NAVIGATING THE EVOLVING EUROPEAN POWER TRADING MARKET

HANSEN

Navigating the Evolving European Power Trading Market

Introduction

When looking at global energy markets, Europe's drive towards liberalisation has led to significant progress and innovation. A broader quest towards sustainability, in parallel with technological advancements, has shaped recent policy reforms and transformed the marketplace. In this Hansen paper, we explore some of the significant existing evolutions within the European power trading market, investigate what could factor next, and analyse implications for stakeholders across the value chain.

Technological Advancements and Digitisation

Smart grids empowered by advanced sensors, ubiquitous and agile communications, and an explosion in the pervasiveness of digitisation and data analytics are just some of the factors that have been central to the transformation of the European power trading market. Together, these evolutions have revolutionised how grids operate and how power is generated, transported, and consumed. In stark contrast to an earlier time, hallmarks of the modern grid include real-time monitoring, predictive maintenance, and demand-response management. Grid operators now have an agile set of tools that help to optimise asset utilisation and enhance system reliability.

Beyond the fundamentals of power delivery, advances in digitalisation, pioneered by developments such as blockchain, are bringing changes in how energy transactions are processed and settled; this, in turn, has fostered growth in peer-to-peer trading.

The European marketplace is becoming increasingly complex, with diverse participants, including prosumers, large-scale generators, single-source asset owners, and multi-asset aggregators. Digitisation and advanced trading algorithms have democratised market access and enabled a new stream of market participants to actively engage in energy trading and monetise their assets. The convergence of these technologies has enabled unprecedented innovation, efficiency, and enhanced grid resilience.

Integrating Renewable Energy

A transition to renewable energy is pivotal in transforming Europe's energy grids and the long-term agenda for a low-carbon economy. Ambitious targets set by individual member states, and by the European Union, have spurred dramatic growth in deploying renewable energy technologies. Wind and solar are the most prominent examples, being well-understood and relatively straightforward when gaining financing, planning approval, and deployment.

An influx of renewables results in a corresponding displacement of conventional fossils in the overall power generation mix; however, the inherent intermittency and variability of renewables pose significant challenges to grid stability and alter energy market dynamics.

To address these challenges, innovative solutions such as agile demand-side management, flexible energy storage systems, and grid-scale integration technologies have gained traction. Large-scale energy storage, in particular, has emerged as a critical enabler. Storing surplus clean energy – at a massive scale – when demand from the grid is low allows for its reintroduction later when demand outstrips real-time supply. Options vary, ranging from the relatively well-understood and low-tech pumped hydro storage – although geographical requirements and investment constraints exist – through to conventional chemical batteries (Lithium-Ion, etc.), flow batteries, and compressed air energy storage; all have the potential to deliver scalable and flexible storage, including enhanced locational flexibility.

Navigating the Evolving European Power Trading Market

The emerging green hydrogen economy presents exciting opportunities for energy storage and grid flexibility. Rather than extracting hydrogen from traditional fossil sources, this form of hydrogen is produced through water electrolysis using renewable electricity. It offers a versatile energy medium to store, transport, and revert to electricity.

Hydrogen storage facilities and electrolyser plants can act as a balancing mechanism between supply and demand, managing the fluctuations in renewable energy generation more effectively and enhancing grid stability. As Europe strives to scale up its hydrogen infrastructure and develop a robust hydrogen ecosystem, the power trading market stands to benefit from the emergence of new revenue streams, market opportunities, and synergies between the electricity and hydrogen markets. Additionally, various secondary and tertiary industrial use cases also help build the investment confidence necessary to help drive adoption. Green hydrogen offers a carbon-neutral alternative to fossil fuels and holds immense potential for decarbonising hard-to-abate sectors such as industry, transport, and heating.

Cannibalisation: The Renewables Conundrum

Some markets are beginning to experience a phenomenon called “renewables cannibalisation”, where the increased deployment of a specific renewable energy source reduces the profitability or competitiveness of existing installations of the same or similar type.

During periods of oversupply, electricity prices may drop significantly, and in some cases, they may even go negative. This situation means that producers are, in effect, paying to put electricity into the grid. Because renewable energy sources have low marginal costs once built and operational, they can bid low prices in electricity markets to ensure their output is the first dispatched.

Here’s how it typically works: When renewable sources like wind or solar deliver a significant portion of the grid’s energy generation capacity, it can lead to periods of oversupply. This oversupply happens when weather conditions are favourable for renewable energy production, such as sunny days for solar panels or windy for turbines. When the sun shines, or the wind blows, all asset owners of the same type generate power simultaneously, driving down spot prices and adversely impacting the return on investments. However, when the opposite occurs, and weather conditions are not conducive to production, these renewable asset owners cannot exploit rising spot prices.

This rollercoaster situation has a knock-on effect on existing conventional power plants, such as coal or natural gas-fired plants. These assets find it increasingly difficult to compete in electricity markets during oversupply and low prices. Since these plants often have higher operating costs, they may become less profitable or even operate at a loss when renewable energy sources are generating at high levels; increasingly, their higher cost base is being amortised over less predictable and deterministic investment periods.

At the macro level, this price-return uncertainty has negative implications for long-term investment strategies for large-scale renewables, leading to a stagnation in new implementations and a slower-than-optimal transition from fossil-based sources to clean and sustainable alternatives. To mitigate the impacts of cannibalisation, policymakers and energy planners need to implement strategies to ensure a smooth transition to a more renewable-heavy energy system without unduly harming existing infrastructure or market participants.

Whatever the Question, Storage is the Answer

Due to multiple interdependent factors but primarily increasing deployment of renewable energy sources, grid-scale storage is emerging as an essential component in the evolution of the European energy marketplace, effectively managing the intermittency and variability of these resources.

At critical mass, storage systems store surplus energy during periods of high generation and release it when renewable generation is low (or demand is exceptionally high), ensuring a reliable and stable energy supply; they help stabilise the grid, reduce grid congestion, and prevent blackouts or brownouts. This flexibility is crucial as Europe transitions towards a more decentralised energy system based on distributed energy resources (DER).

Additionally, grid-scale storage enables more efficient use of energy resources and optimises energy markets. Storage systems can play an active role in real-time energy markets by purchasing excess electricity when prices are low, improving market efficiency and reducing overall energy costs for consumers.

As Europe pursues ambitious decarbonisation goals, including becoming the world's first climate-neutral continent by 2050[1], and transitions towards a cleaner and more sustainable energy system, grid-scale storage plays a critical role. Storage technologies ease our transition to the electrification of transportation and heating sectors, providing a reliable method of integrating renewable energy sources and enabling the effective management of energy demand and supply, helping to reduce greenhouse gas emissions and deliver climate targets.

Grid-scale storage enhances the reliability and resilience of the European energy grid by providing backup power during emergencies, supporting critical infrastructure, and ensuring continuity of electricity supply in the event of disruptions or failures. This resilience is essential for safeguarding energy security and maintaining vital services for businesses and consumers.

Overall, grid-scale storage is a crucial enabler of Europe's more efficient, flexible, and sustainable energy marketplace. Its importance will continue to grow as the region transitions towards a low-carbon future and seeks to address the challenges of integrating renewable energy sources into the grid.

[1]European Union, 2050 Long-Term Strategy. https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2050-long-term-strategy_en

It Takes a Community

Virtual power plants (VPPs) are a concept that aggregates multiple, individually small, distributed energy resources into a single, viable asset. These resources can include renewable energy sources like solar farms and wind turbines, energy storage systems such as batteries, and demand-side resources like smart appliances and electric vehicles.

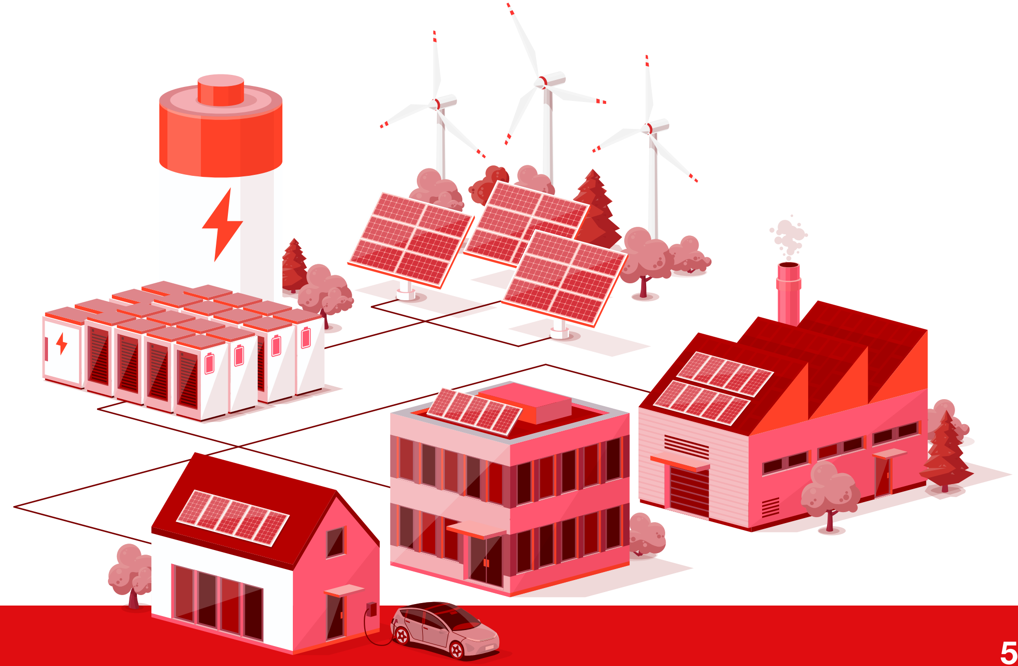
Aggregating and managing a diverse range of DERs using advanced software and control systems, VPPs act as a single entity with capabilities equivalent to a traditional power plant despite comprising numerous distributed and often smaller-scale resources. Continuous monitoring optimises operations using factors such as energy market conditions, grid demand, and individual asset characteristics. This optimisation ensures efficient utilisation of resources and maximises benefits for both the VPP asset owner and grid operators.

VPPs can provide various grid services, including peak shaving, load balancing, frequency regulation, and voltage support. By dynamically adjusting distributed resource output, VPPs help stabilise the grid, integrate renewable energy, and improve overall reliability and resilience.

Additionally, VPPs can participate in energy markets by buying and selling electricity and ancillary services. They can capitalise on fluctuations in energy prices and provide valuable services to grid operators, utilities, and energy consumers.

Large-scale, dedicated battery implementations – called Battery Energy Storage Systems (BESS) – are becoming increasingly commonplace. It seems not a week goes by without another go-live or planning announcement. And while crucial to the energy mix, it's unlikely that BESS alone will fill the gap. Emerging distributed asset management technologies such as V2G – vehicle-to-grid – have the potential to dwarf standalone BESS. As the take-up of battery electric vehicles (BEV) reaches critical mass, hundreds of thousands of BEVs will be available to form VPPs; research shows that most passenger vehicles are usually stationary, either at home or at an office workplace. These VPPs will be available to export into the grid when demand is high or store excess clean energy during periods of low demand, and the potential yield is genuinely significant, with multiple gigawatts of energy capacity available to trade and complement more conventional sources.

V2G is just one of the emerging options that will form the future solution mix. Another example recently operationalised has a BRP partnering with a regional telecoms entity to consolidate a fleet of remote backup battery installations to create a tradable VPP asset. Although currently small, relative to conventional power assets traded day in and day out, this use case is an excellent example of what innovations are possible



Data as the New Oil

Transitioning to real-time data is vital to the continued evolution of the European energy trading sector, providing the timely and accurate information that is essential for decision-making, risk management, and operational efficiency.

The growing integration of renewable energy sources drives an increasingly complex energy marketplace, demanding real-time data. Leveraging tools natively enabled with real-time data, traders, operators, and market participants can:

- **Trading Optimisation:** Reacting quickly to market fluctuations and emerging trends allows traders to capitalise on arbitrage opportunities and mitigate risks.
- **Market Dynamics:** Timely insights enable traders to monitor market trends, assess market sentiment, and adjust their positions accordingly.
- **Risk Management:** Awareness of grid conditions, asset performance, and outage events in real time enables operators to anticipate and respond to potential disruptions, ensuring grid reliability and resilience.
- **Renewables Integration:** Grid balancing and optimisation efforts, supported by insights into renewable generation patterns and forecasting output variability, help maintain grid stability and manage congestion.
- **Regulatory Compliance:** Helps energy companies demonstrate compliance and ensure market integrity by providing accurate and timely data to regulatory authorities.
- **Energy Efficiency:** By monitoring energy usage patterns in real time and implementing demand response strategies, companies can adjust their operations to minimise costs and environmental impact.

Incorporating real-time data into energy metering and trading systems is an indispensable pillar for an effective European energy trading sector. It enables market participants to make informed decisions, manage risks, optimise operations, and comply with regulatory requirements in a dynamic and evolving market environment.

Navigating the Evolving European Power Trading Market

The Emergence of AI

The emergence of artificial intelligence and its associated technologies is helping to transform the European power trading market. As AI continues to evolve, it promises to revolutionise how we conduct energy trading, enabling more efficient market operations, better decision-making processes, and enhanced risk management strategies. With AI-powered algorithms analysing vast amounts of data, identifying patterns, and predicting market trends with greater accuracy, market participants can optimise trading strategies, manage risks more effectively, and ultimately contribute to a more resilient and sustainable energy ecosystem in Europe.

Regulatory Reforms and Market Integration

The European power trading market operates within a complex regulatory framework designed to promote competition, ensure market integrity, and advance policy objectives such as decarbonisation and energy security. Recent regulatory reforms, including the Clean Energy Package and EU Emissions Trading System revisions, aim to modernise energy markets, strengthen price signals, and incentivise investments in low-carbon technologies. Moreover, efforts to enhance market integration and cross-border cooperation have been central to the European Union's energy strategy. Initiatives such as the European Single Intraday Coupling (SIDC) and the Target Model seek to harmonise market rules, facilitate efficient cross-border trading, and create a more liquid and transparent market environment.

These initiatives have unlocked new opportunities for market participants to optimise their portfolio strategies, access a broader pool of resources, and mitigate risks associated with regional imbalances and market fragmentation. However, challenges remain, including greater harmonisation among member states' energy policies. Addressing these challenges will require continued collaboration, innovation, and regulatory foresight to ensure the resilience and sustainability of the European power trading market.

Challenges and Opportunities Ahead

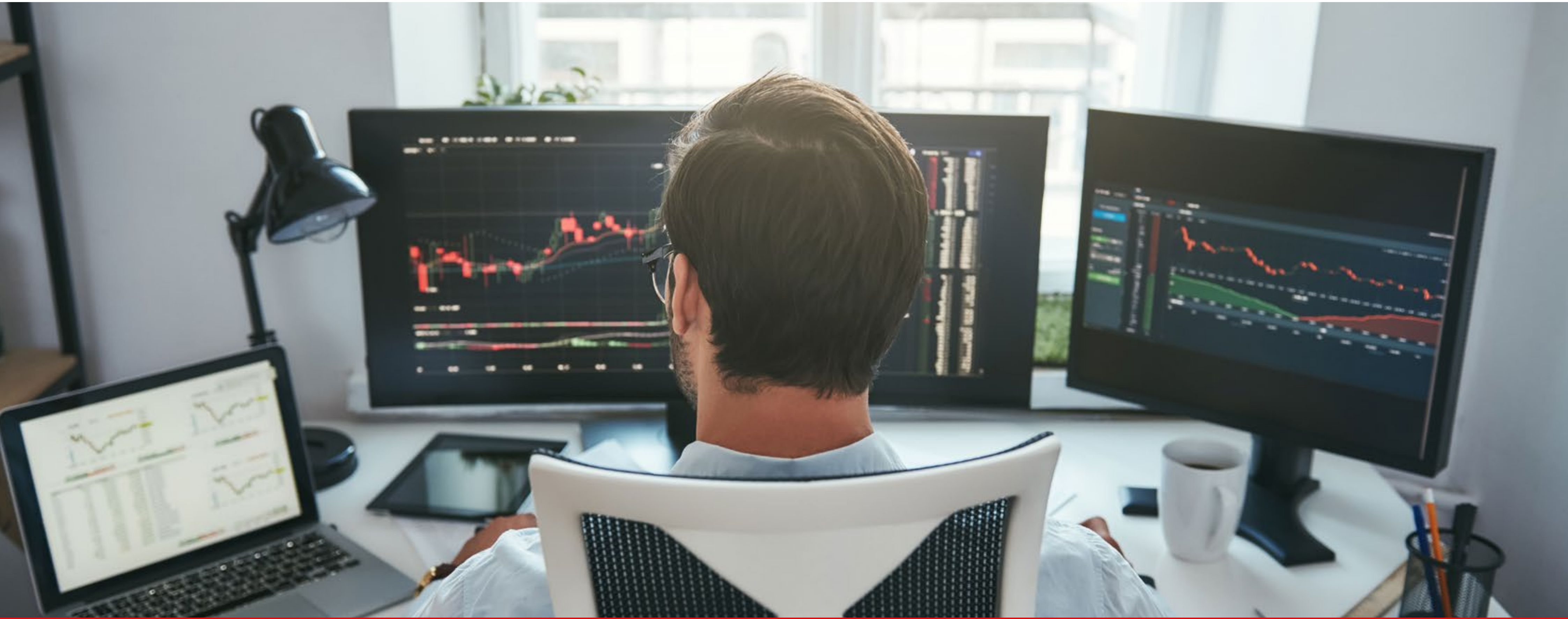
Despite its remarkable progress, the European power trading market faces many challenges on its path towards maturity. Regulatory uncertainties, geopolitical risks, and market fragmentation pose significant obstacles that require concerted efforts from policymakers, industry stakeholders, and regulators. Moreover, the transition towards renewable energy necessitates substantial investments in grid infrastructure, energy storage, and demand-response technologies to ensure system reliability and resilience. Furthermore, cybersecurity threats and data privacy concerns loom as the market is increasingly digitalised and decentralised, underscoring the need for robust governance frameworks and risk management strategies.

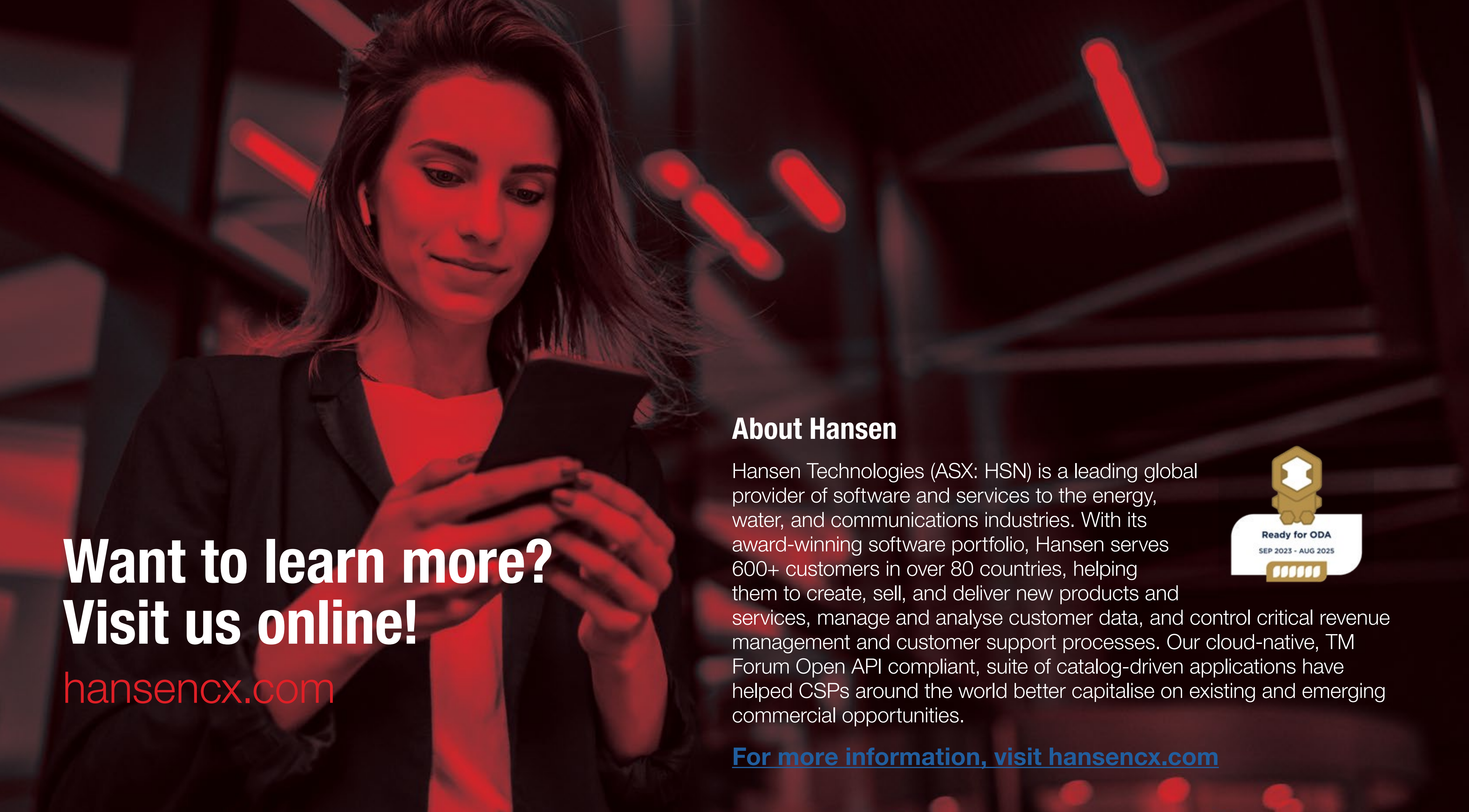
However, amidst these challenges lie abundant opportunities for innovation, collaboration, and growth. The rapid evolution of emerging technologies offers unprecedented avenues for market optimisation, risk mitigation, and value creation. Leveraging techniques such as predictive modelling, machine learning algorithms, and advanced data analytics enables market participants to gain actionable insights, optimise trading strategies, and accurately anticipate market trends.

Collaborative initiatives such as sector coupling, integrated energy systems, and cross-sectoral partnerships unlock synergies between different energy vectors, enhance system flexibility, and accelerate the transition towards a sustainable energy future. Moreover, the rise of new market players, including prosumers, community energy projects, and energy service providers, injects dynamism and diversity into the market, fostering innovation and competition.

Conclusion

The evolving European power trading market embodies the convergence of technological innovation, regulatory reforms, and shifting energy paradigms. As stakeholders navigate this complex and dynamic landscape, embracing change, seizing opportunities, and collaborating towards common goals of sustainability, resilience, and prosperity is imperative. By harnessing the transformative power of digitalisation and real-time energy management and trading data, renewable energy integration, grid-scale energy storage, and the emerging hydrogen economy, the European power trading market will move forward with greater efficiency, transparency, and inclusivity, ensuring a brighter and more sustainable future.





Want to learn more? Visit us online!

hansencx.com

About Hansen

Hansen Technologies (ASX: HSN) is a leading global provider of software and services to the energy, water, and communications industries. With its award-winning software portfolio, Hansen serves 600+ customers in over 80 countries, helping them to create, sell, and deliver new products and services, manage and analyse customer data, and control critical revenue management and customer support processes. Our cloud-native, TM Forum Open API compliant, suite of catalog-driven applications have helped CSPs around the world better capitalise on existing and emerging commercial opportunities.

Ready for ODA
SEP 2023 - AUG 2025

For more information, visit hansencx.com

HANSEN

hansencx.com

Hansen_Tech

/company/hansen-technologies/

/hansentechnologies