

# Demand-side Energy Toolkit

A guide for getting it done.

*February 2026*

# Foreword

## Acknowledgement of Country

The Climate Leaders Coalition acknowledges and pays our respects to Aboriginal and Torres Strait Islander peoples as the First Peoples of Australia whose ancestral lands and waters we work and live on.

We honour their wisdom and pay respect to Elders past and present and acknowledge the cultural authority of all Aboriginal and Torres Strait Islander peoples across Australia.

**Australia's energy system is undergoing a profound transformation.** Businesses are navigating rising input costs, increasing supply volatility, rapid market changes, and intensifying investor expectations.

Managing the trilemma of energy security, access and cost, and carbon – and environmental sustainability more broadly – is no longer optional. The trilemma is now central to enterprise risk management and long-term competitiveness.

A smooth energy transition requires coordination in new supply and infrastructure, and in demand management – particular challenges in a country vast as Australia.

**Demand-side energy (DSE) provides a strategic response.** By actively managing consumption, businesses can reduce operating costs, cut emissions, potentially gain revenue, and enhance resilience against system shocks.

Well-designed interventions – ranging from energy efficiency upgrades and digital monitoring, to demand response and virtual power plants – can deliver measurable commercial returns while safeguarding business continuity.

## What business leaders need is clarity and practical guidance.

For today's leaders, the challenge is both to decarbonise and to build resilience in a context of shifting market dynamics.

DSE has moved beyond a technical option; it is a strategic lever to reduce costs, manage risk strengthen competitiveness, and even create new revenue opportunities.

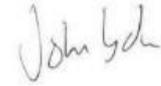
Recognising the opportunity, the Climate Leaders Coalition (CLC) formed a DSE working group comprising CLC member delegates spanning sustainability, operations and functional leadership. Together, we developed this Demand-side Energy Toolkit – a practical guide for business leaders.

The Toolkit is designed to help by:

- Establishing a definition of DSE – what it is, where it applies, and how it delivers value.
- Identifying the barriers and organisational blockers that prevent businesses from acting.
- Highlighting the role of emerging technologies and operational shifts in optimising demand.
- Exploring the opportunity for revenue.



**Anne Sherry**  
Climate Leaders  
Coalition Co-Chair



**John Lydon**  
Climate Leaders  
Coalition Co-Chair



**Beth Dowe**  
CLC Executive  
Director



**Lynette Mayne**  
B Team Australasia,  
Executive Chair

The Toolkit describes the opportunities, quantifies the benefits and provides leaders with a structured pathway to implementation.

It aims to bridge the gap between sustainability commitments and day-to-day operations, turning DSE from an abstract ideal into a set of actionable steps that deliver measurable outcomes.

Acting early and decisively provides multiple benefits: cost savings, quantifiable emissions reductions and enhanced energy security, while positioning organisations for long-term resilience in a rapidly evolving energy system.

We hope that the Toolkit provides you with the clarity, tools and business case insights to embed DSE as a core element of your organisation's strategy and operations.



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**Mark Collette**

Managing Director  
EnergyAustralia



*Demand-side energy is not just about efficiency and risk.*

*It can also unlock new revenue streams by turning flexibility into market value.*

# Executive summary

## The business context

Energy is a strategic enabler for businesses large and small, across all sectors, in all parts of the economy, across Australia.

Businesses everywhere are increasingly exposed to the risks and opportunities of a changing energy market. Availability, cost and decarbonisation is on the mind of many leaders.

The World Energy Council calls this the **energy trilemma**, the challenge of choosing energy sources, whether electricity or gas, that are:

- **Secure** – reliable enough to consistently meet ongoing energy needs.
- **Affordable** – delivered at the lowest practical cost, from production through to supply.
- **Sustainable** – produced and used in ways that reduce emissions and environmental impact.

A balance in these aims will enable the prosperity of energy-intensive business.

*How might businesses, in this complex, evolving context, be an active and strategic participant, rather than passive price-taker?*

DSE is a way for businesses to take advantage of the opportunities and mitigate the risks. Climate change and transition provides the context. The thesis of this toolkit is that it's better for a business to move selectively, strategically and early, to maximise the benefits.

By the time you're paying for energy and carbon, it's too late to move.

Businesses benefit from DSE, and a strong business case will focus on improved reliability, productivity, and flexibility, with lower costs. This boosts organisational value via risk reduction, compliance, capital access, and brand trust, reinforcing social license.

What you do in your business will be based on your exposures, opportunities and constraints. From volatility to advantage, DSE leadership turns energy discipline into predictability, savings, resilience, and enduring credibility.

## Making the case

Your DSE business case can come from:

1. **Cost optimisation:** Maximise ROI by sequencing DSE investments with the fastest payback and lowest total cost of ownership, guided by a marginal abatement cost curve (MACC) or similar planning.
2. **Resilience and continuity:** Limit exposure to electricity or gas shortfalls and price spikes through flexible demand, on-site generation, storage, and fuel switching.
3. **Energy market value:** Lower net energy costs and earn revenue by participating in eligible energy markets.
4. **Scope pathways:** Focus on cost-effective Scope 2 cuts (efficiency, electrification, clean power) and use DSE to enable harder Scope 1 reductions
5. **Collaboration & partnerships:** Use strategic partnerships to expand capability, improve decision-making, and enable faster, more effective DSE deployment

## A toolkit for deciding

Putting it all together is a matter of adding DSE concepts, risks and opportunities to the plans, roadmaps and business cases you're already building.

This Toolkit helps you to

1. Know what demand-side energy is.
2. Understand the energy ecosystem context, risks and opportunities.
3. Identify the DSE uses cases and interventions that may make sense for your business.
4. Build your business case incorporating proven DSE building blocks based on insights from some of Australia's largest organisations.

# The energy ecosystem and your business

## Electricity and fuels

For the purposes of DSE, 'energy' encompasses both electricity and fuels across the ecosystem, including:

- 1. Generation:** renewables, gas and coal-fired.
- 2. Networks:** transmission and distribution.
- 3. Storage:** utility-scale storage, behind-the-meter storage, pumped hydro.
- 4. Supply:** electricity retailers, gas retailers, traders, aggregators.
- 5. Customers:** business and industry end users.
- 6. Supply chain:** Partners where organisations can shape energy use, cut Scope 3 emissions & co-create value.

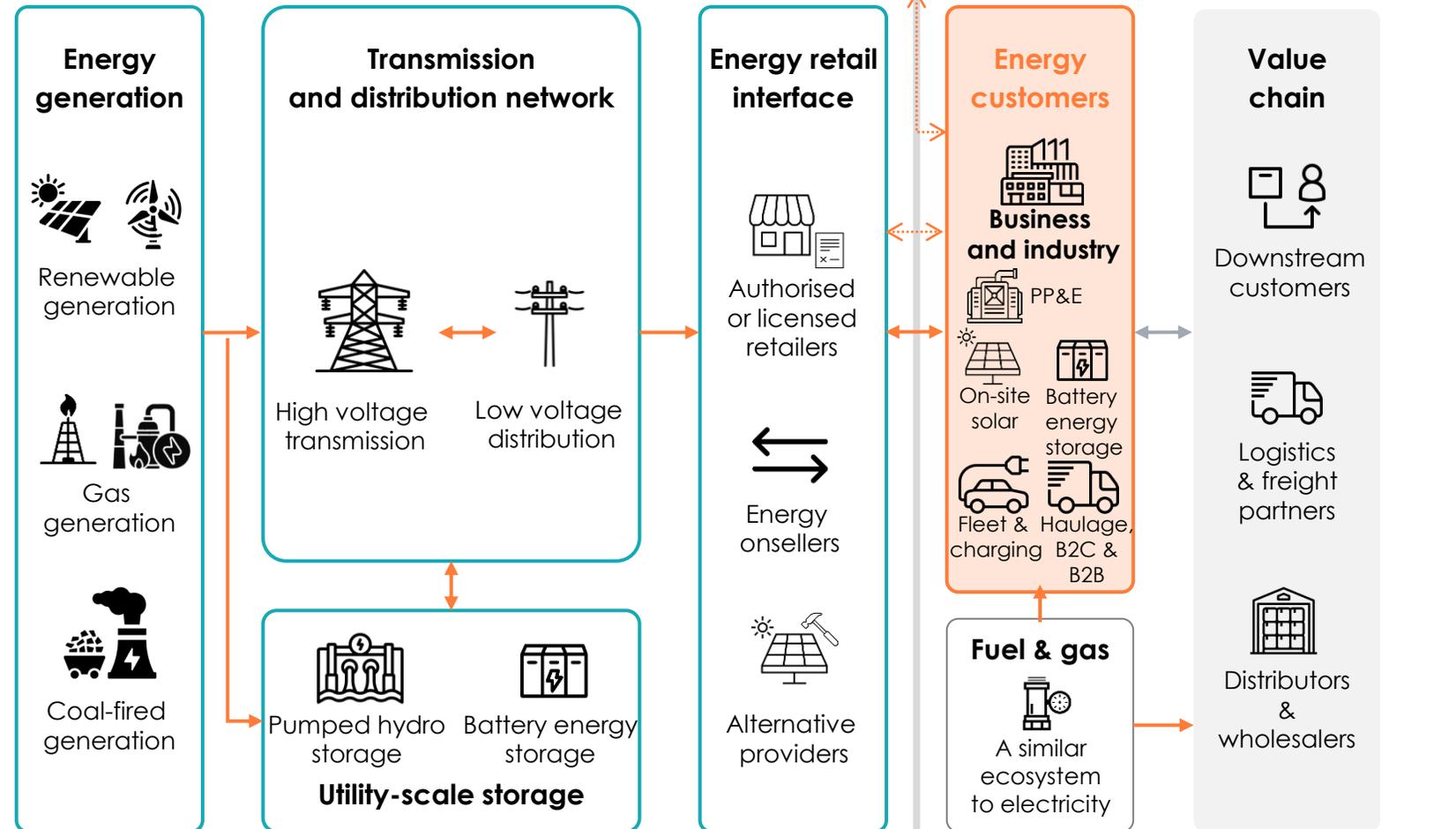
### Ecosystem dynamics

Electricity and fuels have a supply and market interaction that drives energy system risk and opportunity.

### For your operations

The ecosystem should be assessed strategically within the context of your business's operations.

## The energy ecosystem



Sources: NSW Government 'Renewable energy in NSW' [energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/shift-renewables/renewable-energy-nsw](https://energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/shift-renewables/renewable-energy-nsw)

# An indicative DSE business journey

## 1 Strengthen governance and oversight

Assign clear executive accountability. Establish governance across finance, operations and sustainability to ensure accountability and delivery.

## 2 Embed DSE into enterprise risk management

Integrate energy volatility, demand and supply risks and opportunities into corporate risk registers and continuity planning.

## 3 Align with regulatory and disclosure requirements

Incorporate DSE into climate-related disclosures (AASB S2). Use it to demonstrate proactive transition risk management to regulators, investors and other important stakeholders.

### Focus of this Toolkit

## 4 Build the business case for DSE

Develop a compelling case that quantifies resilience benefits, savings and emissions reductions. Frame DSE as a resilience strategy and a competitive advantage. Translate DSE into commercial metrics (EBITDA, valuation multiples, cost of capital, insurance premiums) to compete with other capital projects and to secure C-suite commitment.

Journey stages

Build foundations

1

2

Compliance and transparency

3

Quantify and position value

4

5

Enable delivery

6

7

Deliver and scale

8

## 8 Pilot, scale and share lessons

Start with targeted pilots to validate assumptions, then replicate proven initiatives across the portfolio. Share results internally and externally to build organisational momentum.

## 7 Use advanced technologies to de-risk investment

Deploy AI, digital twins and advanced monitoring to simulate outcomes, strengthen ROI and reduce uncertainty before committing capital.

## 6 Invest in people and skills

Treat DSE as part of a Just Transition. Embed energy literacy across the organisation and reskill staff to ensure operational adoption and ownership.

## 5 Link DSE to financial performance

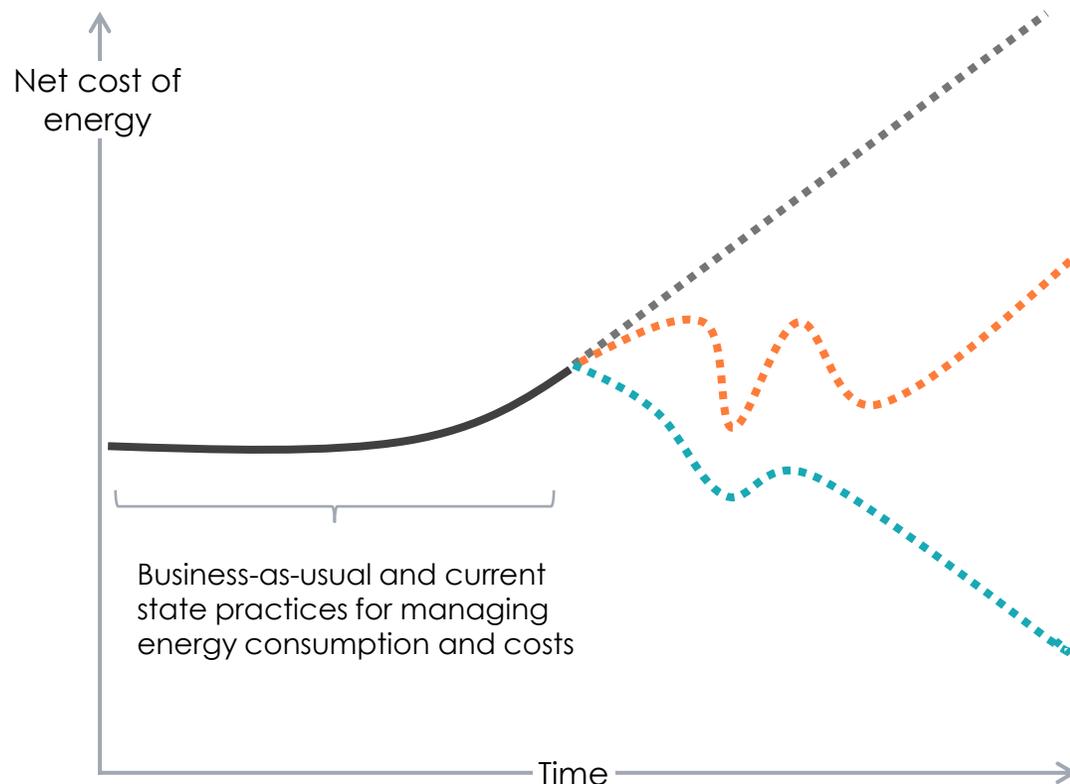
Quantify and track direct financial impacts of unmanaged energy risks. Treat DSE initiatives as value-creating investments rather than compliance projects.

# What if we did nothing?

## The risk and cost of not acting early

Your business choices set your trajectory for advantage or risk.

1. **Energy inaction or 'do nothing'** raises your risk and cost exposure.
2. **Passive management** sees early gains that fade and revert to a 'do nothing' trend.
3. **Strategic investment** cuts intensity, stabilises cost, builds resilience and activates previously unrecognised revenue.



*This is an indicative representation to demonstrate time-cost outcomes of business energy strategies.*

1

### Do nothing

Energy is treated as a utility bill, not a managed input; exposure to price, carbon, and reliability risk compounds over time.

2

### Set-and-forget improvements

One-off fixes and basic procurement break the risk slope, but performance gains stagnate, inherent risks are unaddressed, and revenue opportunities go unclaimed.

3

### Energy as a strategic advantage

Energy is managed as a portfolio of risks and opportunities; intensity and unit cost trend down while resilience and predictability improve.

# How to use this document

## So that you can get started

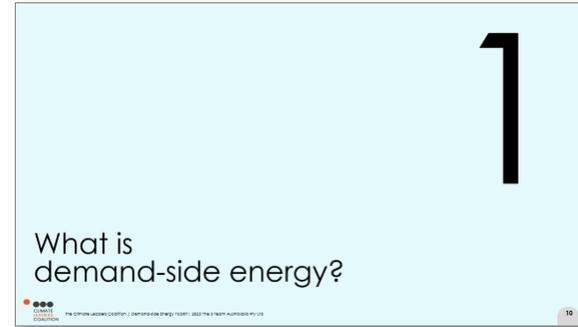
The Toolkit firstly describes **what is demand-side energy** and the wider context of its relevance to business.

Understanding why DSE matters is also based on the **energy system risks and opportunities**, which are rapidly evolving.

The **use cases of your business** are a way to prioritise the DSE interventions in the context of system risks and opportunities.

**Putting your case together** provides a strategic arrangement and typical arguments for the business case that can work for your business.

## The DSE context

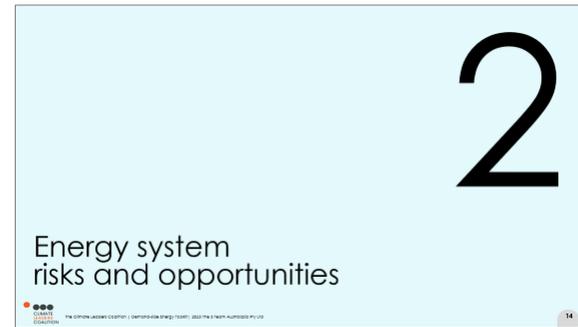


1

What is demand-side energy?

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2

Energy system risks and opportunities

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## Your business response



3

DSE use cases and market mechanisms

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4

DSE action planning and the business case

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# 1

# What is demand-side energy?

# What is demand-side energy?

**Demand-side energy refers to active energy system management, based on interventions behind the meter.**

DSE involves operational changes, asset investments, and active market engagement to optimise energy systems, reduce costs and emissions, managing market- and supply-related risks, and unlocking business opportunities.



*Customers prioritise carbon emissions and price predictability. With demand-side energy measures, customers aren't just passive consumers - they can actively manage risk and unlock new opportunities."*

**Damon Tweedie**  
Head of Sustainability  
EnergyAustralia

**Behind the meter**, DSE includes

- energy investments that enable operational capability, efficiency and resilience, and
- active management of how energy is consumed.

**In front of the meter**, DSE includes

- a site's interactive relationship with its grid, and
- the business trading relationship with the market.

**DSE interventions** can be for

- on-site generation and storage,
- a single operational asset, process or site, or a portfolio,
- fixed assets such as boilers, and HVAC, or
- moving assets, such as vehicle fleet or conveyors.

**DSE strategy** considers

- energy market and transition drivers, risks and opportunities,
- the transition plans and roadmaps of governments, business and industry to create an optimised energy system, and
- management of integrations including transformation, operational needs and risk mitigations.

**DSE enables**

- the customer to be an active participant in the energy market,
- energy system independence and resilience, and
- business to quickly react to rapidly emerging risks and opportunities in the energy system.

# What are examples of demand-side energy interventions

## Investment in new equipment

- On-site renewables (behind the meter).
- On-site energy storage (behind the meter).
- Additional monitoring and control technology on new installations.
- New equipment for DSE, including integration with old equipment.
- Electrification of fleet including on-site vehicles and back-to-base vehicles.
- Electrification of high-heat processes.

## Optimisation of existing equipment

- Site energy demand driver analysis (for both flat and peaky profiles).
- New monitoring and control technology on existing equipment.
- Operational changes for reductions in the cost of energy system.

## Grid optimisation and site infrastructure

- Flexible contracts and new technology for energy demand and load management.
- Time-based optimisation of load.
- Demand-response for customer flexibility to avoid high pricing.
- Grid-controlled assets behind the meter.

## Capability, portfolio and business case

- Revenue and commercialisation opportunities of DSE – with a virtual powerplant (VPP), for example.
- Portfolio analysis, data and AI for energy efficiency.
- Contracts / agreements for co-investment and benefit sharing.
- Roadmap sequencing of investments for optimum cumulative outcomes.
- Adaptive pathways for scenario-based future options.
- Uplift in capability and know-how for better DSE management (across all the above).

For more on demand-side energy interventions see the Appendix, on pages 56 - 57

# Classic first moves to get started

## What to invest in, and why do it sooner

We know the energy system is rapidly changing.

What if you just did one thing?

And for just one reason?



*I've learnt a lot over the years, and the thing that stands out is listening to stakeholders.*

*Then if you've got a plan, test it out, iterate and improve, and if it stacks up, scale it.*

**Michael Shelley**

GM, Green Energy Transition  
Woolworths

## First DSE interventions

### Three operational changes

- Load shifting energy consumption to another time of day, when prices are lower.
- Peak shaving by avoiding load at times of high prices, or by integrating onsite generation or storage.
- Energy provider contracts to enable trading in the wholesale market. Requires on-site infrastructure such as solar and battery storage.

### Three asset investments

- Electrification of on-site fossil-fueled processes to hedge gas and liquid fuel price shocks and focus on a single energy source.
- Install behind-the-meter, site-based solar to lower energy costs and volatility.
- Deploy behind-the-meter, on-site battery storage to shave peaks, enhance resilience, and capture market value.

## Why invest earlier in DSE

### Four quick arguments for action

1. A rapidly decarbonising grid, coal retirement and gas supply uncertainty creates energy-related business risks and opportunities.
2. Business continuity and operational resilience will be increasingly reliant on energy self-sufficiency.
3. DSE enables active participation in the energy market, to mitigate costs and generate revenue through trading and market participation.
4. Delayed transitions risk surprise energy supply price spikes at a time of increasing demand on supply chains for equipment and the risk of rising lead-times.

Combined, the above may mean there's low or even no late mover advantage for your business.

# 2

## Energy system risks and opportunities

# Energy system risks and opportunities

Australia's electricity market is transitioning rapidly as coal exits accelerate, and renewables (wind, solar) grow. This creates variable supply patterns, increasing the importance of storage, firming capacity, and grid stability, while influencing wholesale market prices and reliability

The gas sector is also shifting, with tighter domestic supply, global price exposure, and evolving regulatory settings. Industrial and commercial users face increasing cost and availability pressures, making long-term planning and risk management essential.



*Finding the commercial opportunities of DSE can unlock engagement and agreement.*

**Emily Twigger**

Strategy Lead, Sustainability  
Wesfarmers

## Risks and opportunities

Businesses are exposed to higher price volatility across electricity and gas due to variable renewable output, supply constraints, and global energy market dynamics. Reliability risks are heightened during periods of peak demand or supply stress.

Simultaneously, businesses can access new avenues for cost stability and resilience. Renewable PPAs, gas contracting strategies, on-site generation, and hybrid energy systems help reduce reliance on volatile markets and support long-term operational planning.

Risks and opportunities include:

- Price and supply volatility for electricity and gas
- Rising network and pipeline charges
- Reliability and operational continuity risks
- Opportunities for on-site generation, fuel switching, and energy storage
- Improved sustainability outcomes through low-emissions procurement and efficiency investments

## The role of DSE

Applying DSE thinking to operations and investments can help manage and maintain business outcomes as energy supply conditions evolve.

DSE interventions help businesses respond to changes in electricity and gas markets. Energy efficiency upgrades lower baseline consumption, smoothing exposure to future price fluctuations.

Shifting loads, participating in demand response programs, and optimising energy use in real-time allows businesses to reduce costs during peak periods, improve resilience, and support grid stability.

Processes designed through with a DSE mindset can harmonise the way businesses use energy with energy grid dynamics, improving:

- Security of supply.
- Incorporating behind the meter efficiencies for controlling costs and emissions reduction trajectories.
- Green credentials through generation or storage solutions.

# The business response

Applying DSE thinking to projects can help manage and maintain business outcomes as energy supply conditions evolve. Improving security of supply, controlling costs and emissions reduction trajectories.



*Unstated assumptions, and lack of scenario-based thinking about the future cost and availability of electricity have led to business disengagement with DSE. The answer is in understanding the risks and the opportunities.*

**Lena Parker**

General Manager, Energy Solutions  
Ventia

## Energy system risks

- **Aging infrastructure** as many coal-fired power stations are over 40 years old and increasingly unreliable
- **Emissions** from the electricity grid are not reducing fast enough to meet targets.
- **Gas supply constraints and price volatility:** Declining domestic production, LNG-linked pricing, and pipeline outages can trigger curtailments and sharp cost spikes
- **Grid congestion and transmission bottlenecks** due to increasing demand and new generation in areas lacking transmission capacity.
- **Extreme weather events**, like bushfires, floods, and heatwaves, pose growing threats to energy infrastructure.
- **Policy and market uncertainty** at federal and state levels can undermine rather than enhance investor confidence.
- **Frequency and system stability** due to increases variable renewable generation and inverter-based resources. To some extent this has been improving as big batteries come online, but local context is important.

## Protecting the business

- **Flexible demand** achieved through DSE initiatives helps balance the grid when renewables fluctuate.
- Behind-the-meter renewable generation from solar can assist **in reducing Scope 2 emissions**, and through electrification **reducing Scope 1 emissions**.
- **Shifting consumption** to match availability of supply. For example, this can be achieved via energy storage, time of use EV charging or introducing dual fuel approaches.
- Distributed energy generation and storage systems can provide **enhanced resilience**. If a bushfire or high winds knock-out network infrastructure, local commercial scale solar and batteries can help business continuity or, in extreme events, even provide community support.
- **Policy and Market Uncertainty**, taking more control of energy spend via DSE can help limit or 'hedge' exposure to external policy changes.
- **System Stability and Frequency Control**. Inverter-based technologies (like solar and batteries) can provide synthetic inertia and fast frequency response.

# An energy ecosystem view

The move away from baseload coal generation to variable renewable generation supported by energy storage systems has led to a greater divergence between intraday wholesale electricity prices.

The opportunity arises to secure cheap power from the grid when there is an abundance of renewable energy from the grid, to avoid exposure to high prices in the evening or even opportunities to sell back into the grid at high prices to create revenue.



*Each year the energy market changes. For some businesses the carbon costs change too, and the potential liability rises higher.*

**Energy Analyst**

A chemicals industrial

## Energy system opportunities

- **Flexible demand.** Increasing demand in the middle of the day to take advantage of lower wholesale energy prices and lowering grid demand in the evening to reduce costs.
- **Reducing stress on transmission and distribution systems.** Growing electricity demand from population increase and electrification means LNSP are looking at ways to incentivise useful local generation and demand shifting (two-way network charging).
- **Time matching** renewable generation with demand for renewable product certification such as Product Guarantee of Origin.
- **Supply and cost certainty.** Since 2020 the Australian energy market has seen significantly low prices (COVID 2020) and record high prices (2022 energy supply crisis). Through smart DSE solutions, businesses can be better positioned to take advantage of low prices (abundant renewable supply) and less impacted by high prices (supply instability).

## Managing cost, selling back

- DSE provides flexible demand via **behind the meter generation and storage** which can be used to the benefit of the consumer to manage energy costs, many local network service providers (LNSPs) are **incentivising customers to consume less in peak times**. The incentives can be in the form of fixed payments or reduced network tariffs.
- **Control over electricity generation sources** via behind the meter generation. For some globally traded products (green hydrogen & derivatives) there is growing interest in matching renewable energy generation with demand in making the product.
- **Investment and budget certainty.** Retail energy contracts generally only offer three years of forward contract prices. DSE provides more cost certainty over a longer period as CAPEX is known upfront and DSE is used to manage OPEX variability.

# Emerging areas for DSE

## There's more to consider

This Toolkit has focused on proven, demonstrated DSE approaches and business case arguments for 2025-26.

Sometimes the detail of government policy matters, and changes in technology too have an impact.

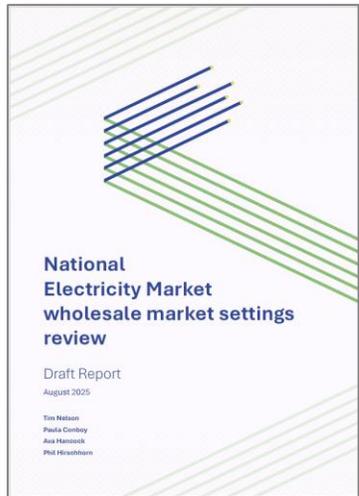
Your own context will determine the importance of these emerging themes and considerations, that may change aspects of the DSE business case over time.

## Market context

- **The NEM wholesale market settings review** ([DCCEEW, 2025](#)) recommends actions and a roadmap for reforms to the NEM wholesale market, to deliver reliable, competitively-priced, safe and secure electricity.
- **Gas risks and opportunities.** Changes in gas infrastructure over the next five years will affect the cost of gas and supply confidence, especially in the Victorian market. This may quickly change the DSE business case.
- **Australia's 2035 NDC, Net Zero Plan, and Energy and Electricity Sector Plan.** The 2035 NDC and sector plans, including for electricity, provide further context for considering future investment in DSE. The *Demand-side Statement of Opportunities (DSOO)* is a new initiative in the Electricity and Energy Sector Plan ([DCCEEW, 2025](#)).
- **Renewable Energy Certification.** A hypothesis held but not explored by this project is that there may be a shift in energy market behaviour, such that time of use carbon will become more important than the Reliability and Emergency Reserve Trader scheme (RERT).
- **The Solar Sharer scheme** ([DCCEEW, 2025](#)), while not directly impacting business, is contextually relevant in considering how the energy market operates.

## Technology and planning

- **Artificial intelligence, data and automation.** AI is rapidly evolving will increasingly, productively integrated with technology solutions, such as BMS and portfolio management software.
- **Technology readiness.** The state of capability and commercial availability of new technology at more competitive pricing can create new opportunities for behind-the-meter investment. This can change the business case for DSE interventions, and it's advisable to keep an active watch.
- **Adaptive planning approaches** enable conditional, scenario-based planning, with multiple pathways and trigger-based responses for the dynamics and uncertainties of future grid, technology, investment and policy context.



## NEM wholesale market settings review

DCCEEW, 2025 [1]



*Price volatility is a fundamental feature of [the] market design, allowing prices to reflect the real-time supply–demand balance and the level of resource scarcity.*

### Sources

[1] Tim Nelson et al *National Electricity Market wholesale market settings review*, 2025 [storage.googleapis.com/files-au-climate/climate-au/p/rij36f491a5284dc4c74959e/page/NEM\\_Review\\_Draft\\_Report\\_August\\_2025\\_Final\\_2.pdf](https://storage.googleapis.com/files-au-climate/climate-au/p/rij36f491a5284dc4c74959e/page/NEM_Review_Draft_Report_August_2025_Final_2.pdf)

# 3

## DSE use cases and market mechanisms

# Use case efficiency and asset transition

## Where to use DSE

DSE opportunities span a business's assets, operations and grid interactions. Understanding these layers shows how flexibility delivers operational and commercial value. DSE value is unlocked through three main areas:

- 1. Physical asset use cases:** There are a variety of common use cases that are supported by solutions and tactics across storage, flexibility and efficiency
- 2. Operational examples:** Applying DSE tactics in real settings outlines how this occurs
- 3. Grid services and demand response:** As flexibility becomes dependable, businesses can participate in grid services.

Finally, to unlock value, these use cases require integration from a **virtual power plant (VPP)**. A VPP can integrate these layers by aggregating and optimizing flexible assets, enabling businesses to access grid services.

## Creating value across assets, operations and markets

### Physical asset use cases

Understanding the use case context for DSE enables consideration of potential interventions in the normal lifecycle of asset renewal. Common use cases include:

- Refrigeration, data processing, air conditioning, hot water, industrial heat, compressed air, lighting and electrification



Pg 30: Asset use case mapping

### Operational Examples

Applying DSE tactics in real settings showcase where complementary opportunities exist. Examples in a supermarket and looking at the residential market highlight this:



Pg 31: Asset use case mapping



Pg 38: Learning from residential customers

### Grid Services & Demand Response

Market mechanisms, including grid services such as demand response and ancillary services, reward flexible energy use, helping businesses cut costs and generate new revenue streams. This complementary to the wide variety of typical upgrades and efficiency opportunities that businesses typically explore.



Pg. 32: Grid services and demand response overview

### Virtual Power Plants

A Virtual Power Plant connects assets and operations to markets by aggregating and optimising flexible loads. It enables:

- 1 Market access for individual sites**
- 2 Automated control across assets**
- 3 Monetisation of flexibility at scale**

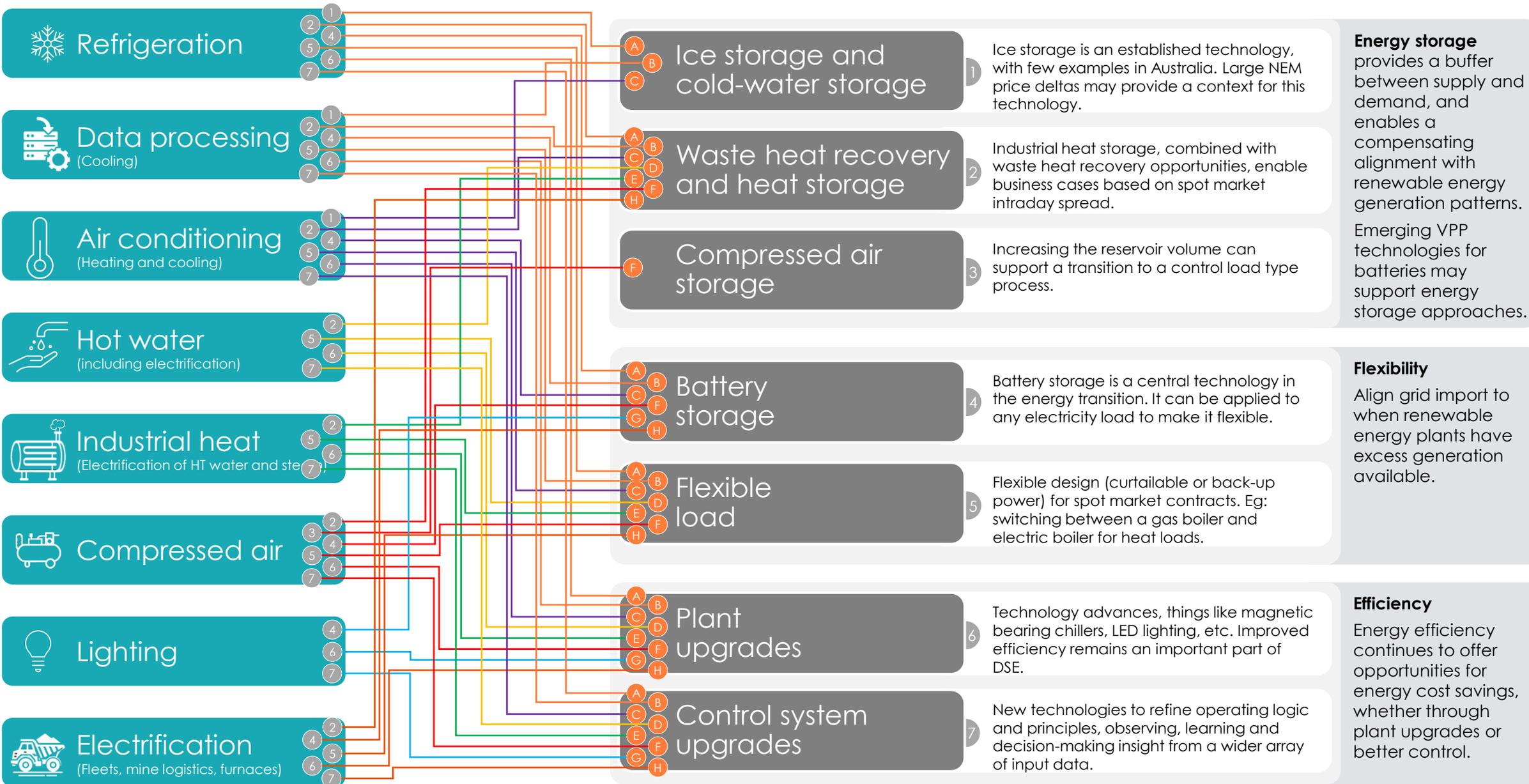
# Physical asset use case examples

DSE Solutions ↓	Physical Asset Use Cases								Tactics ↓
	Refrigeration	Data processing (cooling)	Air conditioning (Heating & cooling)	Hot water (incl. electrification)	Industrial heat (Electrification of hot water & steam)	Compressed air	Lighting	Electrification (Transport fleets, mine logistics, furnaces)	
Ice storage and cold-water storage	✓	✓	✓	X	X	X	X	X	<b>Energy storage</b> Provides a buffer between supply and demand, enabling alignment with renewable energy generation patterns.  Emerging VPP technologies for batteries may support energy storage approaches
Waste heat recovery and heat storage	✓	✓	✓	✓	✓	✓	X	✓	
Compressed air storage	X	X	X	X	X	✓	X	X	
Battery storage	✓	✓	✓	X	X	X	✓	✓	<b>Flexibility</b> Align grid import to when renewable energy plants have excess generation available
Flexible load	✓	✓	✓	✓	✓	✓	X	✓	
Plant upgrades	✓	✓	✓	✓	✓	✓	✓	✓	<b>Efficiency</b> Energy efficiency continues to offer opportunities for energy cost savings, whether through plant upgrades or better control.
Control system upgrades	✓	✓	✓	✓	✓	✓	✓	✓	

## Business use cases

## DSE solutions

## Tactics



# DSE at a supermarket site case study

## How it all comes together

In some cases – such as with this supermarket site – there may be many concurrent opportunities for a range of complimentary investments.

These can be done together or in a staged program of works, across a portfolio.

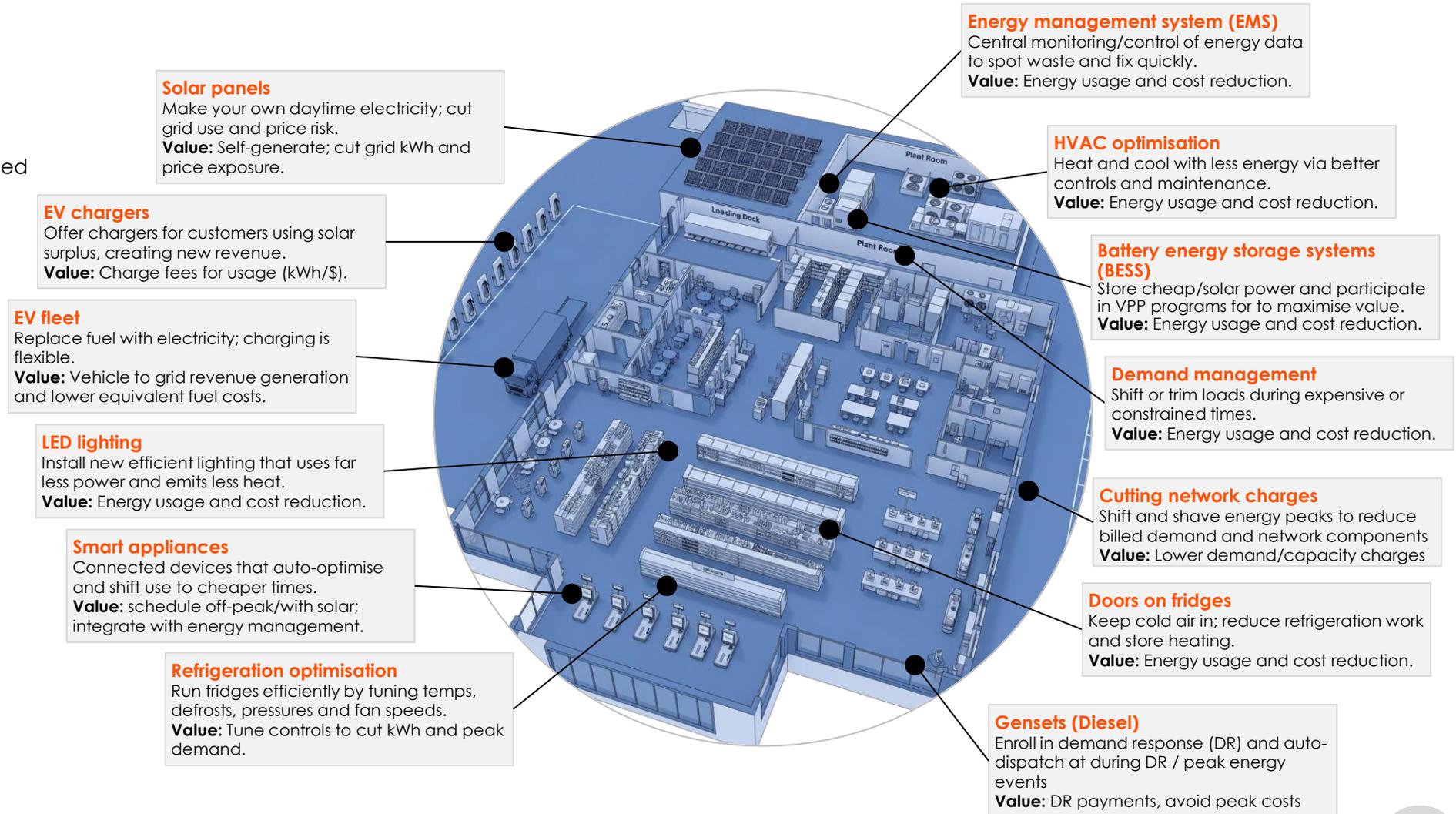


Once we understand the customer use cases, the DSE options become clear. DSE has to work for what the business already does with its energy.

### Tim Ammundsen

Senior Associate, Power & Energy Transition, Worley

## Opportunities at a single site



# Grid optimisation, demand response and market mechanisms

## Market mechanisms for DSE

As our energy system evolves to include cleaner more sustainable generation, the picture around supply and demand imbalances is becoming more complicated.

Market mechanisms and supplier options designed to reward load flexibility are also evolving.

This is creating new opportunities for DSE design, where load flexibility can be as important as energy efficiency.

An example is when over supply of renewables such a solar can drive low electricity prices, the benefit of energy efficiency (lower carbon & lower cost) is diminished.

**Note:** To access grid market mechanisms, businesses need coordinated control and integration through a VPP. The following slides show how a VPP enables participation and unlocks this value.

## Flexible contracts

Negotiating new energy contracts with energy providers to adjust power usage according to demand on the grid, often using new technologies (such as those developed for VPP) to manage these changes efficiently.

Traditionally, a simple pattern of peak (day) and off-peak (night) tariffs were used to encourage more balanced usage behavior. Today, the patterns of supply and demand imbalances are getting more complicated, as we shift to renewable generation.

This creates an opportunity to collaborate with your Retailer, developing strategic and new approaches that aim to balance a site's specific energy needs with energy supply.

For example, some energy retailers are developing contracting options for large market customers, providing tailored approaches for flexible loads.

## Demand response

Reducing energy usage temporarily during peak periods in response to supply shortages or high demand. There are supplier, market operator (AEMO) and third-party demand response (DR) aggregator-based options and solutions. Load curtailment can be achieved by shutting processes down or by switching to back-up generation.

- **Suppliers:** many retailers offer Demand Response options, where businesses are rewarded for curtailing their load in response to high electricity market prices.
- **Market Operator:** Generally provided through your retailer, AEMO operate the Reliability Emergency Response Trader (RERT) and Interim Reliability Reserve (IRR) programs, where AEMO make payments to businesses curtailing loads in response to identified Lack of Reserve (LOR) conditions.

- **3<sup>rd</sup> party demand response (DR)** aggregators enable businesses to participate in DR and selected ancillary service markets. These services reward rapid load reduction or control, allowing flexible sites to earn value during high-price or system-stress events
- **The National Electricity Market (NEM)** has a Market Price Cap (MPC) of \$20,300/MWh, while typical prices sit around \$100–\$200/MWh. This large gap means reducing load during extreme price events can generate significant DR value.

### A worked example

A site with a 10 MW flexible load normally pays about \$1,500 for one hour at ~\$150/MWh.

If it reduces that load during an MPC event (\$20,300/MWh), the DR payment is: 10 MW × \$20,300/MWh = \$203,000.

The value is significant and must be balanced against production and operational impacts.

# The VPP ecosystem

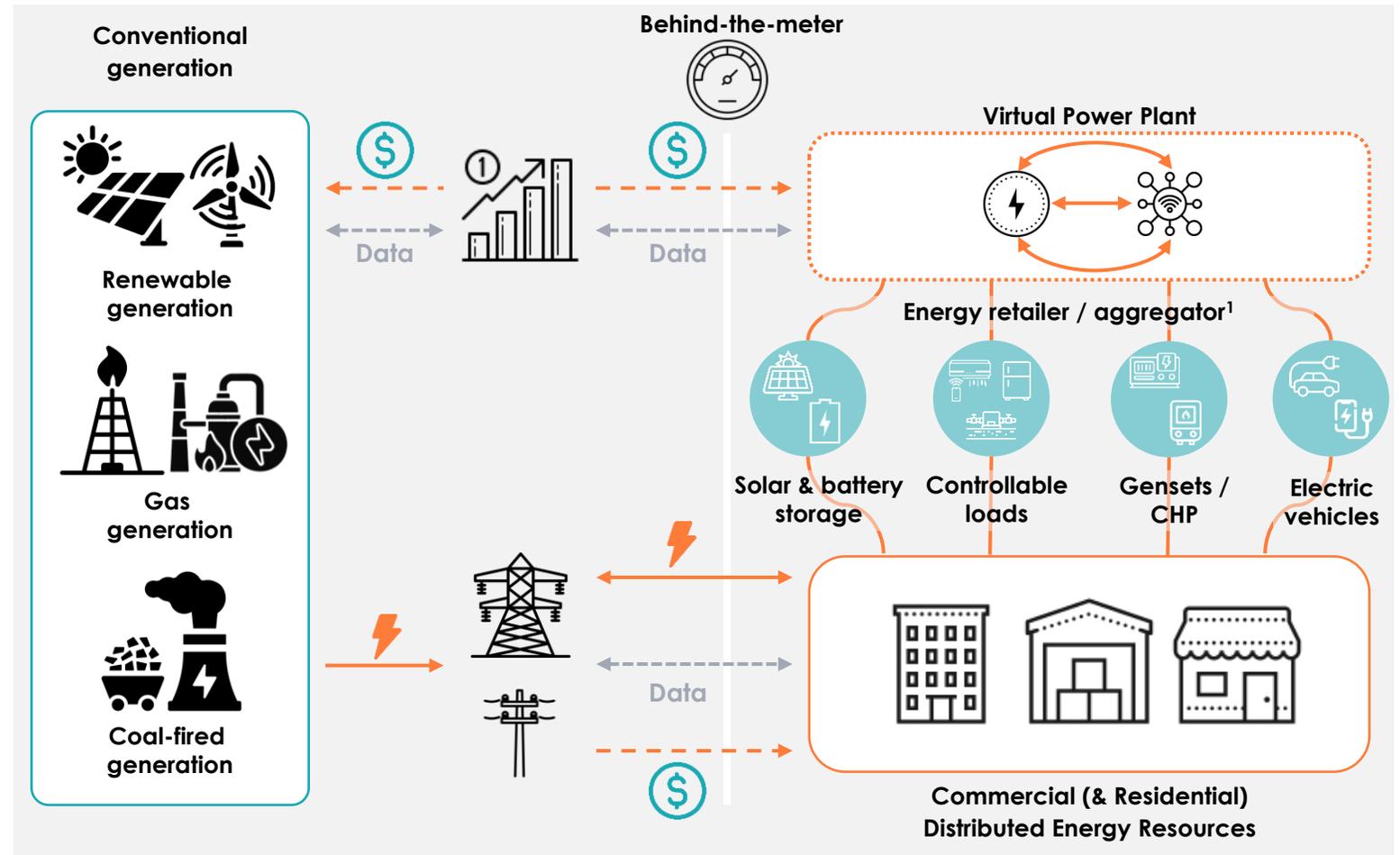
## What is a VPP

A Virtual Power Plant (VPP) is an aggregation of system resources (such as decentralised generation, storage and controllable loads) coordinated to deliver services for power system operations and electricity markets.

## How a VPP works

VPPs rely on a combination of elements: aggregation, centralised control, market participation and incentives for customers to participate. .

- 
**Aggregation.** A VPP collects and aggregates energy from aggregations of distributed energy resources (DERs).
- 
**Centralised control.** A central software platform controls and manages these resources together, acting as a single operator.
- 
**Market participation.** The aggregated VPP acts as a single entity in the energy market.
- 
**Value upside.** Businesses participating in a VPP can be compensated with direct payments or bill credits for their contribution to grid services.



**Note:** Aggregators bundle DERs (also known as Consumer Energy Resources) to engage as a single entity – a virtual power plant – in power or service markets.

# Commercial asset participation in VPPs



## Asset and value opportunities of VPPs

	1	2	3	4	5
	Solar PV	Controllable Loads (e.g.: HVAC/chillers)	EV Charging	Gensets / CHP	Battery Energy Storage (BESS)
Increasing control and dispatchability					
<b>Description</b>	On-site renewable generation, typically daytime, variable	Equipment you can turn up/down or shift (cooling, fans, pumps, cold rooms) via BMS / controls	Smart chargers that can slow, pause, or schedule charging; potential for vehicle-to-grid applications in the future	On-site engines/turbines that are dispatchable to support backup requirements and energy market services	Dispatchable storage to shift load, shave peaks, and provide fast grid supporting services
<b>Value streams</b> A non-exhaustive list.	Energy Bill Savings Energy Market Participation Grid Support Backup / Resilience Carbon Emission Reduction	Energy Bill Savings Energy Market Participation Grid Support Backup / Resilience Carbon Emission Reduction	Energy Bill Savings Energy Market Participation Grid Support Backup / Resilience Carbon Emission Reduction	Energy Bill Savings Energy Market Participation Grid Support Backup / Resilience Carbon Emission Reduction	Energy Bill Savings Energy Market Participation Grid Support Backup / Resilience Carbon Emission Reduction
<b>Commercial value to business</b>	<ul style="list-style-type: none"> <li>Lower daytime energy bills</li> <li>Hedge price rises</li> <li>Make and claim renewable certificate</li> </ul>	<ul style="list-style-type: none"> <li>Fast savings using what you already have</li> <li>Get paid to reduce use at peak energy price times</li> </ul>	<ul style="list-style-type: none"> <li>Keep charging costs down</li> <li>Avoid demand spikes</li> <li>Support fleet growth</li> </ul>	<ul style="list-style-type: none"> <li>Strong backup for outages</li> <li>CHP can cut costs if the business needs heat and/or steam</li> </ul>	<ul style="list-style-type: none"> <li>Most flexible tool to cut energy bills</li> <li>Earn revenue from market services or energy arbitrage</li> </ul>
<b>Decision-making considerations</b>	<ul style="list-style-type: none"> <li>Space and grid connection limits set by local DNSP;</li> <li>Exports may be capped</li> <li>Feed-in rates for large C&amp;I are low or negotiated</li> </ul>	<ul style="list-style-type: none"> <li>Comfort/product quality first; set safe limits and schedules</li> <li>Needs tie-in to BMS/SCADA systems for usage</li> </ul>	<ul style="list-style-type: none"> <li>Manage to avoid coincident peaks</li> <li>Site electrical capacity and upgrades typically required</li> <li>Reliable communication required for smart control</li> </ul>	<ul style="list-style-type: none"> <li>Fuel, maintenance, noise, and emissions a factor in usage</li> <li>Permits and run-hour limits typically apply to usage</li> </ul>	<ul style="list-style-type: none"> <li>Safety and standards and utility approvals required</li> <li>Space and ventilation/fire systems needed</li> <li>Battery life and warranty depend on cycles</li> </ul>

# Value pools in VPPs

## How VPPs generate value

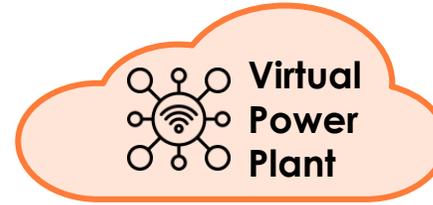
There are six value streams available to a VPP.

**For customers:** businesses with installed assets or controllable loads on their sites, there are four value streams available:

1. Self-consumption
2. Cut peak demand
3. Time-shift by energy price
4. Energy-grid frequency support

**For service providers:** optimisation and support for grid stability through technology platforms or energy generation across a portfolio. There are the two value streams:

1. Lower cost-to-serve
2. Energy-grid network support



	Value stream	Description	What does the VPP do?	How is value created?
Commercial business availability	<b>Self-consumption</b>	Generate and store energy on-site (e.g.: solar and battery) for use in site-based facilities.	Decides when to use, store, or export surplus energy.	<ul style="list-style-type: none"> <li>• Buy less from the grid and lower bills</li> <li>• Reduce exposure to price spikes</li> <li>• Utilise battery charge to lower bill cost based on tariff structure</li> </ul>
	<b>Cut peak-demand</b>	Use the battery (often with solar) to reduce short spikes in usage that drive demand charges.	Decides when to use and store battery energy based on price spikes	<ul style="list-style-type: none"> <li>• Lower demand charges on an energy bill</li> </ul>
	<b>Time-shift by energy price</b>	Utilising an installed battery to capture price variability.	Charges when power is cheap and uses battery energy when it's expensive	<ul style="list-style-type: none"> <li>• Reduce average energy cost</li> <li>• Avoid high-price periods</li> <li>• Improve battery payback by capturing price spreads</li> </ul>
	<b>Energy-grid frequency support</b>	Bidding in available battery (or pooling energy consumption assets) capacity into contingency FCAS markets.	Bids this capacity into FCAS markets and the battery (or assets) respond within seconds when called	<ul style="list-style-type: none"> <li>• Earn new revenue</li> <li>• Add a new income stream beyond bill savings.</li> <li>• VPP manages compliance so site operations aren't disrupted</li> </ul>
Other	<b>Lower cost-to-serve</b>	VPP forecasts and steers customer loads and batteries so the retailer faces fewer expensive moments in the market and simpler operations.	Coordinates loads and batteries to cut the retailer's cost to serve	<ul style="list-style-type: none"> <li>• Reduce wholesale spot exposure and hedging needs.</li> <li>• Lower balancing/ancillary costs and deviation risks</li> </ul>
	<b>Energy-grid network support</b>	Supporting short term disturbances in the energy grid.	Aggregates assets and is paid for availability and activation	<ul style="list-style-type: none"> <li>• Revenue generated from availability and participation</li> </ul>

**Note:** FCAS refers to *frequency control ancillary services*. These services support the balance of frequency across the energy grid in response to deviations in supply and demand of energy

# A business case example

## New business model value at a commercial or industrial site

### Objective

Reduce energy costs, earn new revenue, and improve resilience by connecting onsite solar, battery, and flexible loads at a single site to a VPP.

### Assets



Solar PV



Battery Energy Storage

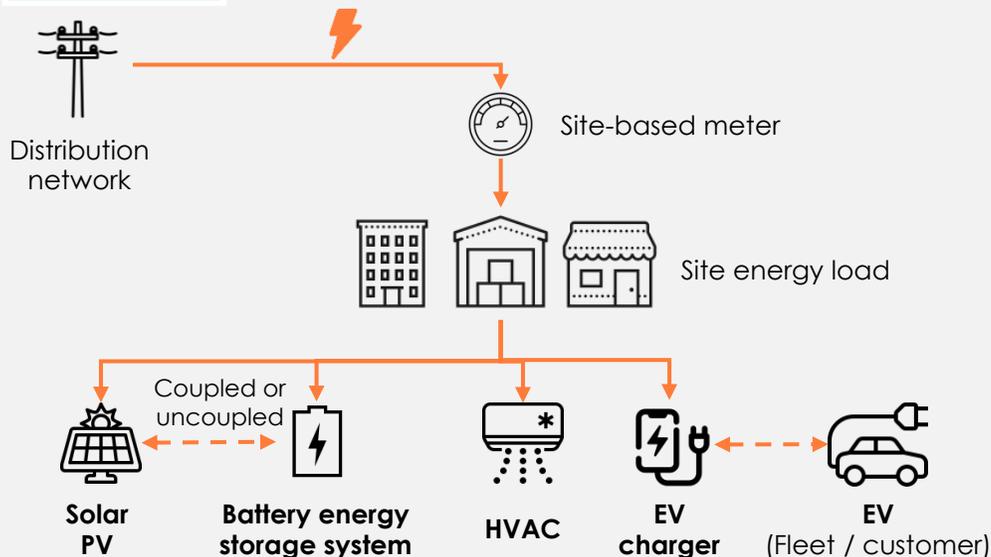


HVAC



EV Chargers

### Schematic



### Available value pools

- ✓ **Self-consumption**
- ✓ **Cut peak demand**
- ✓ **Time-shift by energy price**
- ✓ **Energy grid frequency support**
- Lower cost-to-serve
- Energy-grid network support

### Requirements

- **Fit-for-purpose assets:** solar, correctly-sized battery, flexible loads that can be controlled.
- **Reliable metering and connectivity:** meters, telemetry, internet for real-time VPP control.
- **Market and network readiness:** registrations, export limits, compliance tests and safety certifications.

### Business model examples

A non-exhaustive list.

#	Model	How the value pool works
1	<b>Solar PPA with battery add-on</b>	<ul style="list-style-type: none"> <li>• Third party funds/owns assets (capacity fee or revenue share).</li> <li>• Self consumption, cut peak demand and time shift energy.</li> </ul>
2	<b>Battery-as-a-service</b>	<ul style="list-style-type: none"> <li>• Provider owns battery, and you pay a monthly fee.</li> <li>• Cut peak demand, time shift energy and frequency support.</li> </ul>
3	<b>Shared-savings VPP</b>	<ul style="list-style-type: none"> <li>• You own assets; VPP runs them for a % of verified savings / revenue.</li> <li>• All value pools available.</li> </ul>
4	<b>Retailer integrated VPP</b>	<ul style="list-style-type: none"> <li>• Retailer controls dispatch via VPP; you get bill credits/tariff benefits.</li> <li>• Cut peak demand and time shift energy.</li> </ul>

### Business case summary

Connecting onsite solar, battery, and flexible loads to a VPP can lower energy bills and demand charges, avoid price spikes, earn new revenue and boost resilience.

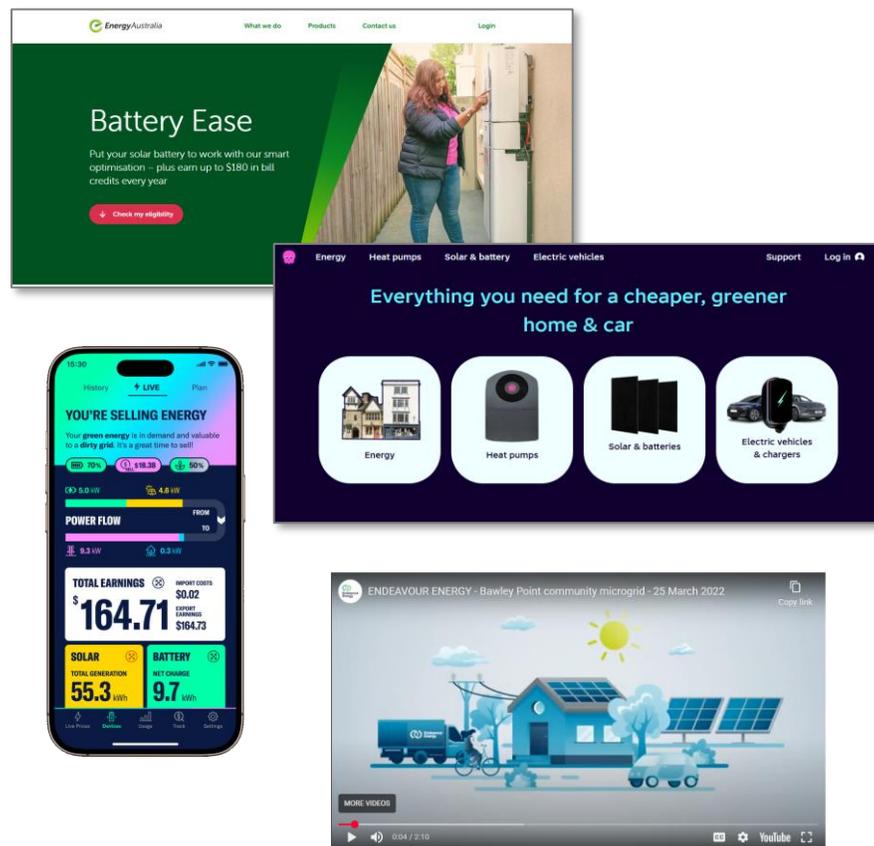
# Learning from residential energy customers

## Residential customers on VPPs

Businesses can learn from residential customers.

Using installed solar and battery storage behind-the-meter, combined with a retail relationship offering VPP, in cases managed through app software for market-connected interactions, consumers are entering into a beneficial trading relationship with their retailer, and even the wholesale market grid.

In your own business there may be employees already on this journey for their home energy.



Clockwise:

- EnergyAustralia's [Battery Ease](#) consumer VPP [1]
- [Octopus Energy](#) (UK) packages [2]
- Endeavour Energy's [Bawley Point community microgrid](#) [3]
- [Amber Electric's](#) consumer wholesale market app [4]

## The residential customer pathway

Residential customers have perhaps the simplest upgrade pathway to accessing the benefits of VPPs.

1. Install solar PV.
2. Install a BESS.
3. Enter a VPP relationship with an energy retailer.
4. Let the retailer do the work, or actively day-trade.

Some retailers offer all-inclusive packages for the solar and battery, in other territories even an EV can be included.

### Sources

- [1] [home.energyaustralia.com.au/battery-ease](https://home.energyaustralia.com.au/battery-ease)  
 [2] [octopus.energy/](https://octopus.energy/)  
 [3] [endeavourenergy.com.au/modern-grid/projects-and-trials/community-microgrid-for-nsw-south-coast](https://endeavourenergy.com.au/modern-grid/projects-and-trials/community-microgrid-for-nsw-south-coast)  
 [4] [www.amber.com.au/](https://www.amber.com.au/)

# 4

## DSE action planning and the business case

# Strategic approaches to the DSE business case

## Five approaches

The business case should make strategic sense to the business. This can be achieved through five strategic approaches:

1. Operational efficiency and low-hanging fruit
2. Smart procurement and hedging
3. Capital projects and retrofit efficiency
4. Renewable energy and carbon-free sourcing
5. Enabled by governance and strategic enablement

DSE interventions across themes can be combined and sequenced in a staged works program for timely and optimum beneficial outcomes.



*Business cases deliver value when they align with strategic ambition, are grounded in operational realities, and fit governance, making them actionable and investable*

**Daniel McKenzie**

Energy Strategy Domain Lead, Global Sustainability Impact Centre, PwC Australia



What is in this section?

Strategy slides are paired with execution slides.

## Strategic approach

Drivers	Risks	Opportunities
<ul style="list-style-type: none"> <li><b>Energy price volatility</b> – Exposure to fluctuating energy markets increases operational costs, necessitating cost containment</li> <li><b>Regulatory compliance</b> – Mandates (e.g. energy efficiency standards) compel businesses to minimise waste or face penalties</li> <li><b>Competitive pressure</b> – Benchmarking against industry peers drives adoption of efficiency best practices</li> </ul>	<ul style="list-style-type: none"> <li><b>Operational disruption</b> – Implementation of new processes/technologies may temporarily reduce productivity</li> <li><b>Behavioral resistance</b> – Cultural inertia or employee reluctance to adopt new workflows can limit savings</li> <li><b>Invest or cash-in tension</b> may weigh against timely action in favour of revenue. Savings framed ROI may lack higher approval compared with growth-focused without thorough analysis</li> </ul>	<ul style="list-style-type: none"> <li>Use cases and interventions</li> <li>Lighting systems</li> <li>HVAC</li> <li>Compressed Air</li> <li>Steam systems</li> <li>Pumping systems</li> <li>Demand-base controls</li> <li>Set-point strategies</li> <li>Heat recovery</li> <li>Waste heat utilisation</li> </ul>

**Example initiatives (per initiative)**

- Locking thermostats or limited override duration** – Unauthorised or poorly informed manual overrides often cause inefficient cycling or unnecessary heating / cooling
- HVAC modulated by CO<sub>2</sub> or occupancy** – Utilisation of demand-controlled ventilation increases/decreases air supply based on detected occupancy or indoor air quality
- Closing thermodynamic loops** – Redirecting thermal energy that one process discards to satisfy the heating/cooling needs of another

Return-on-investment focus	Risk mitigation	Scalability and replicability
Immediate cost reduction (e.g. 10-20% savings via efficiency)	Lower exposure to price volatility (e.g. reduce energy cost volatility by 15-30%)	Replicable across sites/operations via pilot programs in high-energy sites before enterprise rollout.

Introduces the strategic approach to energy and its value for organisations, outlining drivers, risks, opportunities, example initiatives, and the business-case rationale

## Typical steps to execute

**Typical steps to deliver initiatives**

- 1. Baseline and goals/risks** – Quantify current use / cost / emissions and create baselines across site types and geographies.
- 2. Rapid diagnosis** – Use walkthroughs and data review to find asset scheduling, setpoints, and controls issues.
- 3. Prioritise and plan** – Rank quick wins by impact vs ease (or other metrics) and assign project owners to carry out work.
- 4. Execute quick wins** – Implement schedule resets, setpoint tuning, controls fixes, and minor retrofits with minimal disruption.
- 5. Verify and sustain** – Measure savings, update system operating procedures, lock controls, and replicate across sites and geographies.

Example datasets required	Typical internal touchpoints	Typical external touchpoints
<ol style="list-style-type: none"> <li>12-24 months utility bills and tariffs (TOU/demand charges)</li> <li>Internal meter data (mwh and any sub-meters)</li> <li>BMS/SCADA trends (setpoints, runtimes, temperatures)</li> <li>Asset register (HVAC, lighting, compressed air, boilers, motors), hours-of-use</li> <li>Maintenance logs, override lists, commissioning reports</li> <li>Occupancy/shift schedules; production plans</li> </ol>	<ul style="list-style-type: none"> <li>Site operations / facilities managers</li> <li>Controls / automation (BMS / SCADA) engineer</li> <li>Energy team / PwC</li> <li>Finance (benefit/cost) team</li> <li>HR/Comms (behavioural)</li> </ul>	<ul style="list-style-type: none"> <li>BMS / controls integrator</li> <li>Energy utility / retailer account manager (partly, DR)</li> <li>Marketing data provider</li> <li>ODM / service contractor</li> </ul>

Introduces the strategic approach to energy and its value for organisations, outlining drivers, risks, opportunities, example initiatives, and the business-case rationale.

# Strategic approach

1

## Operational efficiency and low-hanging fruit

### Overview

Many organisations overlook the substantial gains available through better controls, smarter equipment scheduling and minor process improvements that require little to no capital.

Industry benchmarking consistently shows up to ~10% in reductions in energy usage can be achieved through operational changes alone (WEF, 2024).

### Why is this important?

 **Cost resilience:** Reduces exposure to volatile energy prices (e.g., recent spikes in Australian wholesale electricity markets)

 **Sustainability goals:** Immediate emissions cuts align with Australia's Safeguard Mechanism and corporate net-zero pledges

 **Operational agility:** Quick wins free up capital for strategic investments



 Drivers	 Risks	 Opportunities
<ul style="list-style-type: none"> <li>• <b>Energy price volatility</b> – Exposure to fluctuating energy markets increases operational costs, necessitating cost containment</li> <li>• <b>Regulatory compliance</b> – Mandates (e.g.: energy efficiency standards) compel businesses to minimise waste or face penalties</li> <li>• <b>Competitive pressure</b> – Benchmarking against industry peers drives adoption of efficiency best practices</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Operational disruption</b> – Implementation of new processes/technologies may temporarily reduce productivity.</li> <li>• <b>Behavioral resistance</b> – Cultural inertia or employee reluctance to adopt new workflows can limit savings</li> <li>• <b>Invest or cash-in tension</b> may weigh against timely action in favour of revenue. Savings-framed ROI may face tougher approval compared with growth-framed without thorough analysis.</li> </ul>	<p>Use cases and interventions</p> <ul style="list-style-type: none"> <li>• Lighting systems</li> <li>• HVAC</li> <li>• Compressed Air</li> <li>• Steam systems</li> <li>• Pumping systems</li> <li>• Demand-base controls</li> <li>• Set-point strategies</li> <li>• Heat recovery</li> <li>• Waste heat utilisation</li> </ul>



### Example Initiatives (Not exhaustive)

1. **Locking thermostats or limited override duration** – Unauthorised or poorly informed manual overrides often cause inefficient cycling or unnecessary heating / cooling
2. **HVAC modulated by CO<sub>2</sub> or occupancy** – Utilisation of demand-controlled ventilation increases/decreases air supply based on detected occupancy or indoor air quality
3. **Closing thermodynamic loops** – Redirecting thermal energy that one process discards to satisfy the heating/cooling needs of another



### Business case arguments

Return-on-investment focus	Risk mitigation	Scalability and replicability
Immediate cost reduction (e.g., 10–20% savings via efficiency tweaks)	Lower exposure to price volatility (e.g.: reduce energy cost volatility by 15–30%)	Replicable across sites/operations via pilot programs in high-energy sites before enterprise rollout.

# 1

## Operational efficiency and low-hanging fruit

Putting the **Operational efficiency and low-hanging fruit** strategic approach into practice. For a typical initiative, it outlines the required datasets, process steps, and internal and external touchpoints, providing a clear guide from initiation to delivery



### Typical steps to deliver initiatives

1

#### Baseline and guardrails

Quantify current use / cost / emissions and create baseline(s) across site types and geographies.

2

#### Rapid diagnostic

Use walkthroughs and data review to find asset scheduling, setpoint(s), and controls issues.

3

#### Prioritise and plan

Rank quick wins by impact vs ease (or other matrix levers) and assign project owners to carry out work.

4

#### Execute quick wins

Implement schedule resets, setpoint tuning, controls fixes, and minor retrofits with minimal disruption.

5

#### Verify and sustain

Measure savings, update system operating procedures, lock controls, and replicate across sites and geographies.



### Example datasets required

- 12–24 months utility bills and tariffs (TOU/demand charges)
- Interval meter data (main and any sub-meters)
- BMS/SCADA trends (setpoints, runtimes, temperatures)
- Asset register (HVAC, lighting, compressed air, boilers, motors), hours-of-use
- Maintenance logs, override lists, commissioning reports
- Occupancy/shift schedules; production plans



### Typical internal touchpoints

- Site operations / facilities managers
- Controls / automation (BMS / SCADA) engineer
- Energy team / PMO
- Finance (benefit sign-off)
- HR/Comms (behaviours)



### Typical external touchpoints

- BMS / controls integrator
- Energy utility / retailer account manager (tariffs, DR)
- Metering data provider
- OEM / service contractors

# Strategic approach

## 2

## Smart procurement and hedging

### Overview

Unlike traditional energy procurement, which often fixates on headline energy and supply rates, better practice demands a more nuanced approach that considers contract structures, market timing, indexed vs. fixed pricing and risk-sharing mechanisms

### Why is this important?



**Budget predictability:** Energy is often the largest variable cost for businesses; smart procurement locks in pricing, reducing financial uncertainty



**Sustainability action:** Green procurement directly supports Scope 2 emission reductions targets



**Risk mitigation:** Hedging against energy market shocks prevents margin compression during supply disruptions



Drivers	Risks	Opportunities
<ul style="list-style-type: none"> <li>• <b>Market uncertainty</b> – Geopolitical, climatic, or economic shocks create energy price risks requiring mitigation</li> <li>• <b>Sustainability investor demands</b> – Stakeholders prioritise transparent, sustainable procurement strategies</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Contract misalignment</b> – Over- or under-hedging due to inaccurate demand forecasting leads to financial penalties.</li> <li>• <b>Greenwashing accusations</b> – Superficial sustainability claims without verifiable action damage reputation of organisations.</li> <li>• <b>Contract management.</b> Mismanaged demand-side contracts misprice supply, compromising security and savings.</li> </ul>	<p>Use cases and interventions</p> <ul style="list-style-type: none"> <li>• Category strategy for electricity and other utilities.</li> <li>• Aggregated procurement across multiple sites.</li> <li>• Indexed and fixed price contracts.</li> <li>• Blending fuel curves for cross commodity hedges.</li> <li>• Carbon offset procurement.</li> </ul>



### Example initiatives (Not exhaustive)

1. **Demand response participation** – Flexible consumption from dynamic energy consuming assets (e.g.: HVAC, refrigeration, freezers) can be turned into a strategic asset, by participating in available energy market programs, e.g.: *Demand Response, Frequency Control Ancillary Services*
2. **Negotiating power purchase agreements (PPAs) with renewables** – Secure long-term contracts to buy renewable energy (e.g.: Physical PPA or Virtual PPA) directly from energy generators at fixed prices
3. **Dynamic hedging strategies** – Blend fixed-price contracts (price certainty) with variable market exposure (flexibility) to balance cost and risk



### Business case arguments

#### Cost avoidance

Mitigate rising energy costs via hedging.

#### Sustainability alignment

Procure renewable energy certificates or carbon offsets, to meet sustainability goals and commitments. These may include Large-scale Generation Certificates, Small-scale Technology Certificates, carbon offsets, state-based mechanisms, and in future Renewable Energy Guarantee of Origin (REGO).

# 2 Smart procurement and hedging

Putting the **Smart procurement and hedging** strategic approach into practice. For a typical initiative, it outlines the required datasets, process steps, and internal and external touchpoints, providing a clear guide from initiation to delivery.



## Typical steps to deliver initiatives

1

### Define strategy and limits

Set hedge horizon, coverage targets, renewable content, and budget-at-risk

2

### Build demand view

Clean metering / settlement data and forecast load to shape procurement volumes

3

### Source and compare

Run an RFP process and evaluate offers / structures on total cost, flexibility, and green attributes

4

### Contract and hedge

Negotiate terms with supplier (volume limits, credit position, certificate claims) and layer hedges per triggers

5

### Monitor and true-up

Track coverage and budget variance, validate settlements, and retire certificates as appropriate



## Example datasets required

1. 15-30 min energy interval data by site
2. Current supply contracts, clauses, expiries; pass-throughs
3. Network/ancillary charges; loss factors
4. Forward curves, spot prices, volatility
5. Certificate markets/prices (LGCs, STCs, VEECs etc.)
6. Counterparty credit ratings/limits; treasury risk policy (Value-at-risk / budget-at-risk)



## Typical internal touchpoints

- Procurement lead
- Treasury / Risk committee
- Operations lead
- Finance (budgeting/settlements)
- Legal (contracting)



## Typical external touchpoints

- Energy utility / retailer account manager
- Energy brokers / aggregator
- Market operator (settlement data, loss factors)
- Energy market data provider (strategic insights and forecasts)

# Strategic approach

## 3

### Capital projects and retrofit efficiency

#### Overview

Optimisation of operational assets and processes can only go so far. To achieve step-change reductions in energy use and emissions, organisations must engage in targeted capital investments. From high efficiency motors and drives to upgrades and on-site generation. These unlock deeper savings and address structural inefficiencies embedded in legacy assets

#### Why is this important?



**Long-term competitiveness:** Retrofits modernise assets, ensuring compliance with evolving efficiency standards



**Asset value:** High-performance buildings/equipment attract premium valuations and reduce lifecycle costs



**Scalable impact:** Large-scale retrofits position businesses to meet net-zero goals while capturing government incentives



 Drivers	 Risks	 Opportunities
<ul style="list-style-type: none"> <li>• <b>Aging infrastructure</b> – Outdated systems incur higher maintenance costs and inefficiencies</li> <li>• <b>Net-zero commitments</b> – Long-term decarbonisation goals require modernisation of energy-intensive assets</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Supply chain delays</b> – Disruptions in equipment/material availability prolong project timelines</li> <li>• <b>Embodied carbon oversight</b> – Failure to account for emissions from retrofit materials undermines sustainability goals</li> </ul>	<p>Use cases and interventions</p> <ul style="list-style-type: none"> <li>• Variable speed drives, high efficiency motors, LED</li> <li>• Roof retrofits and insulation overlays</li> <li>• Air-barrier commissioning</li> <li>• Cogeneration / Combined heat and power</li> <li>• Absorption chillers</li> </ul>



#### Example initiatives (Not exhaustive)

1. **Circular retrofitting** – Reused demolishes concrete from buildings or pads to insulate new builds
2. **Electrification of fossil-fuel-dependent processes** – Retrofit gas boilers with industrial heat pumps for process heating (e.g., food processing)
3. **Renewable-ready building retrofits** – Strengthen rooftops and pre-wire buildings for future solar PV or battery storage installation
4. **Waste heat recovery systems** – Use waste heat from processing plants to generate electricity via organic Rankine cycle (ORC) systems



#### Business case arguments

<p><b>Maintenance avoidance</b></p> <p>Few equipment failures cut repair budgets and business interruption risk.</p>	<p><b>Cost savings</b></p> <p>Rapid ROI (e.g.: 2 to 5 years) through energy/operational efficiencies.</p>	<p><b>Resilience to disruption</b></p> <p>Modernised infrastructure withstands energy market / weather disruptions.</p>
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# 3 Capital projects and retrofit efficiency

Putting the **Capital projects and retrofit efficiency** strategic approach into practice. For a typical initiative, it outlines the required datasets, process steps, and internal and external touchpoints, providing a clear guide from initiation to delivery



## Typical steps to deliver initiatives

1

### Identify and screen

Build a list of upgrade ideas and quickly filter for fit and feasibility across operations

2

### Feasibility and case

Perform a light design and costing exercise to prove the value and risks, and outline how savings will be measured

3

### Procure and stage

Specify, tender, select vendors, and plan site / equipment outages and plan how to do the work safely with minimal disruption

4

### Install and commission

Execute works, integrate controls, and test performance to specification

5

### Validate and embed

Complete maintenance and verification and hand over to operations and maintenance crews



## Example datasets required

1. Asset inventory and condition; engineering drawings
2. Energy audit findings; sub-metering/log data
3. Production/maintenance windows; operational constraints
4. Vendor quotes and detailed cost estimates
5. Grants/rebates eligibility; internal WACC/hurdle rates; carbon price (if used)
6. Risk registers and permitting requirements



## Typical internal touchpoints

- Engineering / projects
- Operations / production
- Finance / CAPEX committee
- Procurement



## Typical external touchpoints

- EPC / general contractor
- OEMs / vendors
- Design engineer/commissioning agent
- Utility / network operator
- Local City Council Planning Department

# Strategic approach

## 4

# Renewable energy and carbon-free sourcing

### Overview

Sourcing clean energy through renewables, either via long-term power purchase (PPAs) or on-site generation. Implementing an on-site or contract focused renewable energy portfolio serves two objectives: 1) it decarbonises the energy supply and 2) protects against long term price volatility

### Why is this important?



**Reputation & Market Access:** Consumers and B2B clients increasingly demand low-carbon products/services. Renewable sourcing differentiates brands in competitive markets



**Cost Stability:** Renewable energy contracts provide fixed pricing over decades, insulating businesses from price spikes



 Drivers	 Risks	 Opportunities
<ul style="list-style-type: none"> <li>• <b>Net-Zero Targets</b> – Corporate commitments to science-based targets require scalable clean energy adoption</li> <li>• <b>Consumer Demand</b> – Market preference for low-carbon products/services incentivises renewable sourcing.</li> <li>• <b>Safeguard Mechanism</b> falling baselines raise emissions liabilities of large emitters.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Intermittency Costs</b> – Unreliable renewable supply necessitates backup systems, raising operational complexity</li> <li>• <b>Offset Credibility</b> – Reliance on low-quality carbon credits risks regulatory and reputational fallout</li> </ul>	<p>Use cases and interventions</p> <ul style="list-style-type: none"> <li>• On-site microgrids</li> <li>• Physical or virtual PPAs</li> <li>• Green tariffs</li> <li>• Renewable energy certifications</li> <li>• On-site solar PV, wind and bioenergy</li> <li>• On-site BESS</li> <li>• Integrating renewables with storage and grid connection</li> </ul>



### Example initiatives (Not exhaustive)

1. **On-site solar/wind** – Install renewable generation systems to offset grid reliance
2. **Virtual Power Purchase Agreements (VPPAs)** – Contract with off-site renewable projects to secure clean energy
3. **Renewable Energy-as-a-Service (REaaS) Models** – Lease solar + battery systems from third-party providers, paying only for energy consumed with no upfront capital
4. **Carbon-Insetting Programs in Supply Chains** – Fund native reforestation near operational sites to counterbalance Scope 3 emissions from operations (e.g.: ore extraction, processing facilities etc.)



### Business case arguments

<p><b>Long-term cost stability and savings</b></p> <p>Renewable energy contracts or assets lock in fixed energy prices, insulating businesses from price volatility.</p> <p>Lower energy intensity.</p>	<p><b>Revenue generation</b></p> <p>On-site storage can be utilised for energy market participation creating a new revenue stream</p>	<p><b>Sustainability alignment and market differentiation</b></p> <p>Renewable sourcing directly reduces Scope 2 emissions.</p> <p>Lower emissions profiles of newer equipment.</p>
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# 4

## Renewable energy and carbon-free sourcing

Putting the **Renewable energy and carbon-free sourcing** strategic approach into practice. For a typical initiative, it outlines the required datasets, process steps, and internal and external touchpoints, providing a clear guide from initiation to delivery



### Typical steps to deliver initiatives

1

#### Set portfolio approach

Decide onsite generation / offsite contracts mix, set targets, and timing of execution

2

#### Onsite feasibility

Assess energy generation / storage / electrification potential across identified sites, grid connection and model the opportunity

3

#### Offsite sourcing

Review the available energy contracts (e.g.: PPA/VPPA/green tariff structures), size to load, and run RFP(s) with due diligence

4

#### Contract and deliver

Finalise terms, align accounting / risk, and manage EPC (or contract) activities

5

#### Operate, certify, optimise

Monitor performance, manage hedge effectiveness, and tune operations for efficiency



### Example datasets required

1. Site load profiles/shape; forecast growth
2. Roof/land/structural assessments
3. Interconnection capacity and curtailment history
4. Energy generation asset information
5. PPA/VPPAs/green tariff price benchmarks
6. Certificate schemes and rules/prices
7. Grid emissions factors (location- and market-based)



### Typical internal touchpoints

- Energy Lead / Facilities Manager
- Sustainability Lead
- Finance/Treasury
- Legal
- Risk committee



### Typical external touchpoints

- Energy retailer / Independent power producer(s)
- EPC/O&M provider (onsite)
- Grid operator / utility interconnection
- Lenders / financiers

# Strategic approach

## 5

## Governance and strategic enablement

### Overview

The preceding four approaches cannot scale or sustain without the right governance, analytics, and change management infrastructure.

Cross-functional enablers are required to translate technical opportunities into sustained enterprise value.

### Why is this important?



**Operational resilience:** Embedding decarbonisation into strategy ensures agility in responding to regulatory shifts (e.g., carbon tariffs) and market disruptions



**Talent and culture:** Clear governance attracts sustainability-minded talent and aligns cross-functional teams to execute energy transition initiatives for a greater purpose



 Drivers	 Risks	 Opportunities
<ul style="list-style-type: none"> <li>• <b>Corporate strategic linkages</b> – Strong governance ensures alignment with strategic ambition, and links core priorities on involved practice areas</li> <li>• <b>Operational alignment</b> – Governance breaks silos, ensuring initiatives considered in core business processes (e.g.: capital planning)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Fragmented accountability</b> – Lack of cross-functional ownership slows progress on decarbonisation goals and time to value realisation</li> <li>• <b>Data silos and reporting gaps</b> – Disconnected data undermines progress tracking</li> <li>• <b>Late finance involvement</b> – Can result in “shadow” math for benefits realised</li> </ul>	<p>Use cases and interventions</p> <ul style="list-style-type: none"> <li>• Cross-functional governance committees</li> <li>• Translating strategy into site-level savings targets</li> <li>• Turning engineering numbers into bookable gains</li> <li>• Benefit tracking dashboards</li> <li>• Auditability of kWh and CO<sub>2e</sub> savings</li> <li>• Employee engagement programs</li> </ul>



### Example initiatives (Not exhaustive)

1. **Decarbonisation-linked executive incentives** – Tie 20–30% of C-suite / leader bonuses to measurable outcomes (e.g.: a percentage reduction in Scope 2 emissions).
2. **Integrated enterprise risk management (ERM) frameworks** – Embed climate risks (e.g., carbon pricing, energy volatility) into ERM systems.
3. **Cross-functional decarbonisation taskforces** – Create agile teams (e.g.: sustainability, legal, operations, finance) to streamline business case development for projects.



### Business case arguments

<p><b>Strategic alignment and funding access</b></p> <p>Robust governance enhances utilisation of provided funds and benefit realisation.</p>	<p><b>Operational efficiency through integration</b></p> <p>Centralised governance reduces project approval times.</p>	<p><b>Organisational trust</b></p> <p>Robust governance builds unshakable trust and proves that commitment transforms to action.</p>
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# Planning and delivery considerations

## Use existing business frameworks

Every business will have its own methodologies for planning and managing change.

Expert operational and technical advice should be sought from within each business as DSE integrations are planned.

The notes here are a non-exhaustive list of considerations and provide some DSE-related additions to those established processes.



*By defining energy use and addressing blockers, DSE enables businesses to optimise demand, integrate new technologies and accelerate decarbonisation.*

**Jane Watts**

Director  
B Team Australasia

## Strategic planning

DSE has a strategic role for business in the context of a rapidly evolving and highly dynamic energy market.

Strategic planning would benefit from:

- **Stakeholder strategic engagement.** Incorporating the concerns and incentives of stakeholders across the business – from the CEO and CFO to the sustainability leaders, energy market leads, portfolio asset managers and operational engineers at facilities is central to success.
- **Energy market future scenarios.** Be informed about the future state scenarios of the energy market. This should be at the level of national, state, regional and depending on the case, even the regional energy market context.
- **Carbon accounting methodology review.** DSE interventions may coincide or be part of a change in carbon accounting methodology settings. As business transitions from location-based accounting to market-based accounting, or change the scope of their emissions, there may be a chain of inadvertent accounting outcomes to be considered.

## Implementation planning

Delivering a DSE intervention, behind the meter, can involve complex site-based infrastructure integrations.

Implementation planning would benefit from

- **Early and continuous stakeholder engagement** with process operation leads, asset management, energy engineers and energy market leads.
- **Integration planning for new or changed equipment** so that processes can continue with low or no disruption.
- **Operational scenario testing** in the planning process to discover and mitigate any potential adverse site, asset, process, accounting or market outcome when outside normal operating conditions. This may include factors for climate future scenarios.
- **Piloting to validate a DSE strategy.** Before making a common change across an entire portfolio, small-scale pilots can discover risks, edge cases, and develop mitigations as well as enable rehearsal of complex roll-outs.



# DSE Working Group

## Potential DSE interventions for plant and equipment

Theme	Intervention	Description
Investment in new equipment and its integration	<b>On-site renewables</b> (behind the meter)	Installation of on-site clean energy generating sources (incl. solar panels or wind turbines etc.) directly at a facility to generate electricity for the site's energy consumption, before excess may be sent to the energy grid.
	<b>On-site energy storage</b> (behind the meter)	Installation of on-site clean energy storage (e.g.: battery energy storage system) directly at a facility to store surplus electricity generated by on-site renewables, and to be used during periods when generation is low (or high energy priced periods).
	<b>Additional monitoring and control technology</b> on new installations	Installation of systems (i.e. advanced sensors or software) and integrated with new equipment to optimise performance and energy efficiency.
	<b>New equipment</b> for DSE, including integration with old equipment	Involves retrofitting an existing piece of equipment with new / advanced components to improve functionality and efficiency.
	<b>Electrification of fleet</b>	Involves transitioning traditional fuel vehicles to electric ones, aimed at reducing emissions and operational costs. It includes vehicles used within facilities as well as those that return to a central depot or hub.
	<b>Electrification of high-heat processes</b>	Replacing fossil fuel-based heating systems with electric alternatives for industrial processes.
Operational optimisation of existing equipment	<b>Site energy demand driver analysis</b> (for both flat and peaky profiles)	Identifying factors that influence how much energy a site uses, across various profiles, incl. peaky and flat for the purposes of enhancing efficiency and reducing cost.
	<b>New monitoring and control technology</b> on existing equipment	Installation and retrofitting of systems (i.e. advanced sensors or software) onto existing equipment to optimise performance and energy efficiency.
	<b>Operational changes</b> for reductions in the cost of energy	Implementing changes in how equipment is used, such as operation schedules, equipment changes and staff training.

# DSE Working Group

## Potential DSE interventions for grid and demand response

Theme	Intervention	Description
Grid optimisation and site-based energy infrastructure	<b>Flexible contracts and new technology</b> for energy demand and load management	Negotiating new energy contracts with energy providers to adjust power usage according to demand, often using new technologies to manage these changes efficiently.
	<b>Time-based optimisation</b> of load	Adjusting energy use to match low-cost periods of the day, by shifting operations to times when electricity is cheaper (where available).
	<b>Demand-response</b> for customer flexibility to avoid high pricing	Reducing or shifting energy usage temporarily during peak periods when electricity prices are high.
	<b>Grid-controlled assets</b> behind the meter	Managing on-site generation and storage assets behind the meter via external parties (i.e. VPP operator) to holistically manage supply and demand across a portfolio of sites (and assets).
Capability, portfolio and business case	<b>Revenue and commercialisation</b> opportunities of DSE through VPPs.	Aggregation of multiple energy resources (i.e. generation and storage) through technologies, such as a VPP, for the purposes of participating in energy trading and grid services to create new revenue streams.
	<b>Portfolio analysis, data and AI</b> for energy efficiency	Examining a company's energy assets using advanced data analysis and artificial intelligence to identify opportunities for reducing waste and improving usage.
	<b>Contracts and agreements</b> for co-investment and benefit sharing	Investigating strategic partnerships where multiple parties invest together in energy projects, sharing both the costs and benefits.
	<b>Roadmap sequencing of investments</b> for optimum cumulative outcomes	Planning investment timing and order to achieve the best overall results of DSE interventions.
	<b>Adaptive pathways</b> for scenario-based future options	Developing flexible strategies for a business case that adapt to different future operational or energy market scenarios to prepare for uncertainties.
	<b>Uplift in capability and know-how</b> for better DSE management	Enhancing knowledge and awareness of 'Demand Side Energy' across an organisation, including opportunities, challenges and nomenclature that reflect the details for energy interventions.

# Glossary of terms and acronyms – 1 of 2

## Demand-side energy and energy market terms

This glossary of terms and acronyms includes those used in this toolkit, and others encountered in the DSE context.

- **Aggregator:** An entity that combines the output or capabilities of multiple DER or CER to participate in energy markets or provide services to the grid.
- **Australian Energy Market Operator (AEMO)** is the Australian Government authority for energy market operational guidance and planning.
- **Benefit-cost ratio (BCR)** is a calculated metric used in cost-benefit analysis (CBA) to assess the commercial viability of a project or investment.
- **Behind-the-meter (BTM)** refers to energy resources located on the customer side of the site electricity meter.
- **BESS:** battery energy storage system.
- **BMS:** Building Management System.
- **CBA:** cost-benefit analysis.
- **CHP:** combined heat and power.
- **Consumer energy resources (CER)** are appliances owned by homes or businesses, such as rooftop solar, home batteries and EVs.
- **Consumption** is the total electricity used over a period of time, expressed in kilowatt hours (kWh), megawatt hours (MWh), gigawatt hours (GWh) and terawatt hours (TWh).
- **DCCEEW.** Department of Climate Change, Environment, Energy and Water. The same name is used for departments in the Australian and the NSW Governments. When used without qualification, the federal department is referred to.
- **Demand** is the electricity needed at a point in time, expressed in kilowatts (kW), megawatts (MW), gigawatts (GW) or terawatts (TW).
- **Demand response (DR)** is a physical response at a site to the price.
- **Demand-side Statement of Opportunities (DSOO)** is a new initiative in the *Electricity and Energy Sector Plan* (DCCEEW, 2025). It will identify opportunities to reward energy consumers for providing demand services to the market.
- **Distributed energy resources (DER)** are small-to-medium-scale energy resources connected to the distribution network, in front or behind the meter.
- **Distribution network:** The low-voltage network of poles and wires used to transport electricity from the transmission network to end-use customers.
- **DSE:** demand-side energy.
- **Energy trilemma:** The World Energy Council's definition of energy trilemma is based on three core dimensions: energy security, energy equity, and environmental sustainability of energy systems.
- **Electricity Statement of Opportunities (ESOO)** is AEMO's demand forecast and supply adequacy assessment for electricity in the NEM and for the southwest interconnected system (SWIS) in WA.
- **Embedded generation** systems (often renewable) are located close to where energy is used, as opposed to large centralised generators
- **Embedded network (EN)** are private electricity networks that serve multiple premises and are located within, or connected to, a distribution or transmission system through a parent connection in the NEM.
- **EMS:** energy management system.
- **EVs:** electric vehicles. Can be customer-owned or asset-owner fleet – for site materials movement or haul.
- **Frequency control ancillary services (FCAS)** balance, over short intervals, power supplied by generating units and power consumed by loads. These services support the balance of frequency across the energy grid in response to deviations in supply and demand of energy.
- **Gas Statement of Opportunities (GSOO)** is AEMO's yearly statement identifying gas supply shortfalls against forecast demand so that investors and governments can make informed and timely investment decisions.
- **Grid:** used to collectively refer to the distribution and transmission networks.
- **HTHW:** high temperature hot water.
- **HVAC:** heating, ventilation and cooling. May also refer to high voltage alternating current, but this would be an uncommon usage in a DSE context.
- **Integrated System Plan (ISP).** AEMO's roadmap for the transition of the NEM power system over a period of 20 years.

# Glossary of terms and acronyms

## 2 of 2

- **LGC:** Large-Scale Generation Certificate, a tradable certificate used in Australia's Renewable Energy Target (RET).
- **LOR:** lack of reserve.
- **LNSP:** the local network service provider is the provider of the network connection.
- **MACC:** the marginal abatement cost curve is a planning method to map emissions abatement potential and the costs of change to support prioritisation and sequencing.
- **Market Price Cap (MPC).** The National Electricity Rules' maximum price at which gas can be bid, offered, or scheduled in the market.
- **NEM:** Australia's National Electricity Market.
- **PV:** photovoltaic systems.
- **PPA:** power purchase agreement.
- **RERT:** the Reliability and Emergency Reserve Trader scheme.
- **RET:** Australia's Renewable Energy Target.
- **REGO:** Renewable Electricity Guarantee of Origin is a scheme that tracks and verifies the origin of renewable electricity through digital certificates.
- **SCADA:** Supervisory Control and Data Acquisition.
- **STC:** Small-scale Technology Certificates, which are a financial incentive in Australia for installing renewable energy systems such as solar panels.
- **Smart appliances** can communicate or be controlled remotely to optimise energy use, forming part of flexible demand or DER.
- **Transmission network:** The high-voltage electricity network used to transport electricity in bulk from generators to the distribution network.
- **VEEC:** Victorian Energy Efficiency Certificate, which are electronic certificates generated under Victoria's Energy Upgrades (VEU) program.
- **Vehicle-to-grid (V2G):** enables electric vehicles (EVs) to send electricity from their batteries to the power grid.
- **Virtual power plant (VPP)** is the name given to an aggregation of resources, coordinated using software and communications technology to deliver services that have traditionally been performed by a conventional power plant. Grid-connected VPPs coordinate rooftop photovoltaic (PV) systems and battery storage.
- **VT:** vertical transport, such as escalators and elevators, which can be energy intensive.
- **WDR:** wholesale demand response.

### Sources

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- Some content developed through checked AI queries.

# More on demand-side energy

## Further reading and resources

In order of recency.

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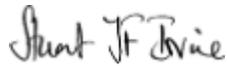
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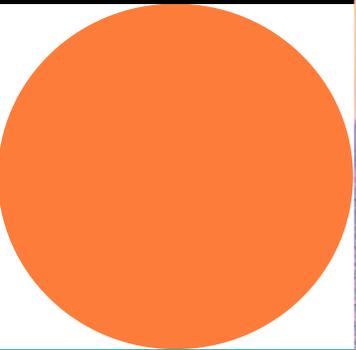
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