strategy+business
a pwc publication

28 NOVEMBER 2023

The energy-demand opportunity: How companies can thrive in the energy transition

Organizations face an energy trilemma involving costs, carbon emissions, and supply uncertainty. But energy system advances can help them create value and become more sustainable and resilient—by taking charge of their energy demand.

by Jon Chadwick, Samantha Vincent, Reid Morrison, and Rob Turner

Jon Chadwick
specializes in energy transition.
He is a partner with PwC Australia.

Samantha Vincent
is a leading practitioner in energy transition.
She is a director with PwC Australia.

Reid Morrison
is PwC's Global Energy Advisory Leader.
He is a principal with PwC US.

Rob Turner
is the UK sector leader for energy and
resources. He is a partner with PwC UK.

Organizations worldwide spend more than US$10 trillion a year to meet their energy needs, and many stand-alone companies struggle under a heavy cost burden. In the UK, more than half of businesses surveyed in 2023 (54%) said that energy accounted for upward of 25% of their business costs.[1] Unchecked energy usage does more than cut into the bottom line. It is also a major source of carbon emissions and a cause of operational uncertainty. But new dynamics in the global energy arena present opportunities for businesses to tackle all three parts of the so-called energy trilemma—costs, carbon emissions, and uncertainty of supply—at once, by holistically evaluating their own current and future energy needs and assuming greater control over energy demand.

Of these new energy dynamics, perhaps the best known is the decarbonization taking place as more large-scale renewable power capacity comes online. But because renewable power can be unpredictable, as when clouds block the sun or the wind stops blowing, energy supplies and prices may be more volatile and harder for organizations to manage. These complexities are why other energy dynamics matter. Decentralization, resulting from the deployment of small-scale renewable energy generation and storage, lets organizations

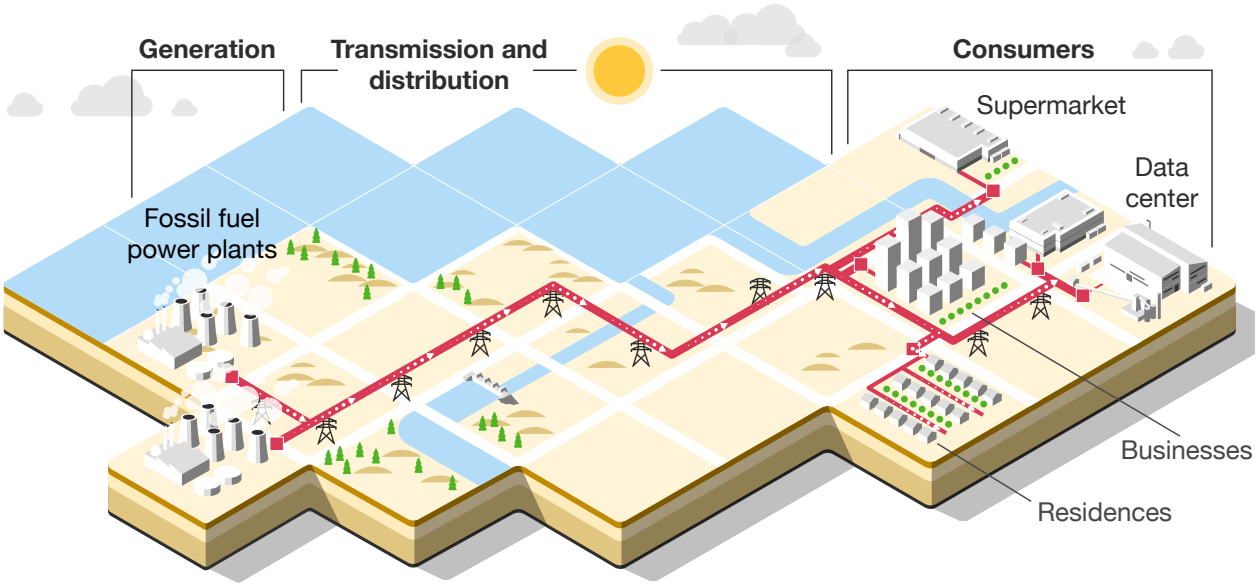
[1] Npower Business Solutions, *Business energy tracker 2023,* 2023, https://npowerbusinesssolutions.com/businessconfidence.

produce and bank electricity to avoid shortages and surging prices. And the digitization of facilities and equipment helps organizations manage their energy use with more precision, reducing costs and guarding against risks.

The combined impact of decarbonization, decentralization, and digitization means organizations that once functioned mainly as energy consumers can now play the dual role of producer–consumer. These energy "prosumers" might still purchase electricity from the grid—only now, they can also produce their own electricity, store it, and sell it. And they can use data and technology to modulate their energy demand and time their energy purchases and sales to match favorable market prices.

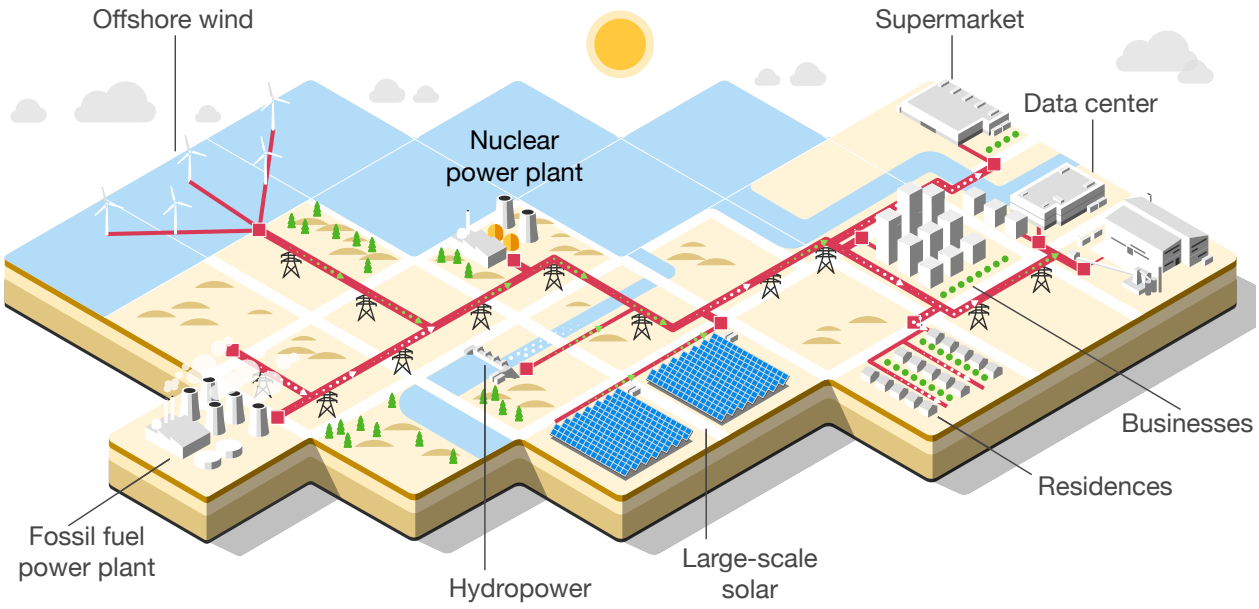
Traditional energy system

Centralized fossil fuel power plants generate electricity, which flows in one direction to customers; energy supply is typically reliable but emissions-intensive.



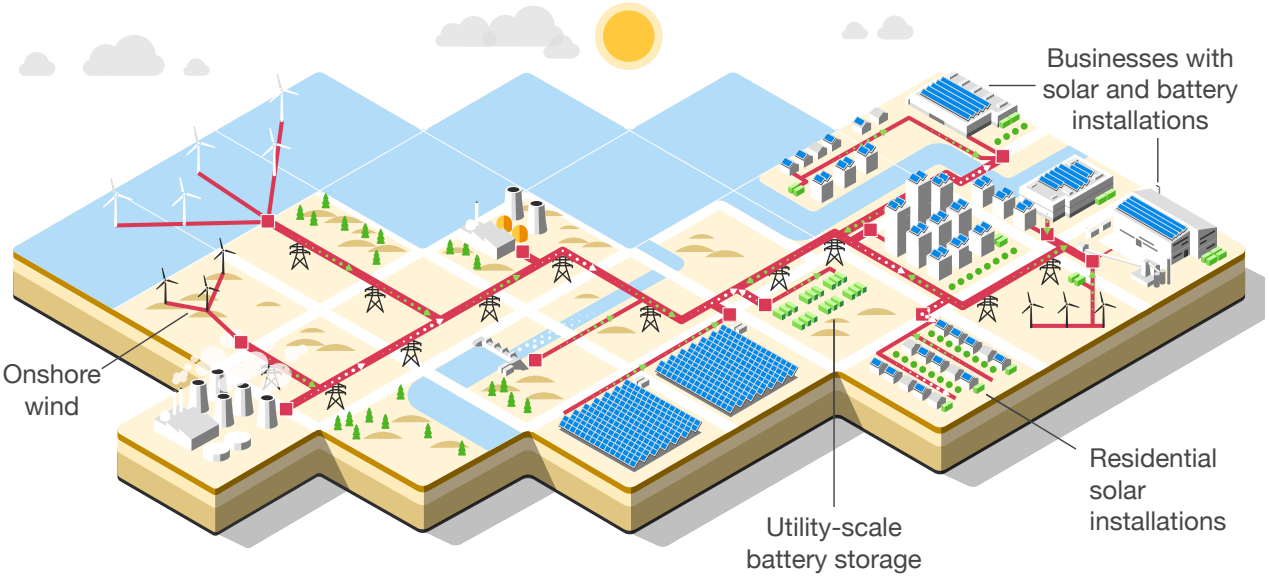
Decarbonization

Utility-scale renewables (e.g., solar, wind) are introduced, starting the phaseout of fossil fuel power; this reduces emissions but creates some supply instability.



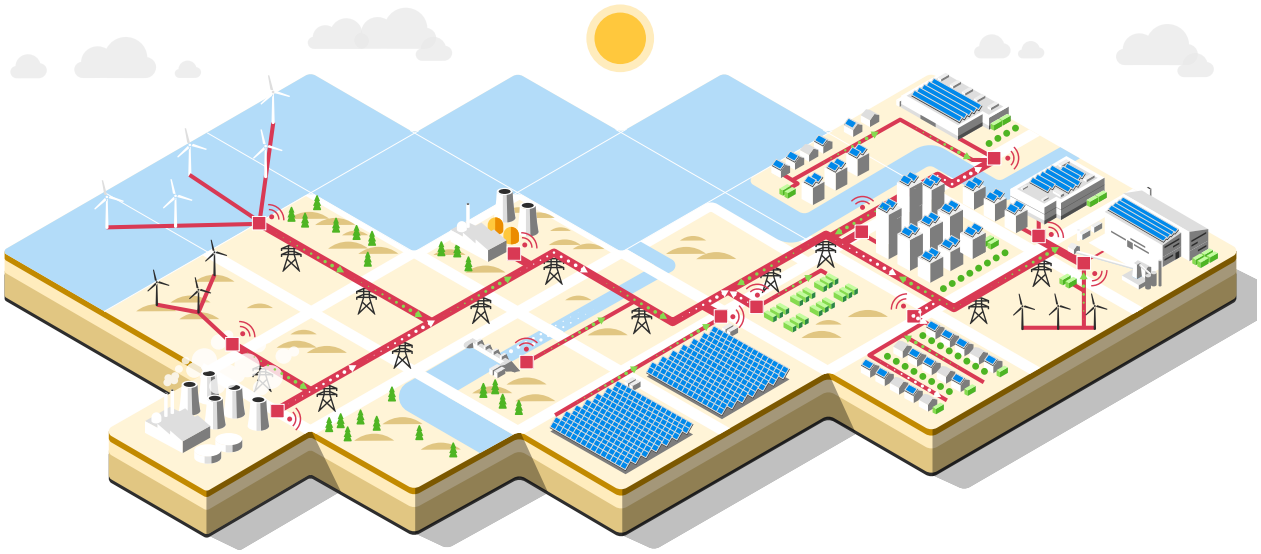
Decentralization

Businesses and households install small-scale renewables and batteries; bidirectional flow of electricity to and from decentralized assets requires investment in network infrastructure.



Digitization

Internet-of-things devices help coordinate decentralized energy assets; energy users manage demand to achieve savings, use more renewable power, and support grid stability.



All told, actions that organizations take to manage their energy demand will help them create commercial value, achieve environmental and social benefits, and boost resilience to risks such as supply disruptions. In this article, we'll show how organizations can realize these benefits and build competitive advantage with four complementary approaches to demand-side energy action: optimizing their demand through energy-efficiency measures and more flexible usage, pursuing energy independence, maximizing interactions with the market, and electrifying operations.

How an Australian industrial park created value by changing its approach to energy demand

To understand how companies can create value by managing their energy demand, consider the example of Moorebank Logistics Park (MLP), Australia's largest intermodal freight facility. Like other large industrial organizations with significant energy demand and ambitious carbon-neutrality goals, MLP and many of its tenants are seeking to reduce the Scope 2 carbon emissions that result from their use of purchased electricity. The facility's ownership consortium also recognized that such

efforts would have to be balanced with tenants' need for economical, reliable electric power. In response, the consortium partnered with renewables fund Solar Bay not only to install and operate Australia's largest rooftop solar installation at the precinct but also to use technology to manage energy demand in an efficient, cost-effective way.

Under the partnership, Solar Bay will install 60 megawatts of behind-the-meter rooftop solar along with 150 megawatt-hours of batteries for energy storage, which will serve tenants across the facility by way of a localized electricity network, or microgrid. This integrated system will be capable of delivering all the energy that the park uses during daylight hours, equivalent to 44% of overall energy needs. The rest of the facility's power will come from an off-site wind farm, giving tenants enough renewable energy to meet the full needs of their electrified operations. The switch to renewables is expected to prevent some 67,200 metric tons of carbon emissions per year, significantly reducing the Scope 2 footprint of MLP's tenants.

The partnership also involves the use of technology such as efficient heating and air-conditioning, lighting and control systems, and extensive submetering and monitoring systems, to optimize the generation, storage, and use of energy across the logistics park. This approach extends to MLP's interaction with the grid. Significant portions of MLP's total energy demand (or load) are flexible enough that they can be shifted to times of the day when power is cheaper or when the grid is under less strain. By adjusting those loads in line with the changing price and supply of power from Australia's grid, MLP can optimize consumption of power generated on-site. It will also provide what are known as grid-support services, which help to balance the supply and demand of power and ensure that electricity flows properly through the network.

Aggregating the energy demand of tenants across the facility and coordinating its management allows MLP to maximize the commercial benefits of its grid interactions, while improving grid performance for others on the network. And as the project expands, MLP intends to offer tenants additional services such as fast charging for electric trucks and hydrogen generation and supply.

The benefits of demand-side action: Commercial, sustainability, and resilience effects

The shift to becoming an energy prosumer may be unusual for now. But our research suggests that almost all organizations—in sectors as diverse as healthcare, manufacturing, and retail—can use demand-side energy action to respond effectively to the trilemma of growing and volatile costs, greenhouse gas emissions, and uncertainty of supply. The business case for demand-side action rests on three categories of benefits.

- **Commercial benefits.** Demand-side action helps organizations and their supply chains forge closer interactions with the energy system, reducing energy and carbon costs and unlocking revenue opportunities. With renewables and batteries, organizations can trade in energy units, offer grid balancing services to energy networks, and create ancillary revenue sources such as energy attribute certificates (EACs, also known as renewable energy credits) and carbon credits. Cost savings can be reinvested in the business. Meanwhile, organizations may have opportunities to fund their energy projects by accessing government grants and incentives, green finance through loans and bonds, and capital from energy system partners.

- **Sustainability benefits.** From an environmental and social perspective, reduced demand for grid power and production of on-site renewable energy will drive emissions reductions across assets and operations. These initiatives can also expand an organization's social license to operate because they demonstrate commitment to supporting grid efficiency and providing energy to local communities during grid disruptions.

- **Resilience benefits.** Finally, organizations can boost their resilience to climate risks (both physical and transition) and reduce their exposure to operational risks resulting from geopolitical and other supply-side factors, such as grid downtime.

The demand-side repertoire: Four approaches that create business value

Some organizations with energy-intensive activities, such as chemicals companies, manufacturers, and steelmakers, have long made it a priority to improve their energy efficiency, knowing this can reduce their costs and their greenhouse gas emissions. Now, many more organizations have the opportunity to take charge of their own energy demand—and to scale up their impact by partnering with other entities in their supply chains. Here, we identify four complementary sets of demand-side practices that reliably yield commercial, sustainability, and resilience benefits.

Optimizing energy demand with new efficiency measures and shifts in usage patterns

When organizations reduce their energy consumption, they lower costs, cut carbon emissions, and build resilience against such difficulties as price spikes or supply shortages. One simple way to save energy is to install digital devices and systems that monitor and control usage in small appliances such as air conditioners and water heaters. Because these basic interventions can yield energy savings of up to 40% for little or no cost, almost every organization stands to benefit from them.[2] The key to their effectiveness is to roll them out at scale (rather than piecemeal or only in some facilities or locations), increasing the amount of energy saved.

Businesses with energy-intensive buildings and equipment or with flexibility in usage, such as industrial manufacturers or retail shopping centers, are well positioned to obtain further benefits by adopting more sophisticated approaches. For example, organizations can use sensors to detect the presence

[2] International Energy Agency, *Coping with the crisis: Increasing resilience in small businesses in Europe through energy efficiency,* October 2022, https://www.iea.org/reports/coping-with-the-crisis-increasing-resilience-in-small-businesses-in-europe-through-energy-efficiency.

Four approaches to taking charge of energy demand that can help companies create business value

Organizations searching for value in the energy transition have many options. In this hypothetical use case, a hardware retail chain surveys the potential benefits

Optimizing energy demand

Possible initiatives

Energy efficiency: Using less energy to perform an activity or achieve an outcome

Energy optimization: Timing energy use to take advantage of better prices

Potential benefits (illustrative)*

30% reduction in energy demand from lighting after installing energy-efficient LED fixtures in stores

Pursuing energy independence

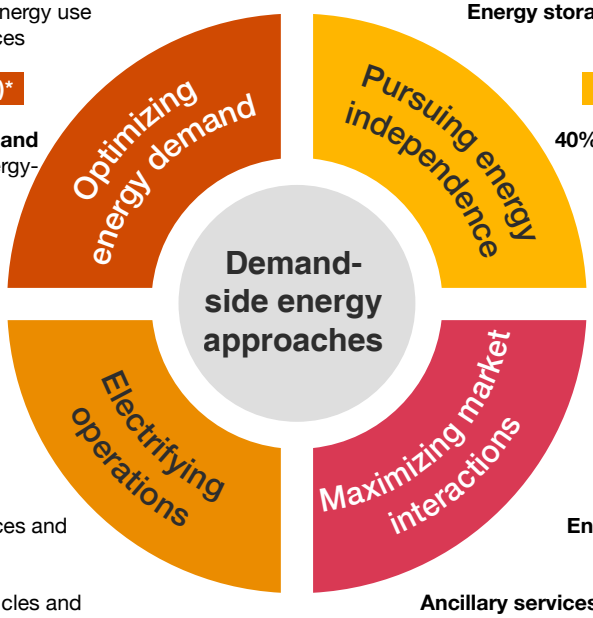
Possible initiatives

Energy generation: Installing on-site renewables, such as solar, to generate electricity for use or sale

Energy storage: Installing on-site batteries to bank electricity for use or sale

Potential benefits (illustrative)*

40% of electricity generated on-site by installing solar and batteries



Electrifying operations

Possible initiatives

Equipment: Switching appliances and machinery to electric models

Fleet: Switching to electric vehicles and charging systems

Potential benefits (illustrative)*

70% reduction in fleet emissions from switching to electric vehicles

Maximizing market interactions

Possible initiatives

Energy trading: Buying and selling energy or energy contracts

Ancillary services: Reducing energy consumption or providing bulk energy at specific times to support grid stability

Energy attribute certificates (EACs) or carbon credits: Selling certificates for units of renewables generation or avoided emissions

Potential benefits (illustrative)*

10% energy spend offset by revenue from solar power generation and sales of green energy credits

60% of energy spend offset by revenue from using batteries to maintain a stable grid

100% carbon neutrality achieved by buying EACs for all energy purchases

*Potential benefits are based on a hypothetical use case for a hardware retail chain.
Source: PwC analysis

of people or changes in temperature, so they can dial their lighting and heating up or down as necessary, taking into account factors such as costs and energy availability. With data from networked smart devices, organizations can forecast their energy needs and find opportunities to apply the approaches described next in this section, such as installing on-site renewables and storage.

Demand optimization techniques came together successfully for one European industrial manufacturer. When managers performed an assessment of the organization's on-site energy demand, they found multiple opportunities to improve energy efficiency, including upgrading to more efficient electric motors, repairing leaks in compressed air systems, and optimizing lighting control software. These changes enabled the organization to reduce its energy consumption by 10%, its annual energy spending by €2 million, and its yearly CO_2 emissions by 3,000 metric tons.

Pursuing energy independence with on-site renewable power and storage

Reducing their reliance on grid power offers organizations another way to avoid such risks as surging prices, power outages, and service interruptions. It also helps them save money, because purchasing fewer kilowatt-hours from the grid results in lower network charges. In Australia, the US, and the UK, these charges account for 20 to 40% of the typical energy bill.[3, 4, 5] In some jurisdictions, pursuing energy independence will also help organizations minimize their environmental levies and taxes, such as those applied under the EU's Carbon Border Adjustment Mechanism (CBAM) and Emissions Trading System (ETS). The action that unlocks these benefits is installing

[3] Australian Energy Regulator, *State of the energy market 2023*, October 5, 2023, https://www.aer.gov.au/publications/reports/performance/state-energy-market-2023.

[4] US Energy Information Administration, *Electricity explained,* accessed November 2023, https://www.eia.gov/energyexplained/electricity/prices-and-factors-affecting-prices.php.

[5] UK Parliament: House of Commons Library, *Domestic energy prices* (research briefing), September 2023, https://commonslibrary.parliament.uk/research-briefings/cbp-9491.

Basic interventions can yield energy savings of up to 40% for little or no cost.

on-site, or "behind-the-meter," renewable energy generation and storage equipment.

An organization's potential to generate energy on-site depends largely on its facilities' location and physical characteristics, as well as what weather patterns prevail—particularly, how much sunshine and wind there is. Potential is also contingent on how much space the organization has available. Those with significant real estate holdings normally have better prospects, because they have more room for solar arrays, wind turbines, or battery installations.

But that does not mean that other organizations are locked out. They might be able to install solar panels on rooftops, in some instances. They can also look to reduce exposure to energy costs embedded in the prices of goods and services they buy—for example, by providing access to low-cost renewables in exchange for better commercial outcomes, such as supply guarantees or discounts on goods or services. IKEA, for one, provided some of its suppliers with power purchase agreements and other mechanisms to help them buy renewable electricity from the grid. The company also offered them direct financing for on-site renewables.[6]

[6] IKEA website, *IKEA expands renewable energy programme to suppliers in ten additional markets,* accessed November 2023, https://www.ikea.com/global/en/newsroom/sustainability/ikea-expands-renewable-electricity-programme-to-suppliers-in-ten-additional-markets-230215.

Reducing their reliance on grid power offers organizations another way to avoid such risks as surging prices and power outages and interruptions.

Another approach to installing on-site renewables and storage is to enter into commercial agreements with energy providers that can supply capital and support rollout. As mentioned above, the MLP ownership consortium partnered with an energy provider to co-fund installation of solar panels and batteries.

Where renewable power generation is practical, there are many precedents for its implementation. Nearly 60% of the members of the RE100 global corporate renewable energy initiative now produce renewable electricity for their own consumption, most using solar.[7] Through on-site renewable electricity and thermal energy generation, one European food manufacturer reduced its Scope 1 and 2 emissions by 68% (from a 2015 baseline). Contracts to purchase renewable energy helped the organization realize further improvements in environmental performance and stay on track to achieve a 100% reduction in operational emissions by 2030.

[7] Climate Group RE100, *Onsite renewable electricity: Why it's a key part of a business' climate strategy,* August 2021, https://www.there100.org/our-work/news/onsite-renewable-electricity-why-its-key-part-business-climate-strategy.

Maximizing market interactions through energy trading, demand response, and product sales

Organizations that participate in markets for energy and energy-related products and services can both reduce costs and generate revenue. Timing their purchases and sales of electricity, for example, lets them take advantage of changes in the price of grid power. Organizations can also develop and sell energy-related products such as EACs and carbon credits. And they can offer energy retailers the right to remotely discharge batteries during peak demand periods or earn income for moderating energy consumption to support grid stability.

To pursue these activities, organizations must put foundational capabilities in place. For example, they must operate their own renewable energy assets to issue EACs, and they need optimization tools to orchestrate their energy loads (that is, the energy consumption across a portfolio of facilities and equipment) in response to changing prices.

For these reasons, participation in energy markets is likely to work best for organizations such as retail chains, commercial offices, and data centers, which have high volumes of controllable energy assets and the ability to tailor their energy usage to daily fluctuations in costs. Organizations with lower levels of energy demand, or less flexible energy demand, may find fewer opportunities to adjust their energy usage as prices change. These organizations might consider partnering with others to aggregate energy demand and collectively engage in the market.

Organizations that do develop the capabilities to engage in energy and energy-related markets can realize substantial gains. One aluminum manufacturer based in Australia earned as much as AU$19.2 million per year over a four-year period after enrolling in the Australian Reliability and Emergency Reserve Trader (RERT) program. The arrangement allowed the

Organizations that participate in markets for energy and energy-related products and services can both reduce costs and generate revenue.

organization to collect fees from the Australian Energy Market Operator in exchange for ramping down its smelter when the electricity load on the grid peaked, helping prevent interruptions and outages.

Electrifying operations to boost efficiency and mitigate emissions

The fourth approach to demand-side action involves replacing fossil fuel–powered assets, including vehicles, with electric alternatives. Running equipment on electricity, particularly renewable electricity, is a direct way to lessen carbon emissions. It can also enable the other three demand-side approaches by positioning organizations more strongly as prosumers in an increasingly electrified energy system. And electrification creates financial benefits, because electric equipment tends to be more efficient than conventional equipment. Electric heat pumps are three to five times as efficient as natural gas boilers, and all-electric vehicles are 4.4 times as efficient as gasoline combustion engine vehicles.[8, 9] A further financial consideration: early adopters may find opportunities for green incentives or subsidies to help pay for electrification.

[8] International Energy Agency, *The future of heat pumps,* revised December 2022, https://iea.blob.core.windows.net/assets/4713780d-c0ae-4686-8c9b-29e782452695/TheFutureofHeatPumps.pdf.

[9] US National Renewable Energy Laboratory, *Efficiency ratios for light-duty all-electric vehicles in the United States,* June 2023, https://afdc.energy.gov/data/10963.

Of course, electrification does boost an organization's demand for electricity, which can then expose it to price volatility caused by macroeconomic events, periods of peak demand, or low renewables generation. This accentuates the importance of optimizing energy demand and costs or installing on-site renewables, as described above, while also electrifying operations.

Numerous organizations around the world have realized multiple benefits from switching to electrified technologies. One UK-based utility, for example, aims to decarbonize its fleet of vans and heavy-goods vehicles by converting to electric vehicles and alternative-fuels vehicles, thereby creating the potential to reduce fleet emissions more than 90% by 2030. The phased rollout targeted by the organization is expected to result in a 50% reduction of its transport emissions by 2027.

Getting started

The trilemma of high energy costs, carbon emissions, and uncertainty in energy supply creates an ever-greater need for organizations to play more active roles within the energy system. And technological advances, along with policy shifts, are providing organizations with new means of responding to energy risks and creating commercial and energy-saving opportunities. If organizations can fully commit to these approaches, they can realize significant value.

In following the four demand-side approaches discussed in this article, organizations needn't prioritize one over the others. They will gain most from bringing complementary actions into an integrated portfolio—for example, by implementing energy-efficiency measures to lower demand while electrifying operations to support the economical use of on-site renewables and storage.

Leading organizations have found it helpful to assemble their energy management portfolios with a few considerations in mind. The first is that creating value through demand-side action normally requires up-front capital investment. This makes it helpful to complete a comprehensive, top-down assessment of financing options early on, including government incentives and private partnerships in which energy players may look to provide organizations with capital in exchange for access to the energy from on-site renewables and storage.

Second, these organizations recognize that payback periods can vary significantly: putting energy-efficiency measures in place is likely to help them break even sooner than building renewables infrastructure. Leaders often prioritize levers with short payback periods, which reduces initial spending and supports the case for more long-term investment. To maximize benefits, leaders also assess demand-side opportunities with a whole portfolio view. Third, leading organizations look for additional opportunities—for example, in supply chains—to accelerate demand-side action and unlock value.

Taking action on energy demand isn't easy. But volatile energy prices, promising technology advances, a changing regulatory landscape, and stakeholder expectations of improved environmental performance all mean that the potential benefits are too significant to ignore. For organizations across sectors, the time to begin crafting demand-side energy strategies is now.

The authors wish to thank Emma Cox, Matt Howe, Tom Hughes, Alexandre Keller, Evelyn Loveband, Daniel McKenzie, and Paul Nillesen for their contributions to this article.

This is the first article in a series focusing on how organizations can create value from the global energy transition through demand-side energy initiatives.

strategy+business
a pwc publication

- strategy-business.com
- pwc.com/strategy-business
- facebook.com/strategybusiness
- linkedin.com/company/strategy-business
- twitter.com/stratandbiz