

**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

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

**AFFIDAVIT OF DR. SAMUEL A. NEWELL
AND MR. CHRISTOPHER D. UNGATE
ON BEHALF OF PJM INTERCONNECTION, L.L.C.**

Our names are Dr. Samuel A. Newell and Mr. Christopher D. Ungate. We are employed by *The Brattle Group* (“Brattle”), as a Principal, and *Sargent & Lundy* (“S&L”), as a Senior Principal Management Consultant, respectively. We are submitting this affidavit in support of the proposal by PJM Interconnection, L.L.C. (“PJM”) to adjust the administrative Cost of New Entry (“CONE”) parameter, representing the cost of building a generation plant for use in PJM’s capacity market (known as the Reliability Pricing Model or “RPM”).

We both have extensive experience estimating CONE in capacity markets administered by Regional Transmission Organizations (“RTO”). For ISO-NE, we submitted joint testimony in April 2014 regarding the CONE for the ISO-NE Forward Capacity Market demand curve.¹ In December 2013, we sponsored testimony before the Commission to establish the ISO-NE Offer Review Trigger Prices based on our estimates of Net CONE values for various technologies.² Dr. Newell co-authored the 2011 PJM CONE study³ and provided affidavits in ensuing litigation,⁴ which informed the Net

¹ Before the Federal Energy Regulatory Commission, Docket No. ER14-1639-000, *Testimony of Dr. Samuel A. Newell and Mr. Christopher D. Ungate on Behalf of ISO New England Inc. regarding the Net Cost of New Entry for the Forward Capacity Market Demand Curve*, April 1, 2014.

² Before the Federal Energy Regulatory Commission Docket No. ER14-616-000, *Affidavit of Dr. Samuel A. Newell on Behalf of ISO New England* and the accompanying “2013 Offer Review Trigger Prices Study,” December 11, 2013.

Before the Federal Energy Regulatory Commission, Docket No. ER14-616-000, *Affidavit of Christopher D. Ungate on Behalf of ISO New England*, December 11, 2013.

³ Kathleen Spees, Samuel Newell, Robert Carlton, Bin Zhou, and Johannes Pfeifenberger, *Cost of New Entry Estimates for Combustion-Turbine and Combined-Cycle Plants in PJM*, August 24, 2011. (“2011 PJM CONE Study”) Available at <http://www.pjm.com/documents/reports.aspx>.

⁴ Before the Federal Energy Regulatory Commission, Docket No. ER12-13-000, *Affidavit of Dr. Samuel A. Newell on Behalf of PJM Interconnection, LLC*,

CONE values PJM used in its capacity auctions for the 2016/2017 and 2017/2018 delivery years. In addition, Dr. Newell's extensive related experience in market design for resource adequacy for ISO-NE, PJM, NYISO, MISO, and ERCOT has provided broad perspective on the capacity market context in which CONE is used. For NYISO, Mr. Ungate developed capital cost and fixed O&M cost estimates for the demand curve reset studies of 2007, 2010, and 2013.⁵

Our experience working for RTOs is also informed by our work for market participants building, buying, and contracting with generation plants. Dr. Newell has led numerous generation asset valuation studies and resource planning studies. Mr. Ungate has performed a number of utility planning studies, and he supports RTOs and utility clients with cost and performance estimates of new entrant technologies that are used in the development of administratively determined demand curves and power supply plans.

Dr. Newell is an economist and engineer with more than 16 years of experience analyzing and modeling electricity wholesale markets, the transmission system, and RTO market rules. Prior to joining The Brattle Group, he was the Director of the Transmission Service at Cambridge Energy Research Associates and previously a Manager in the Utilities Practice at A.T.Kearney. He earned a Ph.D. in Technology Management and Policy from the Massachusetts Institute of Technology, an M.S. in Materials Science and Engineering from Stanford University, and a B.A. in Chemistry and Physics from Harvard College.

Mr. Ungate has over thirty-five years of experience in electric utility operations, planning, and consulting. Prior to joining Sargent & Lundy, he was manager of generation resource planning at the Tennessee Valley Authority. He directed supply planning for 30,000 MW of nuclear, coal, gas, renewable, and hydro generation, and determined peak season power purchase requirements. He has a B.S. and M.S. in Civil Engineering from the Massachusetts Institute of Technology, and an M.B.A from the University of Tennessee at Knoxville. He is a registered professional engineer in the State of Tennessee.

supporting PJM's Settlement Agreement regarding the Cost of New Entry for use in PJM's Reliability Pricing Model, November 21, 2012.

⁵ NERA/Sargent & Lundy, Independent Study to Establish Parameters of the ICAP Demand Curve for the New York Independent System Operator, April 15, 2007.

NERA/Sargent & Lundy, Independent Study to Establish Parameters of the ICAP Demand Curve for the New York Independent System Operator, August 2, 2013.

New York Independent System Operator, Inc., *Proposed NYISO Installed Capacity Demand Curves for Capability Years 2011/2012, 2012/2013, 2013/2014* (Draft report for discussion purposes only) Final report prepared based on NERA/S&L's September 7, 2010 revised final study report, Issued 9/3/2010, Revised 9/7/2010, 10/30/2010.

Complete details of our qualifications, publications, reports, and prior experiences are set forth in our resumes, attached to our affidavit.

In October of 2013, PJM retained Brattle to review the Cost of New Entry (“CONE”) parameters of the Reliability Pricing Model (“RPM”), as required periodically under PJM’s tariff. Dr. Newell led the Brattle review of CONE parameters, together with Mr. Ungate and his team at S&L as a sub-contractor. The Brattle team’s role was to estimate CONE, starting by determining the configurations and locations of the reference plants, overseeing S&L estimates of the capital cost and fixed operation and maintenance (“O&M”) costs, estimating certain components of capital costs (*e.g.*, gas and electric interconnection and land costs), estimating certain components of fixed O&M costs (*e.g.*, property taxes and firm gas contracts), analyzing the key financial assumptions (*e.g.*, cost of capital), and calculating the levelized costs. S&L’s role was to contribute expertise in determining the configurations and locations of the reference plants and to provide detailed capital and fixed O&M cost estimates of the reference plants specified for each PJM CONE Area.

The results of the analysis completed by Brattle and S&L are set forth in a report entitled “Cost of New Entry Estimates for Combustion Turbine and Combined Cycle Plants in PJM with June 1, 2018 Online Date” (“2014 CONE Study”). A copy of the 2014 CONE Study, which was prepared under our direction and supervision, is attached to our affidavit.

This affidavit summarizes the methodology and results of our study with PJM’s requested modifications.

Our starting point for estimating CONE was to determine representative technical specifications and locations for the reference natural gas-fired combustion turbine (“CT”) plant. To do so, we relied primarily on the “revealed preference” of developers in the PJM region and around the U.S., as reflected by recent and proposed CT plants. For CONE Areas where revealed preference data is weak or scattered, we identified promising locations from a developer perspective based on proximity to gas and electric interconnections and key economic factors such as labor rates and energy prices.

We defined a representative reference plant based on two General Electric Frame 7FA.05 gas turbines with selective catalytic reduction (“SCR”) technology and carbon monoxide (“CO”) catalyst environmental controls to reduce air pollutant emissions, evaporative cooling for power augmentation, and dual-fuel capability. We found in our analysis that dual fuel has not been dominant in the Rest of RTO area for CT plants, but PJM requested that we calculate CONE in all areas assuming dual-fuel capability. The net summer installed capacity of such a plant is 383 to 396 MW depending on the ambient atmospheric conditions assumed in each location, with a net heat rate of approximately 10,300 Btu/kWh.

Based on this configuration, we estimated capital and fixed O&M costs for each CONE Area. More specifically, for each plant specified, we conducted a comprehensive,

bottom-up analysis of the capital costs to build the plant: the engineering, procurement, and construction (EPC) costs, including equipment, materials, labor, and EPC contracting; and non-EPC owner’s costs, including project development, financing fees, gas and electric interconnection costs, and inventories. We separately estimated annual fixed operating and maintenance (O&M) costs, including labor, materials, property taxes, and insurance. The 2014 CONE Study describes the bases for each of these estimates.

We then calculated the levelized CONE value using an after-tax weighted average cost of capital (“ATWACC”) of 8.0% based on our review of various market reference points, as documented in the 2014 CONE study. We calculated levelized costs assuming 20 years of cash flows that are constant in real terms (*i.e.*, growing with inflation) and, alternatively, cash flows that are constant in nominal terms. Because PJM is filing CONE values based on the level-nominal assumption, we present only those results in this affidavit.

Following the release of the 2014 CONE Study, PJM conducted a stakeholder process to review the report and solicit input on the assumptions. As a result of those discussions, PJM chose to adopt, in lieu of the labor cost estimates provided in the 2014 CONE Study, an alternative labor cost estimate provided by the Independent Market Monitor for the PJM Region.⁶ At PJM’s request, we included these alternative labor costs in a recalculation of the CONE values from the 2014 CONE Study, and show those results in this affidavit.

The estimated CONE for the reference CT plant in each CONE Area with an online date of June 1, 2018, based on the 2014 CONE Study, including the level-nominal assumption and dual-fuel capability for all areas, as calculated as an alternative option in the 2014 CONE Study, plus the alternative labor cost estimate provided by PJM are as shown in Table 1.

Table 1
Reference CT Plant CONE Estimates

CONE Area	CT CONE (\$/MW-year)
CONE Area 1	\$132,200
CONE Area 2	\$130,300
CONE Area 3	\$128,900
CONE Area 4	\$130,300
CONE Area 5	\$126,400

We note that while we include CONE estimates for CONE Area 5, Brattle has recommended, and PJM has agreed, to merge CONE Area 5 into CONE Area 3.

⁶ See Affidavit of Dr. Paul Sotkiewicz of PJM, which is being submitted concurrently with this affidavit

This concludes our affidavit.