

# Electrification Perspectives

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Caterpillar Inc.

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2022 SMMC  
'Electrify Everything' Session

# Caterpillar Today

**Global Leader for Nearly 100 Years**



**CONSTRUCTION  
INDUSTRIES**

**\$22B<sup>1</sup>**

**RESOURCE  
INDUSTRIES**

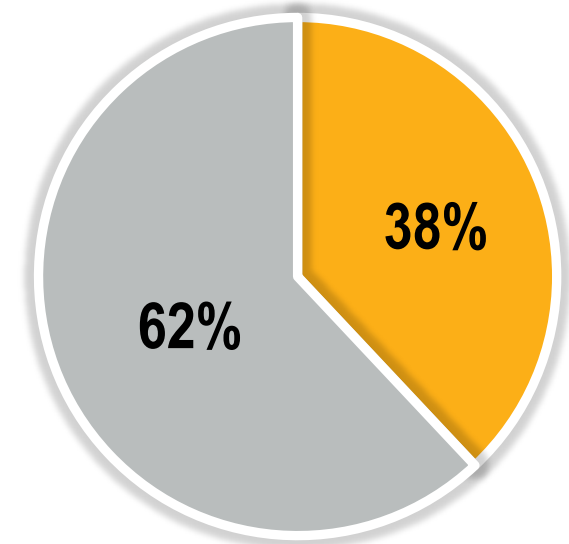
**\$10B<sup>1</sup>**

**ENERGY &  
TRANSPORTATION**

**\$20B<sup>1</sup>**

**CAT  
FINANCIAL**

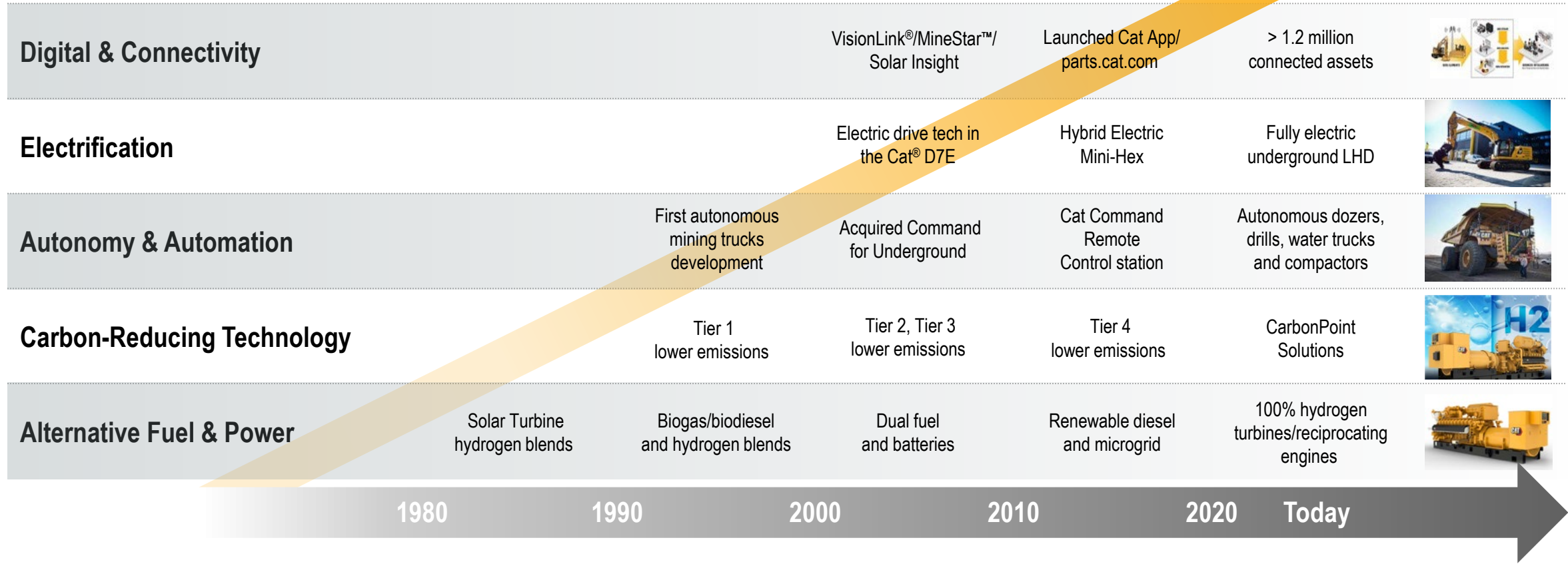
**\$3B<sup>1</sup>**



■ % Sales Inside the United States  
■ % Sales Outside the United States

<sup>1</sup> Includes inter-segment sales.  
All information as of year-end 2021

# Decades of Innovation To Better Serve Customers



# Energy Transition-Related Infrastructure Investment

**~\$5T<sup>1</sup>**

potential incremental  
global spending,  
2021-2040

Infrastructure growth related to grid transmission lines, solar power and wind farms, EV charging stations, and other applications

Source: 1) International Energy Agency (IEA), data based on Stated Policies Scenario; IEA (2021), World Energy Outlook 2021, IEA, Paris; IEA (2021), Net Zero by 2050, IEA, Paris. Energy transition-related infrastructure investment includes grids, EV chargers, hydrogen infrastructure, direct air capture, and CO2 transport and storage through 2040. \$ in trillions

# Investing in Lower-Carbon Advanced Power Technology



ADVANCED  
POWER

## ESTABLISHED POWER SOURCES

More efficient and fuel-flexible



### Low-Carbon Intensity Fuels

Increased use of reduced-carbon options and hydrogen blends

## HYBRID & ELECTRIC DRIVE

Established power sources coupled with new technologies



### Electric and Hybrid Powertrains

Electric drive transmission with power components



### Microgrids

Integrate renewable energy sources into electric power systems

## EMERGING POWER SOURCES

Replacing established power sources



### Batteries

Stored electrical energy



### Fuel Cells

Renewable hydrogen fuel as a scalable source

# Battery Electric Equipment



**R1700 XE  
UNDERGROUND LOADER  
+ MEC500 CHARGER**



**SWITCHER  
LOCOMOTIVE**



**ENERGY  
STORAGE**

**PRODUCTS INTRODUCED IN HIGH POWER APPLICATIONS**

# Electrifying the Product Portfolio



LOCOMOTIVES



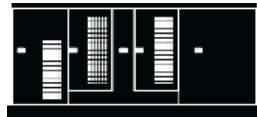
LARGE



CAT MACHINES



SMALL



STATIONARY  
POWER



BATTERY  
CHARGERS

**TAILORED TO  
THE APPLICATION**

**DESIGNED FOR  
SECOND LIFE USE**

bauma Munich 2022

# Prototypes on display



*301.9 mini excavator*



*320 Medium Excavator*



*906 Compact Wheel Loader*



*950 GC Medium Wheel Loader*

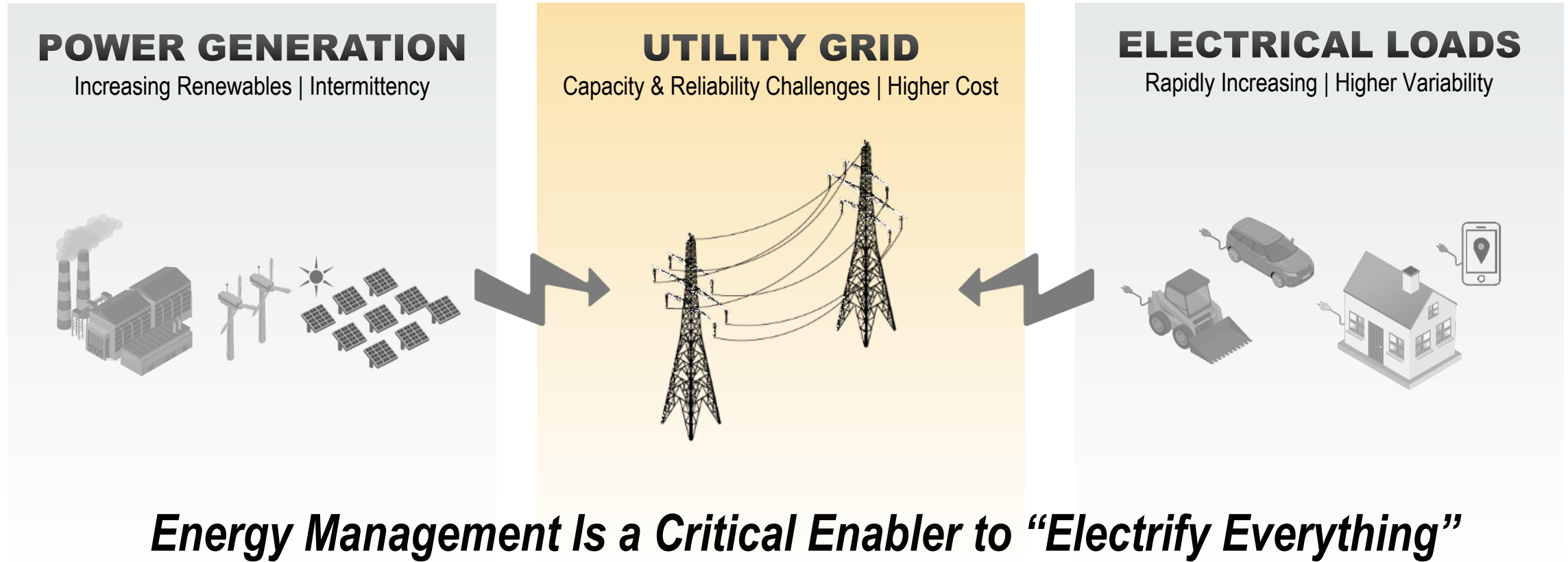


*Caterpillar Lithium-Ion Battery*





# Grid Stability Challenges

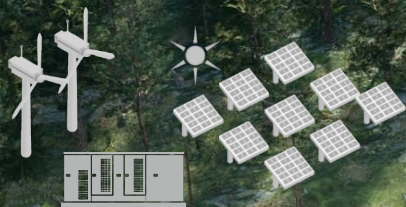


# Site-Level Considerations

## POWER ACCESS

Reliability, Peak Load Management

### ON-SITE



### UTILITY GRID



## DISTRIBUTION

Operational Impacts,  
Energy to Machine vs. Machine to Energy



*Time to Charge*



*Frequency of  
Re-Energizing*

# Industry Challenges

- Global supply chain instability
- Battery-electric product value – cost, power density, life, thermal management
- Charging infrastructure
- Grid infrastructure, modernization, transmission expansion
- Renewables' reliability, TCO, land use

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