Stakeholder Requests for Information and PJM Responses

	Question:	PJM Response:
1	Please identify the increase in Gross CONE for the reference CT unit (GE Frame 7FA) in SWMAAC caused by PJM's adoption of the Brattle recommendation that, due to constrained supply and transport on the Cove Point Natural Gas Pipeline, that a firm gas transportation contract is required to assure reliable service in SWMAAC. See PJM Preliminary Recommendations at p. 5, heading 2, bullet 2; The Brattle Group, Cost of New Entry Estimates for CT and CC Plants in PJM at p. 31 (May 15, 2014).	Brattle did not recommend that a firm gas transportation contract be included in the Gross CONE for the reference CT unit in SWMAAC. The Gross CONE for the reference CT unit for the CONE area that contains SWMAAC zones (CONE Area 2) assumes dual-fuel capability. PJM recommends gross CONE values for the reference CT to include dual-fuel capability in all CONE areas and further recommends continued use of the reference CT as the reference resource used in the VRR curve determination. The section and pages referred to in the question are in regards to the reference CC unit. For the reference CC, Brattle recommends that a firm gas transportation contract be assumed in the Gross CONE for the SWMAAC CONE Area and that firm transportation avoids the need for and cost of duel fuel capability assumed for the CC in the other CONE Areas. The firm gas transportation assumption adds $11,000/MW-year to the CONE for CCs in SWMAAC but avoids the incremental cost of $5,600/MW-year associated with dual-fuel capability so the net impact of the firm gas transportation assumption on the gross CONE of the CC in SWMAAC is $5,400/MW-year. *(see sections II.C.5 and IV.A.5 of Brattle CONE report)* There are currently 2 combined cycle facilities in SWMAAC with CPCN applications before the MD PSC in cases 9280 and 9297 and in both cases the combined cycle facilities have opted not to use oil back-up which leads PJM to adopt the Brattle recommendation that firm gas transportation is required for CC units in SWMAAC. To reiterate, PJM recommends continued use of the CT as the reference resource for VRR curve purposes therefore the firm gas transportation assumption for CCs in SWMAAC has no effect on the VRR curve for SWMAAC under PJM preliminary recommendations
2	Please describe all analyses done and provide all work papers of Brattle or PJM including the rationale and criteria used to identify constrained natural gas supply and transportation pipeline segments throughout the PJM RTO and MAAC. If no such analyses were performed other than as respects SWMAAC, please explain why the analysis was limited to, or focused solely on, SWMAAC?	The gas pipeline serving the part of SWMAAC identified for the reference plants is Dominion Cove Point (DCP) which, based on information from shippers, is capacity constrained and availability of interruptible service has been unreliable and inflexible. DCP is fully subscribed so in order to ensure gas deliverability it will be necessary for new CC to pay for firm transportation to expand pipeline capability to ensure deliverability of gas. Again, as mentioned above, there are currently 2 combined cycle facilities in SWMAAC with CPCN applications before the MD PSC in cases 9280 and 9297 and in both cases the combined cycle facilities have opted not to use oil back-up which leads PJM to adopt the Brattle recommendation that firm gas transportation is required for CC units in SWMAAC. As a consequence of this observation dual-fuel capability was not assumed in this CONE area as it was in

		the other CONE areas for CC units. Brattle has not received similar information regarding operational issues of pipelines in other areas of PJM and thus have not completed any additional analysis concerning firm transportation contracts in other CONE areas.
3	How and in what magnitude would Gross CONE in SWMAAC change if duel fuel capacity rather than firm gas transportation contracts were relied upon to provide assurance of service during natural gas supply or transport shortages? Why has PJM continued to require a firm gas transportation contract for the reference CT unit though Brattle rejects such a contract for CT units as not cost effective. See PJM Preliminary Recommendations at p. 5, heading 2, bullet 2; The Brattle Group, Cost of New Entry Estimates for CT and CC Plants in PJM at p. 14 (May 15, 2014).	See response to #1 *On page 14:"*The incremental cost is approximately $22 million for the CC and $24 million for the CT (in 2014 dollars), including equipment, labor, and materials, indirect costs, and fuel inventory. That contributes approximately $9,500/MW-year to the CONE for the CT and $5,600/MW-year for the CC (in 2018 dollars and in level-nominal terms)."
4	How would changes in Gross CONE in SWMAAC attributable to PJM's assumption respecting dual fuel capability or firm natural gas contracting as described above, affect the SWMAAC VRR curve and the magnitude and cost of generation resources procured to provide reliable electric service in SWMAAC?	See response to #1
5	Please provide all <u>data and work papers</u> upon which Brattle and/or PJM rely in asserting that property taxes in SWMAAC are higher than in other regions of PJM, including particularly Eastern MAAC and Rest of RTO. See The Brattle Group, Cost of New Entry Estimates for CT and CC Plants in PJM at p. iv, 28-30, 33-34 (May 15, 2014). • Please explain fully how Brattle calculated the $5.3 million and the $9.9 million shown for Property Taxes as an O & M Cost in Tables 23 & 24 of the Report, including separate identification of all separate items or components contributing to that cost. • Please provide a similar explanation for other total tax costs for other PJM regions in these tables.	The basis of the property tax values for each CONE area of Tables 23 and 24 of the Brattle report are described fully in section IV.A.3 of the Brattle CONE report. As explained in this section, the main driver behind higher property taxes for CONE areas that include Maryland, Ohio and Virginia is that taxes in these states are based on all property, not just land and building. Maryland tax rates estimated as the sum of county and state rates in Charles County and Prince George's County in 2013-2014. Data obtained from Maryland Department of Assessment & Taxation website: <u>http://www.dat.state.md.us/sdatweb/taxrate.html</u> personal tax rate in MD increases tax expense Per Table 21, sources: [2d] Md. Tax-Property Code Ann. 7-237 [2e] Maryland Depreciation Regulation Chapter 18, Subtitle 03, Chapter 01, Depreciation .02B(2). Phone conversation with State Department of Assessments & Taxation in June 2012.
6	Please provide <u>all labor cost data for SWMAAC</u> relied upon in Brattle's 2011 Second Triennial Review Report and in this Third Report dated 2014. Identify the comparable costs of union and non-union labor in the two Reports and any data relied upon by Brattle and/or PJM to demonstrate greater unionization of labor or use of unionized labor in SWMAAC in 2014 as compared to 2011. Please identify where in Brattle's 2011 Report that Brattle" assumed strictly non-union labor	Craft labor rates used to prepare capital cost estimates in the report were obtained from the publication "RS Means Labor Rates for the Construction Industry", 2014 edition. Costs have been added to the rates to cover social security, workmen's compensation, federal and state unemployment insurance. The resulting burdened craft rates were used to develop typical crew rates applicable to the task being performed. Different tasks require different skilled labor crafts and therefore require a different crew makeup. A crew is a composition of various crafts by a certain percentage of participation to perform a particular task. These crew rates include additional allowances to cover other costs (i.e. expendables, small tools, show up time,

	in the 2011 Report and provided its explanation in support of that decision. See The Brattle Group, Cost of New Entry Estimates for CT and CC Plants in PJM at p. iv, vi, 6, 17-18, (May 15, 2014). a) Please explain why the SWMAAC Cone Area Labor Pool excludes Baltimore, Maryland; other northern Maryland cities and Delmarva; and is restricted only to Washington, DC; Annapolis, MD and Alexandria, VA. b) At page 17 of its Report, Brattle states that "labor rates in this analysis do not reflect a specific assumption of whether union or non-union labor is utilized", but rather rely upon "a survey of prevalent wages in each region in 2014". Please provide access to or a copy of this survey. This new approach is stated to provide "a better representation of the labor force that will include labor from both pools". Employing the data provided in response to this data request, please state fully Brattle's basis for this belief.	working foreman, general liability), construction equipment including cranes, lifts, other rentals, and construction site overhead indirect costs. Craft labor rates used for SWMAAC were the average of rates for the cities of Washington, D.C., Annapolis, MD, and Alexandria, VA. These cities were chosen as representative of the labor costs applicable to projects in the area around Waldorf, MD, including portions of Charles and Prince George's counties. This area was chosen as the basis for SWMAAC cost estimates, as described on page 4 of the report. As stated in RS Means Labor Rates for the Construction Industry, the wage rates "have been compiled and updated after careful checking and cross checking of the wage rates submitted by local unions and employer associations in each city. Local prevailing or Davis-Bacon wage rates are used when union wage rates are not available. These figures are the latest available."[1] This is basis for our statement on page 17 of the report that "the labor rates in this analysis do not reflect a specific assumption of whether union or non-union labor is utilized. Instead, the labor rates have been developed by S&L through a survey of the prevalent wages in each region in 2014, including both union and non-union labor." Labor hour estimates for CTs and CCs are based on construction productivity in the Texas Gulf Coast region, which is a common approach used in construction estimates. Productivity factors were applied to labor hours to reflect the effect union vs. open shop, weather, and other factors that vary by region. Productivity factors were obtained from the 2014 Global Construction Cost Yearbook published by Compass International. The Yearbook's data is based on Compass International's construction cost library, now twenty years old, and data obtained from various sources. This information has been "audited, added to, expanded upon in some situations, modified and calibrated with latest currency, productivity and escalation values, refined and aligned to today's engineering, procurement and construction installation methods and applications."[2] Sources: [1] RS Means Labor Rates for the Construction Industry, 2014 edition, page vi. [2] Compass international, Inc., 2014 Global Construction Costs Yearbook, 14th Annual Edition, page
7	Please explain and provide all data relied upon to establish that CC CONE is greater in 2014 (current study) than in 2011 (prior study) because of increased estimated costs of EPC contingency, owner's project development costs and plant O & M costs. See The Brattle Group, Cost of New Entry Estimates for CT and CC Plants in PJM at p. 18 (May 15, 2014)	As explained in Section III.A.4 of the report, the increased estimated EPC contingency costs are based on input received by stakeholder during 2011 study and proprietary data from S&L. As explained in Section III.B.1 of the report, the owner's development costs and mobilization and startup costs are "based on S&L's review of similar projects for which it has detailed information on actual owner's costs." A full explanation of the O&M costs and the split between fixed and variable O&M costs are included in Section IV of the report. As noted in Section V of the report, "plant O&M" costs, excluding property taxes, are lower than the 2011 for CTs and higher than 2011 for CCs due to differences in methodologies between S&L and CH2M Hill in estimating

		fixed O&M costs.
8	PJM has stated in its Preliminary Recommendations that it does not adopt the Brattle recommendation to average CT and CC costs in developing its Gross Cone determination. Does PJM intend to use a CT unit as its reference technology for purposes of Gross CONE determination through to the next Quadrennial Review in 2019, including the BRA for the 2022/23 delivery year? See PJM Preliminary Recommendations at pp. 5-6, Bullet 4 (2014).	PJM's preliminary recommendations include a recommendation to maintain the reference CT as the reference resource used in the determination of the RTO and LDA VRR curves, and it is PJM's expectation that any tariff requirements associated with the parameters that are the focus of the quadrennial review (gross CONE including reference technology, shape of VRR curve and Net EAS method) would be effective starting with the next BRA (2018/19 BRA) and remain in effect through and including the 2021/22 BRA. The approved changes from the late 2017/early 2018 Quadrennial Review will be incorporated in the BRA for the 2022/2023 delivery year.
9	Brattle asserts in its Report that PJM's three year historic average model for Energy & Ancillary Service revenue offset determination in the calculation of Net CONE overstates the revenues which Generators can actually earn from PJM markets by as much as 25%. Brattle specifically identifies SWMAAC as an area in which overstatement occurs, but also qualifies its statements as follows (PJM Preliminary Recommendations at p. 7; The Brattle Group, at pp. 14-15 (May 15, 2014). *"In SWMAAC, this comparison is a particular challenge because there are no installed CT or CC units similar to the reference unit, and so we report a comparison with older and smaller CTs and no comparison for CCs . . . This discrepancy appears to be attributable to unavailability of non-firm natural gas or inflexible gas scheduling capabilities in the SWMAAC region causing actual units to generate rarely and to more often rely on expensive oil when they do run. The current historical simulation calculations do not account for the higher costs associated with these challenges, causing an overestimation of the E&AS offset and, consequently, an underestimated Net CONE value."* a. Please <u>provide all data, analyses and work papers</u> relied upon by Brattle to support its conclusions respecting the adequacy or overstatement of the E & AS revenue offset from CT and/or CC units in SWMAAC, MAAC and RTO. b. Please confirm that Brattle has	(a) Section III.B describes the data relied upon in this comparison: historical annual net EAS revenues for the reference resource CT and CC were provided by PJM staff and historical actual unit-specific net EAS revenues were provided by the IMM. Brattle compared actual to administrative net EAS revenues for units that Brattle identified as being similar to each reference resource based on fuel type, unit type, online date and unit size from Ventyx and PJM RPM data. PJM has posted the historical annual net EAS revenues for the reference resource; however, the unit specific net EAS revenues used in this analysis cannot be publicly posted. (b) No comparison was or could be made for CC units similar in configuration to the units developed for the CC CONE in SWMAAC. *(c)* Ventyx data indicates that the CTs in service in SWMAAC have higher heat rates than the reference resource CTs (average HR of 13,300 for these CTs vs 10,322 for reference CT.) (d) A review of EPA CEMS data shows CTs in SWMAAC are dispatched on oil more so than in other locations in PJM which leads to lower Net E&AS revenues (e) Brattle identifies an overstatement of administrative net EAS revenues versus actual net EAS revenues on average across all locations as illustrated in the summary of comparison results shown on Figure 6. PJM continues to review the model and various data sources to gain a better understanding of the differences between modeled revenues and actual revenues.

	made no quantitative analysis or comparison for CC units in SWMAAC, as stated in the quoted paragraph above, to support this assertion. c. Please identify and fully compare the characteristics of those older and smaller CTs (including particularly their and the reference unit's heat rate and alternative fuel capability or lack thereof) used in the analysis or comparison done by Brattle. d. Please provide all information and data upon which Brattle relies for its statement that "This discrepancy appears to be attributable to unavailability of non-firm natural gas or inflexible gas scheduling capabilities in the SWMAAC region"? e. Please provide an example with explanation of the comparison made by Brattle to support its assertion of overstatement of A & ES revenues by the PJM historic three year model using a MAAC area CC generator.	
10	Please describe how PJM will implement the Brattle recommendation that minimum Net CONE be established for sub-LDAs equal to the Parent LDA-Net CONE and how that action will affect SWMAAC. Please describe fully all effects within SWMAAC. See PJM Preliminary Recommendations at p. 7.	PJM's presented an example of this implementation using actual 2017/18 BRA parameters at the 6/13/2014 CSTF. The example showed the combined implementation of (1) a proposed change in the method for determining each LDA's net EAS and Net CONE in order to more closely align these values with each LDA, and (2) establishing the minimum Net CONE of sub-LDAs equal to the Net CONE of the parent LDA. The example shows that the combined impact of these proposed implementation is an increase in the SWMAAC Net CONE from $295/MW-day to $336/MW-day based on 2017/18 BRA planning parameters. See: http://www.pjm.com/~/media/committees-groups/task-forces/cstf/20140613/20140613-item-02b-pjm-recommendations-lda-net-cone.ashx (pdf page #13)
11	Please explain fully what effect PJM's adoption of the Brattle recommendation that the Energy & Ancillary Services calculation be "more closely" aligned with modeled LDAs will have upon SWMAAC. See PJM Preliminary Recommendations at p. 7.	See response to #10
12	Please provide all underlying data and calculations that support the value for Gross Cone ($/MW-Yr) of $146,348 and Net EAS ($/MW-yr) of $38,559 shown on slide 5 (Titled-"Application of 5.10(a)(iv) & (v) in Determination of LDA Net CONE Values") of the Presentation titled "Proposed Charges	The gross CONE value of $146,348/MW-day for SWMAAC is directly from the 2017/18 BRA planning parameters as developed using the gross CONE value specified in the table of section 5.10(a)(iv) of the PJM OATT escalated by the applicable HWI as per this section of the OATT. The net CONE value of $38,559 for SWMAAC is the 3-year average of annual net EAS revenues for a reference resource CT located in BGE zone as per direct application of section

	for Methodology used to Determine LDA Net Cone Values" made to the Capacity Senior Task Force on June 13. 2014. Please identify all cost items that contribute to the level of these two values	5.10(a)(v) of the PJM OATT. More details behind these determinations can be found on the 'Net CONE' tab of the 2017/18 BRA planning parameters located at http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2017-2018-planning-period-parameters.ashx
13a	Please explain how the data referenced in, questions 5-7 & 9 is employed in SWMAAC VRR curve development. What specific anchor points, curve shape or other values significant to the development of the curve and affecting capacity resource procurement or prices are affected by that data and how?	The y-axis coordinates of the RTO and LDA VRR curves are based on the Net CONE of the RTO and each modeled LDA. The Net CONE is equal to the gross CONE minus the NET EAS revenues applicable to the RTO and each modeled LDA. Questions 5, 6 and 7 pertain to property taxes, labor rates, EPC contingency costs, owner's project development costs and plant O&M costs which are components of the total gross CONE. Question 9 pertains to the three-year historical reference resource model used to estimate the Net EAS revenues for a new resource located in the RTO or LDA
13b	How will the 2018-2019 VRR curve for SWMAAC be impacted if Gross or Net CONE values differ either upward or downward using the proposed Brattle 2014 Report recommendations or those adopted based on the 2011 Brattle Report based on the results of the last three Base Residual Auctions (BRAs).	The SWMAAC LDA has not separated in price from the MAAC LDA since the 2009/10 BRA. In the last three BRAs, the SWMAAC LDA has cleared at the same price as the MAAC LDA and has had ample capacity import margin; therefore, changes to the input assumptions regarding the SWMAAC gross CONE and SWMAAC Net EAS would have had no impact on the SWMAAC LDA clearing price relative to the MAAC LDA clearing price. The net CONE value specific to the SWMAAC LDA becomes relevant to SWMAAC prices only if the SWMAAC LDA is constrained (i.e., when SWMAAC capacity imports reach the SWMAAC capacity impor limit in the clearing of the auction). Once imports reach the import limi in the auction clearing, capacity located inside of the SWMAAC LDA must be committed out of merit order up to the intersection point with the SWMAAC VRR curve and price of the internal capacity resource that intersects the SWMAAC VRR curve sets the price for the SWMAAC LDA. A change to the Net CONE of an LDA becomes a factor only when the LDA is constrained and the incremental price impact of the Net CONE change on the constrained LDA price is a function of the internal LDA capacity supply curve and is bounded between a $0/MW-day impact (in the case of a horizontal supply curve where all that is needed to intersect the LDA VRR curve is additional MWs from the same marginal resource) to an upper end price impact equal to the change in the LDA Net CONE (in the case where the LDA capacity supply curve is completely vertical).
13c	Please explain how capacity resource procurement and pricing in SWMAAC would have differed in the last three BRAs if Brattle's 2011 recommendations rather than 2014 Gross and Net CONE recommendations were applied in each BRA.	(see above)

13d	Please identify and fully explain any other effect of the data referenced at Questions 5-7 & 9 upon SWMAAC capacity resource procurement and pricing.	(see above)
14	The Brattle Report (Table 19 – page 26) for the reference unit CT for the Rest of RTO excludes any costs for Fuel Inventory – all other CONE Areas have a Fuel Cost of approximately $5 million. Please provide all analysis and data supporting this difference.	Brattle observed that actual projects in the Rest of RTO area have not generally been designed with dual-fuel capability. Only in areas with a dual-fuel assumption was it necessary to calculate cost for Fuel Inventories. See page 23 of the Brattle CONE Report for cost details and page 26, Table 19 for Brattle's output based on preliminary assumptions. However, PJM made a request to model Rest of RTO with a dual-fuel assumption following gas delivery challenges from this past winter and Brattle has provided an alternative estimate for Rest of RTO to include dual-fuel. Table 29 on page 44 of the Brattle CONE Report compares dual-fuel and single-fuel costs for both CT and CC technologies. Level nominal costs for CT were calculated as $138,000/ MW-yr for single-fuel and $147,500 for dual-fuel PJM's preliminary recommendation includes dual-fuel for the Rest of RTO.
15	The Brattle Report (Table 19 – page 26) for the reference unit CT for the Rest of RTO – indicates that the cost of equipment is approximately $4-5 million below all other CONE Areas. Please provide all analysis and data supporting this difference.	Brattle base assumption was single-fuel for Rest of RTO based on reasons stated in answer #2 above.
16	The Brattle Report (Table 20 – page 27) for the reference unit CC (Combined Cycle) for SWMAAC and the Rest of RTO excludes any costs for Fuel Inventory – the remaining CONE Areas have a Fuel Cost of approximately $6 million. Please provide all analysis and data supporting this difference.	Rest of RTO and SWMAAC does not assume dual-fuel CCs in Table 20 SWMAAC CC are assumed to have firm gas CCs assumed to use duct firing based on empirical data (see pp 11-12 section 2)
17	The Brattle Report (Table 20 – page 27) for the reference unit CC for SWMAAC and the Rest of RTO – indicates that the cost of equipment is approximately $5 million below all other CONE Areas. Please provide all analysis and data supporting this difference.	Rest of RTO and SWMAAC do not include dual-fuel in Table 20 1. Assumption – Dual-fuel requires the addition of water injection nozzles (see page 14) 2. Equipment costs are based on S&L's proprietary database and continuous interaction with clients and vendors