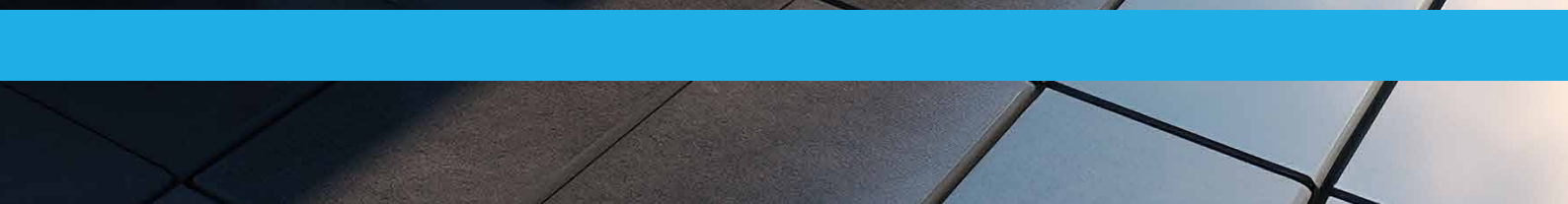
CHINT ELECTRIC

KEARNEY

# CHINT Carbon Neutrality White Paper

Jointly produced by CHINT Research Institute for Carbon-Neutral Technology & KEARNEY




NET
ZERO

# Preface

In recent years, extreme weather has occurred frequently around the world, with melting glaciers, floods raging, and disease outbreaks. Climate change has become an increasingly urgent real crisis rather than a future challenge. How to promote the harmony between the development of human society and the natural environment has become an epochal matter we have to face.

Since the signing of the Paris Agreement, carbon peaking and carbon neutrality have become a global consensus. The transformation of the energy structure to be green and low-carbon has also become a global trend. Facing challenges like resource shortage, environmental pollution, and climate change, it is necessary to replace fossil energies with renewable energies and establish a new electric power system based on new energies, to realize the targets of carbon peaking and carbon neutrality.

Driven by global consensus and China's top-level design, carbon targets will fundamentally change the operating model of our economy and the related energy consumption pattern. They will also promote the low-carbon transition of industrial and manufacturing sectors, opening a window of opportunity for the fast growth of energy and power industries. As a result, global economic growth mode will also be reshaped.

As a world-renowned solution provider of intelligent energy systems, CHINT proactively contributes to the global vision of carbon neutrality. Based on our core business including green energy, intelligent electrics, and intelligent low carbon, we have developed systematical service capability around "green energy, smart grid, load reduction, and new storage" and built a global cross-sector industry ecosystem of smart energy. CHINT is striving to stand as an explorer, advocator, and practitioner in the blue ocean of green and low-carbon development. CHINT has set the carbon reduction goals of realizing carbon neutrality in operations by 2028 and realizing carbon neutrality throughout the whole value chain by 2050. From "one-stop carbon neutral solutions for customers", to "green development options for the society" and "commitments of sustainable development of human society", CHINT comprehensively plans and deploys the group's carbon reduction strategy and outlines a low-carbon blueprint for the industry.

Although the journey to carbon neutrality will be long, we firmly believe that with the global consensus in addressing climate change with net zero emission, CHINT will help our customers achieve carbon neutrality faster with our continuously iterating technology innovations. We will also continue developing future-proofed sustainable development capability, contributing CHINT power to overall carbon targets.

Keep forging ahead towards a promising future. During the rapid revolution of global energy landscape, CHINT will collaborate with partners from all sectors to speed up low-carbon transition, bringing the "CHINT model" to global green and sustainable development and helping the world realize a zero-carbon future.

**Director of CHINT Group**
**President of Zhejiang CHINT Electrics Co., Ltd.**
**President of CHINT Global**
**Lily Zhang**

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# Chapter 1:
# Global Background and Significance of Carbon Peaking and Carbon Neutrality

# I. Carbon Neutrality Becomes Imperative as Global Warning Intensifies

## 1 Changes to come if global temperature rises by 2°C

Global warming is changing the way people live and endangering the habitability of the planet:

rises by 2°C

### Disappearance of coral reefs

Coral reefs produce oxygen and are known as the rainforest of the sea, which provide habitat for one fourth of the marine life.

rises by 2°C

### 10cm Rise of Sea Level

Temperature rise will accelerate the rate of ice melting in Greenland and the Arctic, leading to rising sea levels and the disappearance of lower-lying coastal cities and countries.

rises by 2°C

### Desertification of land and mass extinction

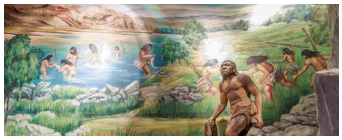
Rising temperature will put food security at significant risk and make some parts of the world unsuitable for outdoor working or living.

Continuous warming causes natural disasters such as floods, droughts, and hurricanes, disrupting ecological balance and endangering species. Global warming is the consequence of climate changes attributable to human behaviors.

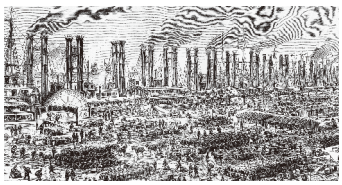
# 2 Carbon emissions to be blamed for global warming

Meteorological observations from countries around the world showed that the Earth's average surface temperature has risen by 0.07°C (0.13°F) every decade since 1880. This rate has been accelerating over time to 0.18°C( 0.32°F) , more than doubled since 1981. According to the World Meteorological Organization (WMO), 2016 was the hottest year since the Industrial Revolution, but 2019 and 2020 were about the same. The global average temperature in 2020 was about 1.2°C above the pre-industrial level.

Carbon dioxide ($CO_2$) is the main contributor to global warming. As human activities increase, we've seen increasing carbon emissions globally starting from the mid-18th century, which obviously picked up the pace since the middle of the 20th century.



Extremely low $CO_2$ emission in prehistoric ages with no application of fossil fuels



$CO_2$ emission grew fast since The Industrial Revolution as global consumption of fossil fuels kept increasing

**1950, global $CO_2$ emission ~ 6 billion tons**

**1990, global $CO_2$ emission increased by 2 times to over 22 billion tons**

**$CO_2$ emission growth kept accelerating during the time**

**2020, global $CO_2$ emission exceeded 34.8 billion tons**

**2022 , global $CO_2$ emission exceeded 41.3 billion tons**

**Global warming** is the consequence of climate change caused by human activities. In response to this crisis, a global action is imperative.

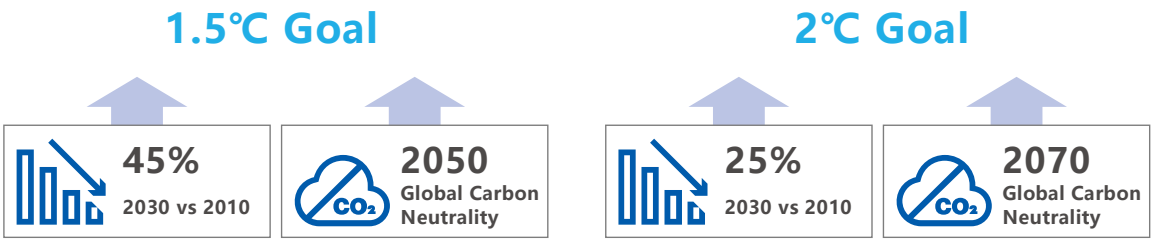
# 3 Global consensus to control temperature rise at 1.5°C or below 2°C

In 2015, parties of the United Nations Framework Convention on Climate Change (UNFCCC) signed up a milestone agreement – the Paris Agreement –the 21st the Conference of the Parties. In the agreement, all countries agreed to work to limit global temperature rise to well below 2 °C, and given the grave risks, to strive for 1.5 °C. Temperature increase above 1.5°C will imperil the planet' s habitability. If remained with no control, the limit would be hit by 2030, and could further move toward an unacceptable direction of 3°C of temperature increase.

Carbon peaking and carbon neutrality complement each other. Since the total amount of carbon absorbed by afforestation and industrial carbon sequestration is relatively fixed and far less than the amount of carbon emitted by industrial development.

① Source: "Historical changes of Global Monthly Surface Temperatures (1851-2020)", by Global Climate Media

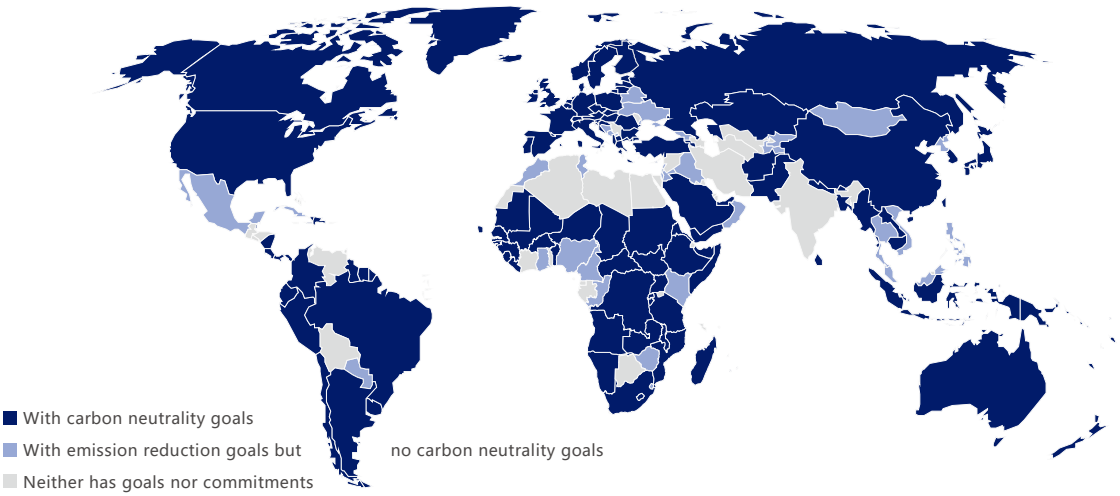
additional carbon peaking plans are required to reverse the growth trend of carbon emissions. The latest research from the Intergovernmental Panel on Climate Change (IPCC) shows **that controlling global warming below 1.5 °C would require the world to reduce $CO_2$ emissions by 45% in 2030 compared to 2010 and realize net-zero $CO_2$ emissions around 2050; limiting global warming to 2 °C would require the world to reduce $CO_2$ emissions by 25% in 2030 compared to 2010 and realize net-zero $CO_2$ emissions around 2070.**




## II. A Race Against Time - Carbon Neutrality Practices across the Globe

Earth is the only planet that supports human life. In the face of global climate challenges, mankind is a community with shared future of prosperity and loss, and no country can stay out of it.

By the end of 2021, 136 countries have committed to realize carbon neutrality. They cover 88% of the world's greenhouse gas emissions, 90% of the world's GDP and 85% of the world's population. Regarding the form of commitments, 13 countries have completed formal legislation, 30 have incorporated them into policy documents, 16 have made declarations, and 70 are at the stage of proposal.




**Concept Difference**

- With diverse development stages, energy structure, emission reduction ambition and resources, different countries use various emission reduction concepts.
- **"Carbon Neutrality"** is adopted by China, Kazakhstan, Colombia, etc.
- **"Net Zero Emissions"** is adopted by U.S., Canada, Argentina, etc.
- **"Climate Neutral"** is adopted by EU, Brazil, etc.

Source: UNFCCC, Kearney

**Figure: Forms of Carbon Neutrality Commitments across the Globe**

Among committed developed countries except Canada and Korea, major economies such as the United Kingdom, Germany, and France have peaked carbon emissions. They are now in the stage of reducing total carbon emissions, enjoying a longer time window and less pressure to be carbon neutral. 2040, 2045, and 2050 are common deadlines committed by most developed countries.

**Table: Timelines and Technologies of Major Developed Countries towards Carbon Neutrality**

| No. | Country/ Region | Goals and Timelines | | | | | Technology directions |
|---|---|---|---|---|---|---|---|
| | | 2030 | 2035 | 2040 | 2045 | 2050 | |
| 1 | United States | Reduce emissions by 50%-52% (YoY change compared to 2005). | 100% clean energy | — | — | Net zero | Liquid fuels, mainly in low-carbon transportation; greater efforts in battery energy storage, next-gen building materials, renewable energy, green hydrogen, and advanced nuclear technologies |
| 2 | Japan | 10GW offshore wind | 30-45GW offshore wind | — | — | Carbon neutral | Hydrogen, ammonia fuel, offshore wind, fuel cells, solid waste recycling, etc |
| 3 | Germany | Reduce emissions by 65% | — | Reduce emissions by 85%-90% | Net zero | — | Focus on renewable energy and hydrogen development; enhance battery strength |
| 4 | United Kingdom | Reduce emissions by 78% (YoY change compared to 1990) | — | — | — | Near zero | Low-carbon technologies in various industries, incl. offshore wind, hydrogen, nuclear, electric vehicles, green public transport, zero-emission jets, green buildings, CCUS, natural environment, green finance and innovation, etc |
| 5 | France | 32% renewable energy | — | — | — | Carbon neutral | Hydrogen, nuclear, renewable materials recycling, biofuel products; also probe into industrial decarbonization |

Major developing countries such as China, India, Brazil, South Africa, Indonesia, and Russia have also committed to carbon neutrality. Brazil and Russia have peaked carbon emissions. While China, India and other countries have not yet, facing pressure from both low-carbon transition and economic development. Compared with international practices, China's commitments leave an interval of only 30 years between the promised carbon peaking time and carbon neutrality time. With similar emission reduction paths, China has a shorter buffer period and will face more challenges.

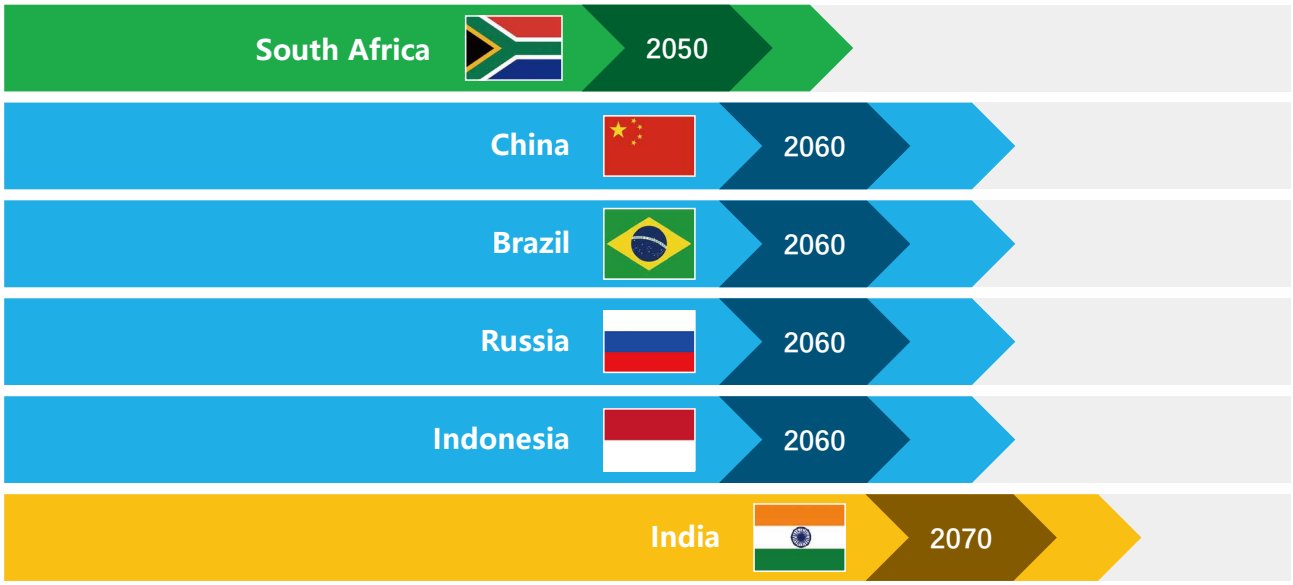



**Figure: Carbon Neutrality Timelines of Major Developing Countries**

To sum up, initiatives around the world have made clear that the essence of global carbon neutrality is the energy transition from non-renewable fossil fuels to renewable energies. In the meantime, the energy substitution driven by carbon neutrality is also a symbol of the progress of human civilization.

# Chapter 2:
# Strategic Plans of China for Carbon Neutrality

Climate change is a common challenge for mankind. As the world's largest developing country, China's carbon emission reduction actions are of great significance to global climate change mitigation. However, China is also facing a conflict between the increasing energy demand from economic growth and carbon reduction targets. and increasing greenhouse gas emissions driven by the needs of economic growth and living standards improvement. Therefore, China's carbon neutrality target becomes a focus of global attention.

## I. Carbon Neutrality Promoted as a National Strategy

China attaches great importance to climate change. It implements a series of strategies, initiatives, and actions to address climate change and engages in global climate governance. China's carbon emission reduction can be divided into three phases.

### Phase I (1988-2008)

#### rioritized economic development but neglected emission reduction

- Negotiations of the United Nations Framework Convention on Climate Change commenced in 1988 but had not been approved by China until 1994
- The Kyoto Protocol was adopted in 1997 and ratified by China in 2002
- "The People's Republic of China Initial National Communication on Climate Change" was issued, and China's greenhouse gas emission data was released by China for the first time in 2004
- "Responding to Climate Change: China's Policies and Actions" was released in 2007

### Phase II (2009-2020)

#### Attentions gradually paid to emission reduction

- China had accelerated carbon emission reduction since 2009 and set a target of 40%-45% cut in carbon emissions per unit of GDP in 2020 compared with 2005
- In 2014, China announced for the first time the plans to peak carbon emissions by 2030 or even earlier, and to increase the proportion of non-fossil energy in primary energy consumption to about 20 percent by 2030
- China stressed to reduce the carbon emissions per unit of GDP by 60%-65% compared with 2005 in a China-US Joint Statement on Climate Change in 2015

### Phase III (2020-present)

#### Carbon emission reduction escalated as a national strategy

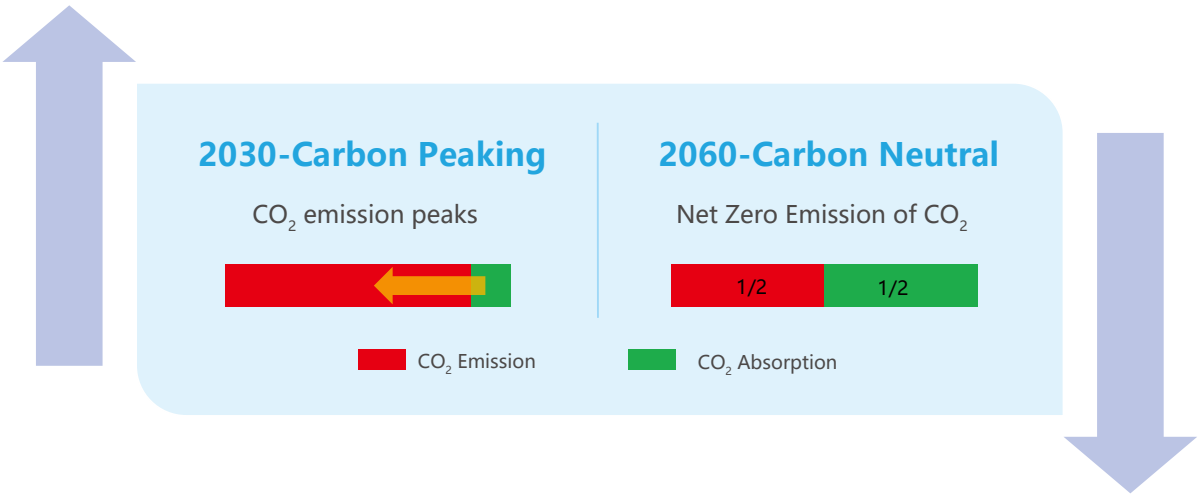
- In 2020, China explicitly stated to peak carbon emissions by 2030 and reach carbon neutrality by 2060 for the first time
- China set the target of increasing the share of non-fossil energy in primary energy to 25 percent by 2030
- In 2020, China established the "1+N" policy system for carbon peak and carbon neutrality, the top-level document has been released, and specific action plans are being released continuously

In view of the inherent requirements for sustainable development and a community with a shared future for mankind, China defined climate change response as a national strategy. By promoting the development of a fair and win-win global climate governance system, China contributes wisdom and strength to the fight against climate changes.

# II. China's Commitments to Carbon Neutrality

To fulfill its commitments in the Paris Agreement, China has announced a long-term carbon neutrality goal, hoping to make a notable contribution to global climate change. **On September 22, 2020, President Xi Jinping announced at the general debate of the 75th Session of the United Nations General Assembly that China would strive to realize carbon peaking by 2030 and realize carbon neutrality by 2060, by adopting more vigorous policies and measures.**

This commitment indicates that, in a rapidly changing global environment, China will assume a global leadership role in addressing climate change and take stronger actions to fulfill both economic growth and inclusive prosperity.



# III. China's Master Plan for Carbon Neutrality

To meet the strategic goals of realizing carbon peaking before 2030 and carbon neutrality by 2060, both top-level design around policy system and scientific objectives are required to guide economic sectors and the society to reduce carbon emission progressively.

## 1 Top-level Design

**"1+N" climate policy system towards carbon peaking and carbon neutrality.**

"1" refers to the guiding principle, which is composed of the "Guidance by the Central Committee of the Communist Party of China and the State Council on Complete and Accurate Implementation of the New Development Concept to Perform Carbon Peaking and Carbon Neutrality"(《中共中央国务院关于完整准确全面贯彻新发展理念做好碳达峰碳中和工作的意见》) and the "Action Plan for Carbon Dioxide Peaking Before 2030"(《2030年前碳达峰行动方案》). "N" represents implementation plans in key areas and key industries and related supporting plans. At the same time, regional action plans have also been drafted.

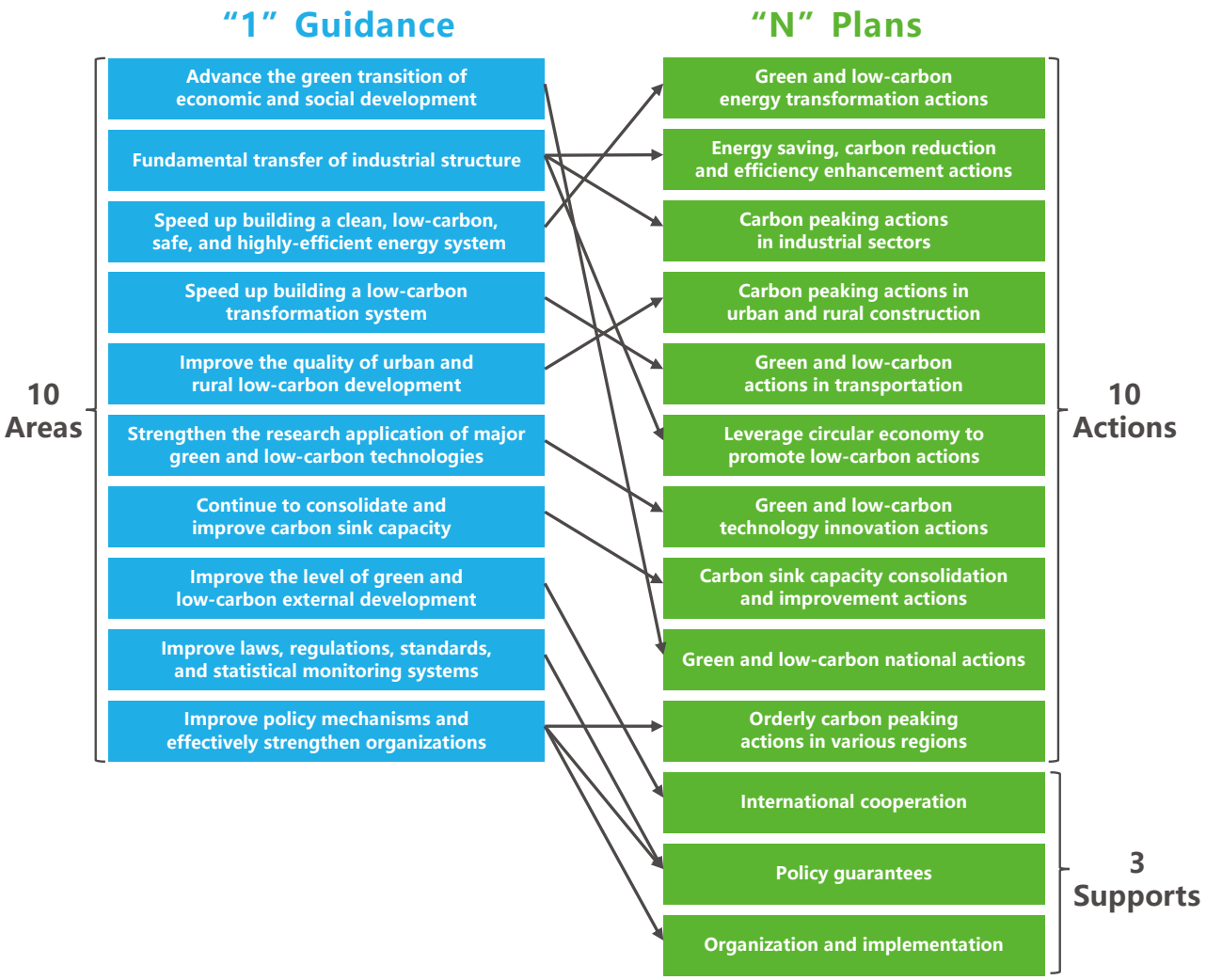



**Figure: Interpretation of contrastive relationships of "1+N" top-level design documents**

**Unified national carbon emission trading market.**

China plans to control and reduce greenhouse gas emissions through market mechanisms. It has launched the national voluntary greenhouse gas emission reduction trading market as a complement of the previous carbon emission rights trading market. These two trading markets together constitute a complete carbon trading system of China.

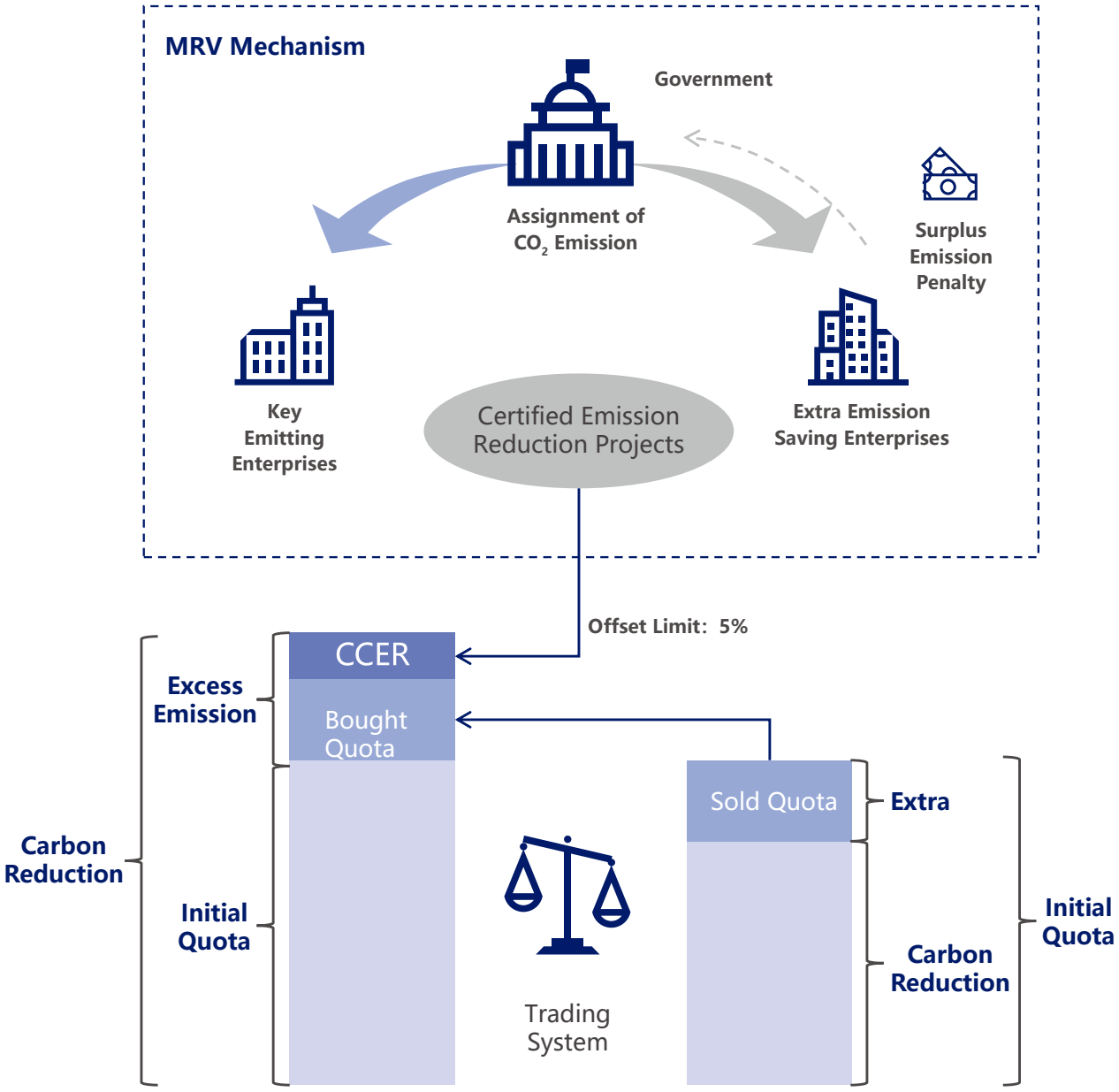



**Figure: China carbon trading market system exhibition**

## 2 Key Objectives

In 2015, China set its determined 2030 carbon emission targets and had exceeded its 2020 targets ahead of schedule by the end of 2019. **In 2020, China announced its new NDC (Nationally Determined Contributions) targets:** strive to peak carbon dioxide emissions by 2030 and achieve carbon neutrality by 2060. By 2030, compared to 2005, China $CO_2$ emission per unit GDP will decrease by 65% and forest stock volume will increase by 6bn m3. Proportion of non-fossil energies in primary energy consumption will reach 25% and total installed wind and solar power capacity will exceed 1.2bn kW.

CHINT opinion: the book <Carbon Neutrality> (碳中和逻辑体系与技术需求) authored by Academician Ding Zhongli's team, which proposes that China will achieve carbon neutrality within about 40 years, provides a clear and instructive timeline and roadmap.

### China's Staged Plan for Carbon Neutrality

**Carbon Control**

**【Total carbon dioxide emissions within 10 billion tonnes by 2030】**

- Allow for small carbon emission increase during the 14th Five-Year Plan period and reduce it after peaking during the 15th Five-Year Plan period.
- In transportation sector, tries to expand the share of electric vehicles and hydrogen energy for transport; in construction sector, strives to complete about half of low-carbon transformation target; in industrial sector, develops and demonstrates "coal + hydrogen + electricity" substituting for coal.
- Try to use more wind and solar power and reduce thermal power to meet electricity demand growth; complete demonstration of inland nuclear power application; complete demonstration and make some progress on hydrogen production and use system.

**Carbon Reduction**

**【Total carbon dioxide emissions within 8.5 billion tonnes by 2040】**

- Strive for basic completion of the low-carbon transformation in transportation and construction sectors.
- In the industrial sector, roll out processes of coal/oil/natural gas + hydrogen + electricity that substitute for thermal power, and promote new carbon-free processes in areas with mature technologies.
- Eliminate 15 percent of backward installed thermal power capacity; complete the system of hydrogen production from wind and solar and hydrogen use and expand the capacity.

**Low Carbon**

**【Total carbon dioxide emissions within 6 billion tonnes by 2050】**

- Realize near-zero carbon transformation in construction and transportation sectors; complete low-carbon transformation basically in the industrial sectors.
- The total installed capacity of thermal power to be reduced by another 25 percent; wind and solar power and hydrogen become main energy resources; affordable energy storage technologies are basically mature.
- echnology for recycling and reuse of nuclear waste in China is estimated to be mature and the on-grid tariff of nuclear power will decrease, basically meeting the conditions to substitute for thermal power as a stable power source.

**Carbon Neutrality**

**【Total carbon dioxide emissions at 2.5 ~ 3 billion tonnes by 2060】**

- Intelligent and low-carbon power supply system to be built, and thermal power will reduce to ~ 30 percent of the current total installed capacity; natural gas will substitute partially for coal in thermal power generation, and dioxide emissions from thermal to be controlled at 1 billion tonnes per year; use water, solar, wind and nuclear as main sources of power supply, with thermal power serving only for emergency need or "base load" in some areas
- Industrial sector will also reach low carbon, in addition to transportation and construction sectors.
- 1.5 billion tonnes of the emission quota will mainly be allocated to areas where emissions are "unavoidable" , such as cement production, chemicals, and the production and processing of certain raw materials, as well as civil energy use in remote areas.
- The remaining 500 million tonnes of $CO_2$ emission quota will be allocated flexibly.

# Chapter 3:
# Carbon Neutrality Goals of CHINT

As a global leading provider of smart energy solutions, CHINT always practices the concept of sustainable development in its intelligent electrical business. Based on national carbon peaking and neutrality goals, CHINT has set its own carbon neutrality goals and incorporated it into its corporate strategy. **By 2028, CHINT will achieve carbon neutrality (including carbon offset) in its business operations. By 2035, CHINT will realize net zero carbon emissions in its operations and build a complete value chain emission management system. By 2050, CHINT will realize net zero emissions throughout the value chain.**

- **By 2028: Carbon neutrality in own operations (with carbon offset).**

  Emission reduction measures including energy efficiency improvement, increasing the use of renewable energy and renewable materials, building one-stop carbon neutral solutions and "Zero-carbon Demonstration Campus".

- **By 2035: Net-zero carbon emissions in operations plus carbon emission management system for the value chain.**

  Emission reduction measures including waste recycling, substitution for fossil fuels, process upgrading, green packaging, and carbon removal.

- **By 2050: Net-zero carbon emission across the value chain.**

  Emission reduction measures including value chain decarbonization through CHINT's one-stop carbon neutrality solutions, zero-carbon operations in all factories and campuses, and striving for carbon neutrality of all products.

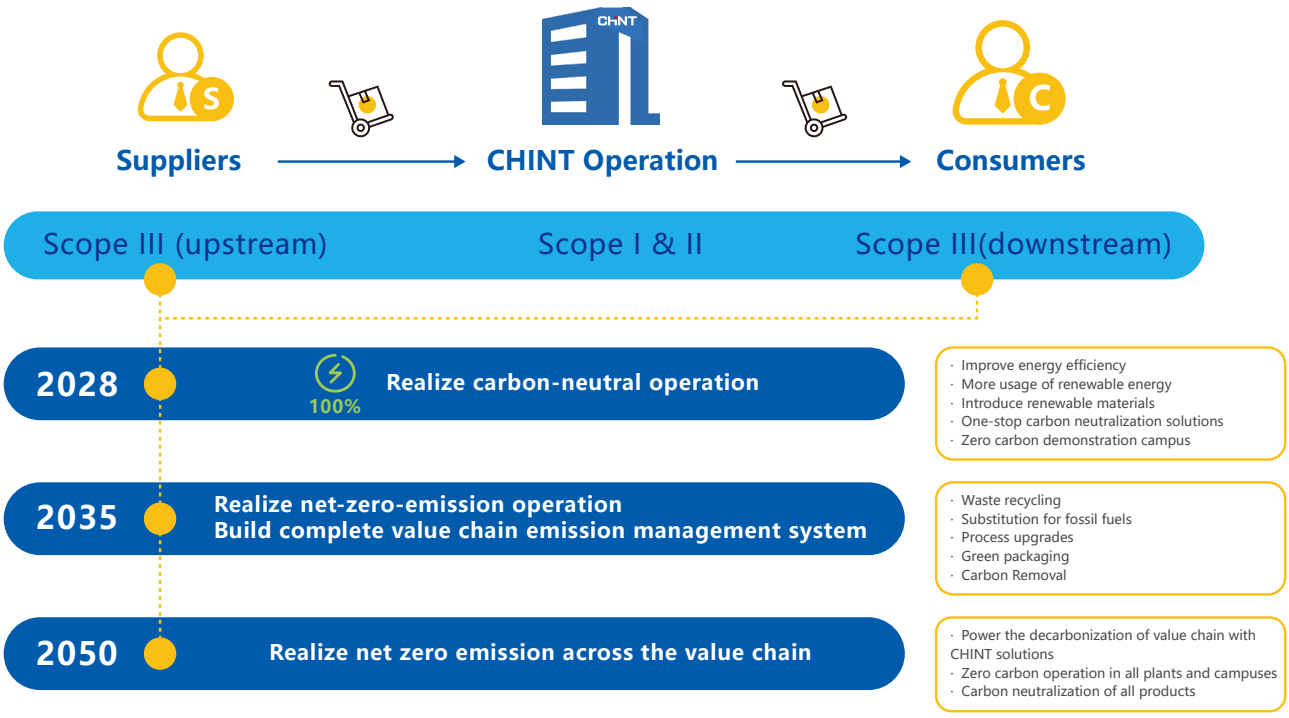
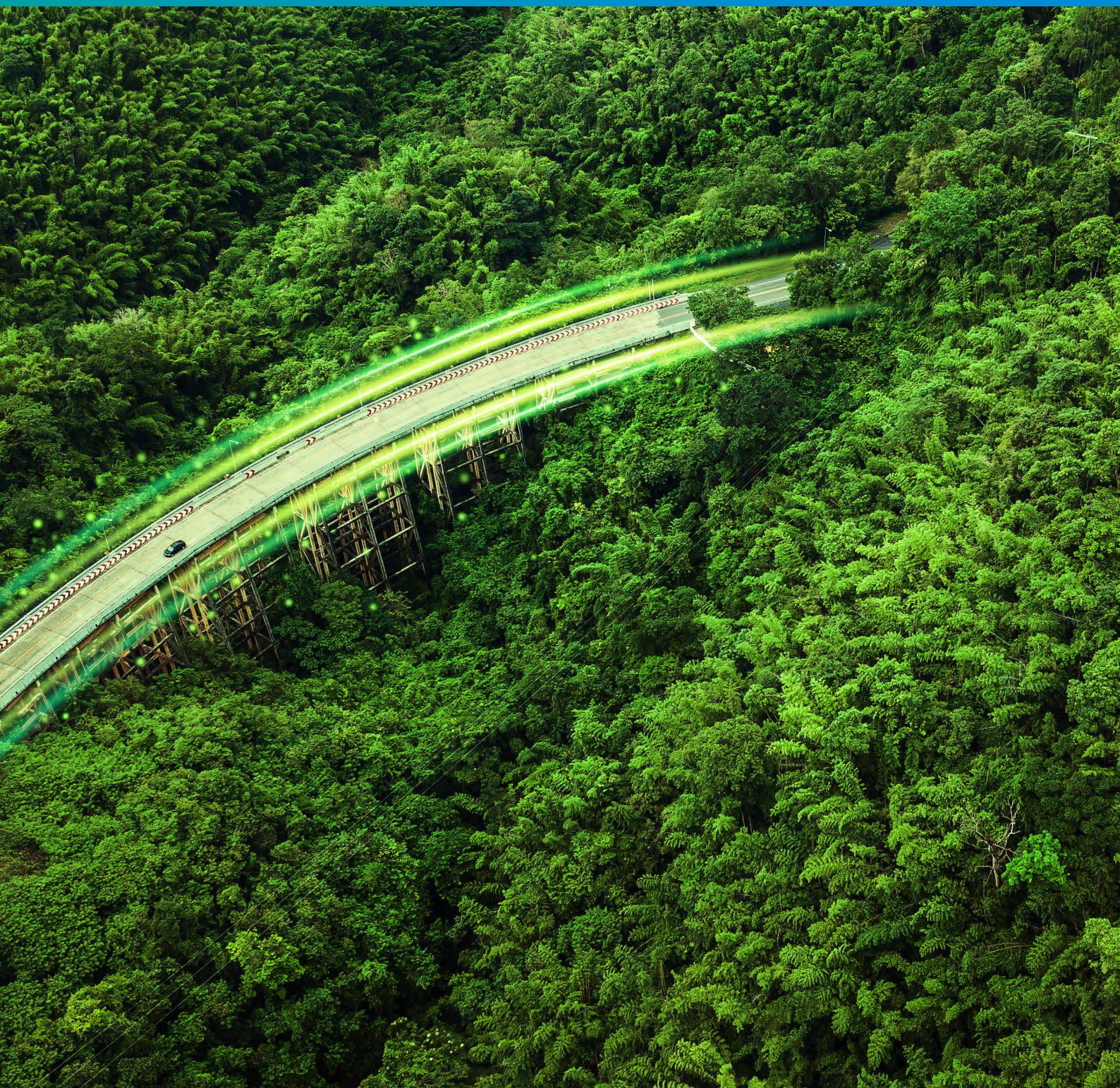


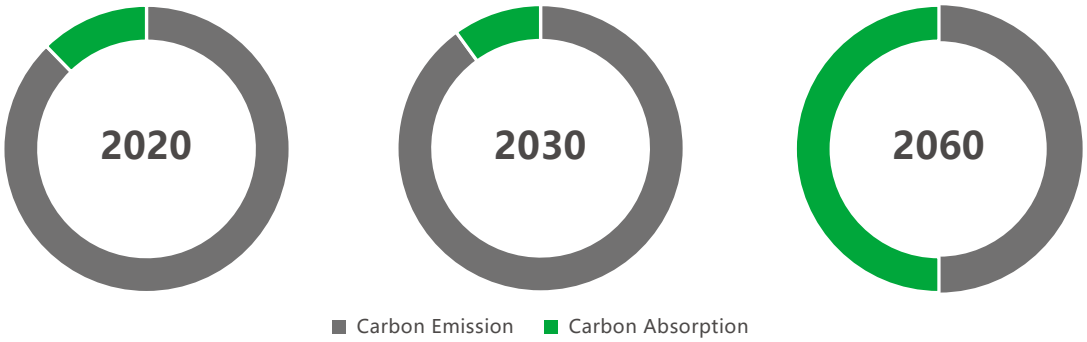

**Figure: CHINT's Carbon Neutrality Goals and Implementation Roadmap**

**CHINT's solemn commitments to carbon neutrality set new milestones on its sustainable development.** At the same time, as an official member of UNGC (United Nations Global Compact), CHINT supports UNGC's developing targets and initiatives. Beyond performing its low-carbon strategy and carbon neutrality goals, CHINT also empowers its customers to build an end-to-end zero-carbon industrial chain, as contributions to the realization of China's carbon neutrality goal.

# Chapter 4:
# Directions to Pursue
# – Paths to Carbon Neutrality



Carbon neutrality means that carbon emissions caused by human activities are controlled within the absorption capacity of ecosystems. To achieve carbon neutrality, we need to go through two stages: first, stop the increase of carbon emission as soon as possible, which is the process of **carbon peaking**; then gradually reduce emissions from peak to **neutrality.**




In terms of CO2 emission control, there are two paths to reach carbon neutrality.

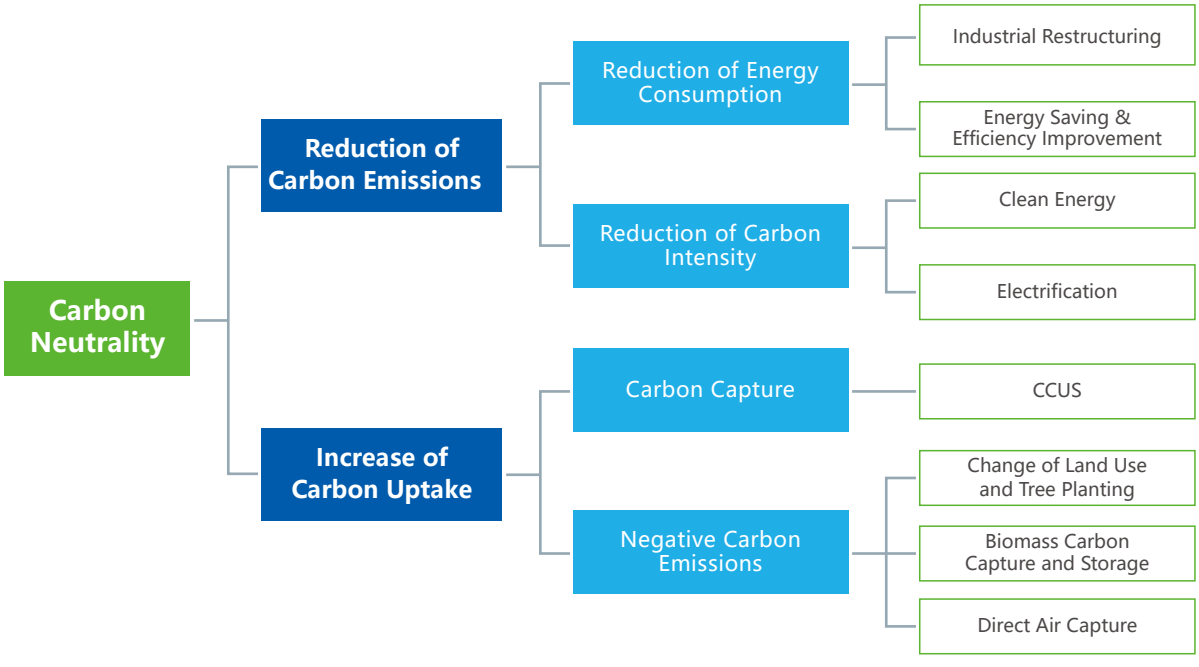

### Reduce carbon emission

Reduce the use of fossil fuels requires large-scale adjustment to the energy structure and the industrial structure of the economy.

### Increase carbon Sequestration

Capture and reuse CO2 in the air through biological carbon sequestration and technical carbon sequestration.

In view of China's current industrial structure and technological development, a feasible path to carbon neutrality is mainly based on **reducing carbon emissions, supplemented by increasing carbon sequestration.**



# I. Emission Reduction: Structural Optimization to Reduce Emissions from Sources

Carbon emission volume is affected by many factors such as economic development, industrial structure, energy structure, and technical development level. The key to $CO_2$ emission reduction is to get rid of the dependence on fossil fuels, so that CO¬2 generation volume will be cut from sources. Electrification and clean energies are two main paths to realize this target.

## 1 Power generation side: build a new power system with adjusted energy structure

China's installed power capacity was 2.38 billion kW in 2021 and is estimated to reach 6-8 billion kW by 2060. The International Energy Agency (IEA) predicts that the share of low-carbon energy resources such as solar power, wind power, hydropower, bioenergy, and nuclear in primary energy demand will jump from 15% today to 74% by 2060.

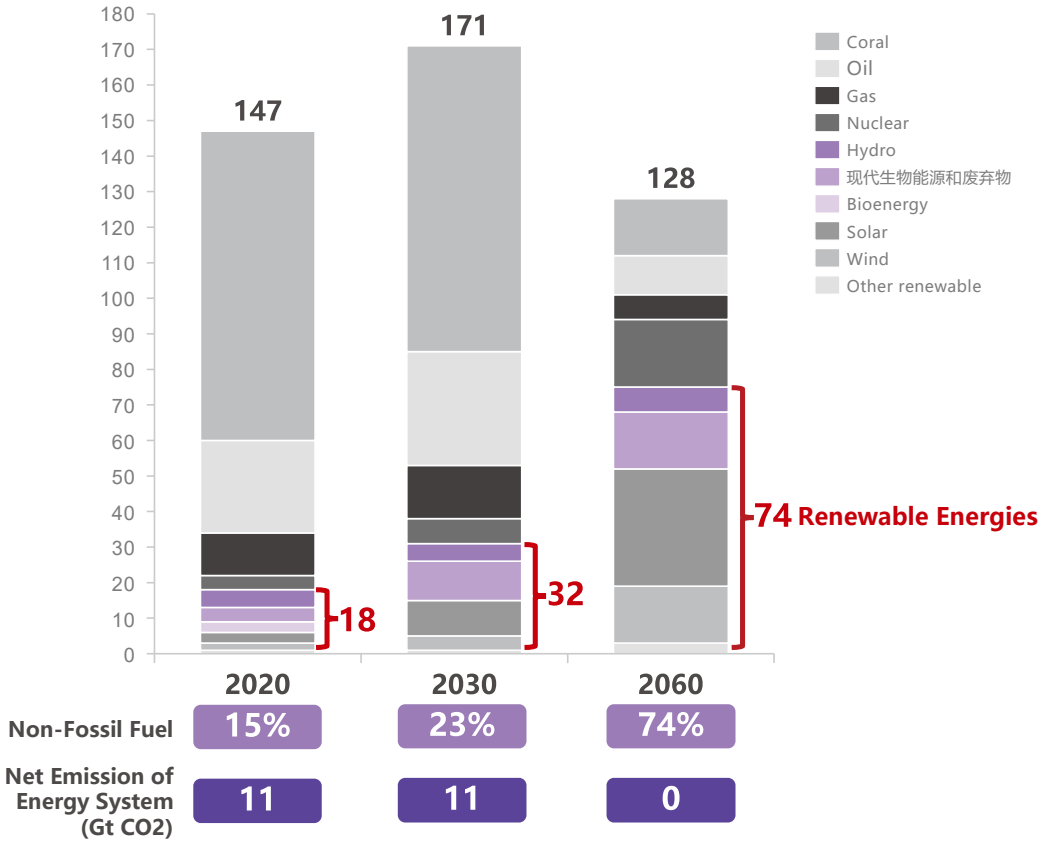



**Figure: Primary Energy Demand under China's Neutrality Pledge** ②

② Source: An Energy Sector Roadmap to Carbon Neutrality in China (《中国能源体系-碳中和路线图》), by the International Energy Agency (IEA)

According to Jiang Yi, an Academician of the Chinese Academy of Engineering (CAE), main tasks of China's energy revolution is to establish a new zero-carbon power system, and to push the industrial, transportation, and construction sectors to change their energy structures with transformed energy supply.

**The future power system should has following characteristics:**

① Huge installed power capacity
② Wind and solar will gradually become main sources for power generation and energy supply
③ Stable power supply should gradually change from thermal power (major source at present) to nuclear power, hydropower, and comprehensive and other complementary clean energies
④ Energy storage, conversion and load adjustment technologies are necessary to overcoming the fluctuation of wind and solar resources
⑤ Thermal power is only used as an emergency power supply
⑥ Several times larger transmission infrastructure to balance regional resource differences; strengthened distribution infrastructure to absorb more distributed resources.

**To be carbon neutral, China plans to build a new power system with a total capacity of 6 ~ 8 billion kW.** In the next 40 years, China will progressively realize carbon-controlled power system, carbon-reduced power system, low-carbon power system and zero-carbon power system. Each stage will last about a decade, along with large-scale construction of power transmission and transformation infrastructure.

To establish such a power system, there are lots of technological thresholds to break through in terms of power generation, energy storage, conversion, consumption, etc., which will become the top priorities along the journey to carbon neutrality. ③

## 2 Power consumption side: new energy-saving technologies to accelerate clean energy application and electrification

At present, around 30% of China's carbon emission comes from industrial energy consumption (excluding industrial electricity use), 10% from transportation, and 5% from buildings. To achieve carbon neutrality, overall user-end electrification, carbon reduction from sources and energy efficiency improvement are required to be promoted in all these sectors.

- **Industrials:** Steel, nonferrous metals, chemicals, building materials, and other emission-intensive industries must be deeply decarbonized, for example the electrification of boilers and kilns. If electrification is not viable, low-carbon mixed fuels can be alternative options.
- **Transportation:** Electricity will replace fossil fuels as the main energy for road passenger transportation. Hydrogen might partially replace fossil fuels for boats, heavy trucks, and airplanes. Safe and economical charging infrastructures and hydrogen supply system are the base of such low-carbon transportation system.
- **Buildings:** Mainly based on full electrification in urban buildings, supplemented by heat pumps and natural gas in regions, a power combination of rooftop PV, electric heat pump, natural gas, biogas, and input electricity can be built for civil energy consumption.

③ Source: "Carbon Neutrality" (《碳中和逻辑体系与技术需求》), by Academician Ding Zhongli

# II. Emission Offset: CCUS

According to the International Energy Agency (IEA), total residual emission in 2060 will be around 610 million tonnes, mostly from sectors that are struggling to reduce emissions, such as heavy industry and long-distance transportation (road, marine and air). The residual emissions in 2060 will be fully offset by negative emissions from Bioenergy with carbon capture and storage (BECCS) and direct air capture (DAC) and storage.

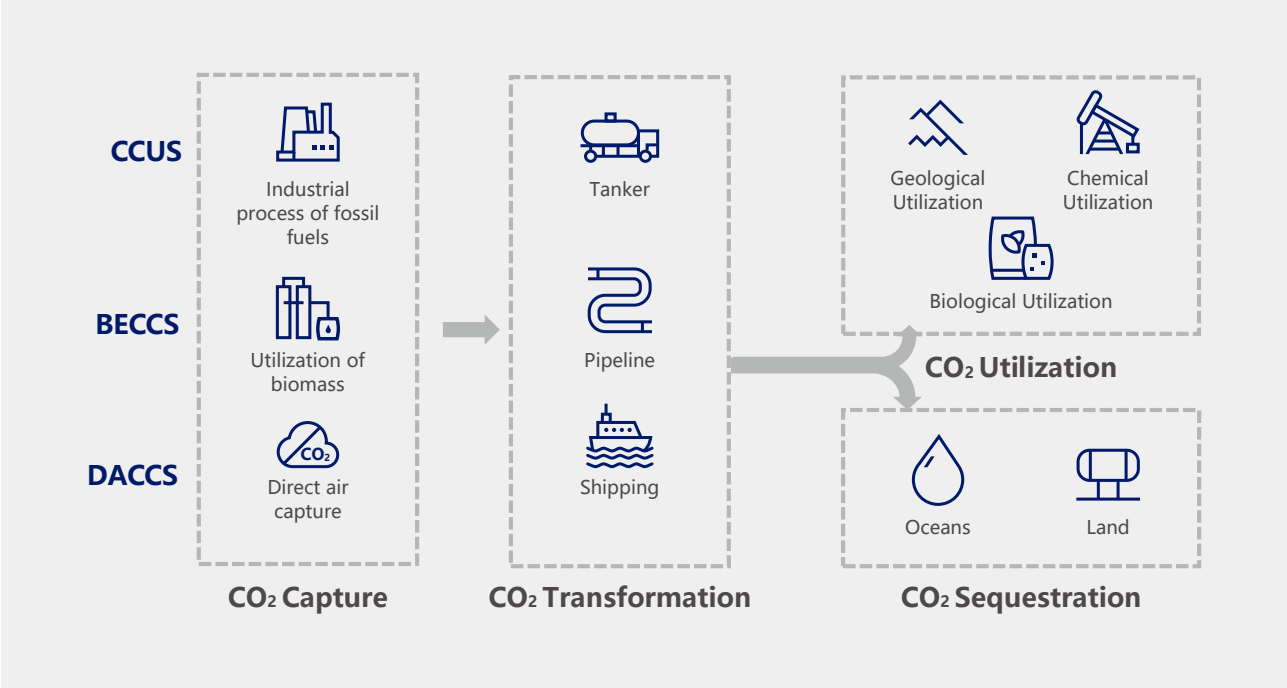



**Figure: Carbon-Negative Technologies including CCUS**

**At present, there are four main means of carbon storage:**

- Restoration and conservation of degraded ecosystems;
- Capture of high-concentration $CO_2$ for chemical, biological and other conversions;
- Underground storage of captured $CO_2$;
- Use of biomass fuels, smoldering of felled trees and straws in the field.

# Chapter 5:
# A Long Way to Go
# – Major Challenges to Achieve Carbon Neutrality

Compared with developed countries, China is facing a shorter time window from carbon peaking to carbon neutrality and larger emission volume to cut. It is an arduous task to meet the ambitious carbon neutrality goal in 30 years. There is a long way to go.

**An important trend in carbon reduction is electrification in key energy-using areas.** The electrification in industry, transportation, and buildings will effectively reduce the dependence of final consumption on fossil energies. At the same time, it introduces continuous increase of electricity consumption. The proportion of electric energy in final energy consumption will increase to about 50% by 2050. Achieving low-carbon development in the power sector is bound to be the top priority for achieving carbon peaking and carbon neutrality.

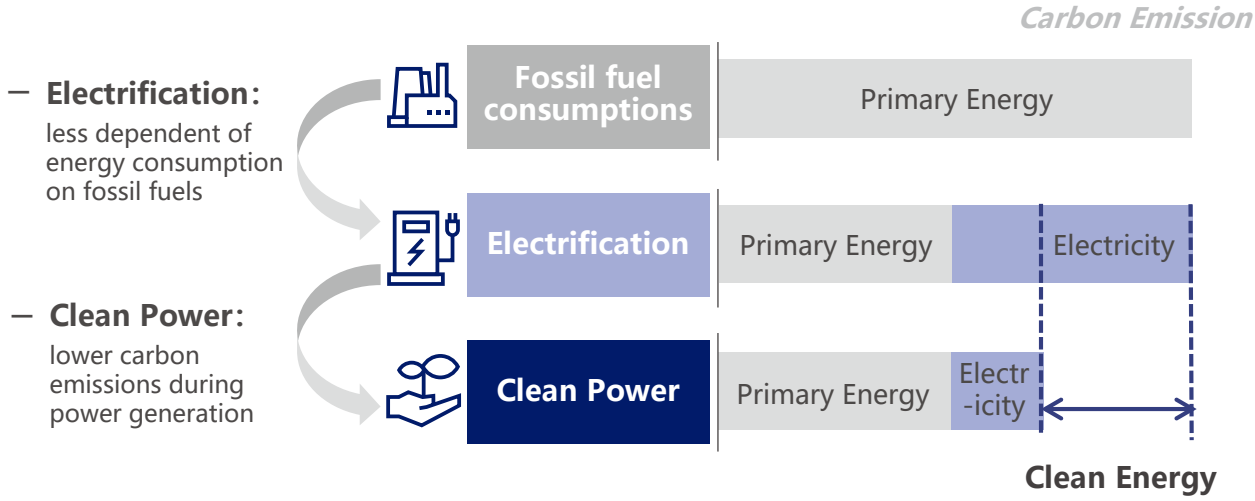



**Figure: Carbon Reduction Caused by Electrification and Clean Power**

# I. Challenge 1: High Dependence on Coal as Power Supply

## 1 China will maintain dependent on coal power for a long time, as it is rich in coal but deficient in oil.

China's resource structure is rich in coal, deficient in oil, and lean in gas. This energy endowment severely constrains the progress of emission reduction. China ranks top in total coal production and consumption. The country imports 73% and 43% respectively for its oil and gas demand, facing intense pressure to secure energy supply. In 2021, fossil fuels accounted for ~ 85% of China's total primary energy demand, of which, coal took up nearly 60% and oil took up about one fifth. Replacing fossil fuels with renewable energy is the most important way to achieve carbon peaking and carbon neutrality. However, the exiting of coal-fired power will bring challenges to power supply stability and short-term economic growth of coal-dependent regions to some extent. ④⑤

④ "China's Challenges and Solutions to Carbon Peak and Carbon Neutrality Goals" (《我国实现"双碳"目标面临的挑战及对策), by Chinese Academy of Social Sciences, 2021
⑤ "An Energy Sector Roadmap to Carbon Neutrality in China"(《中国能源体系-碳中和路线图》), by

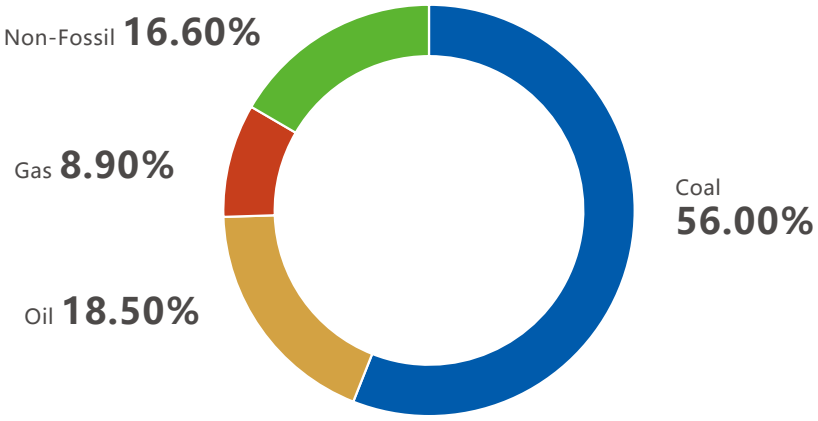



**Figure: China's Primary Energy Consumption Structure, 2021**

### 2 The volatility, randomness, and intermittence of renewable energies constrain its application scale due to difficulties in peak shaving, long-distance transmission, and storage

From technology perspectives, wind, photovoltaic, photothermal, geothermal, and tidal energy have great uncertainties due to uncontrollable natural conditions, such as day and night alternation and weather. Therefore, power generation from these renewable energy resources are volatile, random, and intermittent. Besides, the long distance between power plants and load centers drives up the cost of renewable energy electricity to some extent, and consequently affect consumption. Furthermore, without a national electricity market in place yet, power supply in China has long been allocated and balanced at provincial level. The lack of cross-provincial and regional allocation capacity seriously constrains optimized renewable energy allocation at large scale.

## II. Challenge 2: Power Grid Stability and Flexibility

PV and wind power will be main energy resources by 2050, accounting for 83% of total electricity generation in China. However, power from wind, solar and other new energy resources is random and volatile due to their vulnerability to natural conditions, imposing challenges to large-scale on-grid operations. With more renewable energy capacity inter-connected to the grid, the grid randomness and volatility will come from both supply side and demand side, bringing great challenges to the grid's stability and flexibility.

### 1 Expanding grid capacity catering to peak demand will cause underutilization of power assets given increasing peak and off-peak difference

Regarding China's overall power load, the daily peak and off-peak gap is expected to keep widening, with peak load increasing significantly to more than double of the off-peak load. However, if we expand power plants and transmission capabilities to meet the annual peak demand which lasts only a few days or a few hours, it will be a heavy investment with low utilization.

## 2 Coupling and constraints among multiple energy resources impact the flexibility and reliability of multi-energy systems

In a combined heat and power (CHP) system for example, where there are no energy storage facilities, it works in three models - determining electricity generation based on heat load, determining heat generation based on electricity capacity, or the two combined - which is less flexible. With more energy types in the multi-energy power system, the correlation and coupling will also be stronger, raising urgent demands for flexibility and reliability enhancement.

In a carbon neutral scenario by 2060, the new power system will jointly develop the distribution network and distributed power resources. The power grid will be operating in the form of "macro-grid + active distribution network + micro-grid", with controllable flexibility and visibility as characteristics. The system will be able to accept new energy "unconditionally" and therefore remarkably increase the utilization of capacity. And dynamic power balance and energy balance secures the safety and stability of the system. ⑥

# III. Challenge 3: Limitations in Collaborative Optimization of Power Consumption

The load side of the new power system involves distributed new energy resources and energy storage. Its role will shift from purely consumer to "supplier + consumer", adding uncertainty to grid load. As a result, the whole system needs collaborative optimization of distributed energy resources and flexible loads.

Flexible loads include adjustable or transferable loads with demand flexibility, electric vehicles with bidirectional charging capabilities, energy storage, distributed power supply, microgrid, etc. With power consumption behaviors agilely responding to price signals, they contribute significantly to power system flexibility. In large cities where the power supply falls short of electricity demand growth, flexible loads can balance the peak and off-peak demand, playing a key role in ensuring safe operation of the power grid. ⑦

**Table: Three Key Challenges for Carbon Neutrality in China**

| Field | Conventional power system | New power system | Key challenges |
|---|---|---|---|
| **Supply side** | Fossil fuels focused | Wind, PV, and other clean energy resources focused | The cost of moving away from coal is high; volatility and randomness cause technical difficulties in peak shaving, long-distance transmission, and energy storage |
| **Grid side** | Primarily one-way cascade transmission<br><br>Random volatility at demand side only | Random volatility at both demand and supply sides<br><br>AC/DC hybrid macro-grid+micro-grid + local DC power grid + adjustable load | Great challenges in grid stability and flexibility |
| **Load side** | Rigid, consumption only | Flexible, production+ consumption | Higher requirements for collaborative optimization of distributed energy and flexible loads |

⑥ "Transparent Grid Empowers New Power System Development" (《透明电网赋能新型电力系统建设》), by CAE Academician Li Licheng, 2022

⑦ "Prospects of the Construction and Development of New Power System" (《新型电力系统的建设发展展望》), by Chen Haoyong, Director of the Institute of Power Economics and Electricity Market, South China University of Technology

# Chapter 6:
# Perseverance till Success – CHINT's Answers to Empowering Carbon Neutrality across Sectors

As carbon peaking and carbon neutrality become a worldwide consensus, CHINT, as a pioneering leader in smart energy system solutions, is actively practicing the concept of sustainable development and leveraging its innovation capabilities and intelligent products to empower customers' carbon reduction. Focusing on energy-intensive and emission intensive scenarios, CHINT taps the carbon reduction needs and potentials of key industries to empower their low-carbon transformation, and help China realize carbon peaking and carbon neutrality.

# I. Overall Architecture: Green Energy, Smart Grid, Load Reduction, New Storage

CHINT is actively building a new power system based on new energy resources. By developing new technologies, applications, and business models in four core areas - green energy, smart network, load reduction, and energy storage, CHINT supports China's efforts to realize the overall targets of "dual carbon".

## 1 "Green Energy" – develop clean energy, with PV as focus

The use of clean energy is an important way to achieve carbon neutrality, which means to reduce the use of fossil fuels and increase the proportion of renewable energy, and as a result, to reduce carbon emissions. For power generation, CHINT has been developing various clean energy resources, such as photovoltaic, biomass, wind power, and CCHP, among which over 10 GW of PV power capacity has been delivered around the world.

### (1) PV+ solutions

CHINT provides one-stop PV solutions for projects including large and medium-sized PV power plants, distributed PV power stations and a variety of PV+ power stations. As the only service provider in the industry with advantages in system integration and technology integration, CHINT has many years of experience in PV development and construction, with a total installed capacity of more than 10GW, showing solid capability to construct and operate PV projects globally.

### (2) Residential PV solutions

Residential PV stations are built on residential buildings or nearby buildings. Generated electricity can be either directly consumed by the household or sold to the grid. CHINT provides one-stop services including system survey, design, installation, operation, and maintenance for residential solutions. It has built more than 1000,000 residential PV power stations across the country and is the first residential PV system enterprise in the industry to obtain the "Made in Zhejiang" certification.

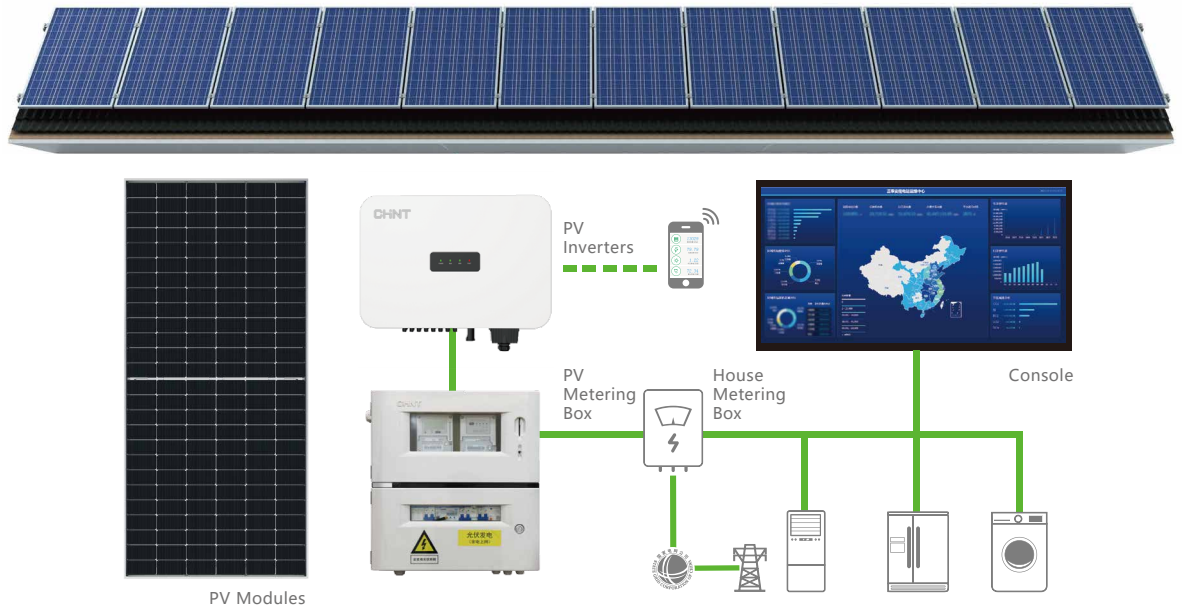



**Figure: CHINT' s Household PV Solutions**

## 2 "Smart Grid" - new power grids powered by intelligence

With the large-scale development and interconnection of new energy, grids are facing larger challenges from load balance, safety, and stability control than ever before. CHINT is devoted to supporting the construction of next-generation power system by integrating information technology, power electronics technology and energy internet technology.

For the granular management of power distribution, CHINT provides smart IoT power distribution platform, which integrates power distribution products, power quality products, smart meters, sensors, and smart terminals to realize comprehensive sensing, data integration and smart application in distribution grids. The platform solution enhances the stability and flexibility of the power grid, bringing higher capability of renewable energy consumption. It enables enterprises to acquire reliable  electricity supply with lower cost less carbon emission.

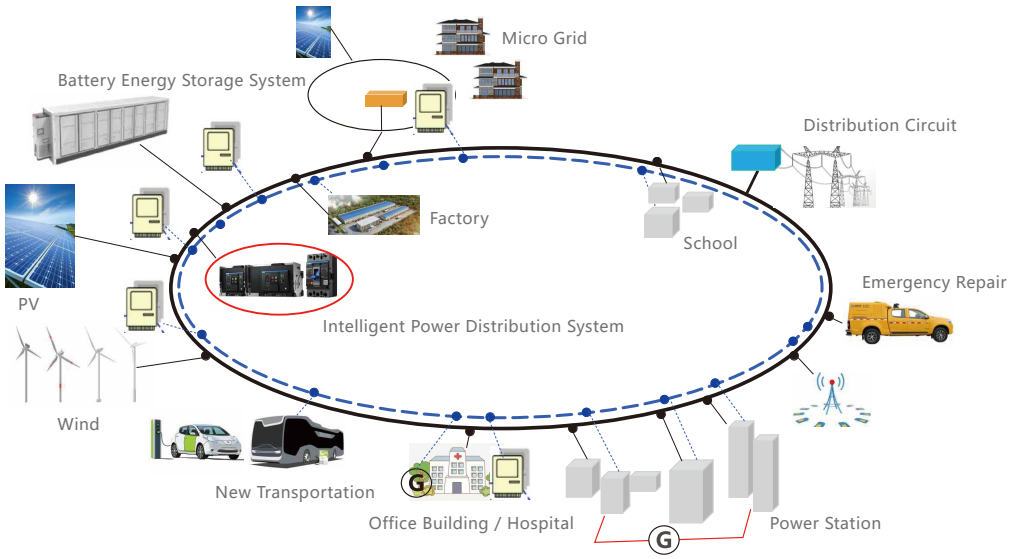



**Figure: CHINT's Smart Platform Solution for Power Distribution IoT**

# 3 "Load Reduction" - end-user energy efficiency management system and end-to-end control of carbon assets

CHINT provides customers with high-quality regional energy solutions aiming at minimum carbon emissions. In line with local energy policies and natural resource endowments, solutions adopt a multi-energy complementary system to provide end users with energy services including heating, cooling and power supply.

The system is based on new energy structure, with low dependency on fossil fuels. Its energy storage system supports CCHP, which significantly improves energy efficiency. And the cloud-based end-to-end energy efficiency management function can be used to ensure the life-cycle energy efficiency of projects in industrial, transportation and building sectors.

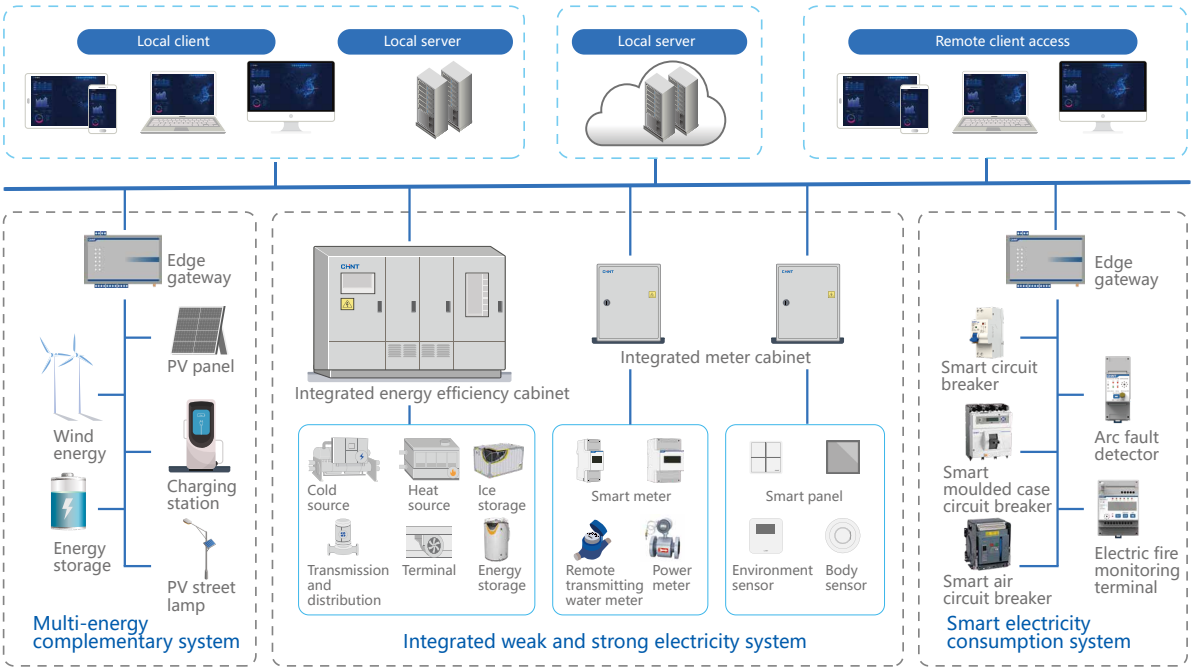



**Figure: Integrated Regional Energy Management Solution**

### (1) Energy efficiency in building sector

CHINT has been deeply engaged in the building sector for years, covering all series of electric products required in building construction and operation. It is further developing an intelligent power distribution system for buildings to realize intelligent and unattended management and real-time monitoring of building energy consumption. It provides a full range of power distribution and automation solutions for substations, power distribution rooms and public power distribution systems of communities, power distribution systems of buildings, and household electrical systems, etc., effectively ensuring the safety and efficiency in electricity use.


Residence | Hotel | Commercial Complex | Community of Tomorrow

**Figure: Application of CHINT's Energy Efficiency Solution in Buildings**

### (2) Energy efficiency in the industrial sector

CHINT provides industrial customers with integrated solutions for the automation, informatization, digitalization and intelligence of electrical equipment, control systems and instruments. They include integrated services across life cycle, such as scheme design, equipment procurement, installation, commissioning, and after-sales. Through this way, CHINT collaborates with industrial enterprises to achieve sustainable development while improving production efficiency and costs.

Metallurgy Industry

Food Industry

Electronics Industry

Petrochemical Industry

**Figure: Application of CHINT's Energy Efficiency Solutions in The Industrial Sector**

### (3) Energy efficiency in transportation sector

In electric vehicle charging, CHINT has EPC capabilities to serve charging stations. It's capable of turnkey projects for PV storage and charging integrated power stations and provides complete low-voltage product solutions for AC charging piles and DC charging piles. In rail transit segment, CHINT provides integrated solutions such as comprehensive traffic monitoring, power monitoring, electricity monitoring, and intelligent operation & maintenance for urban rail transit and high-speed railway stations. The solutions integrate "station-line-network" automation and intelligent system equipment for information sharing and linkage, meeting the management needs of efficient operation of rail transit.

EV Charging Station

MTR Low-voltage Distribution

Power Supply of lectrified Railway


Shore Power System

**Figure: Application of CHINT's Energy Efficiency Solutions in The Transportation Sector**

## 4 "New Storage" – Storage technologies for higher usability of new energies

Energy storage is the key to large-scale application of clean energy. With its main purpose as ensuring the consumption of new energy power and enabling flexible regulation, energy storage has become a key measure to implement the "dual carbon" strategy.

CHINT's energy storage technology and system solutions cover new energy consumption, user-side peak load shaving, power-generation-side ancillary services, and microgrid.

- New energy consumption solutions: reduce wind and PV curtailment, in combination with power grid peak shaving and new energy power output smoothing;
- User-side peak shaving solutions: peak-valley arbitrage, demand adjustment, system capacity increase delay;
- Auxiliary service solutions on the power generation side: improve AVG regulation performance, reduce failure rate of generator sets;
- Microgrid solutions: backup power supply, PV power generation for self-use.

Whether it is the efficiency improvement of traditional energy or the development and utilization of new energy, CHINT's energy storage system can play a key role in energy storage and reuse and realize the low-carbon transition and reliable supply of the entire power system.

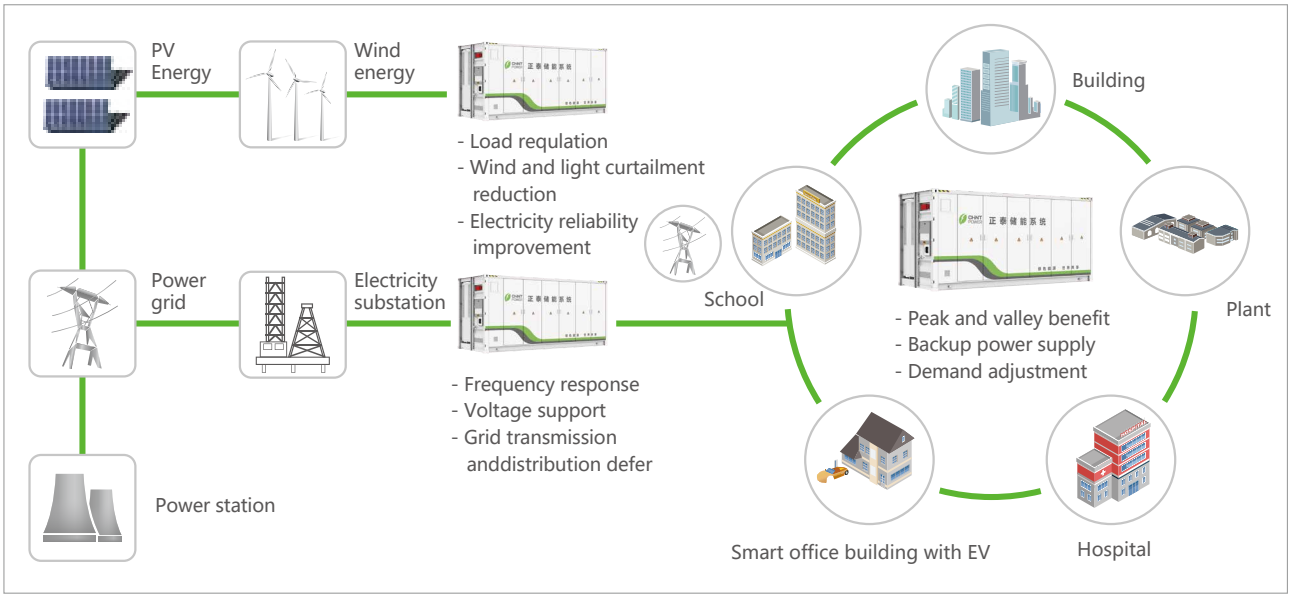



**Figure: CHINT's New Energy Storage Solution**

# II. Solutions by Sectors: "Electricity substitution + Clean Energy Substitution"

**Electricity, industrial, transportation and building are the four sectors with the largest emissions,** accounting for more than 90 percent of the total.[8] To achieve carbon peaking and neutrality goals, China is accelerating the implementation of a "1+N" policy system, in which specific carbon reduction plans are encouraged in these four sectors.

⑧ Source: "An Energy Sector Roadmap to Carbon Neutrality in China"(《中国能源体系-碳中和路线图》), by International Energy Agency, Sep. 2021

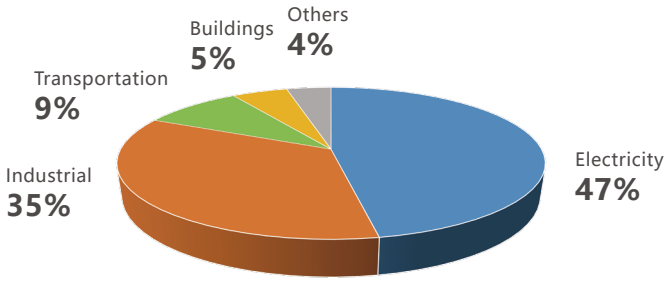



**Figure: Proportion of Emissions by Sector in 2020**

For the above industries, CHINT has built targeting business clusters around green energy and intelligent electric. By utilizing its comprehensive industrial layout of "source, network, load and storage", CHINT takes the lead and promotes "electricity substitution" and "clean energy substitution" through the application of innovative technologies/products in key emission reduction areas. These strategies contribute to the use of low-carbon fuels, electrification, and clean electricity. They also increase the share of renewable energy consumption, thus accelerating the decarbonization of key industries. It is expected that these "two substitutions" will account for 80 percent of the emission reduction.⑨

- **Electricity substitution** refers to replacing direct usage of fossil energy with electricity in end-user energy consumption. It is a fundamental path to solve energy, environment, and climate change issues.
- **Clean energy substitution** refers to replacing fossil fuels with renewable energies such as solar and wind to form a new pattern dominated by clean energy.

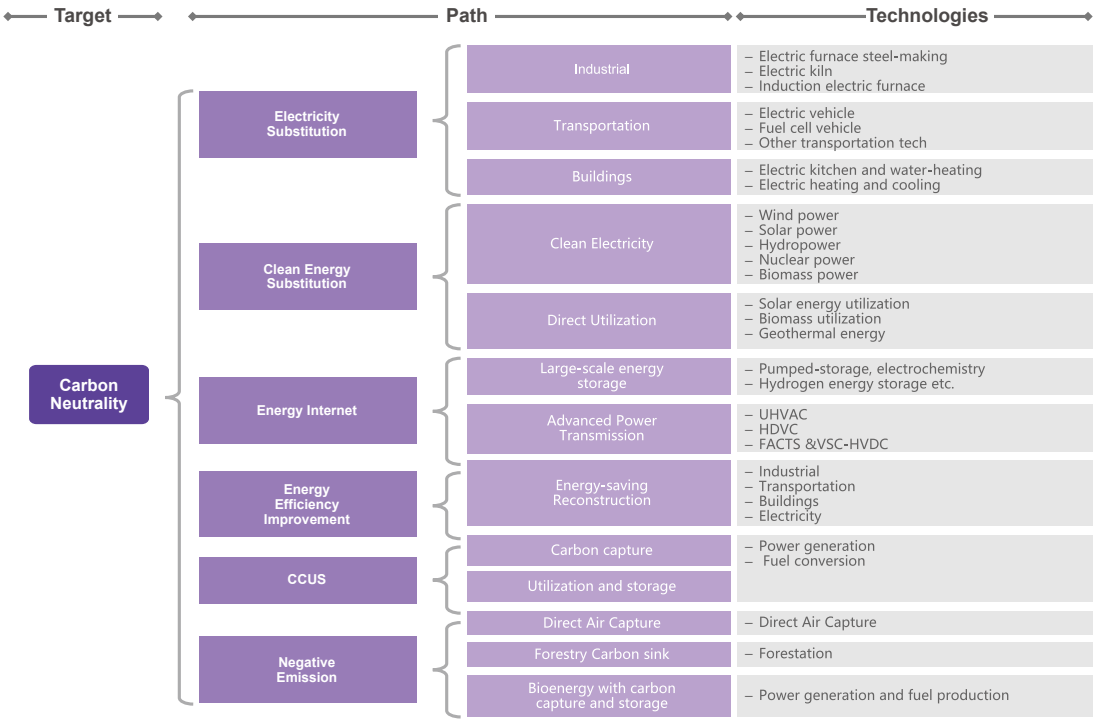



**Figure: Carbon Neutrality Roadmap – "Two Substitutions" Expected to Contribute 80% Emission Reductions**

⑨ Source: Research and Practice of "Two Substitutions" Strategy-based Local Consumption of New Energy in Gansu[J] (基于"两个替代"战略的甘肃新能源就地消纳模式研究与实践), by Li Ming, Hu Diangang, Zhou Youxue, Power Grid Technology

# 1 The Electric Power Sector

Driven by electricity substitution and clean energy substitution measures, the proportion of electricity in end-user energy structure. The portion of new energy in power generation types is also projected to rise. Electric power sector will play a crucial role in overall carbon neutrality.

The International Energy Agency estimates that, propelled by electricity substitution, electricity's share in China's end-user energy consumption will rise from 27% in 2020 to 70% in 2060. During the same period, electric power generation will also see a 130%⑩ increase.

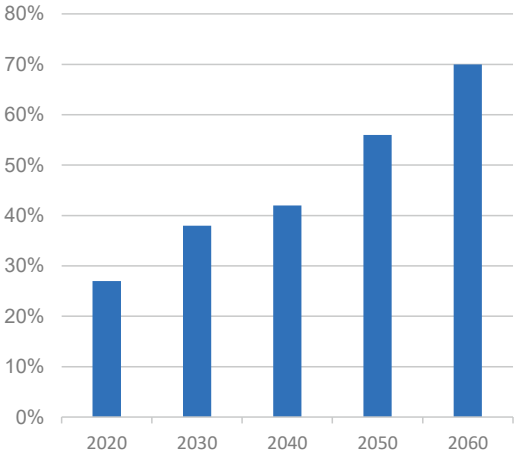



**Chart: China Electrification Level**

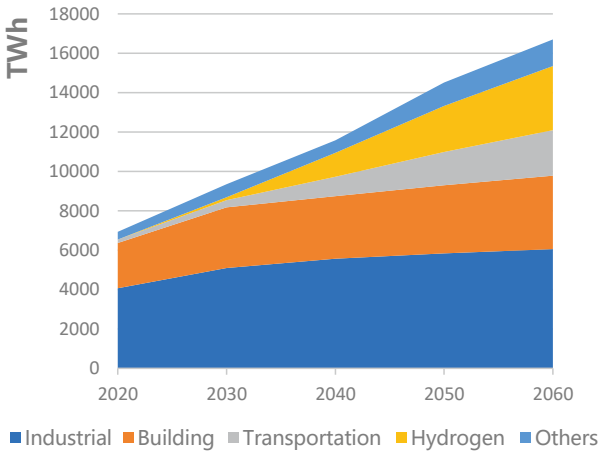



**Chart: China Electricity Demand by Sectors**

To achieve emission reduction targets in the context of rapid growth in electricity consumption, the power grid system needs to enhance infrastructure across all sections, including power generation, transformation, transmission, distribution, and consumption. Establishing adaptive carbon reduction paths for different sections is essential to achieve comprehensive emission reductions.

### Carbon Reduction Path 1: Electricity Decarbonizationt

Under the goal of carbon neutrality, power industry needs to raise the proportion of renewable energy used in power generation. With mature and leading PV solutions, CHINT provides reliable clean power supply to power enterprises, industrial users, and individual households.

At the same time, to overcome the volatility challenges of renewable energy, CHINT strives to develop energy storage technologies to ensure grid resilience. With solutions on both grid side and user side, independent energy storage and peak load shifting can be achieved to smooth the power load within days.

### Carbon Reduction Path 2: Grid Flexibility

Flexibility and intelligence of power grid is critical to increasing the system's ability to accept and use green power.

On the power generation side, CHINT provides comprehensive solutions from hardware to systems, to ensure the smooth interconnection of green power and improve the intelligence of power plant operations.

⑩ Source: International Energy Agency "China's Energy System - Roadmap to Carbon Neutrality"

On the power distribution side, CHINT provides smart power distribution solutions and IoT distribution stations to achieve smart perception and data integration in distribution networks of different scales and improve lean power grid management.

On the power consumption side, CHINT helps enterprises to improve energy management and avoid electric security risks with its power safety management system. Based on IoT devices and intelligent analysis platform, the system collects the power consumption data from critical nodes and performs data analysis in real time.

**Table: Carbon Emission Reduction Paths of Power Sector and CHINT's Solutions**

| Emission reduction path | Direction of action | CHINT solutions |
|---|---|---|
| Electricity decarbonization | Renewable energy | • PV power generation system |
| | Energy storage | • Energy storage solutions |
| Grid flexibility | Peak capacity adequacy | • Power distribution IoT intelligent platform<br>• PV grid-connected circuit breaker |
| | Ramp-up flexibility | • Smart Power Plant Solutions |
| | System stability | • Smart low-voltage power distribution solutions<br>• Smart & safe power management system |

## 2 The Industrial Sector

To achieve the carbon reduction goal, highly ambitious decarbonization actions will be taken in the industrial sector. According to the International Energy Agency, carbon dioxide emissions in the industrial sector will fall by nearly 95% between 2020 and 2060 .⑪

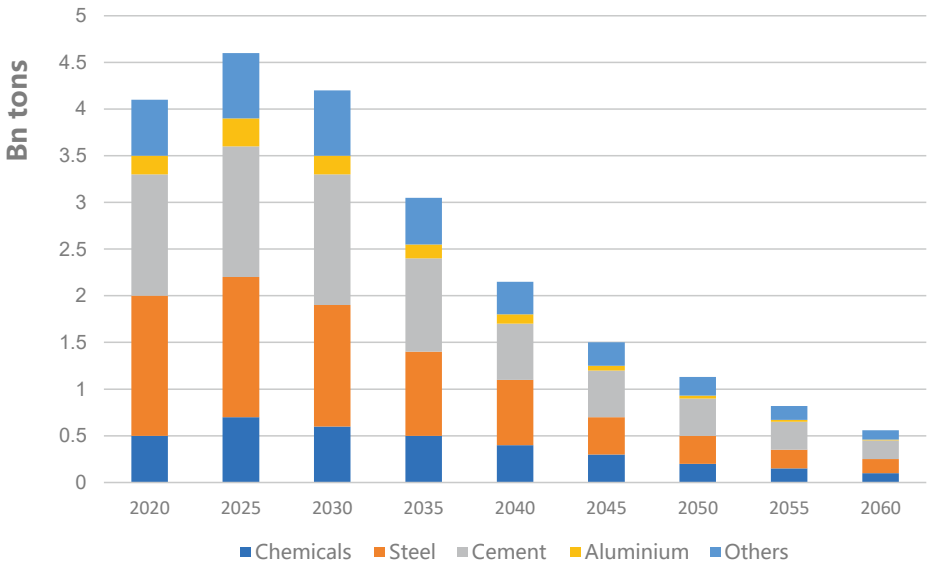



**Chart: China Projected Industrial $CO_2$ Emissions** ⑫

⑪ Source: IEA "China Energy System - Carbon Neutrality Roadmap"
⑫ Data source: National Energy Administration

Core drivers behind this trend are also electrification and clean energy substitution. However, unlike power industry which focuses on "how to generate and transmitting low-carbon electricity", the industrial sector focuses on "how to use low-carbon electricity". To conduct efficient electrification, industrial enterprises need to plan three major carbon emission reduction paths in terms of equipment and system.

### Carbon Reduction Path 1: Industrial Electrification

The two traditional fossil fuels, coal and oil, is currently accounting for over 40% of industrial energy consumption. Driven by electrification, this proportion will drop to 15% by 2060. The electrification of industrial processes is the key driver of this process. Using electricity to replace fossil energy to provide heat and power for industrial production can effectively reduce carbon dioxide emissions. From 1990 to 2020 in China, for every 1 more percentage of electrification level, energy consumption per unit of GDP decreased by approximately 2.8% .[12]

### Carbon Reduction Path 2: Low-Carbon Energies

Besides electrification, industrial enterprises can further reduce scope II carbon emissions by optimizing energy consumption structure and increasing the proportion of green electricity. In addition, for scenarios such as high-temperature productions that are difficult to fully electrify, hydrogen energy can also be introduced as an alternative to fossil fuels to reduce carbon emissions from primary energy.

### Carbon Reduction Path 3: Digitalization in Production

Improving the level of digitization in production helps companies improve energy efficiency on operational level. Embedment of automation, IoT network, and energy consumption management platforms into production can improve the visualization and precise control of energy consumption throughout the process, systematically improve energy use efficiency, and reduce overall carbon emissions.

The application of emerging innovative near-zero emission technologies, especially hydrogen energy and carbon capture, utilization, and storage (CCUS) in cement, steel, and chemical industries, will also play a significant role for carbon neutrality in the mid to long term.

**Table: Carbon Emission Reduction Paths in Industrial Sector and CHINT Solutions**

| Emission reduction paths | Direction of action | CHINT solutions |
|---|---|---|
| Industrial electrification | Fossil energy substitution | • Electrical devices solutions<br>• Heat furnace electric controller solution<br>• Distribution network system<br>• Motor control scheme |
| Low carbon fuels | Renewable energy<br>Energy efficiency improvement<br>Energy storage | • Rooftop PV power generation system<br>• BIPV PV parking sheds<br>• Centralized energy station<br>• Energy storage devices |
| Production Digitalization | Digital terminal energy-using equipment<br>Strengthened energy monitoring and management | • Automated control system<br>• Power distribution IoT technology<br>• Whole-process energy efficiency management |

# 3 The Transportation Sector

Transportation is the third largest carbon-emitting industry. According to the International Energy Agency, China's transportation $CO_2$ emissions will continue to grow in the short term. It will peak in 2030 and then decline to approximately 100 million tons in 2060, which is nearly 90% lower than 202013.[13]

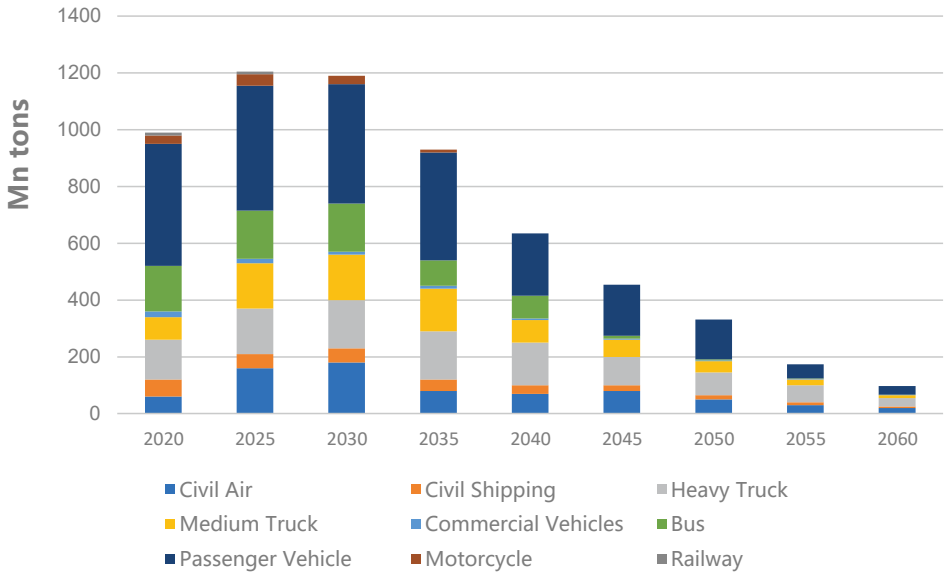



**Chart: China Projected CO2 Emissions in Transportation** [14]

Carbon emission reduction in the transportation industry mainly relies on two major driving forces: low-carbon energy and operational efficiency improvement. However, because the vehicle composition and transportation methods of transportation are relatively complicated, there are relatively independent and specific carbon emission reduction paths in different segments.

### Segment 1: Road

Road transportation currently generates approximately 80% of the transportation sector's carbon emissions. China's new energy passenger vehicles have achieved impressive development results. To further achieve the goal of fully electrifying the automobile industry in 2035,[14] large-scale infrastructure construction of power grids and charging stations is also needed.

### Segment 2: Rail

With the optimization of transportation structure, rail transportation plays an increasingly important role in transportation. Whether in urban rail transit or intercity railway systems, CHINT Electric can provide mature high/low voltage power distribution solutions to help the high-quality development of electrified rail transit.

### Segment 3: Marine

The energy low-carbonization process of shipping is at a relatively early stage. The main emission reduction paths in the future include the electrification of small and medium-sized ships, the transformation of LNG power, and the improvement of port operation efficiency.

[13] Data source: IEA "China Energy System - Carbon Neutrality Roadmap"

[14] Data source: China Society of Automotive Engineers "Energy Saving and New Energy Vehicle Technology Roadmap 2.0"

### Segment 4: Air

Long-term emission reductions in air transport come from the prevalence of biomass fuels and hydrogen-based fuels, and the improvement of energy efficiency of supporting facilities such as terminals on the other hand.

**Table: Carbon Emission Reduction Paths in Transportation Sector and CHINT Solutions**

| Segment | Emission reduction paths | CHINT solutions |
|---|---|---|
| Road | Transportation structure optimization<br>Transport electrification<br>Transport energy efficiency improvement<br>Intelligent transportation | • EV charging pile solutions<br>• PV pavement technology<br>• Zero-carbon smart mobility platform |
| Rail | Electrification<br>Increased energy efficiency in public transport | • Low-voltage power distribution solutions for metro stations<br>• Low-voltage power distribution solutions for high-speed rail stations<br>• Smart rail transit system |
| Marine | Electrification of inland water transport<br>LNG-powered vessels | • Power grid + PV storage integrated application solutions<br>• E-House on-shore power facility program<br>• Power system solutions for battery-powered river-sea vessels |
| Air | Biomass fuels<br>Hydrogen substitution<br>Energy efficiency improvement | • Smart and energy-efficient building solutions for airport terminals |

## 4 The Building / Construction Sector

Buildings accounts for about 20% of China's total emissions, of which about 5% comes from direct emissions of construction industry, and the remaining 15% comes from energy use in building operations and residential use (mainly heating and power supply).

Under the carbon neutrality goal, building CO2 emissions is expected to rapidly reach the peak and then reduce by approximately 90% by 2050, compared with 2015. How to improve the energy efficiency of buildings during use and optimize the energy structure is a key part in achieving the carbon emission reduction goals of the building sector.

### Carbon Reduction Path 1: Electrification of Buildings

Building electrification is the main path to reduce building emissions. Heating, cooling, and cooking account for about 80% of building energy consumption. With the progress of electrification in these major energy consumption applications, the proportion of electricity in building energy consumption will increase from approximately 40% in 2020 to approximately 60% in 2060.[15]

[15] Data source: International Energy Agency "China's Energy System - Roadmap to Carbon Neutrality"

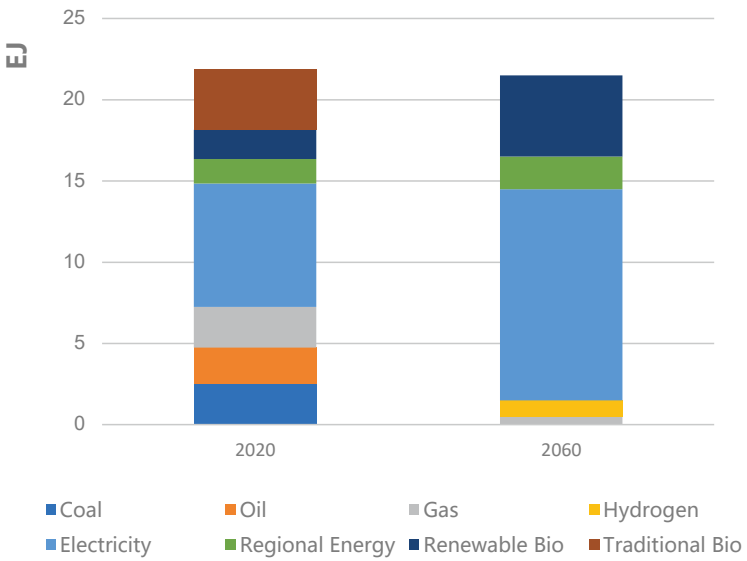



**Chart: China Projected Energy Consumption in Buildings**

### Carbon Reduction Path 2: Zero-Carbon Energy

Increase the proportion of renewable energy in the building construction process and use process. By improving design standards and retrofitting existing buildings, technologies such as renewable energy units, distributed photovoltaics, and solar heat pumps in building air conditioning systems and hot water systems will be popularized so that carbon emissions can be reduced by optimizing energy structure.

### Carbon Reduction Path 3: Building Energy Efficiency Improvement

By improving the energy efficiency of electrical appliances and intelligent operations, the overall energy consumption during building use is reduced, thereby reducing carbon emissions. CHINT Electric has launched targeted intelligent building solutions for commercial buildings and personal residences, combining building automation, room and water temperature detection backhaul, intelligent valve remote control, energy consumption measurement, intelligent lighting, and furniture systems to achieve intelligent control and efficient energy utilization of buildings.

**Table: Carbon Emission Reduction Paths in Building Sector and CHINT Solutions**

| Emission reduction paths | Direction of action | CHINT solutions |
|---|---|---|
| Electrification of buildings | Building system<br>Heating system<br>Cooling system | • Overall solution for heat source automation<br>• Overall solution for heat exchange station automation |
| Zero-carbon energy | Building integrated PV(BIPV)<br>Solar heat pump alternative | • Integrated solution for PV storage & charging + smart power distribution<br>• BIPV solution<br>• PEDF solution |
| Building energy efficiency improvement | Green buildings<br>Smart Buildings<br>Energy-efficient appliances | • Smart energy efficiency building solutions<br>• Smart home solutions<br>• Smart building valve controlling solutions |

# Chapter 7:
# Perspectives from Senior Experts

# Prabhu Ramkumar

**Vice President，Head of Sustainability of TÜV SÜD North Asia**

Climate change is a common challenge for humanity. In the process of comprehensive cooperation between TÜV SÜD and CHINT, as a pioneer, explorer and practitioner of green and low-carbon development, CHINT has successfully integrated ESG concepts into its corporate development strategy. With actions and determination, CHINT actively works with stakeholders to achieve carbon peak and carbon neutrality in China, and contributes its own strength to the global response to climate change.

As the verifier, TÜV SÜD strictly followed the verification standards, and conducted a carbon emission verification for CHINT's CIMF conference in accordance with the requirements of PAS 2060 and ISO 14064-1 standards. We are very pleased to see that CHINT's various carbon reduction actions , including the call for voluntary actions by conference participants, have achieved significant carbon reduction effects . We look forward to the day when CHINT achieves full carbon neutrality through this Carbon Neutrality White Paper.

Going forward, TÜV SÜD will continue to help CHINT make steady progress towards carbon neutrality. We will continue to work closely with CHINT to create a more sustainable future.

# Er. Say Leong LIM

**Global Standards Veteran & former IEC Ambassador (2018-2021)**

Indeed, this is an excellent call by CHINT whom is from the corporate communities, urging for acceleration on implementation of decarbonisation that can be based on global standards that are currently available such as for power generation, electric transportation, smart cities, etc.  to help closing the widening gaps in achieving the SDGs by the target year.

# Li Zheng

**President，Institute of Climate Change and Sustainable Development，Tsinghua University**

Reaching carbon neutrality would require significant efforts in overcoming challenges and driving for fundamental changes. With the long  journey ahead, I do have faith that with hard work we can finally make it happen together.

The imperatives to overcome the challenges along the way towards carbon neutrality are innovation and collaboration. Innovation requires corporates and academia to explore cutting edge technologies for more efficient solutions to facilitate carbon reduction and offset. Collaboration requires all sectors to inspire and enable each other with technologies, solutions and platforms, with an open and win-win mindset.

CHINT ELECTRIC

WE SUPPORT UN GLOBAL COMPACT

TÜV SÜD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