Taiwan's Pathway to Net-Zero Emissions in 2050

March 30, 2022

2050 Net-zero Transition

Cooperating with the world and striving for a net-zero future together

Turn crises into opportunities
Grasp business opportunities

Climate emergency : a global challenge

Global temperature will rise by 1.5 degrees within 20 years

Net-zero emissions : an international trend

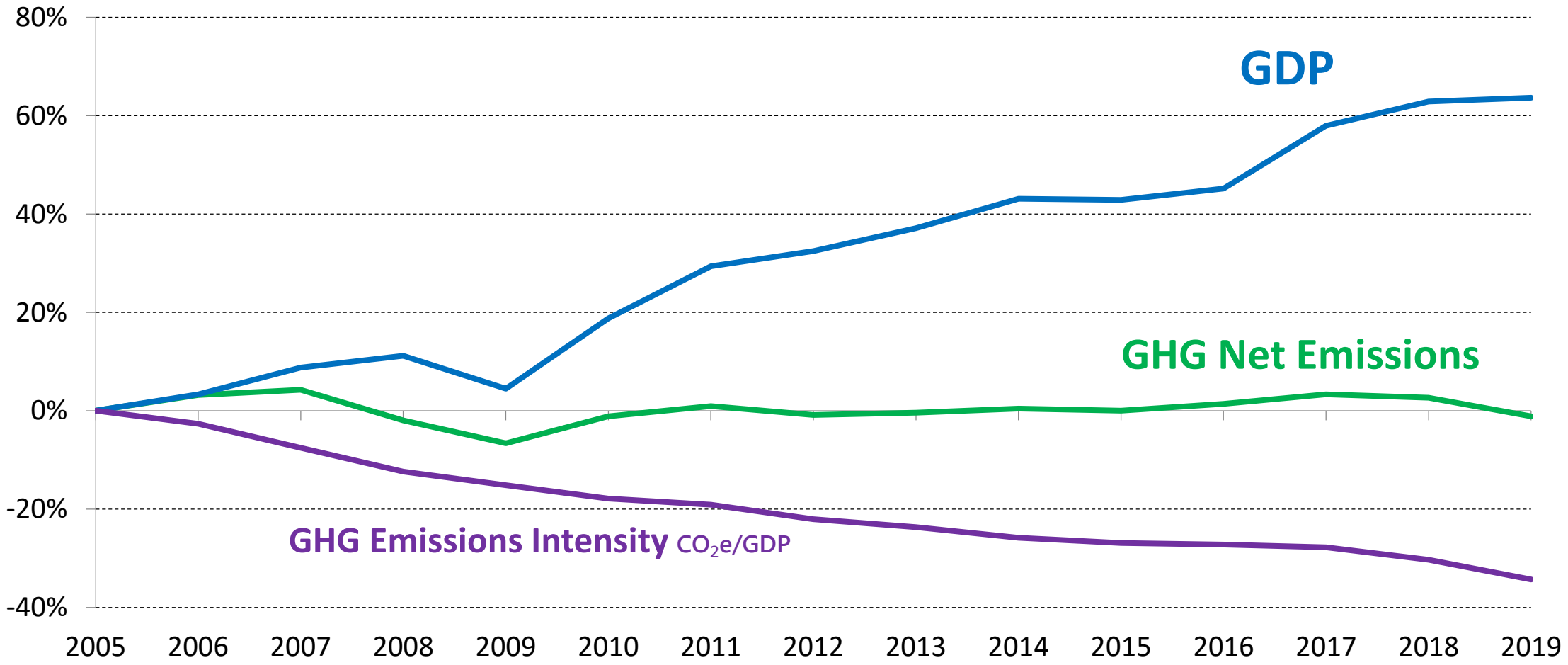
136 countries around the world have declared net-zero emissions targets

Green supply chain and carbon tariff

As an export-oriented country, Taiwan's total value of exports in 2021 reached US$446.3 billion **Accounting for about 57% of GDP**

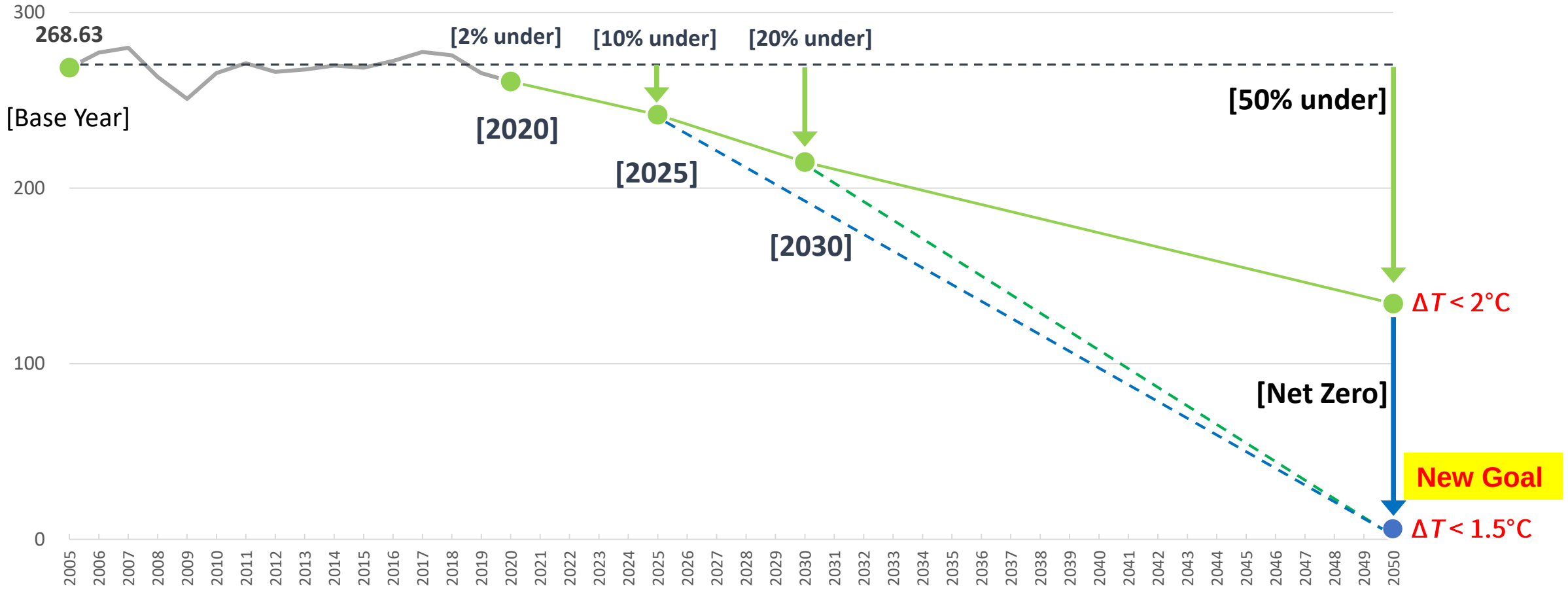
Decoupling Economic Growth from GHG Emissions

Since 2005, Taiwan's GDP has increased by 64%, while the GHG emission intensity (CO_2e/GDP) decreased by 34%.



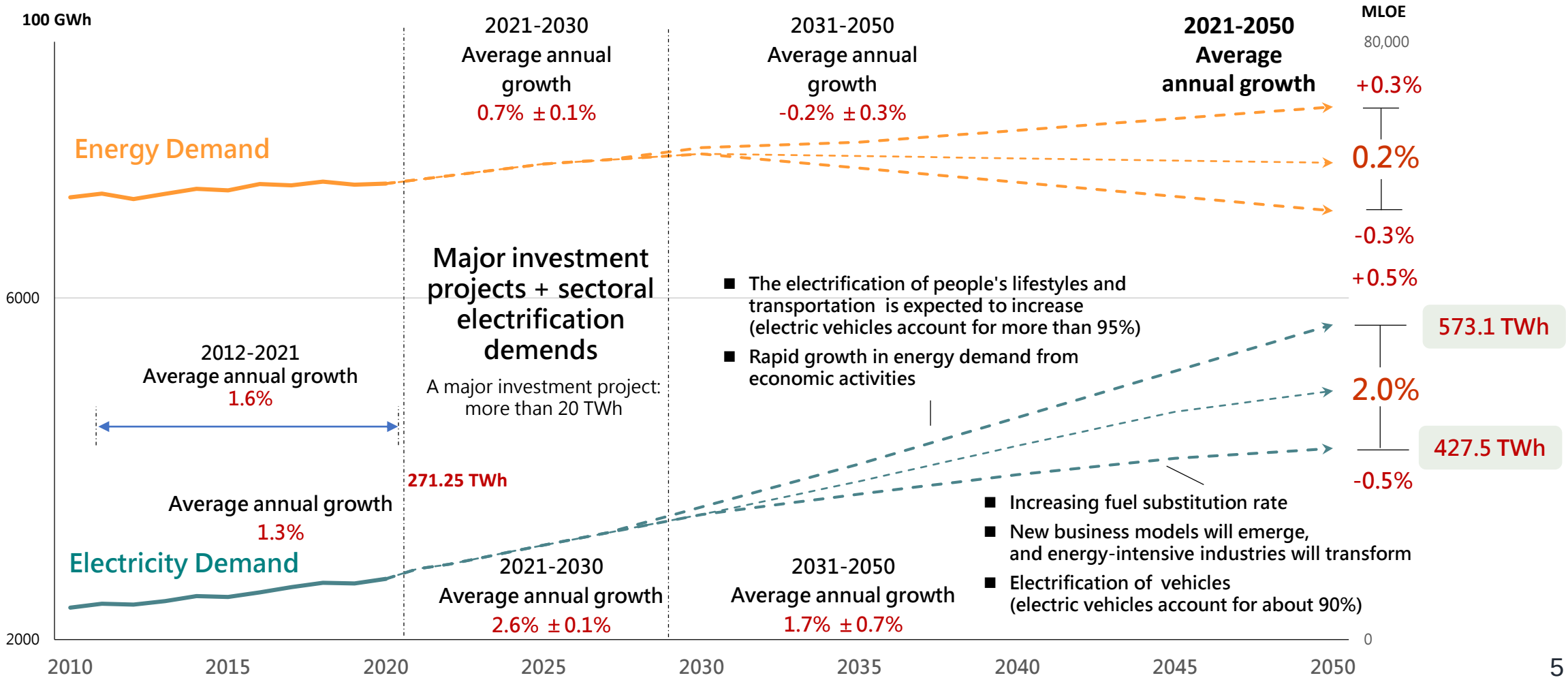
Long-term Path for National GHG Emissions Reduction

Amendments to the GHG Act:
setting target for net-zero emissions by 2050

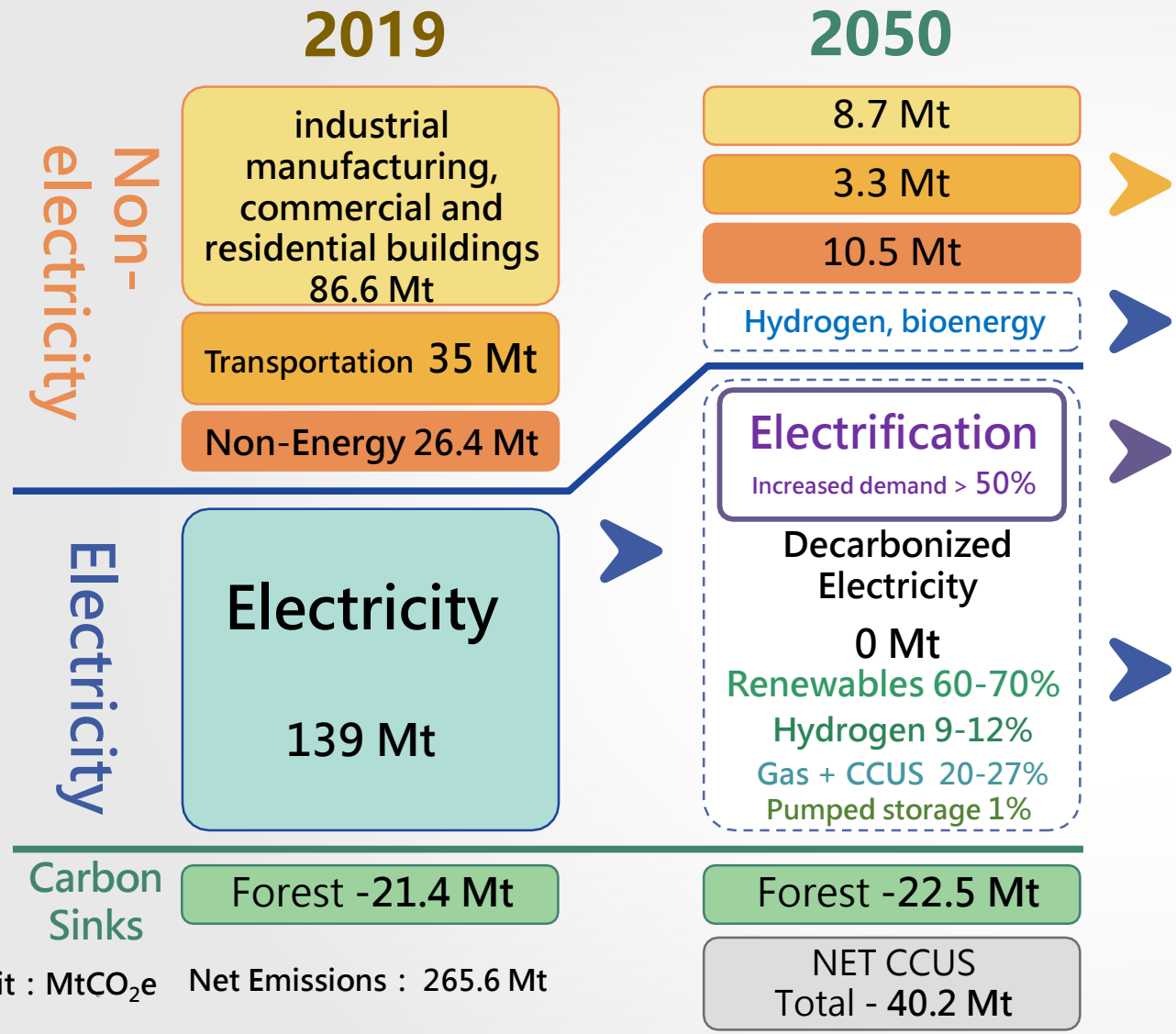


Energy and Electricity Demand

- Electrification being the trend for Net-Zero, energy demand slows down
- Growth in ICT and livelihood products drives up electricity demand



2050 Net-Zero Emissions Plan



Offsetting about 22.5 Mt from refractory emissions by Carbon Sinks

New fuel CCUS process application	Hydrogen, Biomass, CCUS (Steelmaking, chemical materials, cement industry and other process emissions)
Fossil fuels Equipment Electrification	**Industry**：Fossil fuel equipment **Buildings**： household and service appliances **Transportation**： electric vehicles

2050 Electricity Demand Scenario

Average annual growth $2 \pm 0.5\%$

Demand：427.5 – 573.1 TWh

Emissions and absorption achieve the Net-Zero target

Base Year (2005)：268.6 $MtCO_2e$

Peak (2007)：280.0 $MtCO_2e$

2050 Net-Zero Pathway (Key Milestones)

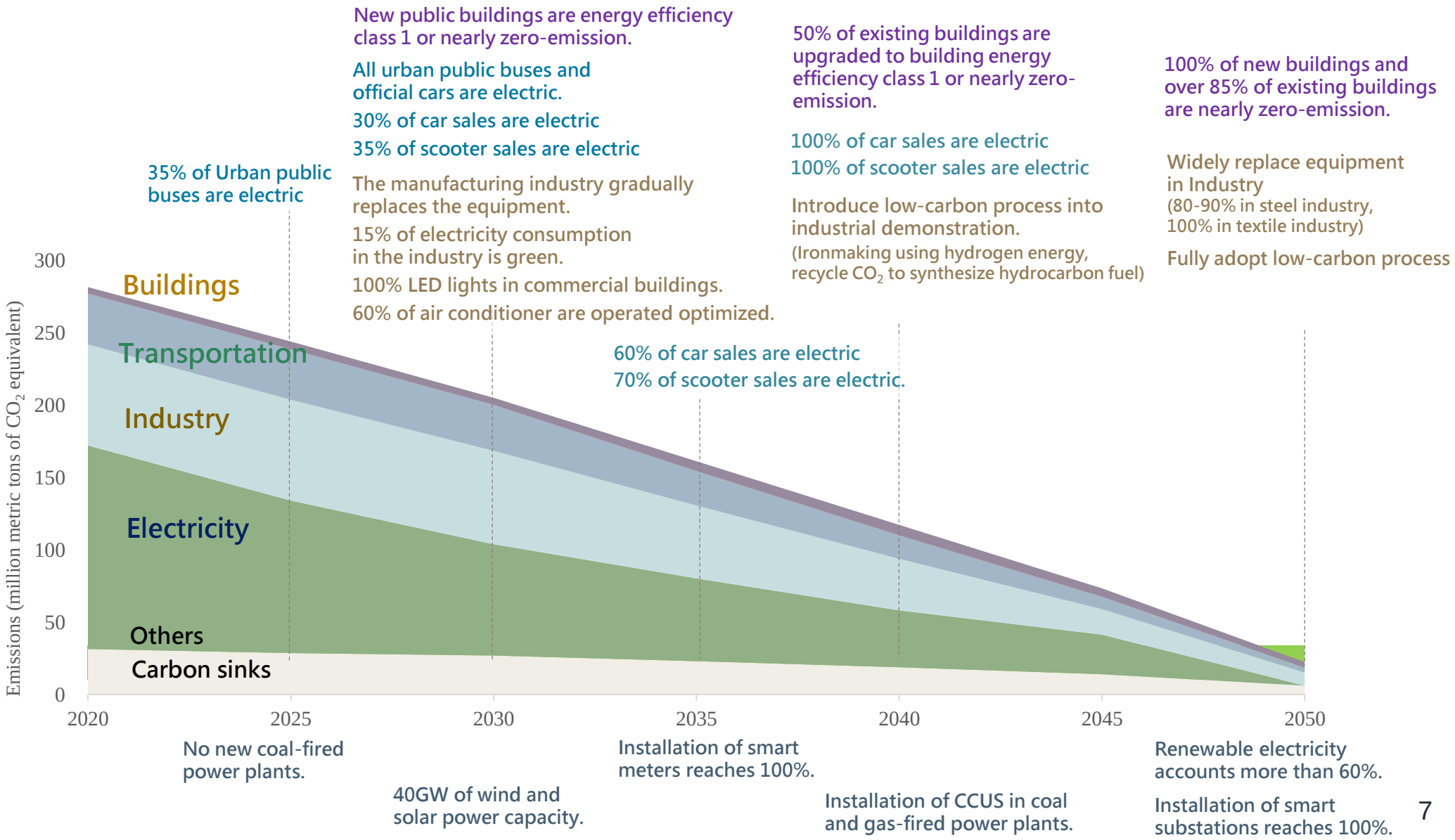
Buildings
Improving in exterior design, energy efficiency and appliance energy efficiency standards.

Transportation
Changing in travel behavior, reducing demand for transportation, and electro-mobility.

Industry
Improving in energy efficiency, fuel switching, circular economy, and innovative technologies.

Electricity
Scaling up renewable energy, developing new energy technologies, energy storage, and power grid upgrade.

Negative emissions technologies
Demonstration by 2030. At scale by 2050.



Taiwan's 2050 Net-zero transition

Strategies for transition

4 strategies + 2 foundations

- Energy transition
- Industrial transition
- Lifestyle transition
- Social transition

foundations in governance

Technology R&D

net-zero technology
negative-emission technology

Climate legislation

regulation and policy
carbon pricing and green finance

Energy Transition

3 aspects - 9 measures

Building a zero-carbon energy system

- **Maximizing renewable energy:** Expanding mature wind and solar PV deployment, with cutting-edge geothermal and ocean energy
- **Decarbonizing Thermal Power Development:** Hydrogen and Gas-fired Power plant with CCS
- **Phasing out of coal:** co-burning with ammonia in the short-term, converted to safe backup in the long-term
- **Building a zero-carbon fuel supply system:** Providing hydrogen, ammonia and biomass fuel for industry and transportation
- **Introducing advanced technologies in a timely manner to increase the space for zero-carbon energy utilization**

Improving energy system resilience

- **Prioritizing the expansion of renewable energy grid infrastructure**
- **Expand energy-storage facilities for renewable energy**

Creating green growth

- **Creating a green energy industry ecosystem:** Port Wind Power Zone, Green Energy Innovation Industry
- **Promoting decarbonization investment and international cooperation:** promoting green energy investment in public and private sector, establish international partnerships to introduce key technologies, and creating opportunities for exporting Taiwan's advantageous decarbonization technologies

Industrial Transition

Manufacturing Sector

3 aspects - 11 measures

Process Improvement

- Replacement of old appliances
- Energy saving (Digitalization)
- Development of hydrogen technology
- Reduction of F-gases

Fuel Switching

- Expanding usage of natural gas
- Expanding usage of bioenergy
- Adopting clean energy/hydrogen

Circular Economy

- Raw material replacement
- Refuse Derived Fuel (RDF)
- Energy Resources Integration
- CCU technology

Commercial Sector

4 aspects - 4 measures

Improvements in Equipments or Operational Behavior

- Energy efficiency of air conditioning and refrigeration (to gradually achieve level 1 for all)
- Air conditioning system optimization
- Adopt LED lights and high-efficiency lamps

Low-carbon Energy

- Conversion to gas and high efficiency boilers
- Green electricity for large energy consumption
- Electrification of commercial vehicles

Business model with low-carbon transition

- Gradually import intelligent management system
- Reduce electricity and energy consumption

Green Buildings

- New buildings to be enveloped with thermal insulation
- Improvement in thermal insulation in existing buildings

Building sector

By 2050, 100% of new buildings and more than 85% of existing buildings will be nearly zero carbon buildings.

Multiple-Stage Policies

1 New buildings

- Establish energy efficiency evaluation systems
- Strengthen building energy efficiency regulations

2 Existing buildings

- Improve energy efficiency of existing public and private buildings

3 Home appliances

- Raise the energy efficiency benchmark for home appliances
- Reserve power-charging parking spaces

4 Technologies and construction methods

- Energy-saving technologies for buildings
- Research and development of low-carbon construction methods

Cross-sector Integration

Renewable energy + Building energy efficiency + Appliance energy efficiency

Promote the popularization of policy

Public buildings lead the low-carbon transition of private buildings.

Industrial Transition

Transportation Sector

By 2040, 100% of cars and scooters are to be electric.

Vehicle electrification

- Increase the market share of electric vehicles.
  - All urban public buses to be electric by 2030
  - All passenger car and scooter sales to be electric by 2040
- Create domestic market demand
- Localize Manufacturing
- Complete Infrastructure
- Strengthen vehicle carbon emission management

People-oriented green transportation

- Promote public transportation
- Complete sidewalks
- Complete bicycle paths

Private car and scooter management

- Private vehicle usage management
- Promote car and scooter sharing

Auxiliary measures

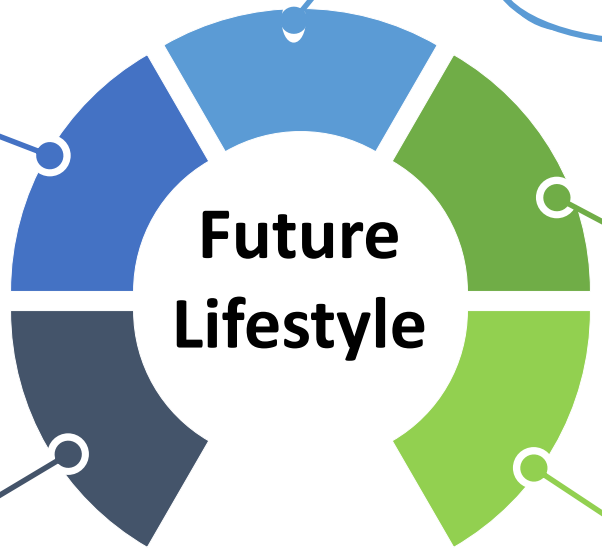
1. Strengthen urban planning

- Transit-oriented Land Use Planning

2. Green transport lifestyle

- Reduce unnecessary travel
- Online meetings
- remote education

Lifestyle Transition



Zero-waste, low-carbon diet

- Reasonable buying
- Zero waste catering
- Highly efficient production, sales and delivery
- Regenerative agriculture

Use rather than own

- Light-weight design
- Easy repair, upgrade and maintenance for products
- Increase of service life
- Recycling of components

Net-zero circular buildings

- Passive design, adopting smart control system, developing deepened energy savings, applying highly efficient appliances, diversifing power and system integration & carbon storage in building materials

Low-carbon transportation

- Avoid unnecessary commuting
- Accessible transportation
- Convenient public transportation

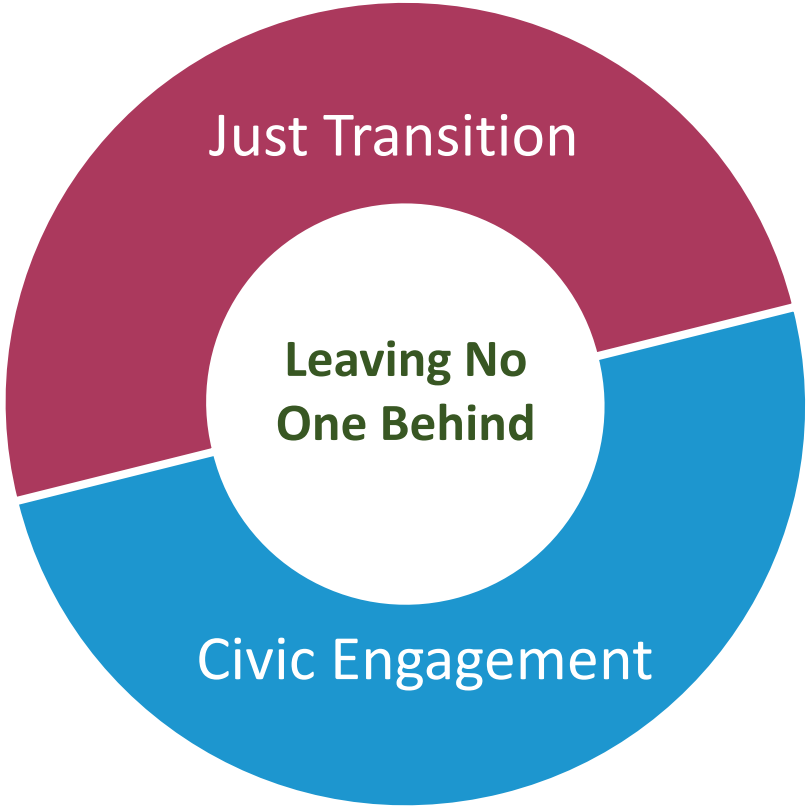
Dialogue with citizens

- Common goal
- Common responsibility
- Collective action

Social Transition

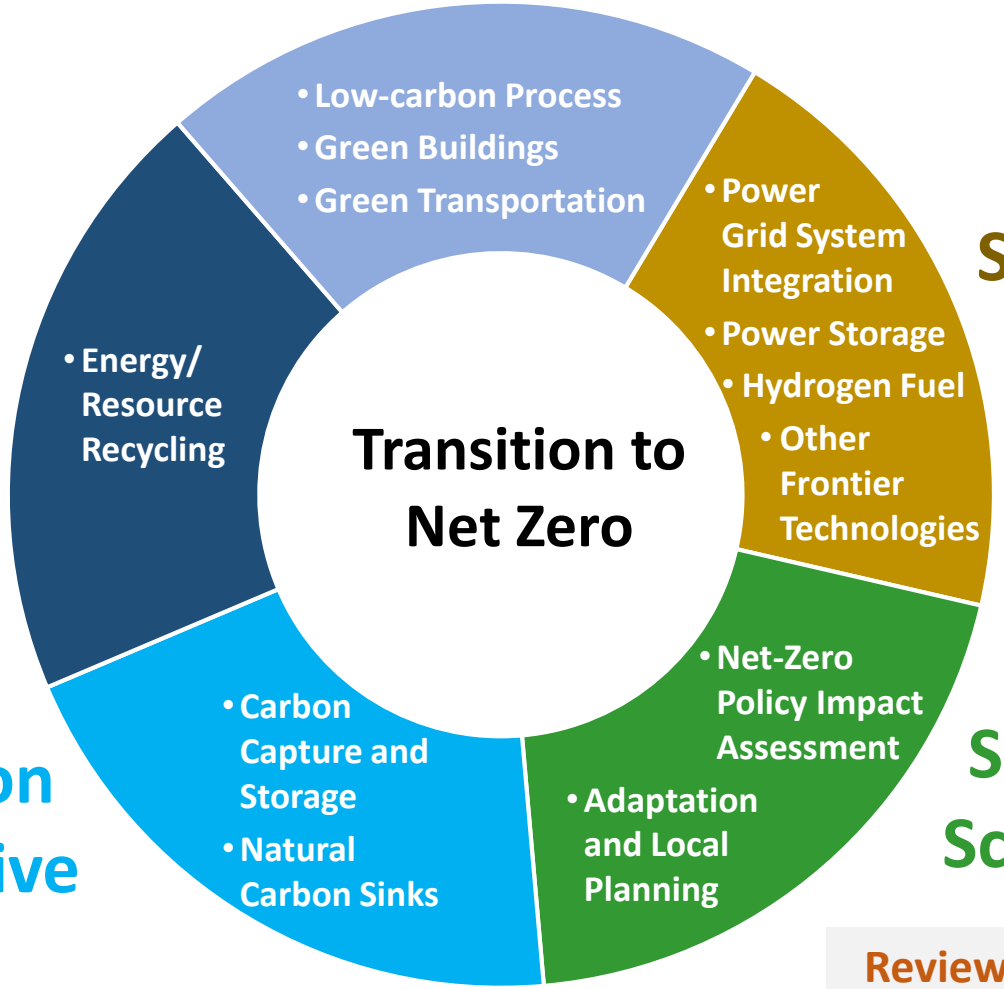
Social support system:
Realizing just transition and civic engagement

Net-zero transition:
a social engineering
that turns conflicts
into opportunities



- Identify and mediate conflicts and disputes arising from transition
- Improve mechanisms for resolving conflicts and disputes
- Establish tools and strategies for the support system
- apply public-private partnerships to increase resilience of a transitioning society

Technology R&D



Review in every five years

Avant-garde Technology	Target-oriented	Public-private Partnership	International Cooperation	Rolling Review

Climate Legislation

Legislation for Climate Governance

Climate

Amending the Greenhouse Gas Reduction and Management Act to the Climate Change Act

- To set up 2050 Net-zero emissions as long-term goal
- To address the needs for GHG emission survey, statistics compiling, validation, and verification
- To cope with global carbon border adjustment trends, promoting carbon tariff and carbon market

Energy

Reviewing the Energy Administration Act, the Electricity Act, and the Renewable Energy Development Act

Hydrogen

Proposing hydrogen management regulations according to hydrogen development trends

Buildings

Promoting central air-conditioning and efficient envelope insulation designs for new buildings
Proposing mandatory solar PV installation

Transportation

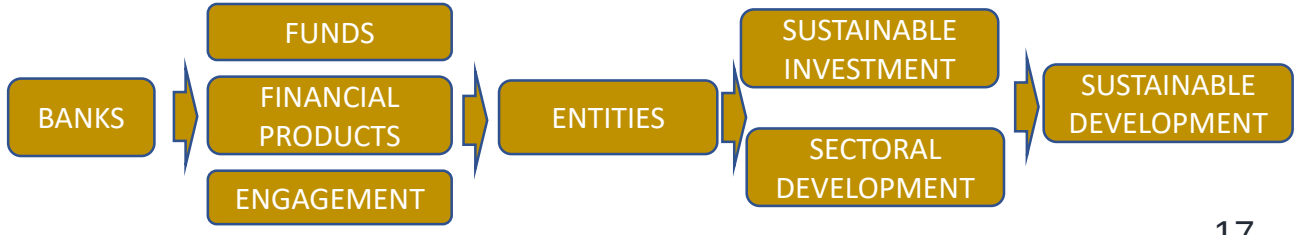
Initiating amendments to regulations related to promotion of vehicle electronification

Green Finance

Capitalize on financial sector's capacity to achieve 2050 net-zero emissions target

Core strategies

- Promoting climate-related information disclosure
- Helping businesses mitigate risks and grasp new opportunities
- Using market mechanisms to guide sustainable development



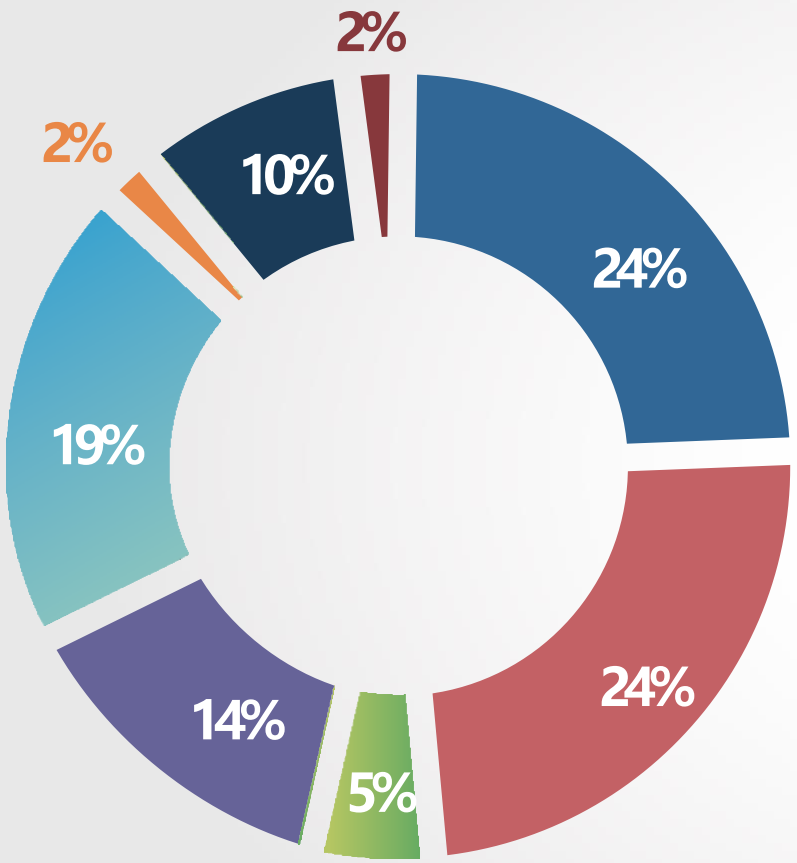
Create Sustainable Development Roadmap for TWSE- and TPEx-Listed Companies

Assist enterprises in setting GHG reduction targets

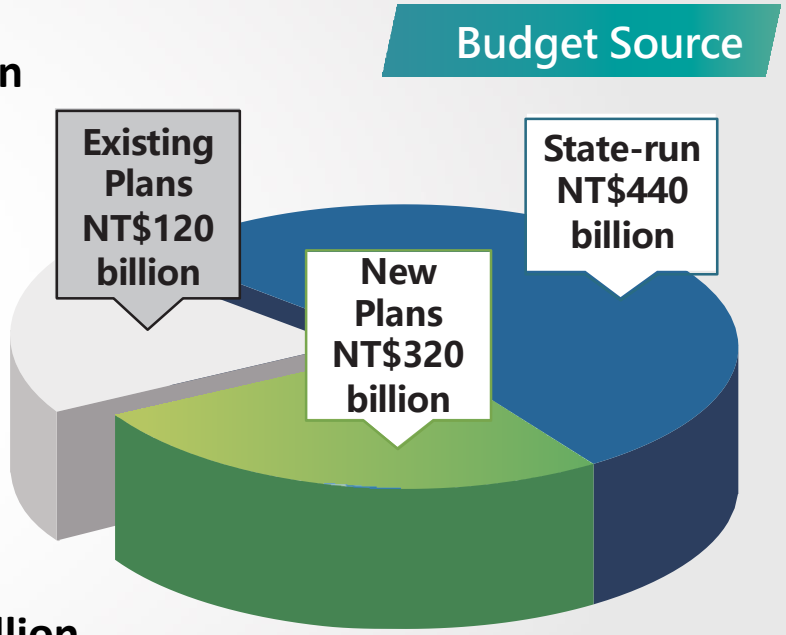
Taiwan's 2050 Net-Zero Transition

12 Key Strategies

A Budget of Nearly NT$900 billions by 2030 for Major Plans of 2050 Net-zero Transition

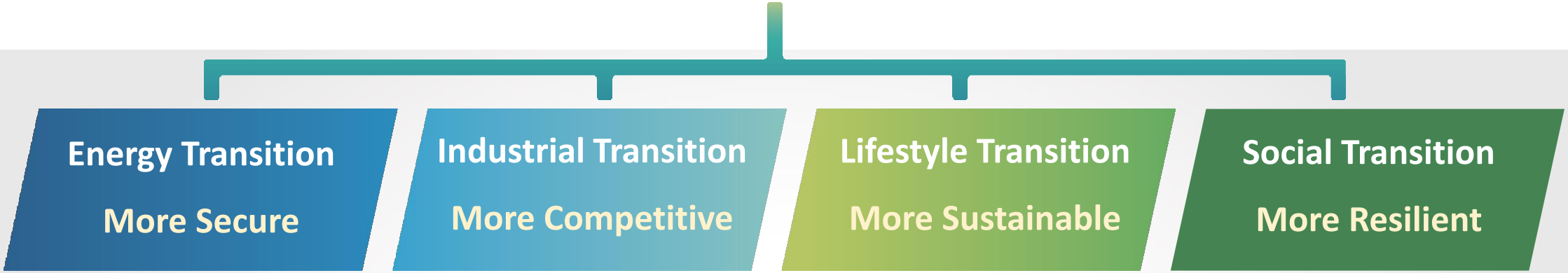


- Renewables and hydrogen: NT$210.7 billion
- Grid and energy storage: NT$207.8 billion
- Low carbon and negative carbon technology: NT$41.5 billion
- Energy saving and boiler replacement: NT$128 billion
- Electrification of transport vehicles: NT$168.3 billion
- Resource circulation: NT$21.7 billion
- Forest carbon sinks: NT$84.7 billion
- Net-zero living: NT$21 billion



2050 Net-Zero Transition

Promoting economic growth, stimulating private investment, and creating green jobs



- Reversing the risk of high dependence on imported energy
- Accelerating industrial transformation and creating green growth momentum
- Driving private investment by increasing public spending
- Improving the quality of life and environmental sustainability

From 97.4% in 2021 to below 50% in 2050

By 2030, drive private investment of over NT$4 trillion

By 2030, the air pollution will be reduced by about 30%, compared to the level in 2019

Transition Assistance for Industries

Four major aspects

1. Carbon quantification and reporting
2. Improving mitigation capabilities
3. Updating information
4. Capacity building in financial industry

Two major cooperation modes

- Major emitters take the lead and then help others comply with the transition policy
- Engaging with all sectoral associations, while making state-owned enterprises serve as examples

Thank you