LAI. My business address is 100 Summer Street, Suite 3200, Boston, Massachusetts 02110.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of PSNH in this proceeding.

Q. Please summarize your professional and educational background.

A. I have over thirty years of experience as an energy consultant and energy software developer and product manager. Since joining LAI in 2008, I have performed a broad array of technical services encompassing energy and environmental economics, wholesale energy market design, wholesale power procurement oversight, portfolio risk measurement, and integrated resource planning. Prior to LAI, I worked for ten years at Ventyx Inc. and its predecessor companies (Global Energy Decisions and Henwood Energy). At Ventyx, I was Vice President of New Solutions in the software division, responsible for development of the System Optimizer software used for integrated resource planning of generation, transmission, and demand-side investments, and the Planning and Risk software used for generation unit or utility portfolio planning, budgeting, contracting, and risk management purposes. As a consultant at Ventyx, I was responsible for a number of assignments pertaining to stochastic analysis of fuel and energy prices, wind and hydro energy simulation, market power, asset valuation, risk analysis and management, optimization of generation unit commitment and dispatch, and fuel, energy, and ancillary services price forecasting. Prior to Ventyx, I was employed at two other consulting firms. I have also held academic positions at Queens College of the City University of New York and at Washington University in St. Louis. I received a Ph.D. and a M.A. in Resource Economics from the University of Wisconsin, and a M.A. and B.S. (with distinction) from Washington State University. A copy of my resume is provided herewith as Exhibit LAI-2.

Q. Please describe your responsibilities as Managing Consultant.

A. My role at LAI is principally to develop and apply analytic methods for economic impact studies, renewable energy credit price forecasting, stochastic forecasting of fuel and power prices, asset valuation of thermal and renewable resources (including on-shore and off-shore wind), independent evaluation and monitoring of utility procurement of power and natural gas contracts, procurement of generation assets, and risk assessments. In this capacity, I am directly responsible for the refinement and application of advanced

mathematical and financial methods to resource planning, valuation and risk management studies on behalf of utilities, state regulatory commissions, generation companies and private equity investors throughout the U.S.

Q. Please summarize your testimony experience.

A. I have testified before the Maine Public Utilities Commission and the Ontario Energy Board. I have not testified previously before the New Hampshire Public Utilities Commission.

Q. What is the purpose of your rebuttal testimony?

A. We respond to the direct testimonies of Mr. George McCluskey and Mr. Edward Arnold on behalf of Staff, Mr. Kenneth Traum on behalf of the Office of the Consumer Advocate ("OCA"), and Mr. Michael Hachey on behalf of TransCanada Power Marketing Ltd. and TransCanada Hydro Northeast Inc. as they relate to the Continuing Unit Operation ("CUO") study of Newington Station. We also respond to the supplemental testimonies of Mssrs. McCluskey and Arnold on behalf of Staff and Mr. Hachey on behalf of TransCanada Power Marketing Ltd. and TransCanada Hydro Northeast Inc.

Q. How is your testimony organized?

A. Our testimony is organized along four general lines: first, we discuss process-related issues; second, we discuss analysis scope and method issues; third, we address data issues, and fourth, we discuss the Newington Station results of CRA's modeling of the regional system.

II. <u>Process Issues</u>

A. Independence of Consultant from PSNH

Q. Mr. Traum calls for an independent consultant to be selected through a collaboration process who would conduct another CUO study of Newington Station (Traum, 3:4-8). Mr. Hachey calls for an independent consultant to redo the CUO study with its own assumptions and method (Hachey, lines 51-54). Do you agree with the respective assertions of Messrs. Traum and Hachey that the CUO study undertaken by LAI for PSNH was not independent and therefore should be redone by an independent consultant?

A. No. On the contrary, the study undertaken for PSNH was in fact independent. Consistent with the Commission's order requiring the Company to conduct a CUO study, PSNH retained LAI. LAI was selected by

PSNH as we are known for technical financial valuation studies that apply cutting-edge quantitative methods on behalf of global investors, utilities, and state public utility commissions. Since our formation in 1989, LAI has conducted many resource planning, asset valuation, transmission, and integrated resource planning studies for diverse clients throughout the U.S., in particular, in New England. Our record of performance, objectivity, and independence has resulted in many high profile engagements on commercially sensitive matters throughout the U.S., especially on matters pertaining to capacity markets throughout New England, New York, and PJM. For several years, we have represented the Connecticut Public Utilities Regulatory Authority (PURA, formerly the Department of Public Utility Control), where we have been responsible for procurement oversight of Connecticut Light & Power Co.'s (CL&P's) regular wholesale power solicitations for standard service products, among other things. In our procurement oversight role, we represent PURA, not CL&P nor United Illuminating Co. Our success in this oversight role is predicated on our independence from Connecticut's EDCs. Moreover, in our former prosecutorial role on behalf of PURA regarding the selection of new, quick-start peakers in Connecticut to meet ISO-NE's Locational Forward Reserve Requirement, LAI conducted due diligence on rival contenders that elected to bid into the long-term procurement. Our due diligence in the prosecutorial role in Connecticut was in opposition to CL&P, and CL&P's two proposals were, in fact, rejected. In summary, LAI's going concern value as an independent national consulting firm depends on our objectivity and independence.

Q. You say that the study was conducted on an independent basis. Does that mean that PSNH had no input into the study framework and research objectives set forth for purposes of conducting the CUO study of Newington Station?

A. No. In issuing the RFP, PSNH outlined the scope of work and the general framework of analysis. The scope of work was in accord with PSNH's understanding of the Commission's order requiring the CUO. Upon selection of LAI, we had a free hand in building the various models used by LAI to quantify the real option value of Newington Station. PSNH did not exert influence on the assumptions, data, or models used in LAI's analysis. However, the majority of the historic and current operational data related to Newington Station were not in the public domain. Hence, LAI worked closely with PSNH to obtain the requisite data needed to run the various models to compute Newington Station's net margin from energy sales over the planning horizon, among other things. In our opinion, had PSNH selected another consultant to perform the CUO study, that consultant would have likely exercised the same degree of professional judgment and freedom to employ its

preferred method of analysis to the determination of Newington Station's real option value ("ROV").

Q. Mr. Hachey (lines 52-54) of TransCanada has also recommended that an independent consultant analyze alternative cases selected by Staff, OCA, interveners, and PSNH. Do you see value in this recommendation?

A. No. We have a respectful difference of professional opinions on this point. Having another consultant in effect "turn the crank" on alternative cases specified by other stakeholders is not tantamount to independence. LAI has to date run one backcast case and one alternative forecast case specified by Staff, including its consultant from Jacobs Consultancy ("Jacobs"). We have been objective and efficient in conducting these case runs in response to the specific inquiries from Staff. Moreover, the CUO analysis was based on LAI's independent case assumptions, *not those delineated by PSNH*.

Even if LAI were to accommodate Mr. Hachey's recommendation to allow multiple parties to offer alternative cases for the consultant to analyze, there would be significant consequential problems on the implementation front. First, what would the consultant do with the results? The consultant would need to explicitly weigh the array of results from the alternative cases, thereby requiring a yet to be defined mechanism to consolidate the results in a way that makes statistical and economic sense. Second, what would the consultant do to reconcile and then interpret opposite results? The consultant would need to define an approach that tosses out irreconcilable outcomes. Third, what would the consultant do when a party defines a scenario or a set of input factors that are either insensible or too burdensome to conduct using the consultant's existing model? The Commission would need to define a mechanism that allows for the consultant to object to far-fetched scenarios or requires unduly burdensome additional model building.

Q. Mr. Traum cited as evidence of the need for another CUO study the fact that LAI used a substantially different forecast of SO_2 emission allowance prices than PSNH (Traum, 10:14-21). Is there merit to Mr. Traum's position?

A. No, there is not. On the contrary, Mr. Traum's view supports the conclusion that LAI's forward-looking analysis was not influenced by PSNH. LAI understands that PSNH uses historical accounting-based emission allowance prices for certain purposes. Those prices were much higher than recent spot prices or the market forward prices for emission allowances that we used in our analysis. We provided a graph of spot SO_2 and NO_x seasonal allowance

prices in response to OCA-2-039 (Exhibit LAI-3) that illustrates the recent collapse of spot prices for these two products.

Importantly, LAI also provided fuel and energy price forecasts to PSNH rather than simply incorporate PSNH's view of fuel and energy price forwards over the planning horizon. LAI's forecasts of expected fuel, emission allowance, and energy prices were based on market forward prices to the extent possible. Another key driver of Newington Station's ROV hinged on the capacity price forecast under ISO-NE's Forward Capacity Market ("FCM"). Consistent with LAI's resource planning expertise in New England, LAI provided PSNH with its capacity price forecast under the FCM. To conduct the study in accord with standards of professional excellence, LAI did in fact rely on PSNH for historical and current Newington Station operational and cost information. Such reliance cannot be avoided regardless of the consultant, and does not signify a lack of independence regarding the research goals established for the CUO study.

B. Use of Confidential Bloomberg Historical Fuel Price Data

Q. Staff claim they were unable to verify the accuracy of LAI's Henry Hub to Dracut basis calculations and the West Texas Intermediate ("WTI") crude oil to residual fuel oil ("RFO") and no. 2 fuel oil ("2FO") basis calculations that made use of Bloomberg LP data (McCluskey and Arnold, 10:14-18; 11:3-9). Why did LAI not provide the data that Staff requested?

A. LAI has a data service license with Bloomberg LP that does not allow distribution of the data to other parties, including when a non-disclosure agreement ("NDA") is in effect with that party. Violation of LAI's licensing agreements regarding the dissemination of confidential data is not in accord with professional standards and, of course, LAI's legal obligations to the licensor. LAI had not previously encountered an instance when a party in a regulatory matter insisted on obtaining data that was licensed to LAI by a reputable data vendor. The only other alternative would be to enter into a second licensing agreement which would cost tens of thousands of dollars, which LAI would have to pass onto PSNH. When informed of this extra expense, PSNH decided not to incur the extra cost on behalf of customers.

Prior to hearing from Bloomberg on the high incremental cost of data redistribution, we had not anticipated that our standard reliance on Bloomberg market data would present a cost barrier. After notifying Staff in our data responses of the prohibition by Bloomberg from providing their data, we had assumed that Staff would obtain the same or similar historical

market data from another source that is much less expensive if Staff needed to validate the basis calculations.

Q. Staff asserts that they were unable to verify the model's results without access to the Bloomberg historical data that was used for calculating historical basis spreads. In your opinion, was the Bloomberg data essential to their model review and validation?

A. No. LAI provided the monthly forward fuel prices in OCA-01-068 to all parties and, due to the volume of data, provided on CD to Staff and OCA the daily spot fuel prices and daily average on-peak and off-peak energy prices that were used in the revised simulation analysis for all 250 randomized price scenarios in STAFF-01-091-SP01. Staff could have compared those price inputs to the dispatch model against other available information sources to determine whether the forecast assumptions were reasonable. Mere validation of the specific basis calculations made by LAI in order to form the expected price forecasts is relatively unimportant in comparison to the key "crystal ball" issues of the level of future benchmark gas and oil prices, such as Henry Hub and WTI, and market-implied heat rates.

In our opinion, to validate the functionality of LAI's basis calculations, a much more productive use of Staff time would have been to compare our forecasted monthly natural gas prices at the Dracut hub in northeastern Massachusetts with NYMEX Henry Hub futures price data that are available for free, and also to compare our forecasted monthly RFO and 2FO prices with NYMEX WTI oil futures price data that are also available at no cost. Even if LAI had incurred the substantial extra licensing fee in order to provide Staff with the proprietary historical data from Bloomberg, the only practical use of that data would have been Staff's determination of whether our historical basis calculations were correct. That determination is not tantamount to the determination that the forecast benchmark commodity prices and basis spreads were reasonable. In our view, Staff focused on a secondary issue instead of the primary validation question.

Q. Nevertheless, if Staff wanted to validate LAI's historical basis spreads, could Staff have done so by using data sources other than Bloomberg?

A. Yes. Staff indicated in PSNH-2-5 (Exhibit LAI-4) that Staff has licensed Platts Gas Daily data, which provides Dracut natural gas prices, since June 18, 2004. In fact, Staff made use of its Platts data for 2010 daily Dracut gas prices to calculate Dracut to Newington Station basis spreads. Platts data is one of the data sources included in the Bloomberg data base. A global engineering firm and consultancy such as Jacobs Consultancy has

subscriptions to data services, according to PSNH-1-14 (Exhibit LAI-5), that would have allowed Mr. Arnold to validate LAI's calculations of oil product basis spreads. Staff and Jacobs could have used their data services to calculate historic natural gas locational basis and oil product basis spreads.

In fact, it is generally better to cross-check two data sources for consistency sake than only to confirm that the subject data source was used in the manner described. It is noteworthy that prior to Staff's first visit to LAI's Boston office -- the visits are described in detail later in our testimony-- Staff expressed its desire to provide alternative data for use in the models. For whatever reason, Staff did not follow through on this plan. If Staff had provided an historical data set shortly before one of the model drill-down sessions in Boston or in a data request to produce alternative case results, LAI could have created an alternative set of basis spread calculations using its procedures for Staff to audit and as the input data for an alternative full simulation model run.

C. Access to LAI's Proprietary Models

Q. Was Staff willing to sign an NDA?

A. No.

Q. Was Jacobs willing to allow Mr. Arnold to sign an NDA?

A. No.

Q. Would Staff's willingness to use Platts or other distributable historic data in conjunction with an NDA have facilitated greater access to the details of LAI's models?

A. Yes. If Staff or Mr. Arnold had signed an NDA, then with a data source that could be shared, LAI would have been willing to provide worksheets or an on-site demonstration of the calculation details of the methods for estimating basis spreads and short-term stochastic parameters.

Q. Staff contends that "[n]either Staff nor Jacobs was given access to LAI's Newington Station asset valuation model" (McCluskey and Arnold, 9:15-16). Is this a reasonable characterization?

A. No. In our view, Staff was given access to the model throughout the period of time set aside to answer their questions and concerns about how the various

models were designed, incorporated proprietary data, and were used to produce solutions.

Q. What is Staff's definition of "access" to the model?

A. The testimony of Messrs. McCluskey and Arnold does not define what they mean by "access," but footnote 3 of their testimony (p. 9) states that Jacob's review included:

> "(a) reading LAI's description of the model structure in summary reports; (b) reviewing LAI's responses to questions issued on those reports; and (c) analyzing the results of model re-runs, made at the request of Staff and Jacobs, based on different inputs."

In reply to PSNH-1-8(a) (Exhibit LAI-6), Mr. Arnold said that he needed to have "direct personal access" to the models to run tests himself rather than to provide data to LAI to run the models for him.

Q. Is physical access to the software models a reasonable, practical request to fulfill?

A. No, it is unreasonable and impractical for several reasons. First, LAI's models are proprietary, valuable tools that are used in other client engagements. As previously stated, neither Staff nor Jacobs was willing to execute an NDA. Release of proprietary information, including models, without legal safeguards governing subsequent use would potentially injure LAI's going concern value. Second, as is typical of consultant-developed models, LAI's models used in the CUO study have open source code, using Visual Basic for Applications ("VBA") and worksheet formulas in Excel models, Stata code in statistical models, and MATLAB code in simulation models. The set of tools are not in compiled form that would hide the intellectual property of hundreds of hours of labor that is embodied in the program code. Third, LAI has not prepared a "user's guide" to facilitate use of the models by analysts other than the LAI model developers. There is a danger that the tools could be misapplied without assistance from LAI. If, as Mr. Arnold has stated, he only wanted to test alternative data inputs, it would have been much more cost-effective and quality-assured for LAI to have performed the runs with data provided by Mr. Arnold. For whatever reason, Mr. Arnold did not furnish such data and did not request LAI to conduct such runs. Mr. Arnold would have been welcome to observe the data setup and retrieval of results of model runs conducted at LAI's office.

Q. Would physical access to the models, with their open source code, have been a benefit to Mr. Arnold in his validation?

A. No. In a conference call discussion with Staff, Mr. Arnold said he did not need to see the model code. Later, in response to PSNH-1-8(i) (Exhibit LAI-6), Staff said that review of the model code was beyond the scope of the budget with Jacobs Consultancy.

Q. Do you believe Staff and Mr. Arnold had sufficient access to the models?

A. Yes, we documented the modeling methods in sufficient detail to provide a basis for any criticism of the analytic approaches used. During the model drill-down period, LAI ran a backcast case and a forecast case specified by Staff and Mr. Arnold. LAI was prepared to conduct additional case runs requested by Staff and Mr. Arnold, using their assumptions or data. In addition to the three types of model access conceded by Mssrs. McCluskey and Arnold in the above quote, LAI also candidly answered questions and showed projections of model data files during the two visits to LAI and the webinar. In our opinion, since Mr. Arnold said he did not need to review the model code, then having provided access to the details of how the models function, providing detailed intermediate and final outputs, and running alternative cases consistent with Staff's and Mr. Arnold's directions is more than sufficient for the purpose of model validation.

We understand that Staff and Mr. Arnold assert that they were denied sufficient access to the models. Again, we have a difference of professional opinions regarding what constitutes access to the models. The CUO report provided a high-level description of the models and analysis methods. Moreover, after answering many model and data-related questions in the first round of discovery, at Staff's request at the first Technical Session, LAI prepared a 10 page technical modeling system overview document about one week later that was twice the requested length. The purpose of this overview document, attached as Confidential Exhibit LAI-7, was to provide Staff and Mr. Arnold a roadmap of all the modeling components as the basis for asking additional model-related questions. Then LAI answered at length 31 data requests from Staff concerning modeling details in the extra round of discovery on the overview document. Despite Jacobs' unwillingness to execute the NDA, this detailed, proprietary model-related documentation was provided to Mr. Arnold, Staff, and OCA in the spirit of cooperation. Finally, LAI answered several other data responses related to modeling details in the second and third rounds of discovery, and provided summary results of the Staff-requested backcast and alternative forecast simulation runs in response to data requests at the second Technical Session.

Q. Did LAI offer to provide further model details or physical access to the models if Staff and Jacobs Consultancy signed the NDA?

A. Yes. LAI, working with PSNH, drafted several versions of an NDA. However, Staff and Jacobs refused to sign any of the proposed NDAs. An NDA is standard operating protocol between companies in the same line of business, thus requiring Jacobs to enter one in order to protect the intellectual work products of LAI. Mr. Arnold indicated that his hands were tied as Jacobs' legal department determined that the draft NDA did not satisfy Jacobs' concerns.

Q. In your view, did the conditions that Jacobs required in exchange for its execution of the NDA require extraordinary concessions by LAI?

A. Yes, Jacobs' legal department wanted to retain working copies of the models and source documentation in perpetuity, along with any other confidential information provided to Jacobs that would have been required to accommodate Staff's request for information. This provision constituted a major variation from any NDA entered into by LAI. We concluded that Jacobs' demands were unacceptable. We then tried to find a reasonable middle-ground to accommodate their concerns. Mr. Arnold later said he did not need to see the model code and in a data response indicated that his budget would not allow for review of the model code. LAI then revised the draft NDA to exclude the provision of model code. Jacobs still refused to execute the revised NDA. Jacobs consistent intransigence in the face of LAI's repeated efforts to modify and soften the NDA language was unreasonable.

Q. In relation to other NDAs that LAI has entered into with rival engineering or consulting firms, in particular, NDAs between Jacobs and LAI, were Jacobs' demands on this matter unusual?

A. Yes. LAI has not entered into NDAs that provide counterparties the right to retain proprietary information in perpetuity. Of relevance in the present context, Jacobs' consistent intransigence was in stark contrast to Jacobs' record of cooperation and reasonableness on other matters. On another commercially sensitive matter undertaken for the CT PURA in 2008 (Docket No. 08-01-01, DPUC Review of Peaking Generation Projects), Jacobs and LAI did not have any difficulty reaching satisfactory agreement on an expedited track regarding the terms and conditions of the NDA. Jacobs' record of performance on the matter as a sub-contractor to LAI was excellent. Notably, there were no issues surrounding the disclosure of confidential information on the CT PURA matter that may have induced Jacobs to seek to incorporate

comparatively draconian terms with respect to the draft NDA covering Jacobs' access to LAI's intellectual property on this matter.

Q. Besides providing written documentation and model inputs and outputs, were there other ways in which LAI provided access to the models?

A. Yes. We were informed on May 24 that Staff and Mr. Arnold planned to visit LAI for four days (June 2, 3, 6, and 7) in order to answer Mr. Arnold's questions about the models and for him to "test drive" the models with his data sets. We replied that while Richard Carlson and other staff responsible for modeling would be available on those dates, Richard Levitan's availability would be limited. Mr. Arnold also later indicated that his time was also very tight. Mr. Arnold indicated that perhaps one and one-half days (June 2 and 3) would be sufficient, but he wanted to keep open the option of also visiting the following week (June 6 and 7). We agreed and requested that an agenda and, if possible, data sets be provided in advance to make the meetings more efficient. Despite the absence of an NDA, we accepted this request to observe the models in action and for providing alternative data sets to run on behalf of Staff. While lack of an NDA violated our standard operating procedure with respect to a competitor's access to LAI's proprietary information, we walked an intellectual property tightrope in order to be helpful as possible to PSNH.

Q. Did Staff and Mr. Arnold visit your office for four days?

A. No. Staff and Mr. Arnold changed their plans and first visited on Friday, June 3. At the conclusion of that day-long meeting, it was decided to have a webinar meeting the next week and meet in person again in two weeks. On Tuesday, June 7, 2011 LAI hosted a two-hour webinar. Then on Tuesday, June 14, 2011 LAI hosted a second meeting at our office in Boston for Staff and Mr. Arnold that concluded in mid-afternoon at the request of Staff and Mr. Arnold. Counting the webinar, we spent the equivalent of two days meeting with Mr. Arnold and Staff.

We, as well as other LAI staff responsible for the various models, were available to Staff and Mr. Arnold, candidly answering questions about model structure and functionality, and data sources, among other things. We granted access to view the models as LAI consultants were quizzed on various model components and procedures.

Q. Did Staff or Mr. Arnold bring data sets to run through the models?

A. No. On Wednesday, June 1, 2011, Staff informed PSNH by email that Staff "aren't bringing any data files of our own for analysis." At the June 3 meeting, LAI was only requested to make certain changes ourselves to model inputs and then report the results to Staff at a later date. At the June 14 meeting, LAI presented the results of the two backcast simulation cases.

Q. Did Staff or Mr. Arnold request to see any of the model code or witness the models run?

A. No. The two days spent on-site were mostly spent answering questions concerning model input data and calculations, discussing the setup of a backcast case in the first meeting, and reviewing the results of the two backcast case runs in the second meeting.

Q. Had you expected a more in-depth examination of the models?

A. Yes. At the end of the second on-site visit we had thought that Staff and Mr. Arnold were sufficiently comfortable in their knowledge of the workings of the models and that the backcast analysis, with certain data adjustments to the dispatch model's start fuel and warming fuel inputs, had sufficiently demonstrated the functionality and accuracy of the models.

Q. You indicated that LAI was told that the model drill-down process in Boston could extend up to five days, conceivably longer if more time was needed in order to answer Staff's questions about the model. Do you know why Staff did not take more complete advantage of LAI's availability to answer Staff's questions and concerns about the models?

A. No. We were available to answer Staff's additional questions and concerns. In response to the two productive sessions in Boston, there were no additional limitations or strings attached to the process of reviewing the models or accommodating any datasets formulated by Staff and Mr. Arnold. Staff simply chose not to take advantage of our continued availability. In response to PSNH-1-8(m) (Exhibit LAI-6) as to why the in-depth examination of the LAI modeling system did not continue for the full amount of time initially requested by Staff, the reply was that "Mr. Arnold contends that only direct personal access to the models would have answered Jacobs' remaining questions." Staff did not indicate what remaining questions Mr. Arnold had.

III. Analysis Scope and Method Issues

A. Detection and Correction of Model Errors

Q. Mr. Hachey claims that neither PSNH nor LAI appeared to recognize the wide gap between Newington Station's recent energy net revenues or PSNH's projection in its 2011 ES rate case and the model simulation results prior to fixing the calculation errors (Hachey, lines 99 to 102). Can you address the basis for Mr. Hachey's assertion?

A. Yes. Mr. Hachey only refers to the model's simulated expected energy net revenue value, not to its distribution across scenarios. The energy net revenue values in the worst scenarios in the revised analysis were increased while those for the best scenarios were decreased, so the adjustments had mixed impacts. Initially, LAI's focus had been on the bottom-line assessment of whether continued operation of Newington Station appeared to be warranted, even under the worst outcomes, as a conservative down-side risk avoidance perspective. Because the initial analysis showed that continued operation appeared to be beneficial, even under adverse outcomes, given time constraints we did not investigate further the higher gross margin scenarios.

Q. What was the process of identifying and correcting the errors?

A. After legitimate questions were raised in the first round of discovery and at the first Technical Session about the results of the simulation modeling, we undertook a lengthy, detailed review of the modeling assumptions, data, and simulation model code. The review uncovered two errors in the calculation of simulated energy prices. In the course of searching for the causes of anomalous results, we added additional intermediate reporting capability to the simulation model, and made available to Staff and OCA those intermediate outputs. We verified that other aspects of the fuel and energy price simulation model and the unit commitment and dispatch model were functioning as intended. This scrutiny also uncovered an issue regarding the heat rate data provided by PSNH that was used in the dispatch model. After completing this review and re-running the simulation with code fixes and different heat rate data, we revised the CUO study report.

Later, while analyzing the results of the 2010 backcast case requested by Staff, we discovered that the start fuel use assumptions were lower than actual use and that additional 2FO use for station warming had not been included in fixed costs. As previously mentioned, LAI voluntarily ran a second backcast case that revised the start fuel assumptions and calculated an estimate of warming fuel cost to present to Mssrs. McCluskey and Arnold

at the second visit to LAI's office. Results of the original and revised backcast cases were provided in response to a question propounded at the second Technical Session.

B. Omission of Divestiture Alternative

Q. Mr. Traum criticizes the CUO study for not analyzing divestiture as an alternative to retirement of the Newington Station (Traum, 21:15 to 22:9). Apart from Staff's view that analysis of divestiture was outside the scope of the CUO study ordered by the Commission, is there merit in analyzing the value of the Newington Station in the context of divestiture?

A. No. LAI's analysis considered the economics of continued operation of Newington Station from the perspective of a merchant plant, buying fuel and emission allowances at spot prices, and selling energy, operating reserves, and ancillary services in ISO-NE's Day Ahead Market ("DAM") or Real Time Market ("RTM"), while capacity sales are cleared through the annual FCM. Under this structure, the asset value of Newington Station would be about the same to any market participant that has a similar view of future energy and capacity prices. While another market participant might place a different value on Newington Station's hedge value with respect to covering that participant's load serving obligation, this component of the overall value of the Newington Station is dwarfed by the value of the net margin derived from the sale of energy and ancillary services, and operating revenue obtained from the FCM.

C. Exclusion of Northern Pass Transmission Project from CUO Analysis Was a Reasonable Assumption

Q. Mr. Hachey attributes three reasons cited in a PSNH data response for why the Northern Pass Transmission ("NPT") project was not included in the CUO analysis to "Levitan" (Hachey, lines 165-172). Is that an appropriate attribution?

A. No. Mr. Terrance J. Large provided the three reasons in the data response, which were the basis for why the scope of work in LAI's contract with PSNH excluded consideration of NPT.

Q. Mr. Hachey asserts that LAI should have included the Northern Pass Transmission (NPT) project's impacts in its Low and Medium capacity cases (Hachey Testimony, lines 182-183). In addition, Mr. Hachey

claims that transfers on the line will have a significant impact on the energy market as well (Hachey Testimony, lines 197-198). Do you agree with Mr. Hachey that Newington Station's capacity and energy value and decision to retire should be based on the projected NPT market impacts?

A. No. Newington Station has a real option value to retire at any time. In our view, it would be insensible to prematurely retire based on perceived market conditions that may or may not materialize, and, should they materialize, may do so much later in the planning horizon of relevance in the CUO study. There is no need to accelerate a retirement decision based on the uncertain prospect that the NPT project will be operational well before the end of the study horizon.

Q. Did LAI exclude other transmission projects that are in an early planning stage from the CUO analysis?

A. Yes. The NPT project is just one of many transmission projects that are in the early planning stage and that were excluded from the CUO analysis. LAI was aware of many other reliability and elective transmission projects on the drawing boards in New England. While some of these projects may ultimately be built, until such time that one or more of these projects on the drawing boards is vetted through ISO-NE's Regional System Plan ("RSP") stakeholder process and then gains regulatory and environmental support, LAI believes it would have been premature to have incorporated the potential impacts of those transmission projects in conducting the CUO study. For planning purposes generally, and for the purposes of performing the CUO analysis specifically, we respectfully disagree with Mr. Hachey's opinion, and believe that it is entirely appropriate and prudent to exclude projects such as the NPT project until such time as such projects advance beyond the planning stage and receive the approvals needed to move forward with full development.

With respect to Mr. Hachey's recommended reliance on a statement about the NPT project made by NU's CEO (Hachey Testimony, lines 164-165), while the NU CEO's statement is instructive in terms of providing perspective on NU's commitment to advancing the NPT project, that statement is not a substitute for the approvals needed to allow full development of the NPT project to proceed. Thus, it should have no bearing on the CUO analysis in this case.

D. Shedding Newington Station's Future Capacity Obligations in ISO-NE's Reconfiguration Auctions Would Provide Zero Net Benefits

Q. Mr. Hachey claims that retiring Newington Station could result in $20 million to $30 million of capacity revenue by shedding its future capacity obligations in the Reconfiguration Auctions (Hachey Testimony, lines 231-234). Do you agree?

A. No. Mr. Hachey's analysis and results hinge on the presumption that the Reconfiguration Auctions ("RA") will continue to clear at very low prices. This assumption is tenuous.

Q. Do you believe that RA clearing prices will likely increase from their historical low levels.

A. Yes. RA prices may increase within the next few years because the capacity of resources seeking to replace their capacity supply obligation ("CSOs") may well increase while the pool of resources without CSOs declines. An increase in resources for which owners seek to shed their CSOs may occur due to retirement of the 604.3 MW Vermont Yankee Nuclear Power Plant and failure of the 183.6 MW AES Thames unit to emerge from bankruptcy. Both of these possible events would increase the resources competing with Newington Station attempting to cover its CSO if Newington Station were to retire, under Mr. Hachey's interpretation of the ISO-NE reconfiguration auction. In our opinion, the increased pool of resources seeking to shed their capacity obligations would heighten sellers' competition in the RAs, thereby putting upward pressure on RA clearing prices as well as narrowing the differential between the FCA price and the RA price. In addition, recent modeling changes have increased the net Installed Capacity Requirement ("ICR") for a given load forecast. So, in addition to possibly competing with other units seeking to shed their CSOs, Newington Station would have to "compete" against ISO-NE, which would be seeking to acquire additional supply, putting further upward pressure on RA prices.

Q. How do the "retirement benefits" estimated by Mr. Hachey compare to the continued operation scenario?

A. Even if we hypothesize that RA prices remain low, at $1.00/kW-month, and that capacity revenue over the three-year period from June 2012 to May 2015 close to the level estimated by Mr. Hachey will, in fact, be earned by Newington Station by shedding its capacity obligation, the resource would still be short by a maximum of approximately $14.4 million compared to the continued operation scenario. Importantly, this amount does not include any

additional lost revenues, i.e., energy and ancillary services. Hence, the "net retirement disbenefit" would be around $14.4 million. The results of this analysis are shown in a table (Exhibit LAI-8).

Q. How would Newington Station's "retirement benefits" be affected after 2016?

A. After 2016, the "retirement benefits" as defined by Mr. Hachey will likely not exist at all.

Q. Please explain.

A. Whether or not Newington Station should participate and clear in the FCAs after 2016 would depend on then prevailing economic conditions. The prevailing economic conditions are not directly related to the FCA versus RA clearing dynamics. The RA clearing prices become a significant factor in Newington Station's continued operation consideration if we assume that it will have obtained CSOs in the FCAs for the commitment years *after* 2016. Mr. Hachey's assumption regarding future RA clearing prices of $1 or $1.50 per kW-month based on the historical data does not seem to be applicable to the commitment years starting from 2016/17. The historical RA prices have correctly reflected the actual excess of capacity – a few thousand MW of excess capacity cleared FCA #1 through FCA #5 because the floor has been in effect that artificially supported the clearing price at around $2.90 per kW-month. These results, however, may not be sustainable in the future. In fact, starting from FCA #7, the floor is removed, the FCA prices will likely decline, and the excess of capacity will likely decline in response to attrition effects in the region and load growth. In its most recent RSP released on October 21, 2011, ISO-NE projects energy consumption to grow an average of 1.1% annually over the next ten years, slightly higher than projected in the 2010 RSP. The anticipated increased load growth compounded over the study period coupled with the removal of the floor in FCA #7 will likely put upward pressure on capacity prices in the back end of the CUO study horizon.

In our view, FCA clearing prices will then gradually increase starting from FCA #8, after the drop in FCA #7. The RA clearing prices greatly depend on the availability of excess of capacity, i.e., qualified capacity without capacity supply obligation. When the floor is removed, the lesser amount of excess of capacity will become available, so the RA prices will increase. Eventually, the FCA and the RA clearing prices will converge, rendering, on average, zero net benefit from initially obtaining capacity supply obligation in the FCA and subsequently shedding it through the RA. Assuming Newington Station clears in the FCAs from 2016 and beyond, potential "benefits" from subsequent shedding of Newington Station's CSO will be greatly diminished or vanish

starting from 2016 as the "benefits" are based on the price differential between FCA and the RA prices. Moreover, it is possible that RAs will clear above the FCA once the floor is gone, because supply and demand will be very tight in the RA, especially if ISO-NE needs to buy additional capacity in the RA market to cover the net ICR increase. If this actually happens, shedding the CSO may cost Newington Station money – a clear disbenefit of the retirement. Regardless, a significant and sustained price differential, positive or negative, between FCA and RA prices is highly unlikely, yet this is the essence of the assertion made by Mr. Hachey.

Q. Mr. Hachey believes that "whether excess capacity exists in New England is independent of whether the floor is removed" (PSNH-1-18 in Exhibit LAI-10). Do you agree?

A. No. Mr. Hachey's conclusion is inconsistent with the market design principles. Removal of the floor will likely make the current surplus disappear in a few years. Without the floor, ISO-NE will procure enough capacity to meet the Net ICR. We are not aware of any resource types that would be willing to operate without capacity payments for many years in a row. In our view of the capacity markets administered by ISO-NE, most of the capacity without obligation will either retire, export to neighboring markets, in particular, NYISO, or deactivate. It appears that Mr. Hachey believes the excess capacity will persist for many years upon removal of the floor, but justification for this assumption has not been provided and is hard to rationalize for older generation assets that do not realize large profits from energy sales. While some excess capacity may persist in the decade ahead, once the floor is removed we are confident in the assertion that the magnitude of the capacity overhang in New England will quickly decline in response to the deterioration in operating cash flows that merchant generators will face. Of critical importance, clearing dynamics that are characteristic of ISO-NE's FCM and RA do not support the view of a significant and sustained divergence in prices between the FCM and RA.

E. LAI's Capacity Price Benefits of Continued Operation is Valid and Should Not Be Ignored by the Commission

Q. Mr. Hachey claims that the concept of price suppression benefits is deeply flawed (Hachey Testimony, lines 245-246) and, therefore, the Commission should give no weight to the LAI price suppression analysis (Hachey Testimony, line 285). Do you agree with Mr. Hachey's characterization?

A. No, we do not. Mr. Hachey's rejection of the price suppression analysis is misplaced. Mr. Hachey referred to the testimony filed by the New England

Power Generators Association ("NEPGA") in FERC Docket ER10-787. However, the NEPGA testimony cited by Mr. Hachey addresses the concept of price suppression attributable to entry of a new out-of-market ("OOM") capacity resource.

Q. Please explain what the OOM capacity resource represents.

A. According to the ISO-NE market rules, the ISO-NE Internal Market Monitor (IMM) reviews each offer from new capacity resources below 0.75 times Cost of New Entry ("CONE"). The IMM determines whether the offer is consistent with the long run average costs of that resource net of expected net revenues other than capacity revenues. If the IMM determines that the offer is not consistent with the long run average costs net of expected net revenues other than capacity revenues, then the amount of capacity clearing from that offer is considered OOM capacity for the purposes of determining the applicability of the Alternative Capacity Price ("APR") rule. A new Minimum Offer Price Rule is replacing the APR, but the new rule was not known at the time of our study, and even now continues to evolve through the ISO stakeholder process.

Q. Can Newington Station possibly be categorized as an OOM capacity resource?

A. No. Newington Station was built in 1974 and has participated in the FCM as an existing price-taking resource since the beginning of the FCM in 2006. Therefore, it cannot be considered an OOM capacity resource allegedly capable of suppressing the FCA clearing prices. Moreover, unless Newington Station submits a de-list bid, it is not subject to review and mitigation by the IMM.

Q. Is there a reasonable basis for Mr. Hachey's misunderstanding regarding the capacity price benefits ascribable to Newington Station?

A. Yes. LAI's use of the term "price suppression benefits" may have been a misnomer because Newington Station's continued operation in no way generates a capacity price suppression benefit in New England.

Q. Does continued operation of Newington Station result in market benefits?

A. Yes. If Newington Station was no longer operational, there would be a shortening of the left-hand side of the capacity supply curve by 400 MW which would result in higher capacity prices, all other things being the same. The capacity price would increase because Newington Station, a price-taker, would be replaced by a new, more expensive resource, one that may be a price-setter

rather than a price-taker. These additional capacity payments would be detrimental to customers. In contrast, continued operation would result in avoidance of those additional capacity payments for as long as the plant stays in service. Avoidance of paying those extra dollars is not a "price suppression benefit" as the term was used by NEPGA in its filing in Docket ER10-787. Rather it is the economic benefit that redounds to customers that is attributable to Newington Station remaining in service.

F. Model Complexity

Q. Mr. Hachey claims that LAI's analysis was overly complicated and that only a few scenarios should have been studied (Hachey, lines 139-145). Would use of such a simple model be warranted?

A. No. Much of the energy value of a peaking, dual-fuel facility results from its dispatch flexibility and fuel-switching ability. Modeling those two forms of flexible operation adequately for the purpose of asset valuation requires a very large number of randomized scenarios. A large theoretical and applied literature on real options valuation methods in both academic and trade publications supports our modeling approach. Mr. Hachey's suggestion is not an appropriate alternative method because it is not best practice for valuing the energy gross margins of a flexible operations generation unit. Mr. Arnold agrees with LAI's use of a Monte Carlo stochastic model that runs many scenarios (Staff Exhibit 9, page 3 of 13).

G. Model Calibration with Backcast

Q. Staff concludes that the dispatch model over-estimates financial performance based on the backcasting analysis comparison with 2010 actual Newington Station performance (McCluskey and Arnold, 18:10-11). Staff notes that after adjustments, LAI's backcast overestimated 2010 expected value by $1.2 million or 45% (McCluskey and Arnold, 19:15). In PSNH-1-22(d) (Exhibit LAI-10), Mr. Arnold indicated that his standard for validation of a stochastic model of asset value is to be within plus or minus 30% of the performance for any given backcast test year. Is Mr. Arnold's benchmark for judging the accuracy of an asset valuation model appropriate for models of Newington Station?

A. No, Mr. Arnold's criterion is not appropriate for four reasons. First, the median is a better point predictor of any one year's actual performance than the expected value ("EV"), which is calculated as the mean or weighted

average of the scenario values. The reason is that by definition the actual annual energy gross margin will be less than the median of its distribution in 50% of sampled years, but that more than 50% of sampled years will have a gross margin less than the EV since its distribution is skewed, with a longer upper tail. The $1.2 million gap between the model result and actual 2010 results was based on the expected value of $3.8 million and the backcast actual value of $2.6 million. The median model result was $3.6 million, an error of 38%. The error based on the median is only 8% greater than Mr. Arnold's threshold rather than 15% beyond for the EV. Elsewhere, Mr. Arnold agrees with LAI in PSNH-1-22(b) and PSNH-1-22(c) (Exhibit LAI-10) that comparison of the median with the actual backcast value is appropriate and is regularly done by Jacobs Consultancy in its studies.

Second, Mr. Arnold's criterion of an absolute percentage prediction error of 30% is not supported by an examination of the volatility of historical gross margins and of the residual sources of variation not controlled for in the backcast test year. For example, the backcast case used the model's stochastic parameters for varying fuel and energy prices in the backcast simulation of 2010 gross margins rather than using a single scenario with actual fuel and energy prices. Importantly, the 30% deviation rule is not tied to a measure of the confidence interval that actual results would frequently lie within. To allow for random variability resulting in year-ahead actual results being higher or lower than the expected forecast values, an uncertainty band or confidence interval should be included in the analysis. For example, the interquartile range ("IQR") represents the middle 50% of possible outcomes, which is a reasonable, strict criterion. It says that the actual result should lie within the IQR for one-half of the years sampled. For the backcast case that LAI ran for Staff, the middle 50% of outcomes between the P25 and P75 results was $2.1 million to $5.2 million. The backcast result of $2.6 million is higher than the P25 result, at the P30 level. By this frequency measure based on the model's distribution of results, the 38% deviation for the backcast test year does not appear to be excessively large.

Third, it is difficult to achieve a very small percentage difference between actual and modeled energy net revenues for a peaker plant since its capacity factor is low and energy net revenues are small. A percentage measure of error works well for baseload and mid-merit resources, but does not work well when the target values are close to zero. An absolute error measure is better. The absolute error measure may be normalized to plant MW size.

Fourth, the model did not simulate ISO-NE calls for Newington Station to provide operating reserves, which reduced its gross margin to barely cover variable costs during those hours, as acknowledged by Staff. A high proportion of operating hours to provide operating reserves has only been

observed in 2010. If the frequency of ISO-NE calls for provision of operating reserves declines in the future, then the model results should lie closer to actual financial performance.

IV. Data Issues

A. Dracut to Newington Station Natural Gas Basis Adders

Q. Staff calculated slightly higher January-February basis and much higher March-December Dracut to Newington Station adders based on 2010 Emera invoices and Platts data (McCluskey and Arnold, 21:1-13) than those provided by PSNH and used in the analysis. Are the basis spreads calculated by Staff reasonable for ten-year forecast purposes?

A. No. The basis spreads proposed for use by Staff are not well-supported**.** Estimating the Dracut to Newington Station basis going forward with only 2010 data is not as reliable as using multiple years of data. For example, 2010 appears to have had unusually large summer basis spreads. This may be due to the unusually large portion of gas volumes purchased in the intraday market due to real-time dispatching to provide operating reserves. Because basis spreads are very volatile over time, it is not good practice to use only a single year of historic data for estimating average basis spreads to use for forecast purposes, especially for ten-year forecasts. For this reason, LAI's approach is to use six or more years of historic data to estimate basis spreads.

After recent discussion with PSNH staff to probe more deeply into the support for the low $0.10 to $0.25/Dth March to December basis spread value to apply, LAI now believes that a more reasonable basis spread is somewhere between the $0.175/Dth initially modeled for these months and the $0.84/Dth assumed by Staff on the basis of 2010 data. In addition, because the gross margin appears fairly sensitive to the increase from $0.175/Dth and $0.84/Dth, it may be better to use a stochastic basis spread because the size of the basis does not appear to be related to the level of natural gas prices.

B. Fuels Price Forecast

Q. Staff claimed that the RFO to natural gas price ratio (Btu basis) was about 4.4:1 based on recent market data, while the ratio in LAI's model started at 2.5:1 in 2011 and declined to 1.75:1 in 2020 (McCluskey and Arnold, 21:18 to 22:1). Staff data response PSNH-1-27c (Exhibit LAI-11) revised that ratio to 4.0:1, and a late-filed

confidential workpaper in support of that 4.0:1 ratio is now available. Staff requested that LAI run an alternate case by trending the RFO to natural gas price ratio from 4.0 in 2011 to 3.5 in 2020. Please comment on Staff's analysis.

A. First, Staff Exhibit 9, Mr. Arnold's report to Staff, and Staff data response to PSNH-1-27b (Exhibit LAI-11) indicate that the 4.0 ratio is for RFO to Henry Hub prices. However, when making the request at the second Technical Session, Mr. Arnold, by telephone, provided confirmation to our question regarding the unnamed natural gas location that the oil-gas price ratio he was discussing was RFO to Dracut. Hence, the analysis done by LAI applied the ratio of 4.0 in 2011 with respect to Dracut prices, and trended it down to 3.5 in 2010. We noted in our response to part (c) of the written request stemming from the second Technical Session, TS-02-007 (Exhibit LAI-12), that we applied the requested oil/gas price ratios to annual average natural gas prices at Dracut. The written request had not named a location for the natural gas price index. This misunderstanding of our run results by Mssrs. McCluskey and Arnold implies that application of the requested RFO/gas price ratios to lower Henry Hub prices would result in slightly higher energy net revenues than in the alternative run LAI conducted.

Second, by "recent" price ratios, Mr. Arnold had based the 4.0:1 ratio on just three shoulder months, March to May 2011. It is not good practice to base a long-term, 10-year forecast on an oil-gas parity ratio spanning only three months, and not normalizing the ratio to account for typically lower natural gas (and 2FO) prices in the spring months than during the winter heating season.

Third, LAI made use of futures market curves for WTI oil prices and Henry Hub gas prices together with oil product and gas location basis spreads to forecast RFO, 2FO, and Dracut fuel prices in the CUO study. Use of available futures or forward prices to the extent available is generally preferred to relying on any single analyst's long-term forecast of spot prices.

For these three reasons, LAI does not give much credence to Staff's projection of expected RFO and 2FO prices.

Q. Aside from your dispute with Staff over the reasonableness of their view of future RFO and 2FO prices, do you believe that the use of Staff's forecast of higher expected RFO and 2FO prices in the simulation case Staff requested made a significant difference in the value of Newington Station?

A. No. The Staff-requested model run with higher RFO and 2FO prices did not decrease energy net revenues by much since LAI's forecast of expected Dracut gas prices, which Staff did not modify, was so much lower than LAI's forecast of expected RFO prices that Newington Station rarely ran on RFO in LAI's analysis. In LAI's case, there was little real option value of fuel-switching capability. In the Staff case, the fuel-switching real option value was even smaller.

C. Newington Station Variable Operating Costs

Q. Mr. Traum suggested that the dispatch model was defective because it simulated a lower heat rate than in actual 2010 operation (Traum, 26:1-3). Was the model defective in that regard?

A. No. The lower heat rate result in the model simulation than recent in experience is due to actual 2010 dispatch at part capacity while providing operating reserves, which the model does not simulate. That is a limitation of the scope of the model, not a model defect. Since there is little to no energy net margin created by dispatching at a lower level to provide operating reserves, not including this type of dispatch does not impact the real option value result, and correctly ignores the higher heat rate consequence of dispatching to provide operating reserves.

Q. Mr. Traum suggested that the smaller number of starts in the model simulation than the large number of starts that actually occurred in 2010 was a reason for the model simulating a lower higher rate (Traum, 26:11-16). Is that true?

A. No. Operating at part capacity to provide operating reserves is the main reason for the lower heat rate in the model, not smaller number of starts.

Q. Mr. Traum suggested that PSNH did a poor job of purchasing natural gas because a table in the CUO study showed lower annual average spot market gas prices than PSNH reported as its average annual cost of gas supply (Traum, 28:14-20). Is that a fair criticism?

A. No. In response to PSNH-1-35 (Exhibit LAI-13), Mr. Traum stated that he had assumed that the Newington Average Natural Gas Cost data series and the Average Natural Gas Spot Price, Dracut data series "were comparing apples to apples." The information provided in the two columns of the CUO study table referenced by Mr. Traum is not directly comparable for three reasons. First, the Newington Average Natural Gas Cost data includes certain fuel-related fixed costs to natural gas acquisition costs, in addition to

the basis spread between Dracut and Newington Station. Second, the Newington Station average annual gas cost is only for days when Newington Station dispatches on gas, while the Dracut spot market price is a time-weighted average of all trade dates. Often, there is a positive correlation between high gas price days and days when it is profitable to dispatch Newington Station. Third, PSNH is purchasing natural gas with substantial intra-day flexibility attached to its contractual rights with Emera, the marketer that provides commodity, transportation, and daily swing service to PSNH. This swing capability effectively insulates PSNH from the incurrence of costly imbalance charges as well as penalties potentially levied by the pipeline, PNGTS, for unauthorized overpulls or underpulls when Flow Day Alerts or Operating Flow Orders are posted. While the Dracut spot market price is a reliable index reflecting the value of natural gas delivered into northeastern Massachusetts, it is not an "apples-to-apples" comparison with PSNH's average annual or daily gas costs.

D. Capital Expenditures Too Low Due to Need for Environmental Compliance Retrofits

Q. Mr. Traum recommends that CUO "studies should take into account reasonably foreseeable changes in environmental regulations" (Traum, 3:9-10). Staff recommends that LAI should have used probabilistic scenarios for capital cost expenditures similar to capacity price scenarios (McCluskey and Arnold, 27:15-17). Why did your analysis not include the possibility of the need for capital expenditures for environmental compliance, at least in some scenarios?

A. There are two analytic reasons for why LAI did not choose to specify capital expenditure values greater than those provided to us by PSNH in order to account for the possibility of environmental compliance retrofits.

First, even when future regulations may be enacted in some form at some future date, it does not imply that a CUO study needs to account for the possibility and timing of those regulatory changes in advance of the changes becoming known with "reasonably foreseeable" certainty. Once new information becomes known with reasonable certainty, a capital expenditure or retirement decision can be made at any time. The decision to defer a decision until such time that new information is available has value. Staff agrees with this concept in PSNH-1-37 (Exhibit LAI-14).

Second, Staff's recommendation of conducting probabilistic modeling of capital expenditures is impractical to implement correctly, since it would

require use of the difficult mathematical technique of dynamic stochastic optimization, rather than using perfect foresight to guide future decisions in each scenario. It is incorrect to simply take the probability-weighted average of the net revenues for multiple scenarios because that technique implies a "now-or-never" decision rather than the option to retire the asset at a sequence of future decision dates.

On a related matter, the two studies that Mr. Traum cited (in footnotes 2 and 3) that discuss future environmental regulations were published six and ten months after the CUO study was filed (March 30, 2011 and July 2011).

V. Relevance of Newington Station Results in CRA Study of NPT

Q. Mr. Hachey's supplemental testimony contrasts the expected energy net revenue for Newington Station in your CUO study of about $40 million to his extrapolation of CRA Study results for 2015, 2016, and 2018 of $1.3 million without NPT and $0.5 million with NPT. Is this a fair comparison?

A. No, it is not a fair comparison for several reasons. First, and most importantly, the CRA Study only simulated a single deterministic scenario with expected (average) fuel prices, loads, and hydro and wind energy availability. As a unit serving peaking energy needs, much of Newington Station's energy is produced when spark spreads are higher than average, as a result of weather, fuel price, and system unit availability fluctuations. The CRA results only show a handful of starts per year, which is unrealistically low. This is not a deficiency of the CRA analysis since its objective was to value NPT, backed by a fixed availability of zero or low marginal cost hydro energy.

Second, the December 7, 2010 CRA Study had assumed that NPT would be operational by the beginning of 2016. The August 3, 2011 announcement that the expected operational date is now a year later means that the case with NPT should not base 2016 energy net revenue on the model results for that year.

Third, the publicly-available data contained in the GE MAPS database as of late 2010 when the study was conducted would most likely not have characterized recent improvements in Newington Station's operational characteristics, including cold and hot start times, minimum run time, start costs, and heat rates. Our CUO analysis reflected those recent improvements based on data supplied by PSNH.

Fourth, while the GE MAPS model and database may be unbiased and accurately simulate LMPs given loads, fuel prices, and interface transfers, as a regional system fundamental model with the objective of minimizing system production costs, it does not have as much accuracy in the simulation of individual generation units. The purpose of a regional model is to focus on system efficiency rather than the performance of any one individual generation unit among the hundreds modeled.

Q. Does this conclude your testimony?

A. Yes, it does.