

# ADVANCED POWER SOURCES



## Our Customers' Goals. Our Commitment.

Global construction and mining companies. International technology firms. Worldwide energy and transportation providers. Across industries and around the globe, our customers are moving towards a reduced-carbon future. They need alternatives to established fuels and energy sources to power their work while growing their businesses.

We are committed to providing the solutions to help our customers achieve their climate-related objectives while meeting their requirements for performance, durability and economic value. Our advanced power offerings facilitate fuel transition, increased operational efficiency and reduced emissions.

Caterpillar will enable our customers to achieve their climate-related goals as they build a better, more sustainable world.

## OUR APPROACH | Multiple Solutions Made to Match the Work

- Making **established power** sources even more efficient and fuel-flexible
- Pairing established power sources with new technologies in a **hybrid format**
- Replacing established power sources with **stand-alone new technologies**
- Delivering **reman, repair, rebuild, retrofit and repower** services

How our customers define success is how we define success. No matter the solution, they can count on our legacy of **application expertise** and innovation in **controls, systems and services** to help optimize and sustain the value of the advanced power technology solutions throughout the lifecycle.

**INNOVATING + INTEGRATING**  
PRODUCTS · SYSTEMS · SOLUTIONS



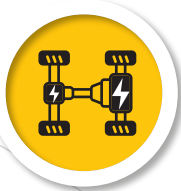
### Renewable Fuels

*Enable increased use of reduced-carbon options and hydrogen blends.*



### Fuel Cells

*Use renewable hydrogen fuel as a scalable source of electric power.*



### Electric & Hybrid Powertrains

*Employ an electric drive transmission with power components.*



### Batteries

*Power the work with stored electrical energy.*













### Microgrids

*Integrate renewable energy sources into electric power systems.*

## Advanced Power Sources Today

Many of our advanced power offerings are already **AT WORK**:

-  Reciprocating engines that run on low-carbon-intensity renewable fuels, including biodiesel, renewable diesel, biogas, landfill gas, coal mine methane, natural gas and hydrogen blends
-  U.S. EPA Tier 4 Final engines that use dynamic gas blending to displace up to 85% of diesel fuel with natural gas
-  Dual-fuel marine engines that can operate on 99% liquefied natural gas (LNG)
-  Semi-modular gas generator sets that convert flare gas into usable electricity
-  Worksite solutions that pair engines with solar, energy storage and advanced controls
-  Electric drive dozers, loaders, trucks and locomotives that reduce greenhouse gas emissions through more efficient fuel burn
-  Hybrid mini excavators that run on diesel fuel or 100% electric power when connected to a remote hydraulic power unit
-  Electric drive mining trucks with a hybrid power system that combines electric power via a trolley and diesel engine
-  Battery-electric underground mining machines that eliminate engine emissions and reduce dust and heat
-  Land drilling solutions that combine battery systems with natural gas generators instead of diesel engines

## Advanced Power Sources Tomorrow

Other solutions are **IN DEVELOPMENT** to meet our customers' climate-related goals and requirements for performance, durability and economic value:

-  Battery-powered mobile equipment (excavators, wheel loaders, etc.)
-  Next generation batteries and power inverters that improve energy density
-  Mobile equipment chargers for expanded applications
-  Hybrid engine systems for heavy equipment that can run in electric-only mode
-  Electric-drive mobile equipment (large wheel loaders, dozers and large mining trucks)
-  Electric drive with energy storage for marine applications
-  Fuel cells powered by renewable hydrogen for stationary and mobile equipment

## INNOVATION THAT DRIVES VALUE THE CATERPILLAR WAY

Caterpillar has been the product and services provider of choice since our earliest days. Our component development and system integration expertise, ability to apply proven solutions across products and industries, and unmatched after-sales support set us apart. Now we're applying our advanced capabilities to the energy transition.

Partnership is key. We'll continue to work alongside our customers to identify their challenges, understand their requirements and deliver solutions that help

them be more successful with Caterpillar than with anyone else. The work they do—building and maintaining infrastructure, producing commodities, generating power and transporting goods—is essential and irreplaceable. Our job is to help them do it more sustainably throughout the lifecycle of our products.

We're committed to providing the advanced power that allows our customers to achieve their goals—lower greenhouse gas emissions, energy flexibility and business sustainability. Now more than ever, customers can count on Caterpillar.