

NEWSLETTER

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APEX Objective

To facilitate the development and communication of ideas and practices in the operation of global competitive electricity markets. One of its primary intentions is to provide a platform for the sharing of information between its members.

APEX Webinar Summary United States Winter Event

On October 27, 2021, APEX held a webinar on the United States Winter Event from February of 2021 moderated by Leonard Kula, Vice President of Planning, Acquisition & Operations and Chief Operating Officer of IESO in Canada. The webinar included a review of weather conditions, statistics from the winter event, existing market mechanisms to acquire capacity, energy and ancillary services, and the effectiveness of existing mechanisms to balance supply and demand during the winter event. Additionally, there were further discussions in the areas of system operations, operational response, regulatory considerations, and next steps.

Leonard started the webinar with a review of the weather conditions and statistics. Temperatures were down to -20 degrees Fahrenheit and up to half of generators in the ERCOT area were unavailable.

Durgesh Manjure, Director System Operations, MISO provided a presentation on the MISO impacts and perspective of the event. In summary, the effects of the Arctic event were felt across MISO and neighbouring systems. MISO’s market procedures worked as drilled and designed, limiting the impact of this extreme event. Durgesh indicated that extreme weather events are increasing in frequency and intensity, leading to increased risk of weather-induced events for our industry. The arctic weather pattern drove widespread extreme weather, with temperatures 20 to 30 degrees below average spanning the entire mid-section of the country, resulting in 40% of MISO’s installed resources being unavailable at one point. Unprecedented flows across the MISO system also resulted in multiple emergency declarations, and transmission and generation outages, which resulted in real-time



Lanny Nickell

**APEX Board Member
EVP and CEO
Southwest Power Pool**

As 2021 draws to an end, I find myself reflecting on one term – resilience. Various definitions of that term exist but the one I find most relevant summarizes it as the ability to withstand adversity and bounce back from difficult events.

Earlier this year, adversity hit the central part of the United States with the second week of February being the coldest week on record for multiple locations in this area. This extreme cold weather event led to electric service being interrupted in the ERCOT, MISO and SPP regions.

For SPP, record amounts of wintertime energy consumption combined with significant amounts of unavailable generating resources caused us to implement region-wide load-shedding procedures for the first time in SPP’s 80-year history. Load forecasts indicated that SPP would have exceeded its previous wintertime peak by more than 8% if sufficient resources had been available. Lack of fuel, primarily natural gas, and equipment failures were the primary causes of SPP’s generation outages.

Although preemptive service interruptions were necessary at times, the power grid showed remarkable resilience that allowed SPP to import as much as 14% of its energy consumption from neighboring systems during the event. SPP’s emergency assistance agreements with neighboring markets and strong transmission interconnections facilitated a level of resilience that limited load shedding to just four hours across two days, with no more than 6.5% of our demand required to be interrupted.

Another important aspect of resilience is the ability to learn from these adverse experiences and to grow stronger as a result of that learning. With that in mind, SPP performed a comprehensive review of the event and generated a report containing key findings as well as 22 improvement objectives. With significant effort now underway to implement the needed improvements, I fully expect that SPP will bounce back stronger.

This brings me to the critical and meaningful purpose of APEX, which is to provide a platform for the sharing of information between members. This sharing of information helps us all learn and grow. In fact, the most recent webinar APEX held on October 27th facilitated the sharing of learnings from the winter event. I hope APEX members found this webinar valuable and gained insight that can be used to support increased resilience.

I applaud the efforts we’ve undertaken to facilitate sharing of information through the multiple webinars hosted by APEX this year. In the midst of adversity created by the pandemic, I believe APEX has exhibited tremendous resilience and I know we will be even stronger as a result.

I look forward to seeing what we can accomplish next year and very much hope to be able to see many of you in person soon!

In the Spotlight

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overload and emergency load reductions. Locational Marginal Pricing in the MISO Southern region reached up to \$3500 /MWh during the emergency pricing. Uplift of \$122 million was charged back to parties responsible for costs, while \$59 million of revenue surplus was credited to Load Serving Entities during the period. Durgesh reviewed some lessons learned from the event associated with Market Design, Operations, and Resource Adequacy that also build on existing initiatives.

Bruce Rew, senior vice president of Operations, SPP, provided a perspective of the winter event and how the system was pressure tested from extreme temperatures. Bruce discussed areas associated with multi-day reliability unit commitment in a Day-Ahead and Real-Time Market, price spike impacts on market price cap designs, Natural gas price spike impacts on credit, and market settlements. Additionally, Bruce reviewed key market design questions associated with these areas. He discussed how MISO procured units several days ahead of the event to allow resources to procure fuel in advance. This multi-day commitment was not normal for SPP and created questions such as what would happen if a generation unit goes on an outage, how the pricing of the generation is determined, and how compensation is determined. The price spikes exceeded price caps and created questions on the market design about units being made whole and honouring FERC ORDER 831, which requires the market monitoring approval for offers that exceed price caps. Coordination between the gas and electricity industry was good during the event and there were many challenges associated with settlements.

Peter Cramton, professor of economics at the University of Maryland, University of Cologne, and former ERCOT Board Member discussed some lessons learned from the Texas event. Peter discussed the interactions between weather, people, gas, electricity, and water systems. Statistics on

historical temperatures, gas productions, and prices were provided. Natural gas production in Texas dropped 40% with prices of gas and LMPs up to \$919 and >\$9000 /MWh, respectively. Extreme outages and weather resulted in blackouts in Texas. Peter provided a chart demonstrating the daily correlation between demand, weather, outages, and renewables for the period of the event. Load shed events and quantities increased as the availability of generation decreased. The difference between Reliability and Resilience was also examined. Resilience includes preparation before the event, alleviating during the event, recovery after the event, and learning from the event. Peter stressed the importance of improved communications and critical infrastructures essentials. He discussed how energy efficiency lowers costs and improves resilience. Market design components were discussed, including enhancements to spot markets to induce efficient behaviours and improvements in market rules. Peter discussed the complications with a capacity market, including how a forward energy market could be more transparent, simple, and efficient. Additionally, a forty-year model using storage and price responsive demand, for example, demonstrated the transition in electricity markets. Finally, Peter discussed the importance of federal action to improve the resilience of critical infrastructures.

After multiple participants provided questions to the panellists, Leonard thanked the panel members for their participation. The webinar is available for viewing on the APEX website.



Association of Power Exchanges

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In the Spotlight

India's premier Power Exchange IEX partners with the Belgian scale-up N-SIDE to implement its Power Matching Algorithm for price discovery in its Day-Ahead Market (DAM)

With effect from 14 April 2021, the [Indian Energy Exchange](#) has started using the [N-SIDE](#) Power Matching Algorithm to determine the daily price and trading volume of electricity in the Day-Ahead Market. IEX expects to benefit from the Power Matching Algorithm as it enables the power exchange to offer complex bid types to meet the changing needs of the Indian Energy market. After deploying and continuously improving a solution for the European market for more than 10 years, [Power Matching Algorithm](#) is now being used to benefit the Indian Energy market.

As a Belgian scale-up, founded in the year 2000, N-SIDE has seen significant growth over the past years. The company combines advanced analytics, software development, and business expertise to create innovative technologies and algorithms that have a positive impact on businesses and people around the world. N-SIDE develops Artificial Intelligence software as a service, but also provides tailor-made solutions to meet specific business needs of customers.

Today, N-SIDE is an international organization with offices in Belgium and the US. Earlier this year, the company announced a capital increase of 10 million euros to accelerate the development of innovative solutions and encourage the international growth of the company. In the next chapter of this growth story, N-SIDE has started to support the expanding energy market of India.

Indian Energy Exchange (IEX) is the biggest power exchange in India with a market share of 95%. In February of this year, IEX registered year-on-year growth in the volume of 50%. As more Indian citizens need access to electricity and the market is becoming increasingly complex, the trading platform was looking for the best global, modern solution to coordinate the trade in its fast-growing power market.

Building on its existing solution that is based on Mixed-Integer Linear Programming (MILP), N-SIDE has provided a solution that meets the expectations and needs of IEX. The algorithm went live on the IEX platform in April and is now running every day to support 70% electricity trade on such markets.

From Europe to India

One of the reasons why India's leading energy exchange IEX has turned to N-SIDE for this solution is the company's experience with the even more complex European energy market. To calculate day-ahead electricity prices across Europe and allocate cross-border transmission capacity on a daily basis, N-SIDE has developed a unique algorithm, Euphemia, that is now being used in 26 countries. The solution excels because of its high performance and robustness and has become a crucial aspect of the EU target to reach a harmonized European electricity market. The successful experience with Europe has convinced IEX that N-SIDE was the right partner to develop an algorithm for the growing Indian market. "N-SIDE's Power Matching Algorithm is a powerful market clearing algorithm that optimizes supply and demand matching in a closed-gate auction fashion. As a scalable solution, it is perfect to support the fast market growth in India. It allows



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the easy implementation of complex bid types”, says **Olivier Devolder, Energy Director at N-SIDE**.

Competitive electricity prices for citizens

Power exchange can be a very complex matter, but N-SIDE's algorithm always finds the most optimal solution given the available resolution time. The N-SIDE algorithm increases the efficiency of the Indian energy market as it makes it easy to offer complex bid types to suit the changing needs of the market.

S. N. Goel, Chairman & Managing Director, IEX, “IEX has been at the forefront of energy transformation in India. With technology and customer-centricity being at the core of our efforts to evolve the Indian energy markets, we have always been one step ahead in adopting and integrating world-class solutions in emerging technologies. Our partnership with N-SIDE has been the result of this constant quest for innovation and technology excellence. Through N-SIDE's globally acclaimed algorithm solution for power markets, we have been able to offer complex bid types to our market participants. This will indeed support Indian industries and the distribution utilities in further optimizing their power procurement costs and in turn, also improve electricity affordability for their end-customers.”

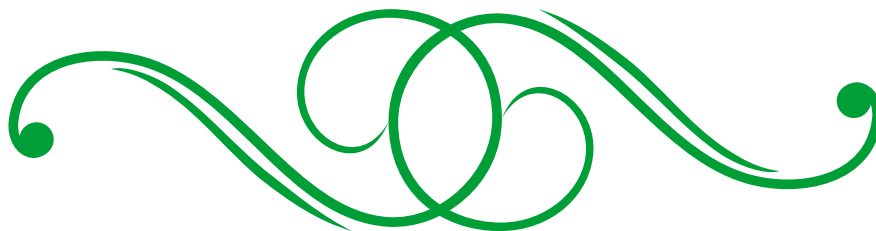
Since the go-live mid-April, N-SIDE's power matching Algorithm has become a successful solution that is being used to discover the price in the Day-Ahead Market. For the duration of the contract signed with IEX, the N-SIDE team is responsible for implementation & operations, license, and support & maintenance. In the coming years, the algorithm will also be constantly improved by the mathematical experts and software engineers at N-SIDE.

N-SIDE remains extremely ambitious to expand its scope even further with power exchanges or other actors in regions outside of Europe and India. “We believe N-SIDE can really help countries around the world to tackle the challenges of their energy market. On top of our acceleration in Europe and India, we are currently looking for new opportunities in Asia and North America”, concludes Olivier Devolder.



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