

GOVERNMENT OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU

2019 DEC 23 PM 3:19

SECRETARIA  
NEGOCIADO DE ENERGIA  
DE PUERTO RICO

IN RE: REVIEW OF THE PUERTO RICO ELECTRIC POWER AUTHORITY INTEGRATED RESOURCE PLAN	CASE NO. CEPR-AP-2018-0001  SUBJECT: PREPA's Discovery on Intervenor's Written Testimony
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MOTION SUBMITTING RESPONSE OF DR. ERIC C. WOYCHIK

TO THE BUREAU:

NOW COME, CENTRO UNIDO DE DETALLISTAS (CUD); CAMARA DE MERCADEO, INDUSTRIA Y DISTRIBUCION DE ALIMENTOS (MIDA); PUERTO RICO MANUFACTURES ASSOCIATION (PRMA); UNIDOS POR UTUADO (UPU), Y EL INSTITUTO DE COMPETITIVIDAD Y SOSTENIBILIDAD ECONOMICA DE PUERTO RICO (ICSE-PR) (hereinafter the not profit intervenors) represented by appearing counsel and respectfully allege and pray:

1. Appearing "Not For Profit Intervenor's" submit with this motion the supplemental response of the expert witness Eric C. Woychik, Senior Vice President, Willdan.

WHEREFORE It is respectfully requested from the Energy Bureau to receive the supplemental testimony submitted.

**CERTIFICATE OF SERVICE**

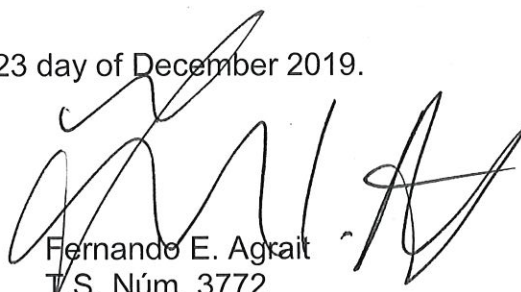
We hereby certify that, a copy of the filing was sent via e-mail to the Energy Bureau Clerk and internal legal counsel to: [secretaria@energia.pr.gov](mailto:secretaria@energia.pr.gov); [wcordero@energia.pr.gov](mailto:wcordero@energia.pr.gov); [legal@energia.pr.gov](mailto:legal@energia.pr.gov); and [sugarte@energia.pr.gov](mailto:sugarte@energia.pr.gov). A hard copy of the foregoing will be filed with the Clerk of the Energy Bureau tomorrow.

In addition, the foregoing filing was sent via e-mail to the approved or pending intervenors (Arctas, Caribe GE, League of Cooperatives and AMANESER 2025, OIPC, EcoEléctrica, Empire Gas, Environmental Defense Fund, Local Environmental Organizations, National, "Non Profits", Progression, SESA-PR, Renew, Shell, Sunrun, Wartsila, Windmar Group) and amicus (ACONER, AES-PR, RMI) at the following e-mail addresses: [sierra@arctas.com](mailto:sierra@arctas.com), [tonytorres2366@gmail.com](mailto:tonytorres2366@gmail.com), [cfl@mcvpr.com](mailto:cfl@mcvpr.com); [gnr@mcvpr.com](mailto:gnr@mcvpr.com), [info@liga.coop](mailto:info@liga.coop), [amaneser2020@gmail.com](mailto:amaneser2020@gmail.com), [hrivera@oipc.pr.gov](mailto:hrivera@oipc.pr.gov), [jrivera@cnsipr.com](mailto:jrivera@cnsipr.com),

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In San Juan, Puerto Rico, this 23 day of December 2019.



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**GOVERNMENT OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD**

**IN RE:**

**PUERTO RICO ENERGY BUREAU  
REVIEW OF THE PUERTO RICO  
ELECTRIC POWER AUTHORITY  
INTEGRATED RESOURCE PLAN**

**CASE NO:**  
CEPF-AP-2018-0001  
**SUBJECT:**  
PREPA's Discovery on Intervenors' Written  
Testimony

**RESPONSE OF DR. ERIC C. WOYCHIK TO DISCOVERY OF THE PUERTO RICO  
ELECTRIC POWER AUTHORITY ON THE WRITTEN TESTIMONY SUBMITTED BY  
THE NOT-FOR-PROFIT INTERVENORS**

**RE: REQUEST FOR INFORMATION PREPA-NFP-01**

This is to respond to the Puerto Rico Public Service Regulatory Board request that *not-for-profit intervenors produce any document prepared by [me] or prepared by a third party and used by [me] which supports [my] claim that the cost of LNG-fired generation is already well above the costs of utility-scale renewable, battery storage and distributed energy resources. See e.g., but not limited to, Direct Testimony of Dr. Eric C. Woychik, Senior Vice President, Willdan Corporation, page 6, ¶ 8 (October 23, 2019).* Please refer to question NFP-02.

**RE: REQUEST FOR INFORMATION PREPA-NFP-02**

This is a response to the request for *Any and all Document and Communications (or Documents reflecting any Communications) that [I] relied on to support all [my] claims and allegations as made in the Written Testimony.*

In response, the documentation and communications offered in my original testimony are further explained in the following five passages and the references following.

First, LNG fired generation would be valued at a combined energy cost and a capacity price, given an availability level (minus forced and planned outages). Distributed energy resources and renewables should be valued in comparable ways.



Second, the assumptions used in other regions combine the value of DERs delivered somewhat differently as DERs can reduce the cost of distribution (grid costs) and transmission (grid costs). An average deferability value can be used with DERs as they reduce both distribution and transmission costs. An example calculation is used for reference:

Third, the rapid declines in solar PVs, battery storage, and wind power are largely unmatched for fossil-burning plants such as CCGTs and CTs. The efficiencies possible in these units have all but been fully wrung-out for CCGTs and CTs, and these units produce both NOx and GHGs.

Fourth, a latest example is the analysis from Bloomberg that shows the rapid decline in battery storage costs, as follows: *Battery prices, which were above \$1,100 per kilowatt-hour in 2010, have fallen 87% in real terms to \$156/kWh in 2019. By 2023, average prices will be close to \$100/kWh, according to the latest forecast from research company BloombergNEF (BNEF).* <https://about.bnef.com/blog/battery-pack-prices-fall-as-market-ramps-up-with-market-average-at-156-kwh-in-2019/>

And fifth, this is a simple Competitive Price Referent = Price of battery storage capacity + price of charging energy (if solar PV or wind @ zero marginal cost) + premium for adverse conditions in Puerto Rico, which can be compared to the reference prices for LNG gas delivered and the most efficient CCGT expected, in light of the following references, primarily from my testimony:

- Battery Pack Prices Fall As Market Ramps Up With Market Average At \$156/kWh In 2019, Bloomberg NEF, December 3, 2019. <https://about.bnef.com/blog/battery-pack-prices-fall-as-market-ramps-up-with-market-average-at-156-kwh-in-2019/>
- Logan Goldie-Scott, Head of Energy Storage, [A Behind the Scenes Tale on Lithium-ion Battery Prices](https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/), BloombergNEF, March 5, 2019; <https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/>.
- Veronika Henze, Battery Power's Latest Plunge in Costs Threatens Coal, Gas, Bloomberg NEF, March 26, 2019. <https://about.bnef.com/blog/battery-powers-latest-plunge-costs-threatens-coal-gas/>.

- Distributed Energy Optimization: Steps and Results for Customer Value Capture in Layers, CRRI-Rutgers 32nd Annual Conference, Monterey California 26-28 June 2019 (coauthored)
- Smart Grids: Infrastructure, Technology, and Solutions, 2<sup>nd</sup> Addition, Stuart Borlase, Editor, CRC Press, 2018 (author of multiple chapters on markets, policy, and future vision).
- To Integrate and Optimize the Grid: Locate and Customize Distributed Energy Resources, Advanced Workshop in Regulation and Competition, CRRI-Rutgers, 30<sup>th</sup> Annual Western Conference, Monterey, CA, 28 June 2017 (coauthored).
- Integration and Optimization of Distributed Energy Resources; Big Data Analytics do the Job, Advanced Workshop in Regulation and Competition, CRRI-Rutgers, 36<sup>th</sup> Annual Eastern Conference, Annapolis, MD, 1 June 2017 (coauthored).
- *Seven Conditions Justify Smart Grid Investments*, Public Utilities Fortnightly, January 2017.
- Steps to Integrate and Optimize DERs, NARUC ERE Staff Subcommittee Webinar, 1 June 2016.
- Assessing Electric Utility Potential for a Distributed Energy Future – Scope and Scale from Value-Added Integration and Optimization, Advanced Workshop in Regulation and Competition: CRRI-Rutgers, 35th Annual Eastern Conference, Shawnee on Delaware, Pennsylvania, 11-13 May 2016, (coauthored).
- Utility Efficiencies with Distributed Energy Resources: Scope, Scale, and Dynamic Benefits, Edison Electric Institute, Alternative Regulation Group, Webinar, 11 April 2016.
- Locational Net Benefits Analysis: To Integrate and Optimize Distributed Energy Resources for Maximum Value, LNBA Methodology and Demonstration Workshop, California Public Utilities Commission, San Francisco, CA, 1 February 2016.
- The Integration and Optimization of DSM: Extraordinary Benefits when the Orchestra Plays Together, AESP National Conference, Orlando, Florida, 9-12 February 2015 (coauthored).
- IDSM Cost-Effectiveness: What Happened Outside of California? Results from Duke Energy, NVE, Avista ... presentation in CPUC R. 14-10-003, 22 January 2015.
- Methods & Tools to Accomplish Distribution Resources Planning, CPUC DRP Workshop, presentation in CPUC R.14-08-013, 8 January 2015.

- Valuing Integrated Demand Side Management (IDSM) for Improved Cost Effectiveness, DistribuTech Conference, San Antonio, TX, 28 January 2014 (coauthored).
- *Integrated Demand Side Management Cost-Effectiveness: Is Valuation the Major Barrier to New “Smart-Grid” Opportunities?* American Council for an Energy-Efficient Economy, Monterey, CA 12-17 August 2012 (coauthored).
- *Integrated Demand-Side-Management Cost-Effectiveness Framework*, IDSM Task Force, San Francisco, CA, May 2011.
- *An Integrated Analysis of the Electricity Market: Does More Knowledge Enable Market Manipulation?* 8th Global Conference on Business and Economics, (Coauthored), Rome, Italy, 13 October 2007.
- *Toward a Standard Practice Approach to Integrated Least-Cost Utility Planning*, Public Utilities Fortnightly, Volume 121 No. 5, March 1988.
- *Integrated Least-Cost Electricity Planning Under Uncertainty: Issues and Progress*, Workshop on Energy Resources Planning for Electricity, Honolulu, Hawaii, May 1987.
- *Least-Cost Resource Plan Integration under Uncertainty: Toward a Standard Practice Approach*, California Public Utilities Commission, September 1986.
- *Standard Practice for Cost-Benefit Analysis of Conservation and Load Management Programs*, Joint Report of the California Public Utilities Commission and the California Energy Commission, 1982 (co-authored).
- *Perspectives and Issues in Least-Cost Planning: Toward a Standard Practice Approach*, Least-Cost Energy Planning in the Midwest: A Symposium, Electric Power Research Institute, March, 1982.
- R. Boland and F. Collopy, Managing as Designing, Stanford U.P. 2004.

Response of Dr. Eric C. Woychik  
Senior Vice President, Willdan

ss: Eric C. Woychik