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Demand Side Response – Have We Forgotten About the Little Guy?

EXECUTIVE SUMMARY

The UK energy transition has largely focused on large-scale renewables and industrial decarbonisation, but this thought piece argues that behind-the-meter (BTM) distributed generation and demand-side response (DSR) solutions are being overlooked. These smaller, decentralised energy assets, such as rooftop solar, battery storage, and hybrid microgrids, offer immediate, flexible, and resilient pathways to decarbonisation.

With over 50% of UK electricity now coming from renewables, the grid faces new challenges in balancing supply and demand. The expansion of battery energy storage systems (BESS) and long-duration storage is critical to managing the intermittency of a renewables-based energy system whilst ensuring grid stability. However, the role of BTM assets in supporting local resilience, reducing peak demand, and enhancing energy autonomy is underutilised.

This article highlights the economic and environmental benefits of empowering consumers and businesses to generate, store, and manage their own energy. These benefits include lower energy costs, new revenue streams, and improved energy security.

The article also underscores the need for pragmatic, diverse energy strategies that integrate renewables, storage, and decentralised generation, rather than relying solely on electrification and hydrogen.

The Carbon Trust estimates that a fully flexible energy system could save the UK up to £16.7 billion annually by 2050 and policy developments that recognise the role of DSR and BTM solutions can help unlock these savings.

In conclusion, the UK must embrace a more inclusive energy strategy that values the contributions of smaller, decentralised contributors. By doing so, it can accelerate decarbonisation, enhance grid resilience, and build a more sustainable and consumer-empowered energy future.

INTRODUCTION

The energy transition has arguably been framed around the macro-level impact of gigawatt-scale renewables, hydrogen, small-modular reactors (SMR), and industrial carbon capture. While these technologies are critical, the recent neglect of behind-the-meter (BTM) distributed generation and demand-side response (DSR) solutions could mean we are missing out on a more nuanced, flexible, and immediate route to decarbonisation.

Behind-the-meter (BTM) distributed generation assets, such as rooftop solar panels, battery storage systems, and microgrids, are becoming critical components in the transition to a resilient, low-carbon energy system. Their impact goes beyond individual consumers, with the potential to meaningfully contribute to grid stability and decarbonisation.

Historically, the UK was at the forefront of distributed generation, a key early adopter of Combined Heat & Power and District Energy, however, with the removal of embedded benefits and stringent sustainability metrics to be met, adoption has been hampered in recent times.

RENEWABLES DEPLOYMENT

As of early 2025, more than 50% of the UK's electricity generation regularly comes from renewable sources, marking the first time renewables have surpassed half of total generation. (National Grid: Live).

Whilst on individual days wind and solar generation assets might satisfy a larger proportion of capacity, the energy-mix figures do highlight that a large proportion of UK supplied electricity does still come from fossil-fuels or interconnectors.

Additionally, the UK has **6GW/8GWh** of operational grid-scale battery energy storage systems (BESS), with nearly **20GWh** currently under construction. The total pipeline of projects with planning approval exceeds **100GWh**, indicating significant future growth in storage capacity. (www.energy-storage.news).

The growing share of intermittent renewables in the UK grid is both a significant achievement and represents a challenge, requiring solutions to ensure system stability and efficiency.

NETWORK STABILITY

1. **Variability & Balancing Needs** – With more than **50%** of the UK's electricity coming from renewables (primarily wind and solar), the grid requires additional balancing mechanisms to manage fluctuations in supply and demand.

2. **Curtailment & Overgeneration Risks** – Without adequate storage, surplus renewable energy can be wasted, especially during periods of low demand.

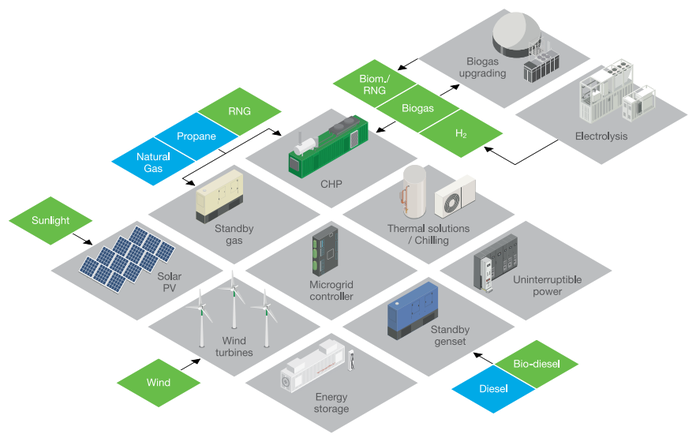
3. **Grid Frequency Management** – Wind and solar do not provide the same inertia as traditional thermal generation, making frequency regulation increasingly dependent on storage and demand-side response.

THE ROLE OF ENERGY STORAGE

1. **Battery Storage Expansion** – The UK's **6GW/8GWh** of operational battery storage is essential for absorbing excess generation and releasing it when needed. Projects under construction and in the pipeline aim to **significantly increase** this capacity in the coming years.

2. **Long-Duration Storage** – Technologies such as pumped hydro, compressed air storage, and liquid air energy storage are gaining traction to provide multi-hour or even seasonal storage to complement batteries.

3. **Hybrid Energy Solutions** – Combining storage with behind-the-meter generation assets, such as onsite solar and reciprocating engines, allows industrial and commercial users to optimise energy efficiency and grid contributions.



DISTRIBUTED GENERATION'S POTENTIAL

BTM assets, such as reciprocating engines, battery energy storage systems (BESS), and hybridised energy solutions offer agility that large-scale infrastructure perhaps cannot.

In my experience, recent conference discussions focus on grid-scale developments and have ignored how decentralised assets can enable businesses and communities to take charge of their energy needs while easing strain on the broader system. These technologies:

– **Enhance Grid Stability** by reducing reliance on centralised energy generation.

– **Increase Energy Resilience** for C&I consumers, allowing operational flexibility in times of system stress.

– **Accelerate Decarbonisation** without requiring vast new infrastructure investments.

FUNDING, SUBSIDIES & FINANCIAL MODELLING

The hydrogen economy and carbon-capture technologies currently rely on subsidies or policy incentives to remain viable at scale. The question is whether such mechanisms will continue indefinitely or if the industry must shift toward accepting lower returns to drive organic market growth. Developers and investors may need to reassess expectations and prioritise long-term sustainability over short-term profit margins.

PRAGMATISM NEEDED

Electrification and hydrogen alone cannot solve the entire decarbonisation challenge. Some sectors will never be fully electrified, while hydrogen's efficiency constraints limit its applicability across all industries. Instead, a **diverse energy strategy** that incorporates renewables, distributed generation, demand-side flexibility, and hybridised energy solutions must be embraced.

Unlocking further deployment of BTM assets and DSR initiatives could yield faster and more resilient decarbonisation outcomes while offering consumers greater energy autonomy.

BUILDNG A RESILIENT NETWORK

1. **Reducing Peak Demand Pressure** – BTM assets help shave peak loads by generating power at the point of consumption, reducing grid congestion and system strain during high-demand periods. Couple this with the necessary cost of upgrading the transmission system and it's clear to see how alleviating network stress can support resilience.

2. **Enhancing Local Energy Supply** – By decentralising electricity generation, BTM assets reduce reliance on long-distance transmission, mitigating risks associated with power outages due to extreme weather or technical failures.

3. **Supporting Grid Flexibility** – With intelligent energy management and storage integration, these systems can adjust electricity supply in real time, responding to fluctuations in demand and supply.

SUPPORTING DECARBONISATION

1. **Integrating Renewable Energy** – Solar, wind, and other renewables deployed behind-the-meter directly contribute to lowering fossil fuel dependence while decentralising clean power generation.

2. **Facilitating Electrification of Key Sectors** – BTM assets enable homes, businesses, and industries to transition to electric solutions, such as EV charging and electrified heating, powered by local clean energy.

3. **Decarbonising Gas** – One thing that the UK has done very well, has been to decarbonise the electricity sector. Notably, however, decarbonising gas as not seen as dramatic a change.
Incentivising the deployment of green hydrogen production and increased use of waste to produce renewable biogases will support a decarbonisation effort that ensures gas appliances don't become stranded assets in the future.

ECONOMIC CONSUMER BENEFITS

1. **Lower Energy Costs** – By self-generating electricity and avoiding expensive peak grid tariffs, consumers can reduce long-term energy costs.

2. **Energy Autonomy & Security** – Consumers gain greater control over their electricity supply, improving resilience against outages and volatile market prices.

3. **Unlocking New Revenue Streams** – Assets such as battery storage can participate in demand-response programs, earning revenue by supporting the broader grid.

CAPACITY MARKETS & FLEXIBILITY

The UK's flexibility market is evolving rapidly to accommodate the growing need for decentralised energy solutions and demand-side response (DSR). Some of the areas worth exploring include:

The UK government is actively exploring ways to improve how consumer-led flexibility is integrated into the **Capacity Market**. This initiative aims to ensure that demand-side assets, such as battery storage, demand response, and behind-the-meter generation, are properly valued and incentivised to support grid stability. (www.gov.uk)

New Flexibility Market Rules are being developed to create a more consistent and accessible framework for flexibility services. These rules will define operational standards, data exchange protocols, and service definitions, ensuring interoperability across different markets. (www.elexon.co.uk)

Ofgem has introduced a **Flexibility Market Asset Registration** system to streamline participation in flexibility markets. This initiative assigns Elexon as the market facilitator, responsible for enabling digital infrastructure that supports decentralised energy systems. (www.ofgem.gov.uk)

These efforts highlight the UK's commitment to unlocking the potential of distributed energy resources and demand-side flexibility.

SUMMARY

The evolving UK flexibility market presents several implications for businesses, particularly those looking to optimise energy costs, enhance resilience, and participate in decarbonisation efforts.

The **Carbon Trust's** own analysis suggests that a fully flexible energy system could save the UK between £9.6 billion and £16.7 billion per year by 2050. This highlights the financial viability of investing in behind-the-meter assets such as battery storage, hybrid energy solutions, and demand-side management. (www.carbontrust.com)

Businesses should stay informed about upcoming regulatory changes, including new **Flexibility Market Rules** and asset registration requirements. These adjustments will shape how companies interact with the energy system and may influence future investment decisions.

The speed to deployment of low-carbon, decentralised generation technologies, is a fraction of that of larger centralised plant and can be seen as a means to save money today for future investment in zero-carbon technologies.

If we also consider the potential for using anerobic digestion with carbon capture to produce renewable gas, then Combined Heat & Power can provide a highly-efficient and low carbon resilient anchor, from which hybridised microgrid solutions can be built.

The UK is at a critical juncture where renewable penetration must be matched by storage expansion to maximise efficiency and resilience.

The little guy may have been forgotten for a bit, but it's starting to feel like a corner has been turned and a dependable, energy-efficient, sustainable energy system is closer to home than it once was.

ABOUT THE AUTHOR

Adam Wray-Summerson leads Clarke Energy's technical sales division, which is responsible for developing sustainable energy solutions and the installation of low-carbon, efficient, and resilient energy projects.

He has steered Clarke Energy's strategy for successful renewable technology diversification and has overseen continuing growth as a leading engineering, procurement, and construction (EPC) provider in renewable energy markets, including battery energy storage and hydrogen.

Throughout his career, Adam has played a significant and leading role in developing specialist power generation solutions across multiple applications and regions, including the UK, Ireland, the United States, and Africa.

Adam is a Fellow of the Institute of Mechanical Engineers, and a Chartered Engineer with a passion for energy efficiency and sustainability. He graduated with a master's in aerospace engineering from the University of Liverpool in 2008.

ABOUT CLARKE ENERGY

Clarke Energy is a multinational renewable technology and EPC business with over 30 years' experience delivering complex energy solutions and project management. We specialise in the delivery of low carbon, hybrid, and flexible energy, backed by strong balance sheet and industry leading aftersales support.

Globally, Clarke Energy has installed more than 10GWe of power generation solutions.

We deliver a complete package, including project feasibility, specification and planning assistance, through to detailed design, project management, construction, and aftersales support.

Our global experience with renewable technology installations is helping countries around the world generate low carbon power, as we transition to net zero.

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