UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)	**Docket No. ER15-852-000**

AFFIDAVIT OF JUDAH L. ROSE
ON BEHALF OF THE PJM POWER PROVIDERS GROUP

INTRODUCTION

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Judah L. Rose. I am a Managing Director of ICF International ("ICF"). My business address is 9300 Lee Highway, Fairfax, Virginia 22031.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND, PROFESSIONAL QUALIFICATIONS, AND EMPLOYMENT EXPERIENCE.

A. After receiving a degree in economics from the Massachusetts Institute of Technology and a Master's Degree in Public Policy from the John F. Kennedy School of Government at Harvard University, I have worked at ICF for over 32 years. I am a Managing Director and co-chair of ICF's Energy Advisory and Solutions practice. I have also served as a member of the Board of Directors of ICF International and am one of three people among ICF's roster of approximately 5,000 professionals to have received ICF's honorary title of Distinguished Consultant.

Q. WHAT IS ICF INTERNATIONAL?

A. ICF International (NASDAQ:ICFI) provides professional services and technology solutions across 13 market areas. Our advisory and implementation services assist clients in strategy and policy analysis, program management, project evaluation, and other

services. Our energy practice employs top experts who use an integrated approach to energy markets, applying cutting-edge technical skills and proprietary modeling tools to provide clients with a complete picture of the energy landscape — from electric power to fuels to market design and operations.

Q. WHO ARE ICF'S CLIENTS?

A. In the public sector, we have worked with the Federal Energy Regulatory Commission ("FERC") on transmission issues and the U.S. Department of Energy ("DOE") on energy security. ICF also has been the principal power consultant to the U.S. Environmental Protection Agency ("EPA") for 40 years, specializing in the analysis of air emission programs, especially cap and trade programs. In addition, we have worked with state regulators and energy agencies, including those in California, Connecticut, Kentucky, New Jersey, New York, Ohio, Texas, and Michigan, as well as with numerous foreign governments.

In the private sector, for over 40 years, ICF has provided forecasts and other consulting services to major United States and Canadian electric utilities. In the United States, ICF has worked with utilities such as AES, American Electric Power, Allegheny, Arizona Power Service, Dominion Power, Delmarva Power & Light, Dominion, Duke Energy, FirstEnergy, Entergy, Exelon, Florida Power & Light, Long Island Power Authority, National Grid, Northeast Utilities, Southern California Edison, Sempra, PacifiCorp, Pacific Gas and Electric, Public Service Electric and Gas, PEPCO, Public Service of New Mexico, Nevada Power and Tucson Electric. ICF also works with Regional Transmission Organizations ("RTOs") and similar organizations, including the Midwest Independent Transmission System Operator ("Midwest ISO"), the Electric Reliability Council of Texas, the Western Electric Coordinating Council, WestConnect, and the Florida Regional Coordinating Council.

Q. WHAT TYPE OF WORK DO YOU TYPICALLY PERFORM?

A. I have extensive experience in assessing wholesale electric power market design and regulation. I also have extensive experience forecasting wholesale electricity prices, power plant operations and revenues, transmission flows, and fuel prices (e.g., coal, natural gas). I also have extensive experience in valuing individual power plants in the context of projected market conditions.

Q. WHAT EXPERIENCE DO YOU HAVE IN PROVIDING EXPERT TESTIMONY RELATING TO THE POWER SECTOR?

A. I have testified before or made presentations to the FERC, an international arbitration tribunal, federal courts, arbitration panels, and before state regulators and legislators in 24 U.S. states and Canadian provinces: Arizona, Arkansas, California, Connecticut, Florida, Indiana, Kentucky, Louisiana, Manitoba, Massachusetts, Minnesota, Missouri, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Quebec, Rhode Island, South Carolina, Texas, and West Virginia. I have testified extensively on the topics of electric power regulation, prices and markets, power purchase agreements, utility planning, and the development and acquisition of new generation resources and transmission. In addition, I have authored numerous articles in industry journals and spoken at scores of industry conferences. For specific details, please see my resume, attached hereto as Attachment A.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of The PJM Power Providers Group ("P3").

II. EXECUTIVE SUMMARY

Q. PLEASE PROVIDE A SUMMARY OF YOUR AFFIDAVIT.

A. The purpose of this affidavit is to provide expert opinion and analysis on the January 14, 2015 "stopgap" filing at FERC.[1] PJM should leverage the existing Price Responsive Demand ("PRD") program for interruptible load and not create and adopt a new Wholesale Load Reduction ("WLR") program. The advantages of the PRD over the proposed WLR proposal include:

(1) Less potential for market distortions from making interruptible load artificially attractive. WLR allows existing programs with these distorting features to remain part of the post-*EPSA v FERC* arrangements whereas adopting PRD will not;

(2) Greater reliance on existing parts of the tariff. PRD already exists, and hence, avoids some of the significant changes and complexities associated with the new WLR program. It is available to allow PJM to act quickly in a dynamic, challenging, and uncertain regulatory environment;

(3) Greater administrative simplicity from fewer and less complex programs and therefore less chance for the types of errors that have occurred in the context of interruptible load programs to date:

(4) Greater efficiency associated with more accurate price signals, including hour by hour and node by node pricing. This can create more efficient and competitive markets, and builds on several recent pricing changes which emphasize high $/MWh prices when the grid faces challenging circumstances;

(5) Greater compatibility with the growing availability of automated interval metering and technology for efficient price sensitive control of loads by consumers and their agents; and

[1] *PJM Interconnection, L.L.C.*, Docket No. ER15-852-000

(6) Better opportunities for further improvements such as replacing Measurement and Verification (M&V) with forecasting of the peak load to account for prices and customer response.

Therefore PRD is better for moving in the direction of a more complete solution to the market problems associated with interruptible load. The ultimate goal of a program for managing interruptible load is to take full advantage of improvements in the energy markets to provide customers with proper price signals upon which to base their choice to consume electrical energy at a given price or decline to do so and decrease their costs. PRD best accomplishes that goal. Indeed, in the words of PJM:

> *PJM's long-term vision is that "Price Responsive Demand", which allows more customers to respond directly to market prices and to voluntarily reduce their consumption when wholesale prices rise, is the ultimate solution to demand participation. The development of Smart Grid technologies promises to spread transparency to new levels through advanced metering devices that display electricity prices at every moment directly to end use customers. These technologies, coupled with innovative retail rate structures will enable electricity users to see and voluntarily react to prices in an automated fashion.*[2]

III. PRE-*EPSA V. FERC* PJM INTERRUPTIBLE LOAD PRODUCTS

Q. WHAT WERE THE PRINCIPAL PJM PRE-*EPSA V. FERC* INTERRUPTIBLE PRODUCTS RELEVANT TO THE CAPACITY MARKETS?

A. The principal Pre-*EPSA v. FERC* PJM interruptible load products relevant for the PJM capacity markets were:

[2] *Statement of Terry Boston, President and CEO, on behalf of the PJM Board of Managers Demand Response in the PJM Markets, June 26, 2009, available at: http://pjm.com/~/media/committees-groups/committees/mic/20100722/20100722-item-02b-statement-on-demand-response-in-the-pjm-markets.ashx*

- Limited: This has been the largest interruptible load program by far. Load is made available for up to ten interruptions, each for up to 6 hours, between 10:00AM and 10:00PM from May through October and 6:00AM through 9:00PM in November through April). *See RAA, section 1.43A*.
- Extended Summer: Load is made available from May through October for an unlimited number of interruptions, each for up to 10 hours, between 10:00AM and 10:00PM *See RAA, section 1.20C.*
- Annual: Load is made available for an unlimited number of interruptions, each for up to 10 hours, between 10:00AM and 10:00PM from May through October and 6:00AM through 9:00PM from November through April). *See RAA, section 1.1A.*

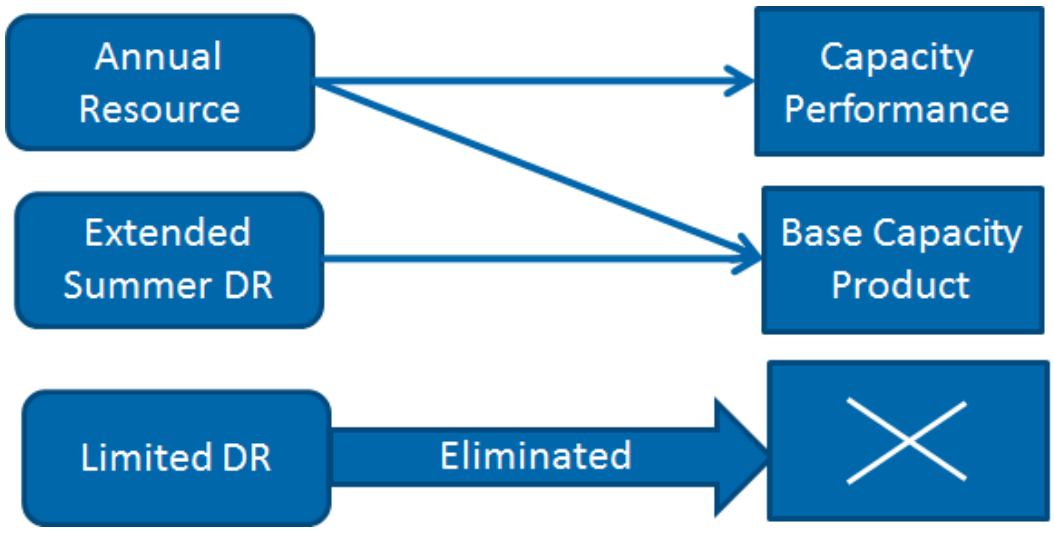
Q. WHAT ARE THE PROPOSED INTERRUPTIBLE LOAD PRODUCTS IF CAPACITY PERFORMANCE (CP) IS APPROVED?

A. If the Capacity Performance proposal is approved, the market products for interruptible load will be configured as follows:

- Base Capacity: The new Base Capacity interruptible load product reflects characteristics of both the Limited and Extended Summer Demand Resource products in that resources are only obligated to perform during the months of June through September (similar to Limited Demand Resources) but are available for an unlimited number of interruptions lasting up to 10 hours each during that period (like Extended Summer Demand Resources). This product will be phased out after the 2019/2020 RPM auction *See proposed RAA, Art. 1, sections 1.2A and 1.13*.
- Capacity Performance: Interruptible loads that clear as Capacity Performance resources may be required to reduce load on any day of the year, for an unlimited number of interruptions between the hours of 10:00am to 10:00pm for the months of June through October and the following May, and 6:00am through 9:00pm for the months of November through April. These are the same general requirements of an Annual Demand Resource, except that load reductions by Annual Demand Resources will no

longer be limited to a maximum of 10 hours in duration (See Exhibit 1). *See proposed RAA, Art. I, section 1.1A*.

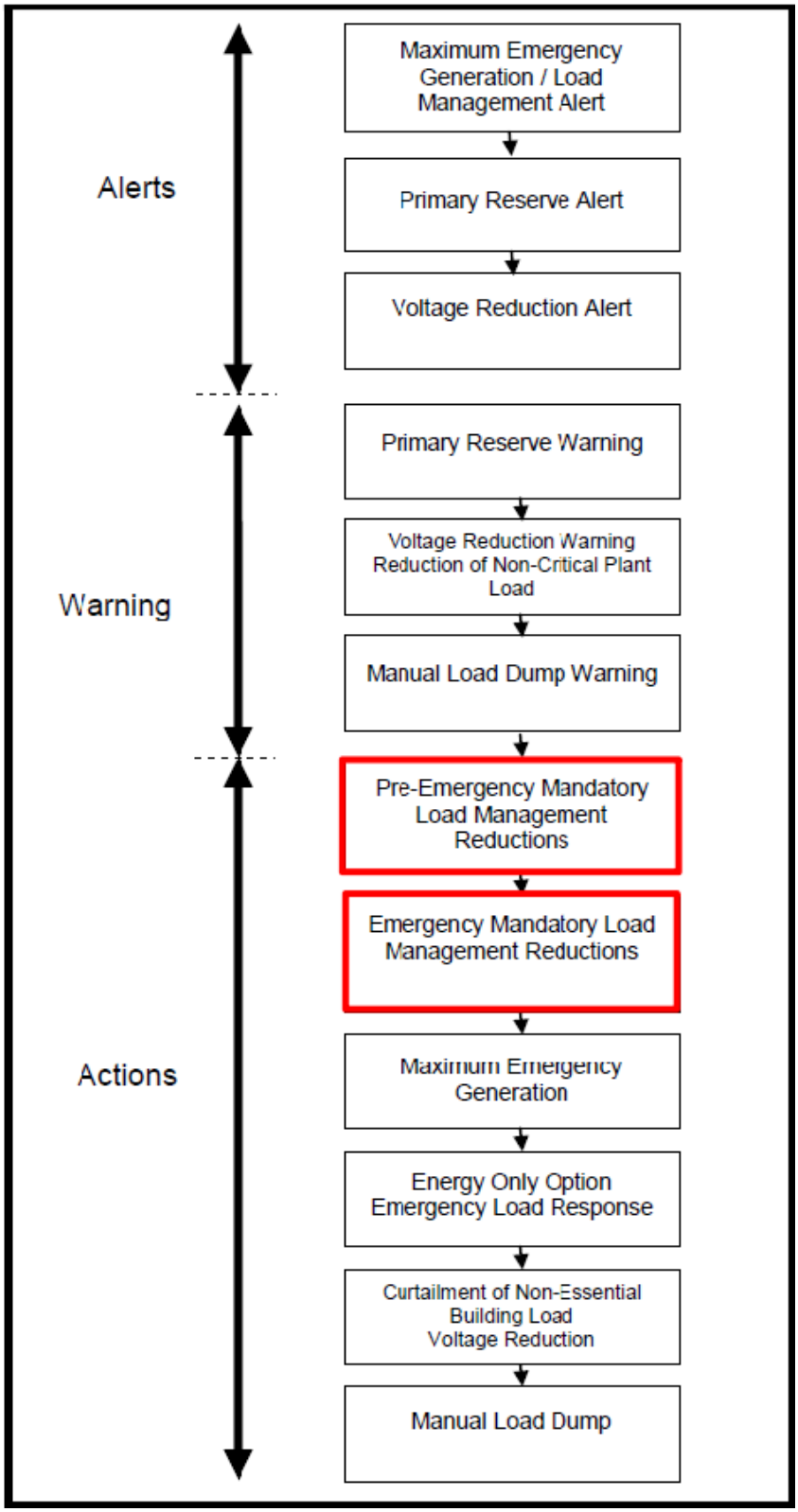
Exhibit 1: Treatment of Demand Response (DR) – CP Filing



Q. WHAT PROVISIONS EXIST FOR INTERRUPTIBLE LOAD TO RESPOND TO MANDATORY LOAD REDUCTIONS?

A. Per PJM's Emergency Operations Manual, the RTO has established procedures for facilitating utilization of Demand Resources in response to emergencies. These actions take place in response to Pre-Emergency Load Management Reduction Actions or Emergency Mandatory Load Management Reduction Actions. These actions are applicable to any site registered in the PJM Demand Response program as a demand resource (a.k.a. DR) type. These resources are required to perform within 30 minutes of notification, unless a resource has a physical limitation preventing it from doing so (in which case either a 60- or 120- minute notification time may apply). Their dispatch is subject to a minimum dispatch duration of one hour during these actions and the reductions are mandatory when dispatched during the product availability windows described above.

Exhibit 2: PJM Emergency Levels



Q. DOES DISPATCH DURING NON-EMERGENCY CONDITIONS (I.E. ECONOMIC CONDITIONS) REPRESENT A SIGNIFICANT ROLE FOR THE PRE-*EPSA V. FERC* SET OF DEMAND SIDE RESOURCES IN PJM?

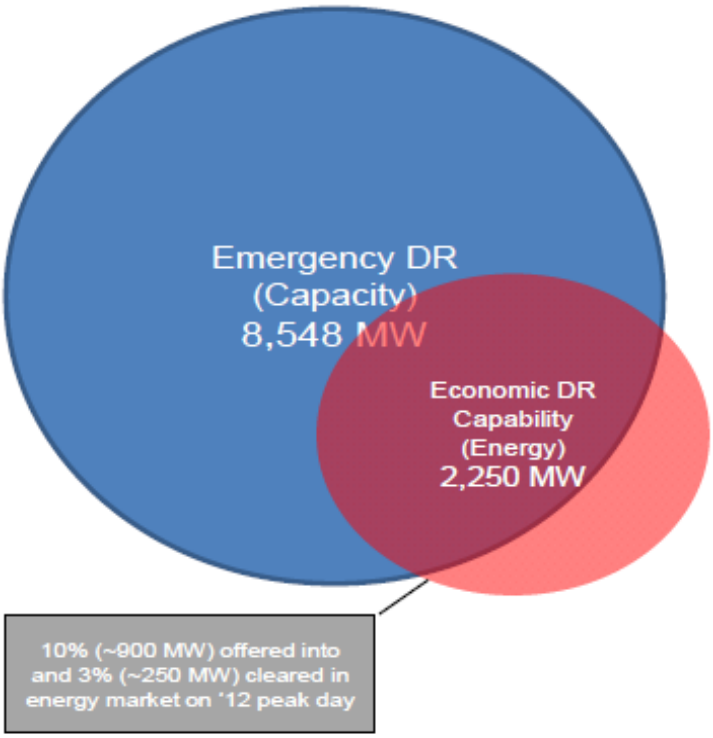
A. No. According to PJM:

"Participation of Demand Resources in the energy and ancillary service markets as economic Demand Resources has been minimal. The low participation level means PJM does not have available to it Demand Resources as part of the normal economic dispatch process until it initiates Emergency procedures."[3]

"In the 2012/2013 Delivery Year, only 2,250 MW of Demand Resources were registered as Economic Load Response resources and had the potential to offer into the energy market, while 8,548 MW of Emergency Load Response resources were registered. In other words, only approximately 25% of Emergency Load Response MWs took the additional step to register as Economic Load Response resources to enable such resources to participate in the energy market on a voluntary basis. Further, only 10% of Emergency Load Response MWs that were also registered as Economic Load Response MWs submitted valid offers into the Energy market on the peak day, and only 3% of such MWs were actually deployed based on economics during the peak day."[4]

[3] PJM Interconnection L.L.C., Docket No. ER14-822-000, p3
[4] PJM Interconnection L.L.C., Docket No. ER14-822-000, p4

Exhibit 3: Registration of DR Resources in PJM for the 2012/2013 Delivery Year



Source: PJM [5]

Q. ARE THERE ANY OTHER EXISTING PJM INTERRUPTIBLE LOAD PROGRAMS?

A. Yes, there is the Price Responsive Demand (PRD) program. Unlike the DR products in PJM discussed above, PRD is not treated as a supply resource in the markets. Instead, PRD decreases the demand in PJM's markets. The other Pre-*EPSA v. FERC* interruptible load products are modeled in the PJM systems and compensated as if they represent supply of additional energy to the grid. In contrast, PRD is modeled as a predictable change in the quantity of electricity consumed once the wholesale market price reaches an indicated level: as wholesale prices rise, consumption would decrease, and conversely, as prices fall, consumption would increase. The result is a reduced cost to the market participant as a result of either less energy consumed or shifting consumption to lower-priced periods, as opposed to supply-side interruptible load products where an explicit payment is made to the participant for energy reductions as

[5] PJM Interconnection L.L.C., Docket No. ER14-822-000, p4

if energy was supplied to the grid. This distinction is important, as it helps develop a more accurate picture of supply and demand conditions through which system operators can manage the grid.

This PRD option has unique and distinct eligibility requirements. To be eligible, the price responsive demand must be:

- served under a dynamic retail rate structure with a Load Serving Entity (LSE) or subject to a contractual arrangement with a PRD Provider for which any compensation:
  - changes as frequently as on an hourly basis,
  - is linked to the PJM real-time energy market clearing price at the physical location on the transmission system nearest the customer, and
  - results in a reasonably predictable response to varying wholesale electricity prices;

- subject to supervisory control such that by direct action or other automated trigger the committed demand reduction may be achieved – if not already accomplished through response to price – should PJM declare an emergency system operations condition and energy prices have risen to the level at which PRD has committed to reduce consumption; and

- subject to advanced metering technology capable of recording electricity consumption at an interval of one hour or less.

Q. DOES PRD COUNT AS A REDUCTION IN DEMAND FOR THE PURPOSES OF THE CAPACITY MARKETS?

A. Yes.

Q. CAN MARKET PARTICIPANTS PARTICIPATE IN THE OTHER PROGRAMS?

A. Yes. In the pre-*EPSA v. FERC* market, market participants were able to offer Demand Response as a supply resource in the PJM capacity and energy markets, and PRD

represented an additional option for Demand Response participation in PJM's wholesale markets.

Q. WHAT WAS PJM'S GOAL IN ESTABLISHING PRD?

A. PJM established PRD to support the long-term evolution of the PJM markets. The key design goal was to facilitate the development of more direct customer response to high priced hours throughout the year. Ultimately, PJM intended PRD to bridge the informational and structural gap between wholesale and retail markets, while aligning the market and system conditions to ensure reliable grid operations, transmission planning, and capacity adequacy planning. As noted above:

> *PJM's long-term vision is that "Price Responsive Demand", which allows more customers to respond directly to market prices and to voluntarily reduce their consumption when wholesale prices rise, is the ultimate solution to demand participation. The development of Smart Grid technologies promises to spread transparency to new levels through advanced metering devices that display electricity prices at every moment directly to end use customers. These technologies, coupled with innovative retail rate structures will enable electricity users to see and voluntarily react to prices in an automated fashion.*[6]

Q. WHAT HAS BEEN THE RESULT OF OFFERING PRD?

A. There has not been any PRD committed in the PJM capacity market through the Base Residual Auction for the 2017/2018 Delivery Year held in May 2014.[7] The PJM Independent Market Monitor (IMM) has concluded that this lack of participation stems from the fact that the Pre-*EPSA v. FERC* DR programs other than the PRD program have artificial incentives embedded in them that have prevented use of PRD. The PJM IMM states:

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[6] Cited above in Executive summary. *Statement of Terry Boston, President and CEO, on behalf of the PJM Board of Managers Demand Response in the PJM Markets, June 26, 2009, available at: http://pjm.com/~/media/committees-groups/committees/mic/20100722/20100722-item-02b-statement-on-demand-response-in-the-pjm-markets.ashx*

[7] PJM Interconnection, L.L.C., Docket No. ER11-4628-000, filed July 22, 2014, page 4

"*This lack of participation is due primarily to the fact that the design of PRD is better than the design of existing demand side programs. The design of the other demand side programs makes them artificially attractive. PRD, by design, includes stronger compliance requirements and more limited aggregation opportunities across nodes. These requirements are necessary for PRD to act as effective, node specific price responsive demand in PJM's capacity and energy markets."*[8]

IV. RECENT AND PROPOSED CHANGES IN PJM MARKETS – SELECTED CHANGES RELEVANT TO INTERRUPTIBLE LOAD PRODUCTS

Q. WHAT IS THE CAPACITY PERFORMANCE PROPOSAL?

A. On December 12, 2014, PJM proposed a new product to address performance problems with capacity resources.[9] Under the proposal, starting with the 2016/2017 capacity period, PJM will introduce the Capacity Performance product which will result in higher flexibility requirements (less than one hour notification time, maximum 12 hours start-up times) and penalties for underperformance or credits for over-performance during compliance hours. For the next 2 upcoming auctions (2018/2019 and 2019/2020), i.e. for the next 5.5 years, PJM ISO will maintain an enhanced version of the existing Annual Capacity Product, the Base Capacity product. PJM will eliminate the Base Capacity product and will procure all its requirements through the CP product starting with the 2020/2021 auction.

Q. WHAT ARE THE PERFORMANCE PENALTIES UNDER THE CP PRODUCT?

A. PJM defines compliance hours (i.e. hours when the performance of the resource will be evaluated for penalties or credits) as the hours when PJM declares an emergency action (i.e. voltage reduction or manual load dump warnings or actions). PJM ISO proposes to

[8] From the PJM IMM's report assessing the performance and effects of Price Responsive Demand (PRD) in PJM's markets: Monitoring Analytics, "Price Responsive Demand" July 2014, Page 5
[9] Filed with FERC (ER15-623-000) December 12, 2014

assume 30 compliance hours for upcoming capacity periods. Performance Payment Rates (PPR) are penalties or rewards rates expressed in $/MWh, reflecting the applicable Net CONE normalized over the compliance hours. With PJM RTO's Net CONE at $300.57/MW-day (UCAP) for the 2018/2019 capacity period,[10] PPR will be at $3,657/MWh (300.57 * 365 /30).

Q. WHAT IS SIGNIFICANT ABOUT PERFORMANCE PENALTIES?

A. The performance penalties applied to the difference between the capacity cleared in the capacity markets and the capacity that is actually supplied are high: $3,657/MWh. This is part of a trend to appropriately apply high $/MWh price signals to the marketplace during periods with the greatest need for supply. In light of the high value that typical customers ascribe to the reliability of power, strong price signals that value performance are a necessary predicate for achieving reliability.

Q. ARE THERE OTHER EXAMPLES OF INCREASING $/MWH PRICE SIGNALS?

A. Yes, there are two that I want to identify.

First, PJM has been increasing the maximum price in its energy markets. As of June 2015, the maximum PJM energy market price will reach $2,700/MWh.[11] In some circumstances, failure to provide energy could cause suppliers to lose the $2,700/MWh price as well as suffer the $3,657/MWh penalty — a substantial potential loss.

Second, ISO-NE has approved penalty rate adders in its market that reach approximately $5,455/MWh by the 2024/2025 delivery year.[12]

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[10] PJM 2018/2019 RPM Base Residual Auction Planning Period Parameters, February 6, 2015

[11] PJM Manual 11: Energy & Ancillary Services Market Operations Revision 72, Effective Date January 16, 2015, Page 14

[12] The Pay for Performance Initiative, which was approved by FERC on May 30, 2014, (ER14-1050-000; EL14-52-000) and will be active starting on June 1, 2018 specifies performance payment rates increasing over time from $2,000/MWh in 2018/2019 to $5,455/MWh starting in 2024/2025. Under scarcity conditions, LMP prices are modified to include an administrative price adder known as Reserve Constrained Penalty Factor (RCPF). Starting on June 1, 2018 RCPF's will further increase from $500/MWh to $1,000/MWh for shortages in 30-minute reserves and from $850/MWh to $1,500/MWh for shortages in 10-minute reserves. Therefore, in the PI regime, a plant that under-performs during a shortage event

Q. WHAT IS THE STOP GAP PROPOSAL?

A. The stop gap proposal[13] attempts to provide for a post *EPSA v FERC*[14] structure for interruptible load. PJM proposes to enable the Load Serving Entities ("LSEs") that provide such load reductions to reduce their PJM capacity obligations and related capacity charges. PJM's proposal includes the following key elements:

- **No Supply Side DR** - Existing terms and conditions of the PJM Tariff and Reliability Assurance Agreement (RAA) for supply-side Demand Resources' participation in future RPM Auctions will be made ineffective, pending a future filing to restore or otherwise address those pre-existing provisions.
- **Wholesale Load Reduction (WLR)** - New provisions in the PJM Tariff and RAA will enable wholesale entities to bid demand-side reductions (interruptible load) in wholesale loads (to be called Wholesale Load Reductions, or "WLR,") into the 2015 Base Residual Auction (BRA) and subsequent BRAs. Such wholesale load reductions will shift the demand curve (Variable Resource Requirement, or VRR) to the left, reducing the amount of capacity PJM will procure in the auction and the price at which the auction will clear, in a manner which ensures that the resulting BRA price reflects wholesale purchasers' choices to reduce their capacity purchases at higher prices.
- **Bidding -** An LSE or other wholesale entity may submit a bid for a Wholesale Load Reduction commitment on its own behalf, or such a bid may be submitted by an agent authorized by state law or bilateral contract to act on the LSE's behalf. Wholesale entities likewise may utilize agents to perform obligations and/or to exercise rights on their behalf under the tariff provisions relating to Wholesale Load Reductions.

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will not only pay capacity penalties, but will also have an opportunity cost in the range of approximately $1000/MWh to $1,500/MWh.

[13] *PJM Interconnection, L.L.C.*, Docket No. ER15-852-000

[14] Electric Power Supply Association v. FERC 753 F.3d 216 (D.C. Cir. 2014). See Amended Complaint of FirstEnergy Service Company, Docket No. EL14-55-000 (filed Sept. 22, 2014).

- **M&V and Charges for Non Performance** - Wholesale Load Reductions accepted in RPM will result in reductions to the PJM capacity obligations and associated charges of the affected LSEs. Committed Wholesale Load Reductions will be subject to measurement and verification ("M&V") requirements, as well as compliance charges for non-performance comparable to those the Commission previously has approved.
- **Switching** - To conform to changes in load-serving responsibility associated with customers in competitive markets that switch LSEs, wholesale entities will be permitted to transfer WLR commitments from one to another, prior to and during the affected Delivery Year including the associated reductions in capacity obligations, M&V obligations, and compliance charge liabilities.

Under this approach, PJM proposes to reduce the capacity obligations of, and thus the capacity charges owed to PJM by, wholesale entities that commit to reduce the wholesale loads they are responsible for serving. PJM's new rules leave it to LSEs, retail customers, and state regulatory authorities to make arrangements regarding compensation to end-use consumers that support Wholesale Load Reductions by reducing their electricity consumption.

Q. WHAT ARE THE PRODUCTS THAT WOULD EXIST?

A. PJM anticipates that the same Pre-*EPSA v. FERC* programs could also exist as WLRs.[15]

[15] The proposed Wholesale Load Reduction product structure mirrors the mechanisms by which demand resources with limited availability clear in RPM. In sections III.B, III.C and V.4 of its Stop Gap proposal (*PJM Interconnection, L.L.C.*, Docket No. ER15-852-000), PJM proposes to use the Pre-*EPSA v. FERC* product structure as a template for the implementation of wholesale load reduction. Both in the case of the Limited and Extended Summer products in "Option A" or to the Base product in "Option B", the mechanisms used to provide a clearing price for these products in RPM under the Pre-*EPSA v. FERC* rules are utilized to determine the "WRL value" which forms the basis for LSE capacity obligation reductions. This in effect retains the structure of the market products and the character of their valuation in the market.

V. ULTIMATE GOAL FOR INTERRUPTIBLE LOAD PRODUCTS

Q. WHAT SHOULD THE ULTIMATE GOAL BE FOR INTERRUPTIBLE LOAD IN PJM?

A. The ultimate goal is to treat interruptible load as a demand side response to prices where loads can either choose to purchase electrical energy at the price in the market or choose not to purchase power.

Q. WHAT ARE THE ADVANTAGES OF THIS APPROACH?

A. The advantages of a market structure based on interruptible load choosing not to consume with energy prices rise to a certain level include:

- **Market Efficiency –** Markets are efficient when consumers can respond directly to proper price signals and exercise choice. By allowing hour by hour choice, efficiency is maximized compared to bundling hours.
- **Builds on $/MWh Pricing Emphasis –** This approach builds on the numerous recent efforts to increase prices in $/MWh to better reflect the value of the power to average consumers during periods of reliability challenges. Some of these developments are described above.

- **Eliminates M&V –** This approach eliminates M&V issues associated with legacy, supply side demand response programs which were fraught with challenges and instead places the focus on measured consumption during high price periods and forecasting load as a function of price and other variables such as consumption patterns. The PJM IMM concludes that the M&V process is challenging (underline added):[16]

[16] Monitoring Analytics, "State of the Market Report for PJM: Volume 2: Detailed Analysis" March 2014

If retail markets reflected hourly wholesale prices and customers received direct savings associated with reducing consumption in response to real-time prices, there would not be a need for a PJM economic load response program, or for extensive measurement and verification protocols.[17]

Load management test results are submitted by CSPs directly to PJM. The test results consist of metered load data provided by the CSP which are compared to a baseline consumption level or firm service level determined by LM participation type. There is no physical or technical oversight or verification by PJM or by the relevant LSE of actual testing. PJM screens the data for unreasonable test results, but relies on the CSP to submit accurate metered load data for the testing period with no verification.

This form of testing is not an adequate measurement and verification protocol to ensure that demand side capacity resources can reliably reduce during a system emergency. Given prior warning of a test event, customers have time to prepare to drop load, unlike in a real emergency event in which a customer will only have one to two hours' notice before an event begins. Customers can test on any day in the summer period between the hours of 1200 (EPT) and 2000 (EPT). The baseline day must occur within the limited demand response resource window of June 1 to October 1 to establish comparability between the baseline day and test day.

The MMU recommends that the testing program be modified to require verification of test methods and results. Tests should be initiated by PJM without prior scheduling by CSPs in order to more accurately model demand response during an emergency event[18]*.*

- **Simplification and Minimization of Errors –** Simplification of the treatment of interruptible load to a single demand program focused solely in the energy markets and not on capacity markets minimizes the potential for inadvertent error created by complex overlapping programs. I elaborate on the general principle of administrative simplicity below by providing an example related to interruptible load in PJM markets.

[17] Ibid., Page 198
[18] Ibid., Page 210

- **Builds on Advanced Metering Infrastructure (AMI) Penetration –** This approach builds on the growing availability of AMI and the potential for third party control of loads.
- **Better Physical Efficiency –** By converting zonal to nodal interruptible load, there is a more specific and localized relationship between the price signal and the choice, enhancing efficiency. Pre-*EPSA v. FERC* interruptible load programs were mostly zonal. As noted, converting to hourly from annual choice also improves efficiency.
- **Eliminates the Need for Additional Changes to Ensure Compatibility with Generation -** This approach would eliminate the need for other changes in existing programs to make their treatment of interruptible load comparable to generation supply. It is important to have the same requirements for interruptible load and generation supply, because to the extent that these programs have previously failed to align on treatment they have given artificial incentives for interruptible load. By eliminating the disparity and applying the correct treatment of interruptible load, market changes are achieved more efficiently. The challenges of having generation and demand response competing directly as supply side resources have been well-articulated by the PJM IMM:

> *If demand resources are to continue competing directly with generation capacity resources in the PJM Capacity Market, the product must be defined such that it can actually serve as a substitute for generation. That is a prerequisite to a functional market design.*
>
> *In order to be a substitute for generation, demand resources should be defined in PJM rules as an economic resource, as generation is defined. Demand resources should be required to offer in the day-ahead market and should be called when the resources are required and prior to the declaration of an emergency. Demand resources should be available for every hour of the year and not be limited to a small number of hours.*
>
> *In order to be a substitute for generation, demand resources should provide a nodal location and should be dispatched nodally to enhance the effectiveness of demand resources and to permit the efficient functioning*

of the energy market. In order to be a substitute for generation, compliance by demand resources to PJM dispatch should include both increases and decreases in load. The current method applied by PJM simply ignores increases in load.[19]

Q. PLEASE ELABORATE ON ADMINISTRATIVE EFFICIENCY AND MINIMIZING ERRORS.

A. The implementation of the legacy Demand Response products has been accompanied by repeated changes and cases of inadvertent problems due to the complexity and number of programs. For example, on November 29, 2013, PJM filed to correct an inadvertent error with large consequences introduced during a major revision to the treatment of DR in 2011. The point is not that PJM or the process is expected to be perfect, but rather that the complexity of the DR treatment increases the likelihood of serious error and unintended consequences, and stakeholders all need to work to help the process perform properly by eliminating, where practical, complexities and administrative challenges. The November 29, 2013, filing is an important warning of the problem, and hence, some quotation of the material in the filing is useful (underlines added, bold is emphasis in the original):

PJM Interconnection, L.L.C. ("PJM"), pursuant to section 205 of the Federal Power Act ("FPA"), 16 U.S.C. § 824d, hereby submits revisions to the PJM Open Access Transmission Tariff ("Tariff") and the Reliability Assurance Agreement Among Load Serving Entities in the PJM Region ("RAA") <u>to correct</u> an aspect of 2011 changes to the Reliability Pricing Model ("RPM") that, by setting minimum requirements for the highest availability capacity product, <u>has unintended adverse implications for the PJM Region's long-term ability to procure the quantities of that product needed to assure reliability.</u>[20]

Ironically, under the current rules, a price premium for Annual Resources ***is a sure sign that the resulting price signal is being suppressed*** *(emphasis in original), because it is an unerring indication that the auction algorithm is preferentially clearing lower-cost, lower availability products for the region's capacity needs between the vertical line at the*

[19] Monitoring Analytics, "State of the Market Report for PJM: Volume 2: Detailed Analysis" March 2014, Page 198

[20] PJM Interconnection, L.L.C., Docket No. ER14-504-000, Page 1

minimum requirement for Annual Resources and the total cleared capacity quantity at the Commission-approved sloped demand curve.[21]

As a result, PJM has inadvertently established a vertical demand curve at the minimum requirement for Annual Resources, which interjects itself at least every time Annual Resources get a price premium, and makes it far less likely that Annual Resource offers will intersect with, and be valued by, the sloped demand curve. The same unfortunate consequence will arise at least every time the intermediate product, known as Extended Summer Demand Resources ("Extended Summer DR"), earns a price premium above the lowest-availability product, known as Limited Demand Resources ("Limited DR").[22]

PJM presents with this filing the affidavit of Professor Benjamin F. Hobbs who provided critical theoretical support at the initiation of RPM for the sloped demand curve that RPM still uses today. He now confirms that PJM has indeed reintroduced a vertical demand curve, and that the new vertical curve will yield much lower reliability at higher cost than if PJM modified the rules to ensure that Annual Resources could again significantly interact with the sloped demand curve.[23]

VI. PRD IS PREFERRED TO WLR

Q. WHY DO YOU RECOMMEND THE PRD RATHER THAN THE PROPOSED WLR?

A. FERC should look to PJM's existing Price Responsive Demand ("PRD") program for interruptible load as a preferred path forward and not create and adopt a new Wholesale Load Reduction ("WLR") program as suggested by the Stop-gap filing. The advantages of the already approved PRD program over the proposed WLR proposal include:

[21] Ibid. Page 2
[22] Ibid. Page 3
[23] Ibid. Page 3

(1) Less potential for market distortions from making interruptible load artificially attractive. WLR allows existing programs with these distorting features to remain part of the post-*EPSA v FERC* arrangements whereas adopting PRD will not;

(2) Greater reliance on existing parts of the tariff. PRD already exists, and hence, avoids some of the significant changes and complexities associated with the new WLR program. It is available to allow PJM to act quickly in a dynamic, challenging, and uncertain regulatory and legal environment;

(3) Greater administrative simplicity from fewer and less complex programs and therefore less chance for the types of errors that have occurred in the context of interruptible load programs to date;

(4) Greater efficiency associated with more accurate price signals, including hour by hour and node by node pricing. This switch will create more efficient and competitive markets, and builds on several recent pricing changes which emphasize high $/MWh prices when the grid faces challenging circumstances;

(5) Greater compatibility with the growing availability of automated interval metering and technology for efficient price sensitive control of loads by consumers and their agents; and

(6) Better opportunities for further improvements such as replacing Measurement and Verification (M&V) with forecasting of the peak load to account for prices and customer response.

Therefore PRD is better for moving in the direction of a more complete solution to the market problems associated with interruptible load. The ultimate goal of a program for managing interruptible load is to take full advantage of improvements in the energy markets to provide customers with proper price signals upon which to base their choice to consume electrical energy at a given price or decline to do so and decrease their costs. I also recommend PRD over WLR because WLR maintains multiple programs, which increases complexity and implementation risk, and more importantly, it maintains

programs that have significant shortcomings. Furthermore, PJM's Stop Gap proposal misses an opportunity to move more directly to the ultimate goal I recommend and describe above.

Q. IS THIS CONSISTENT WITH THE INTENT BEHIND PRD?

A. Yes. For example as the PJM IMM states in its assessment of the performance and effects of Price Responsive Demand (PRD) in PJM's markets:

> *"PRD is a better approach than PJM's other demand response programs. In PRD, load resources see, respond to and benefit at the nodal level from a response to wholesale market price signals rather than receiving side payments. PJM's Economic Load Response program, for example, provides payment for energy reductions based on the zonal, rather than nodal, wholesale energy prices at the time of declared reductions in load, where declared reductions are measured against customer base line consumption levels that have significant measurement issues. PJM's Emergency Demand Response program allows participating load resources to sell in the ability to reduce load by specified MW amounts in times of declared emergencies as capacity supply MW in PJM's capacity market. These MW are treated as supply although they are reductions in demand. Under the PRD program, MW of demand reduction are appropriately treated as demand."* [24]
>
> *"The nodal nature of the PRD response also means that PRD resources have system operation and reliability advantages over demand side resources participating in PJM's other demand response program. Unlike PRD, the location of demand response is not known by PJM in the operational day. While Emergency Demand Response resources are dispatchable, they respond on a zonal (or super zonal) basis, not on a nodal basis, and require at least a thirty minute notice under recent changes, rather than the near instant response required of PRD."* [25]
>
> *"Properly revised, PJM's PRD program would allow end use customers, without intermediaries, to see, react to and receive the direct benefits or costs of changes in real- time energy use and capacity requirements, thereby providing a vehicle*

[24] Monitoring Analytics, "Price Responsive Demand" July 2014, Page 4
[25] Ibid.

for effective demand side participation by customers in PJM's markets. The PRD program would provide an effective replacement for PJM's current DR programs with their critical design weaknesses. In the PRD program, participating LSEs should be required to pass on all the energy and capacity market savings, costs and penalties associated with PRD resources directly to the end use customer that is providing the PRD resource."[26]

Q. WHAT CHANGES TO PRD WOULD FURTHER IMPROVE IT?

A. PJM may require time to hone its forecasting treatment of demand, and hence, it might be useful to have demand reductions be temporarily counted toward an LSE's capacity obligation to facilitate reliability. However, PRD should ultimately be changed to eliminate the M&V process and the only nexus between interruptible load and capacity requirements should be via the forecast impacts on the LSE's expected peak load. Further, there might be additional adjustments to energy pricing during peak periods (e.g. adjustments to ensure that during reliability emergencies energy prices reflect the value of lost load to consumers affected by load shedding) or enhanced PJM information provision (e.g. enhanced warnings by PJM that very high prices are expected).

VII. CONCLUSIONS

Q. WHAT ARE YOUR CONCLUSIONS?

A. It is critical that interruptible load be treated properly given the importance of reliability to the grid and in light of the challenges that the PJM system has experienced over the last year and a half. PJM should move forward with the existing PRD program and not create and pursue the novel and flawed WLR proposal. Among its many problems, WLR provides for a continuation of the multiple product structure for demand resources that plagued the legacy supply side demand response program. Also, the treatment of interruptible load mirrors that of the Pre-*EPSA v. FERC* market, and thus, WLR

[26] Ibid., Page 5

represents a missed opportunity to eliminate artificial incentives that prevent the full realization of the PRD or similar structures and to avoid some of the complexity that has been attendant to the program thus far. Furthermore it is a lost opportunity to remove inefficient price signals, and instead utilize hour by hour and node by node pricing.

PJM should instead leverage PRD, which provides $/MWh price signals to load and creates the opportunity to implement modifications over time to eliminate M&V and limit impacts on capacity markets to forecast decreases in peak demand. PRD appears to anticipate changes in the energy market during pre-emergency and emergency conditions, during which the energy price is allowed to more closely reflect scarcity conditions, facilitating a market signal that takes into account resource adequacy. The important opportunity to utilize this existing structure should not be missed.

In sum, I recommend a more efficient, simplified and transparent structure that would allow for a more effective treatment of this valuable component of markets and avoid the types of implementation errors that have plagued interruptible load thus far.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)	**Docket No. ER15-852-000**

AFFIDAVIT OF JUDAH L. ROSE

County of Fairfax	)	
	)	ss:
Commonwealth of Virginia	)	

I, the undersigned, being duly sworn, depose and say that the foregoing is the "Affidavit of Judah L. Rose on Behalf of PJM Power Providers Group," and that such Affidavit to the best of my knowledge, information and belief, is true, correct, accurate and complete, and I hereby adopt this Affidavit as if given by me in formal hearing, under oath.

Subscribed and sworn before me on this 13th day of February, 2015.

Judah L. Rose

Julia M. Kayne, Notary Public

My Commission Expires: January 31, 2018

JULIA M. KAYNE
NOTARY PUBLIC
COMMONWEALTH OF VIRGINIA
#7505652
COMMISSION EXPIRES
01/31/2018

Attachment A

Judah L. Rose Resume

Judah L. Rose

ICF International

Senior Vice President, Managing Director

EXPERIENCE OVERVIEW

Accomplishment Highlights

- 35 years of experience in the energy industry
- Testimony in over 128 instances in scores of state, federal, international, and other legal proceedings
- Frequent counselor on restructuring and financing of new and existing power plants

Education

- M.P.P., John F. Kennedy School of Government, Harvard University, 1982
- S.B., Economics, Massachusetts Institute of Technology, 1979

Judah L. Rose joined ICF in 1982 and currently serves as a Managing Director of ICF International. He directs ICF's Wholesale Power practice and co-chairs its Energy Advisory and Solution Line of Business. Mr. Rose has approximately 35 years of experience in the energy industry including in electricity generation, fuels, environmental compliance, planning, finance, forecasting, and transmission. His clients include electric utilities, financial institutions, law firms, government agencies, fuel companies, and Independent Power Producers. Mr. Rose is one of ICF's Distinguished Consultants, an honorary title given to three of ICF's 5,000 employees, and has served on the Board of Directors of ICF International as the Management Shareholder Representative.

Mr. Rose frequently provides expert testimony and litigation support. He has provided testimony in over 128 instances in scores of state, federal, international, and other legal proceedings. Mr. Rose has testified in over 24 states and provinces, at the Federal Energy Regulatory Commission, in numerous court settings and internationally.

Mr. Rose has supported the financing of tens of billion dollars of new and existing power plants and is a frequent counselor to the financial community in restructuring and financing.

Mr. Rose has also addressed approximately 100 major energy conferences, authored numerous articles published in Public Utilities Fortnightly, the Electricity Journal, Project Finance International, and written numerous company studies. He has also appeared in TV interviews.

SELECTED PRESS INTERVIEWS

Television

- "The Most With Allison Stewart," MSNBC, "Blackouts in NY and St. Louis & ongoing Energy Challenges in the Nation," July 25, 2006
- CNBC Wake-Up Call, August 15, 2003
- Wall Street Journal Report, July 25, 1999
- Back to Business, CNBC, September 7, 1999

Journals:
- Electricity Journal
- Energy Buyer Magazine
- Public Utilities Fortnightly
- Power Markets Week

Magazines:
- Business Week
- Power Economics
- Costco Connection

Newspapers:
- Denver Post
- Rocky Mountain News
- Financial Times Energy
- LA Times
- Arkansas Democratic Gazette
- Galveston Daily News
- The Times-Picayune
- Pittsburgh Post-Gazette
- Power Markets Week

Wires:
- Associated Press
- Bridge News
- Dow Jones Newswires

TESTIMONY

128. Damages Testimony on behalf of Duke Energy Indiana, Inc. Plaintiff v. Cause No. 1:13-cv-1984-SEB/TAB, Benton County Wind Farm LLC, January 5, 2015.

127. Responsive Testimony of Judah L. Rose on Behalf of Oklahoma Energy Results, LLC December 16, 2014, CAUSE NO. PUD 201400229

126. Rebuttal Testimony on behalf of Duke Energy Indiana, Inc. Plaintiff v. Cause No. 1:13-cv-1984-SEB/TAB, Benton County Wind Farm LLC, November 26, 2014.

125. Statement of Opinions on behalf of Duke Energy Indiana, Inc. Plaintiff v. Cause No. 1:13-cv-1984-SEB/TAB, Benton County Wind Farm LLC, October 30, 2014.

124. Direct Testimony, CO_2 price forecasts provided to IPL for use in their compliance analysis, as well as, support for the probabilities assigned to the Coal Combustion Residuals ("CCR"), 316 (b) and Effluent Limitation Guidelines ("ELG") regulations for use in IPL analysis in support of their Compliance Project, Indianapolis Power & Light Company, IURC Cause No. 44540, October 14, 2014.

123. Direct Testimony, Support for an Electric Security Plan Filing, Ohio Edison Company (FirstEnergy), August 4, 2014.

122. Rebuttal Testimony, Valuation of Mad River Power Plant, FirstEnergy, February 27, 2014.

121. Expert Report, Computation of Future Damages, Breach of Wolf Run Coal Sales Agreement, prepared for Meyer, Unkovic, and Scott, LLP, filed February 12, 2014.

120. Supplemental Direct Testimony of Judah Rose on behalf of National Grid and Northeast Utilities, Petition of New England Power Company d/b/a/ National Grid for Approval to Construct and Operate a New 345 kV Transmission Line and to Modify an Existing Switching Station Pursuant to G.L. c. 164, § 69J, August 8, 2013.

119. Rebuttal Testimony of Judah Rose on Behalf of Monongahela Power Company, The Potomac Edison Company, Petition for Approval of a Generation Resource Transaction and Related Relief, Case No. 12-1571 – E – PC, May 17, 2013.

118. Direct Testimony of Judah Rose on behalf of New England Power Company d/b/a National Grid before the Commonwealth Of Massachusetts Energy Facilities Siting Board and Department Of Public Utilities, Petition of New England Power Company d/b/a National Grid for Approval to Construct and Operate a New 345kV Transmission Line and to Modify an Existing Switching Station Pursuant to G.L. c. 164, § 69, Docket EFSB 12-1/D.P.U. 12-46/47, November 21, 2012.

117. Direct Testimony for the Narragansett Electric Company d/b/a National Grid (Interstate Reliability Project), Before the State of Rhode Island Public Utilities Commission, Energy Facility Siting Board ("Siting Board") Notice of Designation to Public Utilities Commission ("PUC") to Render an Advisory Opinion on need and cost-justification for Narragansett Electric d/b/a National Grid's proposal to construct and alter major energy facilities in RI, the "Interstate Reliability Project", RIPUC Docket No. 4360, November 21, 2012

116. Sur-Surrebuttal Testimony, In the Matter of Southwestern Electric Power Company's Petition for a Declaratory Order Finding That Installation of Environmental Controls at the Flint Creek Power Plant is in the Public Interest, Docket No. 12-008-U, September 21, 2012.

115. Rebuttal Testimony, In the Matter of Southwestern Electric Power Company's Petition for a Declaratory Order Finding That Installation of Environmental Controls at the Flint Creek Power Plant is in the Public Interest, Docket No. 12-008-U, July 30, 2012.

114. Direct Testimony, The Connecticut Light & Power Company, Application for a Certificate of Environmental Compatibility and Public Need for the Connecticut Portion of the Interstate Reliability Project that traverses the municipalities of Lebanon, Columbia, Coventry, Mansfield, Chaplin, Hampton, Brooklyn, Pomfret, Killingly, Putnam, Thompson, and Windham, which consists of (a) new overhead 345-kV electric transmission lines and associated facilities extending between CL&P's Card Street Substation in the Town of

Lebanon, Lake Road Switching Station in the Town of Killingly, and the Connecticut/Rhode Island border in the Town of Thompson; and (b) related additions at CL&P's existing Card Street Substation, Lake Road Switching Station, and Killingly Substation, Docket No. 424, July 17, 2012.

113. Direct Testimony, Southwestern Electric Power Company, In the Matter of Southwestern Electric Power Company's Petition for a Declaratory Order Finding That Installation of Environmental Controls at the Flint Creek Power Plant is in the Public Interest, Docket No. 12-008-U, February 9, 2012.

112. Rebuttal Testimony, Otter Tail Power Company, Before the Office of administrative Hearings, for the Minnesota Public Utilities Commission, In The Matter of Otter Tail Power Company's Petition for an Advance Determination of Prudence for its Big Stone Air Quality Control System Project, September 7, 2011.

111. Rebuttal Testimony, on behalf of Arizona Public Service, In the Matter of the Application of Arizona Public Service Company for Authorization for the Purchase of Generating Assets from Southern California Edison, and for an Accounting Order, Docket No. E-01345A-10-0474, June 22, 2011.

110. Direct Testimony, Duke Energy Ohio, Inc., Application of Duke Energy Ohio for Authority to Establish a Standard Service Offer Pursuant to Section 4928.143, Revised Code, in the Form of an Electric Security Plan, Accounting Modifications and Tariffs for Generation Service, Case No. 11-XXXX-EL-SSO. Application of Duke Energy Ohio for Authority to Amend its Certified Supplier Tariff, P.U.C.O. No. 20. Case No. 11-XXXX-EL-ATA. Application of Duke Energy Ohio for Authority to Amend its Corporate Separation Plan. Case No. 11-XXXX-EL-UNC, June 20, 2011.

109. Direct Testimony, Manitoba Hydro Power Sales Contracting Strategy, U.S. Power Markets, Manitoba Hydro Drought Risks, Modeling, Forecasting and Planning, Selected Risk and Financial Issues, Governance, Trading and Risk Related Comments Before the Public Utilities Board of Manitoba, February 22, 2011.

108. Surrebuttal Testimony – Revenue Requirement of Judah Rose on Behalf of Dogwood Energy, LLC, In the Matter of the Application of KCP&L Greater Missouri Operations Company for Approval to Make Certain Changes to its Charges for Electric Service, Case No. ER-2010-0356, January 12, 2011.

107. Rebuttal Report Concerning Coal Price Forecast for the Harrison Generation Facility, Meyer, Unkovic and Scott, LLP, filed December 6, 2010.

106. Direct Testimony of Judah Rose on behalf of Duke Energy Ohio In the Matter of the Application of Duke Energy Ohio for Approval of a Market Rate Offer to Conduct a Competitive Bidding Process for Standard Service Offer Electric Generation Supply,

Accounting Modifications, and Tariffs for Generation Service, Case No. 10-2586-EL-SSO, filed November 15, 2010.

105. Updated Forecast, Coal Price Report for the Harrison Generation Facility, Meyer, Unkovic and Scott, LLP, filed October 18, 2010.

104. Declaration of Judah Rose in re: Boston Generating LLC, et al., Chapter 11, Case No. 10-14419 (SCC) Jointly Administered, September 29, 2010.

103. Declaration of Judah Rose in re: Boston Generating LLC, et al., Chapter 11, Case No. 10-14419 (SCC) Jointly Administered, September 16, 2010.

102. Direct Testimony of Judah Rose on behalf of Plains and Eastern Clean Line LLC, in the Matter of the Application of Plains and Eastern Clean Line Oklahoma LLC to conduct Business as an Electric Utility in the State of Oklahoma, Cause No.PUD 201000075, July 16, 2010.

101. Direct Testimony of Judah Rose on behalf of Plains and Eastern Clean Line LLC, in the Matter of the Application of Plains and Eastern Clean Line LLC for a Certificate of Public Convenience and Necessity to Operate as an Electric Transmission Public Utility in the State of Arkansas, Docket No. 10-041-U, June 4, 2010.

100. Supplemental Testimony on Behalf of Entergy Arkansas, Inc., In the Matter of Entergy Arkansas, Inc., Request for a Declaratory Order Approving the Addition of the Environmental Controls Project at the White Bluff Steam Electric Station Near Redfield, Arkansas, Docket No. 09-024-U, July 6, 2009.

99. Rebuttal Testimony on Behalf of TransEnergie, Canada, Province of Quebec, District of Montreal, No.: R-3669-2008-Phase 2, FERC Order 890 and Transmission Planning, July 3, 2009.

98. Surrebuttal Testimony – Revenue Requirement of Judah Rose on Behalf of Dogwood Energy, LLC, before the Missouri Public Service Commission, In the Matter of the Application of KCP&L GMO, Inc. d/b/a KCP&L Greater Missouri Operations Company for Approval to Make Certain Changes to its Charges for Electric Service, Case No. ER-2009-0090, April 9, 2009.

97. Hawaii Structural Ironworkers Pension Trust Fund v. Calpine Corporation, Case No. 1-04-CV-021465, Assessment of Calpine's April 2002 Earnings Projections, March 25, 2009.

96. Coal Price Report for Harrison Coal Plant, Allegheny Energy Supply Company, LLS and Monongahela Power Company versus Wolf Run Mining Company, Anker Coal Group, etc., Civil Action. No. GD-06-30514, In the Court of Common Pleas, Allegheny County, Pennsylvania, February 6, 2009.

95. Supplemental Direct Testimony of Judah Rose, on behalf of Southwestern Electric Power Company, In the Matter of the Application of Southwestern Electric Power Company for Authority to Construct a Natural-Gas Fired Combined Cycle Intermediate Generating Facility in the State of Louisiana, Docket No. 06-120-U, December 9, 2008.

94. Rebuttal Testimony of Judah Rose on behalf of Kelson Transmission Company, LLC re: Application of Kelson Transmission Company, LLC For A Certificate of Convenience and Necessity For the Amended Proposed Canal To Deweyville 345 kV Transmission Line Within Chambers, Hardin, Jasper, Jefferson, Liberty, Newton, And Orange Counties, SOAH Docket No. 473-08-3341, PUCT Docket No. 34611, October 27, 2008.

93. Testimony of Judah Rose, on behalf of Redbud Energy, LP, in Support of Joint Stipulation and Settlement Agreement, In the Matter of the Application of Oklahoma Gas and Electric Company for an Order of the Commission Granting Pre-Approval of the Purchase of the Redbud Generating Facility and Authorizing a Recovery Rider, Cause No. PUD 200800086, September 3, 2008.

92. Direct Testimony of Judah L. Rose on behalf of Duke Energy Carolinas, In the Matter of Advance Notice by Duke Energy Carolinas, LLC, of its Intent to Grant Native Load Priority to the City of Orangeburg, South Carolina, and Petition of Duke Energy Carolinas, LLC and City of Orangeburg, South Carolina for Declaratory Ruling With Respect to Rate Treatment of Wholesale Sales of Electric Power at Native Load Priority, Docket No. E-7, SUB 858, August 15, 2008.

91. Affidavit filed on behalf of Public Service of New Mexico pertaining to the Fuel Costs of Southwest Public Service for Cost-of-Service and Market-Based Customers, August 11, 2008.

90. Direct Testimony of Judah L. Rose on behalf of Duke Energy Ohio, Inc., Before the Public Utilities Commission of Ohio, In the Matter of the Application of Duke Energy Ohio, Inc. for Approval of an Electric Security Plan, July 31, 2008.

89. Rebuttal Testimony, Judah L. Rose on Behalf of Duke Energy Carolinas, in re: Application of Duke Energy Carolinas, LLC for Approval of Save-A-Watt Approach, Energy Efficiency Rider and Portfolio of Energy Efficiency Programs, Docket No. E-7, Sub 831, July 21, 2008.

88. Updated Analysis of SWEPCO Capacity Expansion Options as Requested by Public Utility Commission of Texas, on behalf of SWEPCO, June 27, 2008.

87. Direct Testimony of Judah L. Rose on Behalf of Nevada Power/Sierra Pacific Electric Power Company, Docket No. 1, Public Utilities Commission of Nevada, Application of Nevada Power/Sierra Pacific for Certificate of Convenience and Necessity Authorization for a Gas-Fired Power Plant in Nevada, May 16, 2008.

86. Rebuttal Testimony of Judah L. Rose on Behalf of the Advanced Power, Commonwealth of Massachusetts, Before the Energy Facilities Siting Board, Petition of Brockton Power Company, LLC, EFSB 07-7, D.P.U. 07-58 & 07-59, May 16, 2008.

85. Supplemental Rebuttal Testimony on Commissioner's Issues of Judah L. Rose for Southwestern Electric Power Company, on behalf of Southwestern Electric Power Company, PUC Docket No. 33891, Public Utilities Commission of Texas, May 2008.

84. Supplemental Direct Testimony on Commissioners' Issues of Judah Rose for Southwestern Electric Power Company, for the Application of Southwestern Electric Power Company for Certificate of Convenience and Necessity Authorization for a Coal-Fired Power Plant in Arkansas, SOAH Docket No. 473-07-1929, PUC Docket No. 33891, Public Utility Commission of Texas, April 22, 2008.

83. Rebuttal Testimony of Judah Rose, In the Matter of the Application of Tucson Electric Power Company for the Establishment of Just and Reasonable Rates and Charges Designed to Realize A Reasonable Rate of Return on the Fair Value of Its Operations Throughout the State of Arizona, Estimation of Market Value of Fleet of Utility Coal Plants, April 1, 2008.

82. Rebuttal Report of Judah Rose, Ohio Power Company and AEP Power Marketing Inc. vs. Tractebel Energy Marketing, Inc. and Tractebel S.A. Case No. 03 CIV 6770, 03 CIV 6731 (S.D.N.Y.), January 28, 2008

81. Proposed New Gas-Fired Plant, on behalf of AEP SWEPCO, 2007

80. Rebuttal Report, Calpine Cash Flows, on behalf of Unsecured Creditor's Committee, November 21, 2007.

79. Expert Report. Calpine Cash Flows, on behalf of Unsecured Creditor's Committee, November 19, 2007.

78. Application of Duke Energy Carolina, LLC for Approval of Energy Efficiency Plan Including an Energy Efficiency Rider and Portfolio of Energy, Docket No. 2007-358-E, Public Service Commission of South Carolina, December 10, 2007.

77. Independent Transmission Cause No. PUD200700298, Application of ITC, Public Service of Oklahoma, December 7, 2007.

76. Verified Petition of Duke Energy Indiana, Inc. Requesting the Indiana Utility Regulatory Commission to Approve an Alternative Regulatory Plan Pursuant to Ind. Code š8-1-2.5-1, et. Seq. for the Offering of Energy Efficiency Conservation, Demand Response, and Demand-Side Management Programs and Associated Rate Treatment Including Incentives Pursuant to a Revised Standard Contract Rider No. 66 in Accordance With Ind. Code šš8-1-2.5-1 et seq. and 8-1-2-42(a); Authority to Defer Program Costs Associated with its Energy Efficiency Portfolio of Programs; Authority to Implement New and Enhanced Energy Efficiency Programs, Including the PowerShare® Program in its Energy Efficiency Portfolio

of Programs; and Approval of a Modification of the Fuel Adjustment Cause Earnings and Expense Tests, Indiana Utility Regulatory Commission, Cause No. 43374, October 19, 2007.

75. Rebuttal Testimony, Docket No. U-30192, Application of Entergy Louisiana, LLC For Approval to Repower the Little Gypsy Unit 3 Electric Generating Facility and for Authority to Commence Construction and for Certain Cost Protection and Cost Recovery, October 4, 2007.

74. Direct Testimony of Judah Rose on Behalf of Tucson Electric Power Company, In the matter of the Application of Tucson Electric Power Company for the Establishment of Just and Reasonable Rates and Charges Designed to Realize a Reasonable Rate of Return on the Fair Value of Its Operations Throughout the State of Arizona, Estimation of Market Value of Fleet of Utility Coal Plants, July 2, 2007.

73. Supplemental Testimony on behalf of Southwestern Electric Power Company before the Arkansas Public Service Commission, In the Matter of Application of Southwestern Electric Power Company for a Certificate of Environmental Compatibility and Public Need for the Construction, Ownership, Operation, and Maintenance of a Coal-Fired Base Load Generating Facility in the Hempstead County, Arkansas, dated June 15, 2007, Docket No. 06-154-U.

72. Rebuttal Testimony, Causes No. PUD 200500516, 200600030, and 20070001 Consolidated, on behalf of Redbud Energy, before the Corporation Commission of the State of Oklahoma, June 2007.

71. Rebuttal Testimony on behalf of Duke Energy Indiana, IGCC Coal Plant CPCN, Cause No. 43114 before the Indiana Utility Regulatory Commission, May 31, 2007.

70. Responsive Testimony, Causes No. PUD 200500516, 200600030, and 200700012 Consolidated, on behalf of Redbud Energy, before the Corporation Commission of the State of Oklahoma, May 2007.

69. Rebuttal Testimony on behalf of Florida Power & Light Company In Re: Florida Power & Light Company's Petition to Determine Need for FPL Glades Power Park Units 1 and 2 Electrical Power Plant, Docket No. 070098-EL, March 30, 2007.

68. Rebuttal Testimony, Electric Utility Power Hedging, on behalf of Duke Energy Indiana, Cause No. 38707-FAC6851, May 2007.

67. Direct Testimony for Southwestern Electric Power Company, Before the Louisiana Public Service Commission, Docket No. U-29702, in re: Application of Southwestern Electric Power Company for the Certification of Contracts for the Purchase of Capacity for 2007, 2008, and 2009 and to Purchase, Operate, Own, and Install Peaking, Intermediate and

Base Load Coal-Fired Generating Facilities in Accordance with the Commission's General Order Dated September 20, 1983. Consolidated with Docket No. U-28766 Sub Docket B in re: Application of Southwestern Electric Power Company for Certification of Contracts for the Purchase of Capacity in Accordance with the Commission's 'General Order of September 20, 1983, February 2007.

66. Second Supplemental Testimony on Behalf of Duke Energy Ohio Before the Public Utility Commission of Ohio, Case No. 03-93-EL-ATA, 03-2079, EL-AAM, 03-2081, EL-AAM, 03-2080, EL-ATA, February 28, 2007.

65. Electric Utility Power Hedging, on behalf of Duke Energy Indiana, Cause No. 38707-FAC6851, February 2007.

64. Supplemental Testimony on behalf of Duke Energy Carolinas before the North Carolina Utilities Commission in the Matter of Application of Duke Energy Carolinas, LLC for Approval for an Electric Generation Certificate of Public Convenience and Necessity to Construct Two 800 MW State of Art Coal Units for Cliffside Project, Docket No. E7, SUB790, December 2006.

63. Expert Report, Chapter 11, Case No. 01-16034 (AJG) and Adv. Proc. No. 04-2933 (AJG), November 6, 2006.

62. IGCC Coal Plant, Testimony on behalf of Duke Energy Indiana, Cause No. 43114, October 2006.

61. Market Power and the PSEG Exelon Merger on Behalf of the NJBPU Staff, NJBPU, BPU Docket No. EM05020106 OAL Docket No. PUC-1874-05, Supplemental Testimony March 20, 2006.

60. Market Power and the PSEG Exelon Merger on Behalf of the NJBPU Staff, NJBPU, BPU Docket No. EM05020106, OAL Docket No. PUC-1874-05, Surrebuttal Testimony December 27, 2005.

59. Market Power and the PSEG Exelon Merger on Behalf of the NJBPU Staff, NJBPU, BPU Docket No. EM05020106, OAL Docket No. PUC-1874-05, November 14, 2005.

58. Brazilian Power Purchase Agreement, confidential international arbitration, October 2005.

57. Cost of Service and Fuel Clause Issues, Rebuttal Testimony on behalf of Public Service of New Mexico, Docket No. EL05-151, November 2005.

56. Cost of Service and Peak Demand, FERC, Testimony on behalf of Public Service of New Mexico, September 19, 2005, Docket No. EL05-19.

55. Cost of Service and Fuel Clause Issues, Testimony on behalf of Public Service of New Mexico, FERC Docket No. EL05-151-000, September 15, 2005.

54. Cost of Service and Peak Demand, FERC, Responsive Testimony on behalf of Public Service of New Mexico, August 23, 2005, Docket No. EL05-19.

53. Prudence of Acquisition of Power Plant, Testimony on behalf of Redbud, September 12, 2005, No. PUD 200500151.

52. Proposed Fuel Cost Adjustment Clause, FERC, Docket Nos. EL05-19-002 and ER05-168-001 (Consolidated), August 22, 2005.

51. Market Power and the PSEG Exelon Merger on Behalf of the NJBPU, FERC, Docket EC05-43-000, May 27, 2005.

50. New Air Emission Regulations and Investment in Coal Power Plants, rebuttal testimony on behalf of PSI, April 18, 2005, Causes 42622 and 42718.

49. Rebuttal Report: Damages due to Rejection of Tolling Agreement Including Discounting, February 9, 2005, CONFIDENTIAL.

48. New Air Emission Regulations and Investment in Coal Power Plants, supplemental testimony on behalf of PSI, January 21, 2005, Causes 42622 and 42718.

47. Damages Due to Rejection of Tolling Agreement Including Discounting, January 10, 2005, CONFIDENTIAL.

46. Discount rates that should be used in estimating the damages to GTN of Mirant's bankruptcy and subsequent abrogation of the gas transportation agreements Mirant had entered into with GTN, December 15, 2004. CONFIDENTIAL

45. New Air Emission Regulations and Investment in Coal Power Plants, testimony on behalf of PSI, November 2004, Causes 42622 and 42718.

44. Rebuttal Testimony of Judah Rose on behalf of PSI, "Certificate of Purchase as of yet Undetermined Generation Facility" Cause No. 42469, August 23, 2004.

43. Rebuttal Testimony of Judah Rose on behalf of the Hopi Tribe, Case No. A.02-05-046, Mohave Coal Plant Economics, June 4, 2004.

42. Supplemental Testimony "Retail Generation Rates, Cost Recovery Associated with the Midwest Independent Transmission System Operator, Accounting Procedures for Transmission and Distribution System, Case No. 03-93-EL-ATA, 03-2079, EL-AAM, 03-2081, EL-AAM, 03-2080, EL-ATA for Cincinnati Gas & Electric, May 20, 2004.

41. "Application of Southern California Edison Company (U338-E) Regarding the Future Disposition of the Mohave Coal-Fired Generating Station," May 14, 2004.

40. "Appropriate Rate of Return on Equity (ROE) TransAlta Should be Authorized For its Capital Investment Related to VAR Support From the Centralia Coal-Fired Power Plant", for TransAlta, April 30, 2004, FERC Docket No. ER04-810-000.

39. “Retail Generation Rates, Cost Recovery Associated with the Midwest Independent Transmission System Operator, Accounting Procedures for Transmission and Distribution System, Case No. 03-93-EL-ATA, 03-2079, EL-AAM, 03-2081, EL-AAM, 03-2080, EL-ATA for Cincinnati Gas & Electric, April 15, 2004.

38. "Valuation of Selected MIRMA Coal Plants, Acceptance and Rejection of Leases and Potential Prejudice to Leasors" Federal Bankruptcy Court, Dallas, TX, March 24, 2004 CONFIDENTIAL.

37. “Certificate of Purchase as of yet Undetermined Generation Facility”, Cause No. 42469 for PSI, March 23, 2004.

36. “Ohio Edison’s Sammis Power Plant BACT Remedy Case”, In the United States District Court of Ohio, Southern Division, March 8, 2004.

35. “Valuation of Power Contract,” January 2004, confidential arbitration.

34. “In the matter of the Application of the Union Light Heat & Power Company for a Certificate of Public Convenience and Necessity to Acquire Certain Generation Resources, etc.”, before the Kentucky Public Service Commission, Coal-Fired and Gas-Fired Market Values, July 21, 2003.

33. “In the Supreme Court of British Columbia”, July 8, 2003. CONFIDENTIAL

32. “The Future of the Mohave Coal-Fired Power Plant – Rebuttal Testimony”, California P.U.C., May 20, 2003.

31. “Affidavit in Support of the Debtors’ Motion”, NRG Bankruptcy, Revenues of a Fleet of Plants, May 14, 2003. CONFIDENTIAL

30. “IPP Power Purchase Agreement,” confidential arbitration, April 2003.

29. “The Future of the Mohave Coal-Fired Power Plant”, California P.U.C., March 2003.

28. “Power Supply in the Pacific Northwest,” contract arbitration, December 5, 2002. CONFIDENTIAL

27. “Power Purchase Agreement Valuation”, Confidential Arbitration, October 2002.

26. “Cause No. 42145 - In support of PSI's petition for authority to acquire the Madison and Henry County plants, rebuttal testimony on behalf of PSI. Filed on 8/23/02.”

25. “Cause No. 42200 - in support of PSI's petition for authority to recover through retail rates on a timely basis. Filed on 7/30/02.”

24. “Cause No. 42196 - in support of PSI's petition for interim purchased power contract. Filed on 4/26/02.”

23. “Cause No. 42145 - In support of PSI's petition for authority to acquire the Madison and Henry County plants. Filed on 3/1/2002.”

22. “Analysis of an IGCC Coal Power Plant”, Minnesota state senate committees, January 22, 2002.

21. “Analysis of an IGCC Coal Power Plant”, Minnesota state house of representative committees, January 15, 2002

20. “Interim Pricing Report on New York State’s Independent System Operator”, New York State Public Service Commission (NYSPSC), January 5, 2001

19. “The need for new capacity in Indiana and the IRP process”, Indiana Utility Regulatory Commission, October 26, 2000

18. “Damage estimates for power curtailment for a Cogen power plant in Nevada”, August 2000. CONFIDENTIAL

17. “Valuation of a power plant in Arizona”, arbitration, July 2000. CONFIDENTIAL

16. Application of FirstEnergy Corporation for approval of an electric Transition Plan and for authorization to recover transition revenues, Stranded Cost and Market Value of a Fleet of Coal, Nuclear, and Other Plants, Before PUCO, Case No. 99-1212-EL-ETP, October 4, 1999 and April 2000.

15. “Issues Related to Acquisition of an Oil/Gas Steam Power plant in New York”, September 1999 Affidavit to Hennepin County District Court, Minnesota

14. “Wholesale Power Prices, A Cost Plus All Requirements Contract and Damages”, Cajun Bankruptcy, July 1999. Testimony to U.S. Bankruptcy Court.

13. “Power Prices.” Testimony in confidential contract arbitration, July 1998.

12. “Horizontal Market Power in Generation.” Testimony to New Jersey Board of Public Utilities, May 22, 1998.

11. “Basic Generation Services and Determining Market Prices.” Testimony to the New Jersey Board of Public Utilities, May 12, 1998.

10. “Generation Reliability.” Testimony to New Jersey Board of Public Utilities, May 4, 1998.

9. “Future Rate Paths and Financial Feasibility of Project Financing.” Cajun Bankruptcy, Testimony to U.S. Bankruptcy Court, April 1998.

8. “Stranded Costs of PSE&G.” Market Valuation of a Fleet of Coal, Nuclear, Gas, and Oil-Fired Power Plants, Testimony to New Jersey Board of Public Utilities, February 1998.

7. “Application of PECO Energy Company for Approval of its Restructuring Plan Under Section 2806 of the Public Utility Code.” Market Value of Fleet of Nuclear, Coal, Gas, and Oil Power Plants, Rebuttal Testimony filed July 1997.

6. “Future Wholesale Electricity Prices, Fuel Markets, Coal Transportation and the Cajun Bankruptcy.” Testimony to Louisiana Public Service Commission, December 1996.

5. “Curtailment of the Saguaro QF, Power Contracting and Southwest Power Markets.” Testimony on a contract arbitration, Las Vegas, Nevada, June 1996.

4. “Future Rate Paths and the Cajun Bankruptcy.” Testimony to the U.S. Bankruptcy Court, June 1997.

3. “Fuel Prices and Coal Transportation.” Testimony to the U.S. Bankruptcy Court, June 1997.

2. “Demand for Gas Pipeline Capacity in Florida from Electric Utilities.” Testimony to Florida Public Service Commission, May 1993.

1. “The Case for Fuel Flexibility in the Florida Electric Generation Industry.” Testimony to the Florida Department of Environmental Regulation (Der), Hearings on Fuel Diversity and Environmental Protection, December 1992.

SELECTED SPEAKING ENGAGEMENTS

115. Rose, J.L., The Polar Vortex, System Reliability and Recent PJM Developments, American Municipal Power Conference, October 28, 2014.

114. Rose, J.L., Wholesale power Market Price Projection in California, Infocast, California Energy Summit, San Francisco, CA, May 28, 2014.

113. Rose, J.L., The Polar Vortex and Future Power system Trends, National Coal Council, 2014 Annual Spring Meeting, May 14, 2014.

112. Rose, J.L., The Polar Vortex and System Reliability, The Energy Authority (TEA), Jacksonville, FL, April 30, 2014.

111. Rose, J.L., Utility and Transco Plans and Transmission Projects to Deal with the Changing Generation Resource Mix, Panel Moderator, Transmission Summit Panel Discussion, March 14, 2014.

110. Rose, J.L., Examining Natural Gas and Power Price Dynamics During the Polar Vortex, APPA, March 10, 2014.

109. Rose, J.L., Polar Vortex – Skating too Close to the Edge, First Friday Club, March 7, 2014.

108. Rose, J.L., New Developments in the California Power Market, Infocast California Energy Summit, San Francisco, CA, December 3, 2013.

107. Rose, J.L., Financial Issues in Determining the Disposition of Fossil Power Plants, Managing the Power Plant Decommissioning, Decontamination, and Demolition Process, November 7, 2013.

106. Rose, J.L, Reality and Impacts of Plant Retirements, Reading Tea Leaves – The Future of America's Installed Power Plants, July 25, 2013.

105. Rose, J.L., Financial issues in Determining the Disposition of Fossil Power Plants, Plant Decommissioning, Decontamination, and Demolition, May 9, 2013.

104. Rose, J.L., Financial Issues in Determining the Disposition of Plant Decommissioning, Decontamination & Demolition Summit, Infocast, May 1, 2013.

103. Rose, J.L., Implications of Current Low Natural Gas Price Environment on Wholesale Power, Edison Electric Institute, May 3, 2012.

102. Rose, J.L., Anticipating the Next Turn in a Gas-Rich Environment, Key Pricing Drivers, and Outlook, Houlihan and Lokey Merchant Energy Conference, April, 24, 2012.

101. Rose, J.L., CREPC/SPSC Natural Gas – Electricity in West Panel, San Diego, April 3, 2012

100. Rose, J.L., EUCI Financing Transmission Expansion, San Diego, CA, March 8-9, 2011.

99. Rose, J.L., Vinson & Elkins Conference, Houston, TX, November 11, 2010.

98. Rose, J.L., Fundamentals of Electricity Transmission, EUCI, Crystal City, Arlington, VA, June 29-30, 2010.

97. Rose, J.L., Economics of PC Refurbishment, Improving the Efficiency of Coal-Fired Power Generation in the U.S., DOE-NETL, February 24, 2010.

96. Rose, J.L., Fundamentals of Electricity Transmission, EUCI, Orlando, FL, January 25-26, 2010.

95. Rose, J.L., CO_2 Control, "Cap & Trade", & Selected Energy Issues, Multi-Housing Laundry Association, October 26, 2009.

94. Rose, J.L., Financing for the Future – Can We Afford It?, 2009 Bonbright Conference, October 9, 2009.

93. Rose, J.L., EEI's Transmission and Market Design School, Washington, D.C., June 2009.

92. Rose, J.L., ICF's New York City Energy Forum - Market Recovery in Merchant Generation Assets, June 10, 2008.

91. Rose, J.L., Southeastern Electric Exchange – Integrated Resource Planning Task Force Meeting, Carbon Tax Outlook Discussion, February 21-22, 2008.

90. Rose, J.L., AESP, NEEC Conference, Rising Prices and Failing Infrastructure: A Bleak or Optimistic Future, Marlborough, MA, October 23, 2006.

89. Rose, J.L., Infocast Gas Storage Conference, "Estimating the Growth Potential for Gas-Fired Electric Generation," Houston, TX, March 22, 2006.

88. Rose, J.L., "Power Market Trends Impacting the Value of Power Assets," Infocast Conference, Powering Up for a New Era of Power Generation M&A, February 23, 2006.

87. Rose, J.L., "The Challenge Posed by Rising Fuel and Power Costs", Lehman Brothers, November 2, 2005.

86. Rose, J.L., "Modeling the Vulnerability of the Power Sector", EUCI – Securing the Nation's Energy Infrastructure, September 19, 2005

85. Rose, J.L., "Fuel Diversity in the Northeast, Energy Bar Association, Northeast Chapter Meeting, New York, NY, June 9, 2005.

84. Rose, J.L., "2005 Macquarie Utility Sector Conference", Macquarie Utility Sector Conference, Vail, CO, February 28, 2005.

83. Rose, J.L., "The Outlook for North American Natural Gas and Power Markets", The Institute for Energy Law, Program on Oil and Gas Law, Houston, TX, February 18, 2005.

82. Rose, J.L. "Assessing the Salability of Merchant Assets – What's on the Horizon?" Infocast – The Market for Power Assets, Phoenix, AZ, February 10, 2005.

81. Rose, J.L. "Market Based Approaches to Transmission – Longer-Term Role", National Group of Municipal Bond Investors, New York, NY, December 10, 2004.

80. Rose, J.L. "Supply & Demand Fundamentals – What is Short-Term Outlook and the Long-Term Demand? Platt's Power Marketing Conference, Houston, TX, October 11, 2004.

79. Rose, J.L. "Assessing the Salability of Merchant Assets – When Will We Hit Bottom?, Infocast's Buying, Selling, and Investing in Energy Assets Conference, Houston, TX, June 24, 2004.

78. Rose, J. L. "After the Blackout – Questions That Every Regulator Should be Asking," NARUC Webinar Conference, Fairfax, VA, November 6, 2003.

77. Rose, J. L., "Supply and Demand in U.S. Wholesale Power Markets," Lehman Brothers Global Credit Conference, New York, NY, November 5, 2003.

76. Rose, J.L., "Assessing the Salability of Merchant Assets – When Will We Hit Bottom?", Infocast's Opportunities in Energy Asset Acquisition, San Francisco, CA, October 9, 2003.

75. Rose, J.L., “Asset Valuation in Today’s Market”, Infocast’s Project Finance Tutorial, New York, NY, October 8, 2003.

74. Rose, J.L., “Forensic Evaluation of Problem Projects”, Infocast’s Project Finance Workouts: Dealing With Distressed Energy Projects, September 17, 2003.

73. Rose, J.L., National Management Emergency Association, Seattle, WA, September 8, 2003.

72. Rose, J.L., “Assessing the Salability of Merchant Assets – When Will We Hit Bottom?”, Infocast’s Buying, Selling & Investing in Energy Assets, Chicago, IL, July 24, 2003.

71. Rose, J.L., CSFB Leveraged Finance Independent Power Producers and Utilities Conference, New York, NY, “Spark Spread Outlook”, July 17, 2003.

70. Rose, J.L., Multi-Housing Laundry Association, Washington, D. C., “Trends in U.S. Energy and Economy”, June 24, 2003.

69. Rose, J.L., “Power Markets: Prices, SMD, Transmission Access, and Trading”, Bechtel Management Seminar, Frederick, MD, June 10, 2003.

68. Rose, J.L., Platt’s Global Power Market Conference, New Orleans, LA, “The Outlook for Recovery,” March 31, 2003.

67. Rose, J.L., “Electricity Transmission and Grid Security”, Energy Security Conference, Crystal City, VA, March 25, 2003.

66. Rose, J.L., “Assessing the Salability of Merchant Assets – When Will We Hit Bottom?, Infocast’s Buying, Selling & Investing in Energy Assets, New York City, February 27, 2003.

65. Rose, J.L., Panel Discussion, “Forensic Evaluation of Problem Projects”, Infocast Conference, NY, February 24, 2003.

64. Rose, J.L., PSEG Off-Site Meeting Panel Discussion, February 6, 2003 (April 13, 2003).

63. Rose, J.L., “The Merchant Power Market—Where Do We Go From Here?” Center for Business Intelligence’s Financing U.S. Power Projects, November 18-19, 2002.

62. Rose, J.L., “Assessing U.S. Regional and the Potential for Additional Coal-Fired Generation in Each Region,” Infocast’s Building New Coal-Fired Generation Conference, October 8, 2002.

61. Rose, J.L., “Predicting the Price of Power for Asset Valuation in the Merchant Power Financings, ”Infocast’s Product Structuring in the Real World Conference, September 25, 2002.

60. Rose, J.L., “PJM Price Outlook,” Platt’s Annual PJM Regional Conference, September 24, 2002.

59. Rose, J.L., “Why Investors Are Zeroing in on Upgrading Our Antiquated Power Grid Rather Than Exotic & Complicated Technologies,” New York Venture Group’s Investing in the Power Industry—Targeting The Newest Trends Conference, July 31, 2002.

58. Rose, J.L., Panel Participant in the Salomon Smith Barney Power and Energy Merchant Conference 2002, May 15, 2002.

57. Rose, J.L., “Locational Market Price (LMP) Forecasting in Plant Financing Decisions,” Structured Finance Institute, April 8-9, 2002.

56. Rose, J.L., “PJM Transmission and Generation Forecast”, Financial Times Energy Conference, November 6, 2001.

55. Rose, J.L., “U.S. Power Sector Trends”, Credit Suisse First Boston’s Power Generation Supply Chain Conference, Web Presented Conference, September 12, 2002.

54. Rose, J.L., “Dealing with Inter-Regional Power Transmission Issues”, Infocast’s Ohio Power Game Conference, September 6, 2001

53. Rose, J.L., “Where’s the Next California”, Credit Suisse First Boston’s Global Project Finance Capital Markets Conference, New York NY, June 27 2001

52. Rose, J.L, “U.S. Energy Issues: What MLA Members Need to Know,” Multi-housing Laundry Association, Boca Raton Florida, June 25, 2001

51. Rose, J.L., “How the California Meltdown Affects Power Development”, Infocast’s Power Development and Finance Conference 2001, Washington D.C., June 12, 2001

50. Rose, J.L., “Forecasting 2001 Electricity Prices” presentation and workshop, What to Expect in western Power Markets this Summer 2001 Conference, Denver, Colorado, May 2, 2001

49. Rose, J.L., “Power Crisis in the West” Generation Panel Presentation, San Diego, California, February 12, 2001

48. Rose, J.L., “An Analysis of the Causes leading to the Summer Price Spikes of 1999 & 2000” Conference Chair, Infocast Managing Summer Price Volatility, Houston, Texas, January 30, 2001.

47. Rose, J. L., “An Analysis of the Power Markets, summer 2000” Generation Panel Presentation, Financial Times Power Mart 2000 conference, Houston, Texas, October 18, 2000.

46. Rose, J.L., “An Analysis of the Merchant Power Market, Summer 2000” presentation, Conference Chair, Merchant Power Finance Conference, Atlanta, Georgia, September 11 to 15, 2000

45. Rose, J.L., “Understanding Capacity Value and Pricing Firmness” presentation, Conference Chair, Merchant Plant Development and Finance Conference, Houston, Texas, March 30, 2000.

44. Rose, J.L., “Implementing NYPP’s Congestion Pricing and Transmission Congestion Contract (TCC)”, Infocast Congestion Pricing and Forecasting Conference, Washington D.C., November 19, 1999.

43. Rose, J.L., “Understanding Generation” Pre-Conference Workshop, Powermart, Houston, Texas, October 26-28, 1999.

42. Rose, J.L., “Understanding Capacity Value and Pricing Firmness” presentation, Conference Chair Merchant Plant Development and Finance Conference, Houston, Texas, September 29, 1999.

41. Rose, J.L., “Comparative Market Outlook for Merchant Assets” presentation, Merchant Power Conference, New York, New York, September 24, 1999.

40. Rose, J.L., “Transmission, Congestion, and Capacity Pricing” presentation, Transmission The Future of Electric Transmission Conference, Washington, DC, September 13, 1999.

39. Rose, J.L., “Effects of Market Power on Power Prices in Competitive Energy Markets” Keynote Address, The Impact of Market Power in Competitive Energy Markets Conference, Washington, DC, July 14, 1999.

38. Rose, J.L., “Peak Price Volatility in ECAR and the Midwest, Futures Contracts: Liquidity, Arbitrage Opportunity” presentation at ECAR Power Markets Conference, Columbus, Ohio, June 9, 1999.

37. Rose, J.L., “Transmission Solutions to Market Power” presentation, Do Companies in the Energy Industry Have Too Much Market Power? Conference, Washington, DC, May 24, 1999.

36. Rose, J.L., “Repowering Existing Power Plants and Its Impact on Market Prices” presentation, Exploiting the Full Energy Value-Chain Conference, Chicago, Illinois, May 17, 1999.

35. Rose, J.L., “Transmission and Retail Issues in the Electric Industry” Session Speaker, Gas Mart/Power 99 Conference, Dallas, Texas, May 10, 1999.

34. Rose, J.L., “Peak Price Volatility in the Rockies and Southwest” presentation at Repowering the Rockies and the Southwest Conference, Denver, Colorado, May 5, 1999.

33. Rose, J.L., “Understanding Generation” presentation and Program Chairman at Buying & Selling Power Assets: The Great Generation Sell-Off Conference, Houston, Texas, April 20, 1999.

32. Rose, J.L., “Buying Generation Assets in PJM” presentation at Mid-Atlantic Power Summit, Philadelphia, Pennsylvania, April 12, 1999.

31. Rose, J.L., “Evaluating Your Generation Options in Situations With Insufficient Transmission,” presentation at Congestion Management Conference, Washington, D.C., March 25, 1999.

30. Rose, J.L., “Will Capacity Prices Drive Future Power Prices?” presentation at Merchant Plant Development Conference, Chicago, Illinois, March 23, 1999.

29. Rose, J.L., “Capacity Value – Pricing Firmness,” presentation at Market Price Forecasting Conference, Atlanta, Georgia, February 25, 1999

28. Rose, J.L., “Developing Reasonable Expectations About Financing New Merchant Plants That Have Less Competitive Advantage Than Current Projects,” presentation at Project Finance International’s Financing Power Projects in the USA conference, New York, New York, February 11, 1999.

27. Rose, J.L., “Transmission and Capacity Pricing and Constraints,” presentation at Power Fair 99, Houston, Texas, February 4, 1999.

26. Rose, J.L., “Peak Price Volatility: Comparing ERCOT With Other Regions,” presentation at Megawatt Daily’s Trading Power in ERCOT conference, Houston, Texas, January 13, 1999.

25. Rose, J.L., “The Outlook for Midwest Power Markets,” presentation to The Institute for Regulatory Policy Studies at Illinois State University, Springfield, Illinois, November 19, 1998.

24. Rose, J.L., “Developing Pricing Strategies for Generation Assets,” presentation at Wholesale Power in the West conference, Las Vegas, Nevada, November 12, 1998.

23. Rose, J.L., “Understanding Electricity Generation and Deregulated Wholesale Power Prices,” a full-day pre-conference workshop at Power Mart 98, Houston, Texas, October 26, 1998.

22. Rose, J.L., “The Impact of Power Generation Upgrades, Merchant Plant Developments, New Transmission Projects and Upgrades on Power Prices,” presentation at Profiting in the New York Power Market conference, New York, NY, October 22, 1998.

21. Rose, J.L., “Capacity Value – Pricing Firmness,” presentation to Edison Electric Institute Economics Committee, Charlotte, NC, October 8, 1998.

20. Rose, J.L., “Locational Marginal Pricing and Futures Trading,” presentation at Megawatt Daily’s Electricity Regulation conference, Washington, D.C., October 7, 1998.

19. Rose, J.L., Chairman’s opening speech and “The Move Toward a Decentralized Approach: How Will Nodal Pricing Impact Power Markets?” at Congestion Pricing and Tariffs conference, Washington, D.C., September 25, 1998.

18. Rose, J.L., “The Generation Market in MAPP/MAIN: An Overview,” presentation at Megawatt Daily’s MAIN/MAPP – The New Dynamics conference, Minneapolis, Minnesota, September 16, 1998.

17. Rose, J.L., “Capacity Value – Pricing Firmness,” presentation at Market Price Forecasting conference, Baltimore, Maryland, August 24, 1998.

16. Rose, J.L., “ICF Kaiser’s Wholesale Power Market Model,” presentation at Market Price Forecasting conference, New York, New York, August 6, 1998.

15. Rose, J.L., Campbell, R., Kathan, David, “Valuing Assets and Companies in M&A Transactions,” full-day workshop at Utility Mergers & Acquisitions conference, Washington, D.C., July 15, 1998.

14. Rose, J.L., “Must-Run Nuclear Generation’s Impact on Price Forecasting and Operations,” presentation at The Energy Institute’s conference entitled “Buying and Selling Electricity in the Wholesale Power Market,” Las Vegas, Nevada, June 25, 1998.

13. Rose, J.L., “The Generation Market in PJM,” presentation at Megawatt Daily’s PJM Power Markets conference, Philadelphia, Pennsylvania, June 17, 1998.

12. Rose, J.L., “Market Evaluation of Electric Generating Assets in the Northeast,” presentation at McGraw-Hill’s conference: Electric Asset Sales in the Northeast, Boston, Massachusetts, June 15, 1998.

11. Rose, J.L., “Overview of SERC Power,” opening speech presented at Megawatt Daily’s SERC Power Markets conference, Atlanta, Georgia, May 20, 1998.

10. Rose, J.L., “Future Price Forecasting,” presentation at The Southeast Energy Buyers Summit, Atlanta, Georgia, May 7, 1998.

9. Rose, J.L., “Practical Risk Management in the Power Industry,” presentation at Power Fair, Toronto, Canada, April 16, 1998.

8. Rose, J.L., “The Wholesale Power Market in ERCOT: Transmission Issues,” presentation at Megawatt Daily’s ERCOT Power Markets conference, Houston, Texas, April 1, 1998.

7. Rose, J.L., “New Generation Projects and Merchant Capacity Coming On-Line,” presentation at Northeast Wholesale Power Market conference, New York, New York, March 18, 1998.

6. Rose, J.L., “Projecting Market Prices in a Deregulated Electricity Market,” presentation at conference: Market Price Forecasting, San Francisco, California, March 9, 1998.

5. Rose, J.L., “Handling of Transmission Rights,” presentation at conference: Congestion Pricing & Tariffs, Washington, D.C., January 23, 1998.

4. Rose, J.L., “Understanding Wholesale Markets and Power Marketing,” presentation at The Power Marketing Association Annual Meeting, Washington, D.C., November 11, 1997.

3. Rose, J.L., “Determining the Electricity Forward Curve,” presentation at seminar: Pricing, Hedging, Trading, and Risk Management of Electricity Derivatives, New York, New York, October 23, 1997.

2. Rose, J.L., “Market Price Forecasting In A Deregulated Market,” presentation at conference: Market Price Forecasting, Washington, D.C., October 23, 1997,

1. Rose, J.L., “Credit Risk Versus Commodity Risk,” presentation at conference: Developing & Financing Merchant Power Plants in the New U.S. Market, New York, New York, September 16, 1997.

SELECTED PUBLICATIONS AND PRESENTATIONS

Rose, J.L., “Return of the RTO: Auction Results Portend Recovery,” White Paper, June 14, 2014.

Rose, J. L., “The Next Polar Vortex: How Long Will Grid Emergencies and Price Volatility Continue?” Public Utilities Fortnightly, June 2014.

Rose, J.L., “Wind Curtailment, Assessing and Mitigating Risks,” White Paper, December 2012.

Rose, J.L. and Henning, B. “Partners in Reliability: Gas and Electricity,” PowerNews, September 1, 2012.

Rose, J.L. and Surana, S. “Using Yield Curves and Energy Prices to Forecast Recessions – An Update.” World Generation, March/April 2011, V.23 #2.

Rose, J.L. and Surana, S. “Oil Price Increases, Yield Curve Inversion may be Indicators of Economic Recession.” Oil and Gas Financial Journal, Volume 7, Issue 6, June 2010

Rose, J.L. and Surana, S. “Forecasting Recessions and Investment Strategies.” World-Generation, June/July 2010, V.22, #3.

Rose, J.L., “Should Environmental Restrictions be Eased to Allow for the Construction of More Power Plants? The Costco Connection, April 2001.

Rose, J.L., “Deregulation in the US Generation Sector: A Mid-Course Appraisal”, Power Economics, October 2000.

Rose, J. L., “Price Spike Reality: Debunking the Myth of Failed Markets”, *Public Utilities Fortnightly,* November 1, 2000.

Rose, J.L., “Missed Opportunity: What’s Right and Wrong in the FERC Staff Report on the Midwest Price Spikes,” *Public Utilities Fortnightly,* November 15, 1998.

Rose, J.L., “Why the June Price Spike Was Not a Fluke,” *The Electricity Journal*, November 1998.

Rose, J.L., S. Muthiah, and J. Spencer, "Will Wall Street Rescue the Competitive Wholesale Power Market?" *Project Finance International*, May 1998.

Rose, J.L., "Last Summer's "Pure" Capacity Prices – A Harbinger of Things to Come*," Public Utilities Fortnightly,* December 1, 1997.

Rose, J.L., D. Kathan, and J. Spencer "Electricity Deregulation in the New England States," *Energy Buyer*, Volume 1, Issue 10, June-July 1997.

Rose, J.L., S. Muthiah, and M. Fusco, "Financial Engineering in the Power Sector," *The Electricity Journal,* Jan/Feb 1997.

Rose, J.L, S. Muthiah, and M. Fusco, "Is Competition Lacking in Generation? (And Why it Should Not Matter)*," Public Utilities Fortnightly,* January 1, 1997.

Mann, C. and J.L. Rose, "Price Risk Management: Electric Power vs. Natural Gas," *Public Utilities Fortnightly,* February 1996.

Rose, J.L. and C. Mann, "Unbundling the Electric Capacity Price in a Deregulated Commodity Market," *Public Utilities Fortnightly,* December 1995.

Booth, William and J.L. Rose, "FERC's Hourly System Lambda Data as Interim Bulk Power Price Information," *Public Utilities Fortnightly,* May 1, 1995.

Rose, J.L. and M. Frevert, "Natural Gas: The Power Generation Fuel for the 1990s." Published by Enron.

AWARDS AND RECOGNITION

One of ICF's *Distinguished Consultants*, an honorary title given to only three of ICF's 5,000 employees

EMPLOYMENT HISTORY

ICF International	Managing Director	1999 - Present
ICF International	Vice President	1996-1999
ICF International	Project Manager	1993-1996
ICF International	Senior Associate	1986-1993
ICF International	Associate	1982-1986