

# China's New Energy Future

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A R T I S A N



P A R T N E R S

For Institutional Investors Only—Not for Onward Distribution

# Today's Topics

- Growth in Alternative Energy
- A Big Opportunity Set
- Fast-Compounding Companies

THE BIG PICTURE

# Growth in Alternative Energy

China's Vast Energy Needs

Motivations for Change

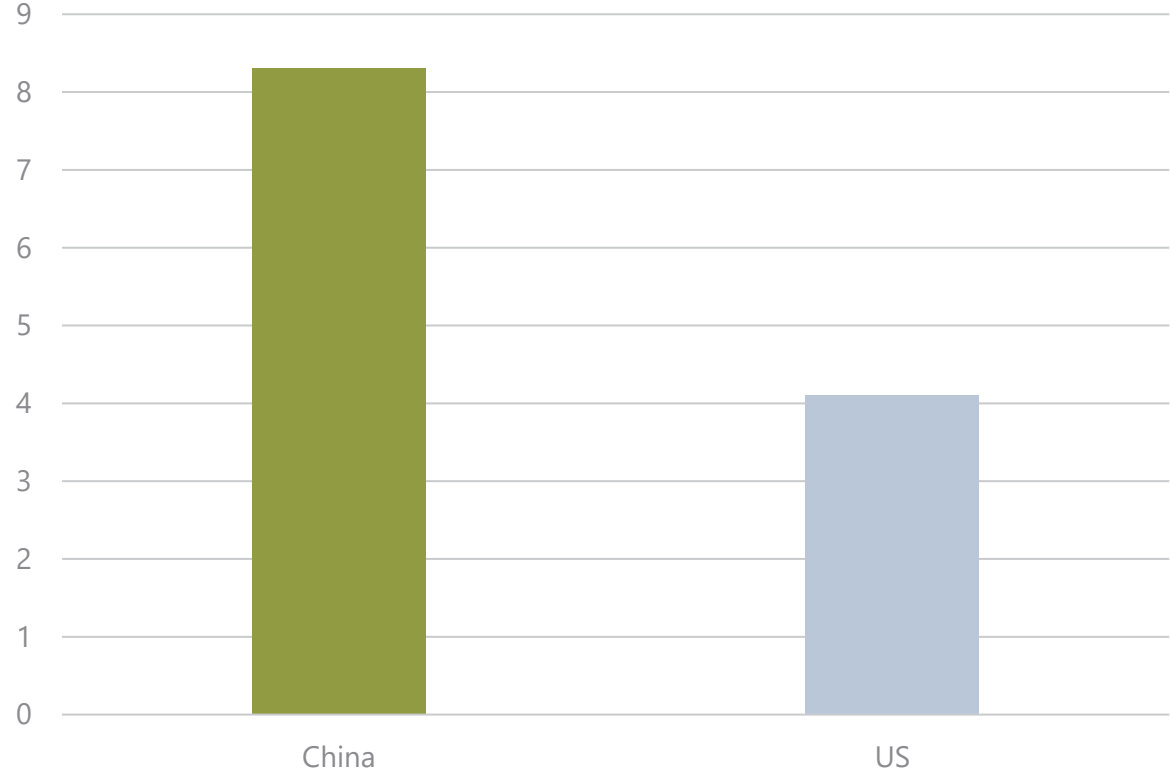
Scale Becomes an Edge

GROWTH IN  
ALTERNATIVE ENERGY—  
CHINA'S VAST ENERGY NEEDS

# China Consumes Twice the Energy of the US

## Electricity Used in 2021

Trillion Kilowatt Hours



Source: China's National Energy Administration (NEA) and US Energy Information Administration (EIA)

GROWTH IN  
ALTERNATIVE ENERGY—  
MOTIVATIONS FOR CHANGE

# China's Domestic Priorities

Long-term policy goals:

- **Reduce dependency on foreign imports** of fossil fuels to support domestic growth
- Lower environmental pollution to **cut health care costs**
- Redirect strong manufacturing capabilities into **higher value-add global products**

GROWTH IN  
ALTERNATIVE ENERGY—  
MOTIVATIONS FOR CHANGE

# Positive Impact for the Global Community

China's innovation may also be felt globally

- China's **technology innovations** can be exported, helping other countries generate green energy
- **Domestic energy production** can benefit many different economies via enhanced energy security
- Renewables may offer potential to **reduce geopolitical tensions** over fossil fuels

GROWTH IN  
ALTERNATIVE ENERGY—  
SCALE BECOMES AN EDGE

# Roadmap to a Greener Future

China's "dual carbon" goals:

- Reach carbon emissions peak before **2030**
- Become "carbon neutral" before **2060**

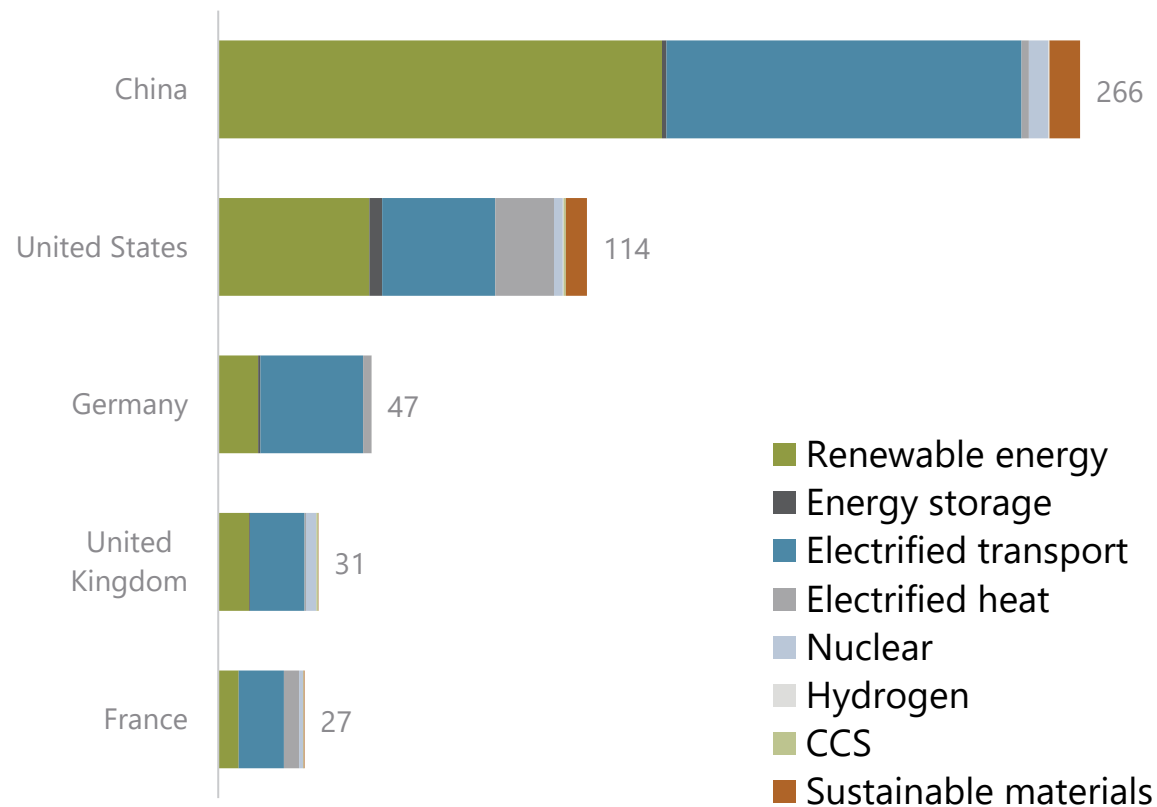
"Dual carbon" goals refer to China's two climate goals announced by president Xi Jinping at the 75th session of the United Nations General Assembly in September 2020.

GROWTH IN  
ALTERNATIVE ENERGY—  
SCALE BECOMES AN EDGE

# China's Head Start in Clean Energy Investing

## Investment in Energy Transition — 2021

US\$ Billions



Source: Bloomberg NEF



INDUSTRY FOCUS

# A Big Opportunity Set

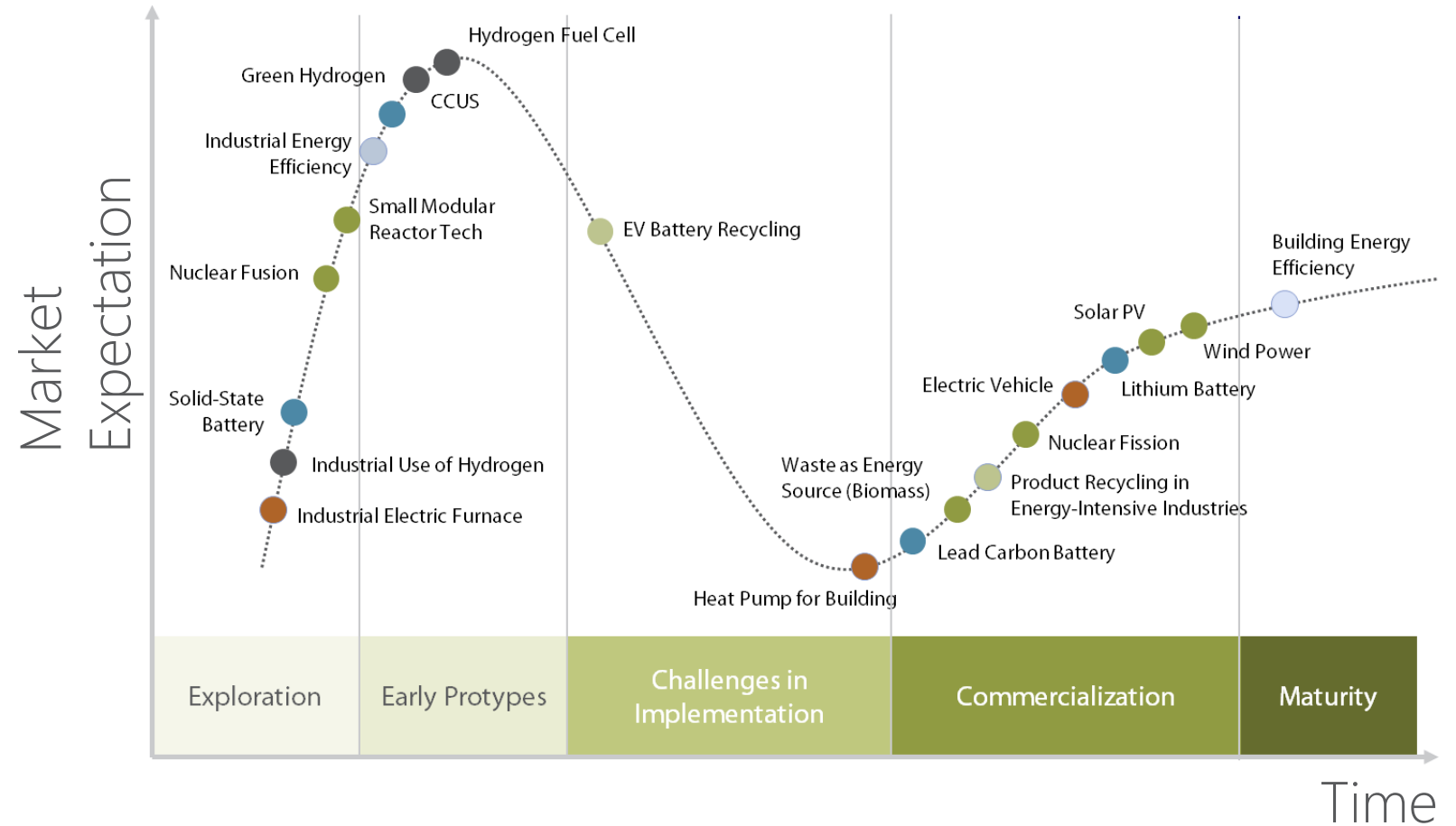
Production

Storage

Consumption

A BIG OPPORTUNITY SET—  
PRODUCTION, STORAGE AND  
CONSUMPTION

# Path Toward Market Maturity



● Circular Economy

● Electrification

● Energy Storage

● Energy Efficiency

● Clean Energy Generation

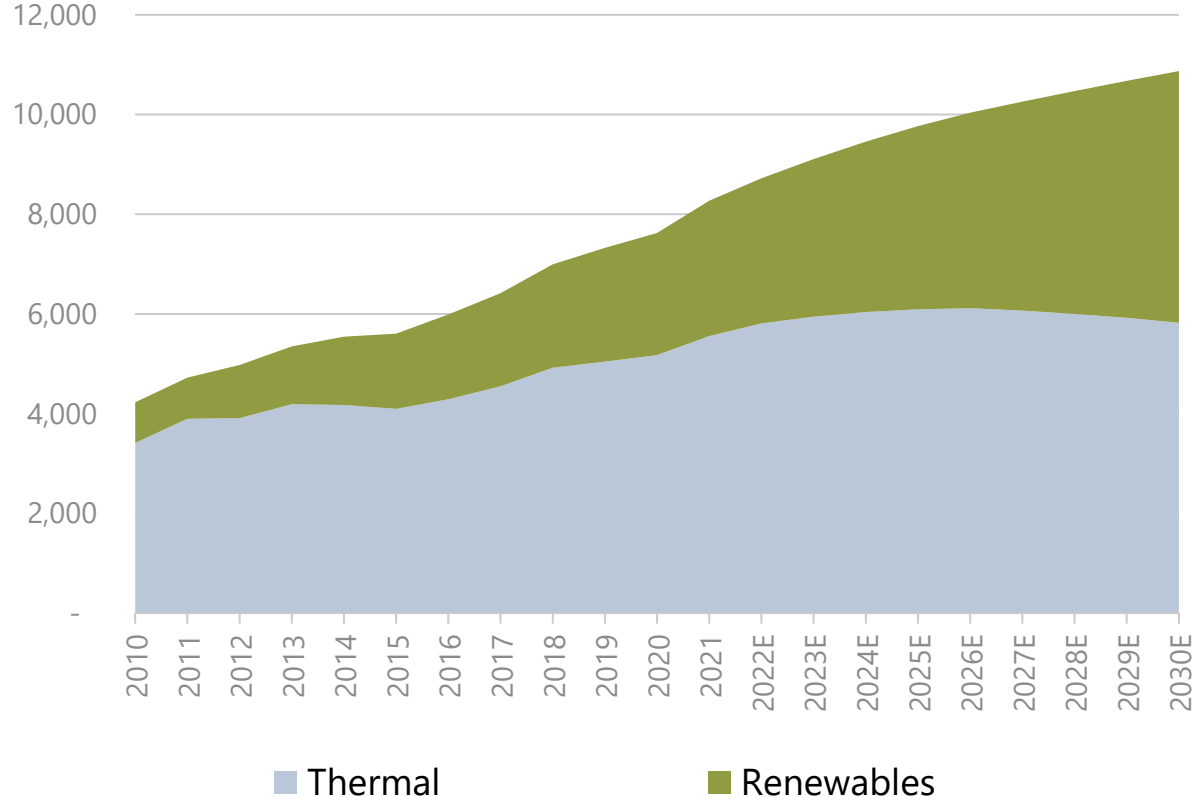
● Hydrogen

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PRODUCTION, STORAGE AND  
CONSUMPTION

# Renewable Production Has Increased

## China's Changing Energy Mix

Billions of Kilowatt Hours



Source: China's National Energy Administration (NEA), Artisan Partners

A BIG OPPORTUNITY SET—  
PRODUCTION, STORAGE AND  
CONSUMPTION

# Solar Is Already Competitive in Key Markets

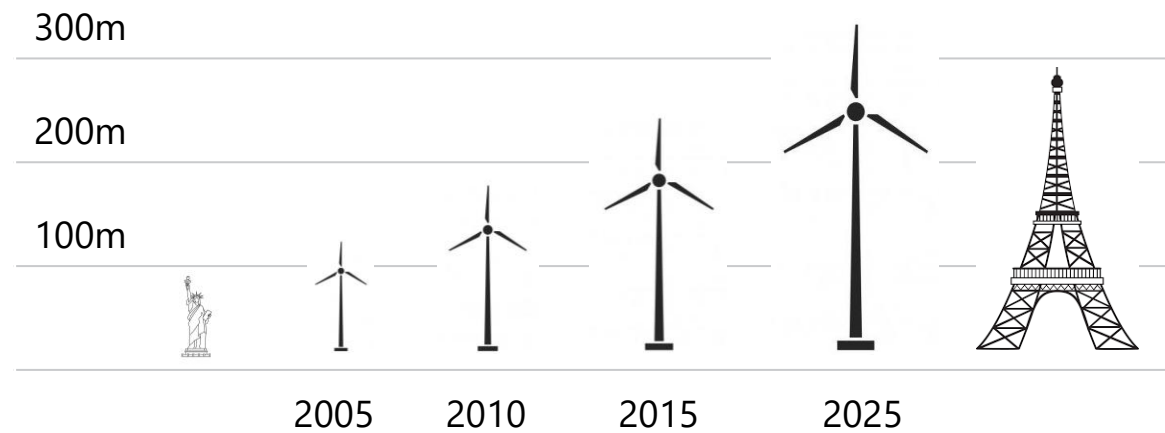
## Solar's market potential

- Solar has reached grid parity in China, as well as in many global markets
- Less reliance on subsidies
- Market for solar can grow based on market economics

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PRODUCTION, STORAGE AND  
CONSUMPTION

# Wind Is Getting More Affordable

As turbine size increases, efficiency gains translate into greater affordability of wind energy



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PRODUCTION, STORAGE AND  
CONSUMPTION

# China's Industrial Might—an Advantage for Wind



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PRODUCTION, STORAGE AND  
CONSUMPTION

# Storage Buffers Against Downtime

Energy storage is a must to buffer volatility in alternative energy generation

- Currently, steadier energy sources—coal, gas and nuclear power—are required to supplement the grid
- Storing surplus renewables electricity allows for use later
- **Catalyst:** The business model can finally be profitable due to new government policy framework

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PRODUCTION, STORAGE AND  
CONSUMPTION

# LFP Leaps Ahead in Storage

Lithium-Iron Phosphate (LFP) technology is a well-established battery chemistry

- China commercialized the technology first
- Key benefits of LFP include **long-life cycle** with **good thermal stability** with **cheaper price and less usage of rare earth metals**
- Addressable market boomed in a very short period of time from EV to energy storage



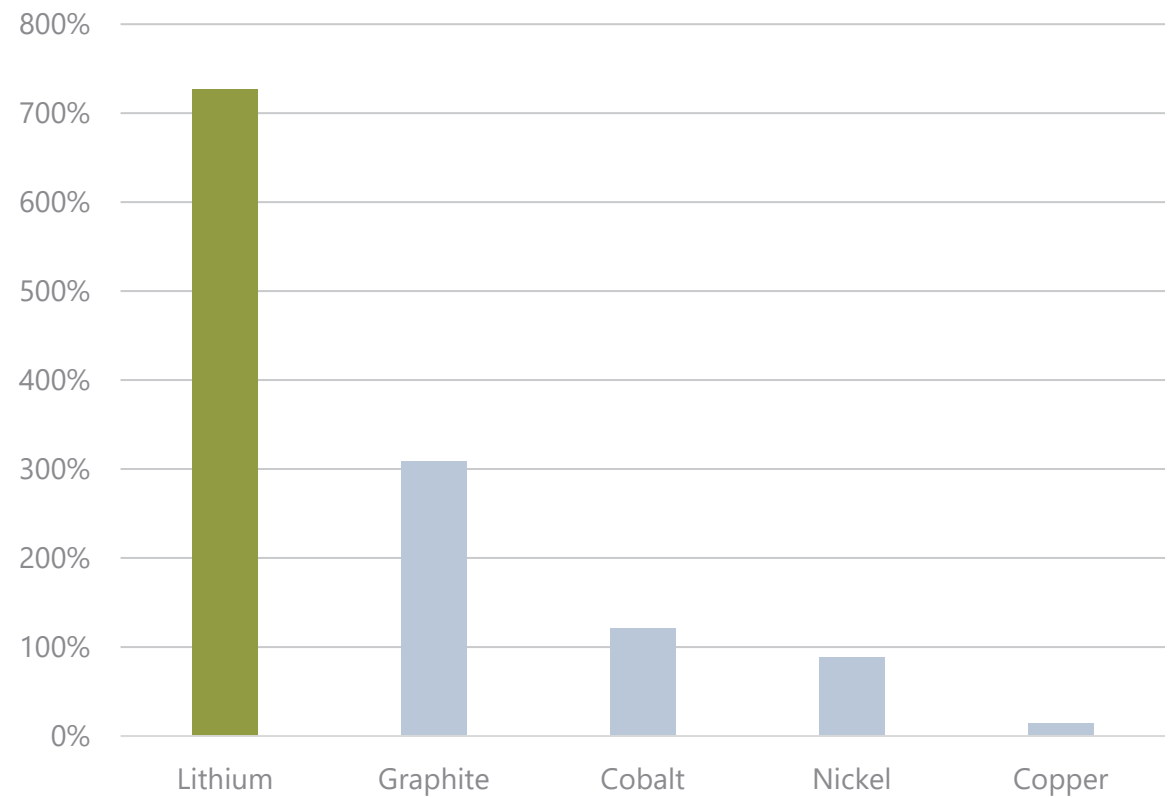
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# China's Refines 55% of Lithium Globally

Demand for lithium will greatly outpace supply

## Global demand for battery metals in 2030

As a % of 2020 global supply

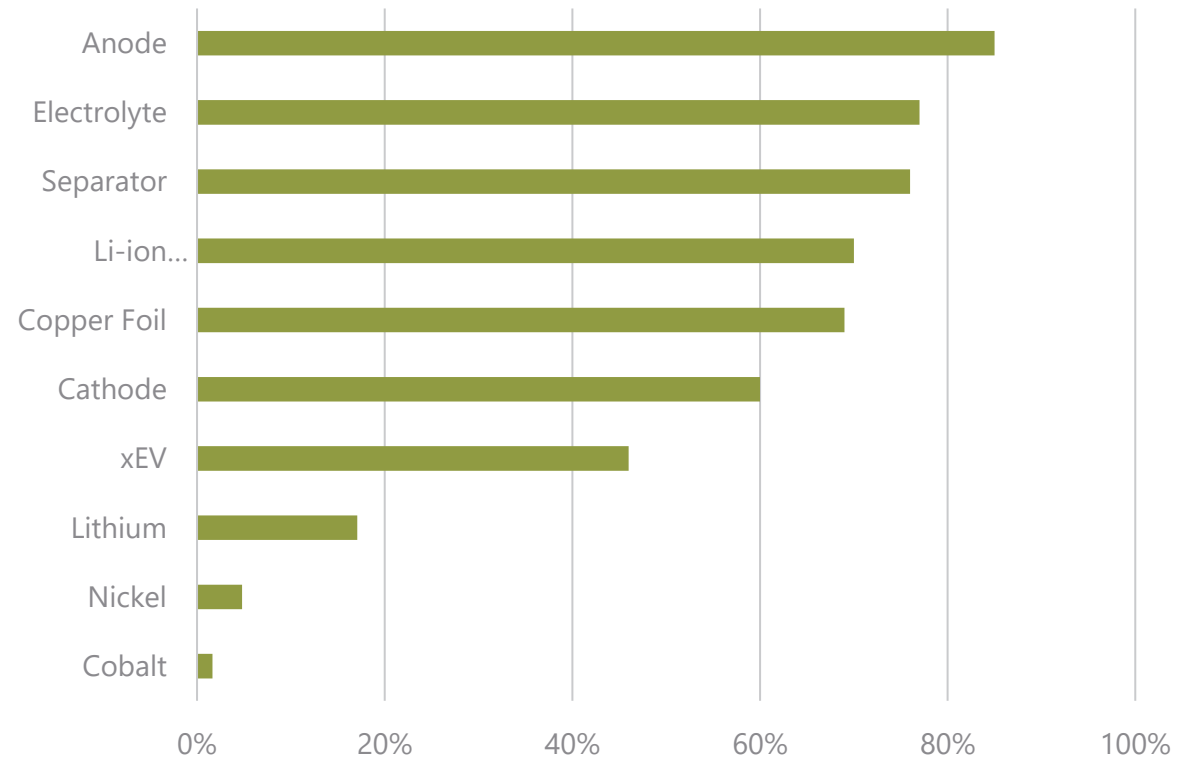


Source: 2030 demand estimates from Artisan Partners, using 2020 global supply data from the United States Geological Survey. Estimates are illustrative and subject to revision. There is no guarantee that estimates will prove accurate.

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PRODUCTION, STORAGE AND  
CONSUMPTION

# China Leads in Battery Production

China's Global Market Share Battery Component  
Production 2020

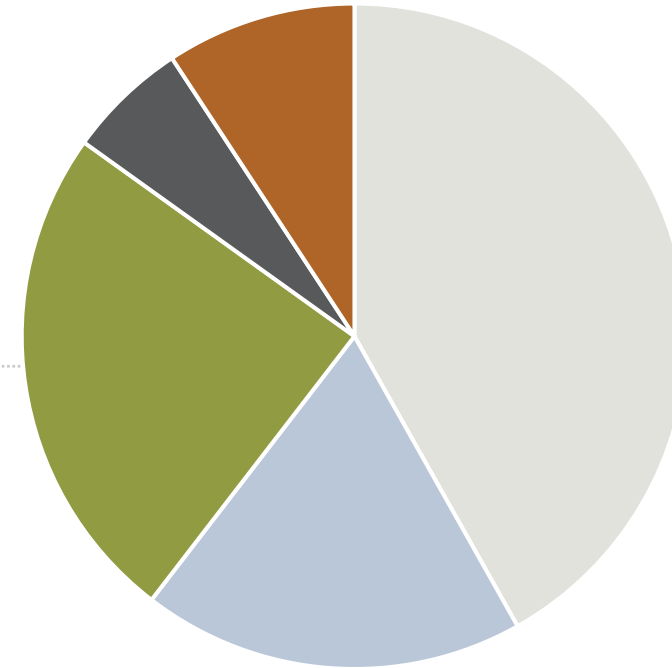


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CONSUMPTION

# Moving to EVs Can Help Reduce Emissions

Global Carbon Emissions  
2019

Transport  
makes up  
roughly a  
quarter of  
global  
emissions



- Electricity and heat producers
- Industry
- Transport
- Residential
- Other sources

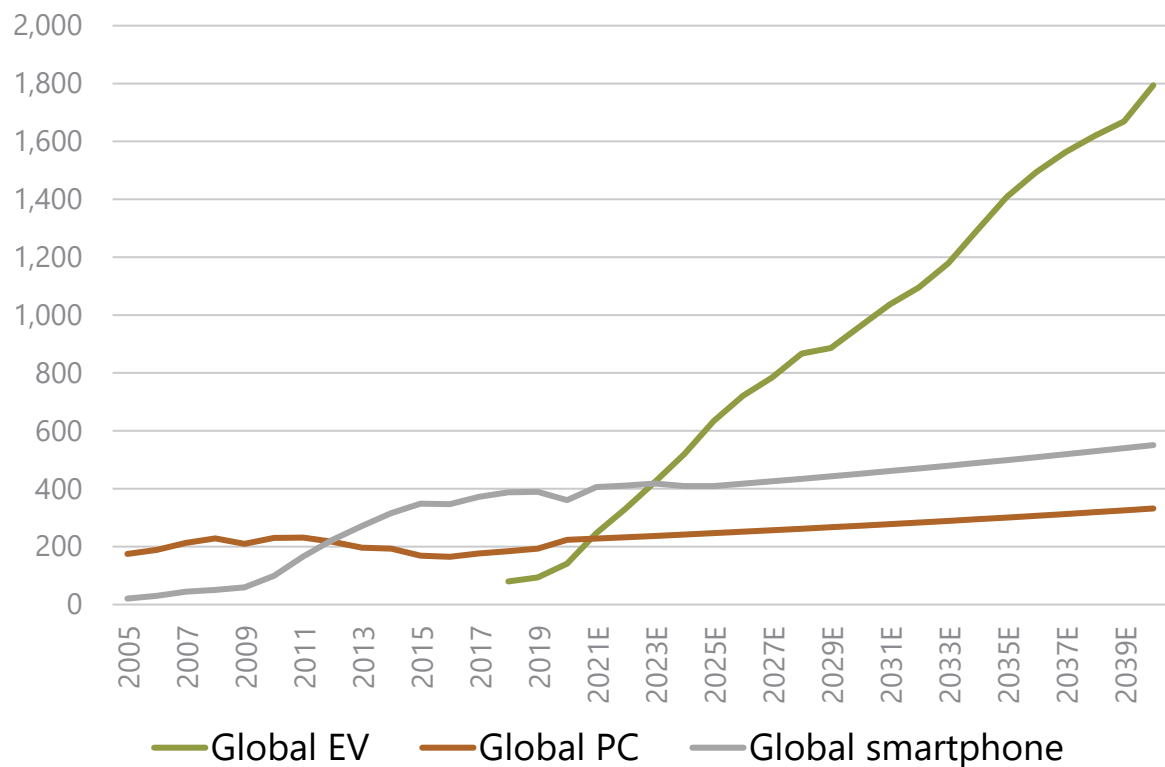
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CONSUMPTION

# EV Sales Poised for Growth World-Wide

EV sales may eclipse previous tech innovations

## Projected Market Size Over Time

US\$ Billions

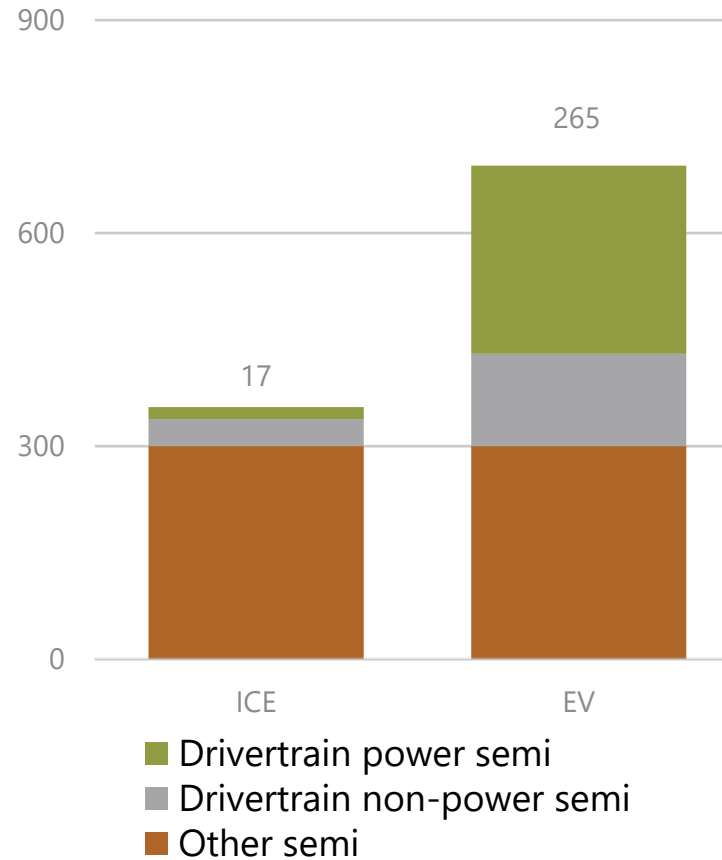


Source: Historical data from International Data Corporation. Data estimates for 2021 and beyond from Artisan Partners. EV category includes battery electric vehicles, full hybrid electric vehicles and fuel cell electric vehicles. Estimated EV sales data based on average vehicle price of USD 30,000. Estimates are illustrative and subject to revision. There is no guarantee that estimates will prove accurate.

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CONSUMPTION

# Semi- Conductor Demand Also Rising

Semiconductor Content in EVs vs ICE  
US\$ Billions



Semiconductors are another likely beneficiary of China's transition to renewable energy and greener transit, as EVs require 2x more semiconductors as ICEs (internal combustion engine vehicles)

INDUSTRY FOCUS

# Fast-Compounding Companies

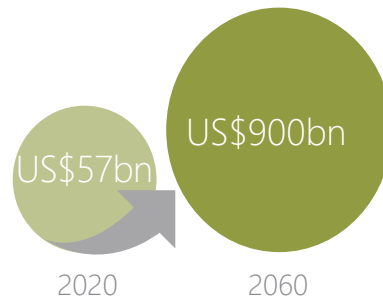
Long-Term Secular Growth

Three Risks for Investors

China Is a Global Hub for New Energy

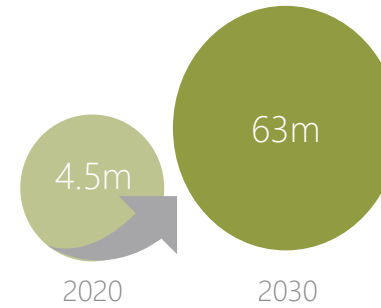
# Long-Term Secular Growth

### China New Energy Investment: Total by 2060



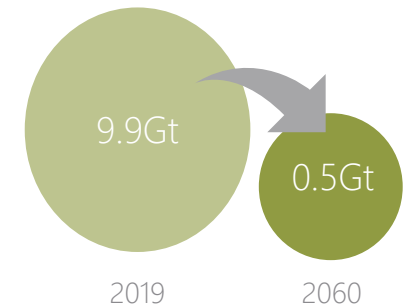
Source: International Energy Agency (IEA)

### China New Energy Job Creation: Total by 2030



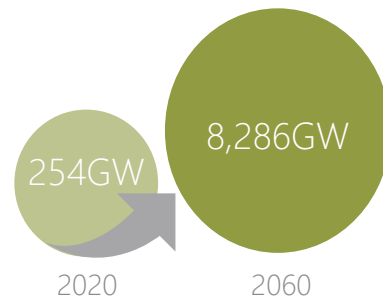
Source: Artisan Partners

### China CO2 Emissions: Drop by 2060



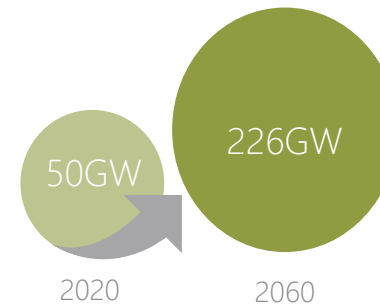
Source: International Energy Agency (IEA)

### China Solar: Capacity by 2060



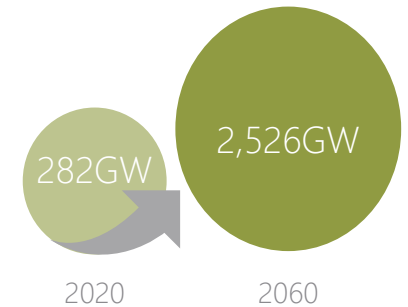
Source: International Energy Agency (IEA)

### China Nuclear: Capacity by 2060



Source: International Energy Agency (IEA)

### China Wind: Capacity by 2060



Source: International Energy Agency (IEA)

Abbreviations used above: Gt = gigatonnes. A gigatonne is the mass of all land mammals in the world other than humans and is often used to measure human output of carbon dioxide. GW = gigawatt. A gigawatt is equal to one billion watts. Estimates are illustrative and subject to revision. There is no guarantee that estimates will prove accurate.

# Three Risks for Investors

- 1 **GEOPOLITICAL RISK**
  - Importance of **global** perspective
- 2 **SUPPLY RISK**
  - **Transition** from fossil fuels won't be smooth
  - China experienced **rolling power outages** in 2021
- 3 **TECHNOLOGY RISK**
  - Stock **selection** is essential
  - On-the-ground **research** and insights matter



FAST-COMPOUNDING  
COMPANIES

# China Is a Global Hub for New Energy

Alternative energy presents  
high-growth opportunities

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Production, storage and consumption  
are key sectors for investment

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Chinese companies are leaders  
in renewable energy innovation

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