

LEVERAGING GRID-EDGE DATA ON THE ROAD TO

NET

ZERO

CONTENTS

Abstract	3
Regulating in a Data-Led Energy Sector	4
Optimising Flexibility with Data	7
Where are my Distributed Energy Resources?	9
Creating the Right Price for the Right Customer	10
Leveraging Data to in Forecasting Methodologies	12
Transforming the Retail Sector with Actionable Data Insights.....	13

ABSTRACT

As found in many other walks of life, **change can be either an opportunity or a challenge** – often depending on whether it is anticipated or planned for. The energy sector will be subject to sustained changes as the global economy transitions to net-zero.

Leading industry stakeholders, including energy retailers and systems operators, are now starting to ramp up efforts to digitally transform their businesses in the fastest and most cost-effective ways possible to decarbonise. This operational transformation has only recently become a possibility due to substantial technological innovation in low carbon technologies, coupled with regulatory reforms that underpin the business cases for their widespread deployment.

Whilst there are an abundance of energy technology companies, innovators, start-ups, and SaaS businesses, all offering to solve the world's digitisation challenges, market participants are tasked with designing and orchestrating an entirely new energy ecosystem. This requires not only unprecedented investment in low-carbon technologies, but exploration and implementation of new business models to accompany them, often a timely and risky endeavour to get right. Underpinning this evolution, data will be the key to unlocking the operational challenge of decarbonising an entire sector when leveraged in the right way. To create this new energy landscape that is fully decarbonised, digitised, and equitable, stakeholders from across the sector must look to how best they can leverage data on their journey to net-zero.



“90% of the world's data has been produced in just the last two years”
US Chamber of Commerce, 2021

This white paper will outline the key challenges and opportunities associated with the newfound abundance of data in the energy sector, offering recommendations for stakeholders on how best to capitalise on their road to net-zero.

REGULATING IN A DATA-LED ENERGY SECTOR

Realising that progress towards net-zero can only be attained through the proper management and governance of data, regulators and policymakers are now starting to introduce a series of policy frameworks and regulatory reforms that put data at the heart of the energy transition. **By affirming the substantive role of data in the sector's journey to decarbonisation, governing entities are paving the way for private sector businesses to realise the true value of data.**

Released in July 2021, the UK Government authored the 'Energy Digitalisation Strategy and Action Plan,' establishing a policy framework for the sector, detailing how it can harness data to support the UK's net-zero carbon goals. Although many energy retailers have committed to achieving net-zero, several are yet to structure digital ecosystem architectures that will underpin the digital transformation of their operations.

Ofgem, the energy regulator for the United Kingdom, has also announced a series of sweeping reforms for the energy sector, putting data and digitisation at the forefront of the regulatory landscape. In late-2020, Ofgem confirmed that Distribution System Operators (DSOs) would be able to access smart-metering data in aggregate pools of five meters, ensuring they can benefit from the abundance of data on the low voltage network whilst maintaining customer anonymity. What was once a challenge for DSOs has suddenly become an opportunity, unlocked by proper regulatory reform (Ofgem), technological innovation (smart meter infrastructure), and evolving business models for cost recovery (RIIO-2).

Distribution System Operators also benefit from regulatory mandates coupled with newly available digitalisation solutions in the market. The epicentre of many RIIO-2 business plans that have been submitted to Ofgem in recent weeks has been



“This will require an enormous step-change in the system's ability to understand and react to its increasingly complex energy flows. The success of this step-change relies on the digitalized exchange of data to facilitate an energy system which can accelerate, automate, plan, and anticipate processes far better than at present.”

Energy Digitalisation Strategy and Action Plan 2021 - UK Government



the need for flexibility management, a requirement driven by increased electrification of heat and transport, as well as ageing wires particularly within low-voltage networks. A similar trend emerges of regulatory changes presenting challenges and opportunities to DSOs and retailers. Are the future issues of flexibility and network decarbonisation a challenge or an opportunity? How do we turn a challenge into an opportunity? For a DSO, visibility is key – they need to be able to understand what is happening across their network, with data from sensors at the substation, to the feeder, to the meter being at the heart of this. But how can a highly regulated DSO capitalise on technological innovation if regulations do not permit them to access this data? One such example of the regulatory environment paving the way for digitisation for DSOs is allowing them to access smart meter data. Although there are still bureaucratic hurdles to overcome, such as drafting and submitting a data and cyber security plan to Ofgem for approval prior to any data access being granted, this is a huge opportunity for DSOs to modernise their operations whilst supporting whole-system decarbonisation.

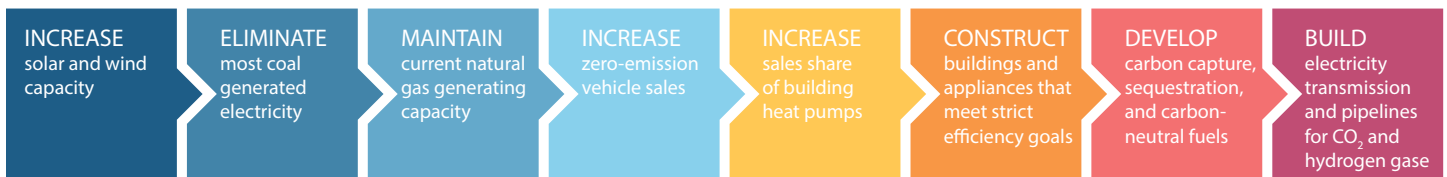
Similarly, in April 2021, Ofgem confirmed that market-wide half-hourly settlement would become mandatory in 2025, meaning all electricity customers (not just those who have a peak demand of 100kW) in the UK would be settled on their actual consumption versus an assigned load profile. This is a prime example of a sweeping

regulatory reform that has the potential to ‘make or break’ an energy retailer – driven by data. With the creation of billions of new datapoints from 100% smart meter penetration, suppliers are faced with a challenge and an opportunity. Should they decide to invest in the necessary tools to perform data-led activities such as dynamic pricing, product suitability, and bottom-up load forecasting, they are likely to keep costs low, better serve their customers, and ultimately secure and maintain profitability. For the most part, the industry has welcomed these regulatory updates, with many investing in these emerging, often innovative technologies, designing a digitised operating system that can leverage data from downstream assets as they continue to be deployed.

Policymakers and regulators must continue to set the scene far in advance, sending a clear message to the market – data is the key to ensuring efficient and effective market operation under a net-zero system. Also, we must understand that this change is not stemming from just an individual, a team, or even a company but an entire sector. Those overseeing the governance process of ‘net-zero’ must provide a clear, timely, and transparent policy strategy. In doing so, they will pave the way for suppliers to adapt to the new energy landscape and regulatory upheaval, ultimately benefiting by accessing new revenue streams, attracting new customers, and lowering operational expenditure.

Whether a DSO or a supplier, the possibilities unlocked by applying artificial intelligence to data are almost endless. Regulators and policymakers now face the stupendous challenge of balancing data openness with data protection and cyber security whilst considering how to get to net-zero as quickly and cost-efficiently as possible. Market engagement will be paramount through this decade-long process, requiring industry participants to collaborate with the common goal of whole-system decarbonisation and modernisation.

EIGHT POTENTIAL STEPS TO NET-ZERO



OPTIMISING FLEXIBILITY WITH DATA

Often polluting, centralised power plants are quickly becoming a technology of the past, with low carbon non-synchronous generation assets getting deployed at pace globally. **The goal of achieving net-zero will not come from one single technology class but multiple, installed, and operationalised in various configurations.** Whilst there are growing numbers of large wind farms, solar parks, and hydro plants, sending a flurry of gigawatts into energy systems across the world, there are equally a growing number of downstream assets being introduced behind-the-meter within homes and businesses. There is a commonality between all of these; irrespective of the technology type, generation capacity, or location, all will generate data that can be used to support the energy transition.

The challenge of 'how do we create electricity without emitting carbon' has been solved, for the most part. The next frontier is 'how to balance the grid when the sun isn't shining, and the wind isn't blowing, cost-effectively.' Owners and operators of flexible assets and energy retailers must look to data to streamline the management of low-carbon system operations. To optimise operations, participants must make a series of decisions, often in near-real time, based on a cocktail of datapoints - load forecasts, generation forecasts, weather forecasts, wholesale prices, flexibility revenue opportunities, network constraints, carbon intensity of supply, and so on. Leveraging a centralised system that ingests these datapoints and disseminates analytics in a clear and actionable front-end will be a critical move forward.

It is not only upstream assets that will require management, but energy consumers are also no longer serving as passive agents within the system having installed distributed energy resources (DERs) of their own – as such, industry stakeholders have a significant opportunity (and challenge) to enable their customers to access new revenue streams through flexibility management. Retailers, in particular, must look to data analytic solutions that can provide automated and accurate meter-level energy insights, using this to capitalise on flexibility-driven opportunities, whether it be through dynamic pricing or direct participation in localised constraint events.

Downstream flexibility is critical to system decarbonisation as it enables carbon-emitting synchronous generation assets to be taken offline. Energy flexibility is not only a key part of the UK's journey to net-zero but offers several benefits to the consumer as well as the industry. By using their own energy assets (e.g., solar, battery, electric vehicles (EV)) consumers can actively participate in the energy system and therefore be rewarded financially for this. With DSOs continuing to



lower their kW thresholds for system services, residential customers with flexible assets as low as 100w can participate (note WPD procuring 300w of flexibility from a residential battery in 2019). Data, however, is one of many components for enabling systemwide flexibility, whether from downstream assets such as the 300w inverter procured by WPD or the 300MW wind farm off the coast of Norfolk. Put simply, without data, there is no flexibility.

Data-led solutions that link these two together will be a vital step on the journey to net-zero, as retailers and generators will need to match up supply and demand, protecting their gross margin through efficient trading (and market participation in system services to the National Grid and DSOs). A case in point, between March and July of 2020, balancing costs increased by a staggering 39% – £718 million – as a result of COVID-19 and unpredictable weather. Suppliers must use data to make informed decisions on their trading activities and flexibility management, e.g., which customers can be flexible, which customers are likely to have a high degree of weather sensitivity, and so on.

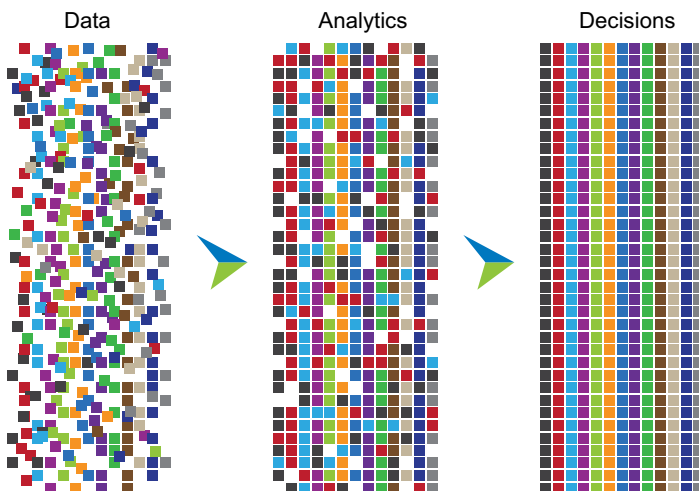
WHERE ARE MY DISTRIBUTED ENERGY RESOURCES?

With an increasingly competitive landscape in the retail energy sector (in deregulated markets), suppliers often facilitate the installation of DER products, with a customer then deciding to change hands and switch to a new provider. When this happens, the new supplier (and customer) is ultimately at a disadvantage. They do not know who has installed DER technology within their customer base that could be leveraged for activities such as wholesale arbitrage via a dynamic pricing regime or used as a flexible asset generating revenue.

Fortunately for the new retailer, this challenge can quickly be turned into an opportunity, looking to data for the solution. Each DER technology will leave an energy footprint, allowing it to be detected when the load profile for the customer is analysed correctly. As the retail energy provider for the property, suppliers will automatically have access to the home's smart meter data, which is all that is needed to detect DERs. Inversely, suppliers can also look to analytics providers to

help them better understand which customers within their portfolio would be suitable candidates for new products, tariffs, and demand response programmes. Examples such as this, highlight how suppliers can turn a challenge into an opportunity by using data and expert analytics providers to get a 360-degree view of their customers' energy profile, demand drivers, and potential receptiveness to new offerings outside of 'electrons'.

Business Analytics - From Data to Decisions



Internal and External Datasets/Integrations

- | | |
|-----------------------|-----------------------|
| ■ Smart-Meter Data | ■ Weather Information |
| ■ CRM | ■ Macro-Economic Data |
| ■ DSR Requirements | ■ ETRM Systems |
| ■ Generation Forecast | ■ Tariff Data |
| ■ Standard Meter Data | ■ Carbon Forecasting |
| ■ Billing Platforms | ■ Demographic Data |
| ■ Pricing | |

CREATING THE RIGHT PRICE FOR THE RIGHT CUSTOMER

Many energy retailers have already introduced dynamic pricing, mostly for EVs, which on average double the peak demand at residential properties. Whilst it is broadly acknowledged that these more innovative tariffs will play a key role in consumer-led load shifting, **retailers must think about how they can use data to ensure their customers are on the right pricing regime.**

One customer who drives their EV five miles to work at 11:00 a.m. will benefit from a different tariff when compared to someone who drives 50 miles to work at 8:00 a.m. By applying machine learning and artificial intelligence to smart-meter data, suppliers can now group customers, pricing them independently, resulting in improved customer satisfaction, optimised gross margin, and a lower cost per kWh to the end customer. However, this does come with a caveat. If the data is incorrectly analysed, the inverse of this may happen. A customer may be priced incorrectly, causing them to spend more on their electricity and seek alternative retail solutions. Introducing intelligent pricing, based on a deep understanding of a customer profile, demand drivers, behind-the-meter technologies, and localised weather conditions would allow retailers to ensure that their customers get the right services at the right price while cost-effectively enabling system flexibility.



LEVERAGING DATA TO IN FORECASTING METHODOLOGIES

To date, retailers have forecasted using top-down methodologies, looking to industry bodies such as Elexon for load profiles for residential and commercial customers. Increased electrification, COVID-19 lockdowns, remote working, and uptake in distributed energy resources have made this endeavour more challenging. **Evolving consumption trends coupled with wholesale pricing volatility have created substantial risk for retailers.** Demand and generation forecasting are paramount in protecting their bottom line.



Digitisation and data analytics are the rescue vehicle that will take suppliers back to the safety of profitability, matching supply, and demand with minimal mean absolute percentage error (MAPE). Each deployed smart meter presents the supplier with transparency on the customer's consumption pattern and behaviour towards externalities, such as weather events. By forecasting for every meter within their portfolio and aggregating these up, suppliers will have a 'top-down view' by adopting a 'bottom-up' approach to demand forecasting. Forecasting for each meter will create automated weather-adjusted outlooks on demand, both in near-real-time and up to 15-years ahead, supporting anything from balancing mechanism strategies to wholesale procurement years ahead.

By adopting a data-driven, bottom-up approach to load forecasting, retailers will not only lower costs, improve margins, and retain customers; they will also help the market's decarbonisation, protecting customers from peak pricing events motivated by weather-driven volatility.

A LESSON IN CUSTOMER PROFILING FOR FORECASTING ACCURACY

During extreme weather events in Texas, which caused rolling blackouts and power shortages, **Innowatts applied its AI-driven algorithms to meter data, in near real-time, to identify and illuminate customers that had been poorly profiled.**

Typically, Texas energy retailers bucket residential customers into two broad groups: electric heat and non-electric heat. In addition, customers are often wrongly categorised into one or the other. When analysed properly, it becomes apparent there are more than 30 groups of residential demand profiles present in the Texas market with a price spread of 107%.

By producing granular level insights, Innowatts also highlighted those customers in southern Texas that would create a surge in demand by deploying temporary heaters to keep warm. Innowatts' clients then reprofiled those customers to create a much more accurate forecast and procurement strategy for the days ahead.

The forecast improvement allowed the energy retailer to hedge their market positions, thereby reducing pricing exposure on the spot market – where wholesale electricity prices soared to nearly £7,000 per MWh. Several suppliers with less accurate forecasts found themselves at the mercy of the spot market. Eventually unable to make the necessary payments to participate, they were barred, leaving thousands of Texans without power.



TRANSFORMING THE RETAIL SECTOR WITH ACTIONABLE DATA INSIGHTS

Whilst there are a myriad of solution providers in the energy-tech sector, supply chain teams are focused on the interoperability of different SaaS technologies. **Mixing and matching these technologies together may lead to higher cost, additional complexity, and the possibility of increased operational risk that can surface through the coordination of disparate systems that do not all contain the same native interoperability.** Therefore, market participants must adopt a broader strategy that contemplates a holistic approach when evaluating and selecting digital solutions.

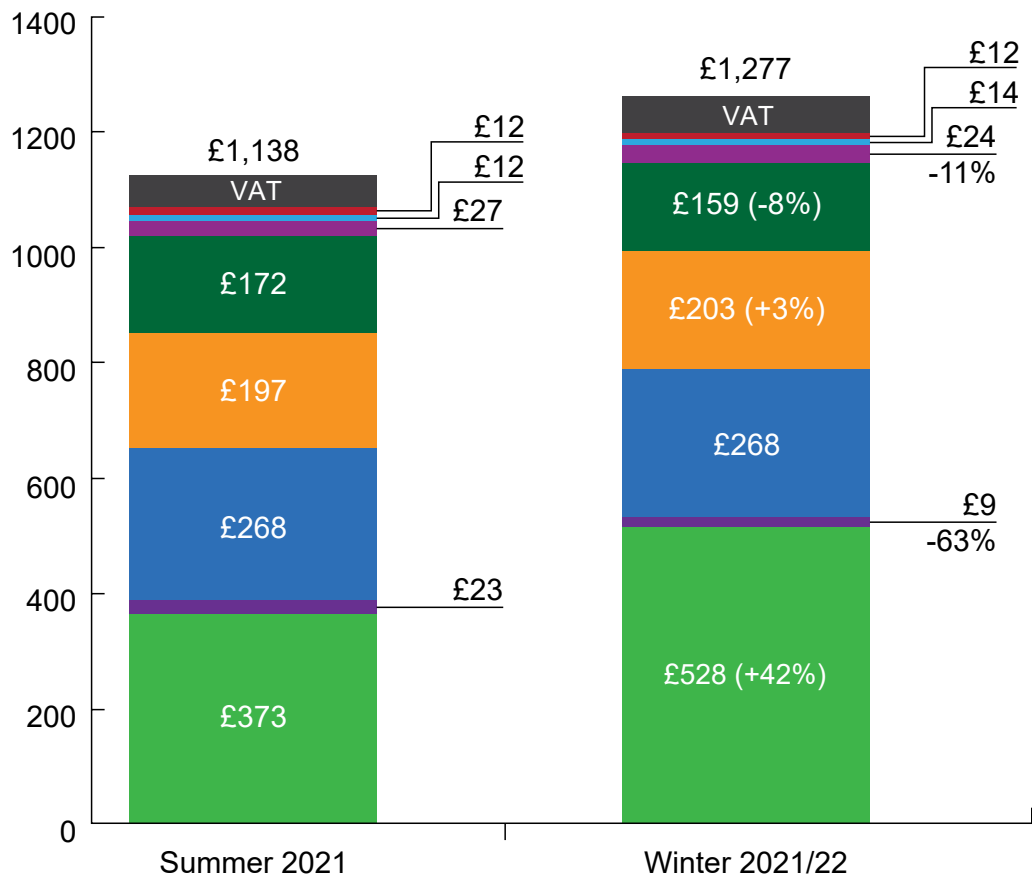
Instead of relying on standard industry profiles or available market data, Innowatts uses insights from actual energy consumption – customer level load disaggregation and predictive clustering models. Its models encapsulate learnings from 45 million+ smart meters to turn detailed customer usage information into accurate, AI-enhanced predictions. When leveraged with its products, this highly precise customer data can be utilized in any way a retailer or DSO requires – from customer segmentation and future load forecasting to product marketing and sustainability.

The platform aggregates and anonymises data from across energy territories to provide an unrivalled resource for users to better understand the evolutionary trends such as electrification and decarbonisation, the impact of weather conditions, and customers' response to pricing and flexibility events. It provides users with an unrivalled level of confidence that the forecasts they make are in line with those of their competitors.

While an energy retailer may be tempted to custom-build a similar platform in-house, it will never achieve the same level of insights as a platform that utilises data from across markets and retailers. Instead, Innowatts has invested the time and resources needed to create a platform that can take any energy retailer's customer usage information and turn it into accurate, AI-enhanced predictions that will transform their operations.

Winter 2021/22

Cost Stack Breakdown for Typical Dual Fuel/DD Customer



- Wholesale
- Adjustment
- Networks
- Operating
- Policy
- Smart
- Headroom
- DD Uplift
- VAT



WHERE DATA GOES TO WORK

Whether you're looking to forecast load, design rate plans accurately, or achieve sustainability goals, Innowatts' secure, AI-powered platform works for you. It automates your business processes while making those processes smarter through analytics. That translates to a reliable grid, a more profitable position, increased efficiency, and a sustainable energy future — with happy customers every step of the way.

- **Lead the energy transition:** Everyone wants to reduce their carbon footprint, whether it's a goal or a requirement. Innowatts' platform enables sustainability, giving you the power to influence usage for greener energy – profitably.
- **Make smarter business decisions:** Data-centric means customer-centric. With accurate, actionable, and predictive information in your corner, you can improve margins, better manage the cost of supply and reduce the cost to fulfil your customers' demand.
- **Enjoy limitless connectivity:** The Innowatts platform is as flexible as it is powerful. Deploy a single product, the full suite, or connect it seamlessly with your existing platforms and workflows. Best of all, you're up and running in weeks, not months.

For more information, or to arrange a demo, please email:



sales@innowatts.com