Phased Goals and Actions Toward Net-Zero Transition

Dec. 28, 2022

2050 Net-Zero Pathway Promotion Process

TAIWAN 2050 Milestones

Apr. 22 2021

Declaration

President Tsai

Taiwan's 2050 Net-Zero Transition Target

Aug. 30 2021

Legislation

Premier Su

Amendments to the GHG Reduction and Management Act (revised as the Climate Change Response Act) including 2050 Net-Zero Emissions Target

March 30 2022

Planning

Promulgation

Taiwan's Pathway to Net-Zero Emissions in 2050

DEC. 2022

Implementation

Official Release

Taiwan's 2050 Net-Zero Transition 12 Key Strategies

Taiwan’s 2050 Net-Zero Transition

4 strategies + 2 foundations

Strategies for Transition

Energy transition
Wind power, solar PV, system integration & energy storage, new energies (hydrogen, deep geothermal, ocean)

Industrial transition
High-tech, traditional manufacturing, construction, transportation electrification, food, agriculture and forestry, resource recycling

Lifestyle transition
Green transportation, electrified environment, residential and commercial lifestyle (behavior change)

Social transition
Just transition, public participation (social dialogue)

Foundations in Governance

Technology R&D
Net-zero technology
Negative-emission technology

Climate Legislation
Regulations and policy
Carbon pricing and green finance

International Situation

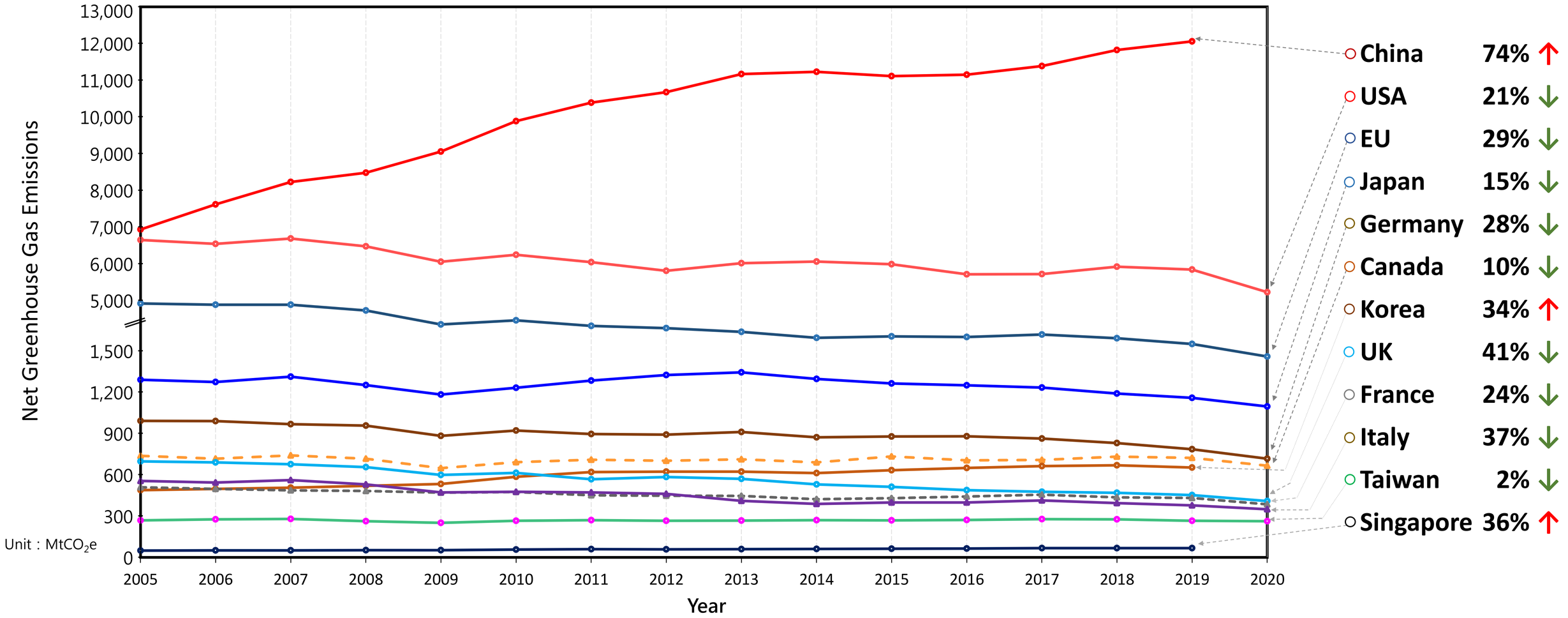
2015 The Paris Agreement requires parties to submit NDC every five years.

2021 COP26 Glasgow Climate Pact — Parties are required to submit updated NDC by the end of 2022.

2022 COP27 Sharm el-Sheikh Implementation Plan — Parties are required to immediately scale up ambition and implementation, strengthen NDC target.

Japan	Updated NDC Target	46% ~ 50% reduction in 2030 relative to 2013 (equivalent to a 41% ~ 46% reduction in 2030 relative to 2005)
Korea	Updated NDC Target	40% reduction in 2030 relative to 2018 (equivalent to a 14% reduction in 2030 relative to 2005)

Changes in Net Emission of Greenhouse Gases of Major Countries



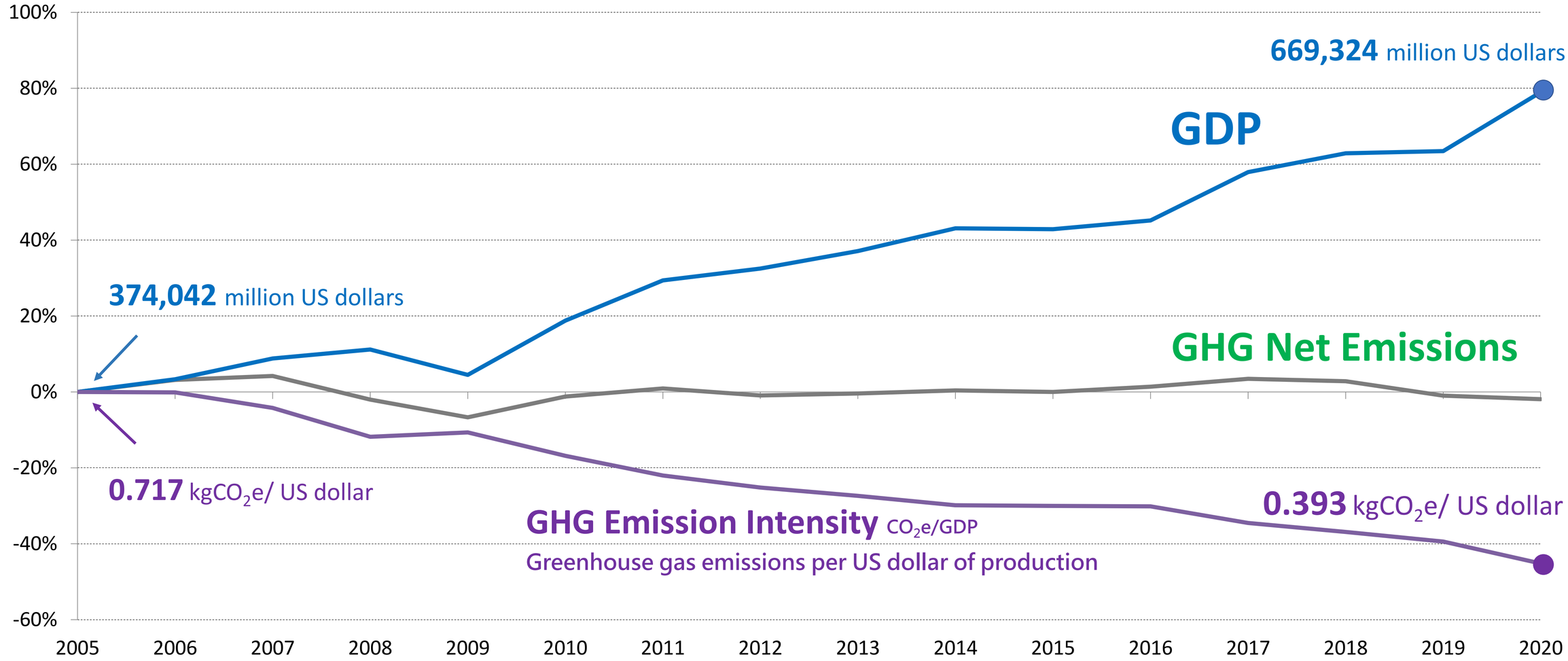
Source: 1. Greenhouse gas net emission of each country is summarized from the UNFCCC website (https://unfccc.int/)

2. Korea, China and Singapore are not listed in reference 1 UNFCCC. Their net emission is summarized from the WRI website (https://www.wri.org/)

3. Taiwan's greenhouse gas net emission is summarized from the National Greenhouse Gas Emission Inventory released by the Environmental Protection Administration (2022 edition)
(https://unfccc.saveoursky.org.tw/nir/tw_nir_2022.php)

Decoupling Economic Growth from GHG Emissions

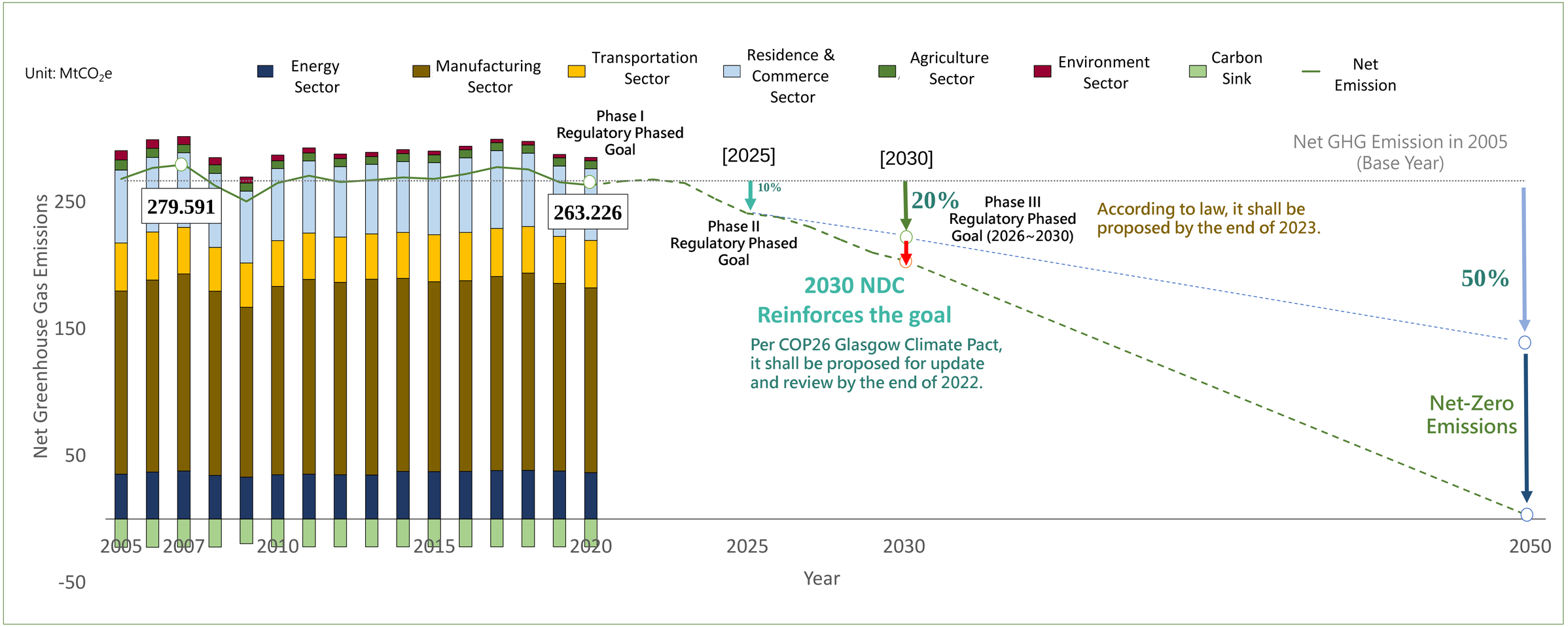
Since 2005, **Taiwan's GDP has increased by 79%, while the GHG emission intensity** (CO_2e/GDP) **decreased by 45%.**



National Long-Term Roadmap for GHG Reduction

Regulatory goals of each phase on a 5-year basic according to the GHG Reduction and Management Act

- Phase I (2020): **2%** below the level of year 2005 **(approved in Jan. 2018)**
- Phase II (2025): **10%** **(approved in Sep. 2021)**

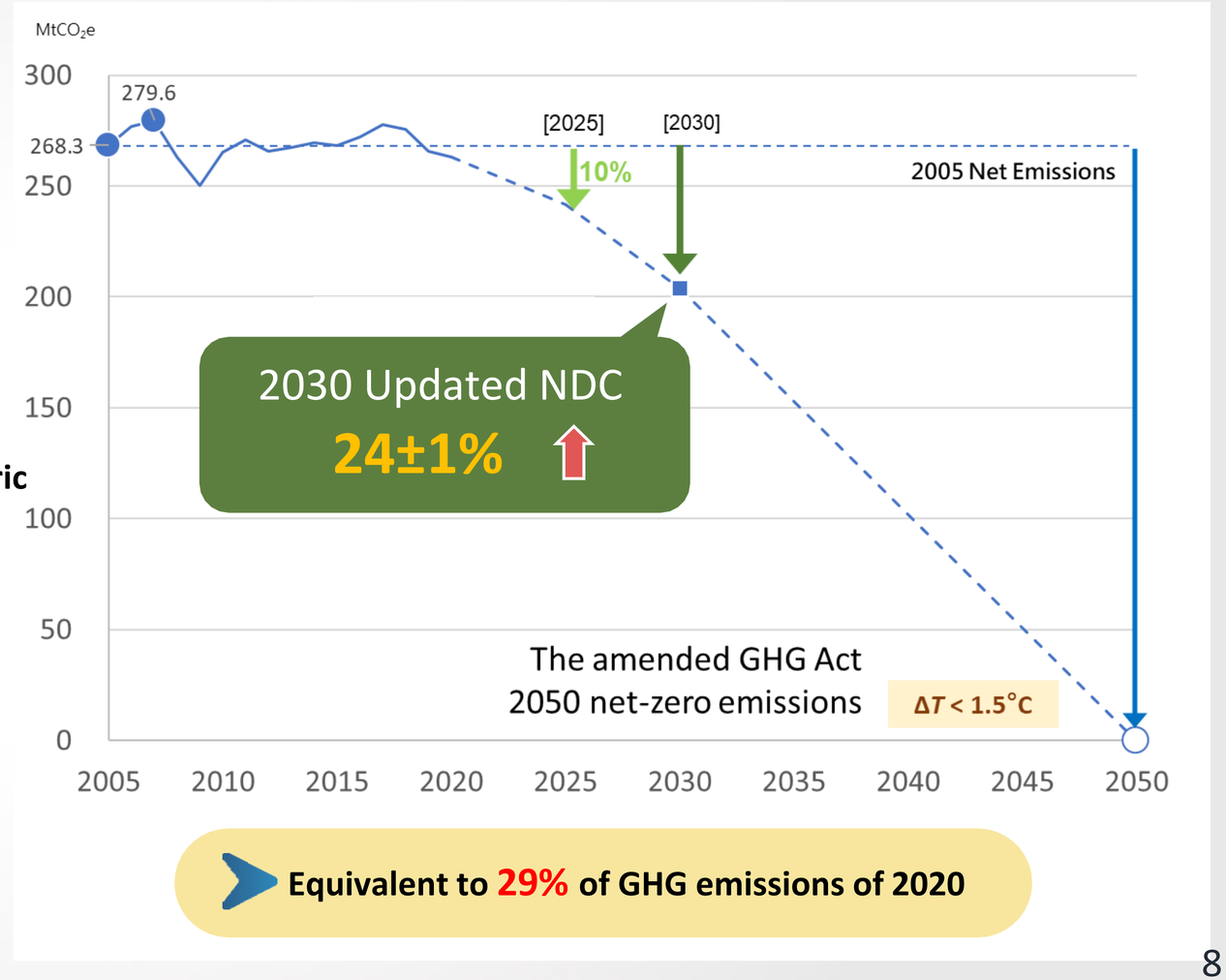


2030 Updated NDC

Integrated implementation of 12 key strategies
Expand central/local/public-private collaboration and international cooperation to increase carbon reduction efforts and cultivate negative carbon potential

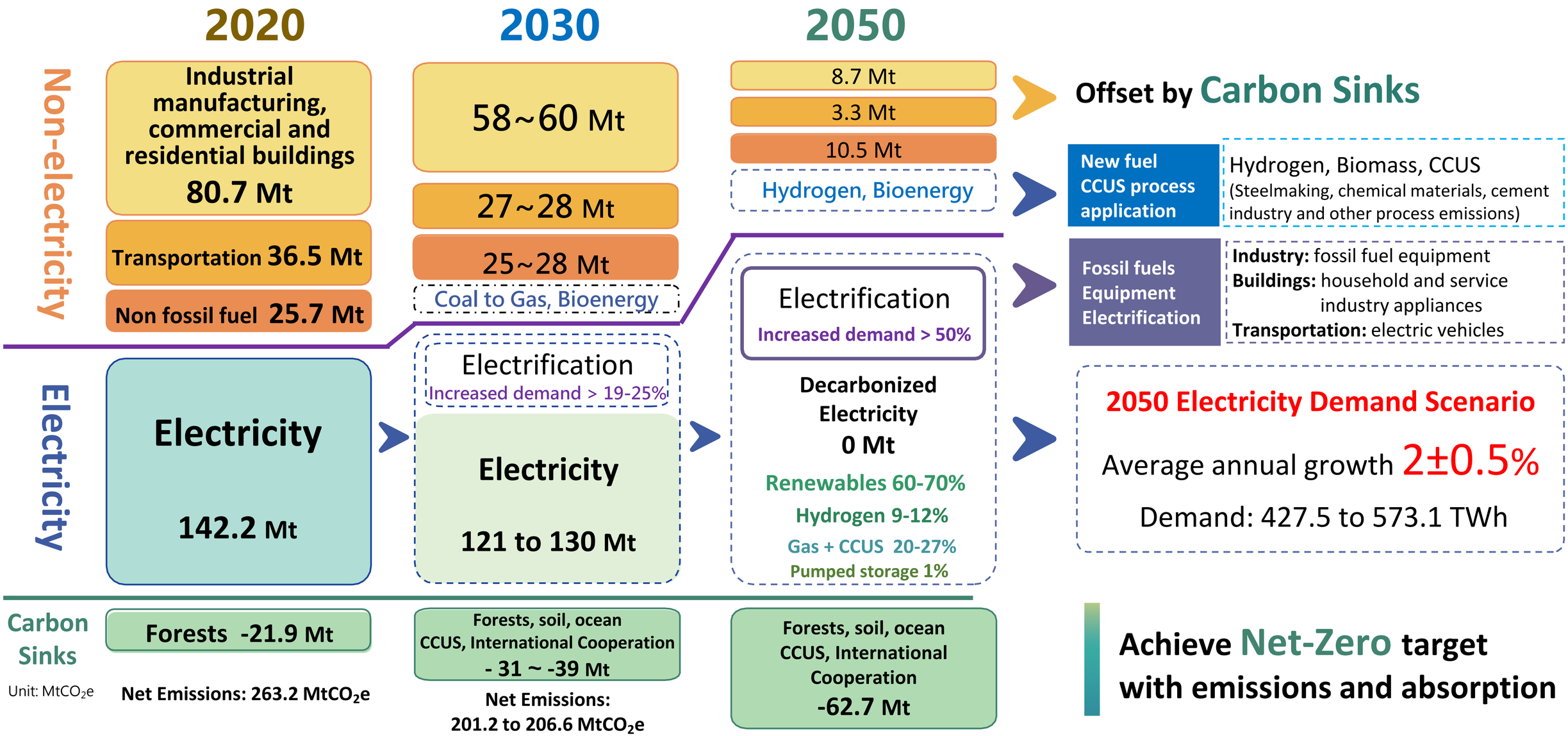
2030 Updated NDC Key Strategies

- **All Renewables**
  - Installed capacity increases from 9.6 GW in 2020 to 45.46 ~ 46.12 GW in 2030 (Offshore Wind 13.1 GW, Solar PV 31 GW)
- **Energy Saving**
  - Increasing electricity saving by 34.57 TWh
  - Saving heat by 2,273 MLOE
- **Electric Vehicles**
  - All urban buses and official vehicles are electric
  - New electric sedans up to 30%
  - New electric motor scooters up to 35%
- **Carbon Sinks and Negative Emissions**
  - Natural carbon sinks (forests/soil/ocean): 1.4 $MtCO_2e$
  - CCUS: 4.6 $MtCO_2e$
- **International Collaboration**
  - Responding to Article 6 of the Paris Agreement, promoting carbon reduction overseas



Equivalent to 29% of GHG emissions of 2020

2050 Net-Zero Emissions Plan



Achieve Net-Zero target with emissions and absorption

2050 Net-Zero Pathway (milestones)

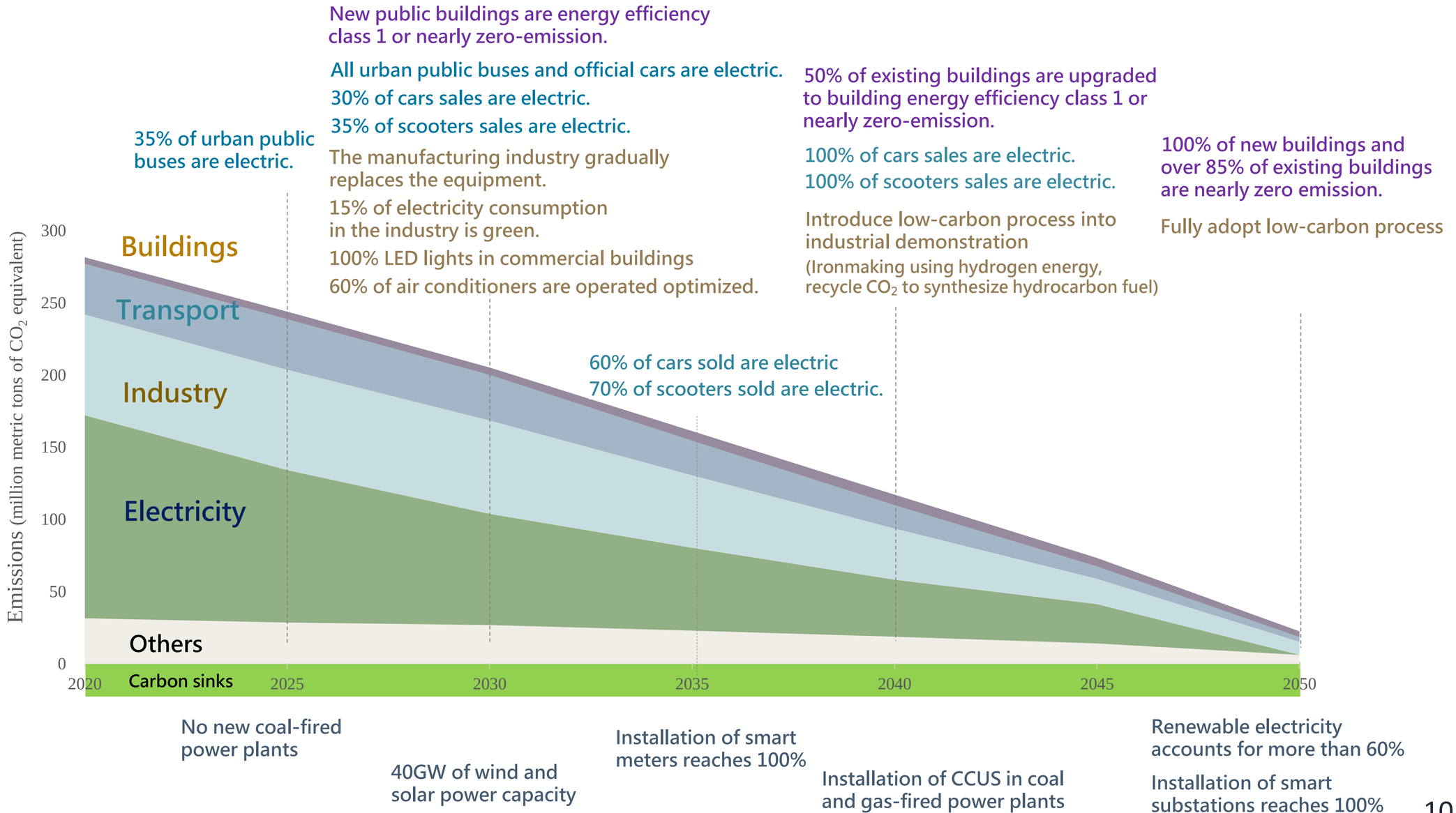
Buildings
Improving in exterior designs, energy efficiency and appliance energy efficiency standards.

Transportation
Changing in travel behavior, reducing demand for transportation, and electric vehicles.

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

12 Key Strategies

Goals and Benefits

中華民國經濟部
Ministry of Economic Affairs, R.O.C.

	2025	2030	2050
Offshore Total Installation	5.6 GW	13.1 GW	40 to 55 GW
Solar PV Total Installation	20 GW	31 GW	40 to 80 GW

Offshore Wind
(24.65 Mt GHG Reduction by 2030)

- Policy creates market demand
- Technology to expand capacity
- Market-support industry
- Fostering talents and educating locally

Solar PV
(19.45 Mt GHG Reduction by 2030)

- Installation space development
- Flexible grid connection
- Module recycle and security
- High efficient product R&D

*Emissions calculated by a factor of 0.502 $kgCO_2e/kwh$

01 Wind/Solar PV Strategies

中華民國經濟部
Ministry of Economic Affairs, R.O.C.

Policy creates market demand

Laws and regulations

- Through three stages of development (demonstrative, potential and zonal) to steadily and pragmatically achieve the installation goal.

Market supports industrial development

Incentives and assistance measures

- Build independent key manufacturing capacity to accommodate the characteristics of domestic industry
- Build independent maritime engineering service capacity for the need of localization in service.

Optimizing technology to expand capacity

Incentives and assistance measures

- Develop new floating technologies, expand wind farms towards greater water depth area.
- Develop domestic digital OM technologies to cut down costs and stabilize power generation.

Cultivating local talents

Incentives and assistance measures

- Provide GWO basic and advanced training programs to meet the demand for engineers from wind farms.
- Train professional technical talents in wind turbine operation and maintenance and marine engineering.

Exploring and developing appropriate installation location

Laws and regulations

- Inter-ministerial coordination with national land planning thinking to get a full grasp of available installation sites.
- Fishery and electricity symbiosis and areas with unfavorable conditions for agricultural first to create value from compound usage of lands.
- Develop high niche products and appropriate business models with integration of transportation facilities.

R&D for high efficient products

Incentives and assistance measures

- Accelerating the development of module efficiency to reduce land demand pressure.

Flexible grid connection

Laws and regulations

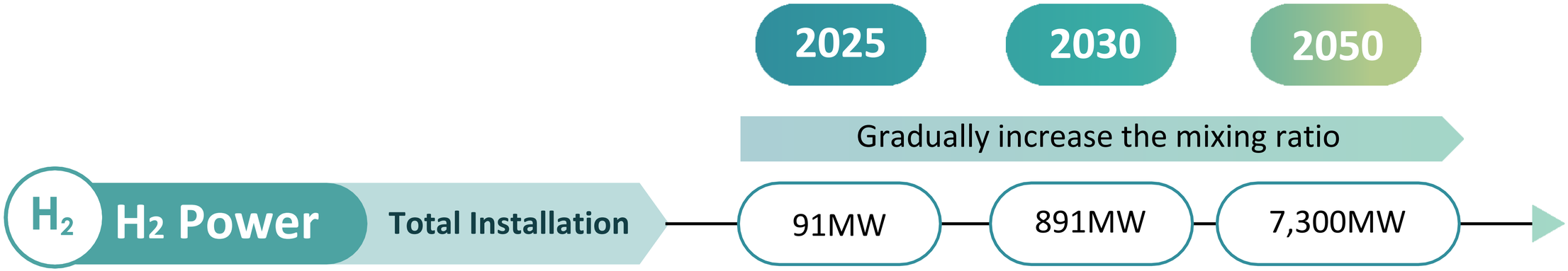
- Integrating power generation, energy storage, smart grid for grid resilience.
- PV with energy storage system, OM and security technology to increase supply stability and reduce feeder demand.
- Prioritizing the installation of energy storage system in ground-based PV projects.

System reliability and module recycling

Laws and regulations

- Train inspection personnel through public association related to system to establish an OM reporting mechanism.
- High value-added reutilization of recycled module, while increasing the ratio of re-utilized modules and reducing processing costs.

Goals and Benefits



Hydrogen Power (427 – 6,877 ton GHG reduction by 2030)

- Cooperating with major hydrogen energy producing countries, expanding imported hydrogen energy supply sources, and building a hydrogen energy production, transportation and storage foundation, including international supply chains, liquid hydrogen receiving stations, and transportation/storage facilities, to obtain long-term and stable supply.
- Having state-owned enterprises demonstrate first, driving enterprise investment from the demand side, and establishing public-private cooperation
- Establishing hydrogen energy mixed combustion/dedicated combustion operation and maintenance technology, completing the research, analysis and establishment of technology demonstration and verification field control specifications for the goal of hydrogen energy power generation accounting for 9% ~ 12% in 2050

*Emissions calculated by a factor of 0.502 kgCO_2e/kwh; 891 MW in 2030 includes mixed hydrogen (91 MW) and mixed ammonia (800 MW).

Hydrogen Strategies

H_2 Hydrogen supply

Incentives and assistance measures

Arranging imported material sources, developing self-produced technology, and stabilizing hydrogen sources

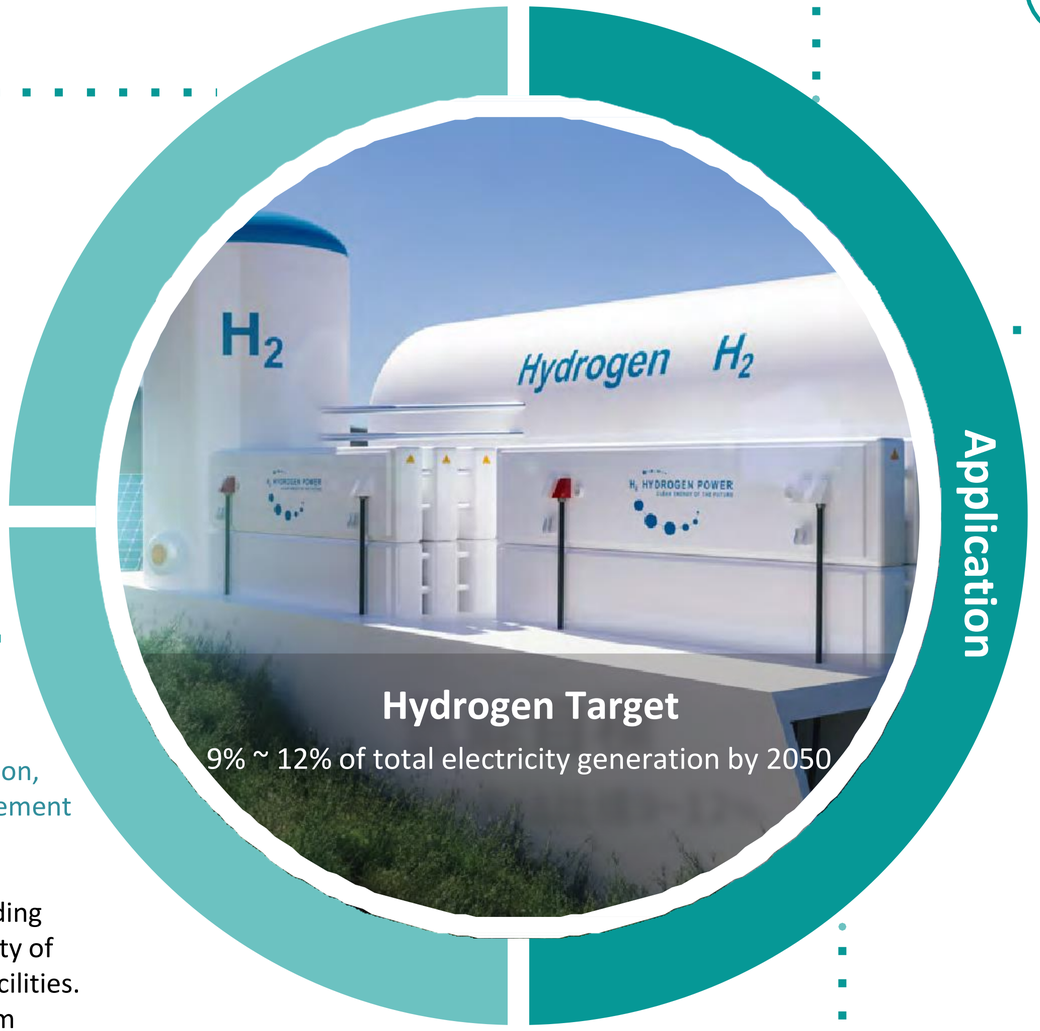
- Import: completion of import assessment, and gradually import as international supply and the costs are appropriate.
- Self-production: development of blue hydrogen in combination with the CCSU test plan; establishing key technologies for localized hydrogen production with demonstration sites.

Infrastructure

Laws and regulations

Administrative regulation for international cooperation, demonstration first, then establishment and improvement of transportation and storage facilities

- International cooperation: exchange storage and transportation models with hydrogen energy-leading countries, and assessing the demand and feasibility of domestic hydrogen transportation and storage facilities.
- Demonstration first: To meet short- and med-term application needs, first mobile hydrogen refueling station will be built in 2023.



Electricity

Incentives and assistance measures

Introduction and establishment of independent OM technology

- Introduce mixed/dedicated combustion power generation technology, complete 5% mixed combustion demonstration in 2030, and build domestic capabilities.

Industry

Incentives and assistance measures

Parallel joining alliances and international cooperation, and existing Low-Carbon processes first

- Iron and steel manufacturing process: evaluating imported hot-briquetted iron; developing hydrogen energy iron smelting technology.
- Industrial process: low-carbonization of existing processes is preferred, and H2 reduction processes are deployed.

Transportation

Incentives and assistance measures

Forming an alliance to jointly establish hydrogen energy power modules and key technical energy

- Developing a MW-class module system, and establishing a platform for verification of vehicle components and subsystems.
- Promoting the introduction of hydrogen fuel-cell buses into routes for demonstration and verification.

03 Innovative Energy

Goals and Benefits

中華民國經濟部
Ministry of Economic Affairs, R.O.C.

		2025	2030	2050
Geothermal	Total Installation	20 MW	56 - 192 MW	3 - 6.2 GW
Bio-Energy	Total Installation	778 MW	805 - 1,329 MW	1.4 - 1.8 GW
Ocean	Total Installation	0 - 0.1 MW	0.1 - 1 MW	1.3 - 7.5 GW

Geothermal
(180-620 Kt GHG reduction by 2030)

- Strengthening of economic incentives
- The legal aspect is clearly regulated
- Transparent and open resources
- Technical expansion of energy

Bio-Energy
(2.18-4 Mt GHG reduction by 2030)

- Building an applicable environment
- Building a large burning system
- Optimizing technology to expand capacity

Ocean
(0.13-1.3 Kt GHG reduction by 2030)

- Policy support clarifies the application procedures
- Technology development effectively utilizes marine resources

*Emissions calculated by a factor of 0.502 kgCO2e/kwh

03 Innovative Energy Strategies

中華民國經濟部
Ministry of Economic Affairs, R.O.C.

Economic

Incentives and assistance measures

- Feed-in Tariff for small-scale power plants below 2MW
- Formulating incentives for exploration

Legal

Laws and regulations

- Amendment of the Renewable Energy Development Act for exploration and development

Resourc

Incentives and assistance measures

- Investment in national resource surveys and expanding geothermal exploration
- Encouraging private companies and sharing risks
- Disclosing geothermal exploration data

Technical

Incentives and assistance measures

- Expanding drilling ability and accelerating geothermal capacity
- International cooperation to deploy geothermal technology

Policy Support

Laws and regulations

- Administrative regulation for international cooperation, demonstration first, then establishment and improvement of transportation and storage facilities

R&D Strategies

Incentives and assistance measures

- Inventory of shore-based seawall locations and excellent marine energy fields
- Evaluating the ocean resource (such as offshore wind power, fish farms) and expanding the utilization of sea
- Introducing/developing generator sets adapting to Taiwan

Geothermal
56 - 192 MW by 2030
3 - 6.2 GW by 2050

Ocean
0.1 - 1 MW by 2030
1.3 - 7.5 GW by 2050

Bio-Energy
805 - 1,329 MW by 2030
1.4 - 1.8 GW by 2050

Building an Environment

Laws and regulations

- FIT and demonstration incentives for biomass/waste-to-power market
- In 2025, SRF power plants, agricultural waste, and biogas power generations
- Promoting the transformation of coal-fired units

Building a Single Firing System

Incentives and assistance measures

- Establish/introducing (coal to Biomass)-fired unit into system
- Laying out overseas biomass sources (pellet biomass)

Optimizing and Expanding

Incentives and assistance measures

- Developing high-efficiency conversion technologies (thermochemical gasification, biological anaerobic biogas)
- Effective use of by-products (ash, biogas slurry/residue, etc.) to improve the economic benefits of biomass energy use

Power Systems & Energy Storage

Goals and Benefits

中華民國經濟部 Ministry of Economic Affairs, R.O.C.

		2025	2030
RE Forecast Accuracy	Days/Hours Ahead Error Rate %	Wind 10% / 5% Solar 10% / 5%	Wind 8% / 4% Solar 10% / 5%
Storage System	MW	Grids 1,000 MW; Generators 500 MW; Total 1,500 MW	Grids 3,000 MW; Generators 2,500 MW; Total 5,500 MW
Demand Response Program	GW	2.8 GW	3.0 GW
AMI Smart Meter	Accumulative Households	3 Million HH By 2024	6 Million HH
Auto-Feeder Accidents Downstream within 5 Mins.	Percentage	70%	90%

Increasing the grid-connected capacity of renewable energy

- Increasing the grid-connected capacity of renewable energy: Increasing the capacity of offshore wind and solar PV grid-connected devices.
- Expanding the transmission capacity of ultra-high voltage (UHV) transmission lines.

Activating ancillary service demand

- Preparing ancillary service capacity precisely
- Deploying ancillary service energy effectively

Reduce blackout loss

- Auto-Feeder Accidents Downstream within 5 Mins up to 90%

Reduce OM costs

- Replacing manpower with automated monitoring to improve Taipower's ability to detect abnormalities in power supply lines

Expand Resources

- Expanding the market and promoting storage/EV investment
- 5,500MW energy storage battery target in 2030

Strategies

Digitizing Power Grid

Incentives and Assistance Measures

- Promote grid IC integration
  - The increase of single purchases of smart meters, bid willingness, speed up the deployment of AMI and maintain the quality of smart electric meters
  - Automatic switch in localization policy
- Refine Regional Scheduling
  - The ADMS stipulates the establishment of a local maintenance team during the bidding, improving the construction cooperation and maintenance time efficiency, and promoting the investment of domestic industry

Laws and Regulations

- Formulate/revise national standards of smart grids

Grid Infrastructure

Laws and Regulations

- Renewable Energy Enhanced Grid Project
- Reduce transmission problems between regional grids
  - Following the Electricity Act to ensure electricity safety
- Introduce power quality control equipment to strengthen power system stability

Supply System Flexibility

Laws and Regulations

- Update/Improve responsiveness of traditional plants
- Application of energy storage system
  - Install compliant storage system based on user's equipments, and contract qualified electrical company for the installation to ensure safety
- Mastering renewables generation
  - Revise the RE regulations for better reporting real-time operation data and improve support and assistance for the system's frequency and voltage control
- Refine Demand Response Management Measures
- Expand electricity market
  - Revise relevant regulations such as "Rules for Setting Up Power Trading Platforms," "Management Measures for Standby Power Supply Capacity," and "Outline of Power Dispatching Principles"

Goals and Benefits

Goal: Maximize efficiency

		2025	2030
		• Save 12.73 billion kWh of electricity • Save 0.628 million KOE of fuel	• Save 34.57 billion kWh of electricity • Save 2.273 million KOE of fuel
Industrial	Incorporate ISO50001 STD	50% majority managed by ISO 50001	60% majority managed by ISO 50001
	Process efficiency ↑	Replace process equipment	Efficient & low-emission equipment
Commercial	Building efficiency ↑	400 cases/yr	New public buildings reach level-1 energy efficiency or near zero carbon buildings
	LED lighting & Improved air-conditioning	70% LED; 30% air conditioning	100% LED; 60% air conditioning
Residential	Construct green buildings	300 cases/yr	350 cases/yr
	Tighten building standards	5%	10%
	Commercial standards	100% LED bulbs	Air conditioner & Fridge MEPS Lv.3
Transportation	Vehicle efficiency ↑	Efficiency standards for vans >2.5t	30% improvements for new sales

Industrial

Equipment improvements, guidance with energy-saving targets, efficiency standards

Commercial

Equipment/behavioral improvements, low-carbon transition, green-buildings

Residential

Increased efficiency of buildings and electronics, advocacy and engagement

Transportation

Expand and enhance the scope of efficiency standards, behavioral change

Technology

Innovation, energy efficiency, system integration

Strategies

Governance

Subsidies

- Introduce educational and relevant capacities, train certified experts

Regulations

- Expand regulated scopes, promote local governance and private capacities

Best practice

Subsidies

- Encourage better efficiency in manufacturing, promote process improvements and guidance

Corporate responsibilities

Regulations

- Enhanced corporate targets, efficiency increase in the public sector

Smart system & innovation

Subsidies

- Promote smart energy managements, R&D in innovative technologies

Knowledge spillover

Subsidies

- Advocacy and promotion, visualization of electricity usage, subsidies

Building energy efficiency standards

Subsidies

- Promote green-building, subsidize efficiency improvements

Regulations

- Establish assessment and labelling mechanism, enhanced energy-saving design regulations

Vehicle efficiency

Subsidies

- Replace old vehicles, promote introduction of high-efficiency vehicles

Regulations

- World-aligned efficiency standards, management of public transport system, enhanced fuel efficiency

Goals and Benefits

Target **2030 CCUS target: 1.76 - 4.60 million tons**

Technology

- Increase CCUS capacities
- New technology with improved efficiency
- Lower cost for implementation

Legislation

- Establish guidelines
- promulgate regulations
- Introduce subsidies

Academia

- Local CCUS database
- Establish research teams
- Assess CCUS potentials
- Establish techniques for exploration & monitoring

Economy

- At least 4 demonstration sites
- Engage > 9 companies with > NT$2 billion R&D investments

Just Transition

- Policy package for just transition
- Establish platform or engagement
- Promote transparency

Two CCS demonstration verification projects by 2025

Strategies

NSTC 國家科學及技術委員會
National Science and Technology Council

Establish key technologies, finalize regulations and ensure just transitions

R&D

Pioneering

- Develop immature concepts and prototypes before 2030 to reach 2050 net-zero goal
- Enhance research capacities

R&D — NSTC, Academia Sinica

Implementation

- Develop low-cost CCUS technologies
- Promote CO_2 utilization techniques
- Establish demonstration sites
- Experience sharing and scale-up best-practice

Case Study — MOEA, Public/private sectors

Regulation & Governance

Regulation

- Integrated assessment of net-zero pathways
- CCUS regulation on frameworks, methodologies and verification

Policy — EPA

International

- Connect with international entities, enhance R&D and training capacity
- Technical collaboration on potential demonstration sites

Collaboration — NSTC, MOEA, EPA, Academia Sinica

Just Transition

National Development Council
(in collaboration with other ministries)

07 Carbon-Free & Electric Vehicles

中華民國交通部
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS R.O.C

Goals and Benefits

		2025	2030	2035	2040
Electric buses	Rate of adoption	35%	100%		
Official vehicles	Rate of adoption		100%		
Electric sedans	% of new sales		30%	60%	100%
Electric motor scooters	% of new sales		35%	70%	100%

1 Electrification

11,700 urban buses, 100% electrification for official vehicles

Subsidize 0.5 million motor scooters, 500 electric taxies

Promote local OEMS to invest in two new freight models

2 Infrastructure

Establish 400 charging areas, 6,365 slow charging stations, 802 fast charging stations

Encourage new companies to establish at least 2% charging stations in self-owned car parks

3 Transition

Re-training of professional skills, including 5,760 mechanics, 960 inspectors

Subsidies on the transition of 16,000 motorcycle shops

Domestic electric cars to reach 15% of new vehicle sales

Carbon-Free & Electric Vehicles

Strategies

Electrification

Subsidies

- **Encourage market demand**
  - ✓ Subsidize replacements for electric bus & taxi
  - ✓ Subsidize electric motor scooters purchase
  - ✓ Subsidize electric motor scooters for deliveries and postal services
  - ✓ Subsidize R&D of electric freight vehicles
  - ✓ Promote hydrogen vehicles, demonstration sites
  - ✓ Subsidize electric passenger ships & airport vehicles
- **Introduce tax incentives and loan packages**

Regulations

- **Propose import standards, encourage market penetration of electric vehicles**
- **Enforce emission standards and improve transparencies to encourage low-emission transport**

Infrastructure

Subsidies

- **Accelerate expansion of charging networks**
  - ✓ Establish charging stations in highway service areas, transport hubs, tourist sites.
  - ✓ Promote charging stations in gas stations, industrial and science parks, exhibition centers, commercial and relevant sites
- **Set dedicated rates for electric cars, establish single window for grid application, promote smart charging demonstration sites**

Regulations

- **Specification and building-related regulations**
  - ✓ Mandatory proportion of charging space for public carparks
  - ✓ Revise building codes to include charging stations

Transition

Subsidies

- **Research and upgrade key technologies such as vehicle subsystem, smart charging, OEM capacities**
- **Promote local OEMs, expected sale by 2024**
- **Provide assistance & guidance on transition for mechanics, inspectors, motorcycle shops**

Goals and Benefits

Advanced Waste Treatment Technology → Improve Resource Utilization Efficiency → Sustainable Consumption and Production

Indicators

		2020	2025	2030
Resource Productivity	NTD/kg	70	90	104
Material Consumption	Tons/capita	10.9	10.8	10.7

Benefits of Key Project

		2020	2025	2030
Resourcezation: Ratio of recycled aggregates for engineering materials	%	53	60	70
Resourcezation: Conversion rate of chemical waste liquid into high-value materials	%	7.6	40	45
Fuelization: Ratio of industrial waste converted into fuel	%	47	60	80
Fertilization: Conversion of organic waste to fertilizer application (growth rate)	%	-	60	130

Resourcezation

Inorganic materials and pellets: -420 kt CO_2e

Chemicals: -48.2 kt CO_2e

Fuelization

Waste to energy and bioenergy: -287.6 kt CO_2e

Fertilization

Biomass: -286.6 kt CO_2e

Strategies

3 Major Goals, 4 Strategies to be Promoted, 10 Key Items, 37 Measures to be Promoted, 71 Actions

Priority Strategies

- **Green design**: Reduce the use of raw materials, promote circular procurement, and extend product life cycle.
- **Resource reutilization**: Promote the conversion of waste into materials, energy and fertilizers.
- **Circulation network**: Establish a regional circulation network or a virtual industrial park.
- **Technological and institutional innovation**: Promote resource recycling and carbon reduction technology, combination with digital technology, and legal and institutional innovation.

Assistance and Incentives

- **Support small and medium-sized enterprises** to establish a circular business model, and promote excellent resource recycling cases.
- **Assist companies** that dealing with waste removal, treatment and reuse, and introduce carbon reduction processes or technologies.
- **Provide care and guidance services for self-employed recyclers.**

Carbon Sinks

Goals and Benefits

Adding 10 Mt CO_2e from carbon sinks annually by 2040

		2025	2030	2040
Forests	Sink Enhancement (tons of CO_2e)	0.271 million	0.758 million	10 million
Soil	Sink Enhancement (tons of CO_2e)	0.159 million	0.2595 million	
Ocean	Sink Enhancement (tons of CO_2e)	Technical Development	0.34 million	

Forests

- Increase forest coverage
- Enhance forest management
- Enlarge the utilization of timber products

Ocean

- Develop the measurement methodology of ocean and wetlands
- Develop the complex fish farming business models
- Increase ocean carbon sinks management measures and promote restoration of aquatic plants

Soil

- Strengthen soil management
- Develop carbon negative cultivation mode

Carbon Sinks Strategies

Technological research and development

For setting the foundation of carbon sinks, continue scientific and technological research and development on the three major paths of carbon sinks - soil, forests and ocean - before 2050.

- Complete the inventory report of national greenhouse gas emissions
- Develop innovative technology to increase carbon sinks
- Promote the management of conservation
- Methodology and incentive mechanism for establishing carbon rights conversion

Develop carbon sinks and establish a benefit-sharing mechanism

Protect the rights of residents and all people as wetland, ocean and forest resources are protected.

Increase carbon sink benefits with multiple models:

- Set up sharing mechanisms by introducing multi-sources, such as incentives and rewards, carbon rights mechanism, and agricultural ESG.

10 Green Lifestyle

Targets and Benefits

行政院環境保護署
Environmental Protection Administration
Executive Yuan, R.O.C. (Taiwan)

	2025	2030
Public Awareness of Green Living	85%	90%
People's Green Behavior	75 points	80 points

- "Public Awareness of Green Living" is quantified with a yes/no question (such as “know/ don't know") to calculate the percentage of awareness.
- "People's Green Behavior" is quantified with a 5-point scale ("always, often, sometimes, rarely, never") to calculate the target score.

Green Lifestyle

- Lifestyle education: Raise awareness of green living
- Infrastructure: Build a green and friendly environment
- Business model: Drive the green industry
- Green products and services: Encourage green consumption
- Behavioral change: Enhance green lifestyle and literacy

10 Green Lifestyle Strategies

行政院環境保護署
Environmental Protection Administration
Executive Yuan, R.O.C. (Taiwan)

Zero Waste and Low-carbon Diet

- Tableware sharing, green dining, local buying and selling, safe eating.

Environment-friendly Fashion

- Environmentally friendly materials, energy-saving clothing, carbon labels.

Improvement of Living Quality

- Passive energy-saving buildings, energy-saving equipment, carbon storage building materials, promotion of green labels.

Provide subsidies and aid for organic farming, enhance citizen participation and green action.

Net-Zero Green Lifestyle

Implement green living from 2023 to calculate the carbon reduction benefits of life transition scenario, and set a net-zero pathway and goals.

Public Dialogue

- Common goals, responsibilities, and actions, information disclosure, education for all.

Sharing Economy

- Expand green products, prolong service life, recycle parts and components, replace purchase with service.

Low Carbon Transport Network

- Public transportation, perfect walking and cycling environment, private vehicle management, and car sharing.
- Transit-oriented development (TOD), remote living, green freight, green tourism, and low carbon exhibition.

Develop relevant guidelines to enhance public awareness and behavioral change.

11 Green Finance

Goals and Benefits

金融監督管理委員會 Financial Supervisory Commission R.O.C. (Taiwan)

Accounting of GHG Emissions for Listed Companies

From individual firms to consolidated firms, conduct GHG emission inventory first, then verification

Downward-Scaling Demands

Scheduled Timeline	Conduct Individual firms' GHG Inventory	Conduct Consolidated firms' GHG Inventory	Conduct Individual firms' GHG Inventory verification	Conduct Consolidated firms' GHG Inventory verification
Listed Companies w/ a capital amount exceeding NT$10bn, iron & steel, and cement industries	2023	2025	2024	2027
Listed Companies with a capital amount of NT$5~10 bn	2025	2026	2027	2028
Listed Companies with a capital amount below NT$5bn	2026	2027	2028	2029

Financial Services Firms → **Drive companies to put forward investment and lending instruments** → **Spur supply chains and industries to conduct transition**

- Encourage financial services firms to act on their own initiatives to respond to climate issues

- Promote responsible governance, investment and lending operations, and financial instruments to drive companies to conduct GHG inventory and set targets and strategies

- Support corporate actions to conduct carbon neutrality on supply chains simultaneously to encourage an industrial transition to net-zero emissions

11 Green Finance

Strategies

Disclose GHG emissions & promote value-chains reduction

- Encourage financial services firms to conduct GHG inventory, ascertain GHG emissions status from their clients, and promote financial instruments and responsible governance to support corporations' net-zero transition
- Promote listed companies to conduct GHG inventory and assist them in setting reduction targets in response to making net-zero transition

Integrate information and data to enhance climate resilience

- Construct and integrate an ESG info platform for individual financial services firms to assess climate-related risks and determine strategies and a risk management control scheme
- Promote information value-added and field-crossing linkage applications of financial markets risks assessment and potential improvement aspects for enhancing climate resilience

Consolidate stakeholders' consensus and seek to leverage a cooperative mechanism

- Establish a cooperative platform of financial services firms based on their fund management capabilities and experiences to enhance corporations' sustainable development in Taiwan
- Promote a cross-ministerial level cooperation mechanism to accomplish a recommended national sustainable economy activity guidelines to support corporations' net-zero transition

12 Just Transition

Goals and Benefits

國家發展委員會 National Development Council

Objectives

Realize Just Transition and Leave No One Behind

Ensure labor employment rights during a net-zero transition

- Offer cross-ministerial efforts on re-training and hiring-matching to defuse possible unemployment impacts due to industrial structural change for laboring issues during a net-zero transition

Avoid increasing the burden of public living costs

- Establish a benefit-sharing mechanism with cross-ministerial cooperation to put people at an advantage when making a green transition

Encourage meaningful public-private dialogues and cooperation opportunities

- Expand the private sector's engagement to ensure policy planning and assessment with the inclusion of multi-stakeholder opinions

Assist domestic industries in making a transition with low-carbon manufacturing processes

- Conduct an industrial manufacturing shift with cross-ministerial cooperation to actively assist SMEs in building better capacity for GHG reduction

Protect the diversity of local groups and regional development

- Balance rights to local groups and sustainability of the environment and ecology when promoting a net-zero transition

Effectively reduce potential resistance during a just transition process

- Ease potential resentful responses from impacted employees, and encourage the general public to come to support the net-zero transition

12 Just Transition Strategies

國家發展委員會 NATIONAL DEVELOPMENT COUNCIL

Supportive solutions with resources and strategies

Crossing-Ministerial Taskforce on Promoting Just Transition

- The Taskforce consists of the main responsive ministry for **12 key strategies, the Ministry of Labor, and the Council of Indigenous Peoples**
- When developing net-zero transition strategies, identify impacted issues **from labor, industrial, regional, and living aspects** simultaneously to plot a Taiwan Just Transition Picture with response strategies
- Convene the Taskforce meetings **regularly to progress control, coordinate, and rolling adjust** on just transition measures when implementing 12 key strategies

Ensure a just policy-making process with civic engagement

Just Transition Committee

- The Committee is convened by the **Minister of National Development Council** and consists of representatives from governmental agencies and civil society
- Focusing discussions **on labor, industrial, regional, living, and governance** topics
- Propose **improvement recommendations** for governmental just transition projects and measures

Public Consultation

- Organize **Just Transition consultation meetings to gather experts' opinions** for policy planning references
- Organize **discussion forums and public hearings** with involvement from central agencies, local governments, and social groups to gather opinions from all stakeholders

Technology R&D

Net-Zero Technology

National Net-Zero Technology Development Strategies

Invest in 5 Net-Zero Technologies

Sustainable Energy
- Renewable energy
- Hydrogen power generation
- Grid resilience and system integration
- Energy storage
- Others

Low Carbon (mitigation)
- Industrial sector
- Green transport
- Residential and commercial sector
- Green construction project

Carbon Negative
- Carbon capture utilization and storage
- Natural carbon sink

Circularity
- Industrial and civil waste recycling
- Water recycling
- Biomass cycle

Social Science
- Green lifestyle (Low Carbon Life)
- Net-zero strategy
- Just transition
- Green finance
- Benefit evaluation

Focus on 4 Key Points

People-oriented
- Introduce technology into society.
- Promote a new net-zero lifestyle with the private sector.

Life Cycle
- Link technology research and development with local practice.
- Promote the development of the whole life cycle of the industry.

Future Vision
- Invest in technologies with high carbon reduction potential.
- Explore breakthrough innovation research and development.

Globalization
- Collaborate with global benchmarking institutions.
- Master key international leading technologies.

Climate Legislation

- Amending the Greenhouse Gas Reduction and Management Act
- Amending the Renewable Energy Development Act and the Energy Administration Act
- Managing system for carbon capture and storage, Green Finance, and regulations for the construction sector

Climate Legislation

行政院環境保護署
Environmental Protection Administration
Executive Yuan, R.O.C. (Taiwan)

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

On April 21, 2022, the cabinet meeting of the Executive Yuan passed the amendment and sent it to the Legislative Yuan for review;

On May 11-12, joint review by 6 committees, including Social Welfare and Environmental Hygiene Committee of the Legislative Yuan was completed; on December 9 and 16, the Legislative Yuan conducted consultation among political parties

- **The national long-term goal is revised to 2050 net zero emissions**
- **Strengthen climate governance**
  Coordination and integration by the National Council for Sustainable Development
- **Accelerate carbon reduction and enhance industrial competitiveness**
- **Strengthen climate change adaptation**
  Capacity building, scientific reports and risk assessment
- **Public participation to build power of climate action**

Inventory and verification

- Classification for management
- Enhance verification capacity

Energy efficiency standard

- Process for production
- Manufacture or import vehicles
- New buildings

Carbon footprint

- For announced products, manufacturers, importers or sellers should obtain carbon footprint verification within a specified period and display it on the container or package

Voluntary offsets trading

- Encourage voluntary reduction and issue reduction credit
- Establish a supply and demand mechanism to promote credit trading

Environmental Impact Assessment Commitments Offset

- For newly built or modified facilities up to a certain scale, the GHGs increments should be offset by a certain percentage

Carbon Fee

- Use economic instruments to promote carbon reduction
- Raise incentive by levy and expenditure

Governance Foundations

Climate Legislation

行政院環境保護署
Environmental Protection Administration
Executive Yuan, R.O.C. (Taiwan)

Establishing guidance to assist companies in quantification and reporting of greenhouse gas emissions

Amending the guidance and building capacity for carbon quantification and reporting, and verification, to respond to companies' needs, and the EU CBAM, which will begin to operate from 1 October 2023 onward, with simplified rules initially, requiring sectors including iron and steel, cement, fertilizer, aluminum, electricity and hydrogen to fulfill the reporting obligations.

- Collaborating with Ministry of Economic Affairs in 118 training sessions on carbon quantification and foot-printing and 48 advocacy activities about net-zero emissions and carbon quantification for industry associations.
- Collaborating with Chinese National Federation for Industries on 3 5-day carbon quantification and reporting workshops.
- Establishing 4 certification bodies and organizing GHG verifier training courses.

3rd party verification required

EPA's regulated GHG emission sources

- GHG emissions > 2.5 $MtCO_2e$/year
  Regulated entities: 287 (1st batch) + 250 (2nd batch)

Non-mandatory

Voluntary participants

- Carbon Disclosure Project (CDP) / Dow Jones Sustainability Indexes (DJSI): hundreds of Taiwan's companies invited to participate in 2021

Interested SMEs are welcomed to try online trial calculator

3rd party verification/assurance required

FSC's TWSE-/TPEx-listed companies to conduct GHG inventory

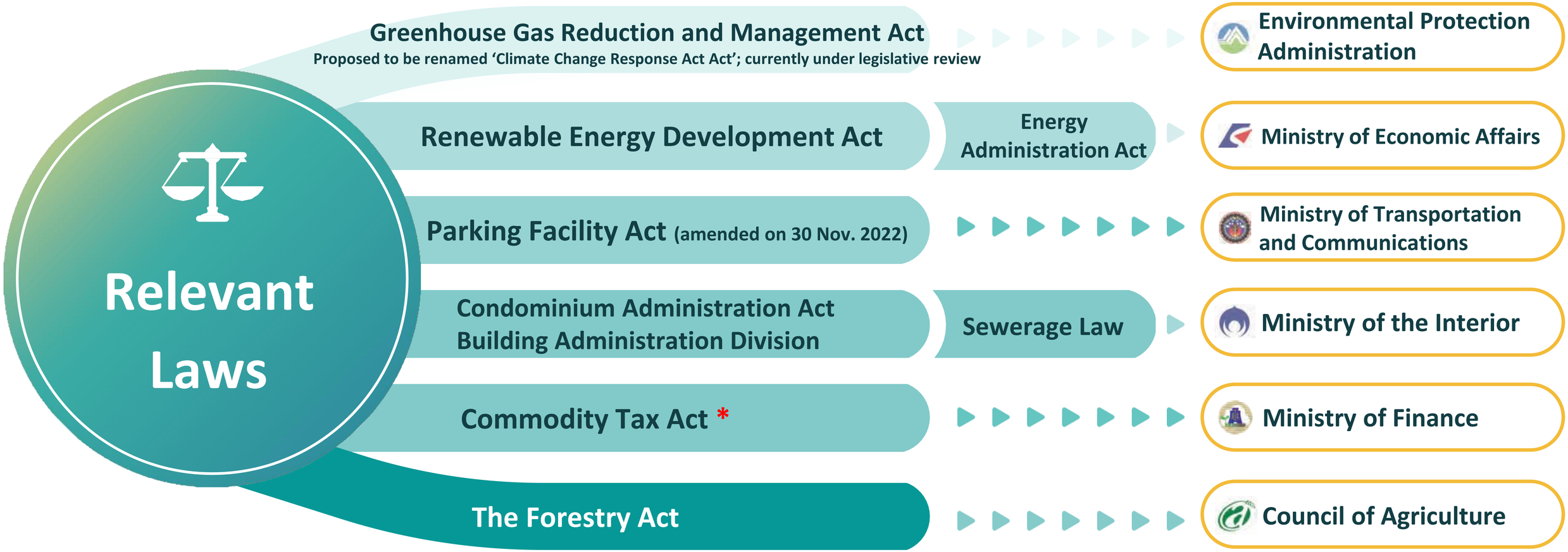
- 1ST STAGE Paid-in Capital >NT$10 bn + Iron + Cement
  Assurance acquired by 2024 (~0.1k companies)
- 2nd STAGE Paid-in Capital NT$5~10 bn
  Assurance acquired by 2027 (~0.1k companies)
- 3rd STAGE Paid-in Capital <NT$5 bn
  Assurance acquired by 2028 (~1.4k companies)

Non-mandatory

Stakeholders in supply chain

Climate Legislation

Reviewing and amending 7 laws and 12 regulations in response to net-zero transition

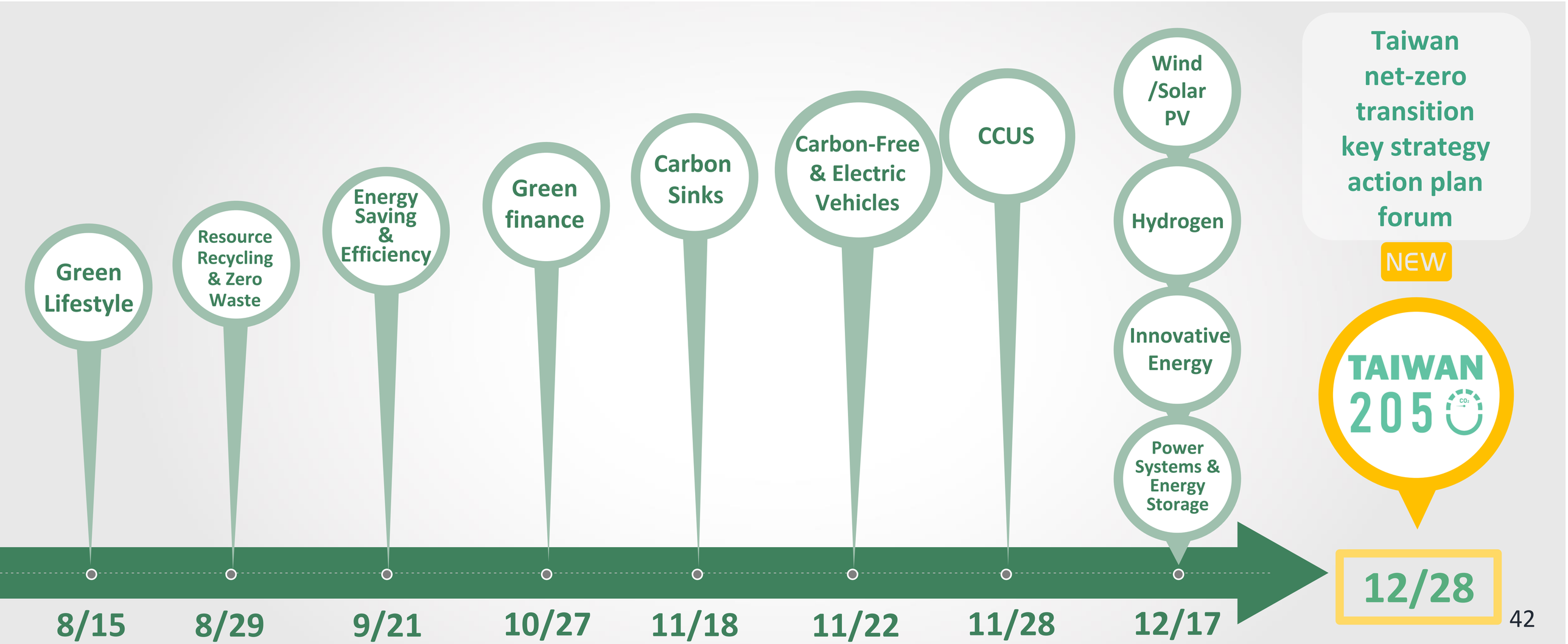


* In accordance with regulations in force, from 15 June 2021 to 14 June 2023, the commodity tax on electrical appliances which are classified as 1st- or 2nd grade of the energy-efficient levels approved by the Ministry of Economic Affairs shall be reduced. After the tax incentive is expired, the Ministry of Finance will coordinate with the policy authority and decide whether the provision will be extended according to the authority's overall review of its necessity, validity and feasibility.

Social Communication

Open Information

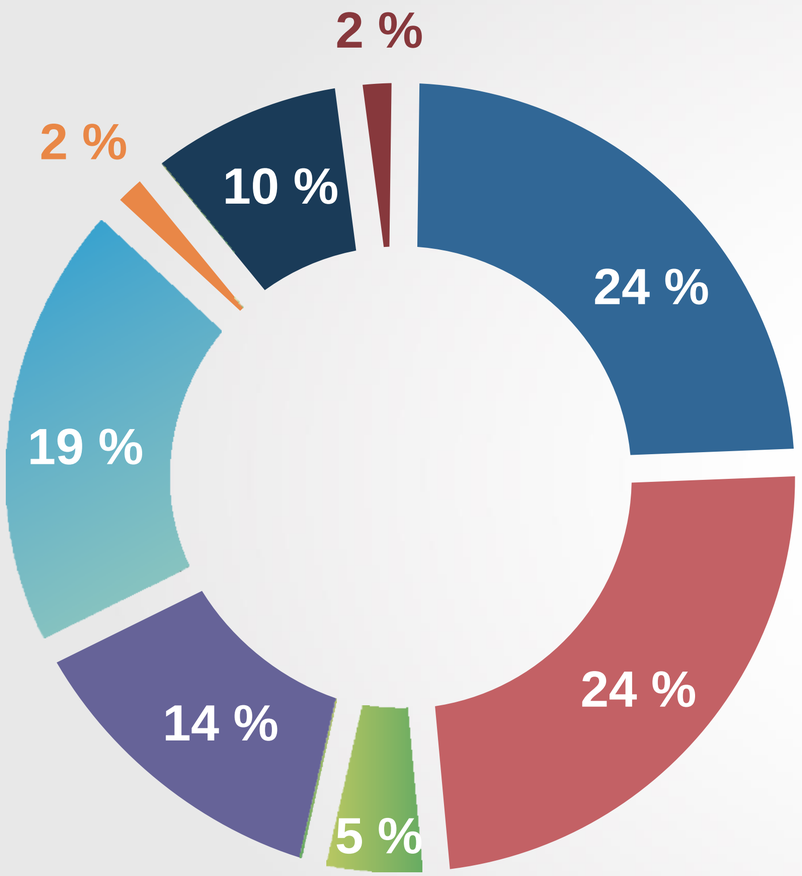
- Some 50 key strategic social communication and symposium activities have been held
- Relevant information is published on the Environmental Protection Administration's "Climate Citizen Dialogue Platform" (climatetalks.tw)



A budget of nearly NT$900 billion by 2030 for major plans toward 2050 net-zero transition

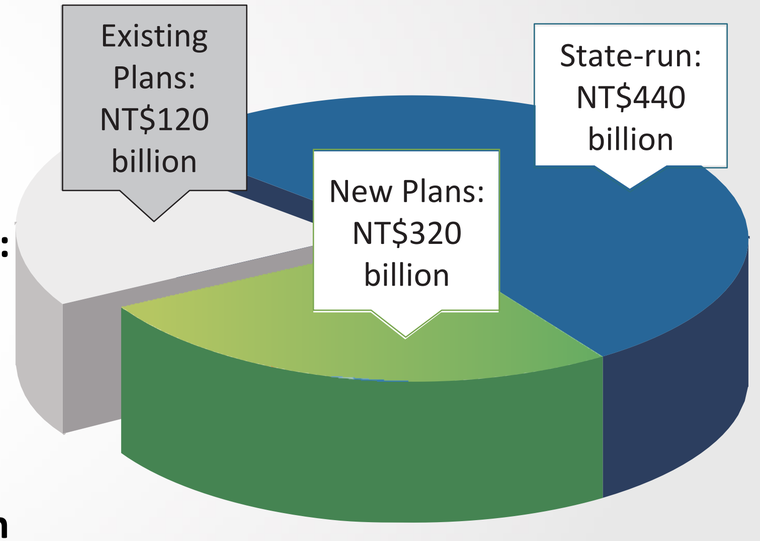
By **2023**, Total Budget **NT$68.2 billion**

- **Net-zero transition related budget**: NT$44.5 billion
- The fourth phase of Forward-Looking Infrastructure Plan: NT$4.8 billion
- Operating and non-operating special foundation: NT$18.9 billion



- **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**

Budget Source



Government subsidies to raise efficiency of carbon reduction

Energy saving and home appliances replacement

- Subsidy for **640,000** level-1 energy-efficient air conditioners and refrigerators. Each appliance may receive **NT$3,000** in grants.

Business equipment replacement and system energy saving projects

- A **NT$200,000** subsidy is available for the purchase of new air conditioner
- Integrating system improvements such as AC, freezer/refrigerator, boiler, energy monitor et al. Each case may receive **Max NT$5,000,000** in grants.

Carbon reduction demonstration in existing buildings

- Combining disaster prevention functions, subsidy for **30** existing buildings to enhance carbon reduction benefits.

Accelerating vehicle Electrification

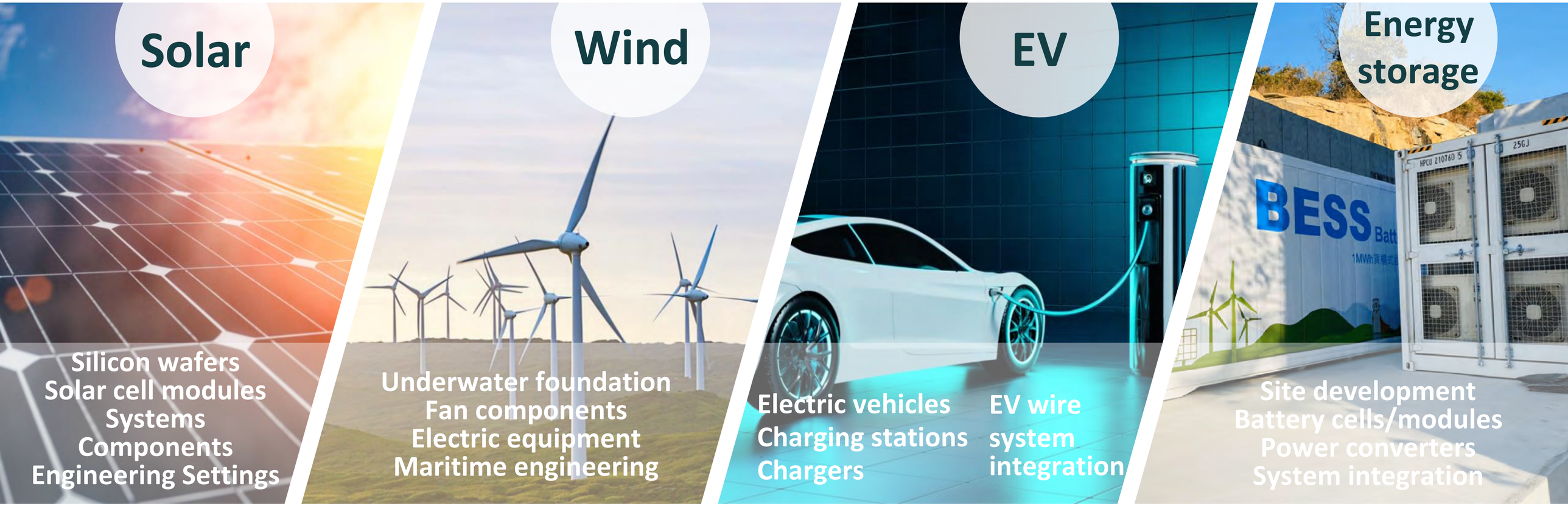
- Subsidy for **11,000** urban electric buses
- Subsidy for taxi/logistician/airport ground/catering service
- Subsidy for developing charging stations and charging piles
- Supporting conventional motorcycle shop transition
- Subsidy for electric boat demonstration project.

Economic Benefit

Developing four main supply chains

Spurring private investment of NT$4 trillion

1	2	3	4
Solar	Wind	EV	Energy storage
Silicon wafers Solar cell modules Systems Components Engineering Settings	Underwater foundation Fan components Electric equipment Maritime engineering	Electric vehicles Charging stations Chargers EV wire system integration	Site development Battery cells/modules Power converters System integration



Expanding Energy Saving

Improving the industrial process of six sectors

electronic/metal/petrochemical/cement/textile/paper

Promoting equipment replacement in households and commercial sector

Adopting the energy management systems

Up to NT$550 billion in output value

Economic Benefit

Accelerating the deployment of net-zero and negative carbon technology

1	2	3	4	5
Hydrogen	Geothermal	Ocean	Biomass	CCUS

2050 Net-Zero Transition

Energy Transition
More Secure

- Lowering the risk of high dependence on imported energy

Industrial Transition
More Competitive

- Accelerating industrial transition and creating green growth momentum

Lifestyle Transition
More Sustainable

- Improving the quality of life and environmental sustainability

Social Transition
More Resilient

By 2030

- Driving private investment over **NT$4 trillion**
- Creating production value **NT$5.9 trillion**
- Creating **551,000** jobs

- **Energy dependency:**
  From 97.4% in 2011 to **below 50%** in 2050
- Air pollution will be **reduced** by about **30%**, compared to the level in 2019

Key Issues

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 help others comply with the transition policy
- Engaging with all sectoral associations while having state-owned enterprises serve as examples

Thank You