GridBeyond™

Optimize Energy Strategies around Cost Reductions and Resiliency Improvements

OESM

Your hosts

Presenting to you today…

Joe Hayden
VP North America

GridBeyond

Who we are

Ireland | Great Britain | USA | Japan

Dublin HQ
Cork Software development
Territory sales & Field Engineering offices.

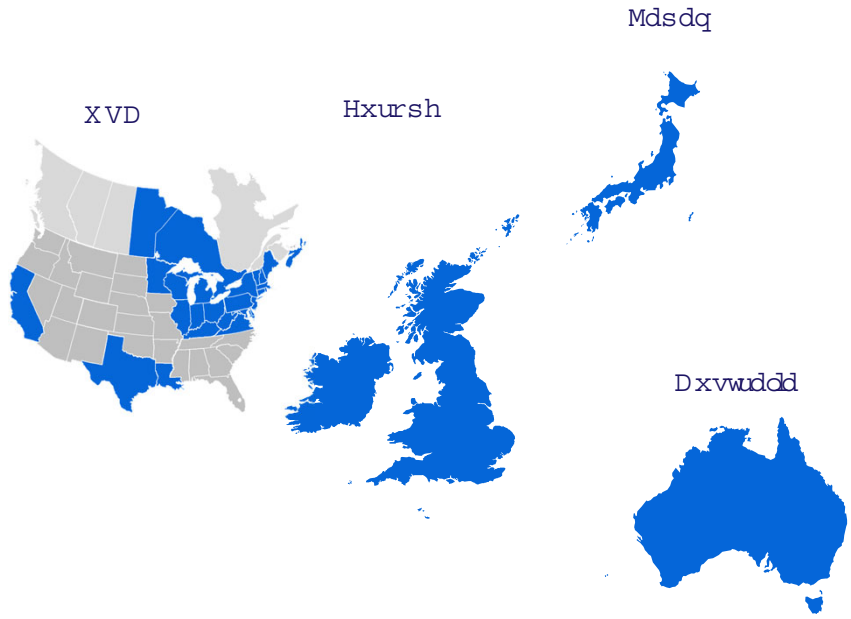
End to end In House control.
24/7 control / Trading/ Regulatory
Systems engineering + Data Science

350+ Customers | 500+ Sites

1,500+ MW portfolio with 700MW of flexibility under management.

400MW of Batteries under management

Where We Operate



Some of our Partners/Investors

Some of our Success Stories

Batteries

ZENOBE ENERGY

VEOLIA

ArdaghGroup

EURAC POOLE

Food / Logistics

brakes

RICK BESTWICK

Reed Boardall

natures way foods

abp

Glass / Metals

B SHAKESPEARE & CO

BAS CASTINGS

MAT FOUNDRY GROUP LTD

TIVAC ALLOYS LIMITED

SIMEC

VALE

outokumpu

Mills

Muntons Passionate about malt

Odlums

TARMAC A CRH COMPANY

Kilsaran INTERNATIONAL

IMERYS

Chemicals /Water/

DESCH PLANTPAK

ATHLONE EXTRUSIONS

ROYDON RECYCLING UK LTD

northern ireland water

Dŵr Cymru Welsh Water

UISCE EIREANN | IRISH WATER

Commerce

AVIVA STADIUM

DUNNES STORES

TIFCO HOTEL GROUP

CELTIC MANOR

Anglia Co-operative

webprint

foyleside The Centre of Shopping

Pulp & Paper

GLENNON

MEDITE

Smurfit Kappa

kronospan

UPMBIOFORE BEYOND FOSSILS

Other

RANDOX

Fingleton White

eir let's make possible...

Key Partnerships

GENFLEX

ESB

electricity north west

VEOLIA

RAINPOWER

EDFENERGY

Crown Commercial Service Supplier

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Aim of today's presentation

- Environmental, macro-economic, and geopolitical shocks have put the global energy transition under pressure
  - Security of supply concerns over global **volatility and high prices** in the wake of Russia's invasion of Ukraine
  - Record-breaking installations of **renewables**
  - Surging **EV** sales and electrification
  - Increased urgency for **decarbonization**
- This means the we can expect plenty of **legislative, policy and market changes**
- But how can your business **realise these opportunities?**

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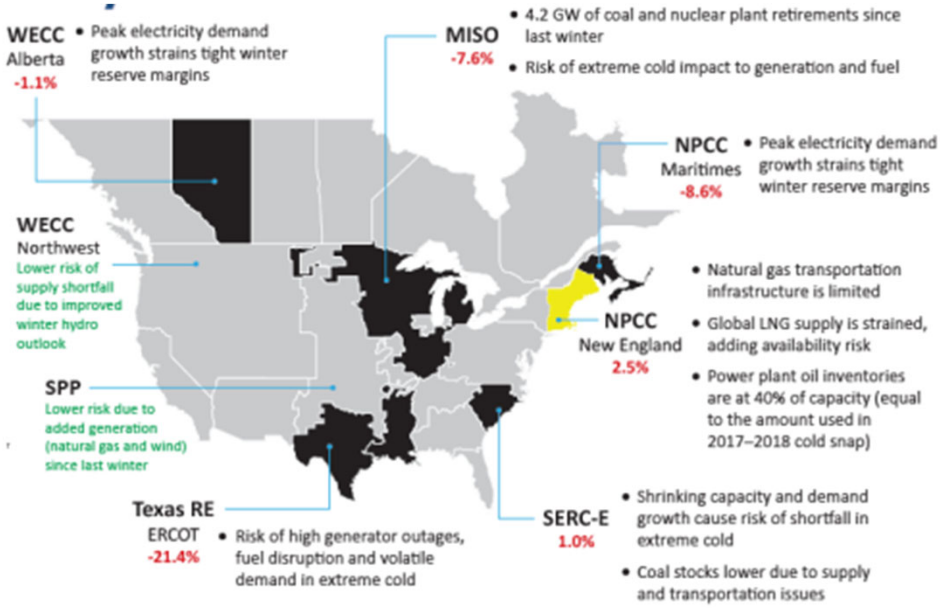
Tight margins expected

- Supply showed how tight this winter, with "a large portion" of the US and Canadian power system at risk of shortfalls during severe weather
- ISO-NE, MISO, ERCOT and parts of the Southeast, could struggle with power capacity shortfalls during extreme weather scenarios
- As the system moves towards zero carbon, the cost and volume of balancing will increase
  - Greater volumes of **distribution connected generation** and **aggregated capacity** participating
  - Emerging flexibility providers such as **vehicle to grid** (V2G) and **residential DSR**
- Spend and budgets for response programs will increase
  - Depending on how competitive the markets are and zero-carbon procurement requirements



Source: FERC

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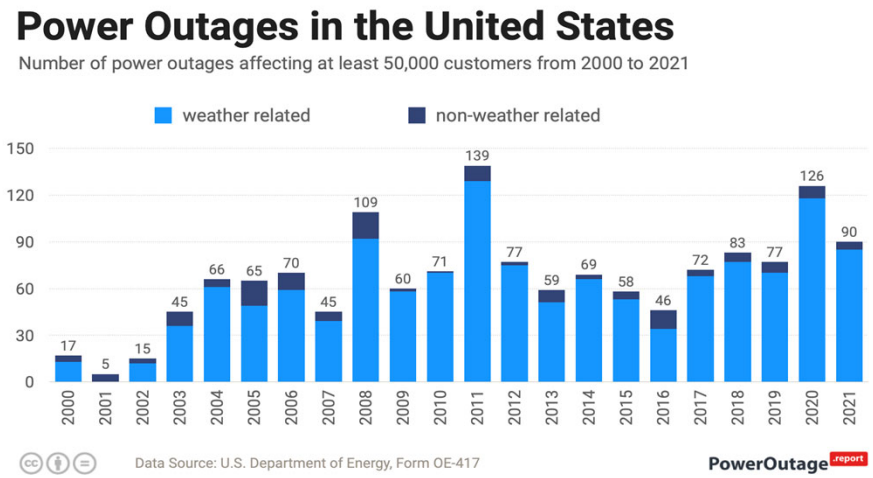
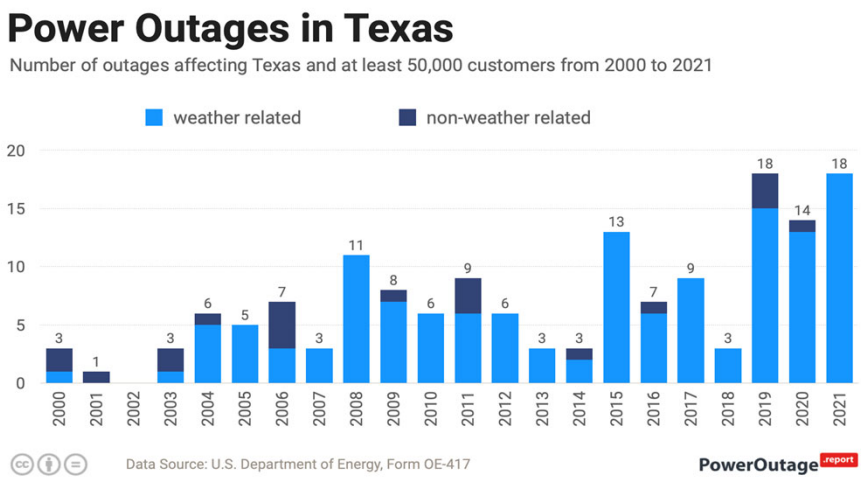
Power insecurity is here to stay





Source: EIA

Implications of failures – the cost of outages

Data Centre	**$750K** per event
Hospital	**$850K** per event
Pharma – Med	**$1.5M** per event
Steel works	**$350K** per event
Glass industry	**$250K** per event
Telecoms	**$30k** per minute

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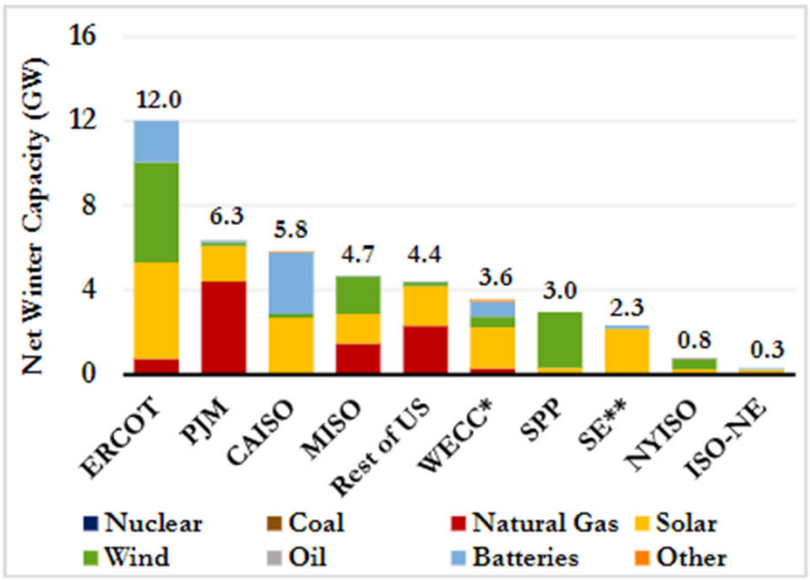
The energy mix is changing

- The share of US power generation from renewables will increase from 21% in 2021 to 44% in 2050
- This increase mainly consists of new wind and solar power
- Meanwhile, the total share of fossil fuel-fired generation is forecast to decrease from 60% to 44%
- **The price crisis has intensified a critical debate - to what extent variable renewable energy is impacting electricity markets and prices?**

Figure 7: Planned and Actual Capacity Additions



Source: EIA

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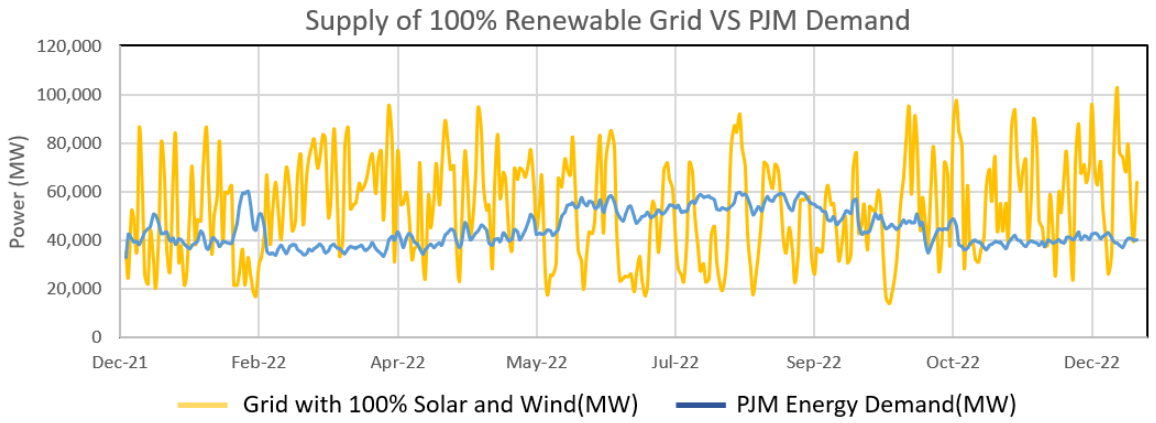
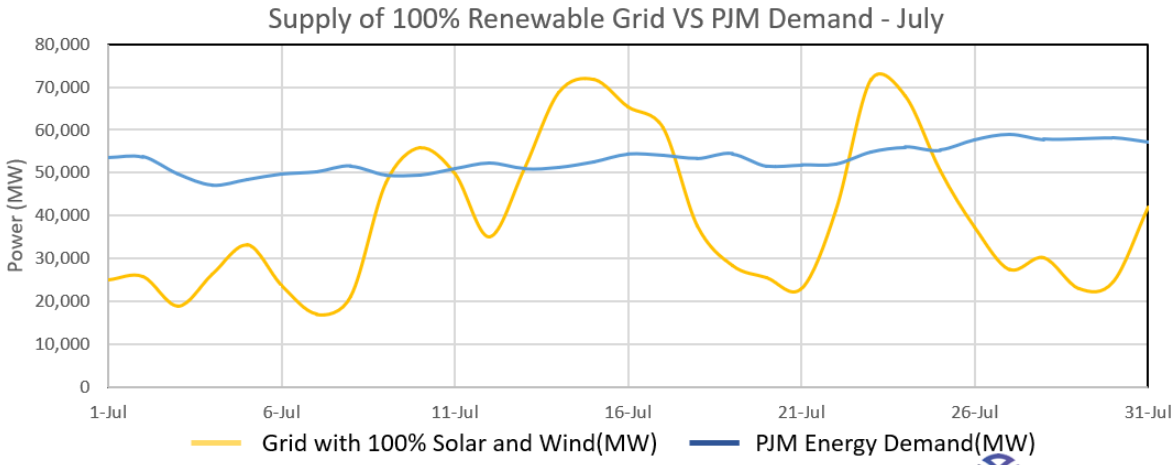
Renewables Powering 100% of the Grid

What if the Grid was 100% Solar and Wind?

- While powering the grid by 100% renewables is the most eco-friendly way to reduce emissions, it might not be practical.
- Renewable energy can fluctuate intermittently with a magnitude of 60%.
- The variability of renewable energy does not always match the demands on the grid which can lead to issues in powering the Grid.





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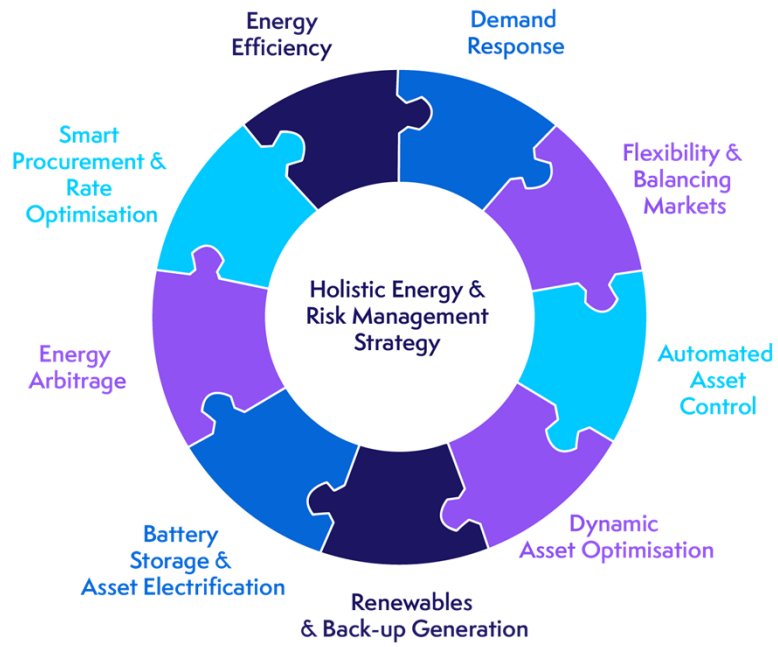
Participation is key

- Understand and manage your **flexible vs inflexible demand**
  - Flexible **load** and **processes** can participate in demand response and ancillary services
    - Gain revenues
    - Avoid (or reduce) consumption during high-cost periods
    - Reduce peak demand charges
- **Explore self-generation and batteries** to ensure security of supply and earn revenues
  - Avoid costly outages
  - Avoid high-cost periods
  - Reduce peak demand charges
  - Monetize excess generation
  - Environmental/sustainable benefits from green generation
- **Use technology to manage risk** in your energy procurement strategy and unlock significant savings



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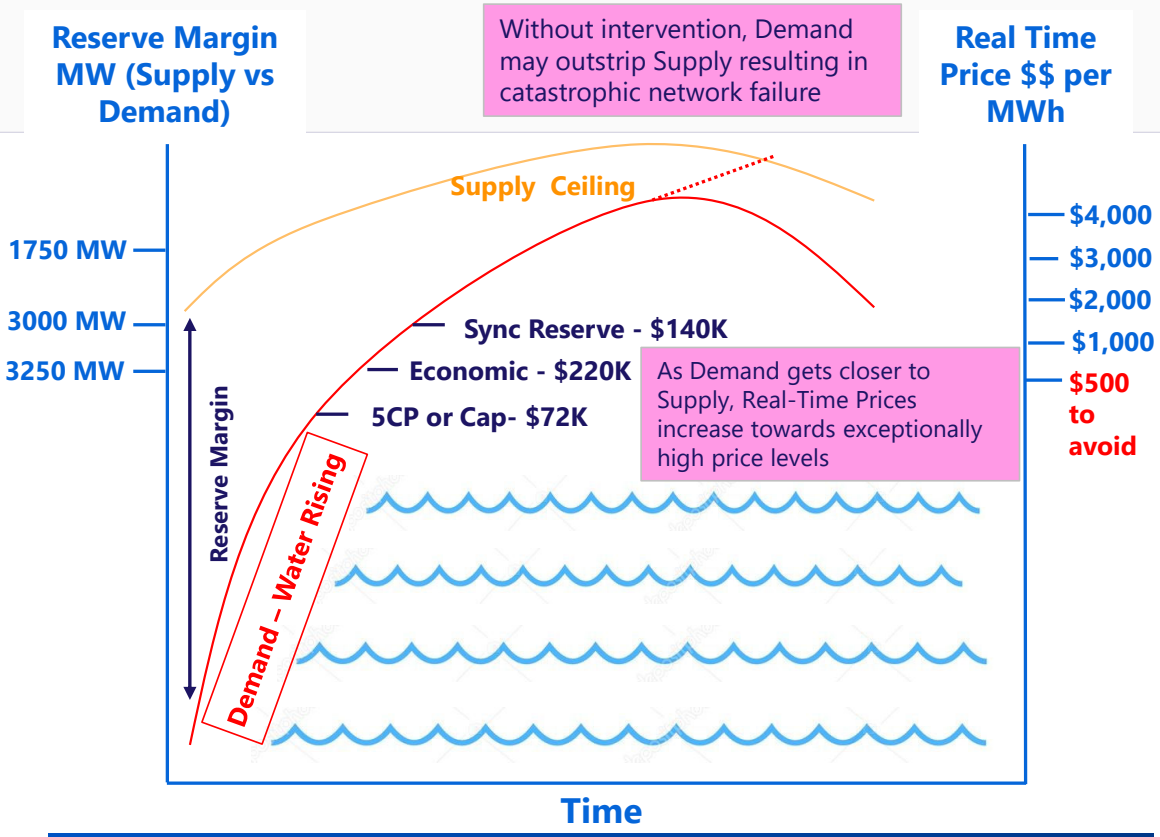
PJM Demand Response Services



Enhanced data science forecasting and automation allow for optimized stacking of DR with Real Time Cost Avoidance which unlocks additional value in the markets.

Service -4MWs	Value/Year	Dispatches per year
Synch Reserve Service	**$140K**	**10 to 12**
Economic Dispatch – Price spike avoidance of $500/mwh	**$220K**	**20**
5CP - Coincidental Peaks **(5CP) or Capacity**	**$72K**	**10-15**
Total Stacked Revenue	**$432K**	

$90k from PJM is equivalent to:

- $4.3M in annual sales for a business with a 10% Profit Margin
- $8.6M in annual sales for a business with a 5% Profit Margin
- $43M in annual sales for a business with a 1% Profit Margin

Assess: PJM Site

Your Site(s) Name:
Max Load: 19.42MW
Min Load: 11.56MW
Average Load: 14.98MW
Flexible Load (Phase 1): 4.00MW of Lighting/HVAC load
Flexible Load (Phase 2): Diesel Generator retrofit.MW TBC

Applicable PJM Programs based on Flexible Assets:
- Synch Reserve (SR)
- Economic Dispatch (Energy)
- 5CP or Capacity

Flexible Assets

Lighting

Response Time: Within 30 minutes

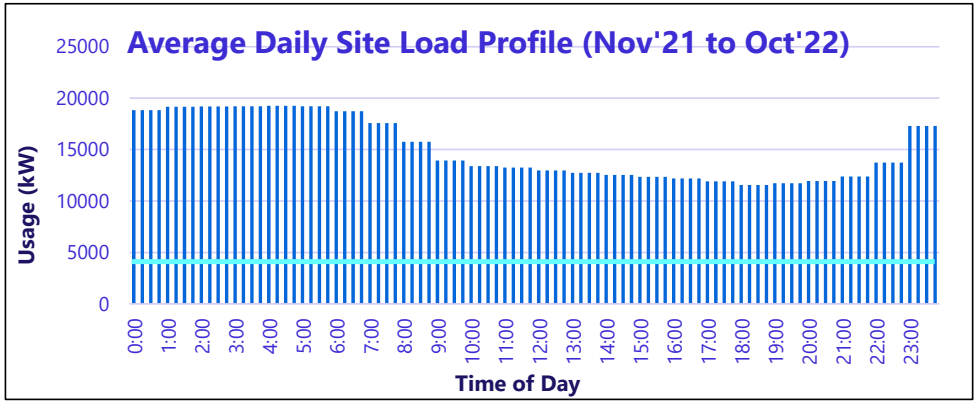
HVAC/Thermostat

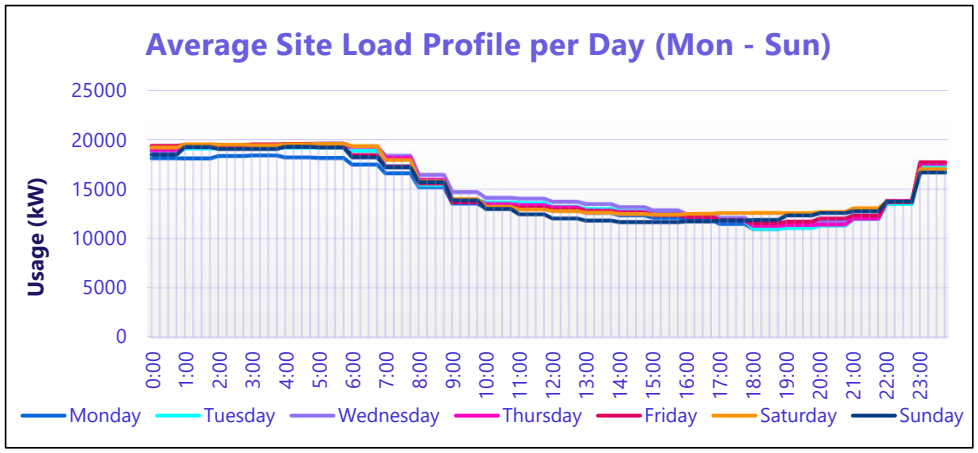
Response Time: Within 30 minutes

BackUp Generators

Response Time: Within 10 minutes

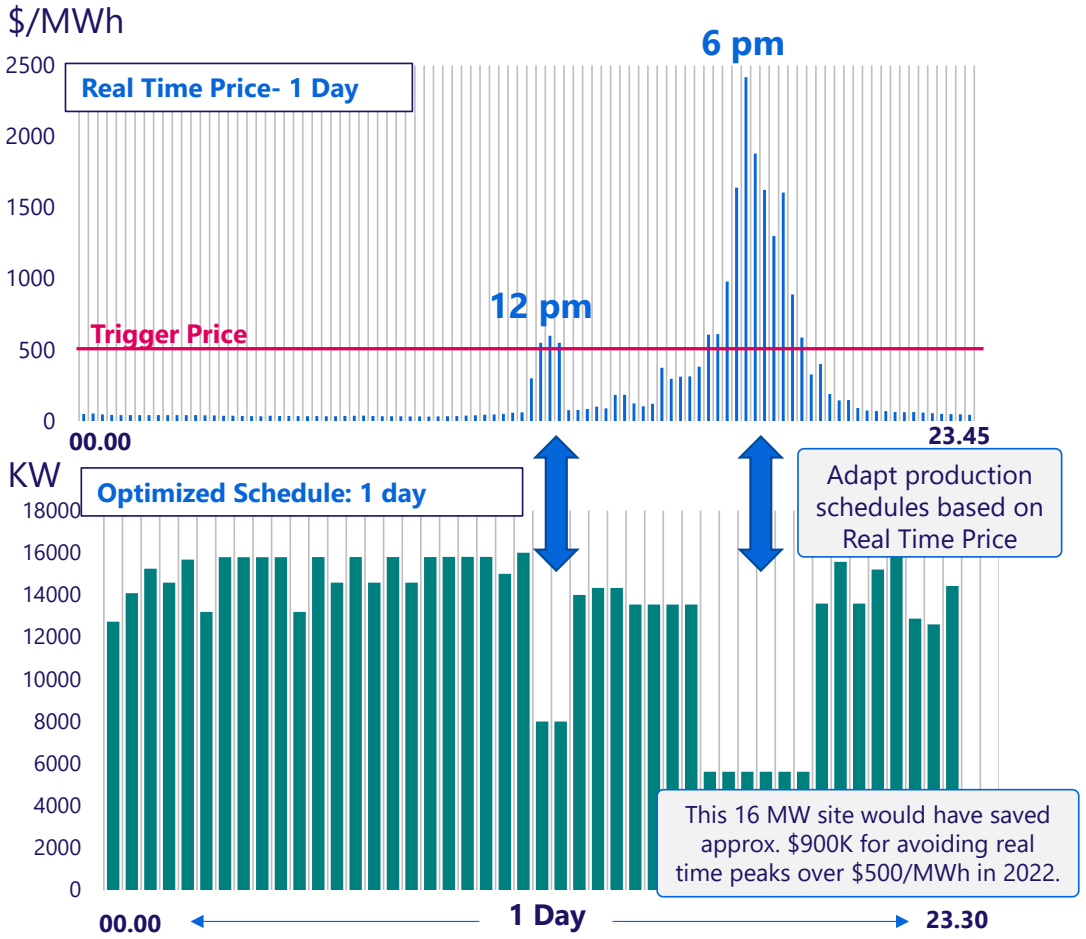
Energy Load Profile





Optimized Real Time Cost Avoidance when less than full Capacity

Load/Price Forecast



What Could I have been saved in 2022?

Trigger Price	Value	Hours Dispatched
$100/MWh	**$96K/MW**	510 Hours Annually (5.8% Annual Impact)
$150/MWh	**$83K/MW**	273 Hours Annually (3.1% Annual Impact)
$200/MWh	**$75K/MW**	200 Hours Annually (2.2% Annual Impact)
$500/MWH	**$55K/MW**	62 Hours Annually (<1% Annual Impact)

Please note these values are based on market estimates.

How does this work with energy supply contract?

Index

Block & Index

Fixed

Full Exposure to RT Market: GridBeyond works directly with the customer to generate energy savings.

Part Exposure to RT Market: GridBeyond works with REP to generate customer savings on indexed MW volume.

Fixed Price: In PJM, Economic Dispatch rewards customers with additional revenue even if they are on a fixed contract

Optimized Market Participation

Maximise your return from real-time markets: Day Ahead, Real-time, Ancillary Services

GridBeyond:

Tariff optimization & Recommendation Engine

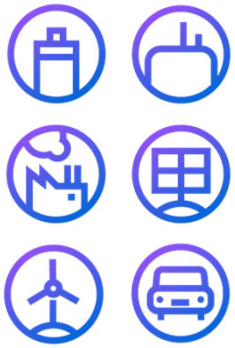
Ai. Trade Dashboard

To maximize the opportunity for your flexibility in the short-term energy markets requires two things:

- Ability to **forecast load** in real-time combined with asset control
- **Market access** and the Trading & Data Science to optimize asset flexibility in the short-term markets

Market Price forecasts

Market Arbitrage optimization



Load/generation profile

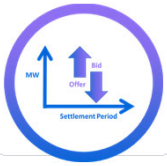
Asset dispatch

GridBeyond Trading Desk

Energy Supplier

Monetize flexibility

Day Ahead / Real-time markets



Ancillary Services

The key is to balance Ancillary energy markets independently of supply contract

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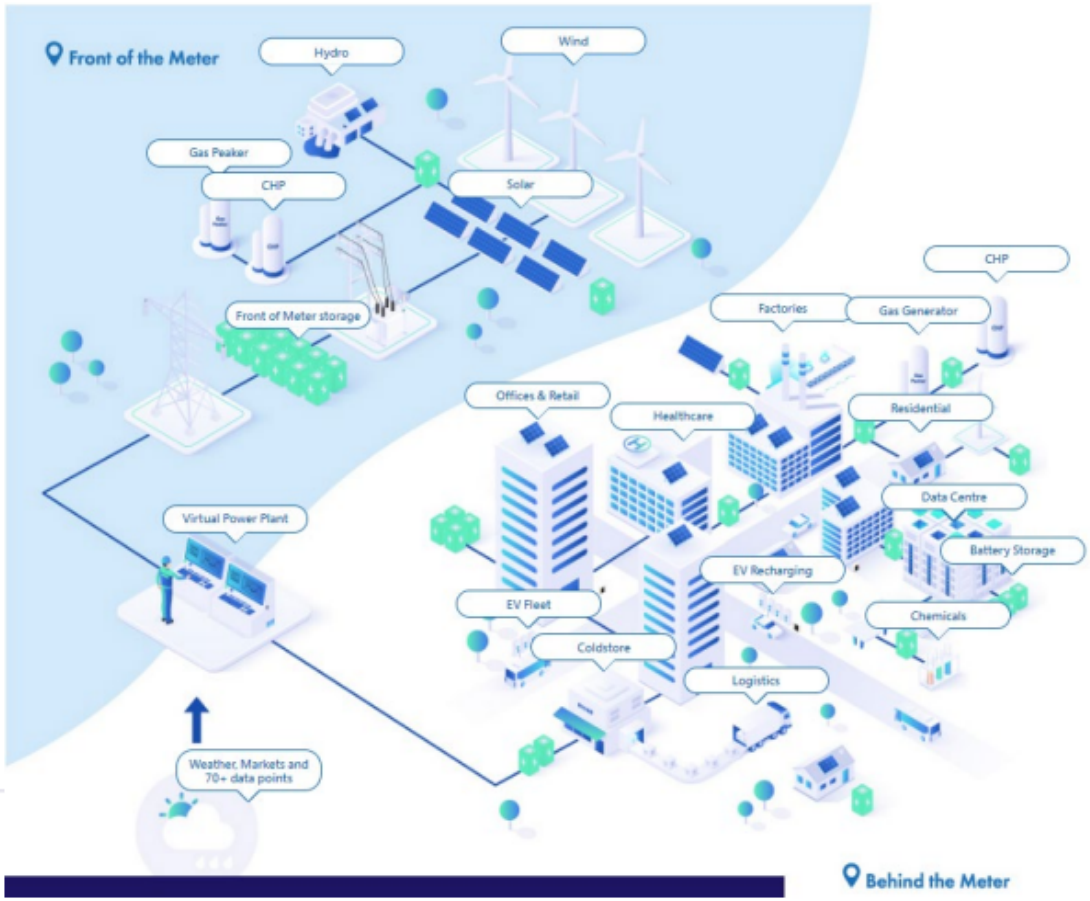
As Markets Become Increasingly Complex, Technology Becomes More Critical



Navigating the Energy Transition

Decarbonisation + Decentralisation

Digitisation

Assets

- DSR
- FTM – Battery, Generation
- BTM – Battery, Generation

Markets

- Capacity
- Balancing – System
- Balancing – Local
- Energy Markets

Expertise

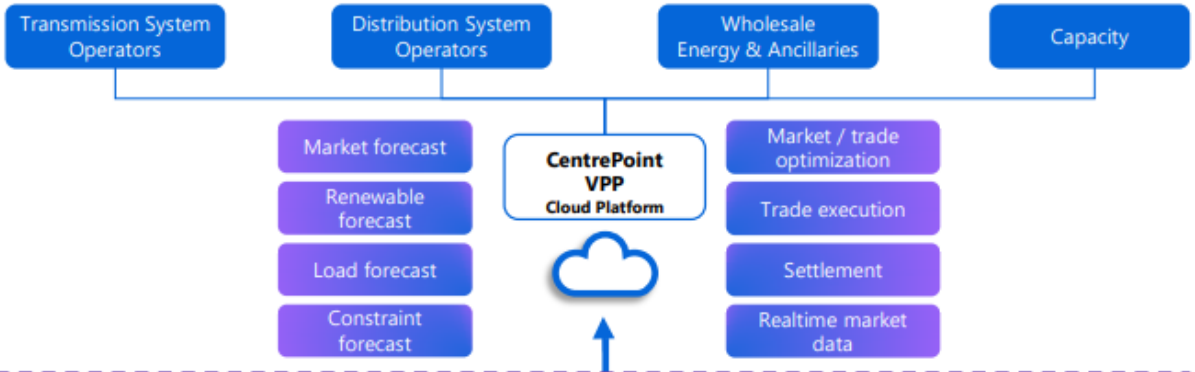
- Automation
- Control
- Engineering, HW, SW, Data Science, Electrical
- Energy Markets

VPP's that optimize market volatility to Revenue Generation

Distributed asset market optimization combined with localized microgrid optimization

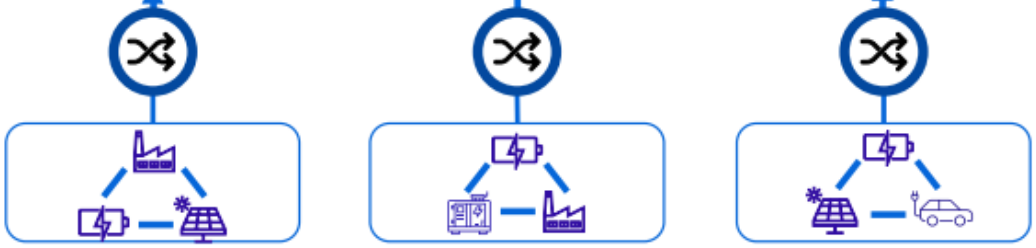
Virtual Power Plant

- Represents opportunities for market optimization
- Introduces additional revenue from customer sited load generation and storage



Microgrid

- Represents local and site-level optimization
- Minimize demand charges and optimize customer bill
- Carbon optimization for ESG targets.
- Customer drives sequencing priority



Microgrid – Industrial load with renewable generation and onsite storage

Microgrid – Industrial load with onsite generator and storage

Microgrid – EV bus fleet with onsite storage and generation

As microgrids become a regular part of the energy landscape, the opportunities for optimization increase and technical challenges become more complex for VPPs

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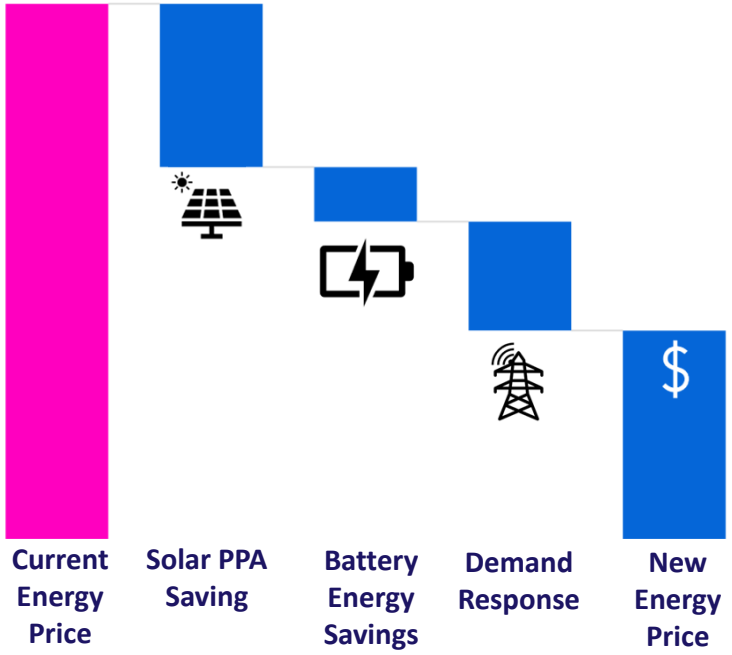
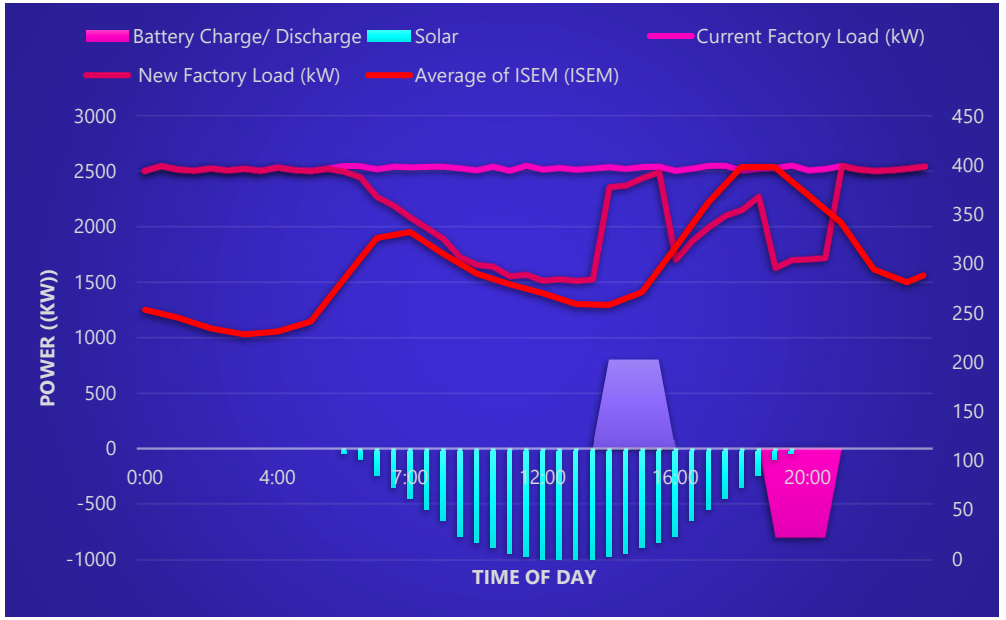
Solar + Battery on your site

This Is How to Reduce Your Energy Bill



How Will Solar + Battery Change Your Energy Profile



The battery will charge during solar or cheap energy hours to use later for more expensive electricity rates.

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Decarbonization Strategy & Asset Funding

A global process duplicating experience, expertise and technology to achieve energy and sustainability goals

Efficiency

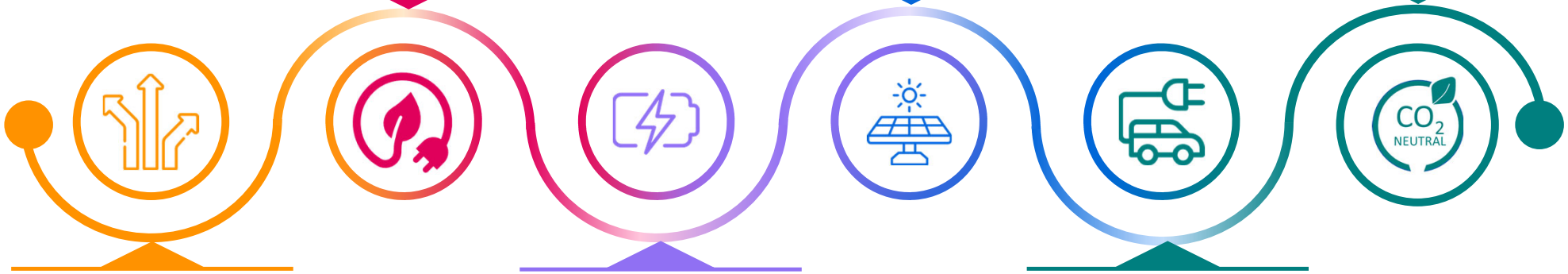
- Carbon Emissions Reporting - Visibility
- Benchmarking, Fault finding
- Energy Efficiency analysis

Solar

- Reduce carbon emissions
- Save on import energy costs
- Enhance on-site resiliency

Net Zero

- Make your energy strategy an asset to your business
- Energy strategy aligned with market & regulatory evolution
- Sustainability strategy for enhanced product offering



Flexibility

- Audit & identify flexibility
- Provide route to market
- Monetize flexibility (revenue & savings)

Battery / Generation

- Improve Resilience
- Earn revenue
- Support transformation of the grid

EV Charge Points

- Reduce Max import charges
- Support fast charging
- Reduce carbon emissions

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Market Prediction Summary

- The future of renewables is unlimited
- Safety net of fossil-fuel plant reducing rapidly
- Growing need for flexibility
- Storage takes centre stage at the edge
- Demand side response requirements continue to grow
- Market and price volatility is here to stay
- **Growing opportunities to gain revenue from smart optimization of assets – with the right technology in the right markets at the right time**

C&I's Predicament:
When the sun shines and wind blows, there is nothing cheaper to generate electricity.
And during interruptions, there is nothing more expensive.
How do you play the middle ground? Business continuity, supply chain disruption, Economics?

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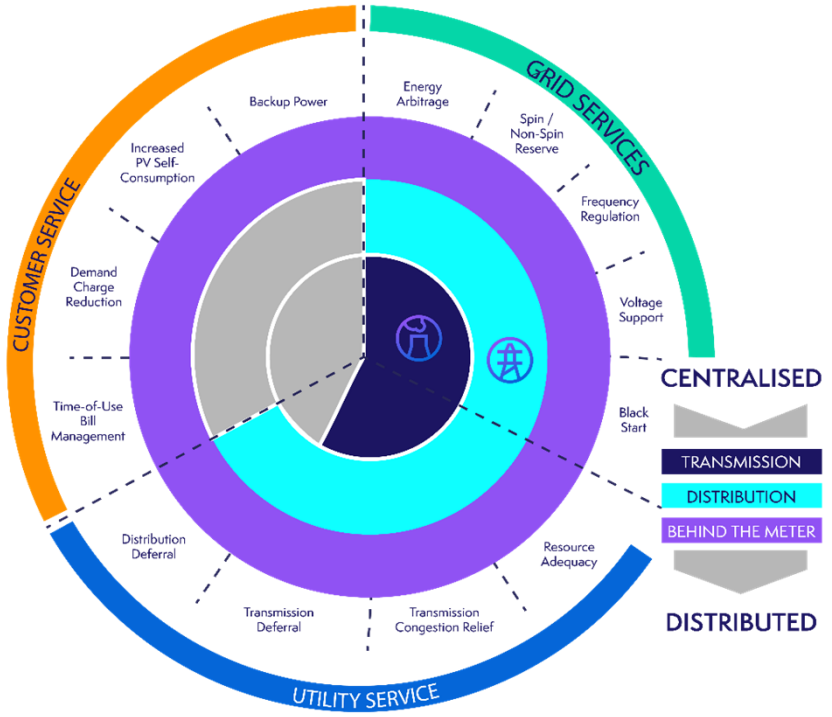
The growing need for a strategy with flexibility

- Participation of **demand load** in ancillary services and wider energy markets
- Gas **peaking plants** as a transition technology
- Energy **storage** increasingly important
- Where do **batteries** play in your future as an option for **reduction in costs**
  - The increase in demand is already clearly reflected in markets
  - Globally storage installations are projected to reach a cumulative 411GW by the end of 2030—15 times the 27GW of storage that was online at the end of 2021
  - The US and China are set to remain the two largest markets, representing more than half of installations
  - The Inflation Reduction Act is expected to drive 30GW of energy storage build from 2022 to 2030



THE ECONOMICS OF BATTERY ENERGY STORAGE

Source: RMI

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Thank you

Any questions?

For more information, contact academy@gridbeyond.com

Joe Hayden
972-822-9341
Joe.Hayden@gridbeyond.com

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Back up

About GridBeyond

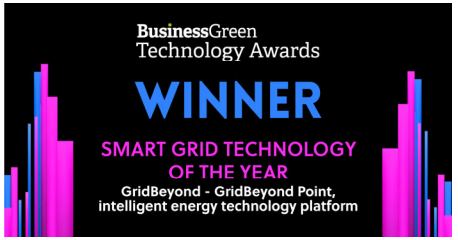
Transform energy into opportunity.

The transition to a Net Zero economy is driving significant change in the energy sector. From the rise of renewables generation to the ever-increasing need for grid balancing services. The result is a significant requirement for scalable and real-time solutions to manage the energy system of tomorrow.

At GridBeyond we bridge the gap between distributed energy resources and energy markets, our technology means every connected asset, whether its utility-scale renewables generation, energy storage or industrial load, can be utilised to help balance the grid. The benefit?

By intelligently dispatching flexibility into the right market, at the right time, asset owners and energy consumers unlock new revenues & savings, resilience, manage price volatility, while supporting the transition to a Net Zero future.

Awards & Accolades



Biographical Information

Joseph C. Hayden, V.P. of Revenue
GridBeyond
2101 CityWest Blvd. Ste. 100, Houston, TX 77042
972-822-9341
joe.hayden@gridbeyond.com

Joe Hayden is the VP of Revenue for North America for Dublin-based GridBeyond. He has lead businesses supporting the electric utility sector for over 20 years and in demand response over the last 5 years during what he terms the 4th major electricity grid transformation.

GB is the world's leading technology platform for helping companies manage distributed and flexible energy resources. The transition to a Net Zero economy is driving significant change in the energy sector and GB helps navigate the opportunities resulting from this transformation. From the rise of renewables generation to the ever-increasing need for grid balancing services that go well beyond traditional Demand Response. The result is a significant requirement for scalable and real-time solutions to manage the carbon friendly, energy system of tomorrow through an automated AI controls-based grid services solution.

Joe will attempt to explain where we are in the transformation of the grid's generation makeup, how carbon reductions have made significant strides balancing against reliability and resiliency challenges never seen before, and certain to increase in severity and frequency over time.

Joe has served in leadership positions with Motorala, GE, Ercisson while focused on the first high-tech industry, electricity generation, transmission, and distribution. He resides as a native Texan and is a graduate of Texas Tech University.