ENT000479
Submitted March 30, 2012

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 50-247-LR and
	)	50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.	)	
	)	
(Indian Point Nuclear Generating Units 2 and 3)	)	
	)	March 30, 2012

TESTIMONY OF ENTERGY WITNESSES DONALD P. CLEARY, DAVID HARRISON JR., AND EUGENE T. MEEHAN REGARDING CONTENTION NYS-37 (ENERGY ALTERNATIVES)

William B. Glew, Jr., Esq.
William C. Dennis, Esq.
ENTERGY NUCLEAR OPERATIONS, INC.
440 Hamilton Avenue
White Plains, NY 10601
Phone: (914) 272-3202
Fax: (914) 272-3205
E-mail: wglew@entergy.com
E-mail: wdennis@entergy.com

Kathryn M. Sutton, Esq.
Paul M. Bessette, Esq.
Jonathan M. Rund, Esq.
MORGAN, LEWIS & BOCKIUS LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004
Phone: (202) 739-3000
Fax: (202) 739-3001
E-mail: ksutton@morganlewis.com
E-mail: pbessette@morganlewis.com
E-mail: jrund@morganlewis.com

COUNSEL FOR ENTERGY NUCLEAR OPERATIONS, INC.

TABLE OF CONTENTS

Page

TABLE OF CONTENTS
(cont'd)

Page

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. 50-247-LR and
	)	50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.	)	
	)	
(Indian Point Nuclear Generating Units 2 and 3)	)	
	)	March 30, 2012

TESTIMONY OF ENTERGY WITNESSES DONALD P. CLEARY, DAVID HARRISON JR., AND EUGENE T. MEEHAN REGARDING CONTENTION NYS-37 (ENERGY ALTERNATIVES)

I. WITNESS BACKGROUND

A. Donald P. Cleary ("DPC")

Q1. Please state your full name.

A1. (DPC) My name is Donald P. Cleary.

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

A2. (DPC) I am an Environmental Safety Consultant with Talisman International, LLC.

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

A3. (DPC) My qualifications are summarized in the attached *curriculum vitae* (ENT000133). Briefly, I hold a Bachelor of Arts degree in Economics from the University of Massachusetts, Amherst, a Master of Arts degree in Economics from the University of Florida, and have taken additional graduate courses in Natural Resource Economics and Policy at the University of Michigan. I have 38 years of experience in the nuclear regulation industry. Since 2001, I have provided consulting services in the areas of environmental impacts, power and alternate energy sources, and regional socioeconomic impacts. Prior to joining Talisman, I was a

member of the U.S. Nuclear Regulatory Commission regulatory staff ("NRC Staff") from 1973 to 2001.

During my time with the NRC, I had a lead role in developing and applying methodologies to assess various topics covered in environmental impact statements for nuclear power plant construction and operation, including such topics as the need for power (electrical generating capacity), alternative energy sources, and regional socioeconomic impacts.

Furthermore, as Task Manager for NUREG-1437, the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (May 1996) ("GEIS") (NYS00131A-I), and the license renewal rulemaking, I was directly involved in license renewal environmental impact studies addressing socioeconomics impacts and energy alternatives. I also managed several rulemakings, and the writing of technical and policy papers related to reactor license renewal.

Additionally, while at the NRC, I also developed an in-house training unit, "Compliance with the National Environmental Policy Act in U.S. Nuclear Regulatory Commission Rulemaking and Licensing" and, with participation from the NRC Office of General Counsel and the Environmental Protection Agency ("EPA") led periodic training sessions. During 1995 and 1996, I taught a course titled, "Environmental Policy Making" in a Master degree program at The Johns Hopkins University.

I am familiar with the NRC's requirements and guidance on the treatment of alternatives to license renewal in nuclear power plant license renewal reviews. The major documents articulating the NRC's requirements and guidance include the Commission's environmental protection regulations in 10 C.F.R. Part 51; the GEIS (NYS00131A-I); Regulatory Guide 4.2, Supplement 1, Preparation of Supplemental Environmental Reports for Application to Renew Nuclear Power Plant Operating Licenses (Sept. 2000) ("Regulatory Guide 4.2, Supp. 1")

(excerpts attached as ENT000136); and NUREG-1555, Supplement 1, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan for Operating License Renewal" (Mar. 2000) ("NUREG-1555, Supp. 1") (ENT00019B).

Q4. Please describe the basis for your familiarity with Indian Point Energy Center ("IPEC" or "Indian Point"), and the Indian Point Nuclear Generating Units 2 and 3 ("IP2" and "IP3," respectively) license renewal project, including the associated license renewal application, environmental report, and environmental impact statement.

A4. (DPC) My initial familiarity with Indian Point developed as a member of the NRC Staff team reviewing alternative closed-cycle cooling systems in the 1970s. As part of that review, I evaluated information on the site and vicinity and participated in an intensive site visit, which included meetings with local and county officials.

More recently, I have been retained by Entergy Nuclear Operations Inc. ("Entergy") as an expert in connection with the adjudication of several contentions in this proceeding, including New York State ("NYS") Contention 9/33/37 (jointly, "NYS-37" unless otherwise noted), NYS-17B, and CW-EC-3A. In preparing my testimony, I reviewed the parties' pleadings on Contention NYS-37 (including the various reports and declarations by David Schlissel, Peter Lanzalotta, and Peter Bradford); the Atomic Safety and Licensing Board ("Board") orders on NYS-37; the alternative energy information in Entergy's Environmental Report ("ER") (Apr. 24, 2007) (ENT00015B) and in the NRC Staff's Final Supplemental Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3 (Dec. 2010) ("FSEIS") (NYS00143A-J); and the license renewal GEIS (NYS00131A-I).

B. <u>David Harrison, Jr. ("DH")</u>

Q5. Please state your full name.

A5. (DH) My name is David Harrison, Jr.

Q6. By whom are you employed and what is your position?

A6. (DH) I am a Senior Vice President at NERA Economic Consulting, a firm of consulting economists with about 500 staff located in more than 20 offices in North America, Europe and the Pacific Rim that specializes in applying economic, finance, and quantitative principles to complex business and legal challenges. I am the head of NERA's global Environment Group, which provides world-recognized expert services related to the economics of environmental policies in the fields of climate change, air quality, water quality, and other environmental, health, and safety areas.

Q7. Please describe your educational and professional qualifications, including relevant professional activities.

A7. (DH) My qualifications are summarized in the attached *curriculum vitae* (ENT000480). I received a Ph.D. in Economics from Harvard University, where I was a Graduate Prize Fellow. I also hold a Bachelor of Arts degree *magna cum laude* in Economics from Harvard College, where I was a member of Phi Beta Kappa, and a Master of Science degree in Economics from the London School of Economics, where I was the Rees Jeffreys Scholar.

Before joining NERA, I was an Associate Professor at the John F. Kennedy School of Government at Harvard University, where I taught economics, energy and environmental economics and policy, benefit-cost analysis, regional economic development, and other subjects for more than a decade. I was a member of the Faculty Steering Committee of the Energy and

Environmental Policy Center at Harvard University, and a member of the Advisory Board of the Interdisciplinary Program in Health at the Harvard School of Public Health.

I earlier served as a Senior Staff Economist on the President's Council of Economic Advisors, where my areas of responsibility included energy and environment, natural resources, occupational health and safety, and transportation. I also have worked at the U.S. Department of Transportation, the U.S. Department of Housing and Urban Development, and the National Bureau of Economic Research.

I have directed or co-directed numerous studies of electricity markets in the United States. These include analyses related to integrated resource plans for electric utilities as well as analyses related to the potential electricity market impacts of changes in power plant operation in conjunction with compliance with cooling water intake requirements for facilities located on the Atlantic Ocean, the Pacific Ocean, the Great Lakes, and other lakes and rivers.

I have also directed numerous studies using the U.S. Energy Information Agency's ("EIA") National Energy Modeling System ("NEMS"). These studies include assessments in the context of integrated resource planning, climate change policy, air emissions policy, water policy, and other environmental policies.

I have analyzed the benefits, costs and other impacts of energy and environmental policy for more than 35 years, beginning in 1974, when I participated in the benefit-cost study of the automotive emission standards mandated by the 1970 Clean Air Act that was undertaken by the National Academy of Sciences under a Congressional directive. At Harvard, the courses I taught in energy and environmental policy and economics included analyses of major environmental policies, including those related to the Clean Air Act and other major environmental legislation. At the President's Council of Economic Advisors, I was an acting member of the Regulatory

Council, the group charged with developing benefit-cost methodologies to evaluate federal regulatory requirements. As the principal staff member on the Regulatory Analysis Review Group, I participated in the review of major proposed regulations. These reviews included analyzing information prepared by federal agencies on the costs and benefits of proposed regulations, including those related to the Clean Air Act, the Clean Water Act, and other major environmental statutes.

At NERA, I have directed numerous projects related to benefit-cost assessments of environmental regulations, including air quality and climate change, water quality, and other categories. In the area of water quality, I have carried out cooling water intake structure analyses for numerous facilities on various water bodies across North America. I have been a consultant to the South Coast Air Quality Management District, the Massachusetts Department of Environmental Protection, the U.S. Environmental Protection Agency, the Organization of Economic Cooperation and Development, the European Commission, the UK Department for Environment, Food and Rural Affairs, the Italian Ministry of the Environment, and other public agencies, as well as to numerous private companies and organizations. I have authored or co-authored two books and numerous articles on various energy and environmental topics.

As a result of these and other activities, I am very familiar with New York State's electricity market and economic methodologies used to determine the reasonable alternatives for nuclear power plant license renewal projects, as well as the methods to assess the environmental benefits and costs of energy projects and their alternatives.

Q8. Please describe the basis for your familiarity with Indian Point, and the IP2 and IP3 license renewal project, including the associated license renewal application, environmental report, and environmental impact statement.

A8. (DH) In 2002, I co-directed an analysis in conjunction with electricity market modelers at General Electric to assess the electricity market impacts of permanent shutdown of IPEC and other potential scenarios. The project included an analysis of the potential economic and environmental impacts of shutdown of these nuclear power plants using the GE-MAPS model and NERA's volatility model analysis. Updated results for this analysis were released in 2003. In 2009, I co-directed efforts to prepare comments to the NRC related to the Draft Supplemental Environmental Impact Statement ("DSEIS") for IPEC.

I have been retained by Entergy as an independent economic expert in connection with the adjudication of Contention NYS-37. In preparing my testimony, I reviewed the parties' pleadings on Contention NYS-37 (including the various reports and declarations by David Schlissel, Peter Lanzalotta, and Peter Bradford); the Atomic Safety and Licensing Board ("Board") orders on NYS-37; the alternative energy information in Entergy's Environmental Report ("ER") (Apr. 24, 2007) (ENT00015B) and in the NRC Staff's FSEIS for Indian Point (NYS00143A-J); and the license renewal GEIS (NYS00131A-I). Eugene Meehan and I led the NERA team that independently assessed the validity of the claims made in NYS-37. This assessment is documented in our report entitled, "Potential Energy and Environmental Impacts of Denying Indian Point's License Renewal Applications" (Mar. 2012) ("NERA Report") (ENT000481).

C. <u>Eugene T. Meehan ("ETM")</u>

Q9. Please state your full name.

A9. (ETM) My name is Eugene T. Meehan.

Q10. By whom are you employed and what is your position?

A10. (ETM) I am a Senior Vice President at NERA Economic Consulting.

Q11. Please describe your educational and professional qualifications, including relevant professional activities.

A11. (ETM) My qualifications are summarized in the attached *curriculum vitae* (ENT000482). In brief, I hold a Bachelor of Arts in Economics from Boston College and have taken additional graduate courses at the New York University Graduate School of Business Administration. I have more than 35 years of experience advising electric and gas utility clients in the areas of strategic planning, regulatory strategy, and financial and economic analysis. I have extensive experience evaluating economic issues associated with electric power markets in the United States, including in the New York Independent System Operator ("NYISO") region. For example, I have performed assessments associated with power pooling and interconnection issues, and the development of projected market clearing prices. I have also performed assessments of the economic impacts of energy and environment policies and related infrastructure programs. These assessments have involved a wide range of economic models, including state-of-the-art national and regional models such as NEMS. These assessments have included estimates of the potential impacts on electricity cost and reliability using numerous electricity market models in various electricity regions of the United States.

Before joining NERA, I was a Utility Consulting Partner with Deloitte & Touche and a Vice President at Energy Management Associates. I have modeled the New York State electricity system for various analyses since 1980. These analyses include modeling the impact of the Nine Mile Point 2 nuclear unit in review of its continued construction in 1981, modeling the impact of additional transmission between upstate New York and Southeast New York throughout the

early 1980s in connection with the Marcy South transmission expansion (the last major project increasing transfer capability between these regions), working with the New York State's utilities and the Department of Public Service to implement a model-based approach to long-run avoided cost, developing the framework used by the State's utilities to assess the economics of conservation investment, developing a model based reliability approach for determining avoided generation capacity costs for the State's utilities and modeling the economic and fuel use impacts of the potential closure of the Indian Point plant for its then owners in connection with a 1983 proceeding before the Atomic Safety and Licensing Board.

Thus, I am very familiar with economic methodologies used to determine the reasonable alternatives for nuclear power plant license renewal projects, as well as the methods to assess the environmental benefits and costs of energy projects and their alternatives.

Q12. Please describe the basis for your familiarity with Indian Point, and the IP2 and IP3 license renewal project, including the associated license renewal application, environmental report, and environmental impact statement.

A12. (ETM) My prior work related to IPEC includes modeling the economic and fuel use impacts of the potential closure of IPEC for its former owners in connection with a 1983 proceeding before the Atomic Safety and Licensing Board. I co-directed the project noted by David Harrison above in 2002 and 2003 related to modeling the potential economic and environmental impacts of IPEC shutdown using the GE-MAPS model and NERA's volatility model analysis.

I have been retained by Entergy as an independent economic expert in connection with the adjudication of Contention NYS-37. In preparing my testimony, I reviewed the parties' pleadings on Contention NYS-37 (including the various reports and declarations by David

Schlissel, Peter Lanzalotta, and Peter Bradford); the Atomic Safety and Licensing Board ("Board") orders on NYS-37; the alternative energy information in Entergy's Environmental Report ("ER") (Apr. 24, 2007) (ENT00015B) and in the NRC Staff's FSEIS for Indian Point (NYS00143A-J) and the license renewal GEIS (NYS00131A-I). David Harrison and I led the NERA team that independently assessed the validity of the claims made in NYS-37. This assessment is documented in our report entitled, "Potential Energy and Environmental Impacts of Denying Indian Point's License Renewal Applications" (Mar. 2012) (ENT000481).

II. OVERVIEW OF CONTENTION NYS-9/33/37

Q13. Are you familiar with the Contention NYS-9, as proposed by NYS and admitted by the Board?

A13. (DPC, DH, ETM) Yes. We have reviewed the relevant pleadings in this proceeding concerning Contention NYS-9, including the applicable portions of the "New York State Notice of Intention to Participate and Petition to Intervene," dated November 30, 2007 ("NYS Petition"), *available at* ADAMS Accession No. ML073400187; the Declaration of David A. Schlissel (Nov. 28, 2007) (NYS000051) and attached report entitled "Report on the Availability of Replacement Capacity and Energy for Indian Point Units 2 & 3," (Nov. 28, 2007) (NYS000052) ("2007 Schlissel Report"); and the Board decisions admitting this contention.

As originally proposed, NYS-9 alleged that Entergy's ER is deficient because it failed to include consideration of energy conservation in its analysis of alternatives that are able to replace Indian Point's full base-load generation capacity of approximately 2,158 gross MWe and that, at a minimum, the ER should analyze energy conservation as part of the "no-action" alternative (*i.e.*, assuming that the IP2 and IP3 operating licenses were not renewed). NYS Petition at 106-108. The Board admitted "this narrow aspect of NYS's argument related to the 'no-action'

alternative," explaining that there was a material issue regarding "the need for Entergy to consider energy conservation for the 'no-action' alternative in its ER." *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-08-13, 68 NRC 43, 93 (2008). The Board, however, rejected "those portions of NYS-9 that allege ER deficiencies due to Entergy's lack of considering energy conservation in its alternatives analysis for the defined goal of producing 2158 MWe of base-load generation." *Indian Point*, LBP-08-13, 68 NRC at 93.

Q14. Are you familiar with the Contention NYS-33, as proposed by NYS and admitted by the Board?

A14. (DPC, DH, ETM) Yes. We have reviewed the relevant pleadings in this proceeding concerning Contention NYS-33, including the applicable portions of the "State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement," dated Feb. 27, 2009 ("NYS Contention 33"), *available at* ADAMS Accession No. ML090690303, including a second declaration from David A. Schlissel, dated February 27, 2009 (NYS000053) ("2009 Schlissel Declaration"); the Declarations of Peter A. Bradford, dated November 28, 2007 (NYS000105) and February 2, 2011 (NYS000106), and Peter J. Lanzalotta, dated February 1, 2011 (NYS000098) ("Lanzalotta Declaration"); and a third declaration from David A. Schlissel, dated January 31, 2011 (NYS000054) ("2011 Schlissel Declaration"). We are also familiar with the Board decisions admitting this contention.

After the NRC Staff issued its Draft Supplemental Environmental Impact Statement ("DSEIS"), NYS submitted NYS-33, which updated NYS-9, to also challenge the DSEIS analysis of "the viability of renewable energy resources, energy transmission capacity, and possible combinations of different energy sources" under the no-action alternative. Licensing

Board Order (Ruling on New York State's New and Amended Contentions) at 1, 8 (June 16, 2009) (unpublished) ("June 16, 2009 Order"). NYS alleged that the DSEIS "incorrectly assumed that 'energy conservation would only result in a savings of 800 MW,'" and "that wind power or other renewable energy sources could only provide 200 to 400 MW of energy to replace either or both Indian Point units, and whether the two combination alternatives analyzed in the [DSEIS] were 'artificially narrow and arbitrary.'" June 16, 2009 Order at 13. The Board admitted NYS-33 and consolidated it with NYS-9. June 16, 2009 Order at 13.

Q15. Are you familiar with the Contention NYS-37, as proposed by NYS and admitted by the Board?

A15. (DPC, DH, ETM) Yes. We have reviewed the relevant pleadings in this proceeding concerning Contention NYS-37, including the "State of New York Contention Concerning NRC Staff's Final Supplemental Environmental Impact Statement," dated February 3, 2011 ("Contention NYS-37"), *available at* ADAMS Accession No. ML110680290; the Declarations of Peter A. Bradford, dated November 28, 2007 (NYS000105) and February 2, 2011 (NYS000106), and Peter J. Lanzalotta, dated February 1, 2011 (NYS000098) ("Lanzalotta Declaration"); and a third declaration from David A. Schlissel, dated January 31, 2011 (NYS000054) ("2011 Schlissel Declaration"). We are also familiar with the relevant Board decisions concerning these contentions.

Following NRC Staff's issuance of the Final Supplemental Environmental Impact Statement ("FSEIS"), NYS submitted NYS-37, which updated consolidated contentions NYS-9/33 to apply to the FSEIS, and further challenged the Staff's analysis and recommendations with respect to new alternatives included in Chapter 8 of the FSEIS. *See* Contention NYS-37 at

17, 26. The main crux of NYS-37 is that, in developing alternatives to IP2 and IP3, the FSEIS purportedly did not account for:

- New York's goal of obtaining 30 percent of electricity demand from renewables by 2015 ("30 by 15") and the additional renewable generation it has encouraged;
- New York's goal of reducing electricity demand by 15 percent in 2015 relative to the demand forecast produced in 2007 when the goal was set ("15 by 15") and the energy conservation it has spawned;
- Significant decreases in electricity demand in New York and decreases in forecasts of future electricity demand due to the recession;
- New York's recent and proposed generation capacity additions;
- Increased supply and lower future prices forecasted for natural gas; and
- New transmission lines that increase the transfer capability to deliver power to the downstate region served by Indian Point.

See Contention NYS-37 at 8-9.

The Board admitted NYS-37 to the extent that it updated and superseded NYS-9/33 to apply to the FSEIS, and that it challenged the adequacy of FSEIS responses to public comments on the DSEIS concerning the environmental impacts of the no-action alternative. Licensing Board Memorandum and Order (Ruling on Pending Motions for Leave to File New and Amended Contentions) at 34-35 (July 6, 2011) ("July 6, 2011 Order"). The Board, however, made clear it was "not authorizing a broad-ranged inquiry into alternative scenarios and the need for power which would be precluded by Commission regulations, and which [the Board had] previously excluded." July 6, 2011 Order at 35 (citation omitted).

For purposes of our testimony, we collectively refer to Contentions NYS-9/33/37 as "NYS-37," except when necessary to distinguish NYS-9 or NYS-33 from NYS-37.

Q16. Have you reviewed NYS's initial written statement of position, prefiled direct testimony, and supporting exhibits concerning NYS-37, as filed on December 14 and 22, 2011?

A16. (DPC, DH, ETM) Yes. We have each individually reviewed the prefiled testimony of Mr. Schlissel, Mr. Laznalotta, and Mr. Bradford (NYS000046, NYS000047, and NYS000048, respectively) and other supporting exhibits related to NYS-37.

Q17. Has the Board issued any additional guidance on the scope of NYS-37?

A17. (DPC, DH, ETM) Yes, the Board did provide further guidance in its recent ruling issued earlier this month on Entergy's Motion in Limine on NYS-37. *See* Licensing Board Order (Granting in Part and Denying in Part Applicant's Motions in Limine) (Mar. 6, 2012) (unpublished) ("Ruling on Motions in Limine"). In that decision, the Board again confirmed that NYS "may not conduct 'a broad-ranged inquiry into . . . the need for power' because such an inquiry in this proceeding is prohibited by 10 C.F.R. § 51.95(c)(2)." Ruling on Motions in Limine at 19 (citation omitted).

Q18. Have you reviewed other materials in preparation for your testimony?

A18. (DPC, DH, ETM) Yes. We note at the outset that we cannot offer legal opinions on the language of the NRC regulations, orders, or related guidance discussed in our testimony. However, reading statements therein as technical statements, and using our expertise, we can interpret what those statements mean for the no-action alternative and energy alternative evaluations.

Q19. What is the source of those materials?

A19. (DPC, DH, ETM) Many are documents prepared by government agencies, energy planning and regional transmission organizations, or documents prepared by or for the electric generation and transmission industries. These documents include, for example, NRC regulations and guidance documents, Commission decisions, the Indian Point license renewal application, NRC Staff's GEIS and FSEIS for Indian Point, New York Independent System Operator ("NYISO") reports, New York State Public Service Commission ("NYPSC") orders and New York State Department of Public Service reports, and U.S. Energy Information Administration ("EIA") reports.

Q20. I show you what has been marked as Exhibit ENT000001. Do you recognize this document?

A20. (DPC, DH, ETM) Yes. It is a list of Entergy's exhibits, and includes those documents which we referred to, used, or relied upon in preparing respective portions of our testimony, ENT00015B, ENT00019B, ENT000133, ENT000136, ENT000147, and ENT000480 to ENT000519.

Q21. Please direct your attention to what has been marked as ENT00015B, ENT00019B, ENT000133, ENT000136, ENT000147, and ENT000480 to ENT000519. Do you recognize these documents?

A21. (DPC, DH, ETM) Yes. These are true and accurate copies of the documents that we have referred to, used and/or relied upon in preparing this testimony. Where we have attached only a document excerpt as an exhibit, that is noted on Entergy's exhibit list.

Q22. How do these documents relate to the work that you do as an expert in forming opinions such as those contained in this testimony?

A22. (DPC, DH, ETM) These documents represent the type of information that persons within our respective fields of expertise reasonably rely upon in forming opinions of the type offered in this testimony.

III. SUMMARY OF TESTIMONY AND CONCLUSIONS

Q23. What are the purposes of your testimony?

A23. (DPC, DH, ETM) The principal purposes of our testimony are to evaluate the energy and environmental impacts of the no-action alternative relative to renewing IPEC's licenses and to evaluate the conclusions of the FSEIS and the NYS positions in NYS-37 in light of our analyses. Additionally, we provide pertinent background on NEPA, NRC's NEPA implementing regulations, and the GEIS.

Q24. Could you summarize your overall conclusions?

A24. (DH, ETM) If the IPEC licenses were not renewed, our analyses show that existing IPEC baseload generation would be replaced primarily by fossil-fueled generation from existing natural gas and coal facilities. These results establish that: (1) the adverse environmental impacts of the no-action alternative assessed in the FSEIS are, if anything, underestimated; and (2) NYS is incorrect in its claims that the FSEIS overstates environmental impacts because replacement generation would not be primarily renewable energy and conservation as NYS contends. Indeed, incorporating the factors that NYS cites in its critique of the FSEIS—that it does not take proper account of the State's renewable and energy efficiency mandates and other energy developments—further supports our conclusion that the FSEIS if anything understates the likely environmental impacts of the no-action alternative.

(DPC) In light of this evaluation, the FSEIS contains an appropriate evaluation of alternatives and considers, among other things, the environmental impacts of new natural gas-fired generation, energy conservation, and combinations of alternatives, including a combination involving repowering an existing fossil-powered plant, renewable generation, and a considerable amount of conservation. For alternatives found to not be reasonable alternatives to replace approximately 2000 MWe of baseload power, the FSEIS provides the requisite explanation of the reasons for their elimination. Thus, the FSEIS assessment of alternatives is consistent with NRC guidance, 10 C.F.R. Part 51 regulations, and NEPA.

IV. BACKGROUND ON NEPA REQUIREMENTS, NRC IMPLEMENTING REGULATIONS, AND THE LICENSE RENEWAL GEIS

Q25. Please describe the general requirements of NEPA that are applicable to the claims in NYS-9/33/37.

A25. (DPC) NEPA requires that federal agencies, such as the NRC, prepare an environmental impact statement ("EIS") in conjunction with major Federal actions significantly affecting the quality of the human environment. 42 U.S.C. § 4332(2)(C). An EIS must discuss the environmental impact of the proposed action. 42 U.S.C. § 4332(2)(C)(i). An EIS also must include a detailed statement on "alternatives to the proposed action." 42 U.S.C. § 4332(2)(C)(iii). The NRC's NEPA regulations are codified in 10 C.F.R. Part 51.

Under NEPA's rule of reason, the NRC need not look at every conceivable impact or alternative, but only reasonably foreseeable impacts and reasonable alternatives. *See* 10 C.F.R. Pt. 51, Subpt. A, App. A § 4; *see also* 40 C.F.R. §§ 1502.14, 1508.7, 1508.8(b). With respect to alternatives that are eliminated from detailed study as not reasonable, NEPA requires only a brief discussion of the reasons for their elimination. *See* 10 C.F.R. Pt. 51, Subpt. A, App. A §5.

An EIS's statement of purpose and need helps define which alternatives are reasonable and should be considered. For purposes of nuclear power plant license renewal, the purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license. *See* Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. 28,467, 28,472 (June 5, 1996) (NYS000127), *amended by* 61 Fed. Reg. 66,537 (Dec. 18, 1996) (NYS000128); GEIS at 1-2 (NYS00131A).

Q26. Does NRC guidance suggest which alternatives should be considered in a license renewal proceeding?

A26. (DPC) Chapter 8 of the GEIS states that "a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are *technically feasible and commercially viable*." GEIS at 8-1 (NYS00131D) (emphasis added). This focus on feasibility and commercial viability means that the NRC need only consider energy alternatives that are reasonably available now or in the immediate future. *See* GEIS at 8-1 (NYS00131D).

The GEIS does not expressly define the term "discrete electric generation source," but it is implicit in the GEIS's discussion of various energy alternatives that the GEIS is referring to baseload generation sources. This is a reasonable approach because the resource at issue is itself providing baseload energy. *See* GEIS at 8-17 (NYS00131D) ("The inability to increase the capacity factors of wind power makes the technology an inappropriate choice for *baseload* power.") (emphasis added); GEIS at 8-19 (NYS00131D) ("Use of PV cells for *baseload* capacity requires very large energy storage devices, such as pumped hydro facilities, batteries, or compressed air chambers. Currently available energy storage devices are too expensive to store

sufficient electricity to meet the *baseload* generating requirements.") (emphasis added); GEIS at 8-22 (NYS00131D) ("Solar thermal systems have constraints similar to those of PV systems in that capital costs are higher than for nonrenewable resources, and solar thermal systems lack *baseload* capability unless combined with natural gas backup.") (emphasis added); GEIS at 8-25 to 8-27 (NYS00131E) ("Although geothermal plants offer alternative *baseload* capacity to conventional fossil fuel and nuclear plants, widespread application of geothermal energy is constrained by the geographic availability of the resource and the maturity of the technology.") (emphasis added); GEIS at 8-33 (NYS00131E) ("Combined-cycle plants . . . are particularly efficient and are used as intermediate and *baseload* facilities . . . .") (emphasis added).

"Baseload" power refers to a power source that is intended to continuously produce electricity at or near full capacity, with high availability. Nonetheless, the NRC included in the GEIS a brief discussion of energy conservation and power import alternatives. GEIS at 8-2, 8-38 to 8-42 (NYS00131D, NYS00131E).

Q27. As a general matter, how does NRC characterize environmental impacts of the proposed action and of alternatives in NEPA reviews for license renewal?

A27. (DPC) Issues that are reviewed in NRC license renewal environmental evaluations are assigned significance levels based on the following definitions:

> SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.
>
> MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

10 C.F.R. Pt. 51, Subpt. A, App. B, Tbl. B-1, at n.3.

Q28. Please identify the NRC regulations implementing NEPA and briefly describe how those regulations apply to license renewal applications.

A28. (DPC) Part 51 contains requirements for an applicant's environmental report and requires that NRC prepare an environmental impact statement for certain Commission actions. In 1996, the Commission amended Part 51 to make these regulations efficient and focused with respect to license renewal proceedings. *See* Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,467 (NYS000123). The NRC also prepared the GEIS to evaluate and document those environmental impacts associated with license renewal that are well understood based on experience gained from the many years of operation of the existing fleet of U.S. nuclear power plants. *See* Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,467 (NYS000127). Based on the GEIS, the NRC divided the environmental requirements for license renewal into generic and plant-specific components, and these requirements are codified in Part 51.

Generic issues are identified in the GEIS as "Category 1" impacts. Category 1 issues are those on which the Commission found that it could draw generic conclusions that would apply to all nuclear power plants, or, alternatively, a specific group of those plants. The Commission concluded that such environmental impacts are similar for all plants, and thus need not be assessed on a site-specific basis. The NRC codified its generic findings in Table B-1, Appendix B to Subpart A of 10 C.F.R. Part 51.

Pursuant to 10 C.F.R. § 51.53(c)(3)(i), a license renewal applicant may, in its ER, refer to and, in the absence of new and significant information, adopt the generic environmental impact findings found in Appendix B, Table B-1, for all Category 1 issues. Conversely, an applicant must address environmental impacts for which the Commission was not able to make generic environmental findings. *See* 10 C.F.R. § 51.53(c)(3)(ii). Specifically, an ER must address those issues listed at 10 C.F.R. § 51.53(c)(3)(ii) and identified as "Category 2," or "plant specific," issues in Table B-1. In its ER, an applicant also must include "any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware." See 10 C.F.R. § 51.53(c)(3)(iv).

Following on the applicant's ER, the NRC Staff must itself then prepare a site-specific supplement to the GEIS for each license renewal application that evaluates the "environmental impacts of alternatives to the proposed action," applicable site-specific Category 2 issues, and any "new significant information." 10 C.F.R. §§ 51.71(d), 51.95(c)(3).

Q29. What is the "no-action" alternative and how does it fit with the assessment of alternatives required by NEPA?

A29. (DPC) NEPA requires discussion of the agency alternative of taking "no action." 10 C.F.R. Pt. 51, App. A § 4. In the present context, the no-action alternative involves an examination of the potential environmental impacts associated with denying the license renewal application instead of renewing the operating licenses for an additional 20-year period. *See* NUREG-1555, Supp. 1,§ 8.1 (ENT00019B).

The no-action alternative is intended to foster a comparison of the expected environmental impacts of renewing the Indian Point licenses with the potential environmental impacts of not taking that action. Because Indian Point is a current base load resource,

substantial amounts of energy must be secured from another source were Indian Point's licenses not renewed. Thus, the failure to renew the IP2 and IP3 licenses would lead to the selection of other electric generating sources to meet energy demands, conservation measures, decisions to import power, or a combination of these different outcomes. *See* GEIS at 8-2 (NYS00131D).

It is important to note that NRC generally considers alternative energy sources as direct alternatives to license renewal, and not simply as resulting from the no-action alternative. Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,472 (NYS000127). Although the alternative energy sources review is potentially broader than the no-action alternatives review, there is overlap between the two reviews and it is appropriate for the no-action review to refer to the alternative energy sources evaluation as applicable.

Q30. Which specific energy sources are required to be considered as part of the no-action alternative under NEPA?

A30. (DPC) The no-action alternative need not exhaustively evaluate issues considered elsewhere in an EIS (such as in the separate section on energy alternatives), but may simply refer to these other discussions. NUREG-1555, Supp. 1, at 8.1-3 n. (a) (ENT00019B). Whether under the no-action alternative or the energy alternatives evaluation, NEPA does not require discussion of every conceivable energy alternative. Rather, NEPA requires only consideration of feasible, non-speculative, reasonable alternatives.

Generally, alternatives that are economically impractical may be excluded from the range of alternatives considered under NEPA. *See* Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,472 (NYS000127) ("This approach does not preclude a consideration of economic costs if these costs are essential to a determination

regarding the inclusion of an alternative in the range of alternatives considered (*i.e.*, an alternative's exorbitant cost could render it nonviable and unworthy of further consideration);" *See also* Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18,026, 18,027 (Mar. 23, 1981) (ENT000147) ("Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense . . . ."). Thus, consistent with general NEPA principles, the focus should be on identifying likely and feasible baseload energy sources, not remote, speculative or grossly uneconomic possibilities.

Q31. Does the no-action alternative review include a review of the need for power?

A31. (DPC) No. In the context of license renewal, an FSEIS is not required to include discussion of need for power. 10 C.F.R. § 51.95(c)(2). Specifically, 10 C.F.R. § 51.95(c)(2) provides:

> The supplemental environmental impact statement for license renewal is *not required to include discussion of need for power* or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation.

As the regulation indicates, need for power is *per se* outside the scope of license renewal NEPA reviews. In promulgating this regulation, the Commission clearly stated that "the NRC will neither perform analyses of the need for power nor draw any conclusions about the need for generating capacity in a license renewal review." Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,472 (NYS000127); *see also* Ruling on Motions in Limine at 19. Thus, under the rubric of the no-action alternative, because there is no "need for power" evaluation permitted under NRC regulations, the evaluation

simply considers what alternatives are available to replace all of IPEC's baseload power if it were lost.

Q32. What is the overall standard applied for evaluating the environmental impacts of the proposed license renewal action and the environmental impacts of the alternatives?

A32. (DPC) The standard is set forth in 10 C.F.R. § 51.95(c)(4) and states that "the NRC staff, adjudicatory officers, and Commission shall determine whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable."

During the 1996 rulemaking for license renewal environmental reviews, the Commission provided further explanation for this standard in the context of alternatives:

> Given the absence of the NRC's authority in the general area of energy planning, the NRC's rejection of a license renewal application based on the existence of a single superior alternative does not guarantee that such an alternative will be used. In fact, it is conceivable that the rejection of a license renewal application by the NRC in favor of an individual alternative may lead to the implementation of another alternative that has even greater environmental impacts than the proposed action, license renewal.
>
> Given the uncertainties involved and the lack of control that the NRC has in the choice of energy alternatives in the future, the Commission believes that it is reasonable to exercise its NEPA authority to reject license renewal applications only when it has determined that the impacts of license renewal sufficiently exceed the impacts of all or almost all of the alternatives that preserving the option of license renewal for future decision makers would be unreasonable.

Final Rule, Environmental Review for Renewal of Nuclear Power Plant Operating Licenses, 61 Fed. Reg. at 28,473 (NYS000127). Thus, even if it were determined that the environmental impacts of license renewal sufficiently exceed the impacts of one or even several alternatives, this still should not alter the NRC's decision on license renewal. *See id*.

V. SUMMARY OF RELEVANT EVALUATIONS IN THE ER

Q33. Please summarize how the ER defines the proposed action, and the purpose and need for the proposed action.

A33. (DPC) Entergy's ER defines the proposed action as follows: "The proposed action is to renew the operating licenses for IP2 and IP3, which would provide the option for Entergy to continue to operate IP2 and IP3 through the 20-year period of extended operation. IP2 and IP3 utilize pressurized water reactors and turbine generators licensed for outputs of 3,216 and 3,216 MWt, and ratings of 1,078 and 1,080 MWe, respectively, for a combined total of 2,158 MWe." ER at 7-1 (ENT00015B).

Entergy's ER defines the purpose and need for the proposed action as providing an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs. ER at 1-1 (ENT00015B).

Q34. Which reasonable alternatives does Entergy consider in the ER?

A34. (DPC) In accordance with 10 C.F.R. § 51.45(b)(3), Entergy's ER considers energy alternatives within the range of alternatives capable of meeting a goal of approximately 2,158 gross MWe as base-load generation. *See* ER at 8.2 (ENT00015B). The ER does not consider in detail "[a]lternatives that do not meet this goal." ER at 8-1 (ENT00015B). Rather, in compliance with the GEIS statement that "a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable," the ER considers conventional coal-fired and natural gas-fired combined cycle plants, as well as advanced light-water reactors. ER at 8-2 (ENT00015B) (*citing* GEIS, Section 8.1 (NYS00131D)).

Q35. Were certain alternatives eliminated from detailed consideration as not reasonable in the ER?

A35. (DPC) Yes. Section 8.3 of the ER discusses alternative generation sources that were eliminated as reasonable alternatives to the proposed action because such sources were not baseload technologies capable or feasible of supplying 2,158 gross MWe of electricity. The following sources were considered, but eliminated as reasonable alternatives:

- Wind (Section 8.3.1);
- Solar (Section 8.3.2);
- Hydropower; (Section 8.3.3);
- Geothermal (Section 8.3.4);
- Wood energy (Section 8.3.5);
- Municipal solid waste (Section 8.3.6);
- Oil (Section 8.3.8);
- Fuel cells (Section 8.3.9);
- Delayed retirement of currently operating generation units (Section 8.3.10);
- Utility-sponsored conservation (Section 8.3.11); and
- Combination of alternatives (Section 8.3.12).

Q36. Why is energy conservation not considered a reasonable alternative in the ER?

A36. (DPC) As the ER explains, the concept of energy conservation as a resource does not meet the primary NRC criterion "that a reasonable set of alternatives should be limited to analysis of a single, discrete electric generation source and only electric generation technologies that are technically feasible and commercially viable." ER at 8-20, 56

(ENT00015B) (*citing* GEIS at § 8.1 (NYS00131D)). The ER further indicates while the environmental impacts of an energy conservation program would be SMALL, "the potential to displace the entire generation at the site solely with conservation is not realistic." ER at 8-56 (ENT00015B).

Q37. Why does the ER not consider combinations of alternatives?

A37. (DPC) The ER does not consider combinations of generating sources to fall within the definition of "discrete electric generation sources" set forth in Section 8.1 of the GEIS and, therefore does not evaluate combinations or mixes of generation sources in the alternatives assessment of the ER. *See* ER at 8-56 (ENT00015B).

Q38. Please summarize the relevant findings and evaluations in the ER concerning the no-action alternative.

A38. (DPC) Section 8.4 of the ER compares the environmental impacts of the proposed license renewal action against the environmental impacts of the no-action alternative. The ER defines the no-action alternative as the decision "not to renew the operating licenses for IP2 and IP3." ER at 7-1 (ENT00015B). As the ER further explains, "IP3 constitute[s] a significant block of long-term base-load capacity," meaning that "it is reasonable to assume that a decision not to renew the [IPEC] licenses would necessitate the replacement of its approximately 2,158 gross MWe capacity with other sources of generation." ER at 7-1 (ENT00015B). Thus, the environmental impacts of the no-action alternative include "the environmental impacts from a replacement power source or sources." ER at 7-1 (ENT00015B).

The ER further states that the "environmental impacts of the no-action alternative would be the impacts associated with the construction and operation of alternative replacement electric power" and concludes that, "[i]n effect, the net environmental impacts would be transferred from

the continued operation of the site to the environmental impacts associated with the construction and operation of a new generating facility. . . . Therefore, the no-action alternative would have no net environmental benefits." ER at 8-57 (ENT00015B). The ER also highlights the complications associated with identifying and siting feasible energy replacement alternatives. *See* ER Sections 8.4.1 and 8.4.2 (ENT00015B).

Q39. What are the conclusions in the ER concerning energy alternatives?

A39. (DPC) Section 8.5 of the ER summarizes the results of aforementioned alternatives evaluations and concluded that "[t]he environmental impacts of the continued operation of IP2 and IP3, providing approximately 2,158 gross MWe of base-load power generation through 2033 - 2035, are superior to impacts associated with the best case among reasonable alternatives" and the "continued operation of IP2 and IP3 would create significantly less environmental impact than the construction and operation of new base-load generation capacity." ER at 8-67 (ENT00015B).

VI. SUMMARY OF RELEVANT ENERGY ALTERNATIVES EVALUATIONS IN THE FSEIS

Q40. Please summarize the relevant determinations in the FSEIS concerning the proposed action and the purpose and need for the proposed action.

A40. (DPC) The FSEIS defines the proposed action as follows: "The proposed Federal action is renewal of the operating licenses for IP2 and IP3 (IP1 was shut down in 1974). . . . The facility has two Westinghouse pressurized-water reactors. IP2 is currently licensed to generate 3216 megawatts thermal (MW(t)) (core power) with a design net electrical capacity of 1078 megawatts electric (MW(e)). IP3 is currently licensed to generate 3216 MW(t) (core power) with a design net electrical capacity of about 1080 MW(e)." FSEIS at 1-6 to -7 (NYS00133A).

The FSEIS also adopts the GEIS definition of the purpose and need for the proposed action, namely to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs. FSEIS at 1-7 (NYS00133A).

Q41. Is the fact that IP2 and IP3 provide baseload power factored into the FSEIS evaluation of energy alternatives?

A41. (DPC) Yes. Section 8.3 of the FSEIS contains the NRC Staff's evaluation of energy alternatives with "comparable capabilities" to produce 2,158 MWe as base-load generation. FSEIS at 8-27 (NYS00133C).

Q42. Does the FSEIS consider natural gas-fired generation as an alternative?

A42. (DPC) Yes. Section 8.3.1 of the FSEIS evaluates the environmental impacts of natural gas-fired generation. Table 8-3 of the FSEIS summarizes the environmental impacts from natural gas-fired generation.

Q43. Does the FSEIS consider purchased power as an alternative?

A43. (DPC) Yes. Section 8.3.2 of the FSEIS evaluates whether purchased power could serve as a reasonable "nongeneration" alternative to license renewal. *See* FSEIS at 8-26 (NYS00133C). Unlike the DSEIS, which indicated that purchased power was not a viable stand-alone option for replacing IP2 and IP3, the FSEIS recognized that "purchased power could be an alternative to IP2 and IP3," but is limited by current and pending transmission projects. *Compare* DSEIS at 8-57 (NYS00132C), *with* FSEIS at 8-41 (NYS00133C). While the FSEIS does not discuss specific environmental impacts of purchased power, it nonetheless states, "it is highly likely that any generating source of purchased power will have environmental impacts, the type and magnitude of which cannot be assessed for comparative purposes as an alternative

to license renewal of IP2 and IP3." FSEIS at 8-41 (NYS00133C). This is primarily because "[e]ach type of power generation alternative has its own set of potential environmental costs and benefits, and each must be evaluated with respect to the specific location and features of the generator." FSEIS at 8-41 (NYS00133C).

Q44. Does the FSEIS consider energy conservation as an alternative?

A44. (DPC) Yes. Unlike the DSEIS, Section 8.3.3 of the FSEIS considers energy conservation as a potential standalone alternative "because of efforts made by the State of New York and comments received during preparation of [the FSEIS]." FSEIS at 8-42 (NYS00133C). Section 8.3.3 does not identify specific conservation measures that could replace IP2 and IP3 generation under the no-action alternative, but refers to several reports describing energy conservation success within New York State, such as a 2005 report from the New York State Energy Research and Development Authority which "estimated that its energy efficiency programs had reduced peak energy demands in New York by 860 MW(e)," and a 2006 Report for the National Research Council forecasting that the "technical potential of its efficiency programs in New York would result in a cumulative 3800 MW(e)-reduction of peak load by 2012 and 7400 MW(e) by 2022." FSEIS at 8-42 (NYS00133C). The FSEIS also includes discussion of the New York State "15 by 15" plan. *See* FSEIS at 8-42 (NYS00133C). The FSEIS concludes that the adverse environmental impacts of conservation would be SMALL, except that adverse socioeconomic impacts resulting from the loss of tax and PILOT revenue associated with the closure of IP2 and IP3 may be SMALL to MODERATE. *See* FSEIS at 8-43 (NYS00133C). Table 9-1 of the FSEIS summarizes the environmental impacts from energy conservation.

Q45. Does the FSEIS eliminate as not reasonable any alternatives from detailed, standalone consideration?

A45. (DPC) Yes. Section 8.3.4 of the FSEIS discusses alternative generation sources that were eliminated as reasonable alternatives to the proposed action as stand-alone alternatives. The FSEIS considers, but eliminates the following sources:

- Wind power;
- Wood and wood waste;
- Hydropower;
- Oil-fired generation;
- Solar power;
- New nuclear generation;
- Geothermal energy;
- Municipal solid waste;
- Other biomass derived fuels;
- Fuel cells;
- Delayed retirements;
- Combined heat and power (addition from DSEIS); and
- Supercritical coal-fired generation (removed from the reasonable alternatives section "based on public draft SEIS comments" indicating that new coal-fired generation is unlikely due to policies like the Regional Greenhouse Gas Initiative's ("RGGI"). FSEIS at 8-49 (NYS00133C)).

Q46. Does the FSEIS consider combinations of alternatives?

A46. (DPC) Yes. Section 8.3.5 of the FSEIS considers two combinations of alternatives that included new or existing generation along with conservation or purchased power and which differed significantly from the combinations contemplated by the DSEIS.

Section 8.3.5.1 of the FSEIS evaluates the environmental impacts of Combination Alternative 1, which consisted of continued operation of either IP2 or IP3; renewable generation (600 MWe, higher than the DSEIS combination of 200 to 400 MWe); and conservation programs (600 MWe, compared to the DSEIS's 300 to 500 MWe).

Section 8.3.5.2 of the FSEIS evaluates the environmental impacts of Combination Alternative 2, which consisted of repowering an existing fossil-powered plant in downstate New York with a new 400 to 600 MWe combined-cycle power plant (or constructing a new one at the IPEC site); renewable generation (primarily wood and wind, 600 MWe, compared to the DSEIS's 200 to 400 MWe); conservation (1000 to 1200 MWe, up significantly from the DSEIS's 500 to 800 MWe).

Table 8-4 of the FSEIS summarizes the environmental impacts from these two combinations.

Q47. Please summarize the relevant findings in the FSEIS concerning the no-action alternative.

A47. (DPC) Section 8.2 of the FSEIS addresses the no-action alternative. FSEIS at 8-20 (NYS00133C). The FSEIS further explains: "Plant shutdown will result in a net loss of power generating capacity. The power not generated by IP2 and IP3 during the license renewal term would likely be replaced by (1) power supplied by other producers (either existing or new units) using generating technologies that may differ from that employed at IP2 and IP3, (2)

demand-side management and energy conservation, or (3) some combination of these options. The environmental impacts of these options are discussed in Section 8.3 of this SEIS. While these options can be alternatives to license renewal (given sufficient resource availability), they also constitute potential consequences of the no-action alternative. Impacts from these options will [be] addressed in their respective portions of this Section." FSEIS at 8-22 (NYS00133C).

Q48. What were the conclusions in the FSEIS concerning energy alternatives?

A48. (DPC) Section 8.4 of the FSEIS summarizes the results of aforementioned alternatives evaluations. The FSEIS states:

- "Impacts from the [natural gas combined-cycle ("NGCC")] alternative at a repowered site or the IP site has the potential for larger air quality impacts, but smaller aquatic ecology impacts." FSEIS at 8-73 (NYS00133C).
- "A NGCC alternative at a new site is likely to have a variety of more-significant impacts than continued operations of IP2 and IP3. For most impact areas—land use, air quality, waste, transportation, aesthetics, historic and archaeological resources, for example—the closed-cycle cooling alternative has larger impacts than continued operation of IP2 and IP3 with its current cooling system. Its impact to aquatic ecology, however, is smaller than continued operation with the existing once-through cooling system." FSEIS at 8-73 (NYS00133C).
- "Impacts from the conservation alternative are generally lower than those from other alternatives, including the proposed action." FSEIS at 8-73 (NYS00133C).
- "Impacts from combination alternatives (with or without continued operation of one IP unit) that do not rely on conventional hydropower are likely to have smaller aquatic impacts than continued operation of IP2 and IP3, while they have potentially

larger impacts in other areas, including air quality, aesthetics, and land use." FSEIS at 8-73 (NYS00133C).

Based on the above, the FSEIS arrives at the same conclusion as the DSEIS: "Based on (1) the analysis and findings in the GEIS, (2) the ER and other information submitted by Entergy, (3) consultation with Federal, State, Tribal, and local agencies, (4) the NRC staff's consideration of public scoping comments received, and comments on the draft SEIS, and (5) the NRC staff's independent review, the recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewal for IP2 and IP3 are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable." FSEIS at 9-8 (NYS00133C).

VII. OVERVIEW OF METHODOLOGY AND RESULTS OF EVALUATING THE ENERGY AND ENVIRONMENTAL IMPACTS OF THE NO-ACTION ALTERNATIVE

Q49. Could you summarize the methodology underlying your analyses?

A49. (DH, ETM) We developed two related empirical evaluations to identify the environmental impacts of the generation that would likely replace IPEC baseload power under the no-action alternative. First, we considered the wholesale electric market structure in New York State—which emphasizes minimizing the costs of meeting electricity demand both in the short-term and the longer-term while satisfying all reliability and operating requirements—and the implications of the relative cost of replacement alternatives. Second, we developed empirical estimates of likely replacement generation based upon modeling results from a state-of-the-art energy model—the National Energy Modeling System ("NEMS")—developed and operated by the Energy Information Administration ("EIA") within the U.S. Department of Energy. NEMS allows us to develop estimates of the changes in generation by type as well as the associated

changes in various emissions from these facilities that would occur if IPEC generation were not available.

Q50. Could you provide more detail on your conclusions regarding the changes in generation under the no-action alternative?

A50. (DH, ETM) The following are our conclusions regarding the generation that would be dispatched to replace the IPEC baseload generation lost under the no-action alternative.

- Replacement energy would come primarily from natural gas and coal power plants, with a much smaller amount from renewables and energy conservation, because:
    - The costs of increasing the utilization of existing natural gas and coal power plants, or building new natural gas plants, to replace IPEC generation are lower than replacing IPEC generation with renewables or conservation; and
    - Hundreds of millions of dollars of additional State subsidies (ultimately paid by New York State's electricity consumers through their monthly utility bills) would be required to force additional renewables and energy efficiency into the electricity system as replacements for IPEC generation to overcome the higher costs of these resources.
- The developments cited in NYS-37, including New York State's "30 x 15" renewable energy goal and "15 x 15" energy efficiency goal, would render renewables and conservation even less economic relative to other alternatives, and thus even less viable than under the conditions noted in the FSEIS.

Q51. Could you provide more detail on your conclusions regarding environmental impacts under the no-action alternative?

A51. (DH, ETM) Our examinations of environmental impacts lead to the following conclusions:

- The most likely mix of replacement power—primarily fossil-fired units—would lead to significant increases in air emissions, including an increase in annual carbon dioxide emissions of about 13.5 million metric tons per year (which is nearly as large as the RGGI 15 million metric tons of planned CO_2 emission reductions between 2012 and 2018); and
- Replacement alternatives that involve renewables would also have adverse environmental impacts including incremental impacts resulting from the new transmission infrastructure that would be required to deliver energy produced by renewables to southeastern New York where it is needed.

Q52. How do your conclusions on likely environmental impacts of the no-action alternative compare to those in the FSEIS?

A52. (DPC, DH, ETM) As noted above, our analyses lead us to conclude that, contrary to the claims in NYS-37 and its accompanying documents, additional conservation and renewables would be unlikely to play significant roles in replacing output lost from IPEC under the no-action alternative. In contrast, our analyses and empirical modeling indicate that the replacement mix would be dominated by fossil-fuel generation, including natural gas and coal generation, with modest contributions from energy conservation and additional renewables. Thus, our analyses demonstrate that the range of scenarios considered in the FSEIS was reasonable and sufficient. Our analyses further demonstrate that the conclusion reached in the

FSEIS—that the impacts of license renewal did not exceed the impacts of all or almost all of the alternatives—was reasonable. If anything, the FSEIS understates the likely adverse environmental impacts of the no-action alternative for two primary reasons:

1. Our assessments show that the combination scenarios that the FSEIS evaluates overstate the roles that renewables and conservation would be likely to play and understate the likely role of fossil sources; and
2. The FSEIS assumes that increased fossil generation would be provided primarily by new, highly efficient and tightly controlled natural gas combined cycle units. However, the lower gas prices will likely render new facility development less economic. As a result, a significant amount of the replacement fossil power would, in fact, be likely to come from unused capacity on older natural gas-fired units or coal-fired units, both of which tend to have higher emission rates than new natural gas units, and thus, more adverse environmental impacts.

Q53. Could you summarize your understanding of the critique of the FSEIS in NYS-37?

A53. (DPC, DH, ETM) NYS, in its Statement of Position and testimony, argues that the FSEIS is deficient because it ignores NYS's comments that the environmental impacts of the no-action alternative would be much less than assumed in the FSEIS and less than the environmental impacts of license renewal. The core of the NYS-37 argument is that the FSEIS should have evaluated environmental impacts on the presumption that baseload IPEC generation, which operates effectively on a 24x7 basis, would be largely replaced by additional renewable generation and energy conservation, rather than substantial fossil-fuel generation as assumed in several of the FSEIS alternatives. NYS-37 points to various recent energy and related

developments allegedly ignored by the FSEIS, including New York State programs to encourage renewables and energy conservation as well as recent reductions in projected electricity demand and natural gas prices. *See* State of New York Initial Statement of Position, Contention NYS-9/33/37 ("NYS-37") at 1-5 (Dec. 14, 2011) ("Statement of Position") (NYS000045).

Q54. Do NYS-37 or its experts provide any empirical modeling of the New York State electricity market to support its assertions?

A54. (DH, ETM) No. NYS-37 and the various expert reports do not provide any empirical modeling of New York State electricity markets or any other empirical assessments or supporting data of the relative costs or environmental impacts of different types of generation (or conservation) that might replace IPEC generation. They also do not provide any analyses of how the energy policy and other developments they cite would influence the types of generation that would replace IPEC generation in the no-action alternative.

Q55. Could you summarize your conclusions regarding NYS-37?

A55. (DH, ETM) NYS's claims regarding the implications of the allegedly unexamined factors in the FSEIS lack merit when subjected to analysis. NYS and its experts make very general claims regarding the possible sources of replacement energy for baseload IPEC generation. However, as noted, no analyses were provided to support their assertions. We evaluated the limited information they provided. Our review leads us to conclude that the materials in NYS-37 and the related expert reports have four fundamental flaws.

1. *Failure to recognize market forces and cost-minimization*. NYS-37 and the expert reports fail to account for the key role that market forces would play (and hence the importance of relative costs and cost-minimization) in determining the resources that would be dispatched to replace the lost baseload IPEC generation under the no-action

alternative. It is critical to recognize that New York State has a competitive electricity market. As a result, decisions regarding new investments are largely made by merchant entities that, all else equal, would build the lowest-cost facilities, and facilities are dispatched to provide energy at minimum cost while meeting reliability and operating requirements. This combination of market forces based on cost-minimization principles means that lower-cost fossil generation rather than higher-cost renewable generation or energy efficiency would constitute the bulk of generation to replace IPEC's baseload generation.

2. *Conflation of developments that affect the baseline, not the no-action alternatives*. NYS-37 and its supporting witnesses mention a host of developments that they claim were not considered by the NRC Staff in developing the FSEIS and that they claim would lead to different conclusions regarding the energy mix and environmental impacts of the no-action alternative. These developments include New York State's renewable and energy efficiency goals, lower electricity demand due to the recession, recent increases in electricity generation capacity and transmission system expansions, and lower natural gas prices. The flaw pervasive in the NYS-37 reasoning is that NYS-37 fails to recognize that these developments represent part of the baseline conditions. Put another way, the various factors identified by NYS-37 and its experts—such as the additional renewable generation or energy efficiency resulting from New York State goals—would not be "available" to replace lost baseload IPEC generation because they all would exist regardless of the status of IPEC .

3. *Failure to evaluate the impacts of baseline changes*. To the extent that the developments they cite affect the baseline, those developments generally would, if anything, reduce the roles of conservation and renewables as IPEC replacements under the no-action alternative. The developments emphasized by NYS-37, such as lower electricity demand and lower natural gas prices, would tend to increase the subsidies per megawatt-hour ("MWh") that would be necessary to fund the higher marginal costs of the conservation and renewables alternatives—while at the same time decreasing the marginal costs of fossil resources. As a result, renewables and energy efficiency will actually be less economic relative to fossil-fueled power options due to these market developments.
4. *Failure to provide empirical modeling*. NYS and their experts fail to provide any studies or other analyses quantifying how the electric system would respond to the loss of IPEC baseload generation. In contrast, our analysis using NEMS shows that conservation (in the form of response to higher prices) and renewables would play modest roles, and that the primary impact would be increased generation from fossil-fired sources. This failure on the part of NYS-37 and its experts is important because, without some empirical modeling, they cannot provide a reasonable basis for evaluating which alternatives actually would be dispatched if IPEC generation were not available, and thus, cannot evaluate the environment consequences of the no-action alternative.

VIII. NEW YORK STATE'S ELECTRICITY SYSTEM AND IMPLICATIONS FOR LOST BASELOAD GENERATION IN THE NO-ACTION ALTERNATIVE

A. Background on New York State Electricity Markets and the Role of Indian Point

Q56. Could you summarize the relevant characteristics of electricity markets in New York?

A56. (DH, ETM) Starting in the 1990s, New York and most other states in the Northeast moved to a vertically-disintegrated system in which regulated investor-owned utilities ("IOUs"), such as Con Edison and National Grid, buy most of the power they need to serve their customers from wholesale generating companies (such as Entergy) that are not subject to traditional rate-of-return price regulation. These purchases can occur through the spot markets administered by "Independent System Operators," such as the NYISO, that manage markets in which generators bid to provide power to the system. Generators submit bids that indicate how much power they would be willing to supply at various prices. NYISO finds the price at which sufficient power will be supplied to meet demand at each time of day while meeting all applicable reliability and operating rules, and all bidders with bids at or below this market-clearing price receive this price. NYISO accounts for constraints in the electricity system to ensure the system's reliability, but in essence the market determines which units generate electricity to meet demand based on the objective of minimizing costs. In addition to the market for electricity generation, NYISO also administers a market for firm capacity (to ensure adequate supply at times of peak demand) and markets for several ancillary services, including voltage support. New York Independent System Operator ("NYISO") Market Participants User's Guide, Ch. 2 (May 23, 2011) ("NYISO User's Guide") (ENT000483).

Q57. What is the significance of Indian Point in New York's electricity markets?

A57. (DH, ETM) IPEC is a large facility that provides baseload power, which means that it generally operates at 100 percent power, 24-hours per day, 365 days per year, except for periodic outages. Its generation in 2010 was approximately 10 percent of New York State's total electricity consumption and approximately 17 percent of total consumption in southeastern New York State (assumed to comprise NYISO Zones G-K). NYISO, 2011 Load & Capacity Data "Gold Book" at 21, 34 ("2011 Gold Book") (ENT000483). Figure 1 provides a map of NYISO zones.

Figure 1. NYISO Zones

Source: Federal Energy Regulatory Commission, Electric Power Markets: National Overview (Mar. 2012) (ENT000497).

B. <u>Importance of Competition and Cost Minimization in New York State Electricity Markets</u>

Q58. Could you explain the importance of competition and cost minimization in New York's electricity system?

A58. (DH, ETM) In New York State's competitive wholesale electricity market, cost minimization is central to two different decisions by power companies: (1) the type of generation

capacity that will be built based on levelized costs; and (2) for the capacity that has been built, the bid that will be submitted into NYISO's wholesale energy, capacity, and ancillary services markets based on marginal costs. Companies generally will build new generation capacity only if their expected prices for energy, capacity, and ancillary services are sufficiently above short-run marginal costs to cover capital and other fixed costs (including a "normal" return to investors). Companies generally will bid to operate their facilities in a given time period (subject to production constraints) if the price will at least cover short-run marginal costs, which are primarily fuel costs in the case of fossil generating units.

For nuclear and some types of renewables (such as wind or run-of-river hydro), short-run marginal costs are small relative to potential market-clearing prices, so they operate virtually whenever they are available (*i.e.*, whenever they are not shut down because of scheduled or unscheduled maintenance or because of insufficient wind or water in the case of renewable resources). As a result, generation generally cannot be expanded at existing nuclear and renewable units to provide replacement power if baseload IPEC generation were not available. In contrast, generation can be expanded at existing fossil-fuel units in order to provide replacement power under the no-action alternative.

C. <u>Government Support for Renewables and Energy Efficiency</u>

Q59. How does Federal and New York State government support for renewables and energy efficiency affect these costs?

A59. (DH, ETM) State and Federal policies affect the relative costs of different generation sources in various ways. Federal tax policies and various states' policies subsidize certain types of generation, particularly renewables, thus making companies more able to undertake renewable projects that otherwise would not be cost-effective and profitable. For example, a wind project that otherwise would not be economic under NYISO's market-clearing

prices may become economic by virtue of the Federal tax benefits and New York State Renewable Portfolio Standard ("RPS") subsidies in addition to the market-clearing price that its owners will receive.

New York State Energy Research and Development Authority ("NYSERDA") provides RPS subsidies to renewable generation in New York State. As with Federal subsidies, NYSERDA's subsidies augment the supplier's revenues beyond the market-clearing electricity price that the renewable producers receive from purchasers of their electricity. This may enable them to recover their costs. Thus, the subsidies are intended to elicit additional supply of renewable energy. The total amount of subsidy offered in any year is limited by a budget set by the NYPSC. The budgets are covered by surcharges levied by IOUs on New York State's electricity consumers monthly utility bills. As a result of such policies, consumers already pay a premium for renewable energy. Incremental renewable generation above and beyond the RPS program under the no-action alternative would require increased budgets and fees.

State and Federal policies also can influence the amount of electricity demanded by requiring or encouraging energy efficiency and other conservation measures. Mandatory mechanisms include appliance efficiency standards and building codes. Voluntary mechanisms include education and various subsidies. These efforts may involve distribution utilities that offer conservation programs of various types, generally in response to incentives or requirements created by their regulators. In New York, IOUs and NYSERDA collectively recover the costs of such programs through surcharges to New York consumers on their monthly utility bills.

1. New York State's "30 x 15" Renewable Electricity Goal

Q60. Can you provide an overview of New York State's "30 x 15" renewable electricity goal?

A60. (DH, ETM) New York has adopted a goal of meeting 30 percent of electricity demand in 2015 ("30 x 15") with renewable sources, such as wind, biomass, and hydro. Roughly two-thirds of that goal was met when it was set, because New York historically has generated substantial amounts of power from hydroelectric plants at Niagara Falls, St. Lawrence, and other locations. Those preexisting plants have provided low-cost power for many decades, and are not eligible for the subsidies discussed below. The State expects to obtain most of the necessary incremental resources primarily through the RPS program administered by NYSERDA and funded by New York's consumers through volumetric surcharges on their monthly utility bills. Biogas, biomass, liquid biofuel, fuel cells, hydroelectric (limited to upgrades and "new low-impact run-of-river" plants less than 30 MW), solar photovoltaics, tidal ocean power, and wind turbines are eligible for subsidies. New large-scale hydro development is excluded as an eligible resource under the RPS program due to its significant adverse environmental impacts.

Q61. Could you provide information on the budgets that New York State has set for the RPS program to achieve the renewable energy goal and what these budgets mean for the average production subsidy for qualifying renewable electricity generation under baseline conditions?

A61. (DH, ETM) The NYPSC has set substantial budgets for NYSERDA to subsidize renewables through 2024 under the RPS program. New York State Public Service Commission ("NYPSC"), Order Authorizing Customer-Sited Tier Program through 2015 and Resolving Geographic Balance and Other Issues Pertaining to the RPS Program, Case 03-E-0188, App. Tbl. 13 (Apr. 2, 2010) ("April 2, 2010 Order") (ENT000485). For example, the RPS budget for

2011 was $170 million and the budget for 2015 is $321 million in nominal dollars. The cumulative budget from 2006 to 2024 is $3.0 billion. The budgets represent the payments that NYSERDA is authorized to make to renewable generators—amounts that must ultimately be recovered from New York's consumers. NYSERDA estimates that the average production subsidy resulting from the June 2011 offering was over $20 per MWh, or more than one-third the then applicable wholesale cost of generation. New York State Energy Research and Development Authority, Main Tier Solicitations, Governor Cuomo Announces $191 Million in Project Awards to Increase Renewable Energy in New York State (June 2, 2011) (ENT000486). The subsidies required to elicit renewable supplies, however, have proved higher than expected when budgets were set as reflected by the progress in achieving the goal. By the end of 2010, NYSERDA had spent 57 percent of its budget for the period through 2015 but had secured only 39 percent of the renewable energy goal NYSERDA, New York State Renewable Portfolio Standard Performance Report: Program Period December 31, 2010 at 9, App. C (May 24, 2011) (ENT000487).

2. New York State's "15 x 15" Energy Efficiency Goal

Q62. Could you provide an overview of New York State's "15 x 15" energy efficiency goal?

A62. (DH, ETM) In 2007, New York's then-Governor Eliot Spitzer set a "15 x 15" goal, which called for the State to reduce its energy consumption by 15 percent by 2015 compared to forecast "business as usual" electricity consumption in 2015. From the outset, there has been broad agreement that the goals of the 15 x 15 goal are substantially more ambitious than prior programs and that meeting them would require additional efforts. In announcing the plan, Governor Spitzer characterized it as the "the most aggressive target in the nation." Remarks by Governor Eliot Spitzer, "15 by 15:" A Clean Energy Strategy for New York, 3 (Apr.

19, 2007) (NYS000079). NYPSC announced the Energy Efficiency Portfolio Standard ("EEPS") program in 2008 to fill the gap between the then-existing programs and the efforts that would be required to meet the 15 x 15 goal. Under that program, the investor-owned distribution utilities would add programs to reduce consumption by their customers and would also fund new programs at NYSERDA. The EEPS program is funded by volumetric surcharges that utilities assess to New York's consumers on their monthly utility bills. The NYPSC estimated how much it would cost to implement programs necessary to fill the gap and set surcharge levels to fund such programs through 2011. NYPSC, Order Establishing Energy Efficiency Portfolio Standard and Approving Programs, Case 07-M-0548 Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard, App. 1 (June 23, 2008) ("June 23, 2008 NYPSC Order") (ENT000488). In a subsequent order issued in October 2011, NYPSC announced goals for the investor-owned distribution utilities through December 31, 2015 and set new surcharge levels that it estimated would provide sufficient funding for the IOUs and NYSERDA to achieve those goals. NYPSC Order Authorizing Efficiency Programs, Revising Incentive Mechanism, and Establishing a Surcharge Schedule. Case 07-M-0548 – Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard; Case 07-G-0141 – Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of National Fuel Gas Distribution Corporation for Gas Service, App. 1 (Oct. 25, 2011) (ENT000489).

Q63. Could you provide information on the level of the budgets that New York State has set for the EEPS program?

A63. (DH, ETM) The NYPSC has set substantial budgets to support conservation programs for electricity consumption through 2015 under the EEPS program. June 23, 2008 NYPSC Order, App. 1 (ENT000488). For example, the EEPS budget for 2011 was $159 million

and the budget for 2015 is $183 million in nominal dollars. The budgets represent the payments that NYSERDA and the IOUs are authorized to make to encourage electricity conservation and the amounts that ultimately must be recovered from electricity ratepayers in New York.

D. Costs of Additional Generation in the No-Action Alternative

1. Baseline Conditions vs. No-Action Alternative

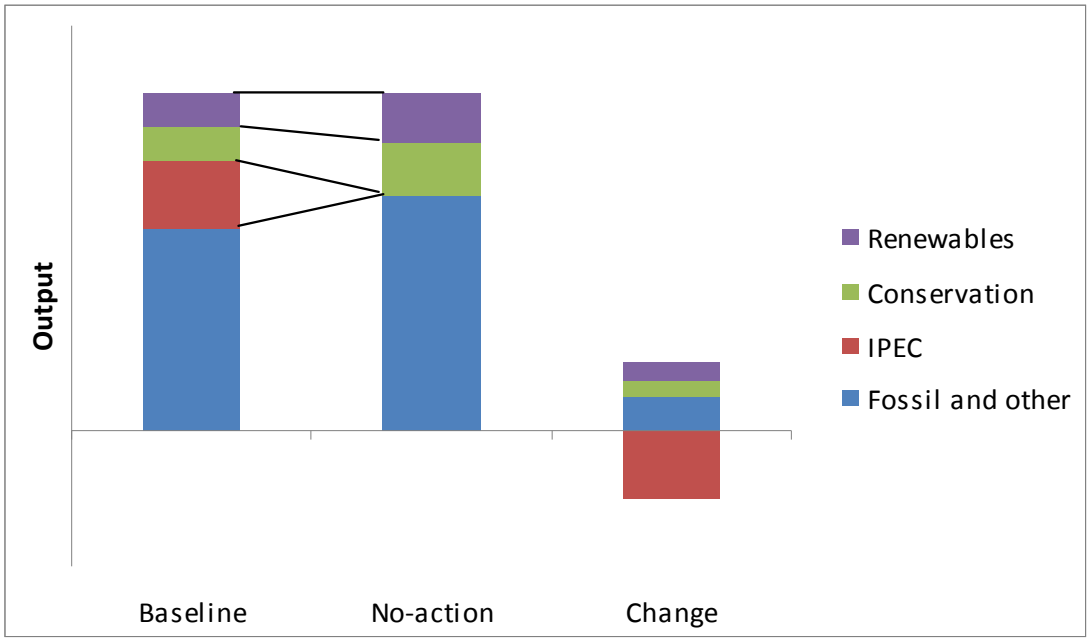
Q64. Could you clarify the distinction between baseline conditions and the no-action alternative?

A64. (DH, ETM) As noted above, the central issue addressed by the FSEIS is the difference in environmental impacts of the no-action alternative relative to ongoing IPEC operation. For clarity, we define the scenario with IPEC generation as the "baseline" and then measure the impacts of the no-action alternative relative to that baseline. The impacts of the no-action alternative are thus the "changes" in environmental conditions relative to the baseline (with continued operation of IPEC). We focus on electricity technologies because before environmental impacts can be evaluated, it is necessary to estimate how the no-action alternative would change the mix of electricity resources (including conservation) used to meet existing demand for electricity services in New York. Any energy developments that occur to an equal degree in both the baseline and the no-action alternative are not directly relevant to an evaluation of the environmental impacts of the no-action alternative. Whatever the baseline is, the relevant question is what incremental resources (including conservation) would replace lost output from IPEC; *i.e.*, what would be the difference in resources between the baseline and the no-action alternative.

Q65. Can you provide an illustration of changes under the no-action alternative?

A65. (DH, ETM) Yes. Figure 2 illustrates how the incremental changes in generation of various types would be calculated using a hypothetical baseline. Note that the components of the stacked bars are not drawn to scale, but are purely hypothetical. The figure does not relate to any particular geographic area. On the left-hand side is a stacked bar showing a hypothetical "original" forecast of the baseline sources of supply—including conservation—that would be used to meet demand. Renewables and conservation play modest roles in this baseline, with the bulk of output coming from IPEC and from "fossil and other," where the latter includes power provided by other nuclear plants as well as fossil units.

Figure 2. Hypothetical Analysis of Change in Generation from Baseline to No-Action Alternative



Note: Mixes of resources (and resulting changes) are not drawn to scale and should be interpreted only in qualitative terms.
Source: NERA Report at 16 (ENT000481).

The middle stacked bar then shows a hypothetical no-action alternative in which baseload IPEC generation would be lost. The final stacked bar shows the changes between the two previous stacked bars. By assumption, all of the output from IPEC would be lost, and it

would be made up by some increases in the other three sources (renewables, conservation, and fossil/other sources). These changes in generation and conservation would provide the basis for analyzing the environmental impacts of the no-action alternative relative to the baseline.

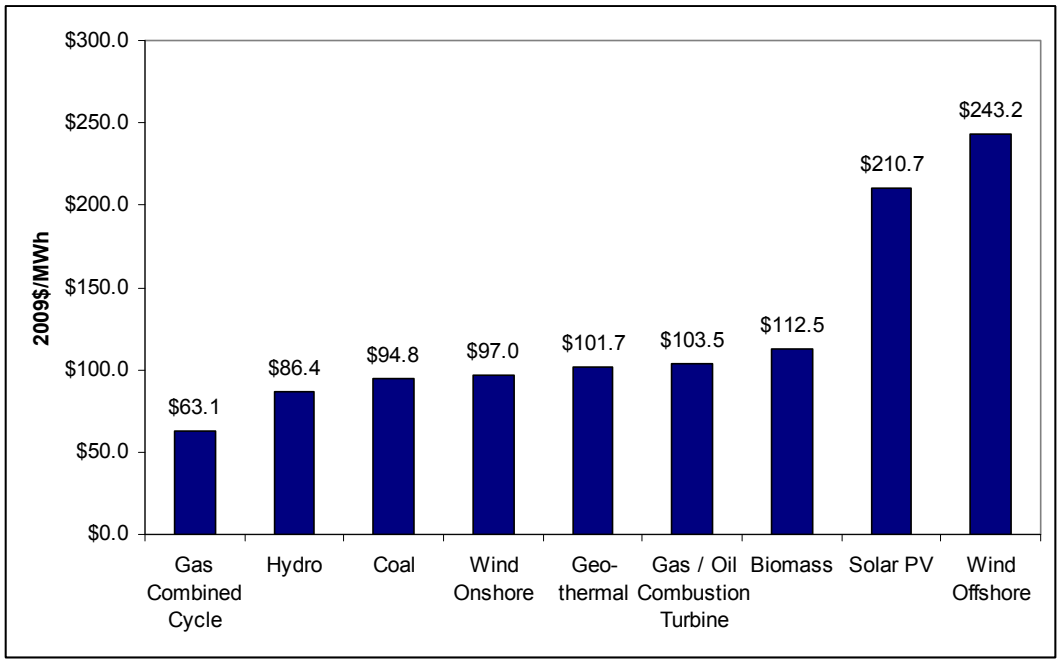
Although the mix of replacement sources is hypothetical, the key point of this illustration is that replacement generation represents *additional* generation that would be forthcoming under the no-action alternative. The market would determine the actual mix based largely on costs, including the expected future "levelized" costs for different types of new units and the marginal costs for existing units.

2. Levelized Costs of New Capacity Excluding Government Support

Q66. Can you provide information on the levelized costs of new capacity without the effects of government support?

A66. (DH, ETM) Yes. Figure 3 displays EIA's estimates of levelized costs—expressed as dollars per MWh—for new electricity generating capacity, exclusive of government support (for example, exclusive of Federal tax credits or New York State RPS incentive payments). Levelized costs incorporate capital costs, other fixed costs, and marginal costs over the entire lifetime of the power plant. EIA's estimates in Figure 3 suggest that, exclusive of government support, natural gas combined cycle units are the least expensive generation alternative and thus would be the most likely to be added in a market setting.

Figure 3. EIA's Estimates of Levelized Costs for New Capacity, Exclusive of Government Support



Note: Figure shows EIA estimates based on AEO 2011 because EIA estimates based on AEO 2012 are not currently available; natural gas price forecasts in AEO 2012 are lower than in AEO 2011 and thus gas-fired power plants have a larger economic advantage based on AEO 2012 than shown here.

Source: U.S. Energy Information Administration ("EIA"), Levelized Cost of New Generation Resources in the Annual Energy Outlook 2011 (Apr. 26, 2011) (ENT000490).

3. Potential Costs of Replacing IPEC's Baseload Generation with Additional Renewables or Additional Conservation

Q67. Could you provide estimates of the costs of replacing IPEC's baseload generation with additional renewables, assuming that the current subsidies per MWh would apply to additional renewables beyond the baseline goals?

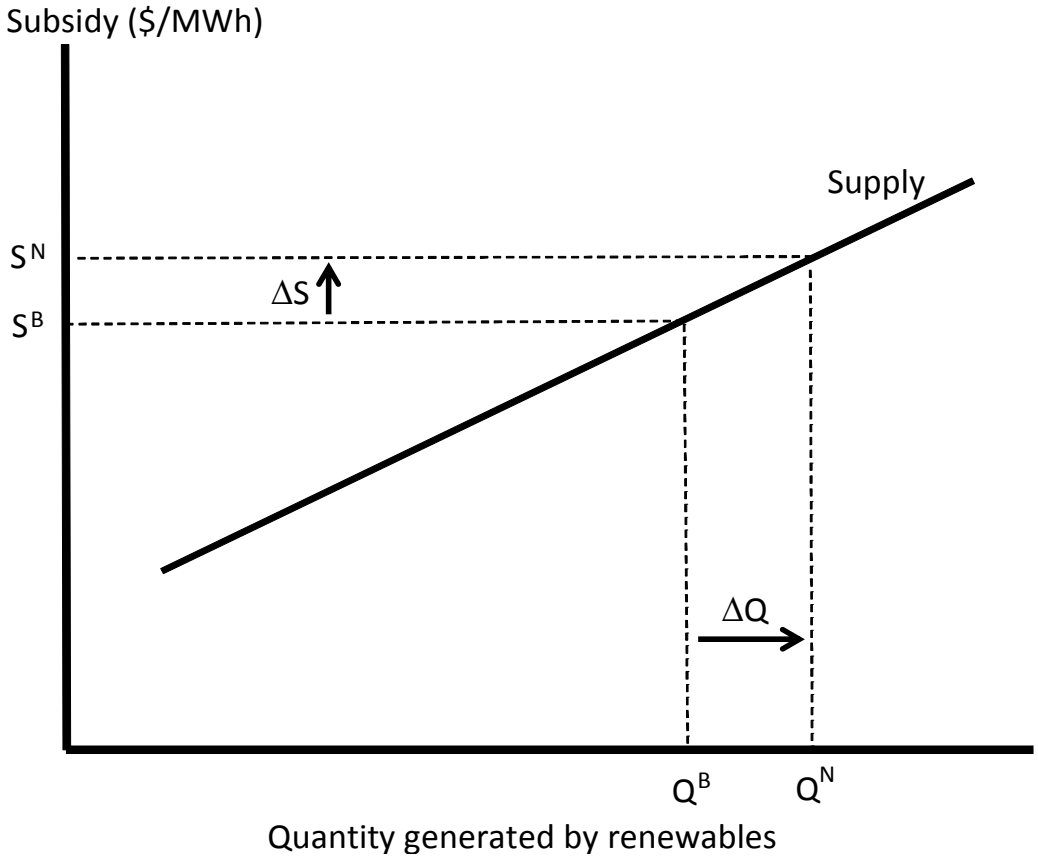
A67. (DH, ETM) As we discuss below, any expansion of the renewables program would tend to require an increase in the subsidy per MWh from current levels in order to elicit greater supply. But even if the subsidy per MWh did not increase, replacing all of IPEC's energy with renewables would cost New York's electricity consumers more than $500 million per year, based on the implied costs per MWh for the NYPSC's current RPS programs. The calculations underlying this estimate are shown in our report (NERA report section II.C.3.b). This estimate

for additional annual costs to replace IPEC generation with renewables is substantially more than the existing budget even in the peak year, which is $321 million. To meet even this conservative cost estimate, the NYPSC would have to substantially increase its budgets and raise the monthly surcharges assessed to New York consumers and/or extend the time period over which such surcharges are collected.

Q68. Can you explain why the cost per MWh of replacing IPEC's baseload generation with renewables would likely be even higher than in these baseline conditions?

A68. (DH, ETM) The reason is based upon supply conditions for renewable resources. There is a supply curve for renewables—the amount of renewable generation that is added will increase as a function of the total price received per unit generated. Holding constant the market price for electricity (which is determined by gas-fired units most of the time) and federal subsidies, we can plot the supply curve as a function of the subsidy paid by NYSERDA. Figure 4 plots a hypothetical supply function. The larger the subsidy, the more renewables would participate in the market. Conversely, the larger the quantity of renewables desired, the larger the subsidy must be. Thus, as noted in Figure 4, if the quantity of renewables in the baseline (with the "30 by 15" policy in place) were Q^B, obtaining additional renewables to a level of Q^N would require an increase in the subsidy from S^B to S^N to secure the last MW needed

Figure 4. Impact of Additional Renewables on Subsidy Rates per MWh



Notes: Q^B: Quantity of renewables in baseline with 30 x 15 policy
ΔQ: Additional renewables desired under the no-action alternative
Q^N: Quantity of renewables with 30 x 15 policy under the no-action alternative
S^B: Subsidy rate for baseline with 30 x 15 policy
ΔS: Additional subsidy required under the no-action alternative
S^N: Subsidy rate required with 30 x 15 policy under the no-action alternative

Source: NERA Report at 19 (ENT000481).

The rising supply curve reflects the fact that different renewable projects differ in their costs, and hence in the incremental subsidy per MWh needed if they are to be built. For example, for wind projects, there may be some projects with relatively low costs, requiring relatively small subsidies. Those projects would be built first. Other projects, however, will have higher costs, perhaps because of less favorable wind conditions, more remote locations, or higher transmission costs. Those projects will not be built unless the subsidies provided are higher.

Q69. Could you provide estimates of the costs of replacing IPEC's baseload generation with additional conservation, assuming that the current baseline cost per MWh would apply to additional conservation?

A69. (DH, ETM) As discussed below, expanding the conservation program to help replace IPEC's energy would increase the subsidies per MWh needed to elicit sufficient supply. Even if the subsidies per MWh did not increase, however, replacing all of IPEC's energy with conservation would cost New York's ratepayers an additional $250 million per year, based on implied costs per MWh for the NYPSC's current EEPS programs. The calculations underlying this estimate are shown in our report (NERA report section II.C.4.b). To meet that cost, the NYPSC would have to increase its budgets and raise or extend the monthly surcharges assessed to New York consumers.

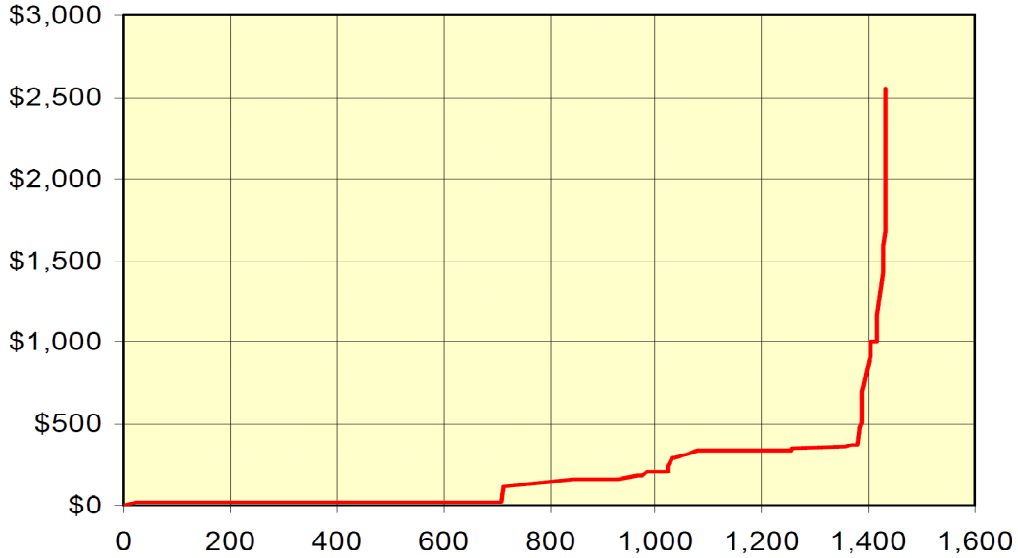
Q70. Could you explain why the additional ratepayer costs of replacing IPEC's baseload generation with conservation would likely be even higher per MWh?

A70. (DH, ETM) As with renewable generation, obtaining additional conservation would likely entail higher marginal cost, thus further increasing the expenditures needed to secure this incremental conservation under the no-action alternative.

In comments on the recent "white paper" prepared as part of the NYPSC's review of its EEPS program, NYISO presents an upward sloping supply curve for conservation based on recent experience in New York, as shown in Figure 5. NYISO Letter, Case 07-M-0548 – Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard (Aug. 22, 2011) (ENT000491). In preparing this graph, NYISO used data in the white paper to plot the cost of the EEPS programs as a function of the cumulative gigawatt-hours ("GWh") saved. As shown in Figure 5, the cost rises substantially as the level of energy saved increases.

This graph shows results for existing programs that have already taken advantage of the "low hanging fruit." Incremental programs to reduce demand under the no-action alternative would require going further. Although the highest costs in the figure may represent programs that the NYPSC supports for reasons other than cost-effectiveness, the curve nonetheless illustrates that as opportunities for relatively low-cost programs are exhausted, additional demand reductions can only be secured by incurring higher costs.

Figure 5. EEPS Energy Efficiency Supply Curve Cost $ per MWh Versus Cumulative GWh



Note: Horizontal axis is cumulative energy saved per year, in GWh. The vertical measure is marginal cost per MWh saved annually. However, because the costs are incomplete and are not amortized over the effective lives of the programs, the marginal costs are not directly comparable to levelized estimates of cost per MWh generated.

Source: NERA Report at 22 (ENT000481).

The graphical analysis of a higher baseline level of conservation is essentially the same as the analysis for renewables in Figure 4. Increasing conservation programs under the no-action alternative would require increased rates of expenditure per unit of electricity saved, assuming that additional conservation programs could be designed beyond those intended to meet the ambitious New York State goal. The higher the baseline level of conservation assumed, the higher would be the cost per unit of electricity saved. Thus a higher baseline level of

conservation would make it more difficult and costly to secure any incremental conservation initiatives beyond the baseline EEPS program to be used in the no-action alternative (again assuming that additional initiatives could be identified, adopted, and implemented effectively).

4. Costs of Additional Generation at Existing Sources

Q71. Turning from the costs of additional new units (or additional conservation), could you provide information on the costs of increasing generation at existing types of generation sources, including various fossil fuel and renewable sources?

A71. (DH, ETM) As noted above in the discussion of competitive electricity markets, after power plants have been built, their utilization (*i.e.*, hours of operation per year) depends largely on physical constraints and their marginal costs relative to relevant electricity prices. The basic physical constraint for all power plants is their maximum rated capacity. Wind, solar, and hydro facilities have an important other physical constraint: the intermittent nature of their respective "fuel." After these types of power plants have been built, their marginal costs of operation are virtually zero, so they generally operate during all times when physical constraints allow. Fossil fuel power plants, in contrast, have much less restrictive physical constraints than wind, solar, and hydro facilities. The utilization of fossil fuel power plants is much more sensitive to market forces, particularly electricity prices, although many coal units are baseload units that operate virtually all of the time. If more generation is needed from the electricity system, such as in the no-action alternative, fossil fuel power plants not operating at full capacity in all time periods would be able to increase their utilization.

Table 1 summarizes the situation for different fuel types and shows estimates of the marginal costs per MWh of generation (from existing facilities or facilities that would be built in the future) based on fuel price projections, heat rates (a measure of fuel input per unit of energy output), and variable operating and maintenance ("O&M") costs from EIA. EIA, Assumptions

to the Annual Energy Outlook 2011 at 97 ("EIA 2011") (ENT000492); EIA, Annual Energy Outlook 2012 Early Release Overview (Jan. 2012) ("EIA 2012") (ENT000493). Marginal costs are estimated for the generation technologies that are generally capable of increasing utilization, which include fossil fuel power plants and do not include wind, solar, or hydro facilities. Based on the estimated variable costs in Table 1, coal and NGCC units are most likely to increase their utilization under the no-action alternative because these two generation technologies have the lowest marginal costs.

Table 1. Estimates of Marginal Costs of Generation

	Capable of Increasing Utilization in Response to Market Forces?	Marginal Costs (2011$/MWh)		
		O&M	Fuel	Total
Coal	Yes	$2	$21	$23
Natural Gas				
- Combined Cycle	Yes	$2	$31	$33
- Combustion Turbine	Yes	$11	$47	$58
Oil Combustion Turbine	Yes	$17	$255	$272
Wind	No	-	-	-
Solar PV	No	-	-	-
Hydro	No	-	-	-

Note: "-" indicates that the variable costs are not estimated because the generation technology generally cannot increase utilization in response to market forces.
Assumed heat rates are 8,800 Btu/kWh for coal, 7,050 Btu/kWh for gas combined cycle, and 10,745 Btu/kWh for combustion turbines based on EIA estimates for new power plants. If existing power plants have higher heat rates, their fuel costs would be higher.
Source: NERA calculations based on EIA 2011 at 97 (ENT000492), EIA 2012 (ENT000493),

E. Implications of Relative Costs for the Mix of Replacement Energy in the No-Action Alternative

Q72. Could you summarize the implications of the relative cost information you developed for the likely role of additional fossil fuel generation in the no-action alternative?

A72. (DH, ETM) Additional fossil fuel generation is likely to constitute the major replacement generation under the no-action alternative. The least expensive generation options are likely to come from increases in generation at existing units, particularly from coal and natural gas units that are not operating at full capacity. Among new units that might be added as

replacement generation, new NGCC units have the lowest levelized costs (*i.e.*, costs per MWh, including capital, fuel and other operating and maintenance costs).

Q73. Could you summarize the implications of the relative cost information you developed for the likely role of additional renewable generation in the no-action alternative?

A73. (DH, ETM) Additional renewable generation is not likely to play a major role in the no-action alternative. New York State has an ambitious renewable goal—accompanied by substantial subsidy programs—that extends into the future. But that future renewable generation would be put in place regardless of IPEC's status. Thus, the future renewable generation due to the New York State renewable goal is in the baseline rather than as additional generation that would be "available" under the no-action alternative. Expanding renewable generation beyond the current goal would very likely require an increase in the level of subsidy per MWh beyond the current levels. The comparison of levelized costs shows that wind generation—the lowest cost renewable generation in New York State—would be substantially more expensive than natural gas. This is before the cost of necessary transmission infrastructure is taken into account. Given the market pressures in New York to minimize the costs of additional generation, the relative cost information indicates that additional wind generation is not likely to be added as replacement generation under the no-action alternative.

Q74. Could you summarize the implications of the relative cost information you developed for the likely role of additional energy efficiency and conservation in the no-action alternative?

A74. (DH, ETM) Additional energy efficiency also is not likely to play a major role under the no-action alternative, for reasons similar to those relevant for renewable generation. Of

course, to the extent that lost baseload of IPEC generation leads to increased retail electricity prices, there will be some effect on conservation through price effects. But we would not expect the price effect on electricity demand to be substantial, given the relatively low price elasticity of demand for electricity; most studies put the price elasticity for electricity at around -0.2, which means that a 10 percent increase in retail electricity price would result in a 2 percent decrease in electricity demand. M. Bernstein and J. Griffin, "Regional Differences in the Price-Elasticity of Demand For Energy," RAND Corporation Technical Report 292 at 18, 21 (2005) (ENT000494). As noted above with regard to renewables, the level of energy efficiency to be achieved by New York State's current programs is in the baseline, since it would be achieved regardless of IPEC's status. Given the increased costs (and thus subsidies) that would be required to expand energy efficiency programs, we conclude that it is not likely that additional energy efficiency would account for substantial IPEC replacement generation (beyond price-induced conservation).

F. Adverse Environmental Impacts of Generation Alternatives

Q75. Because you conclude that fossil fuel generation is likely to be the dominant generation in the no-action alternative, could you provide information on the potential adverse environmental impacts of additional fossil-fuel generation?

A75. (DH, ETM) As market forces would favor replacement generation from fossil fuels (natural gas and coal), the adverse environmental impacts would include increased air emissions of pollutants such as sulfur dioxide ("SO_2"), nitrogen oxides ("NO_x"), and carbon dioxide ("CO_2"). Table 2 summarizes the air emissions from natural gas and coal units that have been identified by EPA in recent analyses of potential air emission regulations affecting electricity generation.

Table 2. Air Pollutants by Generation Plant Type

	Plant Type		
Air Pollutant	Coal	Natural Gas	Nuclear
Particulate Matter	yes	yes	-
Sulfuric Acid (SO2)	yes	yes	-
Nitrogen Oxides (NOx)	yes	yes	-
CO2 and other greenhouse gases	yes	yes	-
Mercury and other heavy metals	yes	-	-
Carbon Monoxide	yes	yes	-
Volatile Organic Compounds	yes	yes	-
Acid Gases	yes	-	-

Source: EPA, Regulatory Impact Analysis for the Federal Implementation Plans to Reduce Interstate Transport of Fine Particulate Matter and Ozone in 27 States at 78, 79 (June 2011) (ENT000495), EPA, Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards at 3-10, 5A-3, 7-33 (2011) (ENT000496).

Table 3 shows average emission rates for the three major pollutants – CO_2, SO_2, and NO_x – for coal and natural gas-fired electricity plants in the United States described above. Note that IPEC generates approximately 16 million MWh per year. Even if only a portion of this

generation is made up by fossil-fired generation, the emissions of these pollutants would increase substantially.

Table 3. Average Emission rates for CO_2, SO_2, and NO_X (lbs/MWh)

	Emission Rates (lbs/MWh)		
	CO_2	SO_2	NO_x
Coal	2,122	8.9	3.1
Natural Gas	944	0.1	0.5

Source: NERA Report at 26 (ENT000481).

The EPA has linked NO_x and SO_2 emissions to various health and welfare effects including the following:

- Asthma complications;
- Chronic lung disease;
- Premature mortality;
- Other respiratory effects; and
- Tree mortality and injury to vegetation.

The extent of damages of course depends upon many site-specific factors, including emission rates, meteorological conditions, population exposures, and background concentrations.

According to the Interagency Working Group on the Social Costs of Carbon, climate change induced by greenhouse gas emissions adversely affects:

- Agricultural productivity;
- Human health;
- Water table levels resulting in flood risk; and

- Ecosystem functions.

The Interagency Working Group on the Social Costs of Carbon for Regulatory Impact Analysis Under Executive Order 12866 at 2 (2011) (ENT000498).

Since CO_2 is a global pollutant, these effects depend upon global emissions (and concentrations) rather than emissions in New York State or the United States.

Recently developed techniques for extracting natural gas—referred to as hydraulic fracturing or "fracking"—have also led to some environmental concerns. In recognition of these concerns, the New York State Department of Environmental Conservation ("NYSDEC") recently issued a draft supplemental environmental impact statement, stating that "[h]igh-volume hydraulic fracturing, which is often used in conjunction with horizontal drilling and multi-well pad development, is an approach to extracting natural gas in New York that raises new, potentially significant, adverse impacts…" NYSDEC, Revised Draft, Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Executive Summary at 1 (Sept. 7, 2011) (ENT000499).

Q76. Although you conclude that additional renewable generation is not likely to play a major role as replacement generation, if renewable generation were added could you provide information on its potential adverse environmental impacts, starting with additional wind generation?

A76. (DH, ETM) Additional renewable generation—assuming it could feasibly be expanded to replace IPEC's energy—would also have adverse environmental impacts. We provide information first on the nature of potential adverse environmental effects of wind generation—which is the renewable source that appears most prominent in New York State—to provide some perspective related to the NYS-37 claim that license renewal would produce larger

environmental impacts than the no-action alternative. The potential adverse environmental impacts of wind generation include increased bird and bat mortality, increased land requirements, decreased aesthetic qualities, and increased noise in the areas where the wind turbines are built. Additional wind generation may also require additional transmission infrastructure with its own adverse environmental impacts.

Q77. How do wind farms impact birds and bats?

A77. (DH, ETM) Wind farms can cause the death of birds and bats in two main ways. U. Irfan, *Bats and Birds Face Serious Threats From Growth of Wind Energy*, N. Y. Times (Aug. 8, 2011) (ENT000500). First, birds and bats can collide with wind turbine blades. Second, bats can suffer internal bleeding (barotrauma) when they fly through pockets of low pressure behind rotating blades. The American Bird Conservancy ("ABC") estimates that 440,000 birds were killed by wind turbines in 2009 and at least one million birds would be killed in 2020 based on growth projections for wind energy. American Bird Conservancy, Rulemaking Petition to the U.S. Fish & Wildlife Service for Regulating the Impacts of Wind Energy Projects on Migratory Birds at 6 (Dec. 14, 2011) (ENT000501). The National Wind Coordinating Collaborative ("NWCC") indicates that wind farms in New York kill between approximately 1.5 and 6 birds per MW per year and kill between approximately 3 and 15 bats per MW per year. National Wind Coordinating Collaborative, *Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions* (Spring 2010) (ENT000502). Assuming a 30 percent capacity factor for energy production from wind turbines, approximately 6,000 MW of additional wind turbines would be required to replace IPEC's 16 million MWh of annual energy output. NYISO, Growing Wind at 44 (Sept. 2010) (ENT000503). Based on the mortality rates from the NWCC, these wind turbines would kill between 9,000 and 36,000 birds

each year and between 18,000 and 90,000 bats each year. Since bats aid farmers by eating insects, one study has estimated that bat deaths at existing wind facilities reduce crop sales by almost $4 billion each year nationwide. J. Boyles et al., *Economic Importance of Bats to Agriculture*. Science 332: 341-342 (2011) (ENT000504). As discussed below, any additional transmission infrastructure required for additional wind facilities could also cause bird mortality.

Q78. How do wind farms impact land?

A78. (DH, ETM) Wind farms can require a significant amount of land around the wind turbines. These land requirements can also have adverse impacts on wildlife by interfering with their habitat and migration routes. GAO Report, *Wind Power Impacts on Wildlife and Government Responsibilities for Regulating Development and Protecting Wildlife*, 1 (2005) (ENT000505). The FSEIS cites the National Renewable Energy Laboratory as estimating that the total land disturbance for onshore wind energy is 1 hectares (2.5 acres) per MW, but 70 percent of this area is only disturbed temporarily for construction (FSEIS at 8-62) (NYS00133C). Thus, 6,000 MW of wind turbines to replace IPEC's energy output would disturb 6,000 hectares (15,000 acres or over 23 square miles). Area requirements are lower for offshore wind energy. FSEIS at 8-62 (NYS00133C).

Q79. How do wind farms impact aesthetics?

A79. (DH, ETM) Modern wind turbines rise hundreds of feet into the air and can be seen from great distances. As a result, wind turbines can significantly affect the aesthetic qualities of their areas, particularly in areas with substantial aesthetic value before the construction of wind turbines, such as forests, rivers, and lakes. If the wind turbines replacing IPEC each had a capacity of 5 MW, then 1,200 tall wind turbines would need to be installed with potentially significant aesthetic impacts.

Q80. How do wind farms impact noise?

A80. (DH, ETM) The whirling blades of wind turbines can cause a noise nuisance for people living near wind turbines. Zeller, *For Those Near, the Miserable Hum of Clean Energy*, N.Y. Times (Oct. 5, 2010) (ENT000506). This noise nuisance can affect many people if the wind turbines are located in densely populated areas. Most current and proposed wind farms are located in the sparsely populated areas of upstate New York.

Q81. Turning to another potential renewable generation type, could you provide information on the potential adverse environmental impacts of additional biomass generation?

A81. (DH, ETM) As with fossil-fired generation, the burning of biomass results in the emissions of various air pollutants. Table 4 displays air emissions rates from biomass facilities for SO_x, NO_x, CO, and coarse particulate matter (PM_{10}) as reported in National Renewable Energy Laboratory ("NREL") (2003).

Table 4. Direct Air Emissions from Wood Residue Biomass Facilities (lbs/MWh)

	SO_X	NO_X	CO	PM-10[1]	Comments
Biomass Technology					
Stoker Boiler, Wood Residues (1,4)	0.08	2.1 (biomass type not specified)	12.2 (biomass type not specified)	0.50 (total particulates) (biomass type not specified)	Based on 23 California grate boilers, except for SO_2 (uncontrolled)
Fluidized Bed, Biomass (4)	0.08 (biomass type not specified)	0.9 (biomass type not specified)	0.17 (biomass type not specified)	0.3 (total particulates) (biomass type not specified)	11 FBC boilers in California
Energy Crops (Poplar) Gasification (a,b)	0.05 (suggested value based on SOx numbers for Stoker and FBC, adjusted by a factor of 9,180/13,800 to account for heat rate improvement)	1.10 to 2.2 (0.66 to 1.32 w/SNCR; 0.22 to 0.44 with SCR)	0.23	0.01 (total particulates)	Combustor flue gas goes through cyclone and baghouse. Syngas goes through scrubber and baghouse before gas turbine. No controls on gas turbine.

Source: National Renewable Energy Laboratory, *Biopower Technical Assessment: State of the Industry and Technology*, 6-2 (2003) (ENT000507).

Q82. Turning to a third potential renewable generation type, could you provide information on the potential adverse environmental impacts of additional hydro capacity?

A82. (DH, ETM) Hydroelectric facilities are responsible for increases in greenhouse gas ("GHG") emissions during both construction and operations. A literature review by Synapse Energy Economics notes that initial reservoir flooding leads to an initial stage of biomass decomposition—releasing both CO_2 and methane—and that post-flooded biomes may remove less carbon from the atmosphere than pre-flooded biomes. Synapse Energy Economics, Inc., Hydropower Greenhouse Gas Emissions, 1-3 (Feb. 14, 2012) (ENT000508). A recent study performed at a newly flooded boreal reservoir in Quebec showed a rapid increase in both CO_2 and methane emissions after the first year of flooding, followed by a return to natural levels within two and three years respectively. Tremblay et al., *Eastmain-1 Net GHG Emissions Project – The Use of Automated Systems to Measure Greenhouse Gas Emissions from Reservoirs*." at 1 (2009) (ENT000509). Tremblay et al. note that GHG emissions at boreal reservoirs typically return to natural levels within ten years of flooding. Hydro Quebec provides information on life-cycle assessments—including emissions from fuel extraction, processing, transportation, power plant construction, and electricity generation—that shows typical greenhouse gas emission results for North American hydro facilities. Hydro Quebec, *Comparing Power Generation Options – Greenhouse Gas Emissions* (Jan. 2003).

The construction of hydroelectric plants leads to the emissions of other compounds that are responsible for adverse environmental impacts. The International Energy Administration ("IEA") lists the following types of impacts associated with emissions released during the construction of hydroelectric facilities. International Energy Agency, *Environmental and Health*

Impacts of Electricity Generation: A Comparison of the Environmental Impacts of Hydropower with those of Other Generation Technologies, 109-138 (June 2002) ("IAE 2002") (ENT000511).

- Ozone layer depletion,
- Acidification,
- Eutrophication,
- Photochemical oxidant formation, and
- Ecotoxic impacts.

The IEA also notes that operation of hydroelectric facilities can lead to the following adverse environmental impacts. IEA 2002 at 109-138 (ENT000511):

- Increased local humidity,
- Erosion and sedimentation of streams,
- Damaged aquatic habitats,
- Impacts to local biodiversity,
- Impacts on fish populations, and
- Aesthetic impacts.

Q83. Could you provide information on the potential adverse environmental impacts of transmission expansions?

A83. (DH, ETM) The siting and construction of new transmission lines could result in additional adverse environmental impacts such as the clearing of forested vegetation and subsequent displacement and impacts on wildlife, including impacts to fish and aquatic invertebrates due to canopy reduction and stream crossings. Transmission expansions can have adverse impacts on birds, including mortality from collisions and electrocutions. American Bird Conservancy, *Power Line Collisions and Electrocutions* (ENT000512).

The DEIS for the Hounsfield Wind Farm in Jefferson County, New York, indicated that 50.6 miles of transmission lines would have to be constructed to connect the wind farm to its regional power grid. Draft Environmental Impact Statement for Hounsfield Wind Farm, Town of Hounsfield, Jefferson County, New York, 1-2 (Feb. 27, 2009) ("Hounsfield DEIS") (ENT000513). Hounsfield's proposed transmission corridor entails a 150-foot wide right of way which would lead to the clearing of 360 acres of forested vegetation and subsequent displacement and impacts on wildlife, including impacts to fish and aquatic invertebrates due to canopy reduction and 53 stream crossings. Hounsfield DEIS at 6-32 (ENT000513).

The Public Service Commission of Wisconsin lists 18 potential impacts associated with transmission lines. These include impacts of the following categories: aesthetics, agricultural lands, airports and airstrips, archeological and historical resources, cultural concerns, electric and magnetic fields, endangered/threatened and protected species, implantable medical devices and pacemakers, invasive species, noise and light impacts, property owner issues, radio and television reception, recreation areas, safety, stray voltage, water resources, wetlands, and

woodlands. *See generally* Public Service Commission of Wisconsin, Environmental Impacts of Transmission Lines (2011) (ENT000514).

The Joint Proposal for the Champlain-Hudson Power Express transmission project (discussed further in subsequent sections of our testimony) provides illustrative information on the types of environmental impacts from the installation of some potential transmission lines. The environmental impacts listed for the Champlain-Hudson Power Express transmission project include the following (*see generally* Champlain Hudson Power Express, Inc. Joint Proposal. Case No.: 10-T-0139, Before the NYPSC (Feb. 24, 2012) (ENT000515)):

- Dredging would be required to lay cables in the Hudson River and portions of Lake Champlain, resulting in temporary sediment resuspension and other impacts;
- Construction would result in temporary impacts to 56 acres of wetlands and many protected streams and tributaries, including impacts associated with turbidity and sedimentation, interference with flow levels and habitat alteration;
- About 10.7 acres of forested wetland cover may be permanently converted to marsh or scrub-shrub communities;
- Approximately 236 acres of existing forest cover may be cleared during construction, 60 acres of which would be permanently cleared;
- Three miles of cable would be installed within the city streets in the borough of Queens, New York City;
- 138,040 linear feet of right-of-way within Agricultural Districts would be included in the Construction Zone.

IX. QUANTITATIVE EVALUATION OF THE ENERGY AND ENVIRONMENTAL IMPACTS OF THE NO-ACTION ALTERNATIVE

A. Introduction

Q84. Could you identify the energy market model you used to develop empirical results of the no-action alternative?

A84. (DH, ETM) We developed quantitative assessments of the no-action alternative using the National Energy Modeling System ("NEMS"), a widely-respected energy model maintained by the U.S. Energy Information Administration ("EIA").

Q85. Could you provide an overview of the results of your NEMS modeling with regard to the likely nature of replacement generation?

A85. (DH, ETM) Our energy market modeling indicates a small role for additional energy conservation and renewables under the no-action alternative. The NEMS model predicts that most of the increase in U.S. generation would come from natural gas-fired plants. The majority of the replacement energy would come from outside New York State, with virtually all being fossil-fuel generation. The increased fossil fuel generation comes not only from highly efficient low-emitting Natural Gas Combined Cycle ("NGCC") units—which are the units assumed in the FSEIS assessment of the natural gas alternative—but also from less efficient, higher emitting existing units fueled by coal as well as natural gas.

Q86. Could you summarize the results of your NEMS modeling with regard to the likely changes in air emissions under the no-action alternative?

A86. (DH, ETM) Our modeling indicates that the increase in fossil-fuel generation would lead to substantial increases in emissions of the major air pollutants, including carbon dioxide ("CO_2"), sulfur dioxide ("SO_2"), and nitrogen oxides ("NOx"). The projected increase in nationwide CO_2 emissions averages about 13.5 million metric tons per year.

B. Overview of NEMS and Modeling Methodology

Q87. Could you provide a brief description of the NEMS model?

A87. (DH, ETM) NEMS is composed of multiple modules that interact to generate projections of energy prices and quantities. These modules project demand and supply from various sectors. The Electricity Market Module provides projections for 22 regions across the United States. New York is modeled by three NEMS regions that cover (1) New York City and Westchester County; (2) Long Island; and (3) the rest of the state. The NEMS Electricity Market Module projects capacity, generation, fuel use, and air emissions, among other measures for each region. The model also accounts for international trade in electricity with Canada and Mexico.

Q88. Why did you use the NEMS model to conduct your quantitative analysis?

A88. (DH, ETM) NEMS is a widely used model for long-term energy and environmental projections. EIA uses NEMS to perform policy analyses in response to requests from Congress, the White House, the Department of Energy, and other Federal agencies. EIA prepares an Annual Energy Outlook ("AEO") with long-term projections of energy prices and quantities. NEMS is also used by the national laboratories (*e.g.*, Cort et al. 2007 (ENT000516)), academics (*e.g.*, Hoppock et al. 2012 at 9-10 (ENT000517)), think tanks (*e.g.*, Krupnick et al. 2010 at 29-32 (ENT000518)), and the private sector. NERA has used NEMS to model potential policy changes in many different contexts. NEMS determines the need for new power plants on its own using modeling algorithms, rather than relying on users to specify hypothetical capacity additions as in some other energy models. Moreover, NEMS integrates changes in the electricity system with changes in other markets, notably fuel markets for coal and natural gas.

Q89. Which version of NEMS did you use?

A89. (DH, ETM) EIA updates NEMS once a year to prepare the Annual Energy Outlook. As noted above, NEMS projections reflect Federal, regional, and state energy and

environmental policies that have been enacted as of the modeling date. We used the latest version of NEMS, "AEO 2012," which was released in January 2012. EIA 2012 (ENT000493).

Q90. Which important energy and environmental policies are included in the baseline in the AEO 2012 version of NEMS?

A90. (DH, ETM) EIA typically incorporates all current environmental policies in NEMS, and, "where it is clear that a law or regulation will take effect shortly after the AEO Reference case is completed," anticipated rules. EIA 2012 at 3 (ENT000493). The energy policies in the NEMS reference case include Federal subsidies for particular types of generation, including renewables subsidies. In addition, NEMS incorporates the RGGI in which New York participates and RPS policies in various states, including New York State's "30 x 15" renewables goal. The AEO 2012 version of NEMS includes the Cross-State Air Pollution Rule ("CSAPR"), which EPA issued in July 2011 to limit emissions of sulfur dioxide and nitrogen oxides from power plants. EIA based its modeling of CSAPR in the AEO 2012 version of NEMS on the original form of the regulation issued in July 2011. EPA subsequently made technical adjustments to state caps and new-unit set-asides, and the U.S. Court of Appeals for the D.C. Circuit subsequently issued a stay on the regulation. The AEO 2012 version of NEMS does not include a national mandatory greenhouse gas policy (such as a cap-and-trade program or carbon tax), because the Federal government has not established such a policy. It also does not include the proposal issued by the NYSDEC in January 2012 to limit CO_2 emissions from new power plants and capacity additions at existing power plants in New York State. NYSDEC Press Release, *DEC Proposed Ground-Breaking Power Sector Regulations to Analyze Possible Environmental Impacts and Limit CO2 Emissions from Power Plants* (Jan. 18, 2012) (ENT000519).

Q91. Can you summarize the methodology you used to develop estimates of the electricity market and environmental impacts of the no-action alternative?

A91. (DH, ETM) We used NEMS to develop estimates of the potential energy and environmental impacts of the no-action alternative by comparing NEMS results between (1) a baseline scenario in which IPEC continues to operate; and (2) a no-action alternative in which IPEC ceases to operate. The differences between these two runs represent NEMS's predictions of how electricity markets in New York State and other regions might respond under the no-action alternative. For the baseline, we used NEMS results from EIA's AEO 2012. For the no-action alternative, we assumed that IP2 and IP3 would cease operation at the end of 2013 and 2015, respectively. Note that these hypothetical closure dates are assumptions for modeling purposes only.

C. <u>NEMS Results for Baseline Conditions</u>

Q92. Could you review how you modeled baseline conditions in which IPEC would continue to operate?

A92. (DH, ETM) We used the AEO 2012 version of NEMS without modification as the baseline against which to estimate the potential energy and environmental impacts of the no-action alternative. In AEO 2012, IPEC continues to operate through the modeling period. We present NEMS results of baseline conditions in the United States for two periods: 2011-2015 and 2016-2025. The NEMS results reflect average annual values during each period.

Q93. Could you summarize the NEMS projections of U.S. electricity generation under baseline conditions according to AEO 2012?

A93. (DH, ETM) Yes. Table 5 presents average annual generation in the United States by fuel type during the two periods under baseline conditions. Generation is expressed in terms of millions of MWh per year. Note that coal accounts for the largest share of U.S.

generation (41.0 percent in the period 2016-2025), followed by natural gas (23.9 percent), nuclear (21.2 percent), renewables (13.2 percent), and oil (0.7 percent). The generation mix in the period 2016-2025 is similar to the mix in 2011-2015, with renewables increasing somewhat from the first to the second period, and coal decreasing somewhat. Changes in other fuels' percentages between the two periods are smaller than the changes for renewables and coal.

Table 5. Projected U.S. Baseline Generation by Fuel Type

	2011-2015		2016-2025	
	1000 GWh/yr	% of Total	1000 GWh/yr	% of Total
Coal	1,673	42.3%	1,712	41.0%
Natural gas	966	24.4%	998	23.9%
Oil	27	0.7%	28	0.7%
Nuclear	811	20.5%	887	21.2%
Renewables	477	12.1%	553	13.2%
Total	3,955	100.0%	4,177	100.0%

Note: Totals differ slightly from sums of components because of independent rounding.
Source: NERA calculations based on NEMS AEO 2012 model

Q94. Are these projections of the baseline consistent with your understanding of U.S. electricity generation markets?

A94. (DH, ETM) Yes. These NEMS results all correspond to the information on the relative costs of alternative generation technologies discussed above. Although the percentage of generation from renewables is projected to slightly increase nationwide between the first and second modeling periods, the U.S. electricity system is projected to remain dominated by coal and natural gas because of their relatively low costs.

D. NEMS Results on Energy Market Impacts of the No-Action Alternative

Q95. Could you review how you modeled the potential impacts of the no-action alternative?

A95. (DH, ETM) To estimate how the electricity system could make up for lost baseload IPEC generation under the no-action alternative, we ran a new NEMS case in which we removed IP2 from the electricity system in 2013 and removed IP3 in 2015. As noted above, these hypothetical closure dates are assumptions for the modeling only. We made no other modifications to the AEO 2012 version of NEMS. We compared the results for this no-action case to the baseline results to estimate the potential electricity market responses according to NEMS. We present results for the ten-year period beginning in 2016 (the first year in which all IPEC generation is lost based on our modeling assumptions for the no-action alternative) and ending in 2025.

Q96. Could you summarize the NEMS projections of U.S. market responses in the no-action alternative?

A96. (DH, ETM) Table 6 presents the projected changes in generation in the no-action alternative based on the NEMS results. The NEMS estimates show that IPEC would produce 16.7 million MWh each year on average during the period 2016-2025, so the no-action alternative reflects this amount of lost baseload IPEC generation. According to the NEMS results, the electricity price effects from making IPEC's baseload generation unavailable would cause a slight reduction in U.S. electricity sales (by 0.3 million MWh per year on average during the period 2016-2025). The United States would also reduce its net imports slightly (by 0.2 million MWh per year on average). Making IPEC unavailable would tend to increase the distance over which electricity would need to travel to consumers, and this would lead to increased "line losses" (*i.e.* dissipation of electricity in the transmission system of by 0.9 million

MWh per year). To make up for IPEC's lost output and the expected changes in imports and line losses, other power plants across the United States would increase their generation by 17.4 million MWh per year on average. The sum of these four categories of market responses, accounting properly for their signs (increases vs. reductions), is equal to IPEC's lost output.

Table 6. IPEC's Lost Output and Projected U.S. Market Responses in No-Action Alternative (2016-2025)

	1000 GWh/yr
IPEC	-16.7
U.S. market responses	
Reduced sales	0.3
Increased net imports	-0.2
Increased generation	17.4
Reduced line losses	-0.9
Total	16.7

Note: Total differs slightly from sum of components because of independent rounding.
Source: NERA calculations based on NEMS AEO 2012 model

Q97. Could you summarize the NEMS projections of generation changes in the no-action alternative?

A97. (DH, ETM) Yes. Table 7 shows that NEMS projects that less than half of the increased U.S. generation in the no-action alternative would occur in New York State. NEMS estimates that generation from other power plants in New York State would increase by 6.9 million MWh per year on average during the period 2016 to 2025 to make up for IPEC's lost output. NEMS estimates that there would not be a large decrease in total electricity sales in New York State in the no-action alternative. New York State would need to import more electricity from other states and (to a much lesser extent) Canada to make up the shortfall between IPEC's

lost output and increases in in-state generation. Indeed, NEMS estimates that generation in other states would increase by 10.6 million MWh per year on average during the period 2016 to 2025 in the no-action alternative, virtually all of which would be transmitted to New York State to make up for the shortfall there. These increased imports into New York State lead to the increased line losses across the United States shown above in Table 6.

Table 7. Projected Changes in Generation in No-Action Alternative (2016-2025)

	1000 GWh/yr	% of Total
Replacement generation		
New York State	6.9	39%
Other states	10.6	61%
U.S. total	17.4	100%
U.S. replacement		
Coal	7.5	43.1%
Natural gas	9.7	55.4%
Oil	0.1	0.5%
Nuclear	0.0	0.0%
Renewables	0.2	1.0%
Total	17.4	100.0%

Note: Totals differ slightly from sums of components because of independent rounding.
Source: NERA calculations based on NEMS AEO 2012 model

Q98. What types of fuels account for the increased generation in the no-action alternative?

A98. (DH, ETM) The lower part of Table 7 shows predicted U.S. replacement generation by fuel type. Note that these values reflect three effects: (1) increased utilization of power plants that exist in baseline conditions; (2) delayed retirements of existing plants; and (3) construction of new power plants. Note too that NEMS determines the need for new power plants endogenously based on its modeling algorithms. We made no assumptions about what types of replacement resources could be used and did not constrain NEMS in any way. As shown

in the lower part of Table 7, the majority (55.4 percent) of the U.S. replacement generation during the period 2016 to 2025 would come from natural gas units, and most of the remainder (43.1 percent) would come from coal units. NEMS projects that the increased coal generation would come from increased utilization and delayed retirement of existing coal plants rather than construction of new coal plants. Small contributions toward replacement generation would come from renewables (1.0 percent) and oil (0.5 percent).

Q99. Are these projections of the no action alternative consistent with your understanding of the relative costs of alternative generation technologies?

A99. (DH, ETM) Yes. These NEMS results all correspond to the information on the relative costs of alternative generation technologies discussed above. In particular, most replacement energy would come from natural gas and coal because of their relatively low costs.

E. <u>Environmental Impacts</u>

Q100. What quantitative information does NEMS provide on the environmental impacts under the no-action alternative?

A100. (DH, ETM) As we have seen, NEMS projects that replacement of IPEC's generation would come primarily from fossil fuel-fired power plants. The increased combustion of fossil fuels would increase emissions of CO_2 as well as other air emissions: sulfur dioxide (SO_2) and nitrogen oxides (NOx). NEMS provides estimates of the changes in these air pollutants.

Q101. Could you summarize the NEMS results on the change in U.S. air emissions in the no-action alternative?

A101. (DH, ETM) As shown in Table 8, NEMS projects that U.S. CO_2 emissions would be 13.5 million tons higher each year on average during the period 2016-2025 in the no-

action alternative, U.S. SO_2 emissions would be 6.4 million tons higher, and U.S. NOx emissions would be 3.3 million tons higher.

Table 8. Projected Increases in Average Annual U.S. Air Emissions in No-Action Alternative (2016-2025)

CO2 (million tons/yr)	13.5
SO2 (thousand tons/yr)	6.4
NOx (thousand tons/yr)	3.3

Note: CO_2 is measured in millions of metric tons (1,000 kilograms), while SO_2 and NO_x are measured in thousands of short tons (2,000 pounds).
Source: NERA calculations based on NEMS AEO 2012 model

Q102. Can you provide some context for these CO_2 projections in terms of changes in New York?

A102. (DH, ETM) To put the CO_2 increases in perspective, as noted in our report (Section III.D), the regional CO_2 cap under RGGI decreases by about 15 million metric tons between 2012 and 2018. Thus, the projected increase in U.S. CO_2 emissions under the no-action alternative would be nearly as large as the planned reduction in CO_2 emissions under RGGI.

Q103. How would these environmental impacts be characterized by NRC under NEPA?

A103. (DPC) NERA's empirical estimate of the increase in CO_2, SO_2, and NO_x emissions is similar to the FSEIS's estimate of emissions from a new 2200 MWe supercritical coal-fired plant, which the NRC Staff found to have MODERATE air quality impacts. *See* FSEIS at 8-53 to -55 (NYS00133C). Although the NRC Staff found that coal-fired generation was not a likely alternative due to air quality policies like the Regional Greenhouse Gas Initiative, the FSEIS discussion provides a useful frame of reference. *See* FSEIS at 8-53 (NYS00133C). NERA's findings show that the SO_2 and NO_x emissions from replacement generation under the no-action alternative are even greater than the emissions from a new coal-

fired plant. *Compare* FSEIS at 8-53 to -55 (NYS00133C), *with* Table 8 above. Therefore, such air impacts should be characterized as at least MODERATE.

X. RESPONSE TO ISSUES RAISED IN CONTENTION NYS-37

A. Overview

Q104. Can you summarize your evaluation of the major arguments in NYS-37 and what information you have developed as part of your evaluation?

A104. (DH, ETM) As noted, NYS-37 and the accompanying testimony and reports reach very different conclusions than we do concerning the no-action alternative. We have evaluated these materials and identified four fundamental flaws in the materials that explain why they come to such different conclusions. These four fundamental flaws consist of the following: (1) failure to recognize market forces and the importance of cost-minimization; (2) conflation of developments that affect the baseline, not the no-action alternative; (3) failure to evaluate the impacts of potential differences in the baseline; and (4) failure to provide empirical modeling.

Two of these flaws—failure to recognize market forces and failure to provide empirical modeling—relate to the issues we have already discussed and thus do not require additional explanation. The other two flaws—related to the conflation of baseline conditions and the no-action alternative—require further explanation to clarify their implications for the environmental impacts of the no-action alternative.

The importance of distinguishing between baseline conditions and the no-action alternative was discussed previously; however, we should also note that differences in the assumed baseline can indirectly affect the potential environmental impacts of the no-action alternative.

Q105. Could you explain why changes in baseline conditions—such as the roles for renewables and energy conservation—are not directly relevant to the question of what generation would be added in the no-action scenario?

A105. (DH, ETM) Changes that would otherwise occur as part of baseline conditions provide no information regarding the incremental effect of the no-action alternative. The relevant comparison is between the *changes* between the baseline and no-action alternative because those changes are what determine the net environmental impacts of the no-action alternative. Even if renewables and conservation play larger roles in a revised baseline, it will not necessarily be true that they will play larger (or, perhaps, any) incremental roles in replacing output lost from IPEC under the no-action alternative.

B. <u>The Major Developments Cited in NYS-37 Should Be Considered Part of the Baseline</u>

Q106. You have indicated that the major developments cited in NYS-37 relate to the baseline rather than to changes that would result if Indian Point generation were not available. Could you list your understanding of the major developments cited in NYS-37?

A106. (DH, ETM) The following are the six major developments that seem to be emphasized in NYS-37 and the expert reports.

1. *New York State renewable electricity goal*. The "30 x 15" renewable electricity goal is being implemented by subsidies paid by NYSERDA to developers of renewable energy sources. These subsidies are collected from New York's consumers on their monthly utility bills through a volumetric surcharge for the RPS program.
2. *New York State conservation and energy efficiency programs*. Conservation and energy efficiency, particularly under the "15 x 15" plan, will play larger roles than projected in the past. Utility and NYSERDA conservation programs are subsidized

with funds from the Systems Benefit Charge ("SBC") and other volumetric surcharges imposed on sales of electricity to New York's consumers, such as, *e.g.*, the EEPS program.

3. *Lower New York State electricity demand due to economic factors*. Future demand for electricity in New York is projected to be lower than earlier projections suggested, such as those available in 2006 for the report by the National Research Council on alternatives to renewing IPEC's licenses, due to the recession and continuing economic pressures.
4. *New York State recent and proposed generation capacity additions*. New York State has added a significant amount of generation capacity in recent years (mostly natural gas and wind), and significant amounts have been proposed for construction in future years.
5. *Lower natural gas prices*. The price of natural gas has fallen over the past several years and is expected to remain lower than previously expected, in large part because of new techniques for extracting natural gas that have sharply increased the reserves that can be extracted economically.
6. *New transmission lines in New York State*. New transmission lines, which did not exist at the time of the 2006 National Research Council report and allegedly were not considered by the FSEIS, will make it easier for the downstate areas served by IPEC to obtain power produced in upstate New York.

1. New York State Renewable Electricity Goal

Q107. Could you explain why New York State's "30 x 15" renewable electricity goal should be considered part of the baseline?

A107. (DH, ETM) Renewables that are induced into New York State's electricity system as part of this goal are elements of the baseline regardless of IPEC's status. These renewables cannot also be counted as replacements for IPEC in the no-action alternative.

Statements by NYS's experts (Schlissel testimony, p. 48) regarding Federal support for renewable energy under the American Recovery and Reinvestment Act of 2009 ("ARRA") provide an example of the conflation of changes in the baseline and changes in the incremental impact of the no-action alternative. ARRA provided temporary Federal support for renewable energy as a response to the recession. Several of the support mechanisms (including the Section 1603 energy grant program) have already expired (U.S. Treasury 2012). Thus, the Federal support mechanisms under ARRA no longer even exist and, in any event, are part of the baseline. Such issues are not relevant to potential replacement of IPEC's baseload energy with renewable energy in the years ahead.

2. New York State Electricity Conservation Goal

Q108. Could you explain why New York State's "15 x 15" electricity conservation goal should be considered part of the baseline?

A108. (DH, ETM) Since conservation measures that are induced in New York State's electricity system as part of this goal are elements of the baseline regardless of IPEC's status, these conservation measures cannot also be counted as replacements for IPEC in the no-action alternative.

In his testimony in support of NYS-37, Mr. Schlissel provides a particularly clear example of a development that relates to the baseline rather than to the impacts of the no-action alternative.

He notes that ARRA spending and incentives have stimulated conservation efforts. Any increase that has already occurred as a result of ARRA, however, is part of the baseline, and in any event is subsumed under the 15 x 15 and 30 x 15 goals. Moreover, expenditures under ARRA peaked in 2010 and have declined since then. No new funding is available. Thus, it will not be a potential source of funding for incremental conservation efforts under the no-action alternative.

3. Lower Demand Forecasts

Q109. Could you explain why New York State's lower electricity demand forecasts should be considered part of the baseline?

A109. (DH, ETM) Forecasts of future electricity demand in New York State are inherently uncertain, in large part because of uncertainties regarding future economic activity in the State and thus the demand from industrial, commercial and recreational customers. These changes in overall demand will of course affect the generation sources that are used to meet future electricity demand. As noted above, however, IPEC currently provides baseload generation, and thus, its operation is not affected by the level of economic activity. Thus, whatever changes might have occurred in the forecasts of future electricity demand—or whatever changes may occur in subsequent forecasts—will not influence the level of baseload generation from IPEC that would be lost under the no-action alternative. Changes in forecasted electricity demand are part of baseline conditions rather than changes that should be attributed to the no-action alternative.

4. New York State's Capacity Additions

Q110. Could you explain why New York State's recent capacity additions should be considered part of the baseline?

A110. (DH, ETM) Recent capacity additions represent options under the no-action alternative only to the extent that these units would not be operating at full output in the baseline.

Thus, these additions generally represent changes in the baseline conditions rather than indications of the changes that would occur if IPEC baseload generation was lost.

Whether additional generation to replace lost IPEC generation would come from these recently-added units depends upon their capacity utilization under baseline conditions and the cost per megawatt-hour of additional generation as well as the ability of the transmission system to deliver the power to the relevant demand regions. Additional recent wind capacity in the baseline would not provide greater opportunities for wind to be used as replacement power because wind capacity is used whenever it is available as the marginal cost is virtually zero.

Q111. Could you explain the relevance of New York State's potential capacity additions in terms of the baseline?

A111. (DH, ETM) The possibility of future capacity additions also does not by itself represent changes that would result from the no-action alternative. Potential future capacity additions, such as those in NYISO's Interconnection Queue, are simply alternatives that may or may not serve as replacements under the no-action alternative. Whether particular units will be added in the future will depend primarily upon their relative costs; this principle applies both in the baseline (*e.g.*, as a response to increased electricity demand) and in the no-action alternative. As discussed above in this testimony, renewable generation is generally not economically competitive with the marginal costs of existing under-utilized fossil capacity or with the levelized cost of new fossil capacity.

5. <u>Lower Natural Gas Prices</u>

Q112. Could you explain why lower natural gas prices should be considered part of the baseline?

A112. (DH, ETM) Lower natural gas prices will reduce the cost of electricity generated using that fuel, in both the baseline and under the no-action alternative. Those lower costs will

increase the relative competitiveness of gas-fired generation, leading to greater use in both states of the world. They also will reduce incentives to replace existing gas-fired sources with new, more efficient units, because the incremental cost savings will be smaller. These effects will apply equally to both the baseline and the no-action alternative, and thus are not directly relevant to the incremental impacts of the no-action alternative. As we discuss below, however, lower natural gas prices are likely to reduce the role of renewables in the no-action alternative and to increase the role of fossil fuel generation, which would run counter to NYS-37's claim that the FSEIS should have considered scenarios with less gas-fired generation and more conservation and renewables.

6. New York State's Transmission Expansion

Q113. Could you explain why New York State's recent transmission expansions should be considered part of the baseline?

A113. (DH, ETM) Our report describes various changes in the New York State transmission system. These include two completed projects, the Neptune Regional Transmission System and the Linden Variable Frequency Transformers, as well as the Hudson Transmission Partners project, which has begun construction and is expected to be completed in 2013. Taken together, these transmission projects will increase the transfer capability into the downstate region which will make more power available. However, as was the case for renewables and energy efficiency, completed and near-completed upgrades are parts of baseline conditions because their existence does not depend upon IPEC's status. Transmission developments that occur in the baseline, regardless of IPEC's status, are not directly relevant to determining the generation that would replace lost baseload IPEC output. To the extent that these facilities provide excess transmission capacity in the baseline conditions, however, these changes could affect the mix of resources under the no-action alternative in an indirect way because they would

facilitate bringing more power into the downstate region. We discuss this potential indirect effect below.

Q114. Could you explain the relevance of New York State's potential transmission expansions in terms of the baseline?

A114. (DH, ETM) Two additional projects—the Champlain-Hudson Power Express and the Cross-Hudson Cable—have been proposed but have not been implemented. If these projects go forward regardless of whether or not IPEC is available, they would constitute part of the baseline conditions. The presence of these transmission alternatives could have an indirect effect on the incremental generation in the no-action alternative. As discussed below, however, relative costs and overall market effects are likely to determine the nature of the incremental generation under the no-action alternative and not just the additional generation options made more accessible by additional transmission options.

7. <u>Summary</u>

Q115. In summary, to what extent are the developments cited in NYS-37 relevant to assessing the environmental impacts of the "no action" alternative?

A115. (DH, ETM) The developments cited in NYS-37 relate to baseline conditions; they do not relate directly to the potential environmental impacts of the "no action" alternative. For example, New York State's "30 x 15" renewable energy goal and "15 x 15" electricity conservation goal will continue to be pursued. Under the "no-action" alternative, additional renewable energy beyond the "30 x 15" level and additional electricity conservation beyond the "15 x 15" level would be required to replace IPEC's baseload energy. Similarly, changes in the other developments—including projected electricity demand, natural gas prices, generation capacity and transmission projects—all represent changes that would occur in the baseline conditions.

C. NYS-37 Fails to Account for the Indirect Effects of a Modified Baseline on the Energy and Environmental Impacts Under the No-Action Alternative

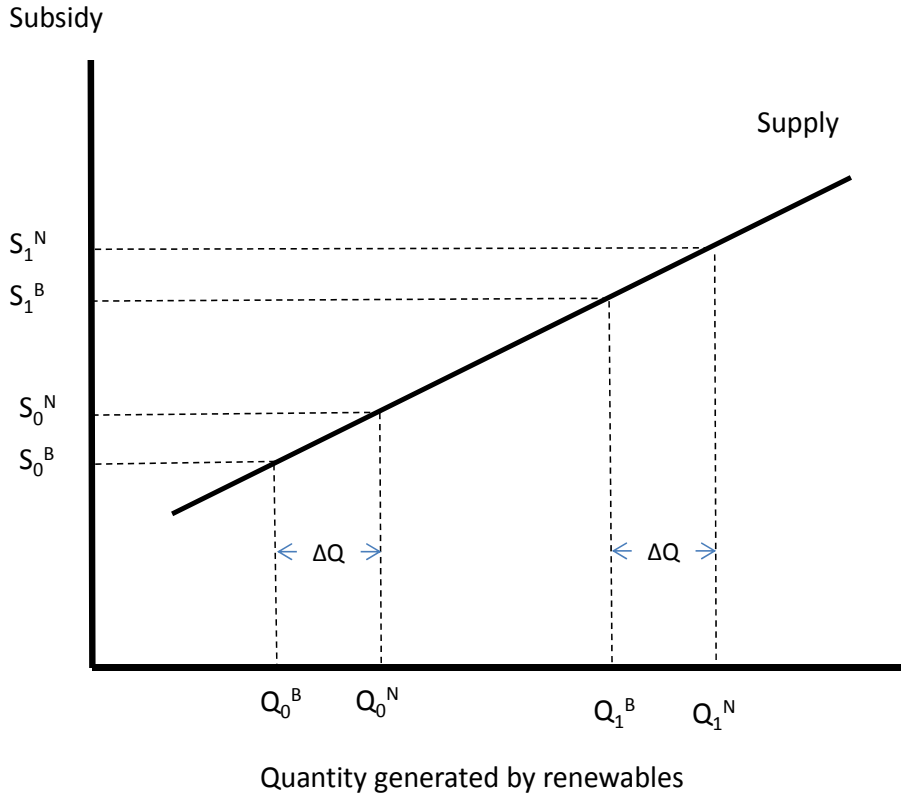
Q116. Could you explain how the baseline developments emphasized by NYS-37 are indirectly relevant to the no-action alternative?

A116. (DH, ETM) Baseline changes can indirectly affect which resources are likely to change incrementally under the no-action alternative. For example, new transmission lines may make power imported from other states more likely to be to part of IPEC replacement generation if those new lines are not fully utilized in the baseline. However, the indirect effects of changes in the baseline can also have counterintuitive effects. For example, as we explain below, a baseline with high levels of conservation is likely to have higher costs of additional conservation as part of replacing IPEC than a baseline with lower levels of conservation. Thus, a baseline with the higher levels of conservation that NYS-37 argues are more accurate than in the FSEIS would make it more expensive and therefore less likely that substantial amounts of additional conservation would be used to replace IPEC's baseload energy.

Q117. Can you explain how the presence of additional renewables in the baseline could lead to higher costs for additional renewables and thus less likelihood that additional renewables would be added?

A117. (DH, ETM) Yes. Figure 6 below (an expansion of Figure 4) relates the total quantity (MWh) of renewable generation in New York State to the subsidy rate per MWh necessary to elicit incremental renewable generation. The upward-sloped supply curve indicates that increasing the total quantity of renewable generation requires increasing the subsidy rate per MWh.

Figure 6. Impact of More Baseline Renewables on the Marginal Cost of Additional Renewables



Notes: Q_0^B: Quantity of renewables in original baseline without 30 x 15 policy
ΔQ: additional quantity of renewables desired under the no-action alternative
S_0^B: Subsidy rate for original baseline
S_0^N: Subsidy rate required to elicit additional renewables under no-action alternative
Q_1^k and S_1^k: corresponding quantities and subsidies under revised baseline.

Source: NERA Report at 55 (ENT000481).

Suppose that under the original baseline without the "30 x 15" RPS program, the subsidy is set at S_0^B and it elicits Q_0^B units of renewable generation. Thus, the incremental cost of securing additional renewables under the no-action alternative would start at S_0^B and increase incrementally. If the desired increase were ΔQ, the subsidy rate required would rise to S_0^N. To provide the additional renewables under the no-action alternative would require raising the subsidy rate, as well as increasing the quantity on which the subsidy is paid, both of which would raise the budget needed.

Now suppose that new renewable programs of the type cited in NYS-37 and its supporting documents are implemented. The baseline quantity of renewables rises from Q_0^B to Q_1^B. To elicit that additional supply, the subsidy must be higher, S_1^B in the new baseline. Similarly, under the no-action alternative, if the desire is to increase renewable output by ΔQ, the required subsidy rises to S_1^N. As the figure illustrates, the more ambitious the goal in the revised baseline, the higher the subsidy that is needed to elicit additional supply of renewables in the no-action alternative and the higher the surcharge that must be borne by New York ratepayers.

Q118. Can you explain how the presence of additional conservation in the baseline could lead to higher costs for additional conservation and thus less likelihood that additional conservation would be added?

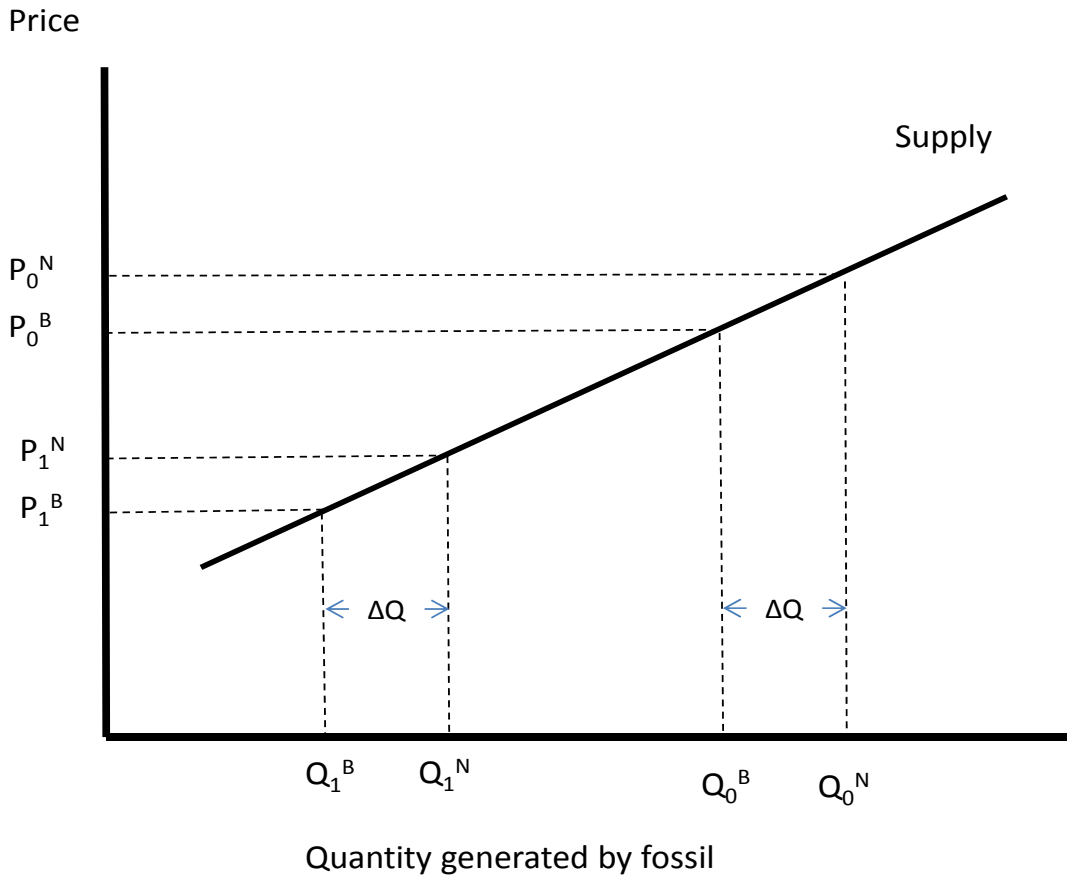
A118. (DH, ETM) The analysis of a higher baseline level of conservation is essentially the same as the analysis for renewables in Figure 6. Increasing conservation programs to help meet reduced output from IPEC under the no-action alternative would require increased rates of expenditure per unit of electricity saved, assuming that additional conservation programs could be designed beyond those intended to meet the already ambitious New York State goal. The higher the baseline level of conservation assumed, the higher would be the cost per unit of electricity saved. Therefore, the higher baseline level of conservation cited by NYS-37 and its accompanying documents in fact would make it more difficult and costly to secure any incremental conservation initiatives beyond the baseline EEPS program to be used in the no-action alternative.

Q119. Can you explain how lower projected electricity demand in the baseline could make fossil sources more attractive as incremental sources of supply under the no-action alternative?

A119. (DH, ETM) As with our analyses of renewables and conservation, we can illustrate the reason with a supply curve. The supply of fossil-generated electricity is rising as a function of the market price; higher prices elicit more supply of this type of resource, as illustrated in Figure 7. In the figure, the initial baseline quantity of fossil generation is Q_0^B, corresponding to a market price of P_0^B. Under the no-action alternative, if ΔQ additional units of fossil were used for lost IPEC output, the price would rise to P_0^N.

Now consider the effects of lower demand in the baseline as a result of lower levels of economic activity. Lower demand means that less fossil will be used in the baseline because existing renewable resources are generally bid in at zero or near-zero levels and thus would not be affected. In addition, higher levels of renewables and conservation also will reduce the amount of fossil used in the baseline. In the figure, the reduced quantity of fossil in the revised baseline is Q_1^B and the corresponding market-clearing price is P_1^B, which is lower than in the baseline. In other words, a lower-cost facility meets the required demand and sets the market-clearing price lower on the supply curve. As a result, the cost under the no-action alternative also would fall, making fossil a more attractive option than under the original baseline. Because the new baseline would lower the market-clearing price, it would increase the subsidies required to meet any given target for renewables. It also would make conservation less attractive because lower market prices would make conservation less cost-effective for customers.

Figure 7. Impact of Reduced Demand in Baseline on Marginal Cost of Fossil Generation to Replace IPEC



Notes: Q_0^B: Quantity of fossil generation in original baseline with relatively high demand
ΔQ: Difference in fossil generation between baselines with relatively high and low demand
P_0^B: Market price in original baseline with relatively high demand
P_0^N: Market price in original baseline under no-action alternative
Q_1^k and P_1^k: corresponding quantities and prices under revised baseline.

Source: NERA Report at 57 (ENT000481).

Q120. Can you explain how incorporating recent capacity additions in the baseline could affect the attractiveness of alternative energy resources?

A120. (DH, ETM) Recent capacity additions in New York are primarily a baseline issue because they do not directly relate to replacement of IPEC's baseload energy in the no-action alternative. The capacity additions may displace high-cost power plants in the electricity market's supply curve, but IPEC remains a source of baseload energy even with the capacity additions. Thus, the capacity additions have not and would not reduce the amount of energy that

IPEC supplies to the New York electricity system (and thus the amount of energy that would have to be replaced if IPEC were not available).

The indirect effects of New York State's recent capacity additions are likely to include decreases in the market price of electricity because these new resources are more efficient and have lower heat rates. This effect would be likely to increase the attractiveness of fossil-fired generation relative to renewables or conservation. As discussed above, in the near term, the market price for a given demand period would be determined by the short-run marginal cost of the marginal generator, where the marginal generator is the highest cost unit generating during the period. In New York, that marginal generator is almost always gas-fired, typically an older, relatively inefficient unit. Newer units are likely to have lower marginal costs of generation than those older units. As a result, generation from new capacity is likely to displace generation from the older, marginal units for some demand periods, which will reduce the market clearing prices. The older, fossil fired units will run at even lower capacity factors than before or will be retired.

This decrease in the market price of electricity could have an indirect effect on the mix of incremental resources under the no-action alternative. As discussed earlier, the predefined per kWh subsidy required for a developer to construct additional renewable generation is the developer's projected difference between the levelized cost of the incremental renewable resource and the (appropriately weighted) wholesale price of electricity. Thus, lower electricity prices would increase the subsidies that are projected to be needed to achieve renewable targets. Similarly, lower prices will make conservation a less attractive option for consumers, requiring higher subsidy rates to achieve baseline conservation goals. These higher subsidy costs are likely to reduce the roles that renewables or conservation would play under the no-action alternative.

Q121. Could you explain how incorporating the potential for additional capacity additions of various types would affect the attractiveness of fossil-fired generation relative to renewables and conservation for additional generation under the no-action alternative?

A121. (DH, ETM) Adding to the list of units that could be added in the future would not by itself affect the relative attractiveness of fossil-fired generation relative to renewables and conservation in the no-action alternative. As we discussed above, which future units would be added depends largely upon their relative costs as well as the relative cost of expanding generation at existing units. These principles apply both in baseline conditions and in the no-action alternative. Under baseline conditions, the growth in electricity demand (and other factors) will lead to some additional units being added to the electricity supply. Similarly, the changes in electricity market conditions under the no-action alternative (e.g., changes in natural gas prices) would lead to changes in the units that are added. But we would expect both the baseline additions and the changes in the no-action alternative to be based upon cost considerations. As our NEMS modeling indicates, fossil-fired units are the dominant sources of electricity supply both in the baseline conditions and particularly in the changes under the no-action alternative.

Q122. Could you explain how lower forecasted natural gas prices in the baseline would likely increase the role of natural gas as replacement generation in the no-action alternative?

A122. (DH, ETM) Lower natural gas prices will shift down the supply curve for gas-fired units. As discussed earlier, lower natural gas prices are likely to increase the amount of gas-fired generation in the baseline and to reduce the extent to which older gas-fired units are replaced with new, fuel-efficient models. Lower gas prices are also likely to lower market-

clearing electricity prices in the baseline, because gas-fired units are the marginal units during most time periods. As noted above in the context of capacity additions, lower market-clearing electricity prices are likely to require larger expenditures on conservation programs to achieve baseline targets and to increase the subsidies needed to meet baseline targets for renewables.

Lower natural gas prices also will reduce the incremental cost of increasing gas-fired generation under the no-action alternative. Thus, lower natural gas prices make it *more* likely that gas-fired units and existing gas fired units with unutilized capacity—rather than renewables or utility-sponsored conservation—would be used. As a result, incorporating lower projected gas prices into the analysis produces market results that are directly contrary to the unsupported contention in NYS-37 that the FSEIS overemphasizes the use of fossil fuel, particularly natural gas, to generate replacement power. Indeed, accounting for this market dynamic demonstrates that, if anything, the FSEIS was conservative in its analysis of adverse environmental impacts under the no-action alternative because lower natural gas prices would lead to more reliance on natural gas under the no-action alternative and more of natural gas facilities' adverse environmental impacts.

Q123. Could you explain how including recent transmission lines to downstate New York in the baseline would affect the likelihood of different generation in the no-action alternative?

A123. (DH, ETM) Additional transmission lines reduce constraints on buying power from outside the downstate region and are likely to result in more imports in the baseline because more out-of-state units will be able to bid in the NYISO auctions. To the extent that these developments create new delivery opportunities that would not be fully exploited in the baseline, they also could produce additional imports under the no-action alternative.

The two recently added transmission lines that are cited by NYS-37 and its supporting documents—Linden and Neptune—will allow greater imports from New Jersey and the rest of the PJM region to the west of New York. PJM generates a higher percentage of its power from coal than New York does. In PJM, coal is the marginal producer approximately 74 percent of the time (and natural gas is on the margin the remaining 26 percent), whereas in New York State the marginal producer is almost always natural gas. Federal Energy Regulatory Commission, Electric Power Markets: National Overview (2012) (ENT000520). Thus, the recently added transmission capacity seems likely to increase the role of coal generation in the baseline conditions. To the extent that these opportunities are exhausted in the baseline, however, this additional transmission would not necessarily lead to greater coal generation in the no-action alternative. If additional low-cost coal generation from PJM were available, however, the additional transmission would lead to a greater role for coal generation under the no-action alternative. As with other projections, the key consideration is the relative cost of alternative generation sources under the no-action alternative.

Q124. Could you explain how the potential development of proposed transmission projects—notably the Champlain-Hudson Power Express project that would connect Quebec to New York City—could indirectly effect generation in the no-action alternative?

A124. (DH, ETM) The same general principles apply when evaluating the effects of potential additional transmission as in evaluating the effects of recent transmission changes. If additional transmission projects such as the Champlain-Hudson Power Express Project go forward, they would provide the opportunity for additional imports of power from outside New York State. These opportunities would be present both in the baseline case and in the no-action case. To the extent that the cost-effective opportunities for additional imports are exhausted

under baseline conditions, however, the additional transmission lines would not lead to additional imports under the no-action alternative. Moreover, because the effects of the no-action alternative depend in large part on relative costs of different generation sources, it would generally be necessary to model the change in electricity market conditions under the no-action alternative to determine the net effect of any change in transmission on incremental generation.

We discuss some of the specifics of the Champlain-Hudson Power Express Project in Appendix C of our report. Hydro Quebec currently is constructing two large hydro projects whose power might be transmitted to New York if the transmission line were constructed. These hydro projects would be in the baseline—since they would be put in place regardless of IPEC's status—and thus the generation from these two units would not represent potential IPEC replacement generation. The hydro generation from these two projects would simply be diverted from other regions (*e.g.*, New Brunswick, New England, Ontario) with the net environmental effect determined by the incremental generation that would be added in those regions to make up for the loss in the hydro generation that otherwise would have been used. Even if additional new hydro facilities were developed in Quebec after the line was in place (if the line were actually constructed), whether or not generation from these hydro facilities would constitute a net replacement for IPEC generation would depend upon the net changes in the overall electricity system and, in particular, whether these hydro resources would otherwise have been used to displace fossil generation in other regions. As with other questions related to the impacts of the no-action alternative, the answer depends largely upon details regarding the relative costs of the different generation alternatives to meet electricity demands in different regions and different time periods.

Even if Canadian hydro resources did constitute the net resources added in response to the loss of IPEC generation, the maximum additional potential hydro generation that could be transmitted over the Champlain-Hudson Power Express Project would represent only 40 percent of the IPEC energy that would need to be replaced in the no-action alternative. Moreover, an expansion of Canadian hydro generation (and any related transmission) in the no-action alternative would have adverse environmental impacts of its own, as discussed above in the context of the adverse impacts of generation alternatives and changes in transmission. Note that NYS-37 does not provide any information on the potential energy and environmental impacts of the no-action alternative if the Project were implemented.

Q125. Could you summarize your evaluation of the claims made in NYS-37 regarding various energy developments and their implications for the role that renewables and energy conservation would play as replacement generation in the no-action alternative?

A125. (DH, ETM) NYS-37 and its supporting documents claim that the FSEIS ignores important recent developments and, as a result, gives insufficient weight to the roles that conservation and renewable energy could play in the no-action alternative. As we discussed above, most of those developments affect the baseline but are not directly relevant to the mix of resources under the no-action alternative.

We also analyzed how those developments and their impacts on the baseline would be likely to indirectly affect the mix of replacement resources. We found that for the most part they would increase the costs of using conservation or renewables to replace IPEC, reduce the cost of fossil-fired alternatives, or both. Moreover, several of the developments, in particular lower fossil use in the baseline and lower gas prices, are likely to increase the attractiveness of using

older fossil sources—delaying retirements or increasing utilization—rather than the new, more efficient NGCC units assumed in several of the FSEIS alternatives. Increased use of older fossil-fired sources and reduced use of new fossil-fired sources generally would increase the environmental impacts of the no-action alternative beyond those identified in the FSEIS. Increased generation and transmission capacity may not have any impacts on the incremental effects of the no-action alternative if the capacity would be fully utilized in baseline conditions. If certain capacity is not fully utilized, its role in the no-action alternative would depend upon its relative costs as a potential source of additional supply to replace IPEC generation.

D. Assessment of NYS Expert Testimony

Q126. You stated earlier that you reviewed the expert testimonies provided by NYS. Are there aspects of their testimonies that warrant a response?

A126. (DH, ETM) We have generally addressed all the points raised in NYS-37 and the supporting documentation above. However, there are a few specific statements that we would like to address in more detail.

Q127. What elements of these testimonies did you focus on?

A127. (DH, ETM) We focused on their discussions of the six major energy developments and the implications that NYS's experts drew regarding energy and environmental impacts under the no-action alternative.

Q128. How are your comments on the NYS expert testimony organized?

A128. (DH, ETM) For this last part of our testimony, we have organized our comments into the six major developments, noting the major comments made by the three experts for each development, followed by a section on other comments. To avoid repetition, we refer to previous sections of our testimony and to our report for detailed discussion of each issue.

Q129. What overall conclusion have you reached regarding the NYS expert testimony?

A129. (DH, ETM) Our overall conclusion is that our analyses and conclusions above address all the major points in the three expert testimonies within the scope of this NRC proceeding. No element of the three expert testimonies leads us to modify our analyses or conclusions.

1. New York's Renewable Energy Goal

Q130. Mr. Schlissel (*see* Schlissel Testimony at 27) and Mr. Bradford (*see* Bradford Testimony at 10) note that New York's "30 x 15" goal aims to obtain 30 percent of electricity sales in 2015 from renewable sources. Could you comment on these statements?

A130. (DH, ETM) These statements exemplify the conflation of baseline conditions with no-action conditions, as discussed above. New York's "30 x 15" goal does not relate directly to the environmental impacts of the no-action alternative. Instead, the "30 x 15" goal is a baseline issue.

Q131. Does New York's "30 x 15" goal have any indirect relevance for the environmental impacts of the no-action alternative?

A131. (DH, ETM) Yes. As discussed above in the context of indirect effects, by inducing an increase in renewable energy in New York, the "30 x 15" goal makes it less likely that renewable energy will play a major role in the "no-action" alternative. This is because the goal causes the lower cost renewable energy opportunities to be realized in the baseline. (Note that this is relative because even the least expensive renewable energy opportunities may still be quite costly relative to fossil or nuclear generation sources and relative to wholesale electricity

prices.) As a result, more expensive renewable energy opportunities would be left for the "no-action" alternative.

Q132. Mr. Schlissel claims that renewable energy (in combination with energy efficiency) would be available in New York to a sufficient degree to replace IPEC's entire capacity. *See* Schlissel Testimony at 34-35. Could you comment on this claim?

A132. (DH, ETM) Even if renewable energy (in combination with energy efficiency) *could* replace IPEC, this does not demonstrate that it *would* replace IPEC. As noted above, the "30 x 15" goal causes the lower cost renewable energy opportunities to be realized in the baseline, leaving only higher-cost renewable energy opportunities available in the "no-action" alternative. As a result, given that replacing lost baseload IPEC generation with renewable energy (in combination with energy efficiency) would be costly, market forces would not cause IPEC's output to be replaced entirely with renewable energy.

Q133. Mr. Schlissel notes that provisions of the American Recovery and Reinvestment Act of 2009 ("ARRA") support renewable energy. *See* Schlissel Testimony at 48. Could you comment on this statement?

A133. (DH, ETM) Support for renewable energy under ARRA is a baseline issue without direct relevance to the environmental impacts of the no-action alternative. In any event, this support was a temporary policy to assist the country in recovering from the recession, which has ended. Expiration of this support makes it entirely irrelevant to evaluation of the future environmental impacts of license renewal.

2. New York's Conservation Goal

Q134. Mr. Schlissel (*see* Schlissel Testimony at 17-18) and Mr. Bradford (*see* Bradford Testimony at. 10) note that New York's "15 x 15" goal aims to reduce electricity sales in 2015 by 15 percent relative to a forecast for that year from 2007. Could you comment on these statements?

A134. (DH, ETM) These statements again exemplify the conflation of baseline conditions with replacement for IPEC, as discussed above. New York's "15 x 15" goal does not relate directly to the environmental impacts of the no-action alternative. Instead, the "15 x 15" goal is a baseline issue.

Q135. Does New York's "15 x 15" goal have any indirect relevance for the environmental impacts of the no-action alternative?

A135. (DH, ETM) Yes. As discussed above in the context of indirect effects, by inducing an increase in electricity conservation in New York, the "15 x 15" goal makes it less likely that conservation will play a major role in the "no-action" alternative. This is because the goal causes lower cost conservation opportunities to be realized in the baseline. (Note that this also is relative because even lower cost conservation opportunities may still be quite costly relative to fossil or nuclear generation sources and compared to wholesale electricity prices.) As a result, fewer low-cost conservation opportunities are available in the "no-action" alternative.

Q136. Mr. Schlissel notes that the total conservation goal in 2015 under the "15 x 15" goal (27,000 GWh) is larger than the typical annual energy from IPEC. *See* Schlissel Testimony at 18. In another part of his testimony, Mr. Schlissel notes that the total conservation goal in 2015 for programs under the Energy Efficiency Portfolio Standard (7,639 GWh) is approximately half of the typical annual energy from IPEC. *See* Schlissel Testimony at 19-20. Could you comment on these comparisons?

A136. (DH, ETM) These comparisons again exemplify the conflation of the baseline with the "no-action" alternative. The savings under the "15 x 15" goal and Energy Efficiency Portfolio Standard are slated to occur irrespective of IPEC's status. Considering these savings as replacement for IPEC's energy in the "no-action" alternative would be double-counting. Additional savings beyond those achieved under the "15 x 15" goal and Energy Efficiency Portfolio Standard would be needed in the "no-action" alternative.

Q137. Mr. Schlissel notes that Optimal Energy has estimated the electricity conservation potential in New York at 37,000 GWh (including 26,000 GWh from conservation policies that are currently in place and 11,000 GWh from new and potential building codes and appliance standards). *See* Schlissel Testimony at 20. In another part of his testimony, Mr. Schlissel notes a different estimate by Optimal Energy that New York has 61,506 GWh of electricity conservation potential. *See* Schlissel Testimony at 19. Could you comment on these statements?

A137. (DH, ETM) These estimates of the electricity conservation potential in New York are not directly relevant to evaluation of the environmental impacts of the no-action alternative for two reasons. First, they include conservation which is expected to be achieved in the baseline from policies that are currently in place, including the "15 x 15" conservation goal.

Second, these statements about conservation measures that *could* replace IPEC do not demonstrate that they *would* replace IPEC. Indeed, New York State may never achieve the full estimated potential for conservation regardless of IPEC's status. As emphasized previously in our testimony, the replacement of IPEC's energy in the "no-action" alternative would most likely be determined primarily by market forces. Our empirical analyses show that IPEC's energy would primarily be replaced with energy produced by fossil-fueled power plants. NYS has not provided any modeling of its own to demonstrate otherwise.

Q138. Mr. Schlissel claims that conservation (in combination with renewable energy) would be available in New York to a sufficient degree to replace IPEC's entire capacity. *See* Schlissel Testimony at 19. Could you comment on this claim?

A138. (DH, ETM) Even if conservation (in combination with renewable energy) *could* replace IPEC, this does not demonstrate that it *would* replace IPEC. As noted above, the "15 x 15" goal causes relatively lower-cost conservation opportunities to be realized in the baseline, leaving only higher-cost conservation opportunities available to replace IPEC in the "no-action" alternative. As a result, replacing IPEC with conservation (in combination with renewable energy) would be costly. Market forces would not produce this outcome.

Q139. Mr. Schlissel notes that provisions of ARRA support electricity conservation. *See* Schlissel Testimony at 48. Could you comment on this statement?

A139. (DH, ETM) Support for electricity conservation under ARRA is a baseline issue without direct relevance to the environmental impacts of the no-action alternative. In any event, this support was a temporary policy to assist the country in recovering from the recession, which has ended. Expiration of this support makes it entirely irrelevant to evaluation of the future environmental impacts of license renewal.

3. New York's Electricity Demand Forecasts

Q140. Mr. Schlissel (*see* Schlissel Testimony at 11-12, 47) and Mr. Bradford (Bradford Testimony at 9) note that recent electricity demand projections for New York are lower than projections from previous years. Could you comment on the implications of lower demand projections?

A140. (DH, ETM) Yes. Electricity sales projections are a baseline issue without direct relevance to the environmental impacts of the no-action alternative. IPEC produces baseload energy. Changes over time in electricity sales projections for New York do not reduce the amount of baseload energy that IPEC would produce for the New York electricity system in the baseline scenario. The same amount of baseload energy must be replaced in the "no-action" alternative irrespective of whether electricity sales projections for New York are lower or higher.

Q141. Do lower electricity demand projections for New York have any indirect relevance for the environmental impacts of the no-action alternative?

A141. (DH, ETM) Yes. Lower electricity demand projections imply a shift along the New York electricity market's supply curve away from high-cost power plants, potentially including natural gas- and oil-fired units, and toward low-cost power plants, potentially including coal-fired units. As a result, the marginal electricity producer in an updated baseline with low demand will have lower costs per MWh than the marginal electricity producer in a previous baseline with high demand. Thus, lower demand projections mean that low-cost coal-fired units are likely to play a larger role in replacing IPEC's output in the "no-action" alternative than if demand projections were high. The environmental impacts of the "no-action" alternative would therefore include the adverse impacts of more generation from coal-fired units.

4. New York's Recent and Proposed Capacity Additions

Q142. Mr. Schlissel (*see* Schlissel Testimony at 9) notes that several thousand megawatts of generation capacity have been added to New York State's electricity system since 2000, and Mr. Bradford (*see* Bradford Testimony at 24) notes that these capacity additions include more than 1,000 MW of wind capacity. Could you comment on these statements?

A142. (DH, ETM) These statements exemplify the conflation of baseline conditions with the no-action alternative. Historical capacity additions are a baseline issue without direct relevance to the environmental impacts of the no-action alternative. Historical capacity additions are in the baseline and cannot be counted as replacement for baseload IPEC generation, so the megawatts of historical capacity additions are not directly relevant to the evaluation of the potential environmental impacts of the "no-action" alternative.

Q143. Mr. Schlissel (*see* Schlissel Testimony at 27-28) and Mr. Bradford (*see* Bradford Testimony at 24) note that NYISO's current Interconnection Queue includes several thousand megawatts of proposed renewable energy projects, and even if only 20 percent of these proposed projects are constructed, their total capacity would be comparable to the total capacity of IPEC. Could you comment on these statements?

A143. (DH, ETM) Proposed renewable energy projects in the current Interconnection Queue are a baseline issue without direct relevance to the no-action alternative. NYS's experts do not provide any justification for their inference that 20 percent of the current Interconnection Queue would be constructed if IPEC were not available. Moreover, megawatts of wind capacity are not directly comparable to IPEC's capacity because wind farms produce far less energy (generally between 10 and 30 percent capacity factors) than IPEC (roughly 90 percent). As a

result, at least 6,000 MW of wind capacity would be needed to match the annual energy production of IPEC.

Q144. Mr. Schlissel notes that NYISO's current Interconnection Queue includes several thousand megawatts of proposed natural gas projects, and even if only 25 percent of these proposed projects are constructed, their total capacity would be approximately half of the total capacity of IPEC. *See* Schlissel Testimony at 45. Could you comment on these statements?

A144. (DH, ETM) Proposed natural gas projects in the current Interconnection Queue are a baseline issue without direct relevance to the no-action alternative. NYS's experts do not provide any justification for their inference that 25 percent of the currently proposed natural gas projects would be added if IPEC were not available. In any event, Staff has explicitly reviewed that scenario and concluded that the environmental impacts of this alternative would exceed the no-action alternative.

Q145. Mr. Schlissel notes that large projects are underway in and around New York City to repower old and inefficient natural gas and oil units as efficient natural gas units. *See* Schlissel Testimony at 16, 43-44. Could you comment on this statement?

A145. (DH, ETM) Like the recent and proposed capacity additions discussed above, the repowering projects are a baseline issue without direct relevance to the environmental impacts of the no-action alternative.

5. Natural Gas Prices

Q146. Mr. Schlissel notes that recent forecasts of natural gas prices are lower than historical forecasts. *See* Schlissel Testimony at 16, 44-45. Could you comment on this statement?

A146. (DH, ETM) Lower natural gas prices make natural gas-fired generation more economically attractive as replacement for IPEC's lost baseload energy. Thus, natural gas-fired generation is a larger part of the "no-action" alternative in a baseline with low natural gas prices than in a different baseline with high natural gas prices. However, lower natural gas prices lead to lower electricity prices. These lower electricity prices require larger subsidies to renewable energy producers to make up the gap between their production costs and projected electricity market revenues. As a result, higher fees must be collected from New York's consumers to induce renewable energy when natural gas prices are low.

6. New York's Transmission System Expansions

Q147. Mr. Schlissel (*see* Schlissel Testimony at 9), Mr. Bradford (*see* Bradford Testimony at 11), and Mr. Lanzalotta (*see* Lanzalotta Testimony at 9) note recent expansions in New York's transmission system. Could you comment on these statements?

A147. (DH, ETM) These statements exemplify the conflation of baseline conditions with the no-action alternative. Recent expansions in New York's transmission system are a baseline issue without direct relevance to the no-action alternative. Their indirect relevance stems from potential changes in generation in the "no-action" alternative that would be made possible by unused capacity on existing transmission lines. NYS's experts do not indicate which transmission lines have excess capacity and thus would be able to carry additional power in the "no-action" alternative. If new transmission lines between PJM and New York have excess capacity and if some of the replacement power in the "no-action" alternative came from PJM

over these new transmission lines, the existence of these new transmission lines could allow for coal-fired generation to be a larger part of the replacement because PJM has a higher portion of coal in its generation mix than New York. Thus, new transmission lines with excess baseline capacity between PJM and New York could lead to worse environmental impacts under the "no-action" alternative than if the new transmission lines did not exist.

Q148. Mr. Schlissel (*see* Schlissel Testimony at 36-39), Mr. Bradford (*see* Bradford Testimony at 15-16), and Mr. Lanzalotta (*see* Lanzalotta Testimony at 9-10) note planned and proposed expansions in New York's transmission system. Could you comment on these statements?

A148. (DH, ETM) Planned and proposed expansions in New York's transmission system are a baseline issue without direct relevance to the no-action alternative. As we discussed earlier, the energy and environmental effects of the no-action alternative depend primarily on the costs of alternatives for meeting electricity demand in different regions and time periods. To the extent that the Champlain-Hudson Project or other transmission expansion projects are built and lead to net increases in hydro facilities or other new capacity, the transmission projects and new capacity would have various adverse environmental impacts, as discussed above.

7. <u>Other Issues</u>

Q149. Mr. Bradford criticizes the FSEIS as follows. "Because the FSEIS does not discuss the economics of IPEC in comparison to the economics of alternatives, including the no-action alternative, it gives decision makers no sense of which among the alternatives is likely to be deployed in what quantities in the event that the no-action alternative is in fact pursued." Bradford Testimony at 14. Could you comment on this criticism of the FSEIS?

A149. (DH, ETM) We agree that decision makers should understand "which among the alternatives are likely to be deployed in what quantities in the event that the no-action

alternative is in fact pursued." But there are two difficulties with Mr. Bradford's testimony in this regard. First, he does not identify the key economic considerations in determining the likely resources that would run under the no-action alternatives. Second, Mr. Bradford provides no empirical analyses of likely replacement resources.

Q150. Could you explain the first difficulty, the lack of identification of key economic considerations?

A150. (DH, ETM) As discussed in previous answers, the key determinants of the likely replacement generation are the costs of the generation alternatives and the transfer capability and other limitations of the transmission system, which influence the ability of different generation alternatives to meet demand at different regions and time periods. Given the market determination of generation as reflected in the activities of the NYISO, the alternatives "likely to be deployed" if IPEC's generation were made unavailable are those that would provide the necessary power at the lowest cost taking transmission requirements into account.

Q151. Could you explain the second difficulty, the lack of empirical information?

A151. (DH, ETM) Mr. Bradford provides no empirical information on the generation that would replace IPEC's generation under the no-action alternative. Thus, he provides no concrete information on the alternatives "likely to be deployed in what quantities in the event that the no-action alternative is in fact pursued"—the same criticism he has leveled against the FSEIS.

Q152. Mr. Bradford criticizes the FSEIS because "it does not consider a no-action alternative scenario involving only energy conservation and renewable energy, the sources having the lowest environmental impacts." Bradford Testimony at 28. Is this criticism justified in light of Mr. Bradford's admonition that decision makers should have a "sense of which among the alternatives is likely to be deployed in what quantities in the event that the no-action alternative is in fact pursued"? Bradford Testimony at 14.

A152. (DH, ETM) No. Mr. Bradford does not establish that additional energy conservation and renewable electricity would be a "likely" combination to replace IPEC's generation. Thus, Mr. Bradford confuses what "could" replace IPEC (without regard to economics) with what "would" replace IPEC.

Q153. In light of these considerations, would it be reasonable to assume a no-action scenario in which additional renewables and energy efficiency replace IPEC's generation?

A153. (DH, ETM) No, not at all. As we have discussed, economic considerations mean that very little if any additional energy efficiency and renewable generation would be added to baseline levels if IPEC's generation were made unavailable. Both our qualitative and our quantitative analyses point to increased fossil fuel generation as the generation likely to replace lost IPEC's generation. In summary, assuming a no-action scenario involving only energy conservation and renewable generation would not achieve Mr. Bradford's stated goal of providing decision makers with an accurate "sense of which among the alternatives is likely to be deployed in what quantities in the event that the no-action alternative is in fact pursued."

Q154. Mr. Bradford states that "[t]he recent history of the electric power industry in the United States, and in New York State in particular, demonstrates beyond dispute the ability of a large power system such as New York to effectively create portfolios of replacement energy resources comprised of energy efficiency, renewable generation, and transmission enhancements once a decision has clearly been made to close a particular unit or once unexpected circumstances produce the same result." Bradford Testimony at 32. Does Mr. Bradford provide evidence to support this assertion?

A154. (DH, ETM) No, as far as we can see, he provides no such information. Indeed, his subsequent emphasis on "power supply procurement realities" on p. 34 suggests the need for the type of qualitative and quantitative analyses we have provided above. It is important to reiterate that the key issue in determining the energy and environmental impacts of the no-action alternative is not what combinations of resources in theory could replace IPEC generation, but rather what the likely combination of resources would be under the market conditions in New York State. Mr. Bradford's testimony seems to conflate past additions of renewable and energy efficiency—which have occurred as a result of expensive public programs that are paid for by New York's electricity consumers through per kWh surcharges on their electric bills every month—with the likelihood of additional, much larger surcharges in the future under a no-action scenario (presuming that additional renewables and conservation exist at any price). He provides no evidence that market conditions in New York State would lead to replacement of IPEC generation with a combination of energy efficiency and renewable generation.

Q155. NYS states that the FSEIS does not provide a site-specific impact analysis of conservation and instead incorporates by reference the findings from the SEISs for Shearon Harris and TMI-1 license renewals, which NYS claims was inappropriate because these facilities are located in different states and different markets than Indian Point. In your opinion, was the FSEIS use of the findings from Shearon Harris and TMI-1 appropriate?

A155. (DPC) Yes. The NYS witnesses overstate the extent to which the Indian Point FSEIS relies on the Shearon Harris and TMI-1 SEISs. The Indian Point FSEIS states: "Analyses in recent NRC license renewal SEISs (*See* NUREG-1437, Supplements 33 and 37, regarding Shearon Harris and Three Mile Island, Unit 1, respectively), indicate that all impacts from conservation are SMALL. The NRC staff adopts the analyses from those SEISs here, insofar as they identified all SMALL impacts from conservation as an alternative." FSEIS at 8-43 (NYS00133C). As this discussion makes clear, the FSEIS simply incorporates the same SMALL environmental impact findings from these other SEISs in this proceeding.

Where appropriate, the NRC did site-specific analysis, noting, for example "that loss of tax and PILOT revenue paid to municipalities near IP2 and IP3, as well as lost jobs, may result in SMALL to MODERATE socioeconomic impacts, which will not be offset by conservation." FSEIS at 8-43 (NYS00133C). Aside from the localized socioeconomic impacts of the no-action alternative, which are separately being adjudicated under NYS-17B, NYS provides no indication that it disputes the FSEIS environmental impact findings. Thus, the FSEIS adoption of the same conservation-related environmental impacts contained in earlier SEISs was appropriate. Further, as discussed previously, because conservation is likely to play a minimal role in the no-action alternative, the FSEIS adoption of these SMALL environmental impact findings for conservation

was conservative and almost certainly resulted in understatement of the adverse environmental impacts of the no-action alterative.

XI. CONCLUSIONS

Q156. Please summarize your testimony and the bases for your conclusions regarding Contention NYS-37.

A156. (DPC, DH, ETM) The FSEIS assessment of the no-action alternative is consistent with NRC guidance, 10 C.F.R. Part 51 regulations, and NEPA. Consistent with the GEIS, the FSEIS contains an appropriate evaluation of alternatives and considers, among other things, the environmental impacts of new natural gas-fired generation, energy conservation, and combinations of alternatives, including a combination involving repowering an existing fossil fuel-powered plant (400 to 600 MWe); renewable generation (600 MWe); and a considerable amount of conservation (1000 to 1200 MWe). Moreover, for alternatives found to not be reasonable alternatives to replace approximately 2000 MWe of baseload power, the FSEIS provides the requisite explanation of the reasons for their elimination. *See* 10 C.F.R. Part 51, App. A § 5.

The NYS claim of additional, allegedly unexamined alternatives lacks merit when subjected to analysis. Analyses show that IPEC baseload generation would actually be replaced primarily by fossil-fueled generation, both from existing natural gas and coal units and from some additional units that would be added (or units whose retirement would be postponed). Our analyses also indicate that both additional renewable generation and additional conservation would constitute small shares of replacement generation. As a result, the FSEIS, if anything, likely underestimates the adverse environmental impacts of the no-action alternative.

Furthermore, for multiple, independent reasons, NYS's experts are incorrect in their claims that the FSEIS overstates adverse environmental impacts because replacement generation

would be primarily renewable energy and conservation. We reviewed their testimony and conclude that their erroneous conclusions are explained by four fundamental flaws: (1) failure to account for the role that market forces play in New York's competitive wholesale market structure; (2) conflation of baseline conditions with the no-action alternative; (3) failure to consider the implications (and likely market outcomes) of their claimed FSEIS shortcomings concerning energy demand and supply conditions; and (4) failure to develop empirical information.

In summary, NYS's testimony contains nothing that substantively calls into question the NRC Staff's conclusion "that the adverse environmental impacts of license renewal for IP2 and IP3 are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable." FSEIS at 9-8 (NYS00133C).

Q157. Does this conclude your testimony?

A157. (DPC, DH, ETM) Yes.

Q158. In accordance with 28 U.S.C. § 1746, do you state under penalty of perjury that the foregoing testimony is true and correct?

A158. (DPC, DH, ETM) Yes.

Executed in accord with 10 C.F.R. § 2.304(d)
Dr. David Harrison, Jr.
NERA Economic Consulting
200 Clarendon Street
11th Floor
Boston, MA 02116
617-927-4512

Executed in accord with 10 C.F.R. § 2.304(d)
Eugene T. Meehan
NERA Economic Consulting
1255 23rd Street, NW
Suite 600
Washington, DC 20037
202-466-9287

Executed in accord with 10 C.F.R. § 2.304(d)
Donald P. Cleary
Talisman International, LLC
1000 Potomac Street, NW
Suite 300
Washington, DC 20007
202-471-4244

March 30, 2012

DB1/ 69416363