



国家电网有限公司
STATE GRID
CORPORATION OF CHINA

*China-Arab Clean Energy
Training Center Smart
Grid Workshop 2022*

Integrated Energy Services (IESs)

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OUTLINE

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- II Major Businesses of Integrated Energy Services**
- III Outlook of Integrated Energy Services**



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PART 01

Integrated Energy Services Overview



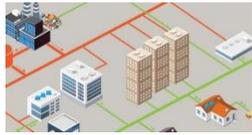
1. Integrated Energy Services



Integrated Energy Services is a new energy service mode of integrating renewable energy, hydrogen energy, energy storage facilities and electrified transportation into the traditional energy supply system of electricity, gas, heat, cold, through combining energy variety or intelligent system, energy technology or business model innovation.



1. Integrated Energy Services



- **Integrated Energy**

- Integrate the energy infrastructures of electricity, heat, cooling and gas;

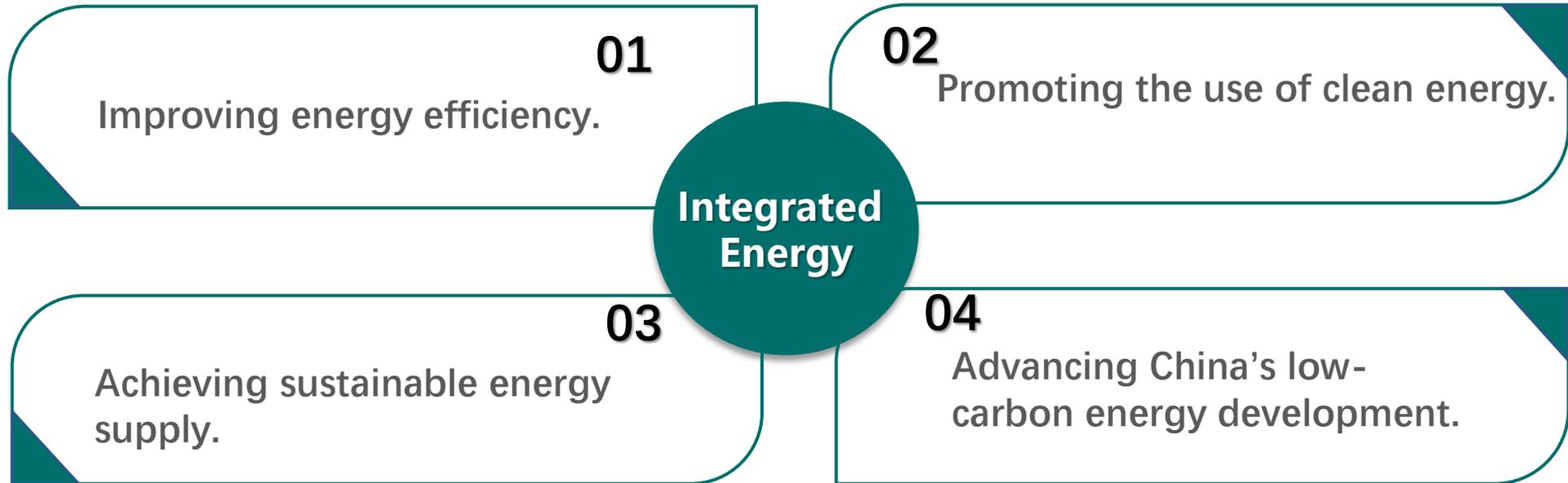


- **Integrated Services**

- Integrated services, including engineering services, investment services and operation services;



3. Contributions of Integrated Energy System





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PART 02 Major Businesses of Integrated Energy Services



II. Six Major Areas of Integrated Energy Services

Six Major Areas

Energy Efficiency Services

Multi-Energy Supply Services

Clean Energy Services

Emerging Energy Services

Smart Energy Management Service

Energy Trading Services



1. Major Businesses



- Energy-saving transformation;
- Cost-reduction;
- High-quality energy service needs.

Public Building



- Waste heat recovery;
- Motor optimization,
- Energy conservation.

Industrial Park



II. Six Major Areas of Integrated Energy Services

2. Key Technology

Zero Carbon Building (Hong Kong, China)

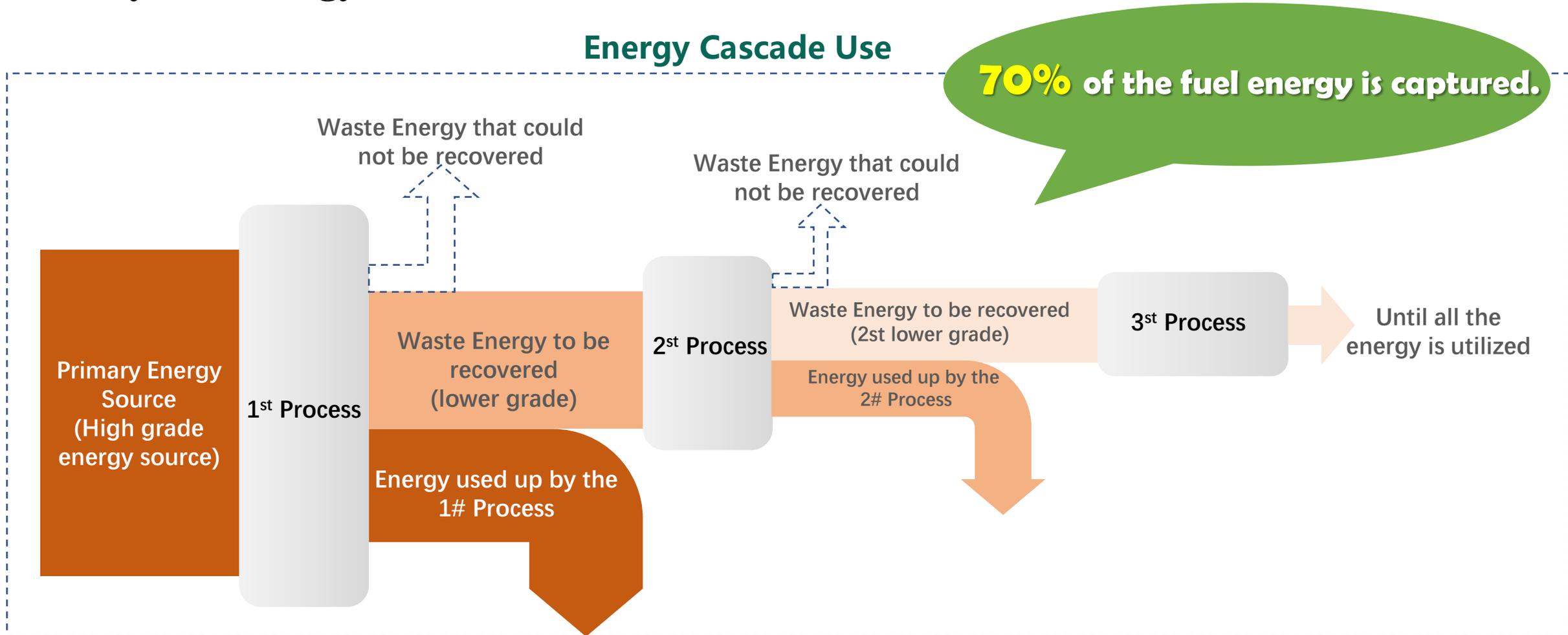


- ZCB building features a tight thermal envelope, the ability to naturally ventilate, waste-to-energy bio-diesel creation, rainwater collection and a photovoltaic roof.
- The building and its surrounding gardens are now open to the public and expected to receive 40,000 visitors annually.



2. Key Technology

Energy Cascade Use





3. Demo Cases

● Projects

- ❑ Natural gas distributed energy station project (Shanghai)
- ❑ Clean heating by using the waste heat of electric furnace circulating water project (Shanxi)
- ❑ Electric energy substitution project (Shandong)
- ❑ Integrated energy-saving transformation demonstration project (Qingdao).





II. Six Major Areas of Integrated Energy Services

Six Major Areas

Energy Efficiency
Services

**Multi-Energy Supply
Services**

Clean Energy
Services

Emerging Energy
Services

Smart Energy
Service

Energy Trading
Services



1. Major Businesses



Industry



Agriculture



Commerce

- Multi-energy complementation;
- Multi-energy collaborative supply;
- multi-energy conversion;
- other services to improve energy efficiency;



2. Key Technology

Energy Conversion (P2X technology)

P2G
(power to gas)



Water Electrolysis

P2H
(power to heat)



Heat Pump

P2C
(power to cooling)



Ice Storage

G2P
(power to gas)



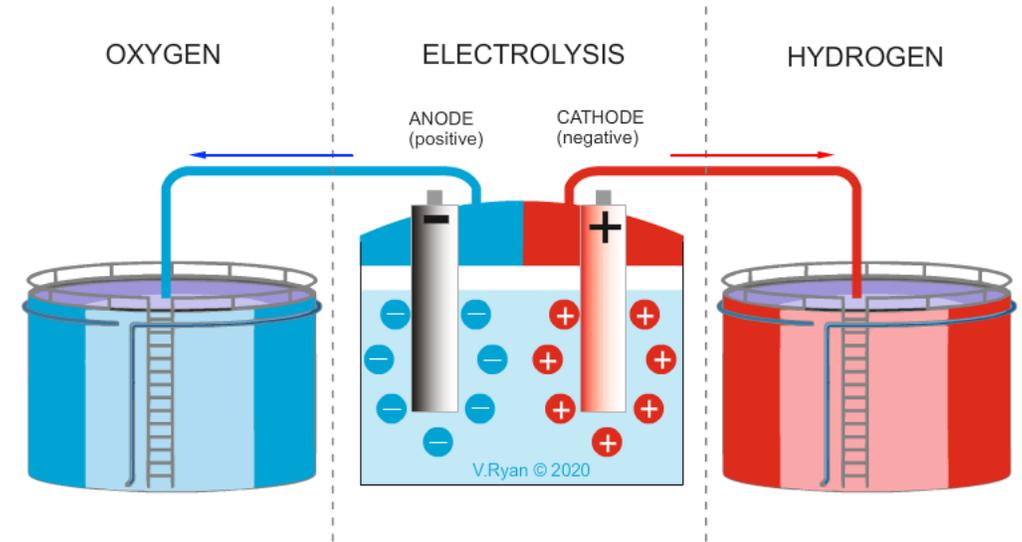
Gas Turbine

2. Key Technology

Electric hydrogen

- **Production:**

- Thermochemical processes use heat and chemical reactions to release hydrogen from organic materials.
- Water (H_2O) can be split into hydrogen (H_2) and oxygen (O_2) using or solar energy



Polymer electrolyte membrane electrolysis (PEM)



3. Demo Cases

Hydrogen-fueled vehicles in 2022 Beijing Winter Olympics





3. Demo Cases

Hydrogen-fueled vehicles in 2022 Beijing Winter Olympics

- 2 hydrogen power production plants ;
- 8 hydrogen refueling stations ;
- Provided a total of 27 tons of hydrogen for 837 vehicles;
- Reduced carbon dioxide emissions by about 400 tons.





II. Six Major Areas of Integrated Energy Services

Six Major Areas

Energy Efficiency
Services

Multi-Energy Supply
Services

Clean Energy
Services

Emerging Energy
Services

Smart Energy
Service

Energy Trading
Services



1. Major Businesses



Wind Power



Solar Power



Hydro Power



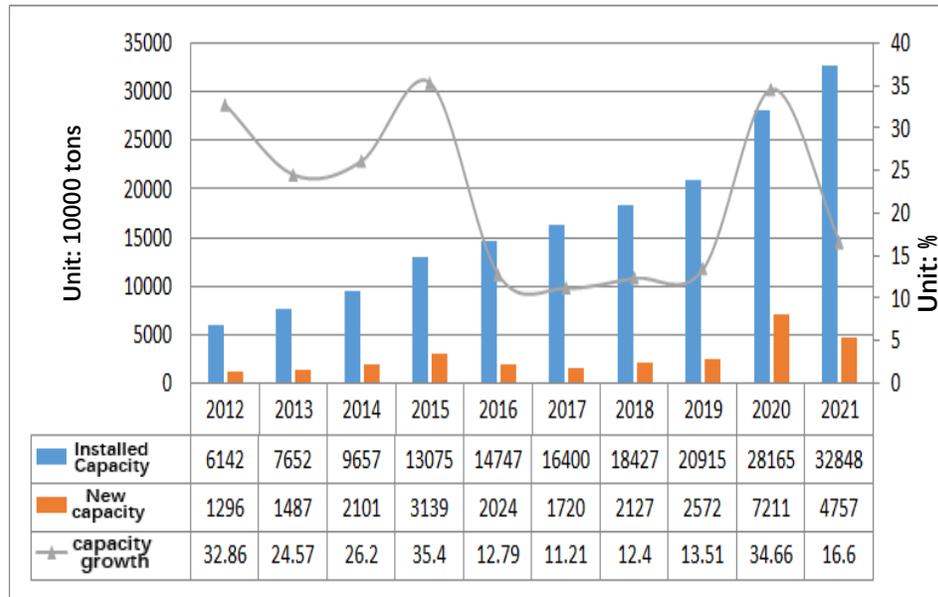
Geothermal Power

- **Generation reserves;**
- **Voltage and frequency control;**
- **Short-circuit power, stability services and black start restoration.**

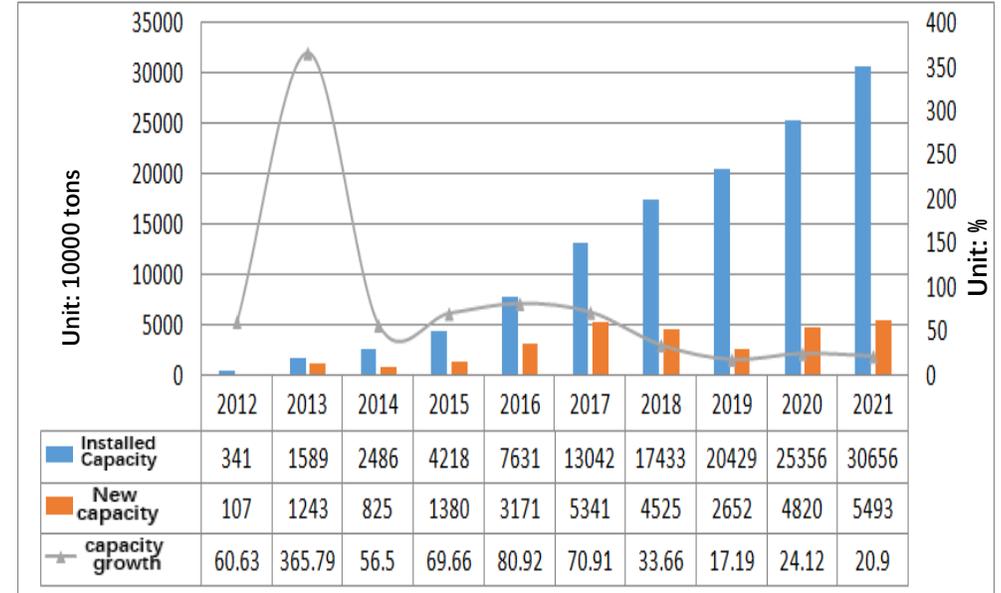


2. Key Technology

The proportion of renewable energies generation



Installed capacity and growth rate of wind power in 2012-2021



Installed capacity and growth rate of solar power generation in 2012-2021

(Data source: National Energy Administration)



2. Key Technology

Qinghai completed a 30-day all clean energy power supply trial





3. Demo Cases

Qinghai completed a 30-day all clean energy power supply trial





3. Demo Cases

Qinghai completed a 30-day all clean energy power supply trial



- Nearly 6 million people in the province,
- Only used electricity generated from wind, solar and hydro power stations, from June 25 to July 25.
- During the trial, the whole province consumed a total 2.84 billion kwh, with the maximum load hitting 8.47 million kw.



II. Six Major Areas of Integrated Energy Services

Six Major Areas

Energy Efficiency
Services

Multi-Energy Supply
Services

Clean Energy
Services

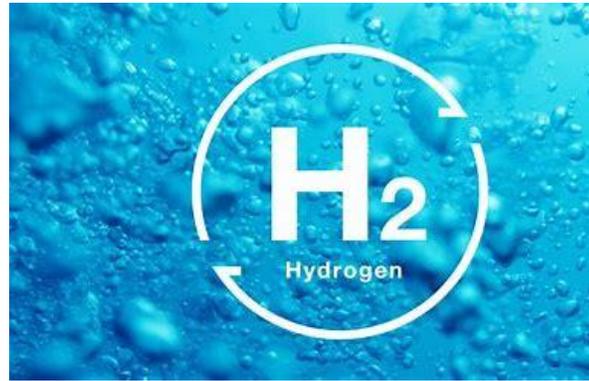
Emerging Energy
Services

Smart Energy
Service

Energy Trading
Services



1. Major Businesses



Hydrogen Energy



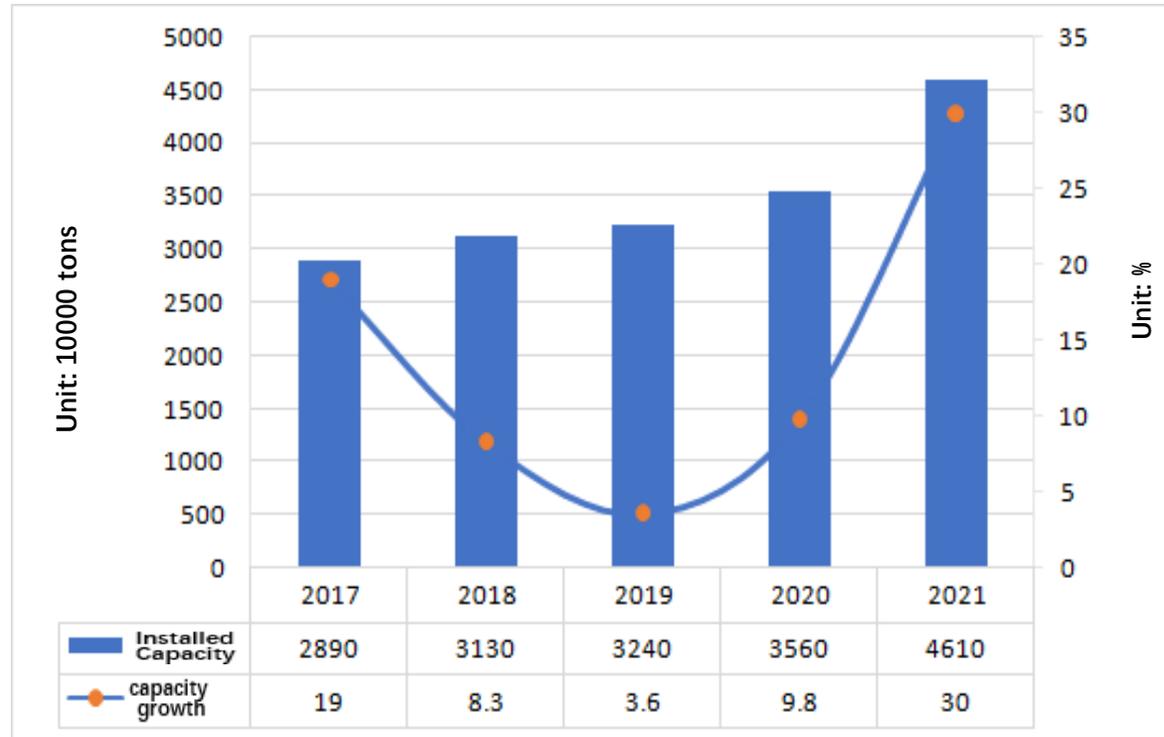
Energy storage

- Promote the comprehensive development and utilization of energy storage and hydrogen
- Energy with the goal of creating a new way of terminal energy consumption centered on electricity



2. Key Technology

Cumulative installed capacity and growth rate of electric energy storage projects put into operation from 2017 to 2021



(Data source: cnesa global energy storage project library)



3. Demo Cases

● Projects



- ❑ Zhangbei wind and solar storage and transmission demonstration project.
- ❑ Jibei Weichang Distributed Power Generation and Energy Storage and Microgrid.

- ❑ Zhuhai Dongao Island Smart Microgrid.
- ❑ Hainan Sansha Smart Microgrid Project.





II. Six Major Areas of Integrated Energy Services

Six Major Areas

Energy Efficiency
Services

Multi-Energy Supply
Services

Clean Energy
Services

Emerging Energy
Services

**Smart Energy
Management Service**

Energy Trading
Services



1. Major Businesses



- IESs planning, optimize operation, maintenance, or and energy trading.

2. Key Technology and demo cases

Chinese national grid developed green energy blockchain trading platform



The platform has completed **integration with 16 provinces**, more than **20,000 of users** are registered, and **6300 drainage resources** are released.



II. Six Major Areas of Integrated Energy Services

Six Major Areas

Energy Efficiency
Services

Multi-Energy Supply
Services

Clean Energy
Services

Emerging Energy
Services

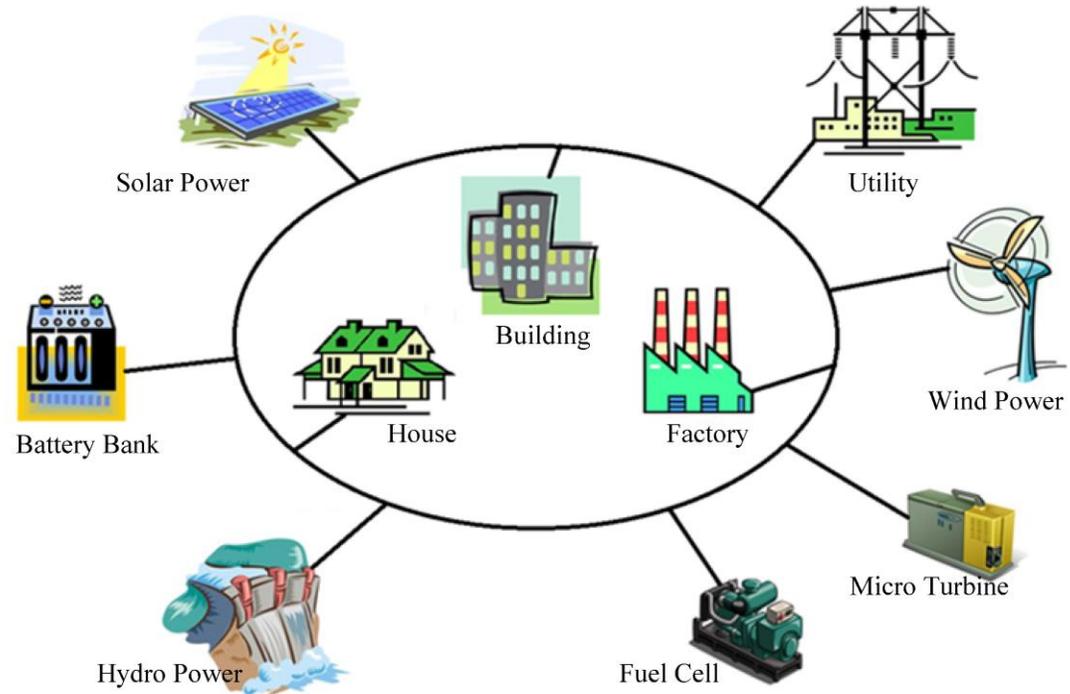
Intelligence Energy
Service

Energy Trading
Services



1. Major Businesses

- Future Trading, Real-time Trading, Day-ahead Forward Trading;
- Auxiliary Service Trading, Virtual Power Plant (VPP), Demand Response.





3. Demo Cases

Shanghai Huangpu District Business Center





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PART 03 Development Outlook of Integrated Energy Services



3 Development Outlook of Integrated Energy Services

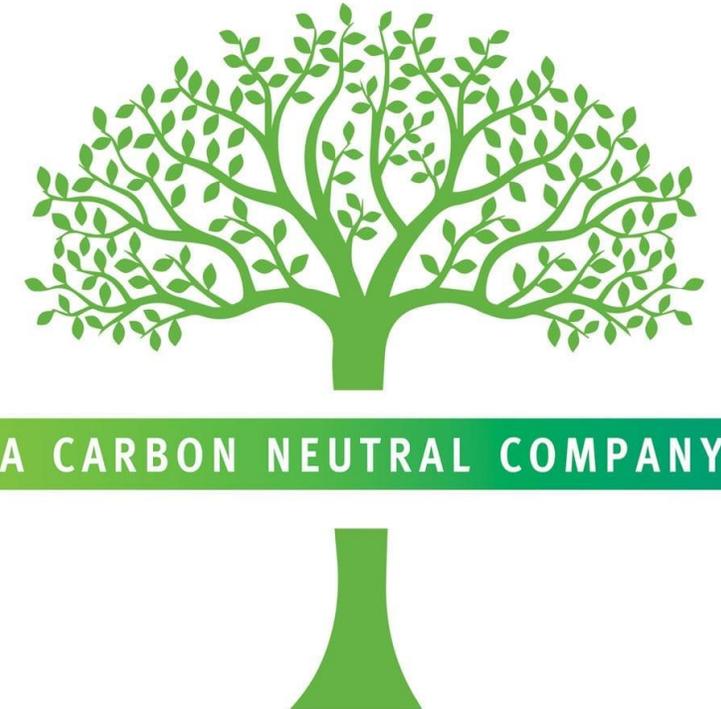




3 Development Outlook of Integrated Energy Services

1. From the political perspective

- Supporting policies have shown the characteristics of encouraging integrated.
- Investment and technological progress in the IES industry will be further promoted .
- Research and formulation of special plans for IESs will be encouraged.





2. From the technical perspective

- China is accelerating the internal cycles of science and technology, consumption, and industry.
- The integration of the technological internal cycle will drive breakthroughs in cutting-edge.
- Provide a wealth of means for IES industry innovation and stimulate potential demand.





3. From the marketing perspective

- The IES market has great potential, and industrial parks and public buildings are key targets suitable for developing IESs.
- With changes in the economic situation and expansion of service targets, new demands for IESs will continue to emerge, driving the continuous release of market potential.
- The scale of China's IES market will reach one trillion yuan by 2025.



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