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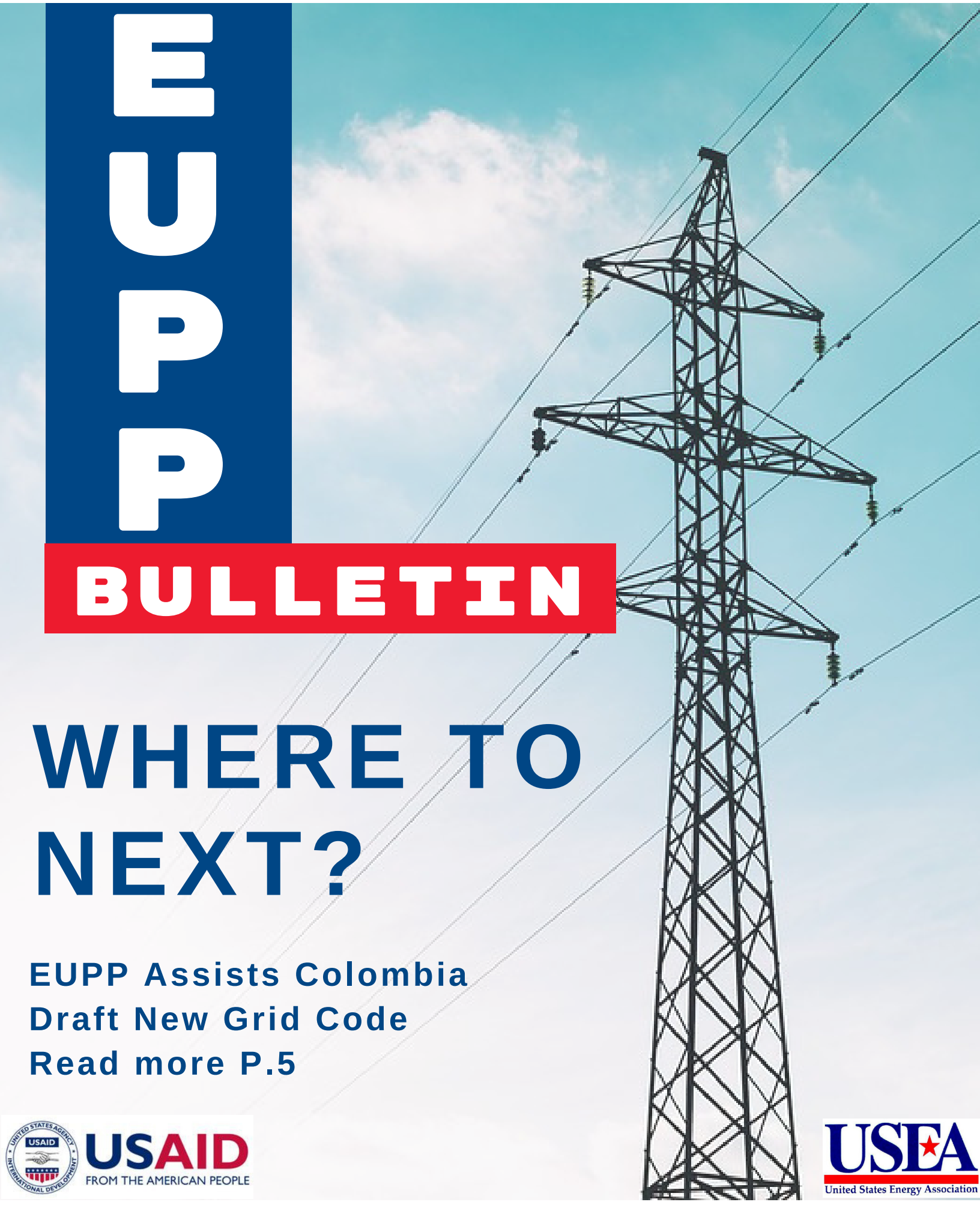
EUPP BULLETIN



WHERE TO NEXT?

EUPP Assists Colombia Draft New Grid Code

Read more P.5

USAID FROM THE AMERICAN PEOPLE

USEA United States Energy Association

Director's Message

Welcome to the inaugural edition of the EUPP Bulletin, a quarterly publication of activities and success stories achieved by USEA's Energy Utility Partnership Program (EUPP), a partnership with the U.S. Agency for International Development (USAID).

The Bulletin highlights EUPP work of the previous quarter, but also upcoming RFPs, volunteer opportunities, and goals. The Bulletin includes an Innovation Corner to unearth technologies that could drive development; it features pilot projects and underscores policies of interest to USAID and the countries that directly benefit from EUPP. If your company has a new technology or pilot project you would like to see included, please contact me.

In June 2017, USEA signed a new cooperative agreement with USAID to advance our work under EUPP. The new agreement will initially focus on: Colombia, Ethiopia, India, Kenya, Rwanda, Tanzania and Uganda. And USEA will continue to use the successful volunteer peer-to-peer approach to assist USAID-partner utilities in improving their service and reliability.

EUPP will continue its geothermal work in Kenya and Ethiopia and will focus on a broad range of issues in other countries including revision of grid codes to allow the integration of renewables; PSSE and system planning; contract and project management; coal flexibility; and, LNG, among others. USEA is excited to work with USAID and our volunteers to bring electric power to all. Here's to another great year.

Sincerely,

– Marjorie Jean-Pierre

USEA Program Director, EUPP

KAZAKHSTAN

ENERGY AUCTION EXECUTIVE EXCHANGE

Through funding from the U.S. Agency for International Development (USAID), USEA organized a nine-day executive exchange to Mexico City and Golden, Colorado for the Republic of Kazakhstan's key stakeholders involved in planning Kazakhstan's first energy auction. This executive exchange was a follow up activity to an October 2016 workshop where USEA volunteers introduced several reverse auction models to Kazakhstani stakeholders. The objective of the executive exchange was two-fold:

- To introduce key stakeholders in Kazakhstan involved in planning the country's first energy auction to best practices, different types and designs of auctions, and Mexico's experience with energy auctions;
- To familiarize the delegates with the latest renewable energy R&D and applications in the United States, with a focus on wind power and on integrating renewable power sources into the electric grid.

The executive exchange was designed to provide Kazakhstan delegates with opportunities to meet with principal stakeholders, government entities, and private sector companies involved in Mexico's power auctions, including the National Energy Control Center (CENACE), the Ministry of Energy (SENER), Energy Regulatory Commission (CRE), Aklara (a private company that designed the power auction platform), the Asociación Mexicana de Energia Solar Fotovoltaica (Asolmex), and the Mexican Wind Power Association. In the U.S., the delegates toured the National Renewable Energy Laboratory (NREL) and visited Excel Energy – a major U.S. utility with a considerable renewable energy portfolio. Because of USEA activities on reverse auctions in Kazakhstan, the Ministry of Energy of the Republic of Kazakhstan released an order on the approval of rules of organizing and holding auctions on December 21, 2017.

This order outlined the qualification requirements for auction participants, the content and procedure for submitting applications, the types of financial guarantees for participation in auctions and conditions of their deposit and return, and the procedure for analyzing the results and determining the winners. Furthermore, in March 2018 a tender was announced for the first auction.

For more information on this activity, please contact Marina Barnett at mbarnett@usea.org.

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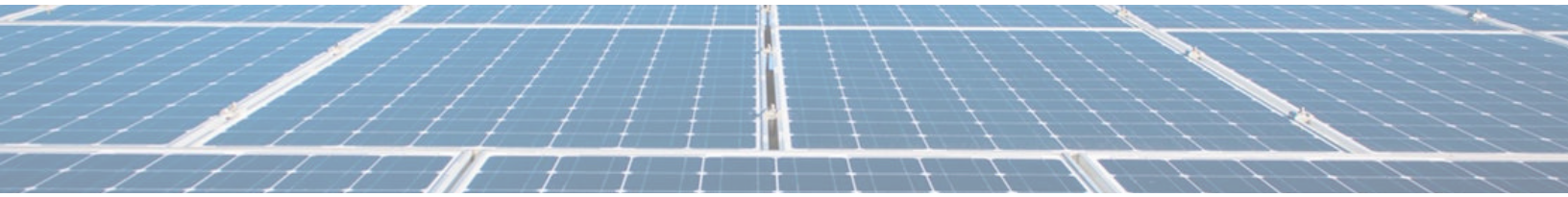

RWANDA

TRAINING ON NETWORK MODELING AND STABILITY ANALYSES TO IMPROVE GRID RELIABILITY

The energy sector in Rwanda is undergoing comprehensive reforms and program to enhance grid operation performance. The grid operation records indicate a history of network outages, which have either caused partial or total network loss. Rwanda is forecasting an increase in electrical generation capacity, which will require additional network modeling to determine the effect on the electrical grid and identify improvements required to maintain grid system stability on a system already struggling with outages.

USEA hired the Belgrade-based Electricity Coordinating Center (EKC) to work with the Energy Utility Corporation Limited (EUCL) on load flow modeling, current state network stability analyses, and other network and integration studies to assist Rwanda with expanding energy access while maintaining reliability. In February, EKC conducted a training to prepare EUCL to develop and improve its national load flow and dynamic models for the existing network topology. This activity was the first training within the framework of a large project on network modelling and long-term planning to enhance the capacity of EUCL for network modeling, analysis, and integration of renewable energy power plants. The objectives of this training were as follows:

- To develop and validate simulation models, necessary for further integration studies of new power plants,
- To perform current state network stability analyses, and
- To recommend mitigation measures to overcome the existing network instabilities that were introduced after the commissioning of several power plants from 2013-2016.

EKC trainers and EUCL engineers work on a network planning exercise as part of the training.

EKC created a data collection questionnaire for the development of a Current State Load Flow Model and developed a draft load flow network model. Once Rwanda confirms the model and sends the final data, EKC will validate the model. Later this year, USEA will conduct additional training on performing advanced contingency analyses, tripping simulations and corrective actions, implementing renewable generation and simulating their effects on the grid, performing Inertia/Governor load flow calculation, PV and QV Analysis, and reactive power planning using load flow programs.

For more information on this activity, please contact Marina Barnett at mbarnett@usea.org.

ETHIOPIA

BUILDING SPAGHETTI STRUCTURES TO IMPROVE LEADERSHIP

As Ethiopia strives to achieve universal electricity access by 2025, the Ethiopian Electric Utility (EEU) has identified leadership development for its management personnel as one of the key capacity building areas necessary to improve the company's overall management practices and increase productivity and profitability. To support EEU in this effort, USEA is organizing a series of leadership development training to assist EEU mid and senior level management to improve their knowledge, competence and techniques for managing their staff and measuring their employees' performance. In February, USEA conducted the second training focused on delivering greater efficiency and effectiveness, increasing personal authority, improving morale and profit and productivity. All of the participants agreed that they do not spend much time thinking and planning, in large part because they do not delegate work to others, leading to long hours at work dealing with issues that arise. This lack of strategizing and analysis creates a less proactive approach with suboptimal results. The participants agreed to begin to carve out time to think about the bigger picture and plan ahead.

This more proactive approach will lead to better decisions, improved long-term strategies, and ultimately improved overall company performance. Delegating more tasks to staff will also help build staff capacity to better handle mandatory retirements of senior executives.

EEU executives work together to build structures out of marshmallows and spaghetti as part of a team building exercise.

For more information on this activity,
please contact Marina Barnett at mbarnett@usea.org.

COLOMBIA

COLOMBIA DRAFTS NEW GRID CODE

Colombia's National Development Plan 2014-2018 seeks to move the country towards low-carbon sustainable growth. To achieve this goal, Colombia plans to increase wind generation from around 200 MW currently to about 1.5 GW by 2023 and solar from around 70 MW currently to around 700 MW by 2023.

However, Colombia's grid code, which hasn't been revised since 1995, is not equipped to integrate these renewable energies onto the grid. In addition, Colombia's system operator, XM, will need accurate estimates of how much electricity it will be able to obtain from these variable energy sources, in order to maintain reliable electricity flows.

As part of the effort to revise and update Colombia's grid code, XM, along with several other organizations was charged with developing a proposal for a modernized grid code, one that would provide clear guidance for integrating variable renewable energy sources, as well as other sources of electricity generation such as distributed generation, microgrids and small and micro-hydroelectric facilities, onto the grid while maintaining and enhancing reliability. USAID was asked to support this effort and turned to USAID's Energy Utility Partnership Program (EUPP), implemented by the U.S. Energy Association (USEA).

USEA collaborated with U.S. experts to help XM Colombia assess the parts of its grid code proposal and review its forecasting trial proposal: Yok Potts of MISO, Bob Staton from Xcel, Daniel Haughton of Arizona Public Service, and Guillermo Bautista of CAISO. The experts made many suggestions and recommendations with respect to XM's grid code proposal in the areas of energy supply and demand forecasting, the need to modify energy market rules.

XM's new draft Grid Code did include several changes that were recommended by the experts USEA assembled including:

- XM changed the availability requirement from 97% to 99% to ensure the quality of data.
- XM added requirements for submitting data on irradiation on the photovoltaic (PV) panel, the temperature on the back of the PV panel, and wind direction.
- XM made significant changes in the sections on demand forecasting and calculating deviations in demand forecasting.
- XM reduced the amount of historical data needed for forecasting from 20 years to 10 years and 1 year measured on site instead of 2 years.
- XM added an entire section on who is responsible for reporting.
- XM added requirements for a cut in and cut out speed and the operational temperature range of wind.

COLOMBIA

EUPP ASSISTS COLOMBIA WITH DEVELOPING PLANS FOR REAL-TIME MARKET

As part of Colombia's efforts to incorporate increasing amounts of renewable energy onto its grid, XM has been asked to develop a proposal for a real-time market. Due to the intermittency of renewables, any successful plan to incorporate them into the electricity grid will require a secondary market that is as close to real-time as possible, in order to quickly acquire supply to offset sudden drops in renewables production. In addition, the closer to real-time the system operator works, the more reliable renewables forecasting becomes, and the closer operators are able to match supply and demand.

Joel Mickey and Carrie Bivens of ERCOT discuss market concepts with Augusta Abrahamse and Kishori Kedlaya of USAID/Colombia.

In order to assist XM with this proposal, USEA organized a technical assistance with the help of U.S. system operators ERCOT and PJM. Senior Director of Market Design and Operations Joel Mickey and Forward Markets Manager Carrie Bivens travelled to Medellín for a week of presentations on how ERCOT uses real-time markets to balance its renewables.

Their efforts were supplemented by PJM Senior Lead Trainer John Gdowik who presented PJM's real-time market via a series of 4 webinars. XM was previously considering implementing an intraday market, along with the lines of the European model, but is now leaning towards the U.S. model after the ERCOT presenters pointed out drawbacks of the European model. A German system operator who participated in a webinar that ERCOT Market Design Principal Sai Moorty gave during the technical assistance echoed these concerns with the European model.

For more information on this activity, please contact Johanna Koolemans-Beynen at jkoolemans-beynen@usea.org.

UPCOMING PROJECTS

- **Hydropower O&M Executive Exchange – Kampala, Uganda**
- **Contract Management Workshop – Kampala, Uganda**
- **Asia Clean Energy Forum – Manila, Philippines**
- **Reverse Auctions Workshop – Medellin, Colombia**

INNOVATION CORNER

Floating Solar Creates Space for Renewable Energy Projects

2017 was a breakout year for floating solar plant installations globally. Floating solar, also referred to as a floating solar farm, is an array of photovoltaic panels on a structure that floats on a body of water such as a reservoir or lake. Floating solar farms have many advantages over land-based solar installations. They don't take up any valuable land, the cooling effect of the water makes them more efficient, they help mitigate the evaporation of water and inhibit the growth of water weeds and bacteria, and the floating panels accumulate less dust than ground-based units.

Solar panels over water are 19% more efficient than land-based solar. This significant efficiency improvement has led to the construction of large-scale floating solar farms around the world in the last year including:

China

The Three Gorges area is currently the site of the world's largest floating solar power plant. When completed in May of 2018, the $151 million installation will generate 150 megawatts of electrical power.

Photo courtesy of Solar Power World

Indonesia

Indonesian power company PT Pembangkitan Jawa-Bali (PT PJB), a subsidiary of state utility PLN, and the UAE's Masdar signed an agreement to develop the world's largest floating solar project with a capacity of 200MW in Indonesia.

U.S.

The Orlando Utilities Commission in Florida built a 31.5-kW floating array on one of its stormwater storage reservoirs in February 2017. This project is the first major floating array in Florida and one of only a handful in the United States.

Korea

A100MW floating solar plant in South Korea on the Seokmun Lake in Dangjin was announced. Construction will begin in 2019 and will be online in 2020.

India

A 500 kW solar plant became operational in December in the state of Kerala at the Banasura Sagar reservoir in Wayanad. The National Hydro Power Corporation (NHPC) announced plans to set up 600 megawatts of floating solar power projects at the Koyna hydropower project. NHPC also plans to set up floating solar projects in Kerala, Andhra Pradesh, Tamil Nadu, and Uttar Pradesh.

INNOVATION CORNER

FERC Issues Order 841 Allowing Electric Storage Participation in Regional Markets

Electric storage resources can now participate in capacity, energy, and ancillary services markets in the U.S. after a game-changing order from the Federal Energy Regulatory Commission (FERC). FERC Order 841 could allow storage to compete against traditional resources such as peaking plants and could encourage a variety of utility-scale storage projects, driving down the cost. The November 2016 Notice of Proposed Rulemaking (NOPR) requires regional grid operators to revise tariffs and market rules to create a participation model for electric storage resources. These rules must:

- **Ensure that an energy storage resource can provide all capacity, energy and ancillary services it is technically capable of providing,**
- **Ensure that an energy storage resource can be dispatched and can set market clearing prices as both a buyer and a seller,**
- **Account for the physical and operational characteristics of energy storage resources,**
- **Establish a minimum size for participation in RTO/ISO markets that does not exceed 100 kW, and**
- **Specify that the sale of electricity from the RTO/ISO markets to an energy storage resource that the resource resells must be at the wholesale locational marginal price.**

The full FERC order can be found at https://www.ferc.gov/whats-new/comm-meet/2018/021518/E-1.pdf.