BEFORE THE

PENNSYLVANIA PUBLIC UTILITY COMMISSION

Docket No. P-2014-2417907

PPL Electric Utilities Corporation

Statement No. 2

Direct Testimony of A. Joseph Cavicchi

April 25, 2014

I. Qualifications, Introduction, and Summary

Q: Please state your full name and business address.

A: My name is A. Joseph Cavicchi. My business address is 200 State Street, Boston, MA 02109.

Q. Who is your employer and what is your position?

A: I am employed by Compass Lexecon as an Executive Vice President.

Q: Please briefly describe the services provided by Compass Lexecon.

A: Compass Lexecon is an economics and financial consulting firm that provides corporations, law firms, and government agencies with analysis of complex economic and financial issues for use in legal and regulatory proceedings, and in strategic decision-making. Compass Lexecon is actively involved in a wide variety of matters that can arise in the areas of economics and finance. Our practice areas include energy and environmental economics, antitrust, securities, damages, intellectual property, as well as business consulting and public policy analysis.

Q: What are your duties as Executive Vice President?

A: I provide economic analysis and expert testimony in various state and federal regulatory proceedings related to electricity markets. In particular, I work with clients on a variety of state regulatory and Federal Energy Regulatory Commission proceedings, and often file testimony and affidavits supported by economic analyses. Throughout my career I have been directly involved with corporations, private and

public institutions, and state and federal regulatory authorities in connection with the economics of the electricity industry. For the past 17 years I have been working almost exclusively on the regulatory economics of the electricity industry, and, in particular, performing economic analyses of wholesale electricity markets.

Q: What is your educational background?

A: I hold Masters degrees in Technology and Policy and in Environmental Engineering from the Massachusetts Institute of Technology and Tufts University, respectively.

Q: Please describe your professional experience.

A: Prior to joining Compass Lexecon, I was a staff mechanical engineer and a project manager at the Massachusetts Institute of Technology, overseeing the development, permitting, engineering, construction, and start-up of a $40 million, 20 megawatt gas turbine-based cogeneration facility on the Cambridge campus. In addition, I was responsible for the implementation of various energy consumption monitoring programs, and optimization of the operation of a centrally distributed electricity, steam, and chilled water production facility.

Q: Have you previously testified as a witness on regulation and competition in the electricity industry?

A: Yes. I have previously testified on power supply procurement plans in Pennsylvania. In addition, I have testified on several occasions regarding wholesale electricity market competitiveness and design issues at the Federal Energy Regulatory Commission. I have also testified on qualifying facility pricing policy and wholesale market design policy in the state of California. Finally, I have

written articles on electricity industry structure and issues associated with procuring wholesale electricity supplies for delivery to retail customers. Additional detail regarding my credentials and experience can be found in my *curriculum vitae*, which is attached as Appendix A to this testimony.

Q: What is the subject matter of your testimony in this proceeding?

A: My testimony describes and evaluates the competitive procurement program proposed by PPL Electric Utilities Corporation ("PPL Electric" or "Company") in its Petition for Approval of a Default Service Program and Procurement Plan ("DSP III"), filed with the Pennsylvania Public Utility Commission ("PUC" or "Commission") on April 18, 2014, to procure default service supply for non-shopping customers from June 1, 2015, through May 31, 2017.[1] Consistent with the Commission's policy on the provision of default service, PPL Electric is proposing a default service program that: (1) establishes a procurement plan for acquiring generation supply; (2) provides an implementation plan that identifies the schedules and technical requirements of these generation supply procurements; (3) provides a rate design plan; and (4) is designed to meet the requirements set forth in Pennsylvania's Act 129 of 2008, P.L. 1592, as codified in 66 Pa.C.S. Chapter 28.[2]

Q: Please describe PPL Electric's proposed DSP III.

---

[1] Petition of PPL Electric Utilities Corporation for Approval of a Default Service Program and Procurement Plan for the Period June 1, 2015, through May 31, 2017, Docket No. P-2014-2417907April 18, 2014 (hereinafter "Petition").

[2] See 66 Pa. C.S. § 2807(e).

A: The central objective of PPL Electric's proposed DSP III is to obtain a portfolio of default service supply contracts that provide power for non-shopping customers from June 1, 2015, through May 31, 2017. To meet this objective, PPL Electric proposes to use a portfolio of laddered fixed-price, full-requirements, load-following electricity supply contracts to meet the demand of its residential and small commercial and industrial customers,[3] and a full-requirements, load-following, spot market service to meet the demand of its large commercial and industrial customers. Notably, the proposed DSP III's portfolio of products is generally similar to the Company's current, successful default service plan ("DSP II"). As I explain herein, PPL Electric's proposal provides a clear, logical procurement plan that recognizes the experience PPL Electric has had with DSP II, the ongoing high numbers of customers obtaining competitive retail service within the PPL Electric service territory, and the potential that PPL Electric's role as a default service provider could change in the future.

Q: What are full-requirements, load-following products and why is PPL Electric proposing to continue using these products for the provision of default service?

A: A full-requirements, load-following product obligates a wholesale electricity seller to supply a fixed-percentage (referred to as a "tranche") of PPL Electric's default

---

[3] Note that under DSP III the Company no longer proposes to procure wholesale power supply for its default service Time-of-Use ("TOU") customers. As the Petition explains, the Company proposes a TOU supply option consistent with the Joint Petition for Partial Settlement filed with the Commission on April 11, 2014, at Docket No. P-2013-2389572 (Petition at P 42). Under this proposed TOU rate option, PPL Electric will rely on Electric Generation Suppliers ("EGSs") to offer TOU rate options and provide the TOU service to customers in the Company's service territory. TOU load will not be included in the default service load procured for residential and small commercial and industrial customers because the TOU load will be separately supplied by retail EGSs.

service hourly load during every hour of a product's term. By assuming this obligation, sellers are responsible for managing the acquisition of energy, capacity, transmission (other than non-market-based transmission services), ancillary services, alternative energy credits ("AECs"), and any other related products (net of transmission and distribution losses) to meet default service customers' hourly loads. The pricing for a full-requirements, load-following product is specified based on the type of default service load being supplied. For PPL Electric's residential and smaller commercial and industrial customers, the price is fixed for the term of the product and does not vary regardless of the number of default service customers being served. Thus, a fixed-price, full-requirements, load-following product provides PPL Electric's smaller default service customers with reasonably stable rates that change in response to power market changes as contracts expire and are replaced. To reduce abrupt pricing changes, PPL Electric staggers, or ladders, procurements to avoid situations where all contracts expire at the same time. For PPL Electric's large commercial and industrial customers, the full-requirements, load-following product pricing includes an energy component that varies hourly based on changes in hourly wholesale electricity prices (commonly referred to as "spot" market pricing). Because the majority of PPL Electric's larger customers obtain electric supply service tailored to their needs from retail power providers, the full-requirements, load-following, spot market product has proven to be the best approach to providing large customers default service. Several power suppliers compete to provide full-requirements, load-following products, and PPL Electric has used these products successfully in all of its default service supply procurement plans.

Q: What guided the development of PPL Electric's proposed DSP III?

A: Pennsylvania's Act 129, the Commission's Final Policy Statement in *Proposed Policy Statement Regarding Default Service and Retail Electric Markets*,[4] its Final Order in *Investigation of Pennsylvania's Retail Electricity Market: End State of Default Service*,[5] and the Company's experience with the Competitive Bridge Plan, DSP I, and DSP II guided the development of PPL Electric's DSP III.[6] Consistent with Act 129 and PUC policy, the proposed DSP III ensures that default service customers will receive adequate and reliable electricity supply at least cost over time while supporting development of a competitive retail market.

Three important objectives were carefully considered when developing the proposed DSP III. First, to be consistent with the Commission's policy outlined in its DS Policy Statement[7] and additional guidance provided in its Final ES Order,[8] PPL Electric's DSP III continues semiannual competitive procurement of a laddered portfolio of supply products with differing terms that emphasizes shorter contract terms while maintaining price stability (similar to the Company's successful DSP II;

---

[4] Final Policy Statement, Proposed Policy Statement Regarding Default Service and Retail Electric Markets, Docket No. M-2009-2140580, September 23, 2011. In particular, the details of the policy are stated in Annex A, Title 52 Pa. Code §§ 69.1802-69.1817, Public Utilities, Part I. Public Utility Commission, Subpart C. Fixed Service Utilities, Chapter 69, General Orders, Policy Statements and Guidelines on Fixed Utilities, Default Service and Retail Electric Markets (hereinafter "DS Policy Statement").

[5] Final Order, Investigation of Pennsylvania's Retail Electricity Market: End State of Default Service, Docket No. I-2011-2237952, February 15, 2013 (hereinafter "Final ES Order").

[6] The Company also took into account Commission guidance when establishing its proposed TOU supply for DSP III (see Opinion and Order, Petition of PPL Electric Utilities Corporation for Approval of a Default Service Program and Procurement Plan, Docket No. P-2012-2302074, January 24, 2013, at p 115).

[7] 52 Pa. Code §§ 69.1802 and 69.1805.

[8] Final ES Order at pp 30-31 and 41-43.

however, shifting away from a greater reliance on 12-month term products to reliance on a mixture of 6- and 12-month term products). Thus, consistent with the Commission's DS Policy Statement, DSP III strikes a balance by providing reasonably frequent price adjustment without exposing customers to unacceptable price volatility, while encouraging retail customers to seek service from EGSs. Second, like DSP II, PPL Electric's DSP III has been designed to recognize some degree of uncertainty regarding PPL Electric's role as the default service provider after the plan's conclusion and does not propose increased reliance on longer-term default service contracts.[9] Third, should the Company no longer serve as the default service provider, PPL Electric's DSP III is designed to allow the Company to modify the contract terms of its proposed final DSP III default service procurement to provide a smooth transition if necessary. This establishes a procurement platform for PPL Electric that can continue in the future as appropriate, or if the PUC properly so determines, easily accommodate transferring the responsibility of providing default service to an entity other than PPL Electric.

Q: Please summarize your conclusions.

A: In my expert opinion as an economist, I believe the proposed DSP III represents a prudent default service product mixture, procured at least cost over time, which will ensure that customers receive the benefits of competition in regional wholesale electricity markets while supporting continued growth of retail competition in

[9] Final ES Order at p 20, where Commission indicates it may in the future consider adoption of an alternative DSP.

Pennsylvania. The heart of PPL Electric's DSP III is its portfolio of power supply products that will provide default service customers with competitively priced power supplies. PPL Electric's DSP III product portfolio provides for customer rates to change on a semiannual basis (and more frequently for larger customers), ensuring that customers have continued opportunities to assess competitive retail opportunities, while guarding against excessive price volatility. Finally, PPL Electric's DSP III relies on fixed-price, full-requirements, load-following products that have a proven record for supplying default service, and proposes to obtain these products through transparent competitive solicitations that have been widely successful in the Company's Competitive Bridge Plan, DSP I, and DSP II and elsewhere throughout Pennsylvania and the Mid-Atlantic U.S.

Q: Please summarize the following sections of your testimony.

A: In my testimony, I first review additional lessons learned from PPL Electric's experience with DSP II. Next, I describe the Company's proposed DSP III's product portfolio for each customer group. I then evaluate the proposed DSP III and explain why the plan is a reasonable approach to procuring default service supply in a manner that is consistent with Act 129's requirements and the Commission's Orders. In particular, I address why the product portfolio constitutes a "prudent mix" that will ensure "least cost over time" to non-shopping customers while continuing to support the development of a competitive retail market.

II. Lessons Learned From PPL Electric's DSP II

Q: Please provide a brief overview of PPL Electric's existing DSP II.

A: For residential and small commercial and industrial customers, PPL Electric's DSP II relies on a portfolio of laddered fixed-price, full-requirements supplies, combined for the residential class with a small decreasing quantity of pre-existing longer-term fixed-price block supplies.[10] For example, Exhibit JC-1 shows DSP II's product portfolio and procurement schedule for the residential customer class.[11] As Exhibit JC-1 shows, the product mixture is designed around semiannual procurements, generally obtaining 9- and 12-month products, and the Company conducts competitive solicitations to purchase these default service products. For its large commercial and industrial customers, PPL Electric's DSP II provides a full-requirements, load-following, spot market power supply to meet the default service demand of those customers electing to receive such service.

Q: In your opinion, have the results of the procurements under DSP II continued to support the emergence of a competitive retail market?

A: Yes. Exhibit JC-2 shows the evidence of a robust competitive retail market within PPL Electric's service territory. Specifically, data from the Pennsylvania Office of Consumer Advocate show that from January 1, 2012, to January 1, 2014, PPL Electric's service territory has maintained a high rate of shopping by residential,

---

[10] Note that DSP I procured long-term block supplies for only residential default service customers.

[11] Note that PPL Electric relies on the same mixture of supply products for small commercial and industrial customers except that block products are not included. Note also that the Company intends to request to extend the two final DSP II residential and small commercial and industrial product terms by 6 months in order to avoid the "hard stop" to all DSP II products as of May 31, 2015, and continue supply product laddering.

commercial, and industrial customers.[12] In addition, residential and commercial customer shopping rates within PPL Electric's service territory continued to slowly increase, and the majority of larger customers that have already shopped are not returning to default service. Finally, there continues to be a large number of licensed EGSs serving residential customers in PPL Electric's service territory as of January 2014.[13] Retail competition is strong in the PPL Electric service territory.

Q: Is there evidence that the auction process used to solicit the fixed-price, load-following product types within DSP II provides least-cost supplies?

A: Yes. With respect to the product types within DSP II's product portfolio, PPL Electric has successfully procured these products numerous times (going back to July 2007, when PPL Electric first began procuring supplies for its Competitive Bridge Plan, through its most recent DSP II solicitation). The results from PPL Electric's auctions, as well as those of numerous similar auctions conducted by Pennsylvania, Maryland, and New Jersey utilities during the past several years for these products, confirm that these default service products draw numerous competitors and that multiple bidders are successful suppliers.[14] Competition

---

[12] *Pennsylvania Electric Shopping Statistics*, Pennsylvania Office of Consumer Advocate, January 1, 2012, and January 1, 2014.

[13] As of January 2014, 36 EGSs were reported as offering service to PPL Electric Utility residential customers (see PA Office of Consumer Advocate's Electric Shopping Guides, January 2014, available at http://www.oca.state.pa.us/Industry/Electric/elccomp/Archive/pricecharts_archive.htm). In addition, 54 EGSs were reported as willing to serve business consumers as of February 24, 2014 (see http://www.papowerswitch.com/shop-for-electricity/).

[14] See, e.g., https://www.pplelectric.com/at-your-service/for-generation-suppliers/archived-dsp-1-information/rfp-results.aspx and https://www.pplelectric.com/at-your-service/for-generation-suppliers/default-service-suppliers-dspp/rfp-results.aspx, accessed February 24, 2014; http://www.bgs-auction.com/bgs.auction.prev.asp, accessed

disciplines the prices offered by suppliers and drives competitors to innovate and find methods to deliver services at lower costs to buyers than their rivals. The evidence shows that there is substantial competition to supply the fixed-price, full-requirements, load-following products.

Q: Are there other lessons that can be learned from PPL Electric's experience with the existing DSP II?

A: Yes. The product mixture within DSP II's product portfolio (relative to PPL Electric's DSP I) for non-shopping residential (and small commercial and industrial) customers has simplified the default service procurement process for PPL Electric, and default service pricing has continued to be responsive to market changes, while avoiding price volatility.[15] For example, under DSP II PPL Electric procures default power supply semiannually using a straightforward product mixture that effectively balances responsiveness to power market changes and default service price stability. Semiannual procurement allows PPL Electric to keep its default service administrative costs lower than under the quarterly procurements in DSP I. Default service pricing updates associated with a large quantity of PPL Electric's default service load being re-priced in each procurement ensures that EGSs continue to have an opportunity to compete for customers in the PPL Electric service territory.

February 24, 2014; and http://www.pepcoholdings.com/business/suppliers/sos/disclosure/, accessed February 24, 2014.

[15] PPL Electric's default service procurements under DSP II have been successful and approved by the Commission.

III. PPL Electric's Proposed DSP III

A. Overview, Product Descriptions, and Procurement Plan

Q: Please provide an overview of PPL Electric's proposed DSP III.

A: For its residential and small commercial and industrial default service customers, PPL Electric's DSP III envisions obtaining a portfolio of laddered fixed-price, full-requirements, load-following supplies.[16] In particular, for its non-shopping residential and small commercial and industrial customers, DSP III provides for the purchase of fixed-price, full-requirements, load-following products with 6- and 12-month contract terms using a laddering approach, and supports the possibility that PPL Electric may no longer be the default service supplier at the end of DSP III. DSP III's reliance on 6- and 12-month products reflects the incorporation of somewhat shorter-term contracts than the 9- and 12-month products (and legacy 24-month products) used to provide default supply during DSP II.

For large commercial and industrial customers, DSP III will continue the approach taken in DSP II and provide for the purchase of power supply pursuant to full-requirements, load-following contracts with an energy component that reflects wholesale electricity spot market prices on a real-time hourly basis to meet the default service demand of those customers electing to receive such service. To be

[16] Under DSP III, PPL Electric will continue to rely upon a small quantity of block supply that was purchased under DSP I. However, during DSP III, remaining pre-existing block supply contracts will continue to expire such that only a single long-term block purchase of 50 MW will remain as of January 2016.

clear, products to supply each customer group (i.e., residential, small commercial and industrial, and large commercial and industrial) will be procured separately.

1. Residential and Small Commercial and Industrial Customers

Q: How is the proposed DSP III structured for residential customers?

A: Exhibit JC-3A shows DSP III's product portfolio and procurement schedule. For residential customers, DSP III obtains a portfolio of 12- and 6-month fixed-price, full-requirements, load-following products procured semiannually. DSP III is structured so that, following its completion, PPL Electric will have only one 12-month default service supply (25% of the default service load) under contract at the end of the DSP III period (other than one 50 MW long-term product purchased under DSP I). If PPL Electric no longer continues to be the default service provider following the end of DSP III, the final solicitation under DSP III can be adjusted to purchase just a 6-month product, or the Company can consider assignment of the overhanging 12-month product.

Q: How is the proposed DSP III structured for small commercial and industrial customers?

A: For small commercial and industrial customers, DSP III obtains a portfolio of 12- and 6-month fixed-price, full-requirements, load-following products procured semiannually that mirrors the structure for residential customers with the exception that there is no reliance on block products. Exhibit JC-3B shows DSP III's product portfolio and procurement schedule for the small commercial and industrial customer group. Note also that the Company will implement a peak billing demand

demarcation of 100 kW between the small commercial and industrial customer group and the large commercial and industrial customer group beginning on June 1, 2015. This will result in a small number of default service customers with peak billing demand between 100 kW and 500 kW being reclassified from small commercial and industrial customers to large commercial and industrial customers.[17]

Q: Why is the proposed DSP III's structure for small commercial and industrial customers similar to residential customers?

A: The proposed DSP III approach for the newly defined small commercial and industrial customers mirrors the approach for residential customers (ignoring block purchases) because these non-shopping small commercial and industrial customers collectively represent PPL Electric's lowest-load customers in this rate class. The incidence of shopping for these lower-load customers is notably less than for larger-load small commercial and industrial customers. In particular, I understand that more than 90,000 small commercial and industrial customers, out of a total of approximately 194,000 customers, are shopping and represent approximately 85% of the load. Moreover, Mr. Rouland states that over 88% of the larger (over 100 KW) Small C&I customers are shopping. Based upon this information, we can conclude that the remaining non-shopping customers, representing 10% of the load, are customers with much lower loads. Thus, the reasoning supporting the small commercial and industrial product mixture is the same as that for the residential

[17] See Testimony of James M. Rouland.

plan (see above). That is, DSP III provides a continued transition to somewhat shorter-term fixed-price, full-requirement, load-following products. Moreover, the PUC's DS Policy Statement allows for a similar mixture of products for these two customer groups, and using an approach that mirrors the residential plan simplifies the procurement process.[18]

Q: When will the DSP III products for residential and small commercial and industrial customers be solicited?

A: The semiannual solicitations envisioned under DSP III will procure the 12- and 6-month products approximately two months prior to delivery.

Q: Why is the reliance on 12-month fixed-price, full-requirements, load-following products reduced for residential and small commercial and industrial customers under DSP III?

A: PPL Electric's DSP III's product mixture seeks to strike a balance where default service pricing regularly adjusts to ensure that the default service price-to-compare reflects changes in market prices, while avoiding price volatility, thereby continuing to support the competitive market. This is accomplished by gradually reducing the Company's reliance on 12-month products serving a majority of the default service load and shifting to a reliance on a more even mix of 12- and 6-month products serving this load. In particular, the first solicitation under the proposed DSP III meets 25% of the default service load under a 6-month term product with the

[18] 52 Pa. Code § 69.1805.

amount growing to 45% in the second solicitation (see Exhibit JC-3A). Thereafter the product terms will continue to ladder a mixture of 6- and 12-month term products using a product supply mixture almost equally weighted (55% 12-month and 45% 6-month).

2. Large Commercial and Industrial Customers

Q: How is the proposed DSP III structured for large commercial and industrial customers?

A: As I describe above, for large commercial and industrial customers, DSP III obtains the default service supply for these customers at prices based on the wholesale electricity spot markets. PPL Electric will annually solicit contracts to administer the provision of this spot market supply. This is identical to the approach taken in the Competitive Bridge Plan, DSP I, and DSP II and, thus, non-shopping large commercial and industrial customers[19] will experience no change in the structure of their default service.

Specifically, PPL Electric proposes to issue single solicitations in the second quarter of 2015 and the second quarter of 2016 in which PPL Electric will request competitive offers from suppliers to manage the provision of its default service spot market supply for a period of 12 months. Customer rates will include the real-time hourly spot market electric energy prices in the PPL Electric transmission zone,

[19] As noted previously, the change in the definition of the small and large commercial and industrial classes from a 500 kW peak billing demand split to a 100 kW split will result in a small number of current small commercial and industrial default service customers being moved from fixed-price to spot market default service pricing.

PJM's pre-determined electric capacity charge in the PPL Electric transmission zone, PPL Electric's costs of administering DSP III, and a competitive supplier charge that encompasses all other components of the spot market default service supply necessary for PPL Electric to satisfy its customer obligations, including AECs. Experience has shown that competitive suppliers will make offers in response to the solicitation, and the successful bidders' charges will form the basis of the competitive supplier charge described above.[20]

Q: Please explain why PPL Electric is not offering a fixed-price product to large commercial and industrial customers.

A: Throughout DSP I, the Company sought bids from wholesale suppliers for a fixed-price, full-requirements, load-following product and for a full-requirements, load-following, spot market product for the large commercial and industrial customer class. The fixed-price product offering was not fully subscribed by suppliers (or no suppliers responded at all) in every attempt the Company made to procure it, and as a result the Company never offered a fixed-price default service option for large commercial and industrial customers. The full-requirements, spot market product, by comparison, has been fully subscribed in every offering throughout the Competitive Bridge Plan, DSP I, and DSP II. For this reason, the Company chose not to offer the fixed-price product as a product under DSP II, which was approved

[20] As discussed above, PPL Electric has successfully used this approach to obtaining default service supplies for large commercial and industrial customers in the Competitive Bridge Plan, DSP I and DSP II. In addition, I note that this service is similar to the commercial and industrial energy product solicited each year as part of New Jersey's basic generation service auctions.

by the Commission; similarly, the Company is choosing not to offer it under DSP III.[21] Additionally, as Exhibit JC-2 shows, PPL Electric's large commercial and industrial customers are purchasing power supplies from competitive retail suppliers, and they can be expected to continue to seek supplies from competitive retail suppliers.[22] Thus, continuing the default service spot market offering for these larger customers provides a flexible default service that is reasonably priced and available whenever a customer must rely on default service supply. Moreover, the spot market product has clearly been an appropriate default service product for supporting the development of a retail competitive market in Pennsylvania for these large customers.

B. DSP III Satisfies the "Prudent Mix" and "Least Cost Over Time" Requirements Put Forth by Act 129 and PUC Policy

Q: Can you please summarize how you have interpreted Act 129 and PUC policy for the purposes of supporting the proposed DSP III?

A: A primary aspect of Act 129 and PUC policy is the requirement that default service providers rely on a "prudent mix" of supplies that is "least cost over time" while

---

[21] I note that the introduction of a new peak billing demand demarcation of 100 kW for small commercial and industrial customers shifts some commercial and industrial customers into the large classification. However, I understand that of these 3,200 shifted customers almost 90% of them are already shopping, according to Mr. Rouland. Thus, the percentage of shopping commercial and industrial customers with peak billing demands of 100-500 kW is similar to those customers that are already classified as large commercial and industrial.

[22] In states where retail competition has been introduced, the majority of large commercial and industrial customer loads have switched to competitive suppliers. This is consistent with PPL Electric's experience (see Exhibit JC-2).

providing default service to customers that is adequate and reliable.[23] At the same time, consistent with Act 129, the PUC's policy regarding default service encourages the continued development of retail competition.[24] Thus, in my analysis I consider that the structure of a default service program should be consistent with encouraging the continued development of retail competition. I also believe a balance should be struck between market-reflective pricing and avoidance of excessive price volatility.

Q: How have you interpreted PUC policy with respect to the default service customers in each of PPL Electric's customer classes?

A: I have considered customer groupings as defined by PPL Electric in accordance with Commission policy.[25] I have evaluated residential and small commercial and industrial customers collectively, recognizing that most non-shopping customers within these various rate schedules are primarily PPL Electric's smallest (i.e., lowest load per customer) customers (see above).[26] I considered the prudent mix for large commercial and industrial customers separately. In this way, I am able to appropriately evaluate a suitable prudent mix for the different customer classes, recognizing the different risks that the customer classes' loads present to the service

---

[23] Act 129, 66 Pa. C.S. § 2807(e) 3.4 and 52 Pa. Code §§69.1802 and 69.1805. See also, *Implementation of Act 129 of October 15, 2008; Default Service and Retail Electric Markets*, Docket No. L-2009-2095604 (Final Rulemaking Order entered October 4, 2011), at p 40.

[24] 66 Pa. C.S. § 2802 (12) and 52 Pa. Code § 69.1802.

[25] 52 Pa. Code § 69.1805.

[26] However, I note that residential customers' default service supply will continue to include remaining block purchases procured under DSP I (which was the result of a settlement process between the relevant parties).

PPL Electric obtains as the default service provider and observations (from both the Company's experience and other jurisdictions) that a substantial majority of large commercial and industrial customers elect service from competitive retail suppliers.

Q: Can you please summarize why DSP III's proposal for residential and small commercial and industrial customers is appropriate to comply with Act 129 and the PUC's related orders regarding default service?

A: Consistent with Act 129, and Commission policy, defining a prudent mix requires consideration of supporting retail competition while providing for the provision of reliable supply without excessive price volatility over time.[27] PPL Electric's proposed DSP III for its residential and small commercial and industrial customers continues to rely on short-term, fixed-price, full-requirements, load-following products which have a proven track record as prudent default service products. As I explain in greater detail below, market uncertainty impacts any particular mixture of power supply products, and it is not possible to know ahead of time that one mixture will be less expensive than another. Thus, there can be many mixtures that will provide customer rates that are consistent with Commission policy.

Moreover, Commission policy does not provide an explicit definition regarding the power supply mix that a default service provider should procure or precisely prescribe how the supplies must be procured, but instead Commission policy offers options to the default service provider as to what types of products and

[27] Act 129, Legislative Objectives and 52 Pa. Code § 69.1802.

procurement processes are acceptable.[28] Commission policy recognizes that it is desirable for default service programs to be structured so as to accommodate incremental changes as more experience is gained with particular product mixtures, and with the impact of Pennsylvania's other policy objectives, including continued development of the competitive retail market.[29] DSP III for PPL Electric's residential and small commercial and industrial customers provides logical incremental changes to DSP II default service product terms and in my opinion is a reasonable evolution of PPL Electric's provision of default service supply.

Q: Can you please summarize why DSP III's proposal for large commercial and industrial customers is appropriate to comply with Act 129 and the PUC's related orders regarding default service?

A: As I discuss above, Exhibit JC-2 shows that the vast majority of PPL Electric's large commercial and industrial customers and load will continue to be served by competitive suppliers.[30] By continuing to offer default service with spot market pricing to non-shopping large commercial and industrial customers, these non-shopping customers will continue to have a strong incentive to consider the competitive offerings from retail suppliers, whose short- and long-term products will be best suited to their particular individual needs. Moreover, as Exhibit JC-2 shows,

---

[28] 52 Pa. Code § 69.1805.

[29] *Id.*

[30] Although the data shown in Exhibit JC-2 do not break down commercial and industrial customers by billing peak demands, the data reveal that practically all these customers' load is served by EGSs. Moreover, as Mr. Rouland explains in his Testimony, almost 90% of small commercial and industrial customers with a peak billing demand of greater than 100 kW are shopping.

PPL Electric's largest customers have demonstrated that they are able to consistently obtain power supply from retail suppliers. Finally, as I explained above, PPL Electric learned from its experience with DSP I that wholesale suppliers are not interested in providing a fixed-price, load-following, full-requirements product to serve the default service needs of the large commercial and industrial customers.

1. The Proposed DSP III Provides a "Prudent Mix"

Q: Does PPL Electric's proposed DSP III represent a "prudent mix" under Act 129?

A: Yes. The Company's proposed DSP III includes each of the default service product types specified in Act 129. Thus, the Company's proposed DSP III is consistent with Act 129's prudent mix requirement.

Q: What factors did you take into consideration when evaluating what products constitute a prudent mix for the Company's two default service customer groupings?

A: As I explained above, the definition of a prudent mixture takes into account balancing the objective that default service rates support the continued growth of retail competition against ensuring that default service rates are not unacceptably volatile. In addition, it is important to ensure that any product mixture can be successfully procured from the wholesale electricity market.

Q: How do the product types within PPL Electric's proposed DSP III constitute a "prudent mix" for residential and small commercial and industrial customers?

A: For residential and small commercial and industrial customers, DSP III's reliance on fixed-price, full-requirements, load-following products with terms of 6 and 12 months will track ongoing changes in wholesale electricity market prices while guarding against price volatility. The proposed product mixture will continue to promote the development of retail competition while protecting against various risks that must be addressed by any default service plan. Simply stated, the costs of otherwise protecting against uncertain future load and prices (e.g., having the Company engage in managing default service procurement risk) will not be known until after the fact and, thus, are best minimized by using short-term (i.e., 12 months or less) fixed-price, full-requirements, load-following products. These products are well known throughout the industry and can be competitively procured by PPL Electric to obtain reasonably priced reliable power supplies for default service.

Q: Can you please explain why the use of fixed-price, full-requirements, load-following products continues to remain appropriate for obtaining default service supply for non-shopping residential and small commercial and industrial customers?

A: The proposed DSP III continues to use a laddering approach whereby fixed-price, full-requirements, load-following products are purchased periodically to establish default service pricing for 6-month periods, and in doing so, reduces the risk of unreasonable price volatility. Moreover, competition between wholesale suppliers in the provision of fixed-price, full-requirements, load-following products has been robust for several years and ensures that PPL Electric will be able to obtain supply

for default service through these products at reasonable prices for its customers while minimizing the risks associated with the provision of default service supply.

Q: What types of risk do wholesale suppliers manage when providing default service?

A: Wholesale suppliers primarily manage the risks associated with offering a fixed-price default service while underlying supply input costs and customer loads can change throughout a product term. For example, wholesale suppliers agree to meet a fixed percentage of default service load regardless of the number and type of default service customers and the variance in load that occurs due to seasonal weather changes. Wholesale suppliers also must manage the costs of default service supply and hedge against possible shifts in fuel and power markets during the product delivery term. Wholesale suppliers specialize in managing these risks and compete to provide the lowest-price default service to PPL Electric's customers.

Q: Is there any evidence to support your claim that PPL Electric's use of fixed-price, full-requirements, load-following products has resulted in reasonable prices for customers?

A: Yes. The pricing of the fixed-price, full-requirements, load-following products is consistent with the actual prices of underlying wholesale electricity market products at the time the purchases are made. To show this I have prepared Exhibits JC-4A and JC-4B, which compare the prices obtained for the various fixed-price, full-requirements, load-following products serving the residential and small commercial and industrial customer groups in the more recent DSP I and DSP II solicitations to the estimated costs of each major component of the full-requirements product obtained separately (not including the costs of overhead and risk management

services, and a competitive profit margin). These components are the cost of energy (whenever possible based on price of the concomitantly procured block product[31] of the same term plus a load-shaping adjustment, otherwise based on contemporaneous forward prices of the same term plus a load-shaping adjustment), the cost of capacity (based on the applicable price of capacity established by PJM), the cost of ancillary services (based on the price of ancillary services reported in PJM's *2012 State of the Market Report*[32]), and the costs of AECs (based on the price reported in *2012 Annual Report: AEPS Act of 2004*[33]).

As Exhibits JC-4A and JC-4B show, the cost build-up (not including the expected costs of overhead and risk management services, and a competitive profit margin) is somewhat less than the full-requirements product (which includes all the costs a supplier expects to incur). On average, across the solicitations, the fixed-price, full-requirements, load-following product prices are slightly higher than the cost build-up (by roughly $3.30 per MWh for the residential customer group and $7.70 per MWh for the small commercial and industrial group).

Next, because estimating the costs a supplier incurs associated with overhead and risk management services is difficult and subject to each supplier's particular

---

[31] The block products obtained under DSP I are around-the-clock electricity service, for a given time period, which includes all necessary energy, transmission (other than Network Integration Transmission Service), transmission losses, congestion management costs, and such other services or products (but exclude capacity, ancillary services, and alternative energy credits to meet Pennsylvania's Alternative Energy Portfolio Standards Act).

[32] *2013 State of the Market Report for PJM*, Monitoring Analytics, LLC, Independent Market Monitor for PJM, March 13, 2014.

[33] *2012 Annual Report: Alternative Energy Portfolio Standards Act of 2004*, prepared by the PA Public Utility Commission in cooperation with the PA Department of Environmental Protection, October 2013.

business structure, I have not tried to estimate these costs for the individual procurements, or tried to estimate a competitive profit margin. However, empirical analysis suggests that these excluded costs are at least in the range of $3-8/MWh.[34] Thus, these excluded costs fall squarely into the range of the difference between default service auction prices and the estimated prices using the cost build-ups. Including an estimate of the costs associated with overhead and risk management services and a competitive profit margin causes the results of my cost build-up analysis to be closely comparable to the actual default service auction prices. This indicates that default service pricing based on fixed-price, full-requirements, load-following products has been competitive and consistent with power market conditions at the time the supply is procured.

Q: Why have the contract terms been reduced for residential and small commercial and industrial customers?

A: Under DSP II, PPL Electric began to transition from longer-term (12- and 24-month) to shorter-term (9- and 12-month) fixed-price, full-requirements default service products, and DSP III continues this transition by moving to 6- and 12-month term products. As I explained above, PPL Electric's lessons learned under DSP II show continued high numbers of shopping customers and competitively priced default

[34] Statistical modeling has shown that the modal premium associated with hedging is around 5%, the median premium is 8%, and the mean premium is 11% (see Faruqui, Ahmad, "The Ethics of Dynamic Pricing," The Brattle Group, March 30, 2010). As with any statistical study, the result depends on assumptions regarding underlining stochastic variables. However, applying these results to the fixed-price, full-requirements, load-following products in Exhibits JC-4A and JC-4B suggests that roughly an additional $3-8/MWh of costs associated with risk management are not included in the cost build-ups. This is consistent with the estimates reported elsewhere.

service supply contracts. Under DSP III, the Company's default service load (less block purchases where relevant) is continually re-priced through semiannual solicitations for non-shopping residential and small commercial and industrial customers. This structure encourages these non-shopping customers to consider offers from competitive retail suppliers (for example, prices each year will rise and fall with market conditions during summer/fall and winter/spring, which helps signal to customers the value of competitive supplier products), promoting the further development of Pennsylvania's competitive retail electricity markets. Moreover, resetting prices for 6-month time periods facilitates non-shopping customers' evaluation of EGS offers by providing a long enough time horizon to make a reliable estimate of the savings available from shopping.[35] In my opinion, this approach is fully consistent with Act 129 and the PUC's default service policies, and an appropriate evolution for the prudent mixture of default service products for the Company's residential and small commercial and industrial customers.

Q: How does the product type within PPL Electric's proposed DSP III constitute a "prudent mix" for large commercial and industrial customers?

A: In my opinion, the full-requirements, load-following, spot market product provides non-shopping large commercial and industrial customers a cost-effective default service that has been consistently available from competitive wholesale suppliers. By using a spot market product, PPL Electric protects large commercial and

[35] For smaller customers, more frequent default service price changes that accompany even shorter-term products (e.g., quarterly, monthly, and spot market) make the determination of savings less certain, and all else equal, will increase price volatility.

industrial customers from the risks of high costs that could result if longer-term products were purchased which required bidders to incorporate into their prices the uncertainty associated with shopping customers possibly returning to default service. For example, almost all of the Company's large commercial and industrial customers are shopping (see above). If the Company were to introduce a longer-term product, wholesale suppliers would be in a difficult position of trying to predict if the provision of a fixed-price product would result in shopping customers returning to default service. To manage this uncertainty, wholesale suppliers would have to increase their bids to account for the possibility that customers would return to default service.[36] Moreover, as explained above, the Company learned from DSP I that suppliers were not interested in bidding for a large commercial and industrial fixed-price, full-requirements, load-following product.

Finally, a spot market-priced service provides default service customers the opportunity to shop without restrictions that would be necessary to support a longer-term fixed-price service. For example, it is likely that a fixed-price service for large commercial and industrial customers would require a tariff provision to ensure customers taking service remain for a certain number of months, or pay a termination fee, in order to define a product that might be of interest to bidders. However, these types of restrictions would reduce customers' shopping options. Company experience has shown that the full-requirements, load-following, spot

[36] This type of uncertainty is not a problem for residential and small commercial and industrial customers whose historical switching behavior has evolved in conjunction with the use of fixed-price products.

market product facilitates retail competition and has been a consistently successful default service product.

2. The Proposed DSP III Ensures "Least Cost Over Time"

Q: In your opinion, will the products procured under the proposed DSP III ensure "least cost over time" to customers?

A: Yes. First, it is important to note that there are numerous assumptions regarding inherently uncertain future market conditions that affect a given product portfolio's costs to customers. On a going-forward basis, there are many possible contract mixtures that can constitute a prudent mix, and the cost of these various mixtures is not necessarily known ahead of time. Thus, when assessing a product portfolio prospectively, it is important to analyze the products recognizing the uncertainty surrounding energy markets at the time the products are purchased. It is impossible to say with certainty whether one particular prudent mixture of products will always be less costly than another prudent mixture of products when evaluated post procurement. What can be said with certainty is that exposing PPL Electric's smaller default service customers to price and quantity volatility can result in unexpected cost increases. DSP III explicitly recognizes such possibilities and insures against uncertain outcomes by relying primarily on fixed-price, full-requirements, load-following products.

Consistent with the realities of the inherent uncertainty in energy markets, I have interpreted "least cost over time" along two dimensions. First, in a broader context, it is my understanding that the phrase "least cost over time" requires the selection of contracts that compose a prudent mix, and that the types of products in

the prudent mix are selected by considering all relevant and appropriate risks and costs. Second, in a narrow context, it is my understanding that this phrase requires default service products to be procured through a process that produces the lowest cost for the particular product being purchased.

Q: How does PPL Electric's proposed DSP III satisfy the broad interpretation of "least cost over time" with respect to residential and small commercial and industrial default service customers?

A: I have analyzed the proposed DSP III from the perspective of satisfying the policy objectives of the Commonwealth. In particular, I have assumed that it is important to promote the development of retail competition while protecting default service customers, over time, from costly risks. As I have explained above, retail competition is supported by default service rates that track changes in wholesale electricity markets and provide customers an opportunity to assess the benefits of shopping. At the same time, I have recognized that fixed-price default service supply products for residential and small commercial and industrial customers continue to provide cost-effective protection against price volatility. In my opinion, DSP III's product portfolio promotes the development of retail competition (one of the Commonwealth's primary public policy objectives). DSP III promotes this objective while balancing market-reflective price changes with reasonable price stability (which is another one of the Commonwealth's public policy objectives especially important for smaller customers). The plan also takes into account the various risks that must be addressed by any default service plan.

Q: How does PPL Electric's proposed DSP III satisfy the narrow interpretation of "least cost over time" with respect to residential and small commercial and industrial default service customers?

A: The proposed DSP III satisfies this provision by regularly holding transparent solicitations in which wholesale suppliers can compete with one another to be the source of default service supply. Over time this approach will produce default service prices that are the least cost over time given the underlying energy market conditions. PPL Electric relies on widely advertised, well-defined solicitations to procure these products where the overarching objective is to seek out the lowest-cost suppliers. By obtaining default service supplies through competitive solicitations in the form of an auction, PPL Electric always obtains default supplies at the lowest possible cost for the product being procured.

Q: How does PPL Electric's proposed DSP III satisfy the broad interpretation of "least cost over time" with respect to large commercial and industrial default service customers?

A: As I have discussed above, by using the spot market to price default service for non-shopping large commercial and industrial customers, the proposed DSP III ensures that these customers are provided a default service product that has been demonstrably successful and competitively priced. An alternative fixed-price, full-requirements, load-following product would require bidders to estimate the costs of managing the uncertainty that large customers will move onto and off of the default service and, as a result, increase default service rates, all else equal. Moreover, such

a product also would require the Company to place unacceptable restrictions on shopping in order to obtain suppliers interested in bidding on such a product.

Providing default service supplies based on the spot market allows the large commercial and industrial customers complete flexibility to shop and recognizes that retail suppliers have clearly offered large commercial and industrial customers products that will take into account the particular needs of the individual customers. It is my opinion that default service with prices based on the spot market will be least cost over time for these customers.

Q: How does PPL Electric's proposed DSP III satisfy the narrow interpretation of "least cost over time" with respect to large commercial and industrial default service customers?

A: The proposed DSP III satisfies this provision for the same reasons I have explained above with respect to the fixed-price, full-requirements, load-following products used to obtain supply for residential and small commercial and industrial customers. Namely, wholesale competition among suppliers of the spot market-priced product will ensure that PPL Electric provides this default service at the lowest possible cost.

Q: Does this conclude your direct testimony?

A: Yes.

Appendix A

CURRICULUM VITAE

Joseph Cavicchi

OFFICE: Compass Lexecon
200 State Street
9th Floor
Boston, MA 02109
(617) 520-0200 main
(617) 520-0251 direct

PROFESSIONAL EXPERIENCE

Compass Lexecon, Boston, MA
Executive Vice President, April 2013 – present
Senior Vice President, January 2007 – March 2013
Managing Director, 2003 – 2006
Vice President, 2001 – 2003
Senior Consultant, 1999 – 2001
Consultant, 1997 – 1999

Provides wholesale and retail electricity market regulatory economic analyses in connection with the restructuring of the US electricity industry. In particular, he advises clients in Federal Energy Regulatory Commission matters, state regulatory proceedings, and arbitration and court proceedings. He files testimony, affidavits and expert reports supported by economic analyses.

Extensive knowledge of wholesale market operations with general economic theory of contracting and electricity generation plant dispatch that provides companies with detailed analyses that impact both regulatory and business decisions. Actively involved in the electricity industry both before and after restructuring for a total of more than 20 years.

Tufts University, Medford, MA
Adjunct Instructor, Summer 2000

Taught graduate-level environmental economics.

Massachusetts Institute of Technology, Cambridge, MA
Research Engineer, 1997
Research Assistant, 1995 – 1997

Performed an analysis of water and electricity resources in Mendoza, Argentina. Developed a computer simulation model to support analysis and permit the display of results to a diverse group of stakeholders. Traveled frequently to Mendoza to interact with government officials and relevant institutions in an effort to establish electricity and water policy.

Massachusetts Institute of Technology, Cambridge, MA
Project Manager/Staff Mechanical Engineer, 1989 – 1995

Managed the development, engineering, and construction of a $40 million, 20 MW gas turbine-based cogeneration facility at the Cambridge campus. Directed all attributes of the project for its three-year duration. Involved extensively in energy conservation programs with emphasis on building and utility plant optimization through innovative engineering applications.

Carrier Building Systems and Services, Waltham, MA
Project Engineer, 1987 – 1988

Engineered and managed the installation of Energy Management Systems used exclusively for demand-side management. Interfaced direct digital control systems to mechanical equipment associated with thermal systems of industrial, commercial, and educational buildings.

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
S.M. in Technology Policy, 1997

Tufts University, Medford, MA
S.M. in Environmental Engineering, 1992

University of Connecticut, Storrs, CT
B.S. in Mechanical Engineering, 1987

TESTIMONY

San Diego Gas and Electric Company

Naturener USA, LLC, et al. v. San Diego Gas & Electric Company, in the Montana Ninth Judicial District Court, Toole County. Declaration, Non-Public (January 22, 2014).

PPL EnergyPlus

Before the Federal Energy Regulatory Commission. RE: Triennial Market-Based Rate Update for the Northeast Region, PPL Electric Utilities Corporation et al, Dockets ER 10-2010 et al. Affidavit of A. Joseph Cavicchi, December 31, 2013, Written, Public.

Before the Federal Energy Regulatory Commission. RE: Triennial Market-Based Rate Update for the Northwest Region, PPL EnergyPlus LLC et al, Dockets ER 10-2011 et al. Affidavit of A. Joseph Cavicchi, December 31, 2013, Written, Public.

Transalta Energy Marketing

Before the Federal Energy Regulatory Commission, Puget Sound Energy, Inc., Complainant v. All Jurisdictional Sellers of Energy and/or Capacity at Wholesale into Electric Energy and/or Capacity Markets in the Pacific Northwest, Including Parties to the Western System Power Pool Agreement Participants, Docket. No. EL01-085. Prepared Answering Testimony of A. Joseph Cavicchi on behalf of Transalta Energy Marketing (U.S.) Inc. and Transalta Energy Marketing (California) Inc., December 17, 2012. Deposition of A. Joseph Cavicchi on behalf of Transalta Energy Marketing (California) Inc., February 8, 2013. Testimony of A. Joseph Cavicchi, October 21 and 22, 2013, Oral, Public.

Avista Corporation et al

Before the Federal Energy Regulatory Commission. In the Matter of Puget Sound Energy, Inc. v. All Jurisdictional Sellers of Energy and/or Capacity at Wholesale into Electric Energy and/or Capacity Markets in the Pacific Northwest, including Parties to the Western Systems Power Pool Agreement. Docket EL01-10-085. Testimony of A. Joseph Cavicchi, September 26, 2013. Oral, public. Answering Testimony of A. Joseph Cavicchi on behalf of Avista Corporation et al. ("Joint Defense Group"), June 24, 2013. Deposition of A. Joseph Cavicchi on behalf of Avista Corporation et al, July 9, 2013.

Department of Justice

Before the United States Court of Federal Claims, Pacific Gas and Electric Company and Southern California Edison Company, Plaintiffs et al v. The United States, Defendant, No. 07-157C, No. 07-167C (Consolidated), No. 07-

184C. Deposition of A. Joseph Cavicchi, March 27, 2013. Confidential, Subject to Protective Order.

Before the United States Court of Federal Claims, Pacific Gas and Electric Company and Southern California Edison Company, Plaintiffs et al v. The United States, Defendant, No. 07-157C, No. 07-167C (Consolidated), No. 07-184C. Expert Report of A. Joseph Cavicchi, March 1, 2013. Confidential, Subject to Protective Order.

PPL Montana and PPL EnergyPlus

Before the Federal Energy Regulatory Commission, Puget Sound Energy, Inc., Complainant v. All Jurisdictional Sellers of Energy and/or Capacity at Wholesale into Electric Energy and/or Capacity Markets in the Pacific Northwest, Including Parties to the Western System Power Pool Agreement Participants, Docket. No. EL01-085. Prepared Answering Testimony of A. Joseph Cavicchi on behalf of PPL Montana and PPL EnergyPlus, December 17, 2012. Written, Public. Deposition of A. Joseph Cavicchi on behalf of PPL Montana and PPL EnergyPlus, February 8, 2013.

Constellation New Energy

Before the Federal Energy Regulatory Commission, Puget Sound Energy, Inc., Complainant v. All Jurisdictional Sellers of Energy and/or Capacity at Wholesale into Electric Energy and/or Capacity Markets in the Pacific Northwest, Including Parties to the Western System Power Pool Agreement Participants, Docket. No. EL01-085. Prepared Answering Testimony of A. Joseph Cavicchi on behalf of Constellation Energy Commodities Group, December 17, 2012. Written, Public. Deposition of A. Joseph Cavicchi on behalf of Constellation Energy Commodities Group, February 8, 2013.

Constellation NewEnergy

Before the Federal Energy Regulatory Commission, San Diego Gas & Electric Company, Complainant, v. Sellers of Energy and Ancillary Services into Markets Operated by the CA ISO and CA Power Exchange, et al., Respondents, Docket No. EL00-95-248. Direct Testimony and Exhibits of Constellation NewEnergy, Inc. Testimony of A. Joseph Cavicchi on behalf of Constellation NewEnergy, July 11, 2012. Oral, Public.

PPL Electric Utility Corporation

Before the Pennsylvania Public Utility Commission, Docket No. P-2012-2302074, PPL Electric Utility Corporation. Statement No. 2. Direct Testimony of A. Joseph Cavicchi, May 16, 2012. Statement No. 2-R. Direct Testimony of A. Joseph Cavicchi, August 17, 2012. Statement No. 3. Testimony of A. Joseph Cavicchi, September 10, 2012. Oral, Public.

PPL Corporation

Before the Federal Energy Regulatory Commission, RE: Notice of Change in Status Regarding Market-Based Rate Authority, Docket No. ER10-2016-___ et al. Affidavit of A. Joseph Cavicchi on behalf of PPL Corporation, January 30, 2012. Written, Public.

Entegra Power Services, LLC

Before the Federal Energy Regulatory Commission, Union Power Partners LP, Docket No. ER05-1191-016, Entegra Power Services LLC, Docket No. ER09-838-002. Updated Market Power Analysis for Market-Based Rates. Affidavit of A. Joseph Cavicchi, December 29, 2011.

Constellation NewEnergy, Inc.

Before the Federal Energy Regulatory Commission, San Diego Gas & Electric Company, Complainant, v. Sellers of Energy and Ancillary Services into Markets Operated by the CA ISO and CA Power Exchange, et al., Respondents, Docket No. EL00-95-248. Direct Testimony and Exhibits of Constellation NewEnergy, Inc. Direct and Answering Testimony and Exhibits of A. Joseph Cavicchi on behalf of Constellation NewEnergy, October 25, 2011. Written, Public.

CP Energy

Before the Federal Energy Regulatory Commission, RE: Triennial Market-Based Rate Update for the Northeast Region, Docket No. ER10-1342 et al. Affidavit of A. Joseph Cavicchi, June 30, 2011. Written, Public.

Edison Mission.

Before the Federal Energy Regulatory Commission, RE: Triennial Market-Based Rate Update for the Northeast Region, Edison Mission Marketing and Trading, et al., Docket No. ER11-___-000, et al. Affidavit of A. Joseph Cavicchi, June 29, 2011. Written, Public.

Entegra Power Services, LLC

Before the Federal Energy Regulatory Commission, Gila River Energy Supply LLC, Docket No. ER11-___-000, Request for Acceptance of Initial Market-Based Rate Tariff, Waivers and Blanket Authority Under Section 205 of the Federal Power Act. Affidavit of A. Joseph Cavicchi, April 11, 2011. Written, Public.

PPL Corporation

Before the Federal Energy Regulatory Commission, Triennial Market-Based Rate Update for the Northwest Region, PPL Northwest Companies, ER10-2011-000 et al. Affidavit of A. Joseph Cavicchi on behalf of the PPL Northwest Companies, January 31, 2011. Written, Public.

Entegra Power Services LLC

Before the Federal Energy Regulatory Commission, Gila River Power, LP, Docket No. ER05-1178-015 and Entegra Power Services LLC, Docket ER09-838-

001, Second Supplement to Updated Market Power Analysis for Continued Market-Based Rate Authority in Compliance with Order No. 697. Second Supplement Affidavit of A. Joseph Cavicchi, January 12, 2011. Written, Public.

PPL Corporation

Before the Federal Energy Regulatory Commission, RE: Notice of Change of Status Regarding Market-Based Rate Authority, Docket No. ER10-1511-001 et al. Affidavit of A. Joseph Cavicchi on behalf of PPL Corporation, December 1, 2010. Written, Public.

Entegra Power Services LLC

Before the Federal Energy Regulatory Commission, Gila River Power, LP, Docket No. ER05-1178-015 and Entegra Power Services LLC, Docket ER09-838-001. Supplement to Updated Market Power Analysis for Continued Market-Based Rate Authority in Compliance with Order No. 697. Affidavit of A. Joseph Cavicchi, November 19, 2010. Written, Public.

Chesapeake Energy Corp., et al.

Before the Public Utilities Commission of the State of Colorado, In the Matter of Commission Consideration of Public Service Company of Colorado Plan in Compliance with House Bill 10-1365 "Clean Air Jobs Act," Docket No. 10M-245E. Testimony of A. Joseph Cavicchi on behalf of Noble Energy, Inc., Chesapeake Energy Corporation and Encana Oil & Gas (USA), November 1, 2010. Oral, Public. November 9, 2010. Written, Public. November 18, 2010. Oral, Public.

Chesapeake Energy Corp., et al.

Before the Public Utilities Commission of the State of Colorado, In the Matter of Commission Consideration of Public Service Company of Colorado Plan in Compliance with House Bill 10-1365 "Clean Air Jobs Act," Docket No. 10M-245E. Cross Answer Testimony and Exhibits of A. Joseph Cavicchi on behalf of Noble Energy, Inc., Chesapeake Energy Corporation and Encana Oil & Gas (USA), October 8, 2010. Written Report Public, Exhibits Confidential, Filed Under Seal.

Chesapeake Energy Corp., et al.

Before the Public Utilities Commission of the State of Colorado, In the Matter of Commission Consideration of Public Service Company of Colorado Plan in Compliance with House Bill 10-1365 "Clean Air Jobs Act," Docket No. 10M-245E. Answer Testimony and Exhibits of A. Joseph Cavicchi on behalf of Noble Energy, Inc., Chesapeake Energy Corporation and Encana Oil & Gas (USA), September 17, 2010. Written, Confidential.

PPL Electric Utilities Corporation

Before the Pennsylvania Public Utility Commission, RE: Petition of PPL Electric Utilities Corporation for Approval of a Default Service Program and Procurement Plan for the Period January 1, 2011 through May 31, 2014, Docket No. P-2008-

2060309. Statement No. 2. Direct Testimony of A. Joseph Cavicchi on behalf of PPL Electric, September 14, 2010. Oral, Written and Public.

PPL Corporation and E.ON U.S.

Before the Federal Energy Regulatory Commission, RE: PPL Corporation and E.ON U.S. LLC Application for Authorization Under Section 203 of the Federal Power Act, Request for Waivers of Filing Requirements, and Confidential Treatment of Agreement and Workpapers, Docket No. EC10-77-000. Affidavit of Dr. Joseph P. Kalt and Mr. A. Joseph Cavicchi, June 28, 2010.

BG Masspower

Before the Commonwealth of Massachusetts Trial Court, Suffolk, SS, Civil Action 07-3243 (BLS2), Masspower, by its General Partners, BG MP Partners I, LLC, and BG MP Partners II, LLC, Plaintiffs, v. Massachusetts Municipal Wholesale Electric Company, Defendant. Deposition of A. Joseph Cavicchi on behalf of Masspower, February 19, 2010. Testimony of A. Joseph Cavicchi on behalf of Masspower, March 18 and 19, 2010. Oral, Public.

Allegheny

Before the Federal Energy Regulatory Commission, State of California ex rel. Lockyer v. British Columbia Power Exchange Corp., et al., Docket No. EL02-71-017 et al. Prepared Answering Testimony of A. Joseph Cavicchi on behalf of Allegheny Energy, September 17, 2009. Written, Public.

MPS Merchant Services

Before the Federal Energy Regulatory Commission, State of California ex rel. Lockyer v. British Columbia Power Exchange Corp., et al., Docket No. EL02-71-017. Prepared Answering Testimony of A. Joseph Cavicchi on behalf of MPS Merchant Services, September 17, 2009. Written, Public.

PPL Montana, LLC

Before the Federal Energy Regulatory Commission, State of California ex rel. Lockyer v. British Columbia Power Exchange Corp., et al., Docket No. EL02-71-017. Answering Testimony of A. Joseph Cavicchi on behalf of PPL Montana, LLC, September 17, 2009. Written, Public.

Constellation New Energy

Before the Federal Energy Regulatory Commission, San Diego Gas and Electric Co. v. Sellers of Energy and Ancillary Services, Docket No. EL00-95 et al. Affidavit of A. Joseph Cavicchi on behalf of Constellation New Energy, August 4, 2009. Written, Public.

Energy Northwest

Before the American Arbitration Association, Seattle, Washington, Grays Harbor Energy LLC, Claimant, Energy Northwest, Respondent, Case No. 75-158-115-08. Testimony of A. Joseph Cavicchi on behalf of Energy Northwest, June 18,

2009. Oral, Public. Deposition Testimony of A. Joseph Cavicchi on behalf of Energy Northwest, May 13, 2009. Oral, Public. Supplemental Expert Report of A. Joseph Cavicchi on behalf of Energy Northwest, April 30, 2009. Written, Confidential. Expert Report of A. Joseph Cavicchi on behalf of Energy Northwest, April 15, 2009. Written, Confidential

Entegra Power Services LLC

Before the Federal Energy Regulatory Commission, Docket ER09-838-000, Request for Acceptance of Initial Market-Based Rate Tariff, RE: Updated Market Power Analysis for EPS' Affiliate, Gila River. Affidavit of A. Joseph Cavicchi, March 13, 2009. Written, Public.

Union Pacific Railroad Company

In the Matter of the Arbitration between Wisconsin Public Service Corporation and Union Pacific Railroad Company. Rebuttal Expert Report of A. Joseph Cavicchi, February 16, 2009.

PPL Electric Utilities Corporation

Before the Pennsylvania Public Utility Commission, RE: Petition of PPL Electric Utilities Corporation for Approval of a Default Service Program and Procurement Plan for the Period January 1, 2001 through May 31, 2014, Docket No. P-2008-2060309. Testimony of A. Joseph Cavicchi on behalf of PPL Electric Utilities Corporation, February 11, 2009. Oral, Public.

PPL Electric Utilities Corporation

Before the Pennsylvania Public Utility Commission, Docket No. P-2008-2060309. Rebuttal Testimony of A. Joseph Cavicchi on behalf of PPL Electric Utilities Corporation, January 20, 2009.

Union Power Partners, L.P.

United States of America, Before the Federal Regulatory Commission, Docket No. ER05-1191-014, Updated Market Power Analysis for Continued Market-Based Rate Authority. Affidavit of A. Joseph Cavicchi on behalf Union Power Partners, L.P., December 30, 2008.

PPL Electric Utilities Corporation

Before the Pennsylvania Public Utility Commission, Docket No. P-2008-2060309, Supplemental Testimony of A. Joseph Cavicchi of behalf of PPL Electric Utilities Corporation, November 3, 2008.

PPL Electric Utilities Corporation

Before the Pennsylvania Public Utility Commission, Docket No. P-2008-2060309. Testimony of A. Joseph Cavicchi of behalf of PPL Electric Utilities Corporation, September 11, 2008.

PPL Electric Utilities Corporation

United States of America, Before the Federal Regulatory Commission, Docket No. ER00-1712-008, ER02-2408-003, ER00-744-006, ER02-1327-005, ER00-1703-003, ER02-1749-003, ER02-1747-003, ER99-4503-005, ER00-2186-003, ER01-1559-004. Affidavit of A. Joseph Cavicchi on behalf of PPL Companies, September 2, 2008.

PPL Electric Utilities Corporation

United States of America, Before the Federal Regulatory Commission, Docket No. EL08-67-000. Affidavit of A. Joseph Cavicchi (with Joseph P. Kalt) on behalf of PPL Companies, August 12, 2008.

PPL Electric Utilities Corporation

United States of America, Before the Federal Regulatory Commission, Docket No. EL08-67-000. Affidavit of A. Joseph Cavicchi (with Joseph P. Kalt) on behalf of PPL Companies, July 11, 2008.

Entegra Power Group L.L.C.

United States of America, Before the Federal Regulatory Commission, Docket Nos. ER05-1178-00 and ER05-1191-00. Affidavit of A. Joseph Cavicchi on behalf of Entegra Power Group L.L.C, Gila River Power, L.P., Union Power Partners, L.P., Harbinger Capital Partners Master Fund I, Ltd., and Harbinger Capital Partners Special Situations Fund, LP, May 30, 2008.

Harbinger

United States of America, Before the Federal Regulatory Commission, Docket No. EC08-87-000. Affidavit of A. Joseph Cavicchi on behalf of the Entegra Power Group L.L.C, Gila River Power, L.P., Union Power Partners, L.P., Harbinger Capital Partners Master Fund I, Ltd., and Harbinger Capital Partners Special Situations Fund, LP, May 9, 2008.

IEPA

United States of America, Before the Federal Regulatory Commission, Docket Nos. ER08-556-000 and ER06-615-020. Affidavit of A. Joseph Cavicchi on behalf of Independent Energy Producers Association, February 29, 2008.

PJM Power Providers Group

United States of America, Before the Federal Regulatory Commission, Docket No. EL08-34-000. Affidavit of Joseph P. Kalt and A. Joseph Cavicchi on behalf of the P3 Group, responding to the Complaint of the Maryland Public Service Commission against PJM Interconnection, L.L.C., regarding marketing power mitigation, February 19, 2008.

Tractebel Energy Marketing, Inc.

Tractebel Energy Marketing, Inc. v. AEP Power Marketing, Inc., American Electric Power Company, Inc. and Ohio Power Company, 03 CV 6731 (S.D.N.Y.) (HB)

(JCF); and Ohio Power Company and AEP Power Marketing, Inc. v. Tractebel Energy Marketing, Inc. and Tractebel S.A., 03 CV 6770 (S.D.N.Y.) (HB) (JCF). Expert Report of A. Joseph Cavicchi on behalf of Tractebel Energy Marketing, Inc., January 21, 2008.

PPL Corporation

United States of America, Before the Federal Regulatory Commission, Docket Nos. ER00-1712-007, ER02-2408-003, ER00-744-006, ER02-1327-005, ER00-1703-002, ER02-1749-003, ER02-1747-003, ER99-4503-005, ER00-2186-003, ER01-1559-004. Affidavit of A. Joseph Cavicchi on behalf of Triennial Market Power Update of PPL Companies, January 14, 2008.

IEPA

United States of America, Before the Federal Regulatory Commission, Docket Nos. ER06-615-003, 005, 012, ER07-1257-000, ER02-1656-017, ER02-1656-018, EL05-146-000 and EL08-20-000. Affidavit of A. Joseph Cavicchi on behalf of Independent Energy Producers Association, January 9, 2008.

NRG

United States of America, Before the Federal Regulatory Commission, New York Independent System Operator – Docket No. EL07-39-000. Affidavits of A. Joseph Cavicchi on behalf of NRG Power Marketing, Inc., Arthur Kill Power LLC, Astoria Gas Turbine Power LLC, Dunkirk Power LLC, Huntley Power LLC, and Oswego Harbor Power LLC, November 19, 2007, December 10, 2007, and December 21, 2007. Written, Public.

American Electric Power Services Corporation, Conectiv Energy Supplies, Inc., DTE Energy Trading, Inc., Energy America, LLC, Integrys Energy Services, Inc., and PPL Energy Plus, LLC

United States of America, Before the Federal Regulatory Commission, The People of the State of Illinois, ex rel. Illinois Attorney General Lisa Madigan v. Exelon Generation Co., LLC, et al., Docket No. EL07-47-000. Affidavit of Joseph Cavicchi and Joseph P. Kalt, June 18, 2007. Written, Public.

Independent Energy Producers Association of California

United States of America, Before the Federal Regulatory Commission, Docket No. R.06-02-013, Long-Term Procurement Plans, Prepared Testimony of the Independent Energy Producers Association. Prepared Testimony of Joseph Cavicchi and David Reishus on behalf of the IEPA, March 2, 2007. Written, Public.

Cross Hudson

Before the State Of New York Public Service Commission, Request of Hudson Transmission Partners, LLC, for Unredacted Copies of Records Filed In Case 01-T-1474. Affidavit of Joseph Cavicchi in Support of Cross Hudson Corporation's Appeal of Records Access Officer's February 9, 2007, Determination (Trade Secret 07-1), February 21, 2007. Written, Public.

PPL Electric Utilities Corporation

Before The Pennsylvania Public Utility Commission, RE: Petition of PPL Electric Utilities Corporation for Approval of A Competitive Bridge Plan, Docket No. P-00062227. Direct Testimony of Joseph Cavicchi, December 19 and 20, 2006. Oral, Public.

PPL Electric Utilities Corporation

Before The Pennsylvania Public Utility Commission, RE: Petition of PPL Electric Utilities Corporation for Approval of A Competitive Bridge Plan, Docket No. P-00062227. Reply to Surrebuttal Testimony of Marjorie R. Philips, Joseph Cavicchi, December 20, 2006. Written, Public.

PJM Interconnect, LLC

United States of America, Before the Federal Regulatory Commission, Docket No. EL05-148-000, 001; Docket No. ER05-1410-000, 001, Initial Comments of the PPL Parties and the PSEG Companies in Opposition to Proposed Settlement, Exhibit D-1 (Exhibit AJC-1). Affidavit of A. Joseph Cavicchi, October 19, 2006. Written, Public.

Excelsior Energy Inc.

Before The Minnesota Office Of Administrative Hearings, RE: In The Matter Of The Petition Of Excelsior Energy Inc. And Its Wholly-Owned Subsidiary MEP-I, LLC For Approval Of Terms And Conditions For The Sale Of Power From Its Innovative Energy Project Using Clean Energy Technology Under Minn. Stat. §216B.1694 and a Determination That The Clean Energy Technology Is Or Is Likely To Be A Least-Cost Alternative Under Minn. Stat. §216B.1693, MPUC Docket No. E-6472-/M-05-1993; OAH Docket No. 12-2500-17260-2, Prepared Rebuttal Testimony and Exhibits of Excelsior Energy Inc. and MEP-I LLC. Rebuttal and Exhibits of Joseph Cavicchi, October 10, 2006. Written, Confidential.

PPL Electric Utilities Corporation

Before The Pennsylvania Public Utility Commission, RE: Petition of PPL Electric Utilities Corporation for Approval of A Competitive Bridge Plan, Docket No. P-00062227. Statement No. 2, Direct Testimony of Joseph Cavicchi, September 15, 2006. Written, Public.

Independent Energy Producers Association of California

United States of America, Before the Federal Regulatory Commission, Docket No. EL05-146-000, Reply Comments of the Independent Energy Producers Association, September 26, 2006. Affidavit of Joseph Cavicchi, August 26, 2006. Written, Public.

Independent Energy Producers Association of California

United States of America, Before the Federal Regulatory Commission, Docket No. EL05-146-000, Affidavit in Support of Justness and Reasonableness of the Offer of

Settlement's Reference Resource's Cost and Performance Characteristics. Affidavit of Joseph Cavicchi, August 21, 2006. Written, Public.

PPL Maine, LLC

United States of America, Before the Federal Regulatory Commission, RE: PPL Maine, LLC, Docket No. ER00-2186-002, Triennial Market-Based Rate Update. Affidavit of A. Joseph Cavicchi on behalf of the PPL Companies, June 19, 2006. Written, Public.

FirstEnergy Solutions Corp.

United States of America, Before the Federal Regulatory Commission, FirstEnergy Solutions Corp., Docket No. ER06-117-000. Prepared Direct Testimony of Scott T. Jones, Ph.D., and A. Joseph Cavicchi on behalf of FirstEnergy Solutions Corporation, March 15, 2006, confirming the auction price result of the Competitive Bidding Process carried out by the Ohio Public Utilities Commission in December 2004, and establishing that Solutions is not charging a rate greater than market prices for wholesale electricity sold to its affiliated Ohio based regulated distribution companies.

PPL Montana, LLC

United States of America, Before the Federal Energy Regulatory Commission, RE: PPL Montana, LLC, Docket No. ER99-3491-003; PPL Colstrip I, LLC, Docket No. ER00-2184-001; PPL Colstrip II, LLC, Docket No. ER00-2185-001; Answer of the PPL Montana Parties to Montana Consumer Counsel's New Uncommitted Capacity Pivotal Supplier Analysis and Uncommitted Capacity Market Share Analysis. Affidavit (filed with Joseph Kalt), February 28, 2005; Affidavit (filed with Joseph Kalt), November 14, 2005 (original October 31, 2005); First Supplemental Affidavit on behalf of the PPL Montana Parties (filed with Joseph Kalt), December 23, 2005; Affidavit (filed with Joseph Kalt), February 1, 2006.

PPL Corporation

United States of America, Before the Federal Energy Regulatory Commission, Triennial Market-Based Rate Update, Submitted by PPL Great Works, Docket No. ER05-4503-004. Affidavit, January 24, 2006.

Independent Energy Producers Association of California

Before the Public Utilities Commission of the State of California, Evidentiary Hearings, Dockets Nos. R04-04-025 and R04-04-003. Testimony of Joseph Cavicchi and David Reishus on behalf of Independent Energy Producers Association of California, January 23 and 24, 2006. Oral, Public.

PPL Corporation

United States of America, Before the Federal Energy Regulatory Commission, Docket No. ER05-1416-000. Affidavit of A. Joseph Cavicchi, Joseph P. Kalt, Ph.D., and David A. Reishus, Ph.D., on behalf of the PPL Parties, October 19, 2005.

Independent Energy Producers Association of California

United States of America, Before the Federal Energy Regulatory Commission, Docket No. EL05-146-000. Affidavit in Support of the Complaint of the Independent Energy Producers Association to Implement CAISO Market Design Modifications, August 26, 2005.

PPL Corporation

United States of America, Before the Federal Energy Regulatory Commission, PPL Resource Adequacy Market Proposal, Docket No. PL05-7-000. "A Policy Analysis of PJM's Proposed Four-Year Forward Capacity Market" (with Joseph P. Kalt), June 16, 2005.

PPL EnergyPlus

United States of America, Before the Federal Energy Regulatory Commission, Docket ER00-1712-004, Request for Leave to Respond and Response of PPL Parties to Protest of PJM Industrial Customer Coalition and the PP&L Industrial Customer Alliance and to Comments of Joint Consumer Advocates. Supplemental Affidavit, December 16, 2004.

PPL Montana, LLC

United States of America, Before the Federal Energy Regulatory Commission, RE: PPL Montana, LLC; PPL Colstrip I, LLC; PPL Colstrip II, LLC; Docket No. ER99-3491-__, Compliance Filing: Triennial Market-Based Rate Update and Revised Tariff Sheet. Affidavit (filed with Joseph Kalt), November 9, 2004.

United States of America, Before the Federal Energy Regulatory Commission, PPL Colstrip I, LLC; PPL Colstrip II, LLC; Docket No. ER99-3491-003, market power analysis in support of application for renewal of authority to sell electric energy and capacity at market-based rates. Affidavit (filed with Joseph Kalt), November 9, 2004.

PPL EnergyPlus

United States of America, Before the Federal Energy Regulatory Commission, PPL EnergyPlus et al., Docket ER00-1712-004, market power analysis in support of application for renewal of authority to sell electric energy and capacity at market-based rates. Supplemental Affidavit, November 9, 2004.

PPL Southwest Generation Holdings, LLC

United States of America, Before the Federal Energy Regulatory Commission, PPL Southwest Generation Holdings, LLC, Docket No. ER01-1870-002, market power analysis in support of application for renewal of authority to sell electric energy and capacity at market-based rates. Supplemental Affidavit, October 25, 2004.

PPL Wallingford Energy LLC

United States of America, Before the Federal Energy Regulatory Commission, PPL Wallingford Energy LLC, Docket No. ER01-1559-002, market power analysis in

support of application for renewal of authority to sell electric energy and capacity at market-based rates. Supplemental Affidavit, October 8, 2004.

PPL Wallingford Energy LLC

United States of America, Before the Federal Energy Regulatory Commission, PPL Wallingford Energy LLC, Docket No. ER01-1559-002, market power analysis in support of application for renewal of authority to sell electric energy and capacity at market-based rates. Affidavit, July 12, 2004.

PPL Southwest Generation Holdings, LLC

United States of America, Before the Federal Energy Regulatory Commission, PPL Southwest Generation Holdings, LLC, Docket No. ER01-1870-002, market power analysis in support of application for renewal of authority to sell electric energy and capacity at market-based rates. Affidavit, July 12, 2004.

PPL Wallingford Energy LLC

United States of America, Before the Federal Energy Regulatory Commission, PPL Wallingford Energy LLC and PPL EnergyPlus, LLC, Petition for Rehearing, Request for Clarification and Request for Expedited Action on Rehearing and Clarification of PPL Wallingford Energy LLC and PPL EnergyPlus, LLC. Affidavit, June 16, 2003.

Massachusetts Department of Telecommunications and Energy

Submission of comments on the investigation by the Massachusetts DTE on its own motion into the Provision of Default Service, DTE 02-40-B (with Charles Augustine), May 28, 2003.

BUSINESS STRATEGY ANALYSES

Electricity Generation Facility Developers

Oversees the development and implementation of transmission-constrained dispatch modeling for proposed electricity generation units locating in the Northeastern, Mid-Atlantic, and Midwestern United States. Analyses typically focus on determining likely facility capacity factors and impacts on local and regional air pollutant emissions as well as on wholesale electricity prices. In addition, these analyses provide detailed knowledge of new facilities' impacts on the operation of the electricity transmission system that is critical to assessing the ability of a generating unit to deliver its power in a wide geographical area.

Electricity Distribution Companies

Provide extensive strategic advice and analytical support to electricity distribution companies that are required to assess new wholesale marketplaces in order to fulfill their regulatory commitments as providers of last resort or default electricity service. In most instances these companies require assistance with the development and issuance of requests for proposals as well as rapid evaluation of commodity bids. The assignments combine extensive knowledge of wholesale market operations with

general economic theory of contracting and electricity generation plant dispatch in order to provide companies with an approach to commodity procurement that agrees with their risk profile. In most cases there are numerous business and regulatory concerns that are incorporated into the procurement strategies. Additionally, each assignment typically requires extensive analysis of customer demand patterns and wholesale market prices in order to develop market-based customer service cost forecasts.

PUBLICATIONS

"The Polar Vortex: Implications for Improving the Efficiency of Wholesale Electricity Spot Market Pricing," A. Joseph Cavicchi, March 2014. Prepared for the Electric Power Supply Association.

"Anatomy of Sealed-Bid Auctions. Bringing Flexibility and Efficiency to Energy RFPs," with Andrew Lemon, published in *Public Utilities Fortnightly*, June 2009, pp. 20-64.

"U.S. Centralized Wholesale Electricity Markets: An Update," published in the *International Association for Energy Economics Newsletter*, First Quarter 2007, pp. 8-12.

"Power Procurement. What's in Your Mix? Why Competitive Markets Are Scaring Regulators," with Andrew Lemon, published in *Public Utilities Fortnightly*, November 2006, pp. 49-54.

"Competition and Regulation in the Power Industry, Part III: Tensions Evolve Between Regulation and Competition," with Charles Augustine and Joseph Kalt, published in *Electric Light & Power*, January/February 2006: volume 84.01, pp. 24-25.

"Gradualism in Retail Restructuring." with Charles Augustine and Joseph P. Kalt, published in *Electric Light & Power*, September/October 2005: volume 83:05, pp. 26-30.

"Competition and Regulation in the Power Industry: Can the Two Coexist?," with Charles Augustine and Joseph Kalt, published in *Electric Light & Power*, July/August 2005: volume 83.04, pp. 28-31.

"Ensuring The Future Construction of Electricity Generation Plants: The Challenge of Maintaining Reliability in New U.S. Wholesale Electricity Markets," with Andrew Kolesnikov, published in *International Association for Energy Economics Newsletter*, First Quarter 2005.

"Electricity Company Affiliate Asset Transfer Self Build Policies: Renewed Regulatory Challenges," with Scott T. Jones, The *Electricity Journal*, November 2004.

"Onward Restructuring," *Hart Energy Markets*, September 2004, Vol. 9, No. 9, p. 64.

"Competition and Regulation in the North American Electricity Industry: Can These Two Seemingly Opposed Forces Coexist?" with Charlie Augustine and Joseph P. Kalt, published in the 24th Annual North American Conference of the USAEE/IAEE Proceedings, July 9, 2004, Washington, DC.

"Wholesale Electricity Procurement Strategies for Serving Retail Demand," published in *International Association for Energy Economics Newsletter*, First Quarter 2004.

"Economic and Environmental Benefits of the Kings Park Energy Project: System Production Modeling Report," with Susan F. Tierney, January 25, 2002.

"Economic and Environmental Benefits of the Wawayanda Energy Center: System Production Modeling Report," with Susan F. Tierney, August 24, 2001.

"Air Pollution Reductions Resulting from the Kings Park Energy Project," with Susan F. Tierney, January 24, 2001.

PRESENTATIONS

Electricity Industry Fundamentals, EUCI, January 29-30, 2013.

"Market Power Monitoring and Mitigation in Electric Capacity Markets," Capacity Markets: Achieving Market Price Equilibrium?, EUCI, October 4, 2012.

"Market Power Monitoring and Mitigation in Electric Capacity Markets," Capacity Markets: Achieving Market Price Equilibrium?, EUCI, November 7, 2011.

"Economics and Regulation of Large Scale Renewable Resource Electricity System Transmission Additions," Center for Research in Regulated Industries, Eastern Conference, Rutgers University, May 6, 2010.

"PJM's RPM Auctions: Emerging and Unsettled Issues," NECA Power Markets Conference, November 1, 2007.

"Locational Capacity Markets: Understanding the Upside," New York City, July 8, 2006.

"Competition and Regulation in the North American Electricity Industry: Can These Two Seemingly Opposed Forces Coexist?," 24th Annual North American Conference of the USAEE/IAEE, July 9, 2004, Washington, DC.

"Merchant Transmission Investment Regimes: An Outsider's Observations," The East Coast Energy Group, April 16, 2004.

"Wholesale Procurement Strategies for the Restructured Electricity Markets: Experiences from the Field," Platts First Annual Electricity Market Design Imperative, Chicago, IL, November 6, 2003.

"Power Plant Technologies and Characteristics," The Harvard Institute for International Development's Third Annual Program on Climate Change and Development, Cambridge, MA, June 19, 2000.

"Transmission Planning & Investment in the RTO Era," with John Farr and Susan F. Tierney, workshop at Infocast Conference on Transmission Pricing, Chicago, IL, May 1, 2000.

"The US Market for Merchant Plants—Outlooks, Opportunities and Impediments," CBI's 4th Annual Profit from Merchant Plants Conference, January 31, 2000.

"Projecting Electricity Prices for a Restructured Electricity Industry," EXNET Merchant Power Plant Conference, Washington, DC, June 3, 1999.

"Transmission Planning and Competitive Generation Markets: The New England Case," EUCI conference on Transmission Restructuring for Retail Competition, Denver, CO, March 25, 1999.

"Key Issues in Ancillary Service Markets," IBC's conference on Pricing and Selling Ancillary Services in a Competitive Market Conference, San Francisco, CA, March 11, 1999.

"Successfully Forecasting the Price of Energy and Other Products," workshop presented at IBC's conference on Successful Load Profiling, San Francisco, CA, December 2, 1998.

"International Perspective: Lessons from the US Deregulation Experience," Nordic Power '98, Stockholm, Sweden, October 7, 1998.

"Successfully Forecasting the Price of Energy and Other Products in a Restructured Electric Power Industry," workshop presented at IBC's 3rd Strategic Forum on Market Price Forecasting, Baltimore, MD, August 24, 1998.

"Managing Market Share Loss with the Opening of Retail Markets to Competition," Electric Utility Business Environment Conference, Denver, CO, June 24, 1998.

"Multi-Attribute Trade-Off Analysis for Water and Electricity Policy Development," presented in Mendoza, Argentina, July 1996 and April 1997.

"The Basics of Cogeneration," presented at the Tufts University Forum on Energy Conservation, December 1993.

"Implications and History of the MIT Cogeneration Project," presented to the Massachusetts Society of Professional Engineers, November 1993.

CERTIFICATIONS

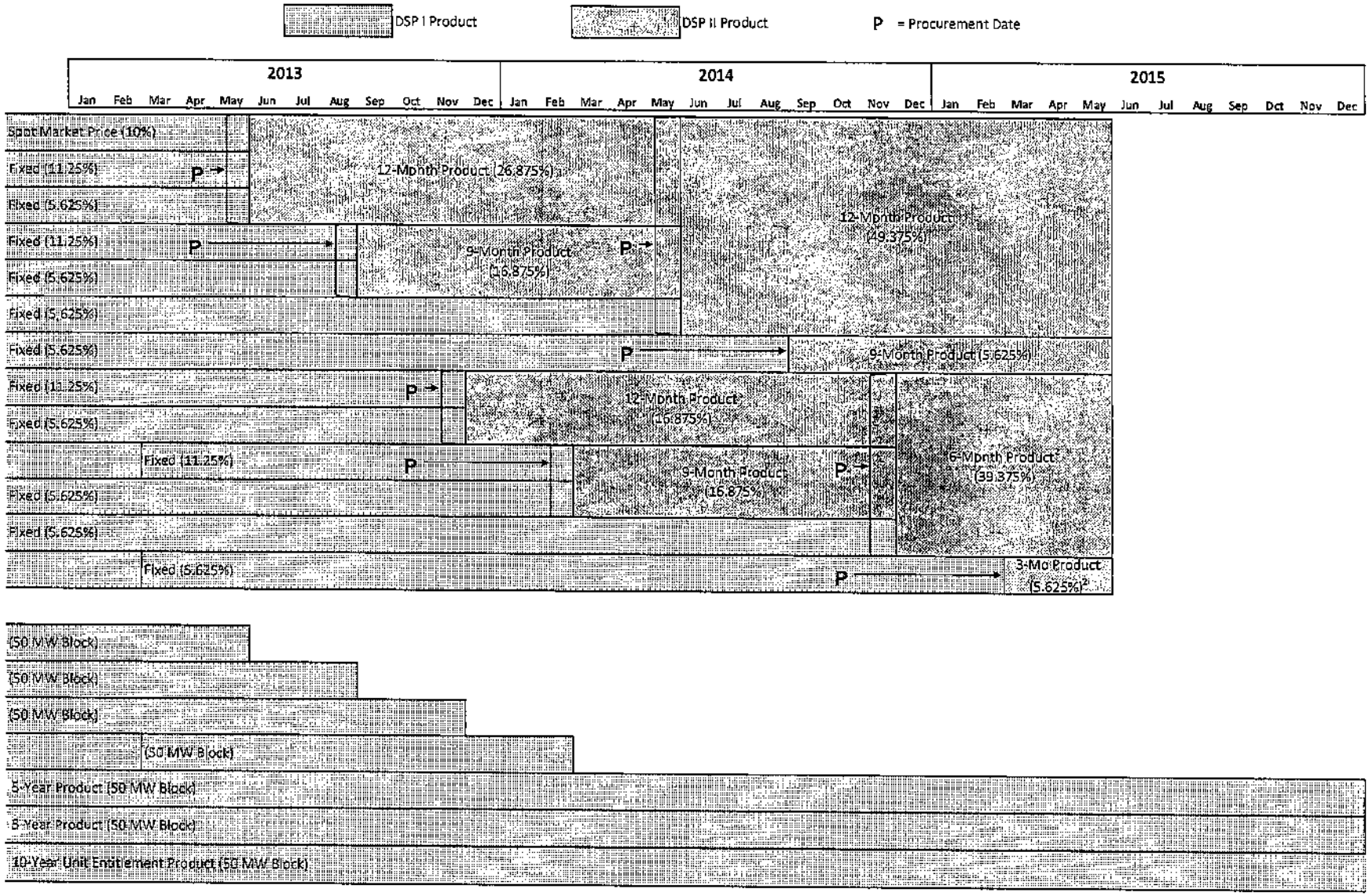
Registered Professional Engineer, Commonwealth of Massachusetts, 1992-2010.

PROFESSIONAL AFFILIATIONS

Member, Board of Directors, Northeast Energy and Commerce Association, 2002-2012.

Exhibit JC-1

PPL Electric Utilities DSP II Product Structure and Procurement Schedule
(Residential Customer Class)



Note: (1) All products are fixed price full requirements service except where noted.

(2) PPL Electric intends to request approval to extend original DSP-II product term 6 months to continue supply product laddering.

Exhibit JC-2

Shopping in PPL Electric's Territory
2012 and 2014

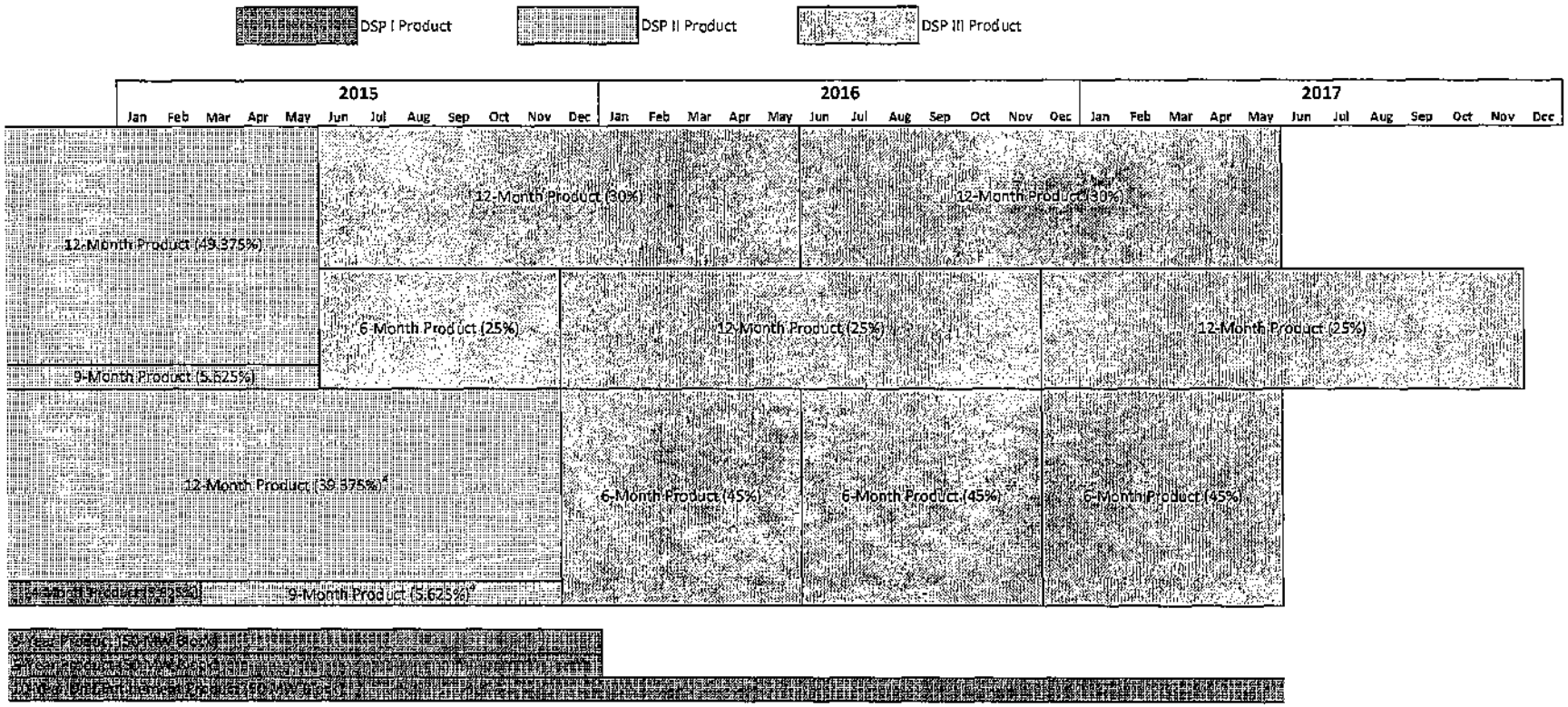
	Residential		Commercial		Industrial	
	1/1/2012	1/1/2014	1/1/2012	1/1/2014	1/1/2012	1/1/2014
Number of Customers Served By An EGS	495,539	566,163	91,888	98,406	1,112	1,127
Percentage of Customers Served By An EGS	40.5%	46.0%	52.1%	55.2%	87.3%	85.8%
Customers' Load (MW) Served By An EGS	1,597	1,606	1,924	1,975	1,810	1,857
Percentage of Customers' Load Served By An EGS	46.3%	51.8%	90.4%	90.0%	96.6%	95.4%

Note: Includes active and pending shopping customers.
Source: PA Office of Consumer Advocate.

Exhibit JC-3A

PPL Electric Utilities DSP III Product Structure and Procurement Schedule (Residential Customer Class)

Exhibit 3A



Notes:

(1) All products are fixed price full requirements service except where noted.

(2) Auctions will be held every six months approximately two months prior to the start of delivery.

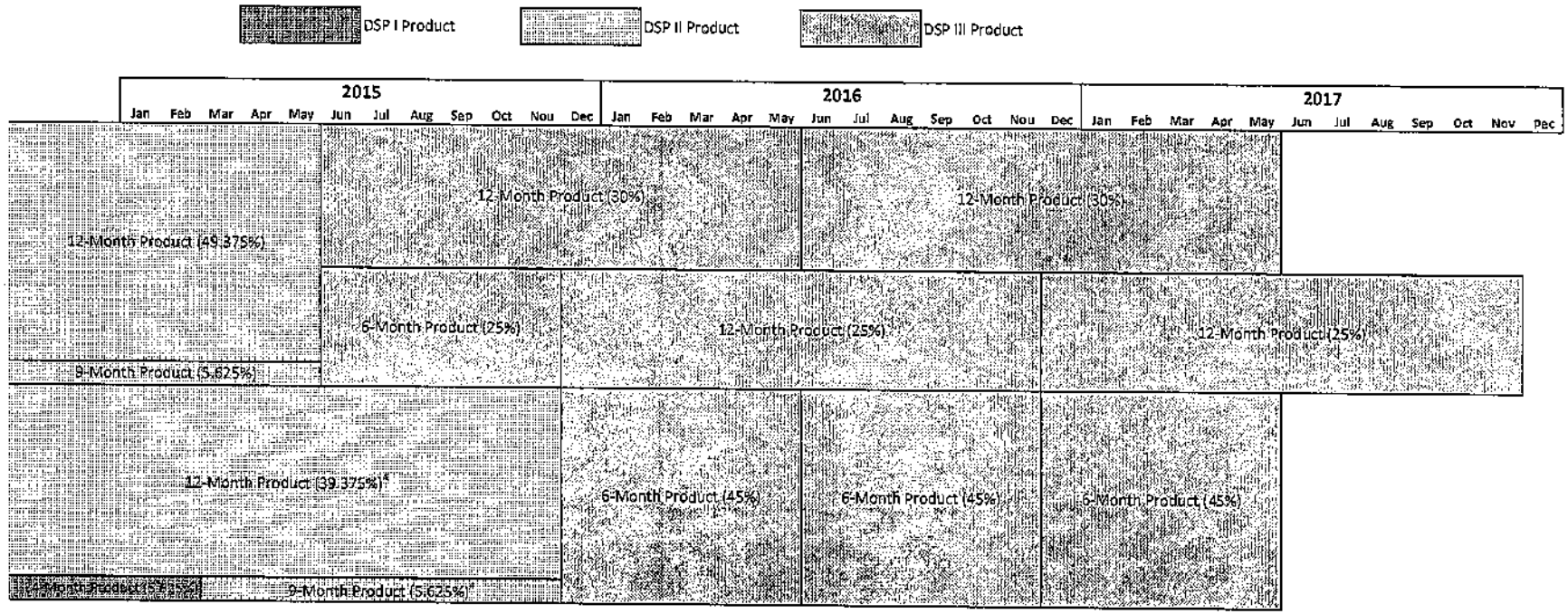
(3) The first auction will be held at the end of March 2015.

(4) DSP-II product term shown with an extension of 6 months to continue supply product laddering.

Exhibit JC-3B

PPL Electric Utilities DSP III Product Structure and Procurement Schedule (Small Commercial and Industrial Customer Class)

Exhibit B



Notes:

(1) All products are fixed price full requirements service.

(2) Auctions will be held every six months approximately two months prior to the start of delivery.

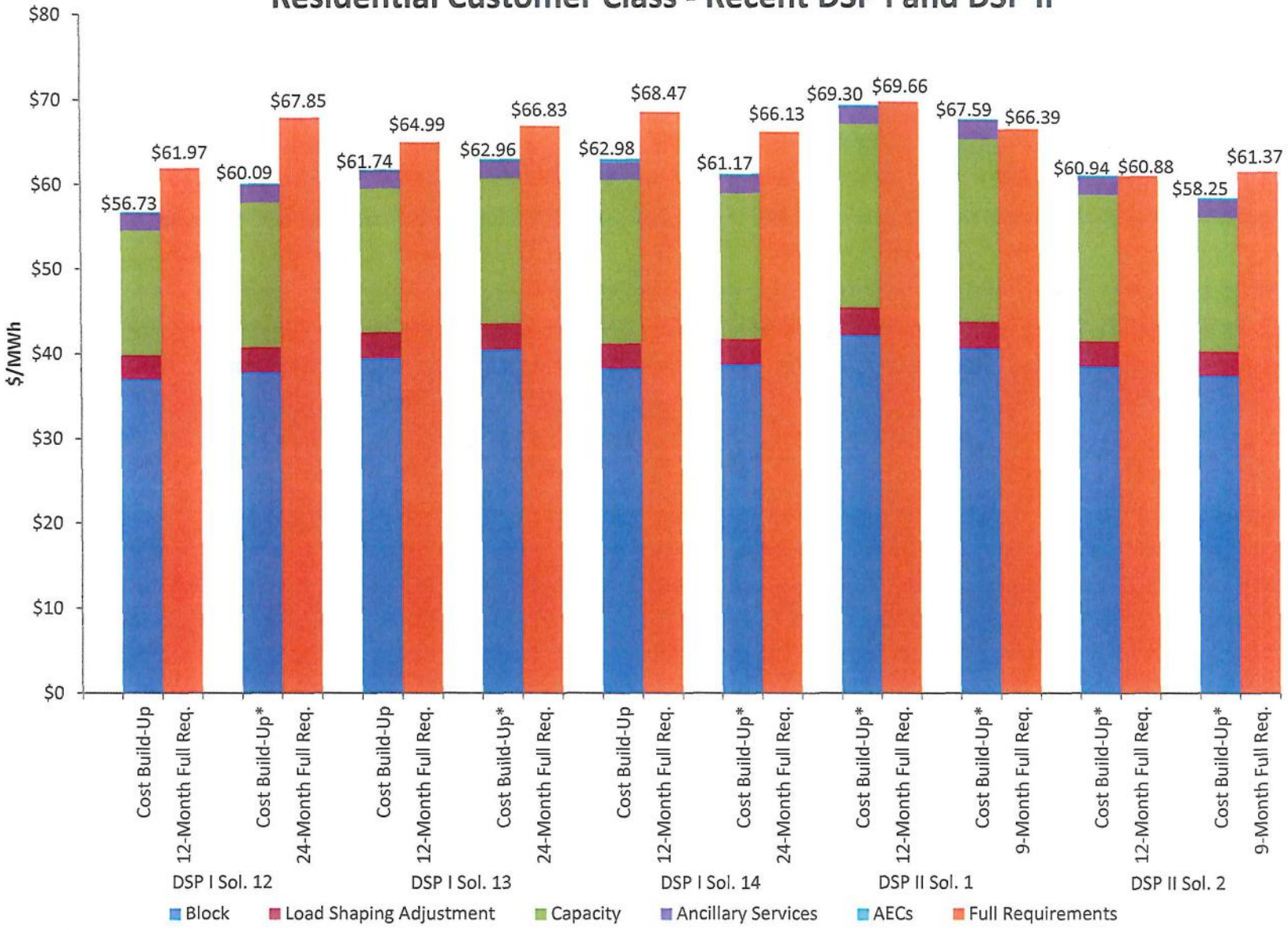
(3) The first auction will be held at the end of March 2015.

(4) DSP-II product term shown with an extension of 6 months to continue supply product laddering.

Exhibit JC-4A

Exhibit J

Cost Build-Up v. Full ..equirements Price
Residential Customer Class - Recent DSP I and DSP II



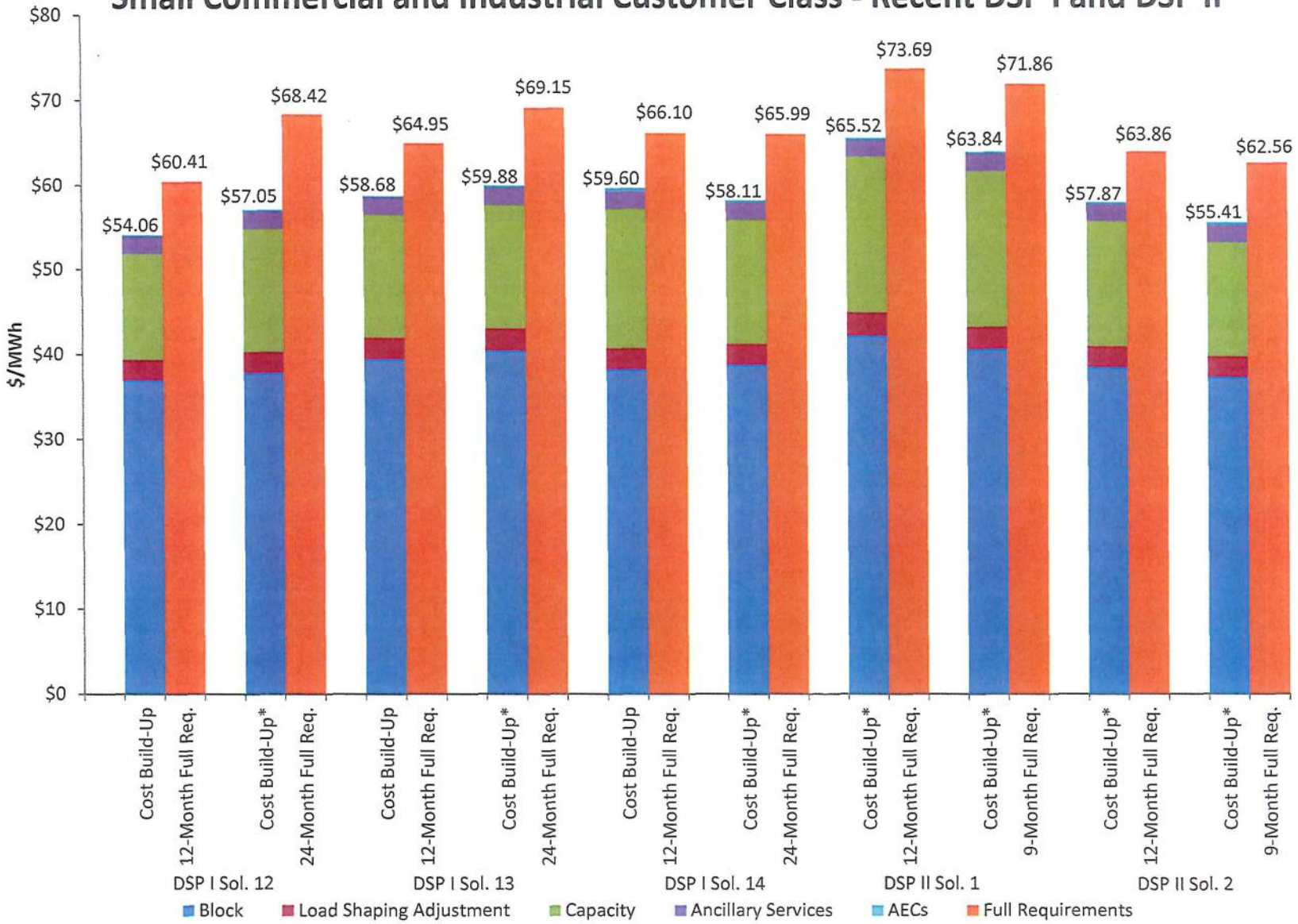
Note: An * indicates that comparable block energy was not procured. An average of contemporaneous forwards prices for the duration of the full requirements term were used instead.

Exhibit JC-4B

Exhibit

Cost Build-Up v. Full Requirements Price

Small Commercial and Industrial Customer Class - Recent DSP I and DSP II



Note: An * indicates that comparable block energy was not procured. An average of contemporaneous forwards prices for the duration of the full requirements term were used instead.