

From Generation to Supply: Electricity Suppliers (Part 4)

Electricity suppliers are probably the agent dealing with the greatest and most diverse number of variables in the energy system.

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“From Generation to Supply: How AI is Transforming the Energy System” is a six-part series on the many ways in which AI is helping to transform the energy sector at every stage of the generation, transmission and distribution, system operation, supply, and regulation cycle. This is Part 4. The next part will appear in June, 2023.

You are not alone! Another [7.6m people across the globe](#) decided to retire their old combustion engine cars and buy a brand new Electric Vehicle (EV) in 2022. But to make this decision, consumers went through many calculations, often hinging on a central variable: the price of electricity. Electrifying items that used to run on fossil fuels, like cars, boilers, or backup generators, requires comparing the costs of powering them. It also means that consumers will pay more attention to how their electricity suppliers charge for their electricity.

The growth of electrification is essential for decarbonizing our economy, but it also creates more pressure on electricity suppliers to adapt their operations to new consumers and markets. If households and businesses were seen as passive offtakers of a commodity in the past, the reality today is completely different. Suppliers have to deal with more active consumers, either those able to generate part of their own electricity ([prosumers](#)), or even the new [omnisumers](#) who seek sophisticated end-to-end solutions from their electricity providers, bundling dynamic tariffs, digital services, and hardware in a single offering.

Among the many technologies involved in this energy transition is a core enabler: [smart meters](#). With a simpler way to access their data and more transparency on how they consume electricity, consumers are better equipped to make complex decisions. They might, for example, learn when and under what conditions a heat pump is more cost-effective than a gas boiler. But this data also gives electricity suppliers a better understanding of their customers' energy behaviors and, consequently, an opportunity to innovate their business models and evolve their offerings beyond just selling electricity. Nevertheless, many are sitting on this gold mine of data without being agile enough to extract all its value.

What Are Electricity Suppliers?

Before we get ahead of ourselves, we should clarify some of the important terms here. First off, what are electricity suppliers, anyway? Put simply, they are companies that buy and sell electricity on the wholesale market. They purchase electricity from generation companies and sell it to retail customers, such as households and businesses. In a nut-

shell, their goal is to aggregate as much demand as possible, increasing their capacity to procure electricity at a lower cost so that they can try to sell it at a profit. It sounds simple at first glance, but electricity suppliers are probably the agent dealing with the greatest and most diverse number of variables in the energy system.

Electricity consumers range from large industrial sites to households with low energy consumption. Each of these consumer groups has different service requirements, which electricity suppliers need to address. For example, large businesses may require customized energy supply contracts, while small residential consumers may prioritize low prices and simple billing. And so when scaling their operations, suppliers should deeply understand their customers' preferences and expectations to tailor their offerings.

The market operation for electricity suppliers also differs significantly between liberalized and regulated markets. In liberalized markets, suppliers compete to offer consumers the best prices and services. This competition is intended to create a more efficient and cost-effective market. By contrast, the government is responsible for setting the prices and rules in regulated markets, which reduces the competition and profit margins for electricity suppliers. Therefore, suppliers' challenges in these two types of markets differ, and they must adapt their strategies and operations accordingly.

AI in Electricity Suppliers

Access to more granular and frequent data in an automated manner can enable a deep transformation in how

electricity suppliers engage with their customers, and can also unlock operational efficiency gains.

AI-powered Innovation

There is a [fourth “D” in the energy transition](#) that is directly related to electricity suppliers' relationship with consumers: *Democratization*. If in the past electricity was the only product available for consumers to purchase from their suppliers without having much of an option as to what could be bought, today consumer empowerment makes the electricity system more inclusive through new markets, products, and the freedom to choose. Enabled by access to their consumption data and to innovative services, consumers are moving away from simply pricing their options and towards actively managing their electricity behaviour, with the aim of lowering their costs while supporting system efficiency and sustainability.

[ESOs](#) and [Grid Operators](#) are responsible for creating these new [demand response markets](#), but in most cases, it's the electricity suppliers' role to operationalize these new services for the final consumer. In this context, automation and the deployment of advanced machine learning (ML) models are indispensable for suppliers to operate [dynamic electricity prices](#) or demand-response incentives, which are much preferable to business-as-usual flat tariffs. The [diversity of AI-powered use cases](#) on demand response programs goes from suppliers simulating the impact of different offerings in their current business models to developing more accurate forecasts for electricity generation, prices, and demand.

On the other hand, turning down electricity demand for financial compensation is not a recent market for commercial and industrial consumers. Yet, electricity suppliers have an opportunity to explore new business models, such as providing value-added services like [optimal demand management](#) or bundling [hardware offers with AI-powered optimisation tariffs](#).

Customer Experience and Segmentation

The non-competitive format of regulated markets never required suppliers to dive deep into mapping consumers' profiles beyond the shallow surface of site types and the shape of average consumption (e.g. residential, SME, or industrial). But the combination of a greater availability of more granular data, new and complex profiles, and opening markets for competition threatens traditional suppliers' market share. The rise of competitors targeting specific customer segments and leveraging technology to tailor products and services to their needs is creating a lot of pressure on those doing business as usual.

[Customer segmentation](#) facilitates both product innovation and new technology adoption. On the research and development (R&D) side, current customer data profiles can help electricity suppliers [prototype and rapidly verify the impact of new dynamic tariffs](#), or product-specific ones like EV tariffs. But with the development of new offerings, marketing and sales teams also have the possibility to leverage ML models to [support message personalization](#) for each customer or even implement new techniques that have been successfully used by traditional retailers to develop data-driven [product recommendation](#) models.

Differentiating whether to offer an installed solar system or an EV tariff is a good starting point, but segmentation can go beyond identifying customers with similar profiles of electricity consumption. Suppliers should develop more complex models that enrich their consumption data with other sources to better understand their customer bases, like [combining qualitative and quantitative techniques](#) to assess their customers' willingness to adopt new technologies linked to the energy transition. These segmentations also help suppliers tailor incentives and [increase uptake into demand response programs](#), which is essential for reducing their operating costs during grid constraint periods.

Trading Optimization

One essential capacity for electricity suppliers' trading teams is accurately predicting how much load their customer base will demand in the near future. [California's Duck Curve](#) transformation throughout the years illustrates why trading teams must evolve their forecasting models to accommodate systemic changes like distributed solar generation.

For medium-term decisions, whenever a customer signs a multi-year contract, the supplier wants to guarantee the future electricity supply at the lowest cost possible. If suppliers do not own any generation capacity to support their trading strategies, they rely fully on the wholesale market to hedge this supply cost. An [overconfident hedging strategy puts the supplier at risk](#) and, depending on the size, can generate a systemic impact in case of failure. However, suppliers can reduce their exposure with more robust hedging strategies. For example, [combining more](#)

[advanced ML models](#) overperforms traditional time-series models when financially hedging energy contracts.

Traders can also utilize short-term load forecasting to increase revenue for electricity suppliers. Deploying [artificial neural network \(ANN\)](#) models increases the accuracy of short-term load predictions, especially in a more volatile electricity system with hard-to-identify consumption patterns. With this information, traders can sell back any excess of future electricity supply guarantees when there is a supply shortage in the market or when price signals are more advantageous. But suppliers can also use their [forecasting expertise as a value-add for industrial customers](#). Embedding electricity forecasting into production processes allows large consumers [to reduce their exposure to market volatility](#) and even align their production schedules with time slots when electricity prices are low.

Moving Electricity Suppliers to Everyday AI

Even with a few AI and advanced analytics use cases here and there, most electricity suppliers are still in the early stages of their journey to embed data across the organization and complete their digital transformation. From marketing to trading teams, the leveraging of consumers' electricity consumption data to improve supplier operations illustrates how multiple domain experts can extract different insights utilizing similar data. These domain experts also share a similar [need to access, transform and make decisions operating diverse data sources](#) without necessarily relying on complex codes.

A collaborative platform like Dataiku enables electricity suppliers' transformation by bringing together [both domain](#)

[experts and data experts into one place](#). For example, in the case of dynamic tariffs, data experts can design algorithms that consider data such as weather forecasts, generation profiles and energy demand to optimize prices. Domain experts can bring insights on electricity market regulations and consumer behaviors to guarantee customer acceptance and to identify revenue opportunities.

This collaboration between data experts and domain experts can be particularly important in the case of regulated markets, where the electricity supplier must abide by strict regulatory frameworks. Having a deep understanding of regulations and the electricity market, in combination with advanced data analytics, can help suppliers navigate these complexities and optimize their operations.

Conclusion

The IEA [projects 500GW of demand response available in the market by 2030](#) to keep the world on track to achieve Net Zero by 2050. This represents 10x more than 2020 numbers. An extremely challenging path that electricity suppliers have a key role in enabling their customers to change behavior and adopt new technologies.

One of the major benefits of AI in the electricity supplier sector is the opportunity to enhance efficiency and optimize operations. Through the use of AI, electricity suppliers can streamline the flow of information and improve the accuracy of data analysis, which can ultimately lead to cost savings and increased revenue.

Our next piece From Generation to Supply will cover how AI is accelerating the development of new energy technologies and their deployment in the market.

