Asia-Pacific Economic Cooperation

APEC Symposium on Bioenergy
- APEC 3rd Sectoral Symposium for Energy Transition

Development and Current Situation of Bio-fuel in Chinese Taipei

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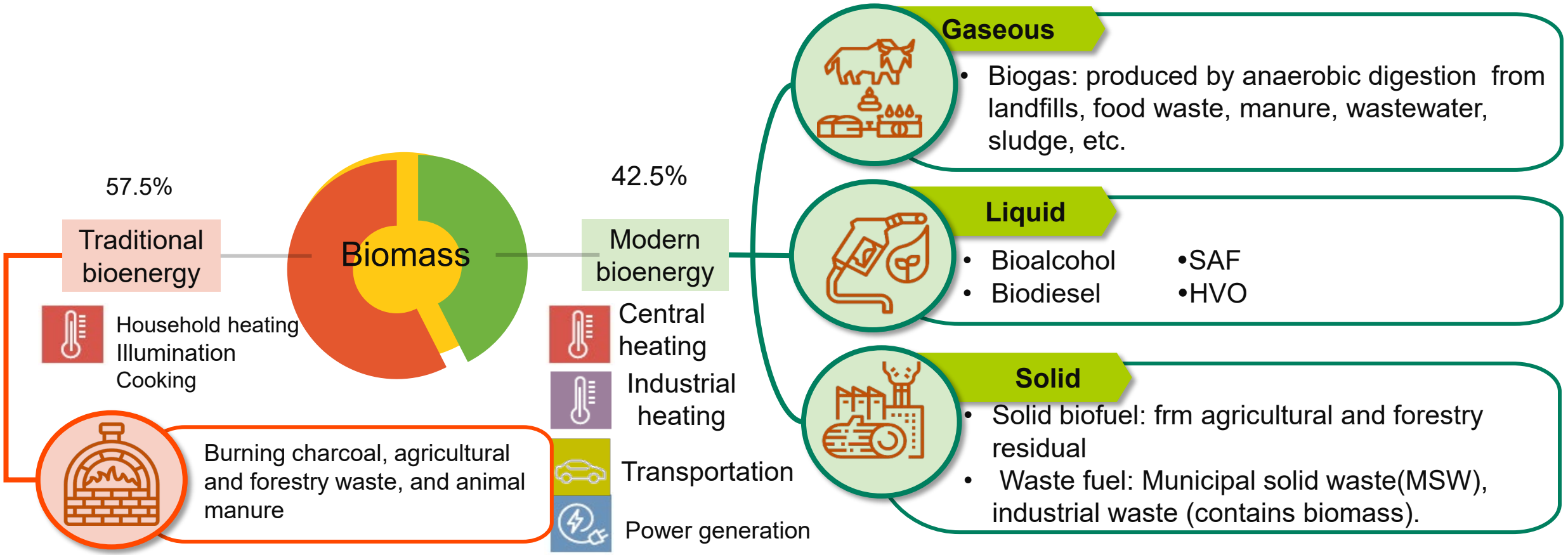
OUTLINE

- **Introduction**
- Renewable Energy Policy in Chinese Taipei
- Development and Current Situation of Biofuels in Chinese Taipei
- Conclusions

Bio-Energy and Human History

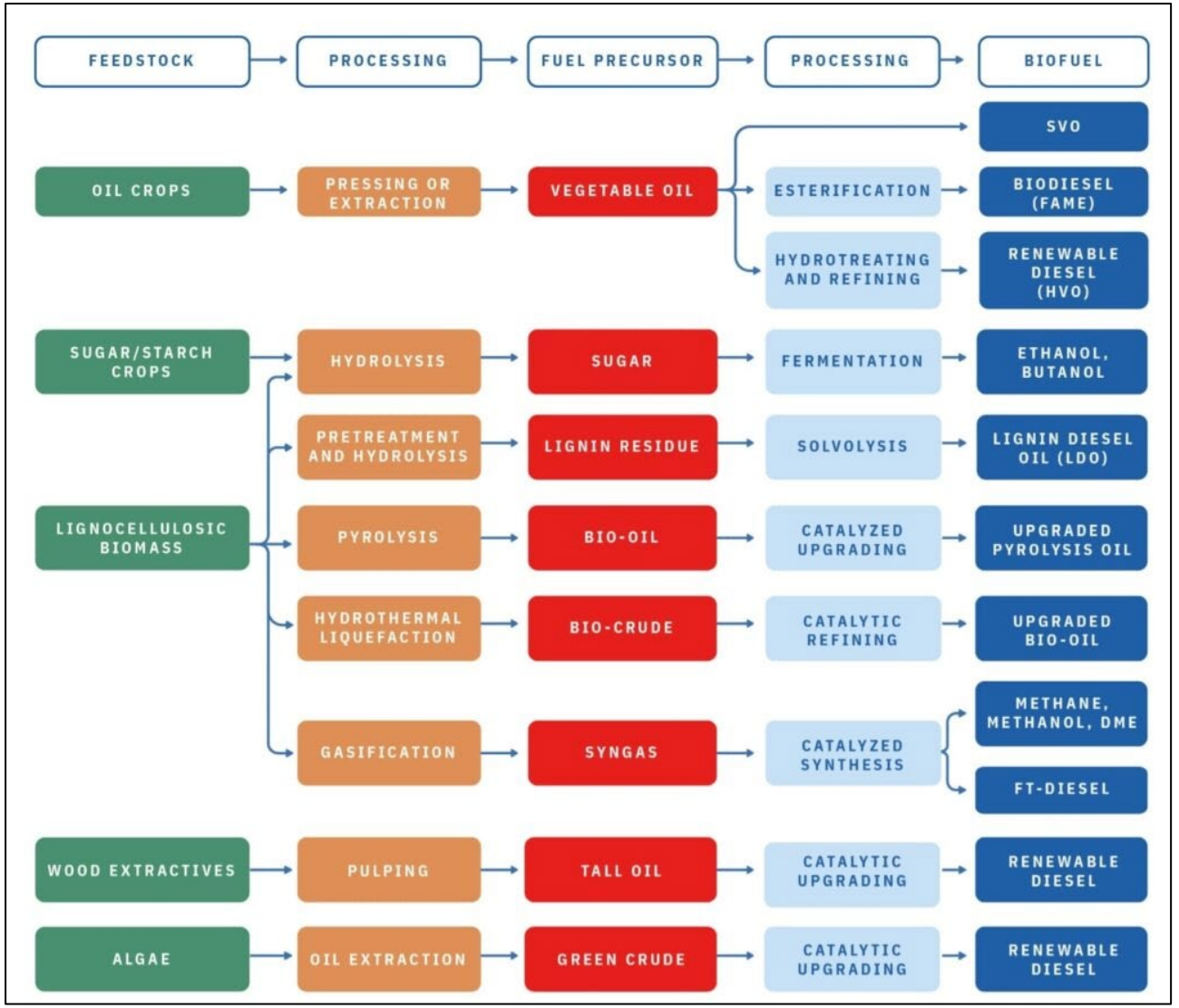
- Traditional bioenergy vs. modern bioenergy



Source: Chung-Hua Institution for Economic Research (CIER), 2019.

Bioenergy Conversion Pathway

- Liquid biofuels are mainly used in transportation as alternative fuels to replace fossil fuels.
- Biofuels can be produced from a large variety of biomass feedstocks.
- In the case of transport biofuels, a number of production technologies have reached maturity and are widely deployed. These so-called established biofuels include
  - Ethanol from sugar and starch crops,
  - Biodiesel from triglycerides and lipids (FAME),
  - Hydrogenated triglycerides and lipids (HVO),
  - Biomethane from upgrading of anaerobic digestion biogas.



Source: IEA Bioenergy, BIOENERGY REVIEW 2023-How bioenergy contributes to a sustainable future., 2023).

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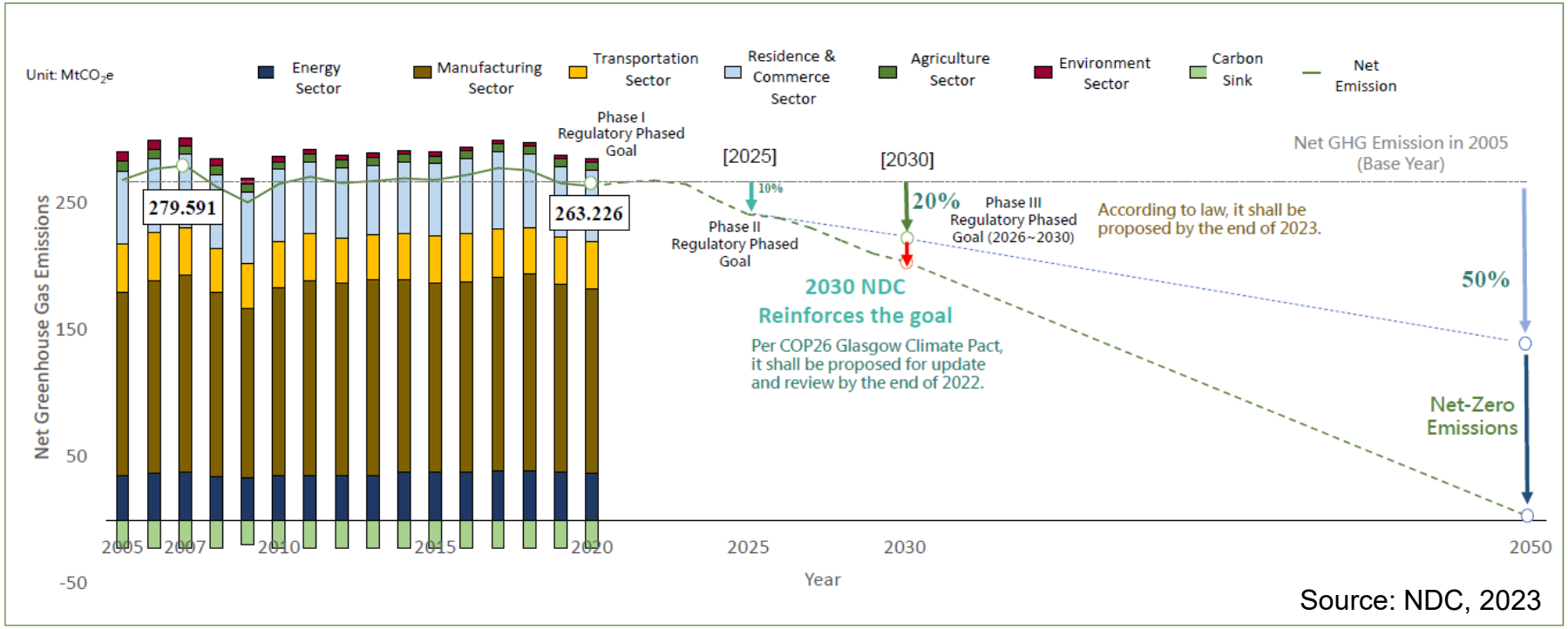
2050 Net-Zero Emissions Plan

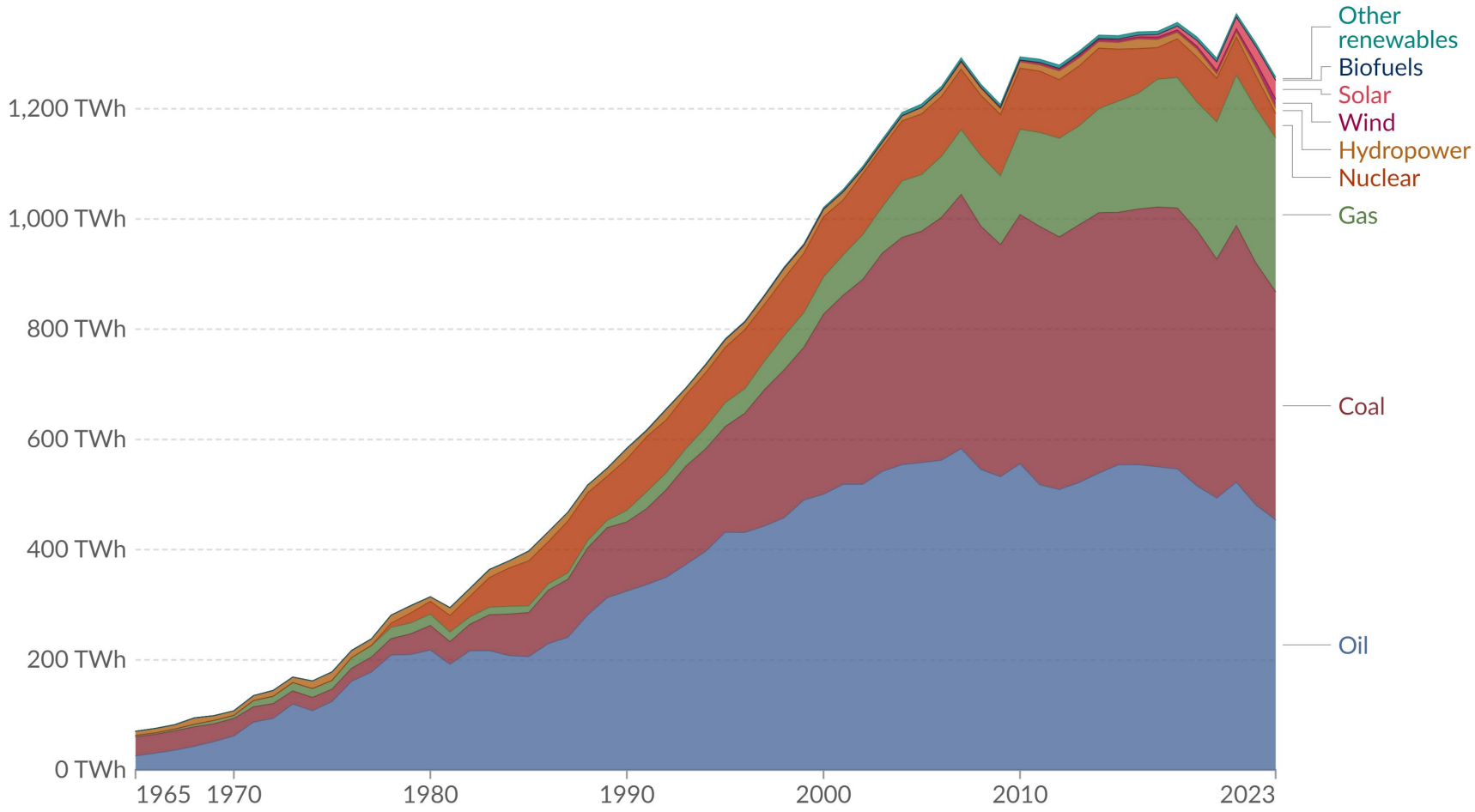
- **Regulatory goals of each phase on a 5-year basic according to the GHGs Reduction and Management Act**
  - Phase I (2020): **2%** below the level of year 2005 **(approved in Jan. 2018)**
  - Phase II (2025):**10%** below the level of year 2005 **(approved in Sep. 2021)**
  - Phase III (2030):**20%** below the level of year 2005 **(approved in Sep. 2021)**



Source: NDC, 2023

Energy consumption by source of Chinese Taipei

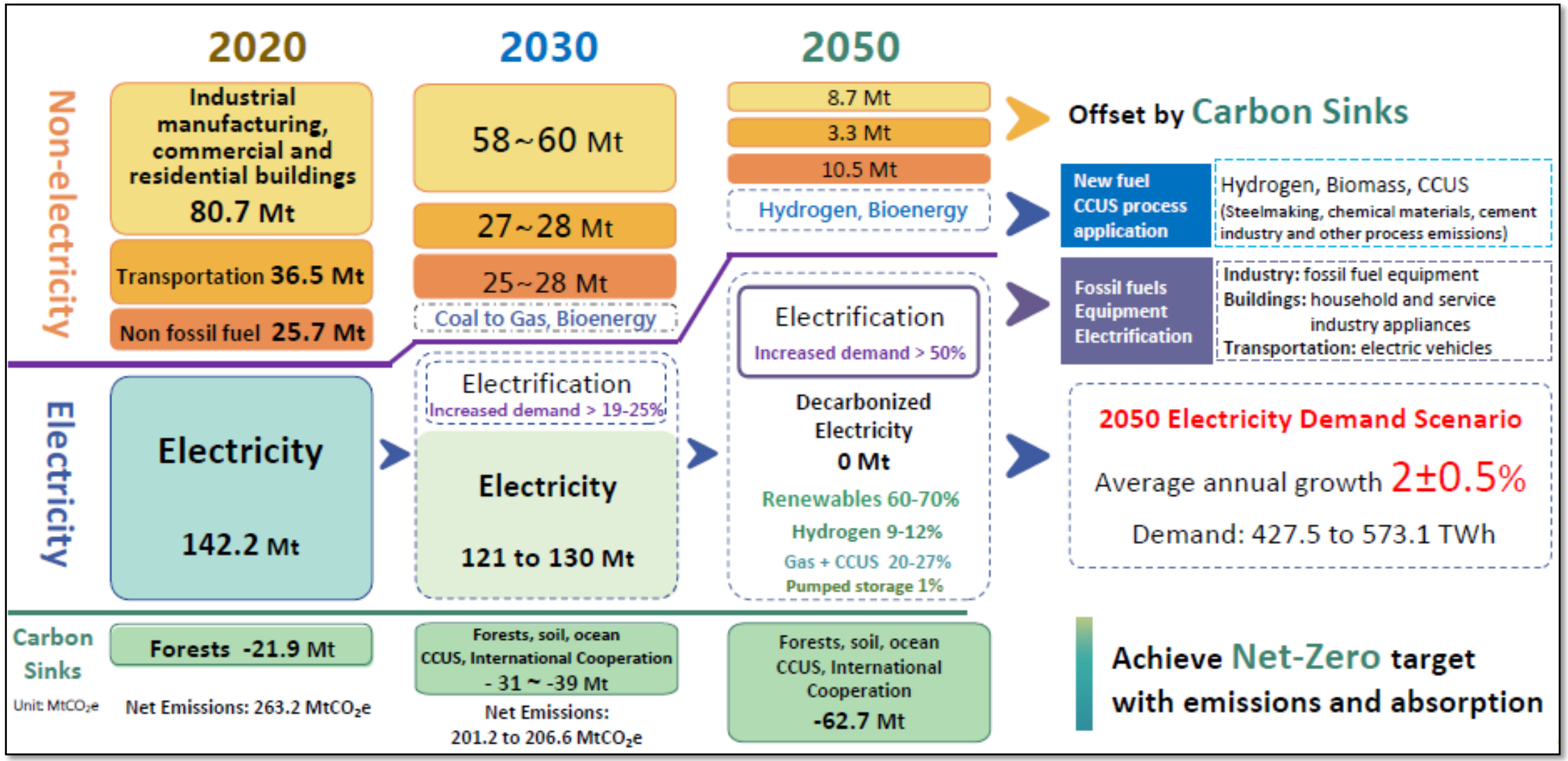
- Chinese Taipei's energy structure is still dominated by fossil fuels.
- The development of renewable energy mainly focuses on power generation.
- The development and application of biomass energy lags behind the international average level.



Data source: Energy Institute - Statistical Review of World Energy (2024)
Note: "Other renewables" include geothermal, biomass, and waste energy.

OurWorldinData.org/energy | CC BY

2050 Net-Zero Emissions Plan of Chinese Taipei



Source: NDC, 2023

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Biodiesel

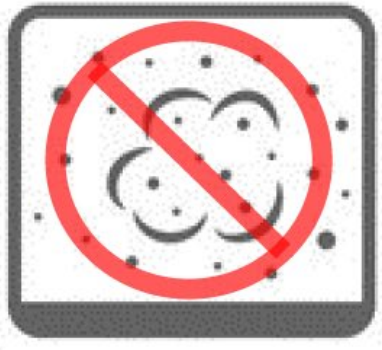
- The Energy Bureau’s promotion of the development of biodiesel is divided into four stages.
  - 1st stage "Energy Crop Green Bus Project": 2006~2008, which encourages public buses to use biodiesel,
  - 2nd stage: "Green Urban and Rural Application Promotion" 2007 ~2008. Selected Taoyuan and Chiayi to establishment of a regional production and supply system for biodiesel,
  - 3rd stage: "B1 policy" 2008~2010. Blend 1% biodiesel into commercial diesel from July 2008 .
  - 4th stage: “B2 policy” 2010~. Blend 2% biodiesel into commercial diesel.

Biodiesel

- Waste cooking oil (WCO) has been reused as a main feedstock for biodiesel production since 2006.
- The benefits of using waste cooking oil as biodiesel :

Solving the problem of waste cooking oil disposal

Renewable energy which can replace fossil fuels and reduce greenhouse gas emissions



Reduce air pollutant emissions

High lubricity extends engine life

Biodiesel

- Biodiesel standard of Chinese Taipei

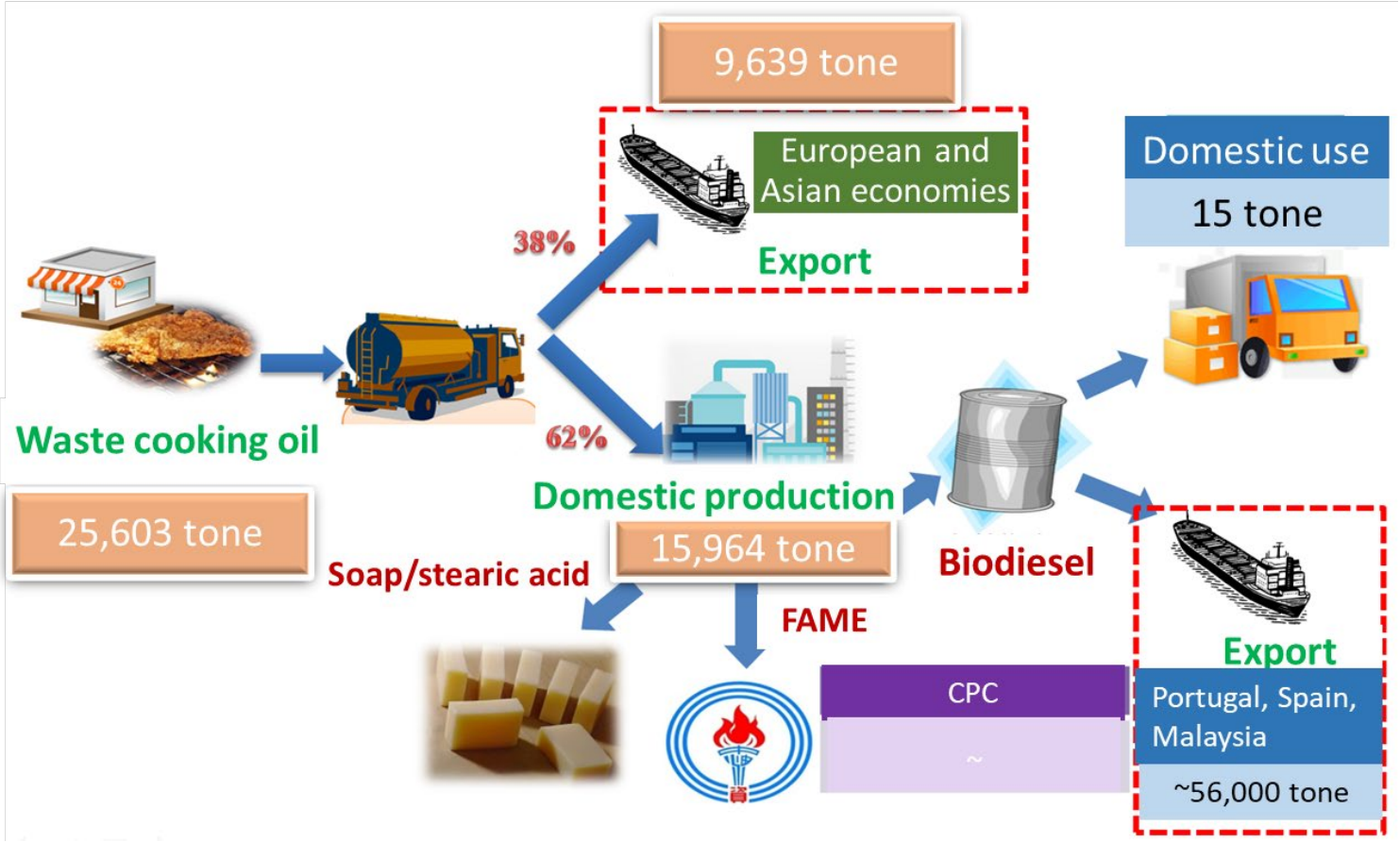
ITEM	SPECIFICATIONS	UNIT	CNS METHOD	EN METHOD
ESTER CONTENT	96.5 Min.	% (m/m)	CNS 15051	EN 14103
DENSITY at 15℃	860~900	kg/m^3	CNS 12017	EN 3675 EN ISO 12185
VISCOSITY at 40℃	3.5~5.0	mm^2/s	CNS 3390	EN ISO 3104
FLASH POINT	101 Min.	℃	CNS 3574	EN ISO 3679
SULFUR CONTENT	10 Max.	mg/kg	CNS 14505 ISO 20846	EN ISO 20846 EN ISO 20884
CARBON RESIDUE (on 10% distillation residue)	0.30 Max.	% (m/m)	CNS 14477	EN ISO 10370
CETANE NUMBER	51.0 Min.		ISO5165	EN ISO 5165
SULFATED ASH CONTENT	0.02 Max.	% (m/m)	CNS 3576	ISO 3987
WATER CONTENT	500 Max.	mg/kg	CNS 4446 ISO 12937	EN ISO 12937
TOTAL CONTAMINATION	24 Max.	mg/kg	CNS 15055	EN 12662
COPPER STRIP CORROSION(3h at 50℃)	No.1	Grade	CNS 1219	EN ISO 2160
OXIDATION STABILITY，110℃	6.0 Min.	Hour	CNS 15056	EN 14112
ACID VALUE	0.50 Max.	mg KOH/g	CNS 14669 CNS 14906	EN 14104
IODINE VALUE	120 Max.	g I_2/100g	CNS 15060	EN 14111
LINOLENIC ACID METHYL ESTER	12.0 Max.	% (m/m)	CNS 15051	EN 14103
POLYUNSATUREATED(≧4 double bonds) METHYL ESTERS	1 Max.	% (m/m)		
METHANOL CONTENT	0.20 Max.	% (m/m)	CNS 8523	EN 14110
MONOGLYCERIDE CONTENT	0.40 Max.	% (m/m)	CNS 15018	EN 14105
DIGLYCERIDE CONTENT	0.20 Max.	% (m/m)	CNS 15018	EN 14105
TRIGLYCERIDE CONTENT	0.20 Max.	% (m/m)	CNS 15018	EN 14105
FREE GLYCEROL	0.02 Max.	% (m/m)	CNS 15018	EN 14105 EN14106
TOTAL GLYCEROL	0.25 Max.	% (m/m)	CNS 15018	EN 14105
GROUP I METALS(Na+K) GROUP II METALS(Ca+Mg)	5.0 Max. 5.0 Max.	mg/kg mg/kg	CNS 15052 CNS 15053	EN 14108 EN 14109 EN 14538
PHOSPHORUS CONTENT	4.0 Max.	mg/kg	CNS 15019 CNS 15058	EN 14107

Biodiesel

- The supply amounts of biodiesel indicated a soaring growth from 1,029 kiloliters in 2006 to 96,373 kiloliters in 2013.
- However, the users have complained about some issues, including fuel tank and filter clogging/plugging, ignition delay.
- The government thus temporarily terminated the biodiesel blends (B2) promotion policy in May 2014.

Biodiesel

- In order to continuously support WCO recycling, the vast majority of biodiesel by domestic production was exported to European (e.g., Spain) and Asian economies (e.g., Korea).



Bioethanol

- The policy for promoting the use of bioethanol and its domestic production plan started from 2007.
- Limited gas stations in the metropolitan cities (8 gas stations in Taipei City and 6 gas stations in Kaohsiung city) provided E3 gasohol for all vehicles by subsidizing a discount rate at NT $1.0–2.0 per liter.
- Due to no ethanol plants currently operating, the bioethanol in the E3 gasohol was completely imported.
- Through the signing of a MOU between CPC and the US Grains Council, the government will provide E10 starting from 2025 to achieve carbon reduction goals.

Source: news.u-car.com.tw, 2007

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Conclusions

- The lack of enthusiasm in promoting biomass energy policies has led to the slow development of biomass energy.
- Compared with fossil fuels, the cost of biofuels is higher. Economic subsidies are needed to promote effectively.
- The EU economics' subsidy policy for WCO-based biodiesel has increased the demand for WCO, resulting in large-scale exports of WCO and soaring purchase prices.
- The new 2050 net-zero policy will help re-examine bioenergy policies and promote the development of biofuels.
- Supply and price are the main obstacles to the future development of biofuels.

THE END

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