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Smart Meters, Data, and Renewables: Global Trends in Shrinking Market Settlement Periods

Renewable adoption and shrinking settlement periods are tightly linked globally.

"By focusing on pre-emptive modernisation of systems, energy companies can be well-prepared for a range of future market requirements and continued transformation as edge use cases become mainstream."

Around the world, increasingly granular energy data intervals – made possible via smart meters – are transforming the energy landscape and energy imbalance settlement processes. Energy providers can prepare now to mitigate the challenges this transformation will present.

Decreasing Settlement Periods Impact Clean Energy Adoption

Among the major shifts in energy markets globally, decreasing settlement periods are, in effect, promoting increased adoption of renewable energy and the promise of a clean energy future. Increasing granularity of power dispatch and settlement financial periods is allowing better and more efficient use of flexible renewable energy sources on the grid in a manner that promotes grid reliability and security of supply.

Over recent decades, the interplay of these forces have required energy companies to rethink their approach to energy imbalance settlements as the complexity of the market outpaced the capabilities of settlements systems. Furthermore, regulatory policy changes continue to place additional stress on settlements systems. This requires agility to comply with changing policies, agility that simply does not exist in settlement systems built many years ago.

For instance, driven by changes in European Union policy, the imbalance settlement period across the continent is moving to 15-minute intervals. Across Europe, many energy providers acknowledge that the settlement systems written many years ago cannot easily adapt to meet the new requirements or rise to meet the challenges presented by increasingly granular smart meter data or increasingly diverse energy sources.

Whilst the increase in granularity of data presents as a technical scalability issue, the overarching challenge for settlement operations is met by the increasingly complex and diverse market activities that are enabled by the new data granularity. This is represented by the digital transformation across the utility by the introduction of smart meters and renewable resources and how increased data volumes has meant much more than just technical scalability.

As energy providers around the world seek to mitigate the challenges presented by changing policy and transformation in the energy market landscape, what can they learn from past decades of transformation, from those around the world who have already faced decreasing settlement periods?

Global Trends in Settlement Periods

Figure 1: Energy markets around the world are shifting to smaller energy imbalance settlement periods.

Brazil

Brazil has traditionally been a hydropower-based system and has not been capacity constrained. Historically, Brazil set 3 spot prices weekly: a peak price, a shoulder price and a valley price. However, with the role of hydro increasingly limited in any system expansion due to environmental constraints and the rise of renewable sources from wind and solar, Brazil now has hourly prices in its power markets and half hourly dispatch. These changes were required to manage short-term flexibility in the system, driven by intermittent renewable resources. Of course, it also serves to encourage a shift to renewables, with wind growing to 8% of the electricity mix. This is an example where reducing settlement granularity has helped to promote renewable energy sources.

California

In California, interval granularity reduced from 1 hour to 15 minutes in real time markets. The objective of this transition was to improve grid reliability and efficiency of the day-ahead market. The reduction in scheduling intervals would allow power-generating resources to more closely follow the load curve as forecasted by the Californian regulator, CAISO.

Australia

Australia is implementing a shorter financial settlement period, down from 30 minutes to five minutes. The purpose of this is to better align the financial settlement period, which was at 30 minutes, with the power dispatch period, which is every five minutes. This misalignment between power dispatch and financial settlement periods has historically produced inefficient pricing signals in the market – with the difference between five-minute dispatch prices and 30-minute settlement prices increasing and expected to further rise. The alignment of these two periods is expected to encourage more flexible sources of power, such as fast-response generation or demand-side response in power markets, ultimately leading to lower energy prices for consumers.

Europe

Like Australia and elsewhere, the European power system is evolving to integrate more renewables, develop flexibility, and enable consumers to play a more central role. An advantage of this is more players in the market, including aggregators, storage, and demand response operators. As the European market – traditionally a collection of several disparate markets – transforms, it will be critical to balance all the new emerging power sources in a manner that promotes grid reliability, security of supply, energy transition and more. Going forward, intra-European markets will balance their markets with the same settlement period. Known as the "Harmonisation of the Imbalance Settlement Period", EU member states will 'harmonise' on a settlement period of 15 minutes, which for most means a shorter settlement period. This effort is expected to be complete by 2025.

Lessons Learned During Settlement Period Transitions Globally

Market settlement is a critical task for all participants in the deregulated energy marketplace as it translates business operations into Euros, Pounds etc. Fast and accurate settlement data is central to market-rule compliance, invoice generation, and ensuring payables are in line with what is actually owed. Despite this significant impact, however, market settlement often takes place in the shadows of utility operations, understood by limited, specially-skilled staff and managed through a variety of make-shift or outdated tools and many manual business processes. As markets around the world have dealt with shrinking settlement periods, these shortcomings have presented several notable pain points:

COMMON PAIN POINTS	FIX
Legacy settlements systems are stressed by more granular settlements, changing settlements timetables, more complex calculation like Time of Use tariffs, and changing cost structures like renewable incentives or carbon taxes.	Settlement systems designed to address the market complexities of today should scale to support extreme volumes of data as settlements transactions becomes more granular and complex.
As the market transforms, legacy systems present severe deficiencies in data integrity, financial settlements transparency, and ability to demonstrate compliance with regulation.	Modern settlements solutions should provide unprecedented visibility into the settlements process, along with data insights, load modeling, and automation. These solutions should allow users to easily publish and analyse reports to demonstrate compliance and identify hidden discrepancies.
Rigid systems and fragmented processes carry risk to the business. Often settlements are understood by only a few, and are managed with spreadsheets and access databases. When this fragile balance gets it wrong, the impact on the business can be catastrophic.	Settlements solutions today must effectively reduce IT complexity and provide a cost-effective way forward to support settlements. Highly configurable solutions provide the most powerful toolkits to meet each energy company's unique market needs. Additionally, the solution should have a well-tested and globally proven calculation engine to improve confidence in the financial output.
Inefficient settlement processes in legacy systems require too much time spent on data preparation and management.	A modern settlements solution should aim to shift this balance completely. Today, energy companies should move from dealing with all data all the time to dealing by exception. Settlements solutions should leverage automation to streamline data management, preparation, and financial calculation.

Mitigate the Impact of Future Transformation

When we look at the technology many energy providers around the world are dealing with as they navigate the challenges of changing energy markets, the pattern we see in these pain points is somewhat predictable. The 20-or-more-year incremental evolution of market settlement systems leaves an intertwined, tightly coupled mess of technology. Settlements systems and processes for most energy providers have evolved over many years. The continued incremental changes, bolted on systems, and even spreadsheets have resulted in entangled systems of billing, financial management, and energy forecasting. What's more, underlining data models and IT infrastructure do not support the exponential increase in usage, forecast, and settlement data.

Often the timeframes given for new rules place pressure on utility IT teams and lines of business to make the necessary changes without sufficient time to switch over and truly prove the new processes work reliably. This combination of legacy changes and limited time means companies are looking for ways to get ahead of the change. What can they start now?

Preparing for Settlements Transformation:

- Remove duplication of functionality. Often non-interval and interval aggregation, profiling, and analysis are done in separate systems, but much of the core data handling for these different data types is common.
- Decouple business processes from data. Develop user-interfaces and workflow management systems that improve your agility to take on increasing volumes of data from disparate sources.
- Leverage off the shelf platforms to commoditise core functionality. This allows you to focus investment on value-adding capabilities and assists in transitioning from inefficient custom development towards flexible and efficient configurable business rules.
- Finally, step by step, increase automation of settlements processes so they are trusted with the current business rules before they are trusted with the new more complex and granular markets.

By preparing systems ahead of settlement transformation, energy providers can run these modern, scalable and configurable settlement tools in parallel with existing systems to build trust and transition to the end state architecture before the market switches over to the new rules.

Prepare for the Future of the Energy Business

Modernisation of settlements systems is not simply a technical, back office challenge, either. There is a real opportunity cost here if settlements is not modernised. The energy transition, fueled by regulation and technology, drives democratisation of energy generation by facilitating a boom in distributive and renewable energy sources. This means more participants are buying and selling in the market, all of whom must financially settle with buyers. In effect, this energy transition represents new business models, customer engagement, and renewable opportunities.

By focusing on pre-emptive modernisation of systems, energy companies can be well-prepared for a range of future market requirements and continued transformation as edge use cases become mainstream. For instance:

- Zero Manual Intervention: Like taking your hands of a self-driving vehicle, could you leave the settlement work to be fully automated, without all the manual checks, reconciliations, data extracts and shadow IT that currently supports it?
- More Competition: Increasing automation and commoditising compliance, even with more complex market rules, will reduce overhead costs and risk for market participation and increase arrival and health of new entrants.
- True Markets: Reduced imbalance activity, more accountability and transparent costs all help support a healthier, fairer market that encourages behaviours to drive the best outcomes of affordability and decarbonization.
- Peer-to-Peer Trading: Previously relegated to the fringe, cost transparency and granular settlements will allow generation and demand players to interact directly, at scale. Potentially bringing in the era of blockchain-driven settlements of generation, storage and demand flexibility to a mainstream market.
- Increased Monetisation of Carbon (swapping KWH for CO2): As decarbonisation continues to increase in focus and customers become increasingly self-reliant in the generation and storage of renewable energy, we can see a future where carbon cost of energy is billed over the actual KWH.

Path Forward

Move to a better path forward now. Build trust and confidence in settlements transactions by implementing a modern, powerful, flexible solution. Put it through its paces, test it out on your legacy settlements structures, and build the internal trust you need to move into more complex and granular settlements structures with confidence.

We have a solution ready to address all of these critical challenges market players face. Oracle Utilities Market Settlements Management (MSM) is a modern, agile solution that delivers reliable core processes, advanced automation, and the adaptability needed to meet market needs today and in the dynamic energy landscape ahead. Oracle Utilities MSM brings the entire settlements process out into the light, providing unparalleled process visibility, data insights, modeling and automation.

Oracle Utilities MSM delivers end-to-end settlements in one solution, designed to streamline and de-risk the financial balancing of the market in the complex energy industry. Our solution helps a range of market players achieve faster, more accurate settlement, reduced manual labor, more peace of mind and lower risk with verified settlements statements. Our solution is driven by our excellence in data analytics and AI, and is ready to take on the continuously changing energy landscape.

Oracle delivers:

- An agile solution with robust imbalance settlement capabilities
- Advanced automation, and the adaptability needed to meet market needs today and in the dynamic energy landscape ahead
- Unparalleled process visibility, data insights, modeling and automation
- A powerful platform that scales to support extreme volumes, with a proven track record supporting utility market players through market transformation all over the world

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