



ASSOCIATION OF POWER EXCHANGES

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.

In the Spotlight

APEX Annual Conference 2024

Sep 24-26, 2024

Venue: Santiago, Chile



Details on Page 04

Omer H. Malik

Head Market Operations & Development (CPPA - Pakistan) / Vice Chairman - APEX BOD



Navigating a Sustainable Energy Future for Pakistan

Last month, many of you attended the APEX Annual Conference in Santiago, Chile, where industry leaders and experts gathered to discuss the integration of renewable energy into power grids. The conference focused on mitigating climate change impacts, exploring innovative technologies, and sharing best practices to shape the future of global energy markets. Key themes included the role of energy markets in combatting climate change, the reliability challenges associated with energy transition, and the impact of renewables on transmission networks. Pakistan, like many nations, is addressing climate challenges while developing its electricity market. Though still in its early stages of implementation, the energy ecosystem is evolving with reforms to boost efficiency, competition, and renewable integration.

Pakistan envisions a green future and is actively incorporating cleaner energy into its generation mix to combat climate change, among other objectives. A key part of this effort is the Alternative and Renewable Energy Policy 2019, which outlines strategies to increase the share of renewable energy in the country's generation portfolio. Under this policy, Pakistan aims to generate 30% of its electricity from variable renewable sources by 2030.

Currently the total installed capacity of Pakistan is 39,454 MW. As of 2024, 42% of the total installed capacity in Pakistan consists of hydel, nuclear, and Variable Renewable Energy Sources (VREs). In 2034 the installed capacity is anticipated to be 56,046 MW in which share of clean energy sources would be around 61%.

Continued Director's column

Additionally, beyond grid-scale VREs, the Net Metering Regulations of 2015 have empowered consumers to install power at a distributed scale.

The road to a green future, however, comes with its own set of challenges and some being experienced by our grid are discussed here. Geographically, Pakistan is a longitudinal Country, its demand-intensive areas are primarily located in the central region, while the major generation sources are situated in the south and north. The country's wind corridor is in the south, where most of the base load generators are also located. These plants are connected to the demand centers through HVDC and EHV AC transmission lines.

Moreover, during the winter, when transmission lines are lightly loaded (below their Surge Impedance Loading) due to lower demand, several lines are opened to prevent over-voltage issues. This reduces the overall Net Transfer Capacity (NTC). The reduction in NTC, combined with the base load nature of the generation mix and the intermittent nature of VREs, necessitates curtailing a portion of wind energy to ensure secure, reliable, and stable grid operations.

Further, the past the demand in the country fell due to rapid adoption of distributed energy resources, energy efficient devices and rising cost of electricity due to the declining demand. Electricity sales are expected to fall by 10% in the current fiscal year. This reduction in demand may lead to higher electricity prices creating a vicious cycle. According to a report by Bloomberg, 13 GW of solar panels were imported into Pakistan in the first half of 2024 alone. Some of this capacity is reflected through net metering, while other part has been installed by grid consumers who do not use net metering facility. This situation, among other things, mandates that the right price signals be provided in the market. In order to overcome these challenges several interventions are in process, some of which are mentioned below. These interventions focus on the areas of System Operations, Market Design & Operations and Grid Planning.

One of the key interventions in this area is the establishment of the Independent System and Market Operator (ISMO), recently approved by the Federal Government of Pakistan. Pakistan is a longitudinal country and therefore the transmission constraints become unavoidable. To mitigate this, our dispatch mechanism is based on the principle of Security Constrained Economic Dispatch (SCED). The design of our market is therefore coupled as opposed to the European sequential markets. Since every dispatch action has a market angle; the merger of the System Operator and the Market Operator into a single entity would ensure streamlined decision-making, reducing inefficiencies and enhancing coordination between operational and market functions. This unification would synergize the complementary roles of System Operations, Market Operations, Grid Planning, Energy Efficiency and Distributed Generation integration in the national electricity market.

To address the challenges of reduced Net Transfer Capacity (NTC) from the south and wind power curtailment due to grid constraints, the System Operator has proposed the installation of various Flexible AC Transmission System (FACTS) devices, including Static Synchronous Compensators (STATCOMs). STATCOMs with capacities of ± 1200 MVARs will be installed in the southern grid, while units totaling ± 800 MVARs will be placed in the central region. These STATCOMs will provide dynamic reactive power support, smoothly adjusting between capacitive and inductive modes to maintain voltage stability during periods of voltage sags and swells.

The proposal of converting out-of-service plants into Synchronous Condensers (SynCons) is also under consideration. A plant with 17 units totaling 1750 MVA is a prime candidate for this conversion. In addition to reactive compensation, SynCons would provide system inertia, which is crucial for accommodating high levels of VRE penetration. In its recent study, the System Operator recommended the installation of 250 MW of Battery Energy Storage Systems (BESS) in both



Association of Power Exchanges

2750 Monroe Blvd., Audubon, PA 19403 Phone: (610) 666-8925 Website: www.theapex.org

Stu Bresler, APEx Chairman

Email: stu.bresler@pjm.com

Continued Director's column

the southern and northern regions of the grid to provide operational reserves, improve frequency nadir, and reduce the Rate of Change of Frequency (ROCOF).

In an effort to incentivize the adoption of Battery Energy Storage Systems (BESS) in households and address the challenges posed by the rapid growth of rooftop solar generators, a proposal to revise the net metering policy is under discussion. The buy back rates will be reflective of market prices and net-metering will be replaced with net-billing. We expect that this move will encourage BESS adoption by prosumers. Integrating BESS would help mitigate demand fluctuations by filling demand valleys during the day, caused by high solar penetration, and shaving peaks during the night. This peak-shaving and valley-filling approach would result in a smoother system profile, reducing the challenges faced by the System Operator in generator dispatch.

Further, we understand that Distributed Energy Resources (DERs) will be the future of today's electricity grid. As the energy landscape evolves towards a cleaner and more sustainable future, the integration of DERs into the wholesale electricity market of Pakistan through aggregators has emerged as a pivotal strategy. DERs, such as solar panels, wind turbines, energy storage systems, and demand response technologies, offer the potential to enhance grid flexibility and transform the power sector. The participation of DERs in wholesale electricity markets, ancillary service markets, and/or capacity markets could provide substantial benefits to a wide range of market participants.

While a single DER may offer limited services to the grid, aggregating a large number of DERs can create a more predictable, sizeable entity with capabilities comparable to those of dispatchable fossil fuel generation. Bundled DERs can provide services for longer durations, adding operational flexibility and supporting grid stability more effectively than individual DERs.

Reflecting on the progress made in Pakistan's energy market and the discussions at the APEx 2024 Conference, it is evident that the journey towards a sustainable and reliable energy future is both challenging and promising. The ongoing reforms, such as the formation of the Independent System and Market Operator (ISMO) and the implementation of advanced technologies like Battery Energy Storage Systems (BESS) and FACTS devices, represent significant steps forward. These interventions will help address technical challenges such as grid stability, the curtailment of renewable energy, and the evolving dynamics of distributed solar generation.

However, the road ahead will require continuous innovation, regulatory adjustments, and coordination between market participants to fully integrate renewable energy into the grid. For example, the potential adjustment of the Net-Metering policy and the introduction of DER Aggregation Models are crucial for aligning economic incentives with grid stability. The synergy between market operations, system planning, and the regulatory framework will be critical in overcoming existing limitations and harnessing the full potential of renewables.



Association of Power Exchanges

2750 Monroe Blvd., Audubon, PA 19403 Phone: (610) 666-8925 Website: www.theapex.org

Stu Bresler, APEx Chairman

Email: stu.bresler@pjm.com

APEX Annual Conference 2024

The APEX Annual Conference for 2024 was held in Santiago, Chile from September 24-26. The conference was a unique three-day opportunity for senior APEX members and representatives to share information and ideas, and network and plan for the future of electricity markets with their industry peers worldwide. The APEX 2024 conference attracted approximately 100 delegates, creating a tremendous opportunity for socializing the latest trends, and technologies amongst global stakeholders.

Conference details are provided at the below link:

<https://www.theapex.org/event/apex-2024-conference/>



The conference kicked off on day one with Stu Bresler, APEX Chair, providing opening remarks and also thanking the sponsors who are critical to the success of the conference. Diego Pardow, Energy Minister of Chile, provided a speech about the Chile electric grid and welcomed the attendees.



The Coordinador Eléctrico Nacional (CEN) of Chile, the host power exchange, began operating in 2017, when the country decided to make a significant improvement in the design of its institutions. Due to the characteristics of the national geography, CEN has a unique system in terms of length, reaching 3,100 km and covering almost the entire national territory. There is over 35,000 MWs of gross maximum power along with an annual cumulative production of renewable energy of over 25,000 GWh as of September 2024 in the CEN territory. APEX participants were provided with the unique opportunity to visit the CEN headquarters and see the state of the control room. Additionally, multiple networking events hosted by CEN provided an opportunity for attendees to experience the culture of Chile while networking with colleagues.

Association of Power Exchanges

2750 Monroe Blvd., Audubon, PA 19403 Phone: (610) 666-8925 Website: www.theapex.org

Stu Bresler, APEX Chairman

Email: stu.bresler@pjm.com

The five panels included discussions on combatting climate change, the energy transition, renewables impact on the transmission system, technologies, and perspectives from regulators. Additionally, the conference included spotlight presentations from the APEx Bright Sparks scholarship winners. The Bright Sparks Program supports the development of young energy professionals. In the first panel, Daniel Wragge from the European Energy Exchange (EEX) moderated a discussion on combatting climate change and the role of energy commodity markets.

The discussions included the interactions between climate change and power markets with focus on electricity, CO2 and green hydrogen markets. The second panel, moderated by Lanny Nickell of the Southwest Power Pool, focused on the Energy Transition. The Energy Transition has impacted most power exchanges and the challenges were discussed from a Markets and Reliability perspective. Discussions on market products to incent reliability and the proper resource mix was discussed along with the importance of Ancillary Services.



Lastly, there was a robust conversations on the challenges of proper price formation in different regions along with centralization. The third panel, moderated by Cecilia Maya Ochoa of XM, explored how renewables impact the transmission network. In particular, there were discussion on how renewables impact market behaviors for power exchanges as well as investments. The fourth panel, moderated by Piotr Listwon from the Polish Power Exchange, focused on technologies. There were discussions on advancements in optimization, smart grid products, artificial intelligence, and data centers. The challenges of supporting the power for the expedited integration of data centers was contemplated. The final panel on the Regulator's perspective was moderated by Juan Carlos of CEN. During this session, the APEx membership had the opportunity to listen to different perspectives from regulators in Chile and other regions. The conference concluded with the Annual General Meeting facilitated by Stu Bresler where twelve existing board members were re-elected and a new Board member approved, Ante Mikulić from CROPEX.



Association of Power Exchanges

2750 Monroe Blvd., Audubon, PA 19403 Phone: (610) 666-8925 Website: www.theapex.org

Stu Bresler, APEx Chairman

Email: stu.bresler@pjm.com

APEx Annual Conference 2024

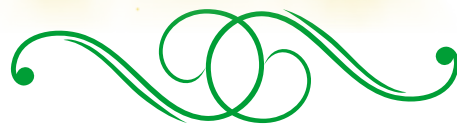




Thank You

**to everyone who contributed to the success of the
APEX Annual Conference 2024.**

To have your member company featured “In the
Spotlight,” please send an email to:
Katrina.Zarczynski-Magee@pjm.com



Association of Power Exchanges

2750 Monroe Blvd., Audubon, PA 19403 Phone: (610) 666-8925 Website: www.theapex.org
Stu Bresler, APEx Chairman
Email: stu.bresler@pjm.com