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October 16, 2014

Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, D.C. 20426

Re: *PJM Interconnection, LLC,* Docket No. ER14-2940-000

Dear Ms. Bose:

Mark Repsher and James Heidell of PA Consulting Group, Inc. ("PA"), on behalf of PJM Power Providers ("P3")[1], respectfully submit comments on the PJM Interconnection, LLC's ("PJM") proposed updates to the PJM Open Access Transmission Tariff (the "Tariff"), in which PJM seeks to revise elements of the Reliability Pricing Model ("RPM"). In this affidavit, we outline an approach (or, in some cases, approaches) to calculate appropriate values for the components of the after tax weighted average cost of capital ("ATWACC"), namely, the debt-to-equity ratio ("D/E Ratio"), cost of debt ("COD"), and cost of equity ("COE"). It is important to note that this affidavit is focused primarily on the appropriate methodology that PJM should adopt to arrive at a just and reasonable Net Cost of New Entry ("Net CONE"), however, we have included preliminary results of our methodology, which may be considered indicative of the general range of expected outcomes.

The ATWACC is a critical component of the Net CONE, which drives the resulting RPM parameters. As discussed at length in the Affidavit of Ryan Hardy and Mark Repsher (referred to herein as "PA Affidavit #1"), we believe PJM failed to put forth a just and reasonable methodology to arrive at the appropriate ATWACC. Within this affidavit, we do not repeat the arguments and issues already raised in PA Affidavit #1.[2] However, to summarize PA Affidavit #1 succinctly, we believe that a market view of D/E Ratio, COD, and COE must be developed based on an approach that considers both the riskiness of the investment (in this

[1] P3 is a non-profit organization dedicated to advancing federal, state and regional policies that promote properly designed and well-functioning electricity markets in the PJM region. P3 membership is comprised of energy providers that are members of PJM, conduct business in the PJM balancing authority area, and are signatories to various PJM agreements. Combined, P3 members own over 87,000 megawatts of generation assets and over 51,000 miles of transmission lines in the PJM region, serve nearly 12.2 million customers and employ over 55,000 people in the PJM region, representing 13 states and the District of Columbia. These comments are those of Mr. Repsher and Mr. Heidell and do not necessarily reflect the specific views of any particular member of P3 with respect to any issue.

[2] See PA Affidavit #1 for a fulsome narrative of observations as they relate to the Net CONE proposed by PJM in its Tariff revision.

case, a merchant CT[3] as the reference technology), the current and three-year future financing environment, and the risk profile of the universe of likely investors in the PJM market.

In addition to the direct analysis in this affidavit, our view and recommendations are informed by market intelligence, both public and proprietary, that has been acquired through substantial work in the PJM market, with developers, private equity investors, distribution utilities, and electric cooperatives. In the last 24 months alone, as part of PA's energy team, we have provided advisory support and market analysis to over 10 GW of new build generation development capacity. Based on this work as well as over 40 years of combined experience in the U.S. electricity markets, we believe that, within this process, it is important to consider a range of reasonableness for each component. Failing to do so may place the PJM grid at unnecessary reliability risk. For example, if each of the components are focused on a least-cost approach and not looked at holistically, it could invariably exclude a large portion of the investor pool. Once the appropriate parameters (D/E Ratio, COD, and COE) are calculated, these parameters can be used as inputs to calculate the appropriate ATWACC to support the Net CONE calculation for PJM's Variable Resource Requirement ("VRR") curve.

Details of our qualifications are set forth in our curriculum vitae, attached to our affidavit.

[3] Combustion Turbine.

continued

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)	Docket No. ER14-2940-000

AFFIDAVIT OF JAMES A. HEIDELL & MARK REPSHER
IN SUPPORT OF COMMENTS AND LIMITED PROTEST OF PJM POWER PROVIDERS

continued

I. Introduction and overview of proposed methodology

1. On September 25, 2014, PJM submitted proposed Tariff revisions to the Federal Energy Regulatory Commission ("FERC"), including updates to the Net CONE calculation utilized within the RPM capacity market construct.

2. In order to develop a robust and competitive capacity market in PJM, it is important to set the Net CONE at a level which will attract the cross-section of market participants actually seeking to develop projects in the PJM region. As illustrated in PA Affidavit #1, the Brattle Group's ("Brattle") ATWACC recommendation in its 2014 Brattle Study[4], the same ATWACC recommendation put forth by PJM in its proposed Tariff revisions, relies primarily on a Balance Sheet Financing Methodology[5]. This methodology skews PJM's proposed ATWACC away from a zone of reasonableness by excluding the majority of recent financings of gas-fired merchant new build generation development projects in the PJM market (each a "Recent PJM Development Project" and, together, "Recent PJM Development Activity").[6] Recent PJM Development Activity has been almost exclusively financed on a project-level basis ("Project Level Financing") by private equity and power generation development entities.[7] The merchant generation companies (i.e., publicly-traded IPPs) that the 2014 Brattle Study relies on to derive its conclusions have an underlying risk profile that is, in aggregate, incongruent with the risks associated with Recent PJM Development Activity. Eliminating this incongruence is important to foster a robust market, which translates into an environment that will ensure reliability for load (and overall market reliability), attract multiple market participants (which include multiple types of investors in new build generation), and mitigate any long-term potential market power issues.

3. Given the above, in order to accurately reflect an appropriate ATWACC, our proposed approach in this affidavit is broadly premised on three (3) key methodological tenets (a through c, directly below):

[4] Cost of New Entry Estimates for Combustion Turbine and Combined Cycle Plants in PJM With June 1, 2018 Online Date, Brattle Group and Sargent & Lundy, May 15, 2014.

[5] This term is further defined and expanded upon in PA Affidavit #1, but is generally defined by the fact that the financial data points utilized in the 2014 Brattle Study are all underpinned by the utilization of corporate-level publicly-traded Independent Power Producer ("IPP") financial metrics. A related term is "Balance Sheet Financing", which we define as financing a project based on a company's balance sheet (versus accessing the debt and/or equity markets) and which may involve debt that has recourse beyond the individual generation development project.

[6] We propose that a "Recent PJM Development Project" and, together, "Recent PJM Development Activity", for the purposes of our proposed methodology, should be defined as new natural gas-fired thermal development projects that cleared Base Residual Auction ("BRA") Delivery Years ("DY") 2015/2016; 2016/2017; and/or 2017/2018, and which have achieved financial close (or, in the case of Dominion Resource's combined cycle development projects, have been approved by the Virginia State Corporation Commission ["SCC"] for inclusion in the company's regulated subsidiary's rate base).

[7] Examples of private equity and power generation development shops with recent or current project developments in PJM include Panda Power Funds, Competitive Power Venture Holdings, Invenergy, Corona Power, Moxie Energy, and Genesis Power.

continued

a. In all cases, ATWACC should be the result of a transparent and fundamental build-up of the core ATWACC building blocks (i.e., D/E Ratio, COD, and COE).

b. The ATWACC building blocks should be underpinned, to the extent possible, by data points and financial metrics associated with Recent PJM Development Activity, and the companies developing those projects:

   i. For D/E Ratio and COD parameters, PJM should utilize the publicly-available financial metrics associated with Recent PJM Development Activity. As applicable, these parameters may be adjusted, in a transparent way, for differences related to technology (CC[8] vs. CT), financing tenor (i.e., in the case of PJM's proposed Tariff revisions, reflecting the financing of CT reference technology over a 20-year financing life), and other key differences that may alter the risk profile (such as geography).

   ii. For the COE parameter, PJM should utilize credible publicly-available financial metrics and/or methodologies that are associated with the types of companies associated with Recent PJM Development Activity, and which account for the unique risk factors facing these types of companies participating in PJM's merchant new build development market.[9] If a CAPM analysis is used, due to the dearth of pure play publicly-traded merchant power generators and the aforementioned unique risk factors, it is necessary to consider appropriate adjustments to a CAPM analysis of those companies consistent with commercial practices and academic theory.

c. When a range of reasonable data points are available (i.e., a zone of reasonableness), as highlighted in FERC Order 531, calculate just and reasonable return metrics that are "halfway between the midpoint of the zone of reasonableness and the top of that zone."[10,11,12]

4. Building from the aforementioned three key methodological tenets, the primary focus of this affidavit is to demonstrate feasible methodologies, utilizing accepted rate-making practices, sound finance theory and publicly-available and reliable data sources, to determine a cost of funds value (i.e., ATWACC) for calculating the Net CONE of the CT reference unit. In the sections that follow, we have outlined

[8] Combined Cycle.

[9] For the avoidance of doubt, these financial metrics *could* include methodologies such as the Capital Asset Pricing Model ("CAPM") approach (or other academic approaches deemed acceptable by FERC), but only if these methodologies incorporate the necessary adjustments (i.e., premiums or discounts) to account for the unique risk profile of the companies actually participating in PJM's merchant new build development market.

[10] FERC Order 531, page 7 and page 68.

[11] As highlighted in FERC Order 531, to promote reliability, FERC exercises caution in the setting of returns that are too low and which may not be '..sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital.' (FERC Order 531, page 68; Hope, 320 U.S. at 603)

[12] Given that the D/E Ratio, COD, and COE parameters are the fundamental components that build up to the "final" ATWACC return metric, we propose to incorporate the FERC Order 531 findings into these "sub-metrics". Alternatively, FERC could calculate an ATWACC for each unique set of three (3) data points (i.e., D/E Ratio, COD, and COE), and arrive at a similar final answer based on the calculated range of ATWACCs and incorporating the findings of FERC Order 531.

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approaches to develop the appropriate parameters for D/E Ratio, COD, and COE (and preliminary results, which may be considered indicative of the general range of expected outcomes). We believe that these approaches meet FERC's threshold for just and reasonable methodologies.

II. D/E Ratio methodology

5. Building from the key methodological tenets outlined in Section I, PJM should adopt a deemed capital structure based upon a proxy derived from the debt and equity requirements reflected in Recent PJM Development Activity. Our proposed approach is similar to the proxy capital structure approaches that are used for Master Limited Partnerships ("MLP"), since these partnerships do not have transparent publicly-traded data and operate within unique capital structures that are incongruent with a Balance Sheet Financing Methodology.

a. To develop an appropriate capital structure, the amount of debt issued for each Recent PJM Development Project should be used in conjunction with either associated public statements about the total project cost of the Recent PJM Development Project or, in the absence of this latter data, the approved PJM CONE capital costs for the same technology.

b. To the extent that Recent PJM Development Activity differs from the PJM reference technology, adjustments to the resulting D/E Ratio should be made to account for the difference in technology (and, thus, perceived riskiness of the merchant new build generation project investment, as further discussed in PA Affidavit #1).

   i. For example, Recent PJM Development Activity has been comprised almost exclusively of CC investments. To account for the difference in these investments and PJM's proposed CT reference technology, PJM should consider, in conjunction with observations from Recent PJM Development Activity, expanding the dataset to other markets, and examining the delta (in terms of D/E Ratio) that exists between *merchant*[13] CC and CT development projects in those markets.

   ii. In the absence of the latter data (or used in conjunction with this data), PJM should consider incorporating an acceptable risk adjustment factor to "normalize" between observed Recent PJM Development Activity and PJM's proposed use of CT reference technology. While there may be a range of acceptable risk adjustment factors, we have proposed a risk adjustment factor of 1.10 (to be applied to the equity component of the D/E Ratio). This adjustment is based on our experience assisting the developers of thermal projects across the U.S. as well as experience in conducting asset valuations specifically for CC and CT technologies.[14] As mentioned previously, there may be other acceptable methods to develop

[13] This is a key point, as many recent development CTs across the U.S. have been built under long-term power purchase agreement ("PPA") structures, which will impact the achievable D/E Ratio (and, likely, COD) for the respective development project.

[14] Based on our experience, we would generally expect the achievable debt leverage of a merchant CT to be approximately five (5) to ten (10) percentage points lower than that of a comparable merchant CC development project; put in terms of necessary equity infusion, this would equate to a risk adjustment factor of approximately 1.10 to 1.25. For example, 50% CT Equity Infusion / 45% CC Equity Infusion = 1.11 (or, approximately, 1.10). For the purposes of our proposed approach, we have assumed the lower end of our calculated risk adjustment factor range.

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risk adjustment factors, although we would generally expect it to produce a lower leverage for a CT, as compared to a CC, based on the underlying risk profile of the CT investment.

iii. Additionally, as outlined in PA Affidavit #1, there are established studies in other markets, such as the 2013 NERA Study for New York[15] and the 2011 Brattle Study[16] for PJM, that support a D/E Ratio of 50/50 for the reference CT technology. Ultimately, FERC accepted the 50/50 D/E Ratio recommendation in both proceedings.[17] Such findings could be used in conjunction with the aforementioned alternative data points and/or risk adjustment factors (i.e., i and ii, listed directly above).

c. As explained in Section I, all of the D/E Ratio data points should be considered within a zone of reasonableness, with the final D/E Ratio parameter "halfway between the midpoint of the zone of reasonableness and the top of that zone."[18]

6. Put together, this series of calculations can be used to identify what the market will debt finance for an asset with similar characteristics and market risk as the CT reference technology proposed by PJM. The following results in Table 1, and, while not conclusive and subject to additional review and due diligence, illustrates this methodology based on publicly-available data and may be considered indicative of the general range of expected outcomes.

[15] NERA, Independent Study to Establish Parameters of the ICAP Demand Curve for the New York Independent System Operator, August 2, 2013, see page 56.

[16] The Brattle Group, Cost of New Entry Estimates for Combustion Turbine and Combined-Cycle Plants in PJM, August 24, 2011, see page 40.

[17] FERC Docket ER12-513-000 and -003; FERC Docket ER14-500-000.

[18] FERC Order 531, page 7 and page 68. Also, see PA Affidavit #1.

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Table 1: Proposed D/E Ratio Methodology[19,20]

Recent PJM Project Development Activity	Market	Developer	Technology Type	New Build Capital Costs ($Millions)	Term Loan ($Millions)	Debt Leverage (%)	Equity (%)	CT vs. CC Risk Adjusted Equity (%)
A	B	C	D	E	F	G = F / E	H = 100% - G	I = H x 1.10
West Deptford	PJM	LS Power	CC	$664	$345	52%	48%	53%
Brunswick	PJM	Dominion	CC	*N/A*	*N/A*	47%	53%	58%
Liberty	PJM	Panda	CC	$960	$585	61%	39%	43%
Woodbridge	PJM	CPV	CC	$891	$561	63%	37%	41%
Patriot	PJM	Panda	CC	$1,020	$585	57%	43%	47%
Warren County	PJM	Dominion	CC	*N/A*	*N/A*	50%	50%	55%
Newark	PJM	EIF	CC	$917	$590	64%	36%	39%
St. Charles	PJM	CPV	CC	$775	$550	71%	29%	32%

	CT vs. CC Risk Adjusted D/E Ratio
Min Adjusted Equity (%)	32%
Median Adjusted Equity (%)	45%
Max Adjusted Equity (%)	58%
Halfway Between Median and Max Adjusted Equity (%)	52%
Halfway Between Median and Max Adjusted Equity (%) (Rounded)	50%
Calculated D/E Ratio	50/50

III. COD methodology

7. Similar to the D/E Ratio approach and methodology outlined in Section II, PJM should adopt a COD proxy derived from the actual financing activity of Recent PJM Development Activity.

a. To develop an appropriate COD, PJM should evaluate the COD associated with Recent PJM Development Activity. While desirable, the proxy group for the COD does not necessarily need to be the same as the proxy group used to determine the D/E Ratio.[21]

b. It is important to consider the specific debt structure and related financing terms for each Recent PJM Development Project, and, in many cases, adjustments may be required to normalize the COD based on the following:

i. For debt that was issued with an "initial issue discount" (i.e., effectively a way for developers to buy-down the basis spread), "normalize" COD by unwinding this initial issue discount.

[19] Data based on an array of publicly-available data sources, including data sourced from SNL Financial, Great North Road Media's SparkSpread.com, and Euromoney Institutional Investor's IJGlobal.

[20] Nelson and York development facilities (both CC development projects) are excluded from this analysis due to the brownfield nature of these development projects and lack of financial data associated with these projects. Brunswick and Warren County D/E Ratios are based on the associated approved rate cases for each facility.

[21] While it may be desirable to have complete consistency between the two proxy groups, the issue may be the availability of public COD data, and only a subset of the proxy group utilized in the D/E Ratio methodology may have publicly-available COD information. For the avoidance of doubt, we would propose utilizing the subset of the Recent PJM Development Activity group that has publicly-available COD information; however, if FERC finds it necessary to expand the scope of the COD proxy group, the group should only be expanded to like project developments that have exhibited similar financing approaches as those employed by the Recent PJM Development Activity group.

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ii. Term B debt is issued under a floating rate structure. For each member of the proxy group which utilizes a similar-type structure to Term B debt ("Term B Type" debt), determine a "baseline" fixed COD through the summation of the quoted LIBOR basis spread (or other quoted basis spread) and the interest rate swap at the time of the debt issuance and for the tenor of the debt in question. To the extent that an interest rate swap is not publicly-available for a specific debt tenor, we would suggest that PJM linearly interpolate between publicly-available interest rate swap tenors. Based on our experience, this step mimics the lens through which investment banks analyze Term B Type debt rates, and it is also consistent with the interest rate hedge structures that developers may enter into in order to flip the floating rate structure of a Term B Type loan into one more akin to a fixed rate structure.

iii. The tenor of Term B Type debt is typically 5 to 8 years and, hence, carries associated risks when compared to the 20-year financing life assumed in the PJM Tariff. Similar to the "normalization" suggested in the previous step, the proxy CODs should be further adjusted to account for certain risks (e.g., refinancing risk, risk to maturity, and inflation risk) between the initial debt tenor (e.g., 5 to 8 years) and PJM's assumed 20-year financing life. Our methodology looks at the difference in "U.S. Treasury Constant Maturity – Nominal" interest rates at the time of the debt issuance for the initial debt tenor (e.g., 5 to 8 years) and PJM's assumed 20-year financing life for the CT reference technology. Similar to the previous step, to the extent that an interest rate is publicly-unavailable for a specific debt tenor, we would suggest that PJM linearly interpolate between publicly-available interest rate tenors.

c. As explained in Section I, all of the COD data points should be considered within a zone of reasonableness, with the final COD parameter "halfway between the midpoint of the zone of reasonableness and the top of that zone." [22]

8. Put together, this series of calculations can be used to identify at what COD the market will debt finance for an asset with similar characteristics and market risk as the CT reference technology proposed by PJM in its Tariff revision. Tables 2A through 2E, while not conclusive and subject to additional review and due diligence, illustrate this methodology and may be considered indicative of the general range of expected outcomes.

[22] FERC Order 531, page 7 and page 68.

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Table 2: Proposed COD Methodology[23, 24]

Table 2A

Recent PJM Project Development Activity	Market	Developer	Technology Type	Deal Date	Loan Tenor (Years)	Quoted Basis Points Spread	Initial Issuance Discount Adjustment	Quoted Basis Spread Unwound for 'H'
A	B	C	D	E	F	G	H	I = G + H
West Deptford	PJM	LS Power	CC	12/1/2011	5	360	0	360
Brunswick	PJM	Dominion	CC	8/2/2013	*N/A*	*N/A*	*N/A*	*N/A*
Liberty	PJM	Panda	CC	8/21/2013	7	650	18	668
Woodbridge	PJM	CPV	CC	9/20/2013	8	425	0	425
Patriot	PJM	Panda	CC	12/20/2013	7	575	0	575
Warren County	PJM	Dominion	CC	2/28/2014	*N/A*	*N/A*	*N/A*	*N/A*
Newark	PJM	EIF	CC	6/19/2014	5	350	0	350
St. Charles	PJM	CPV	CC	8/8/2014	5	350	0	350

Table 2B

Recent PJM Project Development Activity	Market	Developer	Technology Type	Deal Date	Loan Tenor (Years)	Quoted Basis Spread Unwound for 'H'	Interest Rate Swap at Time of Close (for Loan Tenor)	Baseline COD (Quoted Loan Tenor)
A	B	C	D	E	F	I	J	K = I + J
West Deptford	PJM	LS Power	CC	12/1/2011	5	360	134	494
Brunswick	PJM	Dominion	CC	8/2/2013	*N/A*	*N/A*	*N/A*	*N/A*
Liberty	PJM	Panda	CC	8/21/2013	7	668	244	912
Woodbridge	PJM	CPV	CC	9/20/2013	8	425	251	676
Patriot	PJM	Panda	CC	12/20/2013	7	575	236	811
Warren County	PJM	Dominion	CC	2/28/2014	*N/A*	*N/A*	*N/A*	*N/A*
Newark	PJM	EIF	CC	6/19/2014	5	350	176	526
St. Charles	PJM	CPV	CC	8/8/2014	5	350	174	524

Table 2C

Recent PJM Project Development Activity	Market	Developer	Technology Type	Deal Date	Loan Tenor (Years)	US Treasury Constant Maturity - Nominal (Quoted Loan Tenor)	US Treasury Constant Maturity - Nominal (20-Year Tenor)	US Treasury Constant Maturity - Nominal (Tenor Delta)
A	B	C	D	E	F	L	M	N = M - L
West Deptford	PJM	LS Power	CC	12/1/2011	5	97	282	185
Brunswick	PJM	Dominion	CC	8/2/2013	*N/A*	*N/A*	*N/A*	*N/A*
Liberty	PJM	Panda	CC	8/21/2013	7	230	364	134
Woodbridge	PJM	CPV	CC	9/20/2013	8	234	350	116
Patriot	PJM	Panda	CC	12/20/2013	7	233	357	124
Warren County	PJM	Dominion	CC	2/28/2014	*N/A*	*N/A*	*N/A*	*N/A*
Newark	PJM	EIF	CC	6/19/2014	5	171	320	149
St. Charles	PJM	CPV	CC	8/8/2014	5	162	297	135

[23] Data based on an array of publicly-available data sources, including data sourced from SNL Financial, Great North Road Media's SparkSpread.com, and Euromoney Institutional Investor's IJGlobal. Interest Rate Swaps and U.S. Treasury Constant Maturity metrics sourced from the Board of Governors of the Federal Reserve System (http://www.federalreserve.gov/releases/h15/update/).

[24] Nelson and York development facilities (both CC development projects) are excluded from this analysis due to the brownfield nature of these development projects and lack of financial data associated with these projects. Brunswick and Warren County CODs are based on overall corporate-level COD for Dominion Resources (sourced from S&P's Capital IQ).

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Table 2D

Recent PJM Project Development Activity	Market	Developer	Technology Type	Deal Date	Loan Tenor (Years)	Normalized COD (in Basis)	Normalized COD (%)
A	B	C	D	E	F	O = (K + N)	P = O / 10000
West Deptford	PJM	LS Power	CC	12/1/2011	5	679	6.79%
Brunswick	PJM	Dominion	CC	8/2/2013	*N/A*	465	4.65%
Liberty	PJM	Panda	CC	8/21/2013	7	1,046	10.46%
Woodbridge	PJM	CPV	CC	9/20/2013	8	792	7.92%
Patriot	PJM	Panda	CC	12/20/2013	7	935	9.35%
Warren County	PJM	Dominion	CC	2/28/2014	*N/A*	465	4.65%
Newark	PJM	EIF	CC	6/19/2014	5	675	6.75%
St. Charles	PJM	CPV	CC	8/8/2014	5	659	6.59%

Table 2E

	Normalized 20-Year COD (in Basis) O = (K + N)	Normalized 20-Year COD (%) P = O / 10000
Min Normalized COD	465	4.65%
Median Normalized COD	677	6.77%
Max Normalized COD	1,046	10.46%
Halfway Between Median and Max Normalized COD	862	8.62%
Halfway Between Median and Max Normalized COD (Rounded)	850	8.50%
Calculated COD	850	8.50%

IV. COE methodology

9. The lack of publicly-traded IPPs involved in Recent PJM Development Activity can create a significant challenge in assigning an appropriate COE to incent entry under the PJM RPM capacity market construct. As noted previously in this affidavit, for the sake of brevity, these issues and challenges will not be repeated here, as they have been thoroughly discussed and noted in PA Affidavit #1.

10. Based on our analysis, as well as extensive generating asset transaction and project development experience on assets spanning U.S. power markets including the PJM market, and continuous research and analysis of generating asset new builds and existing asset transactions, the publicly-traded IPP CAPM approach does not capture the unsystematic risk associated with a single merchant power generation development project. As such, if the CAPM approach is used to develop COE parameters, it is necessary to account for several asset-specific risks. These risk factors will affect the risk premium(s) that a developer applies to a development project, directly affecting the COE parameter.

11. Similar to the D/E Ratio and COD approaches and methodologies outlined in prior sections, PJM should adopt a COE proxy (or proxy group) that reflects the actual financing activity of Recent PJM Development Activity. We have outlined several key methodological steps and suggested approaches to do so, below:

a. To develop an appropriate COE, PJM should utilize credible publicly-available financial metrics and/or methodologies that are associated with the types of companies involved in Recent PJM Development Activity, which must account for the unique risk factors facing the types of companies developing projects.

b. While private equity and development shops are not typically publicly-traded entities, various publications report COE (or, equivalently, ROE) metrics associated with these types of entities. One such set of metrics is included in the U.S. Private Equity Index and Selected Benchmark Statistics report produced by Cambridge Associates LLC (the "Cambridge Benchmark Report"). In addition to publications such as these, certain state pension plans report the individual returns associated with

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their investments in certain companies engaged in Recent PJM Development Activity, which provide another avenue to explore the COE metrics of these privately-held firms.

i. By way of example, the March 31, 2014 Cambridge Benchmark Report calculates the Cambridge Associates LLC U.S. Private Equity Index on a "pooled end-to-end return, net of fees, expenses, and carried interest"[25] basis for a variety of multi-year look-back periods (e.g., 1-year return of 19.07%; 5-year return of 17.41%; 10-year return of 14.03%; and 20-year return of 13.70%) and single years (average 1-year return of 16.75% over the past 20 years). In addition, the same report provides specific private equity return metrics for the energy industry (e.g., average gross IRR[26] of 19.74% for companies invested in since 2011 – i.e., the beginning of the previous triennial review period).[27]

c. CAPM may also be a reasonable metric to utilize to derive a just and reasonable COE, if appropriate adjustments are made to account for the unique risk and size profiles of the companies involved in Recent PJM Development Activity.[28,29] Put differently, given the type of companies involved in Recent PJM Development Activity, a "pure" CAPM metric (i.e., one without any premiums or discounts applied) is likely below the floor for any calculated just and reasonable COE metric. As such, PJM should consider several adjustments to the COE of publicly-traded firms, if it chooses to rely on the CAPM approach as the basis for determining the COE parameter (or one of the data points it considers in setting the COE parameter). Several studies have been developed to quantify these impacts, including adjustments (in the form of discounts or premiums) for size impacts, lack of marketability, and adjustments for lack of diversification. Ultimately, these adjustments impact the COE applied by investors relying on investments with more risky cash flow projections.[30] Information sources that can be relied on to make these adjustments include:

i. Capitalization size risk premium such as the calculation reported by Ibbotson Associates. For example, appropriate premiums could be determined based on relative capacity (size) differences between the Recent PJM Development Projects and the IPPs utilized in the CAPM approach.

[25] Cambridge Benchmark Report as of March 31, 2014, page 3.

[26] Internal Rate of Return.

[27] Cambridge Benchmark Report as of March 31, 2014, see, among others, pages 3, 6, and 16.

[28] In addition, while not a main focus of our affidavit, we would suggest that Ibbotson (or similar) size premium adjustments should be made on a default basis for any CAPM approach employed, even on traditional (but often differently sized) publicly-traded IPPs.

[29] This could be done as a stand-alone methodology or to confirm the results of a COE study that reflects the actual financing activity of Recent PJM Development Activity.

[30] For the avoidance of doubt, the CAPM approach may be appropriate if it is found that traditional publicly-traded IPPs encompass the vast majority of Recent PJM Development Activity, however, it still may be appropriate to apply certain premiums, depending on the underlying size of the IPP (i.e., a size premium), how the Recent PJM Development Project is actually financed (Project Level Finance versus Balance Sheet Financing), etc.

continued

ii. A risk premium for development risk and to incent new entry as was utilized for transmission under FERC Order No. 679.[31]

iii. Discount for lack of diversification ("DLOD"): DLOD is the discount associated with the degree to which unsystematic risk to an investor cannot be diversified away. A 2007 paper by Daniel L. McConaughy, PhD and Vincent Covrig, PhD explores shortcomings of the CAPM (or Modified CAPM) approach when valuing privately held firms (or assets), and a methodology for calculating the DLOD (the "Certainty-Equivalent Approach" or "CE Approach").[32] This concept has also been explored in a 2003 paper by Frank Kerins, Janet Kiholm Smith and Richard Smith;[33] and separately a presentation given by Professor Aswath Damodaran (New York University Stern School of Business).[34]

iv. Discount for lack of marketability ("DLOM"): DLOM is a discount associated with the degree to which liquidity is impaired relative to more liquid alternative investments.[35] The range of this discount varies by study and, on a COE basis, equates to an approximately 3.5 percentage point premium, on average.[36]

[31] FERC Order 679, page 136.

[32] *Owner's Lack of Diversification and the Cost of Equity Capital for a Closely Held Firm*, by Daniel L. McConaughy, PhD and Vincent Covrig, PhD (Winter 2007).

[33] *Opportunity Cost of Capital for Venture Capital Investors and Entrepreneurs*, by Frank Kerins, Janet Kiholm Smith and Richard Smith (February 2003).

[34] Aswath Damodaran, Private Company Valuation, Stern School of Business at New York University, http://people.stern.nyu.edu/adamodar/pdfiles/ovhds/inv2E/PvtFirm.pdf.

[35] Definition and quote taken from *Financial Valuation Applications and Models, Third Edition*, by James R. Hitchner (p. 365); book referred to hereafter as "Hitchner".

[36] Studies include those outlined in Hitchner; M. Bajaj, D. Denis, S. Ferris, and A. Sarin, "Firm Value and Marketability Discounts," *Journal of Corporation Law* (Fall 2001); 89-115, as referenced in *Owner's Lack of Diversification and the Cost of Equity Capital for a Closely Held Firm*, by Daniel L. McConaughy, PhD and Vincent Covrig, PhD (Winter 2007); and Class materials utilized in Professor of Finance Aswath Damodaran's (Stern School of Business at New York University) – http://people.stern.nyu.edu/adamodar/pdfiles/eqnotes/pvt.pdf.

continued

d. It is also reasonable for PJM to consider other benchmarks to ensure that the adjusted COE (based on a CAPM-type methodology or otherwise) remains in a zone of reasonableness. For example, the COE for merchant generators with merchant (uncontracted) energy generation resources should generally be above the COE awarded to integrated electric utilities that do not have retail competition. If CAPM metrics reveal otherwise, then this could throw into question the outcome of other CAPM-type analyses employed. Indeed, the 2013 NERA Study for New York argued that the current interest rate environment can lead to nonsensical results and, thus, certain parameters like the 2013 NERA Study for New York proposed COE may need to reflect an adjustment (which is the COE that FERC ultimately accepted in that proceeding).[37, 38, 39]

e. In addition to the aforementioned benchmarks, it is also reasonable for PJM to consider the commission approved COE (or, total ATWACC) that regulated developers in the PJM market are receiving for their rate-based development projects (e.g., Dominion Resources) to ensure that any COE parameter outcome is directionally consistent (e.g., higher) than the COE achieved by these regulated parties.

    i. Moreover, if these regulated players are included in Recent PJM Development Activity, then it may be appropriate to include the state commission approved COEs (or, equivalently ROEs) associated with these Recent PJM Development Projects.

f. As explained in Section I, and if sufficient data points are available, all of the "normalized" COE data points derived from the aforementioned steps and approaches should be considered within a zone of reasonableness, with the final COE parameter "halfway between the midpoint of the zone of reasonableness and the top of that zone." [40]

12. Put together, this series of calculations can be used to identify the just and reasonable COE for an asset with similar characteristics and market risk as the CT reference technology proposed by PJM in its Tariff revision. By way of example, Table 3 illustrates this methodology with a sample of potential data sources/points and preliminary CAPM calculation adjustments (to account for risks such as size, DLOD, DLOM and/or an appropriate incentive for development risk) by which the zone of reasonableness can be better derived, and, while subject to additional review and due diligence, may be considered indicative of the general range of expected outcomes.

a. It should be noted that we have assumed, as an initial proposal, an approximately two (2) percentage point adjustment to the 2014 Brattle Study CAPM analysis of Calpine, NRG and Dynegy, which may be on the conservative side of potential adjustments given (1) this is less than the 2.5 percentage point adjustment that the 2013 NERA Study for New York proposed for a COE adjustment in its merchant project financing ("MPF") case (see PA Affidavit #1 for more information regarding this case); and (2) the resulting risk-adjusted COE (i.e., with the proposed two (2) percentage point

[37] As noted previously and in PA Affidavit #1, it is not within the purview of this affidavit to opine on the "correctness" of the actual adjustments made in the New York proceeding. We are merely bringing out that this CAPM deficiency argument is not entirely unique, and has been raised in other similar FERC proceedings.

[38] See the 2013 NERA Study for New York, pages 84 to 86.

[39] FERC Docket ER14-500-000, page 33.

[40] FERC Order 531, page 7 and page 68.

continued

adjustment) for Dynegy would still be 1.9 to 2.3 percentage points lower than the approved COE for Dominion Resource's Brunswick and Warren County CC development projects, among other potential factors.

Table 3: Proposed COE Methodology[41]

Initial Data Source A	Data Series Description B	Base COE (%) C	COE Risk Adjustment (%) D	Normalized COE (%) E = C + D
Cambridge Associates LLC U.S. Private Equity Index	*3-Year Return as of Mar'14 (Pooled Return)*	14.15%	*N/A*	14.15%
Cambridge Associates LLC U.S. Private Equity Index	*Return on Funds Incepted Since 2011 as of Mar'14 (Pooled Return)*	16.13%	*N/A*	16.13%
Cambridge Associates LLC U.S. Private Equity Index	*Return on Funds Since 2011 by Company Initial Investment Year as of Mar'14 - Energy (Pooled Gross IRR)*	19.74%	*N/A*	19.74%
2014 Brattle Study	*2014 Brattle Study - Calpine CAPM Analysis*	11.90%	2.00%	13.90%
2014 Brattle Study	*2014 Brattle Study - NRG CAPM Analysis*	10.40%	2.00%	12.40%
2014 Brattle Study	*2014 Brattle Study - Dynegy CAPM Analysis*	7.10%	2.00%	9.10%
Dominion/Virginia SCC	*Brunswick Approved COE (i.e., ROE)*	11.40%	*N/A*	11.40%
Dominion/Virginia SCC	*Warren County Approved COE (i.e., ROE)*	11.00%	*N/A*	11.00%

	Normalized COE (%) E = C + D
Min Adjusted COE (%)	9.10%
Median Adjusted COE (%)	13.15%
Max Adjusted COE (%)	19.74%
Halfway Between Median and Max Adjusted COE (%)	16.45%
Halfway Between Median and Max Adjusted COE (%) (Rounded)	16.50%
Calculated COE	16.50%

V. Conclusions

13. In summary, the approaches outlined herein provide a just and reasonable approach to determine the appropriate component values of the ATWACC (i.e., D/E Ratio, COD, and COE), and to ultimately determine the ATWACC used to derive Net CONE for PJM's VRR curve.

14. Importantly, whether our recommended approaches, estimates, or alternative methodologies are employed, it is important to capture the following aspects of the market, as it relates to new build generation development:

a. Overall, the methodology to derive ATWACC should independently calculate the appropriate D/E Ratio, COD and COE and use these parameters as inputs to calculate the appropriate ATWACC. None of these parameters should be derived, or backed into, based on an assumption of the ATWACC.

[41] Data based on an array of publicly-available data sources, including data sourced from Cambridge Benchmark Report as of March 31, 2014; SNL Financial; and 2014 Brattle Study.

continued

b. By way of example, our preliminary analysis is summarized in Table 4 (which builds from our preliminary recommendations in Tables 1 through 3), and equates to an ATWACC of 10.8%. This would result in an approximately 25% increase in the Gross Cost of New Entry ("Gross CONE"), which ultimately has a significant impact on the resulting Net CONE value.[42]

c. The methodology must include a significant portion of the investors that are building and will be developing new build generation in the market. The reliance on CAPM as used in the Brattle Study, or Balance Sheet Financing Methodology, is inappropriate as it excludes most of the active investors in the PJM market.

d. The methodology must be market-based, relying on publicly-available data of actual financing structures, and, where appropriate, allow for adjustments to be made to properly align the metrics with the actual risk profile of the reference technology and the companies developing those projects.

Table 4: Preliminary ATWACC Methodological Build-Up

Parameters	Formula	Preliminary Recommended Values
A	B	C
D/E Ratio	*N/A*	50/50
COD (%)	*N/A*	8.50%
COE (%)	*N/A*	16.50%
ATWACC (Assuming 40% Corporate Tax Rate) (%)	**(Debt % x COD x (1-40%)) + (Equity % x COE)**	**10.80%**

[42] The approximate 25% increase is derived from PJM's Capacity Senior Task Force Final Report on August 21, 2014, in which PJM's recommended ATWACC of 8% results in a Gross CONE of $150/kW-yr for Area 1, while an increase of ATWACC to 13.5% results in a Gross CONE of $224.20/kW-yr for Area 1. For illustration purposes only, we linearly interpolated between the 8% and 13.5% Gross CONE impacts to derive the Gross CONE impact for a 10.8% ATWACC.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)	**Docket No. ER14-2940-0000**

AFFIDAVIT OF JAMES A. HEIDELL & MARK REPSHER

I, James A. Heidell, being duly sworn, depose and say that the statements contained in the attached Affidavit of James A. Heidell & Mark Repsher on behalf of PJM Power Providers are true and correct to the best of my knowledge, information and belief, and I hereby adopt said testimony as if given by me in formal hearing, under oath

Signed this 15th day of October 2014

James A. Heidell

I, Mark Repsher, being duly sworn, depose and say that the statements contained in the attached Affidavit of James A. Heidell & Mark Repsher on behalf of PJM Power Providers are true and correct to the best of my knowledge, information and belief, and I hereby adopt said testimony as if given by me in formal hearing, under oath

Signed this 15th day of October 2014

Mark Repsher

Subscribed and sworn to be before
This 15th day of October, 2014

Notary Public

KAREN M. YENOVKIAN
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
November 25, 2016

My Commission Expires:

Jim Heidell — Director

Jim Heidell specializes in electric and gas utility regulation, utility finance, wholesale electricity markets, evaluation of renewable energy technologies and financial analysis of complex investments. Mr. Heidell assists clients with due diligence associated with acquisition of natural gas and electric utilities and wholesale energy market transactions. Mr. Heidell has prepared and submitted testimony in both regulatory proceedings and civil contract damages cases. Mr. Heidell also specializes in strategic analysis and evaluation of opportunities associated with renewable / alternative energy technologies.

Primary expertise

- Electric and natural gas utility regulation and finance
- Analysis of wholesale electric markets
- Renewable energy technologies
- Asset valuation / M&A advisor
- Damages estimation for civil litigation

Related experience

- Strategic planning
- Financial modeling of complex investments
- Financial planning

Qualifications

- 30-years' experience with electric & gas utilities and electricity markets
- MBA University of Washington
- MSE Engineering Economics, Stanford University
- BSE, Civil Engineering, Tufts University
- CFA

Primary expertise

Utility Regulatory Support – Prepare expert testimony in regulatory hearings related to resource acquisition, QF issues, rate impacts, marginal and embedded cost of service, and rate design. Developing marginal and embedded cost studies for regulated utilities.

Financial Analysis – Long-term modeling of utility finance. Analysis of major capital investments using a variety of tools to incorporate uncertainty and risk.

Analysis of Energy Markets – Develop energy and capacity forecasts for U.S. power markets to support: strategic investments by utilities and major energy companies, development of utility risk management strategies, and corporate strategies for generation asset acquisition and disposition.

Renewable Energy Technologies – Develop business plans, market positioning strategies, and financial analysis of renewable technologies including PV cell manufacturing, flywheels, and fuel cells along with renewable generation technologies, including solar thermal, geothermal, wind, battery storage, and IGCC projects.

Asset Valuation / M&A Advisor – Provide valuation advice for acquisition of electric generation portfolios, single power plants, transmission projects, electric utilities, and gas distribution companies. Work also included review of wholesale and retail regulatory pricing mechanisms and analysis of associated risk.

Damages Estimation for Civil Litigation Testimony – Prepare expert witness testimony to support power contract litigation, property tax cases, power plant development agreements, and quantification of economic damages.

Key client achievements

CIVIL LITIGATION TESTIMONY & SUPPORT

Prepared an analysis of claims of economic damage associated with the performance of an anaerobic digester designed to provide gas for an electric generation project. Analysis included evaluation of performance, revenues and costs, and cost of capital used to discount projected future earnings. Prepared expert report and testified in jury trial in federal district court.

Developed an analysis of material and labor cost increases on EPC costs for a natural gas fired power plant located in New Mexico. The analysis was used to refute a claim that cost overruns were not reasonable in a cost plus EPC contract. The analysis demonstrated how much of the total project cost increases was associated with labor and

material costs beyond the control of the general contractor.

Prepared an analysis of loss of margins at two coal plants during periods when there were alleged violations of EPA opacity emission limits. The analysis demonstrated that client did not receive any economic benefit associated with the periods of alleged violations.

Prepared an analysis of the commercial distributed solar sector in the 2010 – 2011 time frame and demonstration of the unreasonableness of the plaintiff's claims for economic damages associated with the defendant's decision not to pursue participation in an equity fund.

Prepared an analysis of the U.S. wholesale electric power markets in the 2008 – 2010 time frame to demonstrate why the plaintiff's decision to terminate construction of a coal fired power plant was due to cost increases in the EPC contract and not due to the changing natural gas prices and emission laws.

Prepared an estimate of lost margins associated with the extended outage of a Canadian nuclear reactor. The analysis included an estimate of what Ontario wholesale power prices would have been but-for the outage and estimates of the total damages including repair and inspection costs.

Prepared an Expert Report regarding rate making and financial policies for a municipal power agency in conjunction with a contract dispute regarding a power contract and investments in new generation resources to serve full requirements customers.

Assisted expert witness by the preparation of a report on how a third party would value a major oil pipeline as part of a property tax dispute with the local municipality.

Prepared an analysis of damages associated with claims for losses associated with the interruption of business of a Texas gas-fired power plant as a result of the rupture of a natural gas pipeline use to supply the power plant.

Prepared of an analysis of the economic benefits that accrued to the defendant associated with the purported delay of implementation of measures to correct water pollution discharge violations associated with a power plant.

ANALYSIS OF RENEWABLE ENERGY INVESTMENTS

Prepared an Independent Market Expert Report to support the debt financing of a large solar thermal projects with purchased power agreements with California investor owned utilities.

Prepared an Independent Market Expert Report to support the debt financing a large solar thermal project with molten salt storage, with a purchased power agreement with an a local utility.

Prepared an Independent Market Expert Report to support the expansion of a CdTe PV manufacturing facility in Colorado including the analysis of the business plan and projection of long-term prices for the PV modules.

Prepared an Independent Market Expert Report to support the expansion of a c-Si PV manufacturing facility including the analysis of the business plan and projection of long-term prices for the PV modules.

Prepared an Independent Market Expert Report to support the expansion of a polysilicon manufacturing facility including the analysis of the business plan and projection of long-term prices for polysilicon and the associated raw materials.

Prepared an evaluation of the global market for concentrating solar power plants as of 2012 as part of a client analysis of a potential purchase of a solar mirror manufacturing company.

Prepared an evaluation of the U.S. solar PV market to support evaluation of a Japanese firm's potential expansion in the U.S. markets.

Assisted client with a bid into a utility's renewable energy procurement program. The analysis included an assessment of competitors and analysis of pricing to support the bid of a renewable energy resource into an RFP for renewable resources.

Prepared long range forecasts of multiple wind portfolios with an emphasis on the valuation of post PPA revenues and the value or renewable energy credits.

Prepared an analysis of the market for future expansion of the wind business of a major U.S. wind developer based upon an assessment of the competitiveness of wind generation with gas fired generation.

Prepared a fair market value analysis of associated with the purchase of a minority position in a wind project located in Ontario, Canada.

Prepared an Independent Market Expert Report to support the debt financing of a geothermal power project located in the Pacific Northwest.

Prepared an Independent Market Expert Report to support the debt financing for a flywheel energy storage project in New York.

Prepared an Independent Market Expert Report to support the debt financing of a battery energy storage project in New York.

Development of an Independent Market Expert Report to support the financing of a combined cycle plant including an analysis of the regulatory structures being relied upon to support cost recovery as well as wholesale electric prices to support wholesale power sales.

UTILITY REGULATORY SUPPORT

Analysis and testimony on behalf of an Investor Owned Utility related to typical merger and acquisition conditions required by regulators in utility and non-utility transactions. Testimony related to the joint venture of the Utility and its partner company.

Testimony related the use and design of ratchet rates on behalf of an Investor Owned Utility. Testimony related to the application of ratchets to the client's unique position and appropriate recovery of costs.

Analysis of the economics of an electric utility's interruptible rates including the value of interruptions versus the payments received by customers. Developed recommendations for pricing interruptible rate programs that were consistent with the utility's avoided costs and ISO markets.

Developed electric cost-of-service studies, rate design, and testimony to support an Investor Owned Utility in multiple general rate cases in Washington. The engagements included addressing issues such as special rates for strategic customers with competitive options, line extension policies, and rates to address revenue attrition.

Developed natural gas cost-of-service studies, rate design, and testimony to support an Investor Owned Utility in a general rate case in Washington.

Prepared marginal cost of service studies and testimony to support an Investor Owned Utility in multiple Montana rate cases.

Assisted an Investor Owned Utility in development of its integrated resource plan through analysis of options using the Strategist planning model.

Supported an Investor Owned Utility in answering a complaint in front of the South Dakota Public Utilities Commission regarding a wind generator requesting a contract under the provisions of PURPA.

Provided expert testimony related to an Investor Owned Utility proposed participation in a coal fired power plant. Prepared and delivered testimony provided in multiple hearings in North Dakota and Minnesota.

Prepared testimony on behalf of a Government Owned Utility regarding rate shock and how to address necessary rate changes associated with the restructuring of the electric utility business in Ontario.

Developed an analysis or weather risk associated with the retail power sales of a local utility. Effort was conducted as part of a comprehensive risk assessment conducted by the utility's parent. Models of the weather / load relationship were developed and then integrated with the rate structures and cost adjustment mechanisms to assess the utility's overall exposure to weather risk.

Advised an electric cooperative on options for acquiring new generation in a depressed power market and incorporation of the analysis in their long-term resource planning.

M&A and BANKRUPTCY ADVISOR

Prepared an analysis of a natural gas distribution company to support a prospective buyer. We assisted multiple clients with due diligence related to the acquisition of gas LDCs. Assisted the client with a review of the deal model including: assumptions about rate cases, assumptions regarding ROE, sales growth by rate class, and revenue by rate class. The engagement also included an assessment of the regulatory climate and potential conditions and costs associated with obtaining regulatory approval of the transaction.

Prepared a valuation of a natural gas distribution company including the analysis of regulatory issues to support the debt financing associated with the purchase of the energy company.

Assisted an infrastructure fund in valuing power contracts and reviewed the regulatory model used in conjunction with establishing the price to bid for the acquisition of a local utility.

Prepared an analysis of a local utility to support an infrastructure fund's bid for the utility. The analysis included projections of growth opportunities through distribution & transmission investment, analysis of the POLR load obligation, and a review of key regulatory issues.

Developed a valuation model of an Independent Power Producer including analysis of debt carrying capacity to assist a strategic player in the U.S. Power Industry determine whether to make an unsolicited offer to purchase the company.

Assisted an international oil company in development of modelling processes and assumptions to support a corporate effort to acquire a fleet of U.S. merchant generating assets.

Support a strategic player in valuing a Northeast generation plant as part of their bid to acquire the asset in a competitive auction. Effort involved projection of future gross margins of the plant, analysis of the ISO-NE Forward Capacity Market, and analysis of transmission constraints.

Directed the valuation of a major power generating company's entire portfolio on behalf of the bank creditors in the company's bankruptcy hearings. The valuation work included advising on a range of types of generation assets in the U.S. as well as in Europe, South America, and the Asia-Pacific region. Advised on the fairness of offers for assets being disposed of by the company.

Assisted creditors in the valuation of assets in a large bankruptcy including the options for completing unfinished gas-fired generation assets. Served as the interim finance manager for a generating facility.

Member of team that advised a major Independent Power Producer as part of the company's restructuring and plan of reorganization. Assignment included analysis of the company's Canadian portfolio, advising on the sale of generation assets, modelling of long-term turbine maintenance costs, and the valuation of complex power contract.

Assisted the lenders on valuation and strategy related to IPP's turn-back of power plant to the lender group.

Advised the bank and lender group on valuation and strategy related to the bankruptcy of a natural gas fired power plant.

ASSET APPRAISALS

Prepared a valuation of a large eastern coal plant as a third party appraiser required in a transaction where the lessee wanted to exercise a buy-back provision in a sale lease-back agreement.

Prepared a valuation of a California cogeneration plant for the purposes of identifying the tax loss.

Completed an appraisal to support the transfer of a large high-voltage direct current line from the development arm to a separate fund managed by the infrastructure fund. The appraisal addressed the California power markets, operations of the CA-ISO high voltage transmission and a forecast of revenues given the FERC and CA-ISO regulatory schemes as part of the income approach. The appraisal also incorporated a comparable sales and replacement cost analysis.

Developed an appraisal of a nuclear power plant based upon discounted cash flow, replacement costs, and comparable sales as part of an effort to determine the fair market value under a lease agreement that contained a buy-back provision.

Completed multiple appraisals of an Investor Owned Utility's generation assets on Long Island that were subject to a generation repurchase agreement. The appraisals were part of the ongoing process for the client to develop a strategy to address the repurchase option.

ELECTRIC GENERATION FINANCE SUPPORT

Market expert report for a national 66 MW portfolio of fourteen landfill gas power plants. The market expert report included a discussion of the key attributes of each of the power markets that the portfolio encompasses, long-term forecasts of wholesale electricity prices, and forecasts of gross margins.

Independent Market Expert Report to support the financing of the repowering and development of a fleet of combined cycle and simple cycle power plants in the ERCOT market. The independent market expert report was used to support the syndication of loans and obtaining debt ratings associated with investing over $1 billion.

Independent Market Expert Report to support the financing of a client's purchase of a 730 MW combined cycle power plant located in ERCOT. The report was used to support the syndication and rating of over $400M of primary and mezzanine debt. The report incorporated forecast of gross margins for both the contracted and non-contracted portions of the facility as well as providing a detailed description of the ERCOT market conditions and key assumptions to the financial analysis.

Independent Market Expert Report to support the financing of a client's purchase of a partially completed 620 MW combined cycle power plant located in the Pacific Northwest. The report was used to support the syndication and rating of over $100M of debt. The analysis included valuing both hedged and unhedged positions for the facility and conducting extensive due diligence regarding how NW power markets are likely to evolve and the role of independent power in a market dominated by vertically integrated public and investor-owned utilities.

Independent Market Report to support the refinancing of an Independent Power Producer's corporate revolver. The effort included analysis of multiple U.S. power markets, valuation of the fleet of generation assets and associated

contracts, and review of regulatory conditions impacting the company's ability to realize earnings in markets with competitive auctions to serve load.

Multiple forecasts of California power market prices including support of a bid for a cogeneration facility located in the San Francisco Bay area and sale of a large combined cycle generator.

Forecast of the New England power markets to support a bid for a portfolio of generation assets.

Forecast of the California and SPP power markets to support a bid for assets from a private developer's portfolio.

Analysis of the ERCOT, PJM and MISO markets for multiple bids for merchant gas fired generation plants.

Development of multiple Confidential Information Memorandums (CIMs) to support the sale of power plants. CIMs included description of the wholesale power markets and summaries of the key attributes of the assets to be sold in auction.

Preparation of sale offering of a large natural gas fired power plant in response to solicitation to acquire new resources an Investor Owned Utility. Effort included evaluation of likely competitors and the development of the bid strategy.

Advise on pricing for offering power contracts as well as the sale of gas-fired combined cycle power plant in the Southeast. Pricing and sale price based upon projections of the value of the power plant as a merchant unit, assessment of potential competitors, and the analysis of transmission constraints.

ELECTRIC MARKETS RISK MODELING

Provided support to a bond insurance company to prepare an assessment of the distribution of income from a fleet of peaking power plants in the Southeast. Analysis used to review the provision for loss reserves.

Supported a bond insurance agency in determining the probability that a fleet of Midwest generation assets would generate insufficient cash to meet debt payments and reserve requirements.

Developed an Excel based model for a Midwest public utility to assist in developing annual targets for the amount of surplus generation capacity to be sold as merchant and in contracts of varying tenor. The model was integrated into the corporate financial model to assist in identifying the appropriate risk profile to support building the reserve fund and to delay future rate increases.

DSM ADVISORY SERVICES

Advised a regulated utility in New York on the status of electric decoupling and incentive mechanisms in the United States as part of the New York state initiative to reintroduce decoupling.

Advised a private equity fund on the status of demand side management in New England, likely projections of growth, and probability of successful implementation as part of an evaluation of long-term supply and demand conditions in the New England electric markets.

Worked with an Investor Owned Utility regarding the incorporation of projections of demand side management potential into the utility's long-term resource plan.

Additional experience – Expert Testimony

Before the Public Service Commission of Maryland, Rebuttal Testimony Of James A. Heidell, Case No. 9173, Phase II In The Matter Of The Current And Future Financial Condition Of Baltimore Gas And Electric Company.

Before the Indiana Utility Regulatory Commission, Rebuttal Testimony in Northern Indiana Public Service Company's request to raise rates in Cause No. 43526. Testimony on behalf of the utility related to ratchets and other mechanisms appropriate to recover costs allocated to large energy using customer classes.

Before Public Service Commission of the State of North Dakota, Direct and Rebuttal Testimony in Montana Dakota Utilities Co., and Otter Tail Corporation; Advance Determination of Prudence, Big Stone II Generating Station Case Nos. PU-06-481 and PU-06-482. On behalf of Montana-Dakota Utilities. 2007 & 2008. On behalf of Montana-Dakota Utilities.

Before the Public Service Commission of the State of Montana, Direct and Rebuttal Testimony in Montana-Dakota's General Rate Case – Marginal Cost of Service Study, Docket No. D2010.8.82. On behalf of Montana-Dakota Utilities.

Before the Public Service Commission of the State of Montana, Direct and Rebuttal Testimony in Montana-Dakota's General Rate Case – Marginal Cost of Service Study, Docket No. D2007.7.79. On behalf of Montana-Dakota

Utilities.

Before the Minnesota Public Utilities Commission, Direct and Rebuttal testimony on behalf of Montana-Dakota Utilities regarding a Certificate of Need for the Big Stone II Power Plant, Docket No. CN-05-619. On behalf of Montana-Dakota Utilities.

Before the Ontario Electric Board, Expert Report regarding the 2006 Electric Rate Distribution Handbook and Rate Mitigation, on behalf of Hydro One Networks, Inc. January 2005.

Before the Washington Utilities and Transportation Commission, Direct Testimony in 2004 General Rate Case Regarding Electric Cost of Service & Rate Design and Gas Rate Design, April 2004. On behalf of Puget Sound Energy.

Before the Washington Utilities and Transportation Commission, Direct Testimony in 2001 General Rate Case Regarding Electric Cost of Service & Rate Design, November 2001. On behalf of Puget Sound Energy.

Before the Washington Utilities and Transportation Commission, Testimony Regarding the Need for a Special Competitive Rate for Intel. Docket No. UE-960299, 1996. On behalf of Puget Power.

Before the Washington Utilities and Transportation Commission, Rebuttal Testimony in the Merger of Puget Power and Washington Natural Gas Regarding Electric Rates, Docket Nos. UE-95-1270 & UE-960185, 1995. On behalf of Puget Power.

Mark Repsher — Managing Consultant

Mr. Repsher is an energy advisor with over 13 years of experience guiding clients through initiatives spanning strategic resource and environmental compliance planning (for utilities, cooperatives, and municipalities), divestitures of non-core assets to enhance shareholder return, mergers and acquisitions, restructurings and other litigation, off-take contract structuring and valuation, asset financing, identification of concrete value 'off-ramps' to realize investment returns for specific power assets, and best practice analyses. He has worked with and presented before various Boards, CEOs, CFOs, and executive management teams when delivering on the aforementioned initiatives. During his career, Mr. Repsher has extensively analyzed North American wholesale energy markets, with a focus on coal and environmental regulatory issues. He has performed extensive work with PA's proprietary multi-pollutant optimization model, analyzing market performance under varying environmental regimes (including SO_2, NOx, mercury, and greenhouse gas programs), optimizing plant retrofit timetables, developing allowance price forecasts, analyzing market entry/exit decisions and assessing market positioning.

Primary expertise

- Strategic resource and environmental compliance planning
- Asset and contract valuation/due diligence
- Mergers, acquisitions and divestitures
- Asset valuation
- Litigation support

Related experience

- Cooperative portfolio supply planning optimization
- Utility non-core asset divestiture
- Utility and cooperative environmental compliance planning
- Private equity acquisition support
- Independent power producer restructuring support

Qualifications

- B.A. in Economics

Types of Clients

- Electric Cooperatives
- Investor Owned Utilities
- Generation Developers
- Private Equity
- Investment Banks
- Environmental Protection Agency

Primary expertise

Asset and contract valuation/due diligence – Mark forecasts plant operating and gross margin performance, values power, fuel, transportation and storage contracts, validates company financial projections, and prepares forecasts for annual budgets.

Environmental modeling – Mark analyzes environmental portfolio impacts, develops allowance price forecasts, and calculates environmental exposure risk.

Coal asset modeling – Mark provides strategic planning guidance by analyzing plant performance under varying environmental regimes, optimizing plant retrofit timetables as well as market entry/exit decisions, assessing coal flows, and forecasting transportation costs.

Litigation support – Mark has supported numerous litigation assignments, including restructuring support, force majeure analysis and other contract disputes for energy, coal, natural gas and transportation agreements, including developing models and price indices to support these initiatives.

Key client achievements

Investment Bank – Retained by a group of clients considering refinancing a natural gas combined cycle asset, and sought an independent energy market expert to provide a market assessment and asset valuation. Evaluated the power market in which the asset is based, provided a baseline valuation of the asset, and prepared an independent energy market expert report for distribution to lenders and rating agencies. The client was able to successfully refinance the project.

Independent Power Producer/Developer – Retained by a client in the process of raising debt for repowering a natural gas facility and was in need of expert assistance in obtaining financing. Evaluated the power market in which the asset operates, evaluated the asset using different economic scenarios, and prepared an independent energy

market expert report. The client was able to successfully achieve financing for the project after previous unsuccessful attempts while working with different partners.

Developer – Retained by a North American developer to evaluate the cost-benefit to local ratepayers of a proposed natural gas-fired combined cycle facility that the company was developing in the Mid-Atlantic United States versus legacy coal-fired assets that the incumbent utility proposed to transfer into local rate base. Evaluated the relative economics of each of the assets (proposed combined cycle and legacy coal-fired assets) as well as the long-term risks and benefits (e.g., fuel risk, supply diversification, etc.) that each technology posed. Based on cost-benefit analysis and strategic guidance, the client was able to successfully file briefs before the state regulatory authority in support of the proposed project and to counter claims made by the incumbent utility.

Investor Owned Utility – Retained by a large investor owned utility that was seeking to reduce its merchant power generation exposure through the asset sale of two large coal facilities and a natural gas peaking generator located in New England and PJM. Supported the client by evaluating the current and projected state of the power markets in which the assets were located, providing market overview material for the sales memorandum, projecting operations and margins for both merchant and contracted capacity, and supporting the client and their financial advisors throughout the transaction process. The work allowed the client to successfully sell the assets in a timely fashion and at a favorable price, despite difficult market conditions for coal plant transactions.

Developer – Retained by a developer to support the development of an approximately 550 MW combined cycle power plant located in PJM. Analyzed the facility's access to natural gas and surrounding transmission infrastructure, projected the operations and gross margins of the facility, as well as prepared an independent market expert report. Support allowed the client to communicate the project's investment risks and benefits to potential equity and debt investors.

Developer – Retained by an developer to support the development of an approximately 1,200 MW combined cycle power plant located in the MAAC region of PJM. As part of work, analyzed the facility's access to natural gas and surrounding transmission infrastructure. In addition, projected the operations and gross margins of the facility, as well as prepared an independent market expert report. Through support the client was able to communicate the project's investment risks and benefits to potential equity and debt investors.

Developer – Developed rebuttal testimony and supported expert witness appearance before the Minnesota Public Utilities Commission, on behalf of thermal developer, regarding Xcel Energy's petition for Approval of Competitive Resource Acquisition Proposal and Certificate of Need. In addition to preparing rebuttal testimony, assisted the client and counsel with strategic analyses and demonstratives in support of direct testimony and cross examination of witnesses.

Private Equity/Hedge Fund – Engaged to provide buy-side support for a confidential private equity client that was considering the acquisition of a contracted natural gas-fired co-generation power plant interconnected with New York Zone J. Reviewed and critiqued sell-side models and reports, conducted an analysis of the Zone J electricity region, projected asset margins both during the multiple contracts and following expiration of the contracts, provided an estimate of asset value, and prepared an independent market expert report. Work helped the client understand and get comfortable with the risks and opportunities associated with the asset and ultimately led to successful acquisition and financing of the asset.

Investor Owned Utility – Retained by a Southwestern U.S. Investor Owned Utility to develop the fair market value related to the acquisition of a peaking facility under long-term contract. In addition to developing project fair market value, required to defend valuation in front of the contract counterparty as well as a third party arbitrator, including defending approach to the utilization of an alternative CAPM approach within a single asset transaction context.

Infrastructure Fund –Retained by an international institutional investor to support the sales process related to the divestment of natural gas- and coal-fired power assets located in FRCC, WECC, and PJM. As part of the sales process, evaluated the current and projected state of the power markets in which the assets were located, developed independent financial projections for the portfolio, which included merchant and contracted capacity, assisted in the development of a confidential information memorandum, produced an independent market expert report for distribution to bidders, and supported ad hoc requests by the management team to support the broader sales process.

Global Corporation –Retained by a global corporation to provide sell-side support for a portfolio of merchant natural gas and coal-fired power assets located in PJM. As part of the sales process, evaluated the current and projected state of the power markets in which the assets were located, developed independent financial projections for the merchant portfolio, produced an independent market expert report, and supported ad hoc requests from the management team.

Investor Owned Utility – Retained by an international investor owned utility to support the sales process related to

the divestment of non-core coal-fired and natural gas-fired power assets located in the Mid-Atlantic and Midwest United States. As part of the sales process, analyzed coal supply and retrofit options for the coal-fired assets, developed independent financial projections for the portfolio, assisted in the development of a confidential information memorandum, produced an independent market expert report for distribution to bidders, and supported ad hoc requests by the management team to support the broader team throughout the sales process. In addition, led team analyzing and projecting future gross margins and asset performance for portfolio; assisted financial advisors in preparation of marketing material and participated in management presentations to prospective investors in the portfolio.

Private Equity – Retained by a global investment bank and a global private equity investor to provide strategic guidance and economic analysis related to a potential natural gas power generating asset investment opportunity in the U.S. As part of this effort, conducted energy market and physical/ financial asset analytics to project the earnings of the enterprise within the power markets; advised the investment banking and private equity teams on the economic risks inherent in the energy markets and specific to the assets; advised the investment bank's commodity team and private equity's contract team on structuring and pricing the financial hedges necessary to raise debt; advised the investment bank's lending team on the inherent risks and selling points regarding the energy markets and power generating asset investment; put forth the initial logic from which the private equity team could develop future investment enhancement and exit strategies within the dynamic energy markets; assisted the private equity team in communicating the market/asset analytic approach and investment risks to potential outside equity investors. The private equity firm ultimately won the bid to purchase the power generating assets, and I continued to support them in their process of raising debt, rating the bonds, structuring hedges, identifying an energy manager, etc. in the successful effort to close the sale.

International Investor – Mark assisted in the provision of strategic market insight and analysis in support of an investor’s consideration of the acquisition of a large wind portfolio including existing and development projects located across the U.S. as well as in Spain and the Netherlands. Mark assisted in the delivery of a presentation that included a market overview of the various regions and focused on the primary risk factors to consider when assessing the future earnings of wind power generating assets. As part of the analysis, Mark helped to analyze the opportunities and potential risks in contracting with local utilities in the regions for the output including the potential willingness to procure wind power under a PPA, projected renewable demand, projected opportunity cost, and exposure to additional renewable/environmental legislation, extreme commodity price movements, and other factors. Findings were presented to the client and included as part of their overall review of the investment opportunity.

Global Conglomerate – Mark assisted a Chinese energy conglomerate to develop its investment thesis surrounding the potential acquisition of a set of hydroelectric facilities located in the Southeastern United States. The analysis spanned multiple facets, including analyzing historical facility performance and other company provided documents, producing going forward production and financial projections, analyzing local and regional transmission constraints (including any value associated with the portfolio's own transmission system), and studying potential off-take opportunities with regional load serving entities. The client was able to utilize the analysis to develop its overall investment thesis, and ultimately a bid for the portfolio.

Infrastructure Fund – Mark assisted a global conglomerate analyze and develop an investment thesis for fifteen wind power generation assets in the U.S. Mark helped to advise the firm on political and regulatory, electricity market structure, and energy fundamental opportunities and risks. The firm was able to successfully close on the investment in the wind power generation assets.

Wind Developer – Mark assisted a wind developer looking to site a merchant wind facility in the SPP market that was in the process of evolving into a Day 2 market. Mark assisted the developer in better understanding congestion and curtailment risk, forecasting cash flow projections, and communicating with various potential co-investors.

Battery Storage Developer – Mark assisted in an analysis that summarized evolving market rules as they relate to battery storage technology, projected the energy and ancillary service market prices of several markets, and used PA’s suite of proprietary dispatch optimization models to project the margins and operations of the client’s battery storage technology. Initial analysis focused on the ERCOT and PJM regions, and also supported executive management in development and execution of a go-to market strategy for the technology.

Confidential – Mark assisted in litigation support for a case involving a coal commodity contract dispute. He helped in developing a new price index for determining contract prices, conducting a market review of contracts, performing data analysis and undertaking a market analysis for the client.

Confidential – Mark assisted in litigation support developing models to estimate commodity price indices and the cost to the producer of obtaining a new agreement in the wake of a supplier’s bankruptcy. Results were used to estimate total damages incurred by the client.

Confidential – Mark forecasted Eastern and Midwestern coal movements under varying pricing and environmental scenarios for a Midwestern mining company. The results of these analyses were used to obtain new financing for the company.

Energy Information Administration – Mark conducted an extensive review of the U.S. Energy Information Administration's long-term market forecast for Powder River Basin coal. He analyzed future coal production and reserves, future coal transportation rates, the potential for siting new coal-fired plants near the PRB supply region, the ability of PRB coal to penetrate into new markets in the eastern United States, and SO_2 emissions and allowance prices.

Environmental Protection Agency – Mark developed optimal coal transportation routing and rates for use in the Environmental Protection Agency's (EPA) national multi-pollutant modeling system, forecasting long-term rail, barge and truck routing for all U.S. coal-fired generators, competitive status of these moves, and probability of new routes being utilized as generators shift coal use patterns. These inputs are used by the EPA when modeling the economic impacts of legislative proposals.

Confidential – Mark analyzed the economics of utilizing various coal supply sources for a coal-fired power plant, the likely commodity and transportation costs of this coal supply, as well as the economics of building a new rail spur to the plant in order to facilitate new coal supply sources. He developed a report and presentation, which was utilized by the client when approaching the state's regulatory board to approve construction of the new rail spur.

Confidential – Mark provided a coal market analysis for a client looking to invest in a Central Appalachian coal producer. As part of the analysis, he analyzed both short- and long-term trends in coal commodity markets, including production, demand, regulatory and import/export trends. In addition, he analyzed the effect of environmental concerns and power market dynamics as it related to likely demand for the target coal producer's product. The client utilized analysis to evaluate the economics of this potential investment, including the future demand for coal produced by the target company.

Confidential – Mark assisted a multinational mining company in its evaluation of the Southwest U.S. power and fuel markets, including regulatory structure and key market drivers. In particular, the analysis outlined the regulatory and market structure for various Southwest U.S. power markets, the relative competitiveness (current and future) of several target coal-fired facilities in the region, the timeline needed for new power generating facility permitting and construction in these markets, the environment for regulated owners to pass through cost of service changes, and, given these factors, the likely maximum coal commodity price that the client could charge the owners of these facilities. The analysis was utilized by the client to evaluate its equity stake in coal mining projects serving both existing and planned coal-fired projects.

Confidential – Mark assisted a Southwestern U.S. investor owned utility in the evaluation of its coal procurement activities. Mark reviewed corporate principles, procurement and logistics, analysis and reporting, contract administration, market optimization, and personnel organization, utilizing on- and off-site interviews, site visits and key company documents to facilitate the analysis. He compared these findings to industry best/leading practices, and delivered a presentation and detailed report outlining findings and areas for the company to implement improvements, including "quick win" changes.

Confidential – Mark assisted a client in developing going forward strategic options for two coal-fired facilities. The client was the target of potential New Source Review ("NSR") violations, and wanted to analyze how to optimize the value of the assets before signing a Consent Decree with the Environmental Protection Agency (EPA). Using market modeling software and market expertise, worked with the client to develop a series of market cases to stress test asset valuations, looking not only at possible Consent Decree options (including 'bubble' limits), but also how the viability of these options and asset values would be impacted by new EPA regulation of SO_2, NOx, hazardous air pollutants (including mercury), combustion ash disposal, and cooling water. Delivered detailed pro formas to the client, as well as a report and board presentation outlining the implications of the findings.

Confidential – Mark provided litigation support for a power company being sued by the EPA for potential NSR emissions violations, which, if successfully argued, would have forced the company to spend significant capital on environmental retrofits. Mark worked with the client's legal team to develop statistical analyses and expert witness testimony, which the client used to counter the government agency's claims.

Confidential – Mark analyzed an Independent Power Producer's extensive coal portfolio under varying environmental scenarios, optimizing long-term plant retrofits and coal burn, valuing coal supply and transportation contracts, and validating company financial projections. The analysis was used as part of the company's successful restructuring effort to emerge from bankruptcy.