Why the US needs a demand-side *energy revolution*

When it comes to success in the energy transition, improving how people use electricity is just as important as how it's produced and distributed

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Companies that can successfully navigate the opportunities and challenges of the energy transition will unlock tremendous benefits for themselves and the nation.

Beyond fighting climate change, moving from fossil fuels to cleaner resources has the potential to protect energy security, limit US reliance on imported fuel, reduce operating costs, create jobs, and multiply competitive advantages.

Nevertheless, many conversations about the energy transition focus solely on the supply side: investments in solar panels, wind turbines, and other renewable technologies. These are undoubtedly important, but we must not overlook the demand side: how and when people use electricity.

It's not just the energy companies that need to transform how they generate and distribute electrical power. Businesses, local communities, and private individuals all have critical roles to play in moving sustainability forward.

However, energy companies can empower their customers to make the right decisions for themselves and the world. New technologies allow people to optimize their usage and even send excess energy back to the grid to make money and support others.

But it's up to the energy companies to show them what is possible.

Energy efficiency and the United States

Improving energy efficiency is imperative to reduce greenhouse-gas emissions by 43 percent by 2030 – as recommended by experts – to avoid the most severe, irreversible impacts of anthropogenic climate change, such as extreme weather events and significant risks to human health.

The U.S. Energy Information Administration (EIA), the federal agency responsible for collecting and analyzing energy data, shows that American energy consumption has been stable since 2000 despite economic growth. This is principally the result of greater energy efficiency.

While pulling other levers (e.g., clean energy, carbon capture and storage) to reduce carbon emissions, the US will need to stay vigilant about rising demand if it wants to maintain energy efficiency.

Demand is increasing as customers adopt more electric products (like vehicles and heaters) and use generative AI more frequently, which puts greater pressure on data centers.

The demand side of the equation: From consumers to omnisumers

Customers are no longer passive consumers of energy. Many are becoming prosumers (who consume and produce energy) while others are becoming "omnisumers" (who take action to manage their energy footprints).

Omnisumers can generate, store, and manage their own energy to save money personally. With the right support, they can also play an active role in assisting the grid and helping the nation move toward its sustainability goals.

To manage electricity consumption more efficiently, consumers can use intelligent technologies: smart thermostats, smart EV chargers, battery storage systems, internet of things (IoT) sensors, and so forth. These products and tools let consumers shift to off-peak times, store power locally, and reduce energy use generally.

Many people are investing in distributed energy resources (DERs) like rooftop solar and battery storage for their homes and businesses – lowering bills, improving resilience, and increasing efficiency.

Enhanced demand-side management is estimated to cut peak demand by 10 percent by 2030, which would reduce the need for new infrastructure.

Encouraging active grid participation

But the responsibility for this doesn't lie exclusively with the public. The shift toward DERs creates a more intricate system with greater load flexibility and more pronounced peaks.

Electricity providers must rethink their planning and operations to manage this increasingly complex system. To balance supply and demand in real time, they would benefit from complementing traditional infrastructure solutions with new tools like non-wire alternatives (NWAs), which are electrical grid investments that eliminate the need for certain upgrades.

Engaging consumers will be essential for an effective and fair energy transition.

Businesses and regulators in the energy sector can help consumers support the grid in several ways:

- **Build trust and transparency** – clearly communicate the advantages to supporting the grid while transparently acknowledging how and why customer data is used
- **Collaborate with other industries to make it easier** – help tech companies, automakers, and retailers integrate their products with the grid
- **Design better incentives around smart tech** – offer rebates for smart devices or demand-response (DR) programs.

Demand-response and time-variable pricing

Most utilities in the US offer DR programs that let large, industrial customers (e.g., factories, office buildings) reduce their electricity usage at peak times to help the grid. They can earn money by using less power or switching to backup generators – helping to balance the grid.

The United States' seven major grid operators, known as independent system operators (ISOs) and regional transmission organizations (RTOs), manage the flow of electricity across different regions. Each runs a DR program that lets these major companies participate in energy markets.

Time-variable pricing is a model where the cost of electricity changes depending on the time of day and the season, to reflect supply and demand. This could include higher prices during afternoon peaks, lower overnight rates, and moderate morning and late-evening rates.

The Federal Energy Regulatory Commission's (FERC) 2024 Assessment of Demand Response and Advanced Metering found that DR resources accounted for 6.5 percent of peak electricity across the US.

The Ontario Energy Board in Canada is collaborating with energy providers to run similar DR incentive programs that provide loyalty points or rebates for reducing energy consumption when supply is constrained.

Virtual power plants run by consumer devices

Hydro One, the electric utility serving the Canadian province of Ontario, was exploring new ways to manage rising electricity demand without building new power lines or stations.

The organization knew many of its customers had invested in DERs like solar panels and smart thermostats. It wanted to capitalize on this technology to drive sustainability while rewarding its DER-owning customers for using less electricity and relying on their own energy production at times.

Hydro One is aggregating customers' smart devices and DERs to create a geographically segmented virtual power plant (VPP) that can provide electricity to the grid when renewable sources are abundant. The company is conducting a study with IEA to determine the best ways to encourage participation and change energy consumption behaviors.

Together, the private and public sectors can build upon the momentum of the other to drive change.

End-to-end efficiency visibility

Homes and businesses can manage energy consumption more effectively with greater visibility into patterns and behaviors.

Schneider Electric, the global technology partner providing solutions for energy management and industrial automation, specializes in these kinds of insights. Alongside Capgemini, the company developed an integrated platform that helps organizations manage their energy supply efficiently across various structures and facilities.

The Energy Command Center (ECC) leverages next-generation tools – advanced AI, internet-of-things tech, machine-learning algorithms, etc. – to measure and predict various metrics like energy intensity, critical-asset health, operations, renewable-energy generation, and overall energy-asset performance. All this information can inform better decisions.

The ECC has the power to increase energy efficiency by more than 25 percent, improve asset utilization by more than 30 percent, and reduce maintenance costs by more than 20 percent.

Selling energy back to the grid

But optimizing energy use for individuals isn't just about reducing electric intake or relying on one's own power. People with advanced electric products can help, and make money, by sending excess energy the other way, into the grid. They become part of the solution.

For instance, there's concern that the rise in EVs puts additional strain on the electric grid. Numerous studies indicate that the US is on track to meet the federal government's goal of having half of all new-car sales be EVs by 2030. In 2024, major automakers and energy providers formed a national nonprofit, the Vehicle-Grid Integration Council, to address this kind of issue and coordinate best practices for this transition.

An effective strategy to offset the pressure of one's EV and even make a profit is to sell DR services through the vehicle's charging station. Known as vehicle-to-grid (V2G) charging, the backfeeding of electric power via bidirectional EVs goes beyond optimizing your energy use – it supports others when they're running low.

Energy-sharing communities

Groups of local businesses and residents have been generating and sharing renewable energy within a localized area. These prosumers are building distinct energy-sharing communities.

By consuming what one needs and sharing the excess with others, community members can reduce their energy costs, generate income, and support the grid.

The EU first set rules for energy-sharing communities in 2019. Some states like New York and California have introduced peer-to-peer energy trading policies and pilot programs. But a federal nationwide regulatory framework is still in development.

Nevertheless, two Department of Agriculture programs – Empowering Rural America (New ERA) and Powering Affordable Clean Energy (PACE) – are investing more than $6 billion into rural electric cooperatives and communities. They emphasize decentralized, renewable energies and community ownership.

Certifications for energy-efficiency specifications

The US runs a voluntary labeling program called Energy Star for products and facilities that meet the Environmental Protection Agency's (EPA) strict energy-efficiency standards. Thousands of organizations, including nearly 40 percent of the Fortune 500 companies, have partnered with the EPA to certify millions of products, according to the agency.

The rapid proliferation of energy-efficient products has forced some regulatory bodies to reassess what's considered sustainable.

For instance, in March 2021, the EU updated its energy labels because too many products were marked "efficient." One example is that over 90 percent of refrigerators on sale were labeled class A or above (A+, A++, and A+++). Now the EU has a stricter, simpler A to G scale in which very few products will achieve an A rating, setting them apart as truly exceptional.

Everyone has a role to play in promoting the wider use of energy-efficient devices. The public can opt for more sustainable options, but businesses and regulators should remove the confusion and guesswork wherever possible.

How energy companies can empower people

The World Meteorological Organization (WMO) reports that global temperatures are expected to remain at or near record levels for the next five years. There's an 80 percent chance that at least one of those years will be the warmest on record.

One of the United Nation's sustainable development goals is to double the energy-efficiency rate by 2030, compared to a 1990 to 2010 baseline period.

But the public can fight this global warming through the demand-side of the sustainability revolution. Furthermore, energy companies can take several steps rooted in the conviction that we all have a role to play in the sustainability transition:

- **Support customers** with tools and information to make informed energy decisions.
- **Collaborate across industries** to address the interconnected and systemic issues we face collectively.
- **Use data from smart devices and sensors** to improve energy efficiency, predict demand patterns, and integrate renewables.
- **Ensure access to sustainability programs** to all people regardless of income or location, so everyone can participate in the transition and enjoy its benefits.
- **Cooperate with regulators** who develop frameworks that encourage innovation, support new business models, and help utilities recover investment costs.
- **Encourage sustainable behaviors** – not just the adoption of certain technologies – throughout your organization and among your customer base to promote energy conservation.

Connect with Capgemini to explore how you can help people become active participants in renewable energy markets while helping to power the grid.

Please contact Kyle Haas, IT Transformation Director, for more information.

About Capgemini

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