

YOUR ENERGY TRANSITION

How To Get Moving With What You Know Now
While Planning For The Future



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WELCOME TO A NEW ERA OF ENERGY. ■

The energy landscape as we know it today is undergoing a complete transformation. If you deliver or generate power, you are standing at a crossroad.

Your customers won't wait for long interconnection timelines. They need power today.

We're here to help you start. You may not have all the answers yet, but you certainly have options that can get you closer to your goals.



what does today's energy landscape look like?



THE DEMAND IS REAL

The current energy supply infrastructure cannot meet the capacity Americans demand today. We need ways to resolve today's issues while solving for future demand, too.

By 2040, new demand will **surpass anything we've seen in history.**

US Power Demand Projected Through 2040

2026

800 TWh

power capacity needed for data centers¹

(The equivalent of one Germany)

2030

+18%

portion of total electricity demand just from EV charging²

(up from 0% in 2023)

2040

+40%

overall electricity demand growth in US³

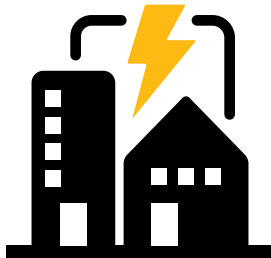
CHALLENGES OVER THE NEXT DECADE

INCREASED DEMAND

70 GW

INCREASE of US power demand through 2030⁶

from data centers, EVs, energy intensive industry and building electrification



RETIRED RESOURCES

50 GW

coal **RETIREMENT** through 2030⁶



CONSUMABLES

2-3x

renewable-generated **CAPACITY** needed to replace a single MW of fossil fuel generation¹



1. JP Morgan 2. A|B Bernstein 3. IEA World Energy Outlook 2023 4. EPRI Electric Power Research Institute, "Utility Preparation for Electrification at Scale" 2024
5. BofA Global Research 6. EIA, Platts, BNEF, BofA Global Research

YOUR SITUATION IS UNIQUE.



Your solution needs to be specific to your business type and needs. What might be a challenge for one region might be a non-issue somewhere else. There are a lot of solutions out there for you to try, but to navigate them most efficiently, consider working with a trusted expert who can advocate for solutions that fit your unique business. Experts will factor in answers to the questions below to target the right recommendation.

- **WHAT'S YOUR BUSINESS LANDSCAPE?**
- **WHAT CHALLENGES DOES YOUR BUSINESS FACE?**
- **WHAT ARE YOUR GOALS & MOTIVATIONS FOR MAKING ENERGY DECISIONS?**
- **WHAT IS YOUR LONG-TERM VISION?**

And, your plan will be affected by other factors, too.

- **LOCATION OF YOUR SITE**
- **ACCESS TO FUELS**
- **YOUR BUDGET**
- **YOUR DESIRE FOR RENEWABLES AND EMISSIONS COMPLIANCE TOLERANCES**

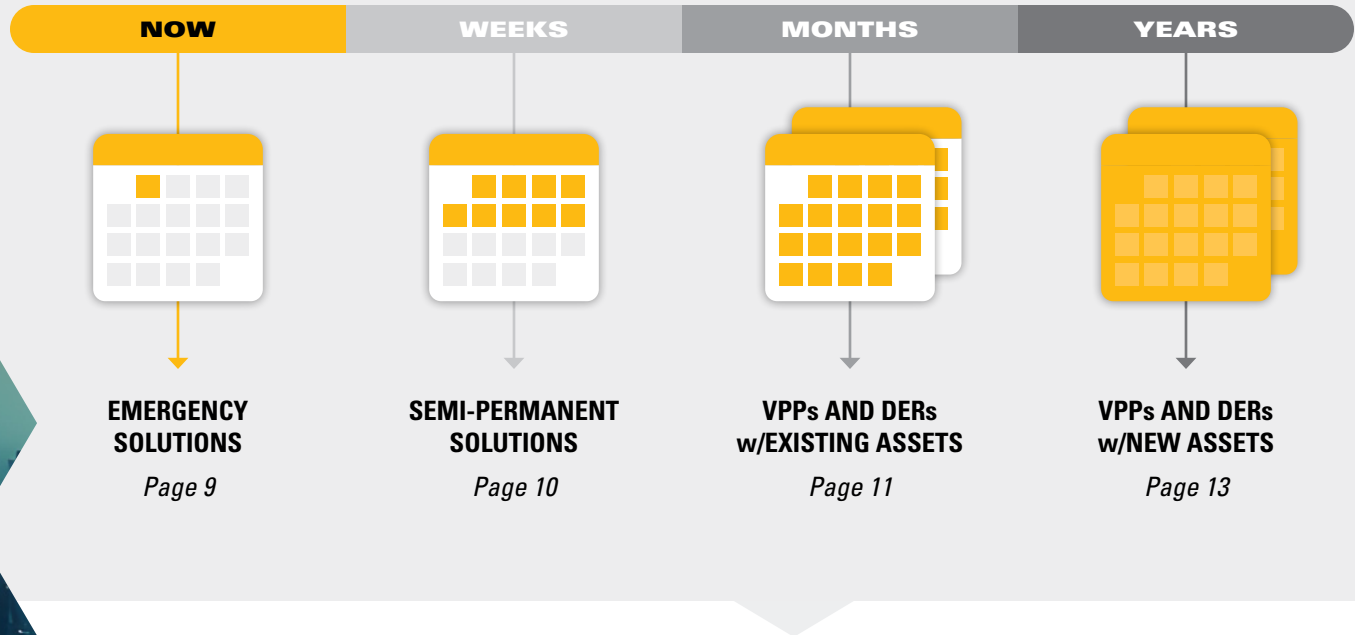
We take great care to understand your business and your goals and help move you through the energy transition journey that's right for you.

Let's get started.

HOW TO USE THIS PLAYBOOK »

We've organized this playbook into solution implementations based on time. Typical project implementations are shown in the chart below. Start by determining how quickly you need power, then refer to the chart to see possible solutions that could meet your deadlines.

A SOLUTION TO FIT ANY IMPLEMENTATION TIMELINE



If you're unsure of how much time you have, the solutions in this book can help you choose by providing the benefits each one delivers.

Either way, this book can help get you going. **Our mutual priority is to serve customers the power they need.**

BRIDGING SOLUTIONS

to fit any implementation timeline.



Let's start by looking at the options available according to timelines. These options will give you the confidence to get going now.

| EMERGENCY SOLUTIONS | SEMI-PERMANENT SOLUTIONS | VPPs AND DERs w/EXISTING ASSETS | VPPs AND DERs w/NEW ASSETS |
|--|----------------------------|---|---|
| | | | |
| NOW | WEEKS | MONTHS | YEARS |
| SOLUTION TYPE | | | |
| Generators, Renewables, Energy Storage, Turbines Distributed Energy Resource Management Software (DERMS) Technology | | | |
| WHEN TO USE | | | |
| Disaster or crisis | Seasonal load support | To add grid capacity | To add resiliency |
| Pop-up events | Remote locations or sites | Participate in available energy market programs | Reduce total cost of energy |
| Backup power | Transmission delays | Resiliency for extreme weather events | Participate in available energy market programs |
| | Utility constraint | | |
| BENEFITS | | | |
| Temporary (days to months) | Temporary (weeks to years) | Fully customizable | Less expensive than transmission upgrades |
| Cost-effective | Cost-effective | Revenue generation | Revenue generation |
| Mobile/Stationary | Relocatable | Renewable fuels | Renewable fuels |
| Renewable fuels | Renewable fuels | | |



Immediate, temporary power.

EMERGENCY SOLUTIONS »

Whether it's an unexpected outage, or your emergency preparedness plan, a short-term power solution is available to you. From gensets to compact battery storage, they are transportable so you can relocate them, right-sized to the project at hand, and ready to supercharge any operation. Have a dealer assess your site so you're prepared.

RENTING SOLUTIONS

Rental mobile power solutions transport to nearly any location where you need power and can be installed for use in prime or standby applications. Whatever your project size, the temporary power solutions can be tailored to your requirements.

OWNING SOLUTIONS

Purchased solutions offer flexibility to use them over and over again. This is a more permanent way to solve for power using Distributed Energy Resources (DER), which will be presented later in this playbook.

Preparedness is key to getting the power you need in unforeseen events.



TEMPORARY POWER BENEFITS

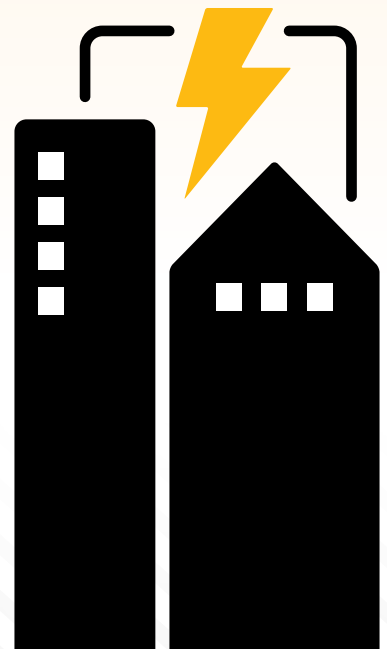
Choose from power solutions that are **customizable**

Temporary, so you can try before you buy or simply keep renting

Scale up/scale down as your project needs change

Mobile gensets **transport** easily

Many options to choose from to fit power into your site, nearly **anywhere**





SEMI-PERMANENT SOLUTIONS »

You are invested in attracting new businesses for economic development. Prospective business may solidify where they choose to build new locations based on the availability of immediate energy. Are you prepared to serve them?

If capacity is a concern, a bridging power solution can provide the quickest route to power for these new customers. The solution can be used for as long as the customer needs them, as they can perform for virtually unlimited lengths of time. You'll have more time to build or plan for a long-term solution while still delivering the needed power.

Bridging power solutions are fast and easy to install and enable businesses to perform while you're working on their full connection. Technology brings it all together for operational efficiency.

GETTING CLEAR

Bridging power solutions often cause confusion, so let's clear the perception of what these can offer.

MYTH

- ✗ They only work for a few weeks
- ✗ The options only include diesel fuel gensets

FACT

- ✓ They can be in place for multiple years
- ✓ Options include natural gas gensets, turbines, other renewables and batteries



GAINING PROJECT APPROVALS

It's important to have all the right voices involved in your planning discussion:

- + UTILITY
- + CUSTOMER
- + REGULATORS
- + SOLUTION PROVIDER

Caterpillar can be that single point of contact for end-to-end solutions.

i *Make sure your plan includes ancillary equipment, like the cabling you'll need, and how you'll source it. The more robust your plan, the easier it is to gain approval.*



A solution that doesn't take years to stand up.



USE WHAT'S NEARBY AS A VPP »

VPPs work automatically to dispatch power and take load off the grid when called upon, delivering resiliency. VPPs can offset megawatts of power in some cases.

Another quick way to add capacity is to identify assets that generate power in your own vicinity. The more-the better.

Why? Because you can form a managed asset grouping, resulting in a Virtual Power Plant, or VPP and solve capacity shortages in an effective and controlled way. While it's set up more quickly, it's not just for the short-term outcome. VPPs can be used for short periods or long-term use cases. VPPs can be built by leveraging a variety of assets, from gensets to thermostats.

HOW TO BUILD A VPP

Start by finding the generating assets or flexible loads in your area, then connect them using a Distributed Energy Resource Management Software, or DERMS. This enables you to control assets through technology. DERMS, like Cat AMP®, can locate and interconnect each asset, forming your VPP.

KNOWING WHERE THE ASSETS ARE SPEEDS UP THE PARTICIPATION PROCESS.

HOW TO FIND NEARBY ASSETS



USE A PROVIDER

An **ENERGY SOLUTIONS PROVIDER** can find the assets for you. They use connected asset locator software to quickly provide the number of assets and required information from them by region.



RUN AN INCENTIVE PROGRAM

You can **INVITE ANYONE** who might have an existing generation asset on their site to register their asset using an incentive program. They get paid to participate, and you understand where the assets are and get permission to use them for supplementing the grid or load shedding.



FIND ON YOUR OWN

If you are locating the assets yourself, **FIND OUT:**

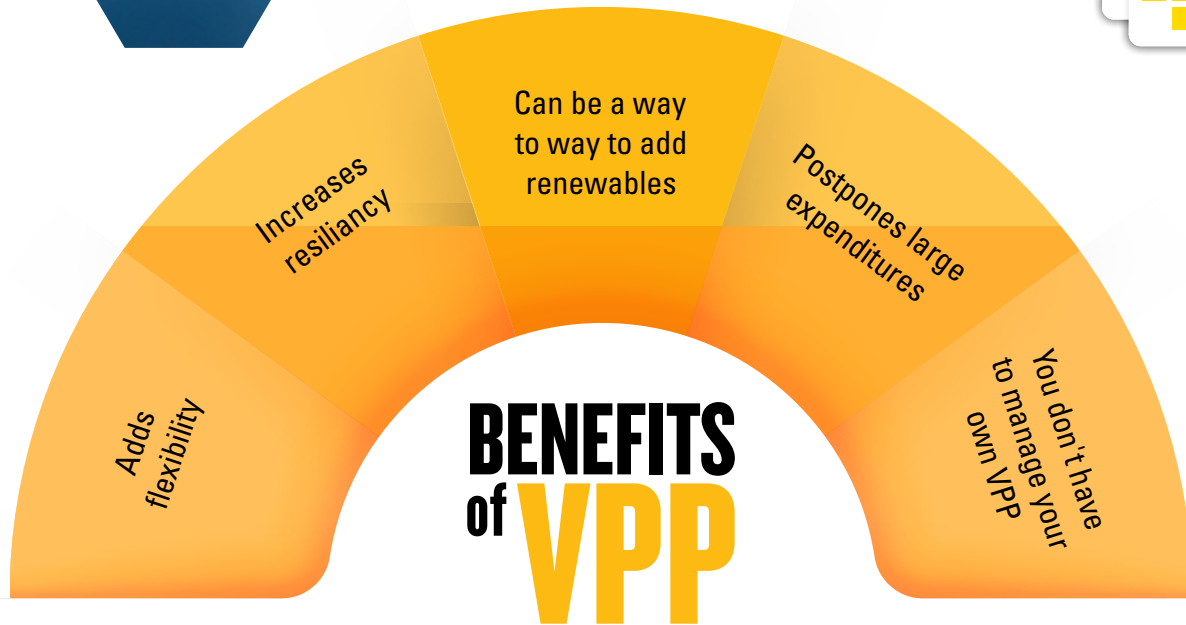
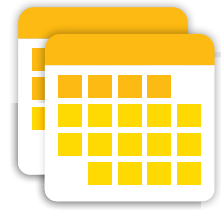
Technology details
(product info / serial number)

Age of the assets in the VPP

The application they are intended for:
continuous or standby.

Certain VPP assets are not eligible for VPP use as they are reserved exclusively as emergency back-up power.

MONTHS



MANAGING A VPP WITH DERMS

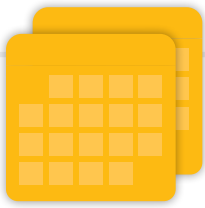
You've set up a VPP. How will you manage it? Do you want a fully automated VPP? Do you want some level of control of your VPP?

VPPs provide visibility, control, and peace of mind.

DERM software flexes to let you make changes any time, through desktop, mobile or SMS, so you can switch from full automation or manual control and back, almost instantly.

A good DERM software can provide:

- ✓ **FINANCIAL SAVINGS & EARNINGS REPORTS**
- ✓ **DEMAND-MANAGEMENT AUTOMATION & EMERGENCY BYPASS**
- ✓ **ASSET HEALTH**
- ✓ **MAINTENANCE OR FAULT REPORTS**
- ✓ **INDUSTRY INTELLIGENCE (DEMAND PEAKS)**
- ✓ **CAN MANAGE MULTIPLE BRANDS AND ASSET MANUFACTURERS**



When you still need more.



GAME-CHANGING SOLUTIONS »

If you've filled the short-term gap and leveraged all the nearby assets for a VPP, but you still need more capacity within the next 3-5 years, then it's time to install additional generation.

Power comes in many different forms and sizes, each with different benefits. The long-term value they deliver is game-changing.

Here are some options.

Natural Gas Genset & Gas Turbines

READY TO RUN 24/7 A solution that can be run rain or shine for added resiliency and sustainability.

READY TO USE ANY GAS The gas itself can vary and might have different amounts of methane or be blended with hydrogen.

PRODUCES LOWER EMISSIONS, TYPICALLY Natural gas fuels generally can produce lower NOX, sulfur, and CO2 than compression ignition gensets.

SAVES MORE OVER THE LONGER-TERM Natural gas as a fuel typically costs less, which can lower total cost of ownership.

REPURPOSES EXCESS HEAT With Combined Heat and Power (CHP), excess heat from natural gas generators can be safely captured and used for building heating or to heat water, thereby saving energy.

Diesel Genset

(Compression ignition)

READY TO RUN 24/7 A solution that can be run rain or shine for added resiliency.

LOWER INITIAL INVESTMENT AND EASY ACCESS TO FUEL Typically costs less than other sources and readily available fuel.

WIDE RANGE OF SIZES FROM SMALL TO LARGE These accept transient loads better than gas products, especially with larger load steps.

MOBILITY LETS YOU INSTALL IT ANYWHERE Trailers allow for fast delivery and installation.

Lower-carbon Intensity Fuels in Gensets & Turbines

REDUCES EMISSIONS IN THE UPSTREAM LIFECYCLE OF THE FUEL Cat gensets are capable of operating on biodiesel, biogas, hydrogen, hydrotreated vegetable oil (HVO), propane, renewable natural gas (RNG), and methanol. HVO is a drop-in replacement in compression ignition gensets. RNG is a direct replacement in natural gas gensets.

HYDROGEN AND H2-BLENDED FUEL IN GENSETS AND TURBINES Gas gensets and turbines can operate on hydrogen blends, with some operating on 100% hydrogen.

Renewables

CLOSEST TO ZERO-EMISSIONS

Renewables get you as close to zero emission power generation as possible.

COMMUNITY-PLEASING AND REGULATORY-COMPLIANT

These include solar, wind, hydro, and are a way to align your power production needs with your sustainability goals and deliver on your customer's desire for lower carbon footprint energy options.

Microgrids

LEVERAGES MULTIPLE SOLUTIONS Microgrids allow customers to have a combination of gensets, BESS and renewable sources.

INTEGRATES WITH CONTROLS AND CREATES ENERGY EFFICIENCIES By leveraging a state-of-the-art control system it creates energy flexibility.

Battery Energy Storage Systems (BESS)

LESS NOISE Battery Energy Storage Systems (BESS) produces significantly less noise than a genset.

INTEGRATES EASILY BESS can be paired with both renewable and traditional power generation assets and moved to nearly anywhere on a work site.

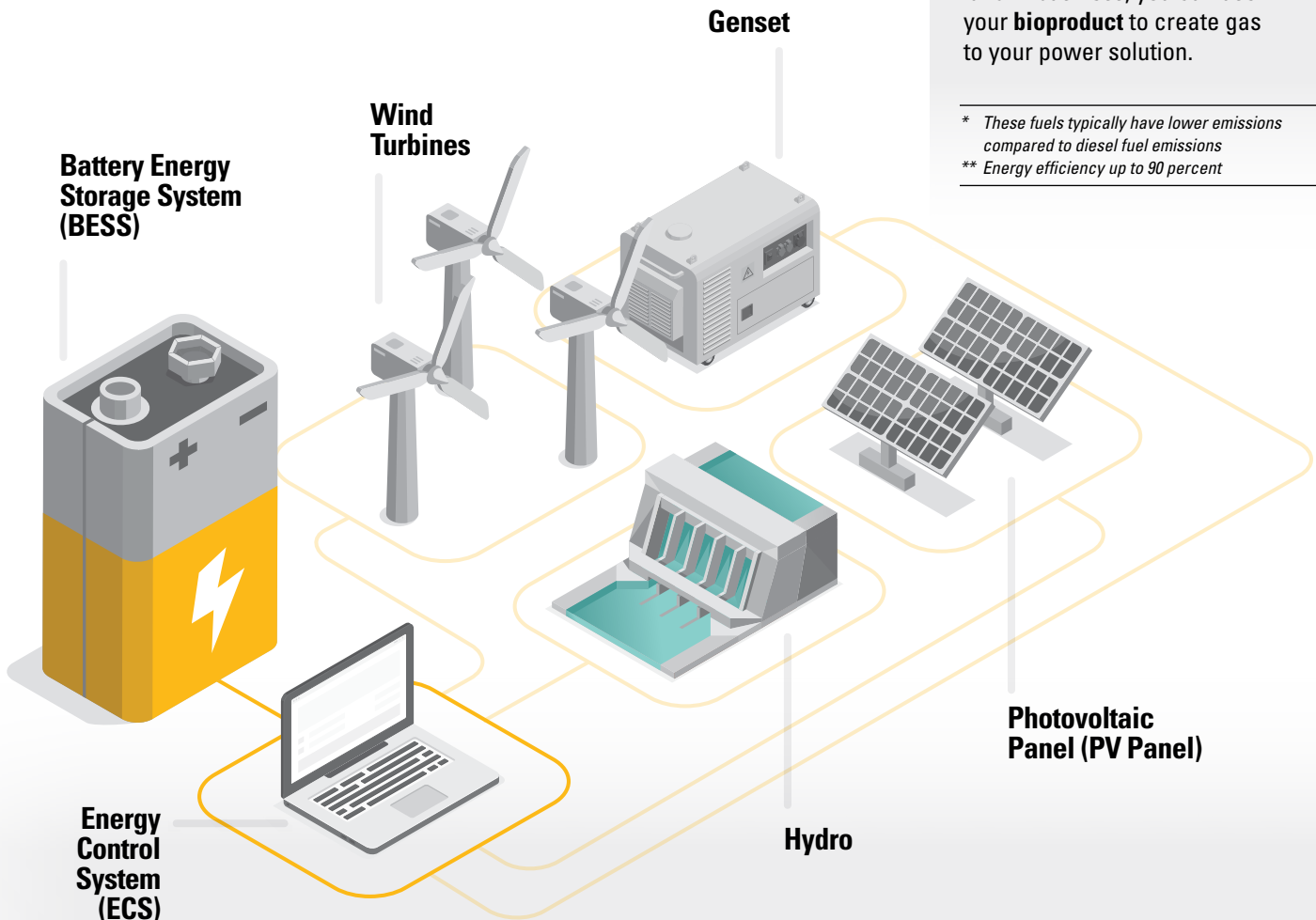
LESS FUEL CONSUMPTION Use the power from battery energy storage instead of a genset to save money on fuel costs. In operations with varying loads, a battery energy storage solution can be paired with a genset to reduce fuel consumption and overall operating costs even more.

RENEWABLES AND MICROGRIDS

RENEWABLE energy generation is a great way to align your power production needs and sustainability goals. The installation, control, integration and interconnection requirements of these assets can vary. Caterpillar is ready to provide solutions to these challenges.

MICROGRIDS offer more control between each asset through microgrid technology. They integrate any combination of generators, renewable power sources, and energy storage. Use these controls to isolate power or when you need to interconnect with the utility to support demand whenever that might be needed. Caterpillar's Microgrid Controls automatically minimize carbon emissions, maximize efficiency and ensure responsiveness across the array of power sources.

Know what your options are.



RENEWABLE FUELS

USE HVO

Run assets using **Hydrotreated Vegetable Oil (HVO)** to reduce lifecycle GHG emissions.*

DON'T WASTE THE HEAT

Install a **combined heat & power (CHP)** system. It repurposes your excess heat energy and uses it for thermal purposes.**

LEVERAGE BIOGAS

If you manage wastewater, food processing, agriculture or even waste management/landfill business, you can use your **bioproduct** to create gas to your power solution.

* These fuels typically have lower emissions compared to diesel fuel emissions
** Energy efficiency up to 90 percent

HOW TO TALK TO YOUR CUSTOMERS.



In the event your customer chooses to purchase and install their solution, you can provide helpful guidance, so they get the most out of their journey.

Energy project costs can be daunting, but costs can be offset via incentives, grants, or financing. There are many incentives available. Customers should choose solutions that are both timely and cost-effective.

We can help them find the right ones, and...

Help weigh the benefits of incentives available

Encourage them to seek out tax credits on relevant projects to offset their purchase costs

Teach them ways to avoid costly energy pricing moments by using their own generating assets, so they can save money

MORE POWER



FINANCING

GRANTS & INCENTIVES

ENERGY AS A SERVICE (EaaS)

BUY IT OUTRIGHT

RENTAL



FINANCING & INCENTIVES



FINANCING

Financing helps them spread the cost over an extended period, breaking it into more manageable costs.

GRANTS & INCENTIVES

Government-based incentives (state, local, federal) can provide funding to purchase an energy solution through grants, or through tax credits to offset what they spend (on solar or battery storage). Many reduced emissions projects benefit from these incentives as they can greatly offset the upfront spend.

ENERGY AS A SERVICE *(EaaS)*

Upfront capital costs are either lowered or completely removed with EaaS because a third party purchases, owns and maintains the energy solution. You get the back-up power; the financier resells the asset's energy in the open market. Zero cost to customer is possible in some cases.

BUY IT OUTRIGHT

While it requires a large upfront investment, they own the entire solution, so if they 'monetize' your assets, they receive 100% of the rewards.

RENTAL

Try before you buy. It's not a commitment. It's a pilot. They can prove effectiveness with real-life data without long-term budget commitments.



CUSTOMERS MONETIZING THEIR ASSETS.

Your customer made an investment, and they have installed an asset. Now it's time for big results. Help them make the most of its benefits so that it's creating value even in its idle moments.



PRODUCE THEIR OWN ENERGY

Help offset grid constraints and avoid peak pricing by producing and running their own generation.



HELP LOWER THEIR OVERALL ENERGY BILL

Encourage them to use their genset and reduce grid consumption to save on energy costs. During a peak event, it's their consumption that sets the cost of energy for the next year. You can help them save by avoiding those premium price hours.



PROVIDE INCENTIVES TO PARTICIPATE IN PROGRAMS

Create an incentive program that pays the customer to take some, or all, of their site's load off-grid and run it from their power asset instead.

YOUR ENERGY JOURNEY WILL EVOLVE »

The resources in this playbook equip you with facts you'll need to get started on your energy transition. Make changes today and see the results you want quickly.



Caterpillar can help.

Schedule a consultation with
a Caterpillar Energy Expert.

Let's Do the Work.





CATERPILLAR ELECTRIC POWER is an expert in Energy Transition Solutions. We can help you find the right path to resilient, affordable power. From energy-source blending to storage, integrated controls, and management technologies, we bring holistic solutions ready for any stage in the journey.

Share your journey with Caterpillar Electric Power as we **#LeadtheTransition**



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