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Inspire the Next

Microgrids Explained: **Top 10 Frequently Asked Questions**

**End-to-end, Resilient, Reliable and Cost-effective Energy
Management for the Commercial and Industrial Sector**

Environment Business Division - North America

Microgrids Explained:

Top 10 Frequently Asked Questions

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Microgrids are self-sufficient energy networks that operate either in tandem with the main electrical grid or independently, harnessing a mix of traditional and renewable energy sources.

Microgrids represent a transformative approach in energy management, offering a localized and efficient solution for electricity generation, distribution, and control. As the energy landscape shifts from one of centralized energy production (consumer) and distribution to decentralized production and distribution (prosumer), these self-sufficient energy networks operate either in tandem with the main electrical grid or independently, harnessing a mix of traditional and renewable energy sources.

For commercial and industrial facilities, microgrids are increasingly vital due to their ability to ensure reliable, cost-effective, and sustainable power supply. By mitigating risks associated with grid outages and enabling more efficient energy usage, microgrids not only bolster operational continuity but also aid in reducing environmental impact and energy costs. This makes them an essential component in the strategic planning of energy resources for businesses seeking resilience in their operations and a reduced carbon footprint in line with evolving environmental standards.

Following are answers to some of the most pressing questions we hear about microgrids – and how a microgrid can offer your company a competitive advantage in the future energy landscape.

1. What is a microgrid?

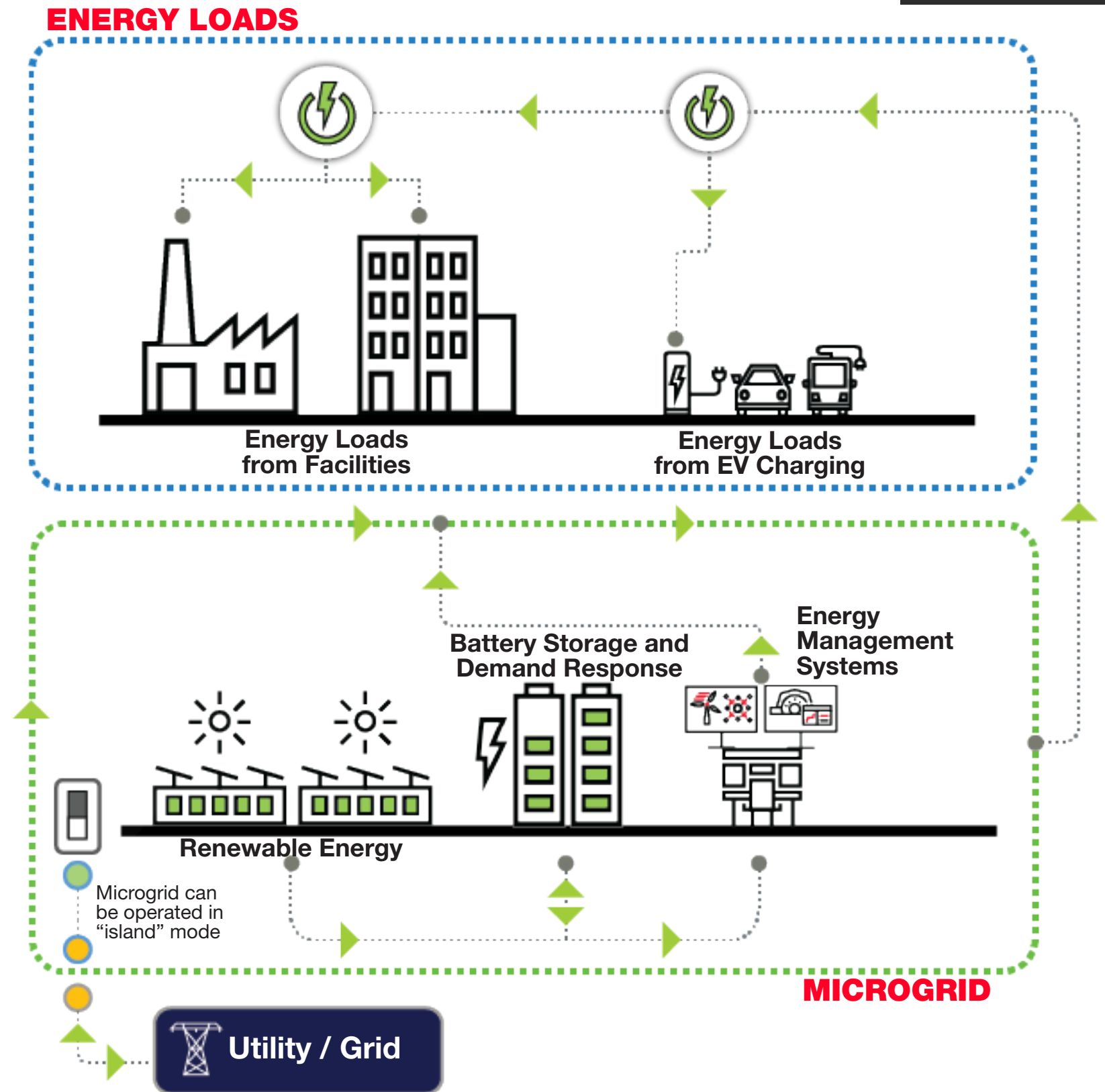
A microgrid is a localized group of electricity sources and loads that can operate autonomously or in conjunction with the main electrical grid. It typically includes various distributed energy resources (DERs) such as solar panels, batteries, and combined heat and power systems. Microgrids can also include controllable loads, energy storage, and advanced control systems.

Microgrids use a combination of power sources, such as solar panels and battery energy storage systems, to generate and store electricity locally. Advanced energy control management systems manage the flow of energy, allowing the microgrid to operate independently or connect to the main grid as needed.

How does a microgrid work?

Microgrids use a combination of power sources, such as solar panels and battery energy storage systems, to generate and store electricity locally.

Advanced energy control management systems manage the flow of energy, allowing the microgrid to operate independently in "island" mode or connect to the main grid as needed.



2. What are the benefits of a microgrid?

Resilience & Reliability

One of the primary advantages of microgrids is that they are a local and decentralized source of power, which means they have the ability to maintain power during grid outages. For businesses that require uninterrupted power supply (like data centers, manufacturing facilities, or hospitals), microgrids can act as a reliable backup to avoid costly downtimes.

If there is a grid outage for any reason, a microgrid can continue to operate independently of the grid, ensuring a continuous power supply to critical facilities. A microgrid enhances emergency preparedness by providing a reliable power source during natural disasters, grid failures, or other emergencies. Critical facilities and operations, such as hospitals, emergency services and critical manufacturing processes, can maintain operations even when the main grid is disrupted.

Energy Independence

Microgrids allow communities, businesses, and facilities to generate their own power, reducing dependence on external energy sources. By generating and managing their own energy, companies can become less dependent on the traditional power grid and the variability of energy prices.

This independence can be particularly valuable in areas with unstable or unreliable grid infrastructure. This contributes to greater energy security and independence.

Cost Savings

Microgrids often utilize renewable energy sources like solar and wind, which can reduce reliance on more expensive and environmentally harmful fossil fuels. Additionally, microgrids can optimize energy usage, leading to cost savings on electricity bills.

Peak shaving, where a microgrid reduces energy consumption during peak demand times, can also lead to significant cost reductions.

Through the optimization of local resources and improved energy efficiency, microgrids can lead to cost savings over time. They provide the opportunity to generate and consume energy locally, reducing transmission and distribution losses.

Grid Support & Peak Shaving

Microgrids can support the main power grid during periods of high demand, helping to alleviate strain during peak hours. This can result in more efficient grid operations and reduced electricity costs.

Revenue Generation Opportunities

Companies with microgrids can potentially generate revenue by selling excess power back to the main grid, especially during peak demand periods when energy prices are higher.

Environmental Sustainability

Microgrids can efficiently integrate renewable energy sources such as solar, wind, and hydropower. As companies increasingly aim to reduce their environmental impact, microgrids offer a pathway to incorporate more green energy sources. This can significantly lower a company's carbon footprint and support its sustainability goals through cleaner energy generation, thus reducing reliance on fossil fuels, contributing to environmental sustainability.

By incorporating renewable energy sources and promoting energy efficiency, microgrids contribute to a reduction in greenhouse gas emissions and other environmental pollutants, supporting broader sustainability goals.

More microgrid benefits

Customization & Scalability

Microgrids are flexible and scalable, allowing for customization based on the specific energy needs of a facility or industrial site. They can be designed to accommodate different energy sources and technologies.

Technological Innovation

The implementation of microgrids encourages the development and integration of advanced technologies, including smart grid components, energy storage systems, and control systems, driving innovation in the energy sector.

Enhanced Power Quality

Microgrids can provide a higher quality of power, with fewer surges and interruptions, which is essential for sensitive equipment used in industries like healthcare, research, and high-tech manufacturing.

Community and Public Relations Benefits

Companies that invest in microgrid technology often gain positive public relations benefits. Demonstrating a commitment to sustainability and innovation can enhance a company's reputation with customers, stakeholders, and the local community.

Preparation for Future Energy Trends

Understanding and investing in microgrid technology positions companies to be at the forefront of energy trends. As the global energy landscape evolves towards more decentralized and sustainable systems, early adopters of microgrid technology may have a competitive advantage.



Grid resiliency is an imperative

The hidden costs of lack of grid resiliency

Some companies can incur hundreds of thousands (or millions) of dollars in costs if the main grid goes down, due to the nature of their business. For example, food, plastics or pharmaceutical manufacturers may have to “scrap” materials and products in process if there is a delay due to a grid shutdown during the manufacturing process.

Food, plastics, and pharmaceutical manufacturers may have to scrap materials and products in process if there is a delay due to a grid shutdown during the manufacturing process for several reasons, each specific to the nature of the materials and processes involved in these industries:

Food Manufacturing:

- **Perishability:** Many food products are highly perishable. A power outage can disrupt refrigeration and controlled environments necessary to preserve raw materials and finished products, leading to spoilage.
- **Safety Standards:** Food safety regulations are stringent. If the manufacturing process is interrupted (for example, cooking or pasteurization processes), there’s a risk of bacterial growth or incomplete processing, making the food unsafe for consumption.
- **Quality Control:** Consistency in taste, texture, and appearance is crucial. Any interruption in the manufacturing process can affect these qualities, rendering the product below standard for sale.

Plastics Manufacturing:

- **Process Interruptions:** Plastic manufacturing often involves precise temperature and timing controls (like in injection molding or extrusion processes). A power outage can cause improper forming or curing of plastics, leading to defects.

- **Material Properties:** Certain plastics may harden or become unusable if the manufacturing process is halted unexpectedly. This can lead to material wastage as they cannot be re-melted or reformed.
- **Equipment Damage:** Sudden shutdowns can also damage manufacturing equipment, which may affect the quality of the product when production resumes.

Pharmaceutical Manufacturing:

- **Sterility and Contamination Concerns:** Pharmaceuticals must be manufactured in sterile environments. Power outages can compromise these conditions, leading to potential contamination.
- **Chemical Stability:** Many pharmaceuticals have strict requirements for temperature and environmental conditions to maintain chemical stability. An interruption can alter the chemical composition, rendering them ineffective or unsafe.
- **Regulatory Compliance:** The pharmaceutical industry is highly regulated. Any deviation from the approved manufacturing process, including interruptions due to power outages, can result in non-compliance, requiring the scrapping of the affected batch.

In all these industries, the cost of compromising safety, quality, or regulatory compliance far outweighs the cost of scrapping and remanufacturing the products. Additionally, the risk of distributing substandard or unsafe products can lead to severe legal and reputational consequences. This is why, in the event of a grid shutdown, these manufacturers often have no choice but to discard materials and products that were in process to ensure they meet the required standards.

3. How does a microgrid help with peak shaving and demand response?

Versatility

Microgrids can play a crucial role in both peak shaving and demand response strategies due to their versatility. They store energy, control distributed resources, and respond dynamically to grid conditions, which makes them an effective tool for both peak shaving and demand response. These capabilities not only benefit the microgrid operator in terms of cost savings but also contribute to a more resilient and stable energy infrastructure at the larger grid level.

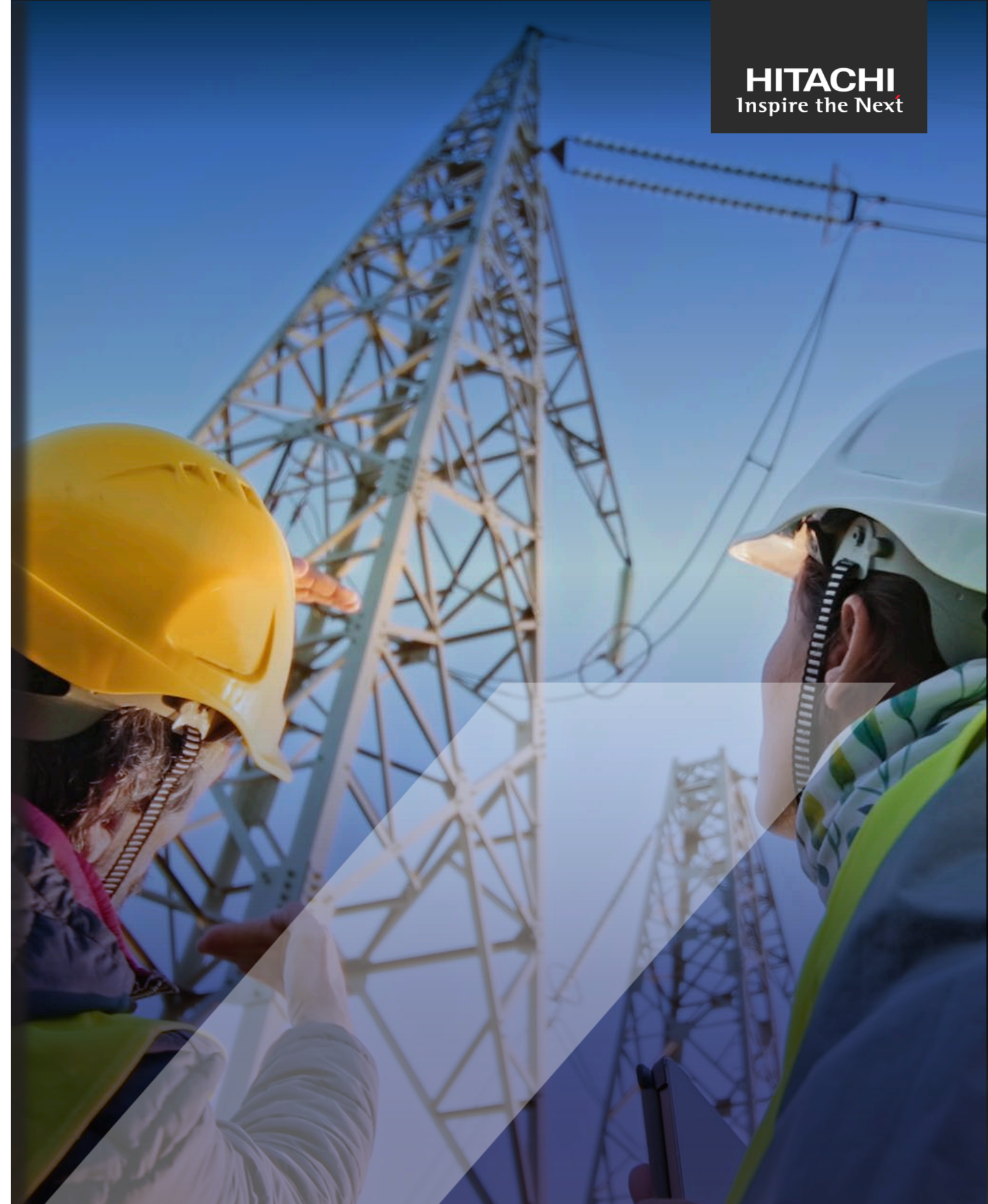
Peak Shaving

In terms of peak shaving, a microgrid integrates energy storage systems, such as batteries, to accumulate surplus energy during periods of low demand or excess renewable energy production. This stored energy is then deployed during peak demand times, effectively reducing the reliance on grid electricity and minimizing demand peaks. The microgrid's advanced control systems and optimized algorithms contribute to the efficient operation of distributed energy resources, ensuring a judicious use of energy.

Demand Response

Microgrids allow for the capture and storage of excess energy produced during peak generation times. This stored energy can then be deployed during periods of high demand or when renewable generation is low. Demand response programs complement storage by encouraging energy consumers to reduce or shift their energy use during peak periods, often in exchange for financial incentives.

In the context of demand response, microgrids leverage real-time monitoring to track energy consumption patterns. Automated control systems enable rapid responses to grid signals, allowing the microgrid to adjust energy usage dynamically. This may involve temporary reductions in non-critical loads or modifications to equipment operation in alignment with grid conditions.



How a microgrid responds dynamically to energy demands

Responsive energy analysis and management

A microgrid responds dynamically to grid and load conditions through a combination of advanced control systems, energy management strategies, and responsive energy resources.

Here's a breakdown of how this works:

- **Sensing and Monitoring:** Microgrids are equipped with sophisticated sensors and monitoring devices that continuously assess various parameters such as energy demand, supply levels, and overall grid stability. This includes monitoring the main grid's frequency, voltage, and power flow.
- **Advanced Control Systems:** These systems, often based on sophisticated software algorithms, are the brains of the microgrid. They interpret the data collected from sensors and decide the best course of action. These control systems can operate in real-time, making rapid adjustments to maintain stability and efficiency.
- **Energy Management:** Microgrids manage a variety of energy sources, such as solar panels, wind turbines, battery storage, and even traditional diesel generators. The control system determines the optimal mix of these sources to meet the current demand while considering factors like renewable energy availability, battery charge levels, and energy prices.
- **Grid Islanding:** One of the key features of a microgrid is its ability to "island" or disconnect from the main power grid during outages or disturbances. When the microgrid detects a problem in the main grid, such as a blackout or significant voltage

fluctuations, it can isolate itself and continue to operate independently, providing uninterrupted power to its connected loads.

- **Demand Response:** Microgrids can respond to grid conditions by adjusting their load. This might involve reducing non-essential energy use or shifting usage to off-peak times. In some cases, microgrids can also supply excess energy back to the main grid, especially during peak demand periods or emergencies, thus supporting the larger grid infrastructure.
- **Battery Storage Utilization:** Modern microgrids often include battery storage systems that can store excess energy generated during low demand periods. These batteries can then supply energy during high demand or when renewable energy sources are not available (like solar panels at night).
- **Predictive Analysis:** Many advanced microgrids use predictive analytics to forecast future energy needs and potential grid disturbances. This allows the microgrid to preemptively adjust its operation, like storing extra energy in anticipation of a high-demand event or a drop in renewable generation.
- **Communication with the Main Grid:** Microgrids often communicate with the main grid to receive updates about overall grid health, pricing information, and demand-response requests. This two-way communication allows for more harmonious operation between the microgrid and the larger grid system.
- **Self-Healing Capabilities:** Some microgrids have self-healing capabilities that allow them to

automatically reroute power in the event of a fault or failure in one part of the system, thereby minimizing disruptions.

- **Scalability and Flexibility:** Microgrids can dynamically adjust their scale of operation, ramping up or down based on the requirements. This flexibility allows them to efficiently manage the balance between generation and load, ensuring optimal performance under varying conditions.

A microgrid dynamically responds to grid conditions by constantly monitoring and analyzing both internal and external data, making intelligent decisions to manage energy resources, and interacting with the main grid to maintain stability, efficiency, and resilience.

The flexibility inherent in microgrids, with their diverse mix of energy sources, allows for quick adaptability to changes in energy availability and demand.

An example of an advanced energy control management system is Hitachi Energy's e-mesh™ energy management system (EMS) for distributed energy resources. Hitachi Energy e-mesh™ EMS is an optimizer suite that provides additional features for the energy management of distributed energy resources. The EMS application is flexible and scalable and can be extended to integrate renewables, conventional power generation sources, and loads like EV chargers.

4. How can a commercial or industrial business use a microgrid?

Microgrids offer versatility for commercial and industrial businesses by providing energy resilience and reliability, peak load management, combined heat and power (CHP) systems, energy storage integration, grid independence for remote facilities, grid support services, energy efficiency and demand-side management, scalability for industrial facilities, environmental compliance, integration with smart technologies, and financial benefits.

In commercial and industrial settings, microgrids offer several compelling benefits and use cases:

1. Enhanced Reliability and Resilience

Emergency Backup: Microgrids can serve as reliable backup power sources during utility outages, ensuring that critical operations remain online without interruption.

Disaster Resilience: They are particularly valuable in areas prone to natural disasters (e.g., hurricanes, floods, earthquakes), as they can quickly recover and provide essential power even when the main grid is down.

2. Cost Savings and Energy Efficiency

Peak Shaving: By operating during peak demand times when utility rates are highest, microgrids can reduce electricity costs.

Load Management: They allow for more efficient management of energy consumption, shifting loads to off-peak hours to further optimize energy costs.

Renewable Integration: Microgrids can incorporate

renewable energy sources (such as solar panels and wind turbines), reducing dependence on fossil fuels and potentially lowering energy costs over time.

3. Sustainability and Reduced Environmental Impact

Lower Carbon Footprint: The use of renewables and more efficient energy management helps in reducing greenhouse gas emissions.

Energy Independence: By generating power onsite, microgrids reduce the need for energy transmission over long distances, which can result in energy loss and additional emissions.

4. Increased Operational Flexibility

Adaptive Energy Use: Microgrids can dynamically adjust to the energy needs of a commercial or industrial facility, enhancing operational efficiency.

Scalability: They can be scaled to match the growth of the facility, providing more power as needed without substantial infrastructure changes.

5. Regulatory and Grid Support

Grid Services: Microgrids can provide services to the main grid, such as voltage support, frequency regulation, and emergency power, potentially creating additional revenue streams.

Compliance and Incentives: Utilizing microgrids can help businesses meet regulatory requirements for sustainability and take advantage of government incentives for renewable energy and energy efficiency.

Applications in Commercial and Industrial Sectors

- **Manufacturing Plants:** Ensuring continuous operation of production lines, especially in facilities that require a constant power supply for high-quality production.
- **Data Centers:** Providing reliable power to maintain operations and protect data integrity.
- **Healthcare Facilities:** Ensuring power for critical medical equipment and systems.
- **Educational Campuses:** Enhancing sustainability and serving as a learning tool for renewable energy and engineering programs.
- **Retail and Office Complexes:** Reducing energy costs and improving sustainability credentials.

Implementing a microgrid in commercial and industrial settings requires a comprehensive analysis of energy needs, site-specific considerations, and compliance with regulations. **We recommend collaborating with energy experts and consulting engineers such as those at Hitachi** who can help design and deploy a versatile microgrid solution that aligns with the unique requirements of commercial and industrial businesses.

5. Can a microgrid connect to the grid?

Microgrids can connect to the main grid through various interconnection methods, enabling them to operate in both grid-connected and islanded modes.

In grid-connected mode, microgrids synchronize with the main power grid, allowing for a seamless exchange of electricity. This connection is facilitated by inverters and synchronization equipment that ensure the microgrid's electrical output aligns with the grid.

During this mode, microgrids can import or export electricity based on demand and supply conditions, contributing to grid stability. In contrast, microgrids can operate independently in islanded mode, disconnecting from the main grid during disruptions or outages.

Advanced microgrid controllers and protection devices play a crucial role in detecting grid disturbances and facilitating a smooth transition between grid-connected and islanded modes. This flexibility in connectivity enhances the reliability and resilience of microgrids, making them valuable for ensuring uninterrupted power supply in various scenarios.

What is Island Mode?

"Island mode" for a microgrid refers to the capability of the microgrid to operate independently of the larger utility grid.

When a microgrid is in island mode, it disconnects from the traditional power grid and continues to provide power to the local network it serves using its own generation resources.

This mode is particularly useful during utility grid outages, whether they're caused by natural disasters, maintenance, or other reasons, ensuring that critical functions and services can maintain power without interruption. "Island mode" for a microgrid refers to the capability of the microgrid to operate independently of the larger utility grid.

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6. What technologies are used in microgrids?

Microgrids utilize a combination of technologies to generate, store, and manage energy efficiently. These technologies allow microgrids to operate efficiently, integrate renewable energy sources, and provide reliable and resilient power.

Commonly used technologies in microgrids include:

Renewable Energy Sources:

- Solar Panels: Convert sunlight into electricity.
- Wind Turbines: Generate electricity from wind energy.
- Hydropower: Generates power from flowing water.

Energy Storage Systems:

- Batteries: Store excess energy for later use, providing backup power during grid outages.
- Flywheels: Store energy through the rotational inertia of a spinning wheel.

Combined Heat and Power (CHP) Systems:

- Generate both electricity and useful heat simultaneously, improving overall energy efficiency.

Advanced Control Systems:

- Microgrid Controllers: Manage the flow of energy, optimize operation, and ensure the balance between supply and demand.
- Smart Inverters: Control the flow of electricity, especially from renewable sources, to maintain stability.

Energy Management Systems (EMS):

- Monitor and control energy usage in real-time, optimizing the performance of the microgrid.

Distributed Energy Resources (DERs):

- Distributed Generators: Small-scale generators that can operate independently or in conjunction with the main grid.
- Combined Cooling, Heating, and Power (CCHP) Systems: Integrated systems that produce electricity, heating, and cooling for industrial applications.

Microgrid Software and Communication Systems:

- SCADA (Supervisory Control and Data Acquisition) Systems: Monitor, gather, and process real-time data from various components.
- Communication Protocols: Enable seamless communication between microgrid components.

Grid Interconnection Technologies:

- Synchronization Equipment: Ensures that the microgrid can seamlessly connect or disconnect from the main grid.
- Islanding Protection Devices: Detects grid failures and initiates islanding to operate independently.

Energy Efficiency Technologies:

- Demand Response Systems: Allow for adjustments in energy consumption during peak demand periods.
- Energy-efficient Lighting and Appliances: Improve overall energy efficiency within the microgrid.

Electric Vehicle (EV) Charging Infrastructure:

- EV Charging Stations: Support the integration of electric vehicles into the microgrid, promoting sustainable transportation.

Cybersecurity Measures:

- Firewalls and Encryption: Protect microgrid components from cyber threats and unauthorized access.

7. How do microgrids and Energy as a Service work together?

Delivers resiliency with cost-effectiveness

Microgrids and Energy as a Service (EaaS) work together seamlessly to provide businesses with comprehensive and sustainable energy solutions.

EaaS is a method of financing that offers businesses a turnkey and comprehensive energy solution to the challenge of having to make expensive capital investment in energy infrastructure.

Energy as a Service allows a business to pay fixed, period payments for energy and related services - including design, installation and construction, operations, monitoring and maintenance - over the term of a contract, which may be 10, 15, 20 years or more.

This eliminates the need to make costly capital investments upfront, so those funds can be used elsewhere for your core business. Payments cover energy generation, storage, and automated energy management, as well as ongoing energy infrastructure management and maintenance. The key benefit is grid resiliency for your business without the costly initial

Allows you to focus on your core business

In the context of a microgrid, an EaaS provider will design, implement, and operate the microgrid infrastructure on behalf of your business. This can include installation and management of renewable energy sources such as solar panels, energy storage systems, and advanced control systems.

The EaaS provider is responsible for the efficient operations, monitoring and maintenance of the microgrid so your company can focus on its core business.



8. What benefits and value can a microgrid bring to my business?

A microgrid is a powerful tool to enhance energy reliability, achieve cost savings, improve sustainability, and navigate the regulatory landscape more effectively.

These benefits align with the strategic priorities of many businesses, making microgrids a compelling investment in the modern energy landscape.

1 Enhanced Energy Resilience and Reliability

A microgrid can enhance energy resilience by providing a reliable and independent source of power, ensuring uninterrupted operations even during grid outages. By operating independently from the main grid in the event of outages (island mode), microgrids ensure continuous operation of critical machinery, data centers, and essential services, enhancing business continuity and resilience against external disruptions. This reliability translates into reduced downtime, safeguarding critical processes and sensitive equipment.

2 Cost-savings and Energy Efficiency

Microgrids offer the potential for cost savings by optimizing energy usage, incorporating renewable energy sources, and participating in demand response programs. Businesses can reduce their reliance on the traditional power grid, especially during peak demand times when electricity rates are highest and potentially lower their energy bills. By generating power onsite and using advanced energy management systems, microgrids can provide protection against volatile energy prices and have the potential to generate revenue by selling excess energy back to the grid.

3 Sustainability and Reduced Environmental Impact

Microgrids allow businesses to incorporate a higher share of renewable energy sources, such as solar and wind, into their energy mix, reducing greenhouse gas emissions and enhancing their sustainability profile. This shift towards cleaner energy sources not only helps in meeting regulatory requirements and corporate sustainability goals but also resonates with environmentally conscious consumers, potentially improving brand image and competitive advantage.

4 Incentives and Regulatory Compliance

Investing in microgrids can help commercial and industrial businesses comply with increasing regulations aimed at reducing carbon footprints and enhancing energy efficiency. Furthermore, governments and utility companies often offer incentives, grants, or rebates for the adoption of renewable energy and the implementation of energy efficiency measures, making microgrid projects more financially attractive. By leveraging these incentives, businesses can offset initial setup costs and achieve a faster return on investment.

9. What are the steps to implement a microgrid?

1 Plan: Feasibility Study and Planning

Define your company's energy goals and conduct a thorough assessment of your current energy consumption patterns. Start with an analysis of the past 12-18 months of your company's facilities' electricity bills, interval data and existing site and infrastructure. This assessment also provides a baseline against which potential energy savings can be measured and informs the scope of the solution and services required.

1. Clearly define objectives; consider factors like energy resilience, cost savings and carbon emission reduction goals.
2. Conduct a thorough energy assessment to understand energy consumption patterns.
3. Analyze the site for renewable energy resource viability and potential sizing.
4. Conduct a financial and technical analysis of the microgrid solution
5. Work with Authorities Having Jurisdiction (AHJs) to ensure compliance with local regulations, zoning laws, and environmental impact considerations that could affect the project.
6. Consider an Energy as a Service model if capital is limited.

2 Design: System Configuration and Engineering

Select the types and capacities of generation and storage technologies, such as solar panels, batteries and generators that will be needed for the facility. Design the microgrid control systems that will manage power generation, distribution and transitions between grid-connected and island modes. Plan how the microgrid will connect to the existing utility grid, including technical specifications for interconnection. Identify any necessary upgrades to existing electrical infrastructure and or facilities to accommodate the microgrid.

1. Collaborate with microgrid professionals and suppliers.
2. Choose appropriate technologies based on energy needs.
3. Develop a detailed design for the site and the microgrid.
4. Secure all necessary local, state and federal permits for construction, electrical work, and operation of energy-generating equipment.
5. Finalize agreements with the utility company for connecting the microgrid to the larger grid, including any requirements for net metering.

3 Build: Installation and Construction

Acquire the microgrid components, such as solar panels, battery energy storage systems and energy management systems. Build the physical infrastructure, including any necessary civil works, installation of energy generation equipment and storage systems, and integrate these systems with existing electrical infrastructure. Ensure all components are installed correctly and function as intended, including testing control systems and the transition between grid-connected and island modes. Upgrade existing infrastructure as needed including buildings or roofs.

1. Partner with reputable energy storage suppliers and renewable energy installers.
2. Install the microgrid system.
3. Test and commission to ensure proper functionality and provide training for staff.

4 Operate: Operations and Management

Provide training for operators and maintenance staff on the operation, troubleshooting and maintenance of the microgrid. Engage a third party if needed for monitoring and maintenance, for example to clean solar panels or conduct periodic testing of systems. Establish procedures for ongoing monitoring, maintenance, and operation of the microgrid to ensure reliability and efficiency. Make any necessary adjustments to optimize the performance of the microgrid, based on actual operating conditions and energy usage patterns. Engage with the community and other stakeholders to ensure support and understanding.

1. Develop an effective operations and maintenance plan, including emergency planning.
2. Implement continuous monitoring and maintenance.
3. Finally, seek opportunities for continuous improvement by regularly assessing performance and stay informed about technological advancements.

Combined with Energy as a Service, a microgrid can drive real results and offers multiple benefits

Delivering economic benefits

If a commercial or industrial business is considering implementing a microgrid, Energy as a Service (EaaS) offers potential cost savings through an affordable OpEx financing model. It also aligns value received with payments made over time, and can lead to financial reallocations to other growth-centric initiatives as well as offering the potential to unlock additional revenue, further boosting economic vitality.

Promoting energy resiliency

One of the transformative aspects of a microgrid is its ability to decentralize energy generation and distribution. By enabling businesses to generate their own renewable energy, a microgrid reduces reliance on traditional, centralized energy grids and imports, thus reducing reliance on the grid. This energy independence not only enhances resilience against grid failures or volatile energy prices but also diminishes geopolitical dependencies that come with fossil fuel-based energy sources. As a result, businesses, regions and even nations can have greater control over their energy destinies, fostering stability and self-reliance.

Addressing sustainability goals

Microgrids play a pivotal role in the shift from fossil fuels to renewable energy sources. By leveraging renewable energy such as solar or wind power, a microgrid directly contributes to the reduction of greenhouse gas emissions. This means that implementing a microgrid can help lead to reduced grid energy consumption, further lowering carbon footprints. As businesses increasingly implement microgrids and adopt EaaS models, the cumulative impact on the environment can be substantial, making microgrids a vital tool in efforts to achieve carbon neutrality and attain a sustainable balance between energy production, consumption and environmental preservation.



Energy as a Service Benefits and Outcomes



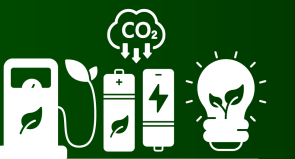
Economic

- Immediate savings
- Reduced energy costs – ~10%-35%
- No upfront capital costs
- Affordable OPEX ownership model
- Unlocking new revenue streams
- Reduces ownership risks
- Aligns value received with payments made over time



Operational

- Reduced energy consumption
- Improved load management
- Increased reliability and resiliency
- Reduce voltage fluctuation
- Decreased grid dependency
- Eliminate blackouts / brownouts
- Flexible and optimized energy



Environmental

- Address sustainability objectives
- Reduce carbon emissions
- Maximize renewable integration



10. How can I get started with implementing a microgrid?

To start the journey of implementing a microgrid, it's always helpful to begin by defining your objectives, whether they are focused on energy resilience, cost savings, or sustainability goals. If you don't have specific targets yet, analyzing your facilities' current energy consumption is a great place to start.

Begin by examining your electric bills – a detailed analysis of your current consumption and costs can provide invaluable insights. Analyzing historical energy consumption data and utility bills will help you understand usage patterns and costs. A comprehensive assessment serves as a foundation for informed decision-making and the development of a tailored plan to optimize energy usage and enhance overall efficiency within your business facility.

If you need help with analyzing your facility's electric bills, we're here to help. Contact us at sustainability@hal.hitachi.com and let's have a conversation about how microgrids can help your company achieve its energy resiliency goals.



About Hitachi: 4 reasons to work with us.

HITACHI
Inspire the Next



1 Reliability

Hitachi is a globally recognized company rooted in a rich history with diverse expertise spanning multiple industries, including energy, industrial manufacturing, transportation and digital services. Our extensive experience in numerous energy projects across the globe is a strong testament to our customers.

2 Advanced technology

Operating in a multitude sectors on a global scale, we offer world-class digital technologies and capabilities, upholding our commitment to efficiency, quality, and sustainability. This translates to shorter lead times, heightened responsiveness, and improved forecasting and best-in-class energy management.

3 Market resilience

With a multifaceted portfolio, global operations, and technological advancements covering a broad range of industries, our market resilience is robust. Leveraging over a century of risk management expertise, you can have confidence in our ability to effectively manage project planning and execution.

4 Global reach

With an extensive portfolio of Hitachi Group companies, our reach is far and wide. We offer access to deep industry expertise, a collaborative innovation ecosystem, resource availability, research and development, economies of scale, risk mitigation, and comprehensive solutions.

Hitachi's customized approach to energy infrastructure and management allows your company to remain focused on its core operations while providing reliable, ongoing support for your long-term success.

Reliability, resiliency, and advanced digital solutions.

We offer a comprehensive and integrated approach to energy management to help companies reduce their energy costs, improve operational efficiency, achieve sustainability goals, access advanced technologies, and benefit from energy solutions that are flexible and scalable.

Cost Savings

Access to energy services through Hitachi means our customers save costs by avoiding capital expenditures for energy infrastructure.

Cost Predictability

Ensure energy expenses remain in line with your business goals and financial projects by enabling better budgeting and financial planning.

Energy Solutions

Leverage data analytics and technology to identify and implement clean energy sources to improve and manage energy supply and storage, lower operational costs and reduce carbon emissions.

Access to Advanced Digital Solutions

Deploy state-of-the-art energy technologies within your business operations without diverting resources or attention away from their core operations.

Renewable Energy Integration

Facilitate the integration of renewable energy sources without making a significant, upfront investment in infrastructure.



We have the power to empower ...and the track record to prove it.

Hitachi brings extensive expertise and experience to the commercial and industrial sector. We empower our customers to achieve resilient, reliable, and efficient energy.

Our portfolio of flexible and scalable energy solutions including remote monitoring and advanced analytics, renewable energy integration, battery energy storage systems, and energy management that can meet the unique needs of any organization, while contributing to a cleaner, more sustainable future.

1910

The beginning of our innovative journey

250+

Global energy installations

186k

Global patents

10th

Largest tech company in the world by revenue
Fortune Global 500

TOP

100

Global innovator for 10 consecutive years
Boston Consulting Group

OT Operational and Industrial Excellence

Global reach, financial strength, innovative solutions, commitment to society and sustainability, vertical sector expertise, and a comprehensive approach to solution design and implementation.



We're committed to creating a sustainable future.

Hitachi brings extensive expertise and experience to the commercial and industrial sector. We empower our customers to achieve resilient, reliable, and efficient energy.

Our portfolio of flexible and scalable energy solutions including remote monitoring and advanced analytics, renewable energy integration, battery energy storage systems, and energy management that can meet the unique needs of any organization, while contributing to a cleaner, more sustainable future.

We believe in more than the pursuit of profits.

Embracing the ethos of environmental responsibility, Hitachi's vision extends far beyond mere corporate interest. We harness the power of cutting-edge technology to forge a harmonious balance between progress and the preservation of our planet.

Our transformative approach integrates advanced digitalization and data-driven insights, paving the way for sustainable urban development and clean energy solutions, while meeting the evolving needs of the modern world without compromising the future.

With our unwavering commitment, cutting-edge technology and global partnerships, we are continuously innovating to help preserve our planet for generations to come.

会社の仕事と云ふものは、
決して唯単なる金儲けばかりやって居るのではない
と云ふことは能く皆さんの頭に入れて戴きたいのであります。
此一つを申上げて置きましたら、
日立精神と云ふものはどういふ風に醸成されて居るか
と云ふことは能くお分りになるだろうと思ふのであります。

1935年「新入社員への訓示」より

“I would like all of you to keep in mind that a company does more than just pursue profits. This single message should be enough for you to clearly understand what the Hitachi Spirit is.”

Quote from Namihei Odaira, Hitachi's founder, to new employees in 1935

We are powering good.

HITACHI
Inspire the Next

Contact Us

To get started, simply send us the **last 12 months of your electricity bills** from your facility.

Our team will analyze your facility's energy consumption and help design a microgrid solution that is right for you. We can also discuss whether Energy as Service can benefit your specific situation.

Ready to speak with an energy expert?

Contact us today



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