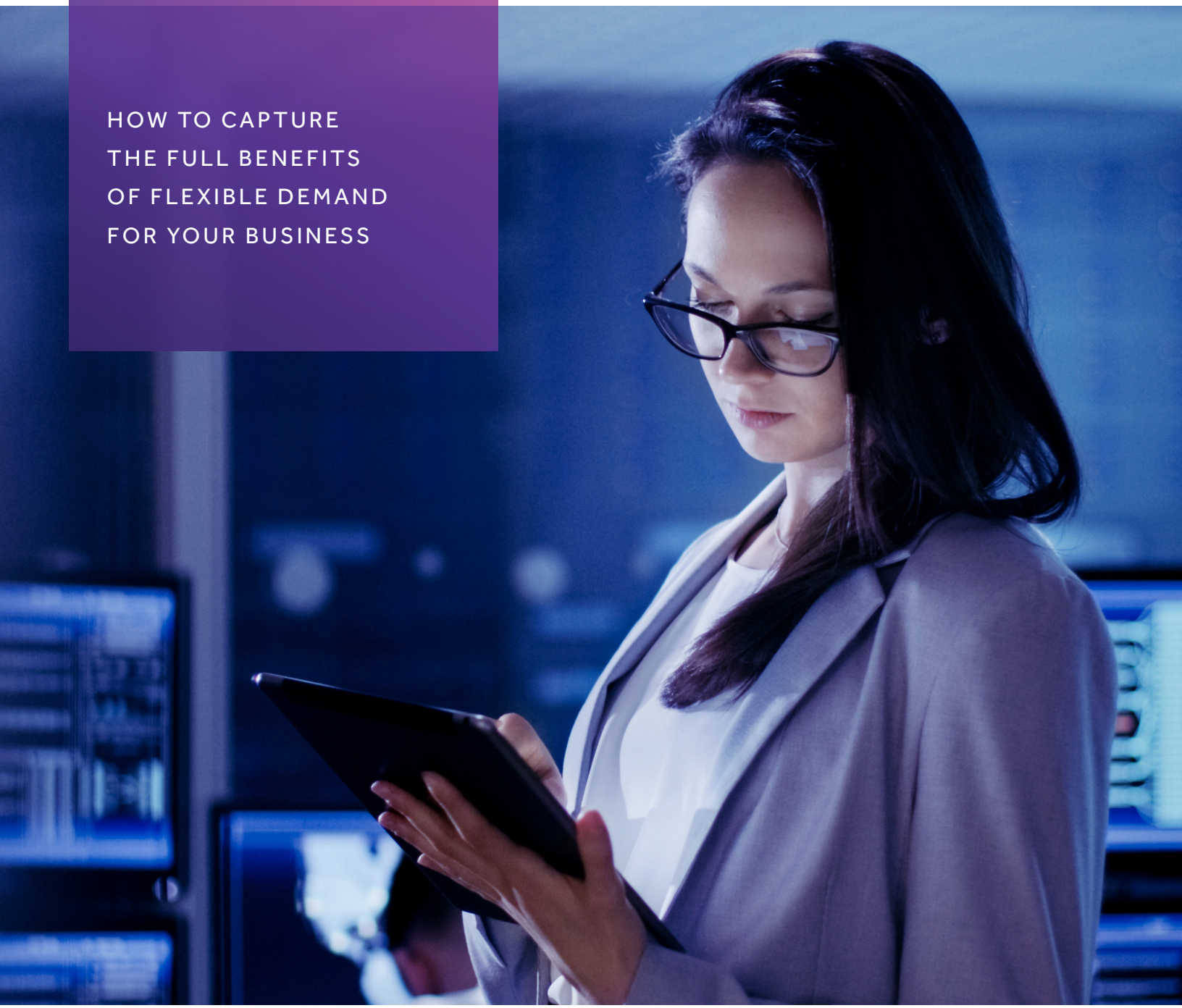
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HOW TO CAPTURE THE FULL BENEFITS OF FLEXIBLE DEMAND FOR YOUR BUSINESS



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Executive Summary

You may have heard how the concept of flexible demand can offer a new layer of savings and energy efficiency for your facility's energy management plan. While that's certainly true, it's also crucial that flexible demand isn't thought of as a standalone resource, but rather coordinated with other aspects of your program to capture its full benefits.

We prepared this white paper to help facility managers understand flexible demand and start taking steps to tap into the immediate opportunities. We explore:

- How flexible demand helps commercial and industrial facilities overcome today's energy challenges
- What technologies enable flexible demand
- Why it's important to implement flexible demand in the context of your larger supply and demand strategies

A range of technologies can facilitate flexible demand — so many, in fact, that facility managers may feel like they face a kaleidoscope of choices. This paper will help bring into focus the best options for your operation to activate flexible demand in a way that enables a holistic approach to energy management.

WHAT IS FLEXIBLE DEMAND?

Flexible demand is the ability of demand-side loads, such as hot water heaters or electric vehicle (EV) chargers, to change their consumption patterns. Shifting often occurs at the direction of communication and control technologies while still performing required functions.

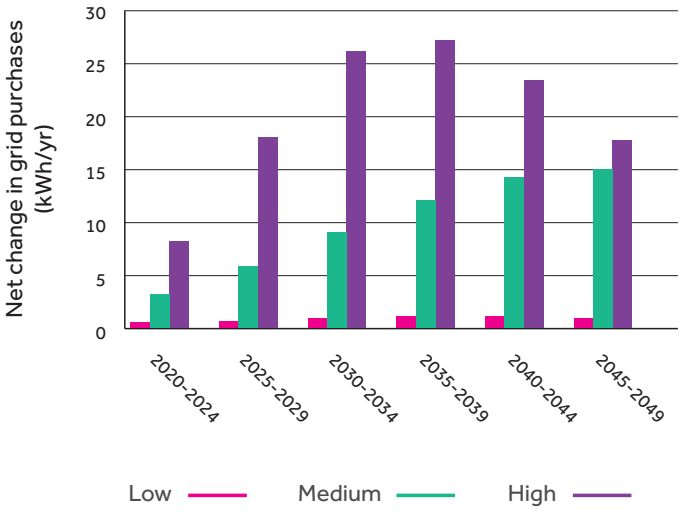
Flexible demand turns challenges into opportunities

Commercial and industrial facility managers face a series of emerging challenges and opportunities related to energy use today and into the foreseeable future. Among the most common:

- Energy price volatility makes it difficult — without expert assistance — to lock in the right contract for energy supply while optimizing price and risk
- Energy use is rising as facilities add electric vehicle fleets and electrify building systems
- Equipment must be replaced because it's aging, or has become outdated due to sustainability goals
- Onsite resources — EV chargers, solar, battery storage, controllable generators, and microgrids — open the way for new and sometimes complex ways to manage energy

PROJECTED ENERGY GENERATION TO SUPPLY EVs

Projected annual incremental energy generation to supply EVs, averaged to five-year periods for the low, medium, and high market-penetration scenarios



Source: USDRIVE, "Summary Report on EVs at Scale and the U.S. Electric Power System."

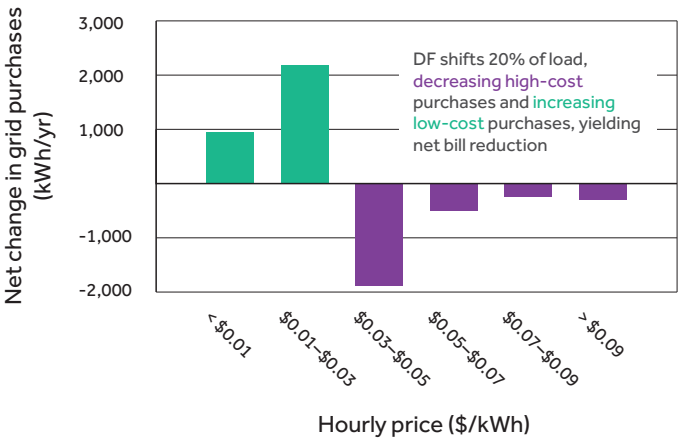
All this comes at a time when the grid's power supply is becoming increasingly intermittent with the addition of solar and wind power. As a result, the grid requires services to maintain its supply and demand balance, and in some cases electricity customers can provide them and be compensated for it.

These challenges turn into opportunities when flexible demand is utilized. To activate flexible demand, you must first understand the applicable technologies, strategies, and markets. Facilities and energy managers also must gauge whether they have the bandwidth to pursue flexible demand value streams on their own, or engage an expert partner. And if you do need an expert partner, how do you choose one?

How flexible demand works

Flexible demand allows businesses to tap into the power of smart technologies to best manage the energy they buy and the energy they consume. Think of it as technology-enabled actions that can change the answers to the questions: When, where, and how much energy? In essence, flexible demand is a valuable asset that exists when a customer's operation allows for the ability to shift demand easily with minimal or no disruption. It ultimately results in integration and optimal management of energy supply and demand through the use of automated systems. Startup barriers do exist to launching flexible demand activities, but businesses reap rich benefits, including maximum energy savings with minimal effort once the right strategy is activated.

SHIFT TO LOWER-COST TIMES THROUGH DEMAND FLEXIBILITY (DF)



Source: Rocky Mountain Institute, "The Economics of Demand Flexibility: How 'Flexiwatts' Create Quantifiable Value for Customers and the Grid."



FLEXIBLE DEMAND IN ACTION

The easiest way to understand flexible demand is by looking at it in action. Take a hot water heater, for example. If the unit has smart controls, it can be programmed to a schedule to avoid heating water during peak periods of energy demand and shift that heating to times when electricity is cheaper. But the flexibility goes beyond just scheduling. If the electric grid is facing a supply shortage — say because a large power plant has to shut down suddenly or there's no wind to generate wind power on a hot day — grid operators can signal the water heater to shut down for a short period of time while the power shortage is managed, thus helping to avoid a costly system outage.

Because flexible demand evolved from now common demand response capabilities, the two are closely associated. But there are several key differences between flexible demand, demand response, and standard energy supply.

Flexible Demand does not reduce energy use at all times like energy efficiency. It does manage energy loads in a smarter way, so your business uses the energy it needs to operate at the most advantageous times. To be a fit for flexible demand, a load source must be what grid operators call "dispatchable" (i.e., it can be ramped up or shut down in a relatively short amount of time) and have at least one of three load attributes:

1. The load is firm when there is a 95 percent or higher probability it is available to reduce the load behind the meter when asked by building management or automated processing software. Conversely, in the case of a distributed energy resource (DER) like rooftop solar, the source sends power into the local distribution grid.

2. The load is controllable when it can be reduced or exported within a defined time frame, and preferably is available within 24 hours or as short as 30 minutes of notification.

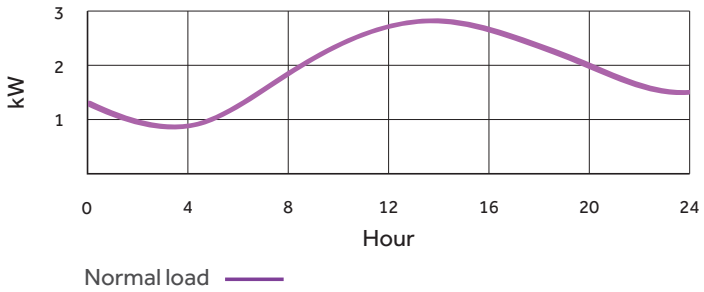
3. The load is available when it's able to operate between five and seven days a week and up to 24 hours a day. In addition, the dispatchable load can reduce or export for a duration as short as 15 minutes or up to several uninterrupted hours.

   You might have noticed DERs were mentioned as a source of firm dispatchable load. In fact, onsite generation sources such as rooftop solar utilizing battery storage are firm, controllable, and flexible, making them excellent resources in a flexible demand program. That's right, a source of energy can participate in flexible demand programs, too. While much of the attention is on sources of energy demand, such as water heaters, EV chargers, and HVAC systems, any customer-owned resource that can export power to the grid or reduce demand for power from the grid can be part of a customer's flexible demand mix.

Grid purchases, distributed generation, energy efficiency, and demand flexibility compared:

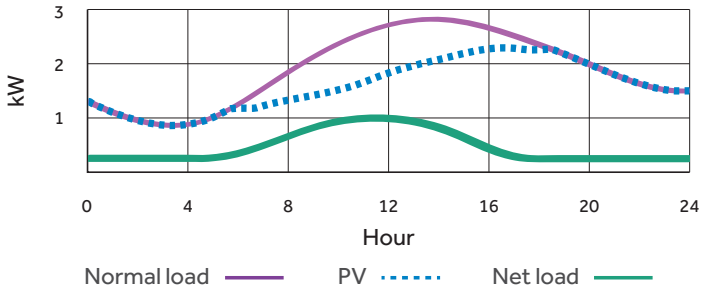
GRID PURCHASES

Buy kWh from the grid as and when needed



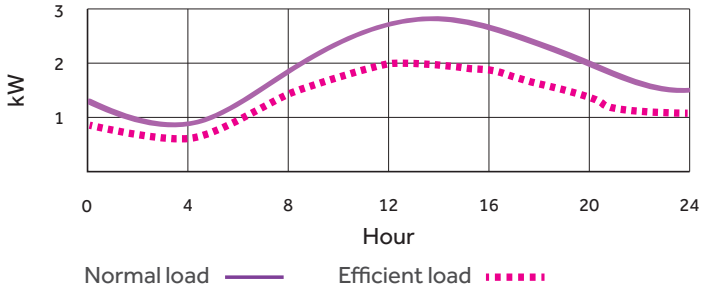
DISTRIBUTED GENERATION

Generate electricity, changing the profile of net grid demand while reducing total grid demand



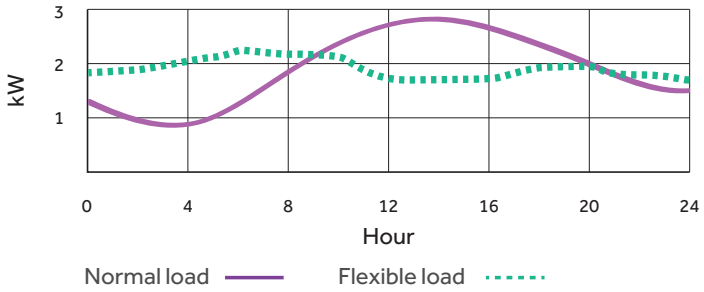
ENERGY EFFICIENCY

Reduce demand whenever load is operated, thus lowering the daily load curve



DEMAND FLEXIBILITY

Shift eligible loads across the hours of a day to lower-cost times, reshaping the daily load curves



Source: Rocky Mountain Institute. "The Economics of Demand Flexibility: How 'Flexiwatts' Create Quantifiable Value for Customers and the Grid."

What gave rise to flexible demand?

Several developments have contributed to the rise of flexible demand:

- Increased availability of nonproprietary software, such as open ADR standards, have enabled faster changes in electricity demand for products that use and control energy
- Onsite generation resources such as diesel generators, rooftop solar, battery storage systems, and microgrids have proliferated
- Higher quality, lower cost bandwidth has created reliable communication links to remote sites — Broadband cellular, Bluetooth, and Wi-Fi signal upgrades have allowed for better data collection and control
- The rise of intermittent renewable energy resources like solar and wind providing power to the grid has created the need for new market responses to reduce energy demand when the sun is not shining, the wind is not blowing, and conventional power plants need time — even just a few minutes — to ramp up
- Federal, state, and energy market rules and regulations have evolved to allow programs that harness the power of new technology
  - New demand response program rules often favor faster, remote, firm controllable load over slower, onsite, manual control
  - FERC's landmark Order 2222 opens wholesale markets to DERs, breaking down barriers to emerging technologies and allowing customers with DERs to maximize their potential for energy cost savings in myriad ways, including flexible demand

A quick survey of technologies that enable flexible demand

Flexible demand enablement does not always require new capital investments. Enabling technologies may already be available at your site. Or they are widely available, affordable, and ready to be integrated into your energy management.

They include:

- Smart thermostats
- Smart building energy management controls
- Smart, timed water heating and building HVAC systems
- Electric vehicle chargers
- Distributed energy resources and backup generators
- Microgrids
- Refrigeration, elevators, and other electric appliances

In cases where those technologies are tied to energy demand, the resources are connected to communication systems that allow them to receive orders to reduce, stop, or shift their functions. For DERs and microgrids, smart controls can deliver orders for the supply to be shifted from onsite to the grid. These control orders can be automated and scheduled as part of a facility manager's strategy to use flexible demand to reduce energy costs or, if allowed, by a grid operator as part of a demand response program.



How to get the most out of flexible demand

When activated correctly, flexible demand enables the integration of supply and demand business strategies for optimal value, autonomously manages energy consumption and load shifting, generates energy cost savings, and creates new revenue streams by allowing a business to participate more actively in market programs.

Similar to energy supply and demand response programs, businesses often benefit from employing a partner to help them manage flexible demand for maximum benefit.

To get the most out of flexible demand, businesses should consider it in terms of their entire energy supply and demand portfolio. Doing so allows them to combine demand-side load management through means such as demand response programs, along with the right energy supply structure to achieve the greatest benefits from a business' load flexibility.

Every business will need to integrate supply and demand in a thoughtful manner to ensure that new flexible demand capabilities can "see both sides" to achieve benefits that deliver on company goals, such as energy efficiency, new revenue opportunities, or progress toward sustainability goals. To accomplish that, businesses should consider choosing one vendor with appropriate expertise, size, and scale to provide all the energy management services they need, including flexible demand.

There are two primary reasons to consider one partner across energy supply, demand, and flexible demand planning.

1 Managing volatility

When choosing an energy supply agreement, you must make a decision months in advance of using the electricity. That requires assumptions about future electricity prices and your energy use that may or may not prove true. It's a gamble. There's no way to be certain that the plan you choose is optimal.

The same is true with demand response. You sign your business up for a program with the assumption it will save a certain amount of money. But because of unforeseen day-to-day operational needs and other factors, you may not realize the full gain. Just think of how the massive supply-chain disruptions during the coronavirus pandemic have led to supply shortages and surging prices for any number of materials and products. If you operate a widget factory and widget prices have risen 400 percent since entering into a demand response program, scaling down production to dial back energy use is probably not desirable.

The volatility of energy prices can threaten to disconnect your supply and demand strategies. It is a risk that can and should be managed carefully.

2 Managing relationships

When you contract for energy supply from one vendor and choose a different vendor to manage your demand response program, you at best miss opportunities that emerge from integration, and at worst may find your programs inadvertently undercutting each other. Adding a third vendor to manage flexible demand only increases the disconnect among service providers, creates unnecessary hassle for you, and results in suboptimal energy management.

Your business is busy doing what you do best: delivering for your customers. You don't want to worry about energy every day and may not have the bandwidth to manage the complexities of balancing energy supply and demand on your own. Choosing a single partner means the ease of contracting and one point of contact.

An expert partner will incorporate flexible demand into a holistic energy management approach so that it enhances your energy supply strategy and demand-side capabilities. Aligning flexible demand, demand management, and supply strategies helps meet company goals, maximizes cost savings, reduces energy use, boosts system reliability, and ensures you're not sacrificing energy opportunities.

Choosing the right partner

The ideal vendor to manage flexible demand within a broader energy load management plan offers several key attributes:

- An established energy supply provider that delivers insight and expertise into complex markets
- An established demand response provider that operates in programs across the country and understands their nuances
- A large player with the size, scope, and reach to offer a business the benefits of its economies of scale and ability to work anywhere an energy solution is available
- A seasoned expert equipped with the technology, skills, and knowledge to best align energy supply and demand decisions
- A knowledgeable consultant that understands your critical needs and pursues energy management opportunities that align with them



Partnership in action

Recently, a leading hospital system was looking to institute a greater level of savings across its organization. The goal in doing so was to expand its mission, elevate patient care, and grow into a system of eight hospitals. With an aging power infrastructure and a high priority on resiliency, they needed an energy partner that could construct a custom solution to meet its goals.

This healthcare provider turned to NRG to map its energy needs to tangible solutions that focused on cost, resiliency, and efficiency with a custom, holistic energy strategy that:

- Provides a flexible energy supply plan
- Ensures the hospital system is enrolled in relevant demand response programs and prepared to participate without sacrificing energy use required for care
- Delivers a flexible demand approach that reduces energy spend, prioritizes emergency readiness, and maintains grid stability for the local energy network

By working with one partner, the customer also has access to a single online account management tool that allows it to create tailored reports and share data with facility managers overseeing nearly 200 electric metered sites.

In total, the approach delivered $750,000 per month in cost savings and resulted in a stronger grid for customers whose lives literally depend on reliable power.

Flexible demand opens the door to a strategic energy approach for managers

If your business is considering activating your flexible demand, you need a partner with scale to provide the right advice and capabilities to properly consider your energy supply and demand strategies.

By working with one vendor, your energy partner can achieve a holistic view of your business. This approach yields a more collaborative, streamlined relationship delivering energy management benefits aligned with your operation.

Next steps



Understand your facility's mission-critical operations and your energy resources

Where one business can easily dial back operations without a major impact to operations or customer service, the next business might have a fixed load profile with little flexibility



Conduct deep analysis with an expert adviser to make the best decisions about how to implement flexible demand

Consider local policies and programs

Evaluate what technologies you already have onsite that may be employed for flexible demand and consider what new investments are necessary



Evaluate and choose a single energy partner with scope and scale across energy markets and with customers in many industries to maximize benefits for your business through integrated energy management

As an expert in developing customized energy solutions for businesses and organizations across the nation, NRG can devise a winning energy management strategy for its customers. NRG can provide auditing, advisory, implementation, and management services to help launch flexible demand programs that integrate with your overall energy strategy to deliver results customized for your business needs.

About NRG Energy, Inc.

At NRG, we're redefining power by putting customers at the center of everything we do. We create value by generating electricity and serving nearly three million residential and commercial customers through our portfolio of retail electricity brands. A Fortune 500 company, NRG delivers customer-focused solutions for managing electricity, while enhancing energy choice and working towards a sustainable energy future. More information is available at nrg.com. Connect with NRG on Facebook, LinkedIn and follow us on Twitter at @nrgenergy.

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