



DEMAND RESPONSE MANAGEMENT FOR A CLEAN ENERGY TRANSITION

Abstract

Sustainable access to clean energy for everyone is one of the United Nations' sustainable development goals. And a clean energy transition and achieving net-zero emissions in the energy sector are big steps towards achieving this goal. Energy demand response management is one of the key strategic tools that can help the international energy sector flatten peak demand to achieve a more reliable, stable, and sustainable grid infrastructure. Because once these goals are achieved, the energy sector can focus on safely transitioning away from fossil fuel-backed traditional energy. RPA-backed innovation can be the way to go to accelerate the clean energy transition with the help of demand response management.



The world today is moving towards a 100% renewable energy supply and net-zero emissions by 2050. However, it is clear that a clean energy transition and a sustainable future depend heavily on the full electrification of the existing systems in both consumer and commercial spaces. This naturally would lead to a significant increase in electricity demand, with experts estimating a 60% increase in demand for

electricity by 2040. If we want to move towards a decarbonised economy, 79% of the energy has to come from renewable sources by 2050.

However, the renewable energy supply is highly unpredictable and intermittent, which we cannot “turn on or off” depending on the fluctuations in demand. And we can no longer rely on traditional power stations and “spare power plants”

to meet the demand peaks and maintain consistent electrification. This is where energy demand response management comes into the picture, facilitating a balance between electricity demand and supply, eliminating the need for high infrastructure investments for a zero-carbon energy transition.

What is demand response?

Demand response (or demand-side flexibility) is a tool that can help reduce the load on utility grids during peak hours by allowing consumers to reduce or shift their usage for time-based rates or financial incentives. Ensuring grid reliability and stability to avoid blackouts is the key goal of demand response management. A typical demand response event involves the grid operator predicting a grid stability problem, aggregator optimising their

distribution based on the balance, clients modulating their consumption, and clients receiving financial incentives (or benefits) per contract.

Common methods to engage customers in energy demand response management include time-based rates and other financial incentives. Customers can either allow the power companies to cycle their appliances on and off during peak demands or use advanced metering

infrastructure and smart in-home systems to monitor and reduce their peak period consumption. Both industrial and residential customers can benefit from participating in demand response programs while allowing the electricity grid operators to balance supply, reduce costs, and move towards a clean energy transition.

Role of demand response in clean energy transition

International Energy Agency's (IEA) Net Zero Emissions by 2050 (NZE) – in alignment with the UN's energy-related SDGs – outlines a pathway to achieve net-zero carbon emission in the energy sector. The NZE anticipates a significant increase in electricity demand from widespread electrification as the world becomes increasingly reliant on renewable energy resources like solar and wind. This means an increased demand for global power grids with unpredictable and intermittent energy resources. Efficient

demand response management systems can help accommodate the potential impact of increased electricity demands without the need to invest heavily in building new transmission and distribution infrastructure.

Additionally, the need for demand response typically arises on the hottest or coldest days, where grid operators have to rely on old and inefficient peaking power plants that have much higher emission rates than typical grids. So, reducing demand during peak periods eliminates

the need for emissions from peaking power plants. By reducing their consumption, customers can also reduce their emissions during peak periods. Going further, effective demand response management can also help provide a more stable grid – with renewable energy integration – while avoiding ratepayer increases. With a reliable and stable grid, there is a reduced need for additional power-generating facilities, which in addition to avoiding emissions, can also save consumers money for new infrastructure development.

Energy demand response management in action

Different energy demand response management programs can offer many benefits and opportunities for businesses to tackle high energy costs or create new revenue streams. Enrolling in demand response programs can help businesses save energy costs by adjusting their operations to shift consumption to off-peak hours. They can also plan their

operations around potential disruptions with advance outage notices. Additionally, demand response programs also contribute towards the company's own sustainability goals by improving energy management and helping transition towards a greener energy infrastructure. An example of a business saving 10% in energy costs through demand response

management systems is Misawa Homes – a sawmill in Finland. They use industrial fans to dry the lumber before exporting it to Japan. Periodically shutting down these fans or adjusting their power has allowed the company to be flexible in their power consumption, save energy costs, and earn revenue by participating in a demand response program.





Benefits of demand response management

Demand response programs have played a significant role in increasing the efficiency of electricity production and resource allocation. This has several benefits for customers and energy grid operators. The key benefits of demand response management include:

1. Lower electricity costs: Participating in demand response programs allows consumers to offset their overall energy costs by availing of time-based rates or earning financial incentives from participation. Additionally, these programs can help reduce electricity costs in the wholesale market, which, in turn, can lower retail prices for customers.

2. More reliable grid: Energy demand response management ensures energy stability via a more reliable grid. Effectively

balancing demand and supply means a lower likelihood of unexpected power outages. Additionally, flexible energy assets can also help maintain grid frequency, lowering the chances of running into any major problems.

3. Lower market prices: Demand response can help grid operators flatten peak usage, which often requires them to either purchase electricity from the wholesale market or rely on spare or peaking power plants. This is often a costly and emission-heavy alternative owing to its reliance on fossil fuels. Eliminating the need to acquire additional electricity can lower the market prices.

4. Accelerating energy transition: Making the grid more reliable is one of the key challenges to transition to renewable

energy because of its intermittent and often unreliable nature. But with a more reliable grid, demand management can accelerate the process of phasing out fossil fuel plants in favour of cleaner and renewable alternatives.

5. Greater sustainability: Demand response management systems can help your company achieve its sustainability goals by optimising energy consumption and managing dependence on the traditional grid. This also allows you to supplement your energy needs with cleaner energy alternatives, contributing to net-zero emission goals and sustainable development goals.

Digital transformation for demand response management

Although it is possible to implement manual demand response programs, grid modernisation through digital transformation and robotic process automation (RPA) can help ensure more effective demand response management. As a result, authorities and energy and utility industries around the globe are investing in development programs that

can allow national and international grids to utilise demand response programs to optimise grid operations. Therefore, most companies and residential customers rely on demand response software providers, smart devices, and utility programs to engage in energy demand response management. Applications like distributed energy resource management

systems (DERMS), virtual power plant software, smart EV charging apps, and connected devices and utility programs have made it easier for industrial and residential customers to support clean energy transformation through automated demand response programs.

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support clean energy transformation through automated demand response programs.

However, to achieve the NZE targets, policy and technology implementation to support demand response has to accelerate. This urgency has prompted international authorities to deploy enabling technologies and innovative solutions to support and track demand

response. One way to achieve this is for electric grid operators to work with customers, coupling distributed energy resources and connected devices with smart meters and RPA to boost demand response programs, reduce overall peak demands, and support NZE.

Many countries are taking innovative approaches to achieve this, especially when it comes to engaging domestic

customers in demand response programs. Some countries are exploring electrical vehicle-to-grid charging, interoperable demand response on energy smart appliances, or virtual power plants. An increasing number of stakeholders around the globe are investing in technologies and infrastructure that will support energy demand response management for a faster clean energy transition.

Conclusion

Zero emission and clean energy transition have to be key goals of global energy and utilities industries if we want to achieve sustainable development. Developing and implementing effective demand response management systems is crucial to achieving this goal. It can help achieve enough energy stability through reliable grids to offset the intermittent and

unpredictable renewable energy resources. Additionally, it also offers benefits like lower energy costs, accelerated energy transition, and greater sustainability. Understanding its significance in achieving the zero-emission goals, energy and utility industries and government authorities around the globe have started to invest in technology deployment and

innovative solutions to support effective energy demand response management. Partnering with [leading BPM organisations](#) can help you leverage next-gen technologies and RPA to harness the power of demand management programs and accelerate the clean energy transition.

* For organizations on the digital transformation journey, agility is key in responding to a rapidly changing technology and business landscape. Now more than ever, it is crucial to deliver and exceed on organizational expectations with a robust digital mindset backed by innovation. Enabling businesses to sense, learn, respond, and evolve like a living organism, will be imperative for business excellence going forward. A comprehensive, yet modular suite of services is doing exactly that. Equipping **organizations with intuitive decision-making** automatically at scale, actionable insights based on real-time solutions, anytime/anywhere experience, and in-depth data visibility across functions leading to hyper-productivity, [Live Enterprise](#) is building connected organizations that are innovating collaboratively for the future.

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