

工業技術研究院

Industrial Technology
Research Institute

Improving Energy Efficiency in Industry in Chinese Taipei

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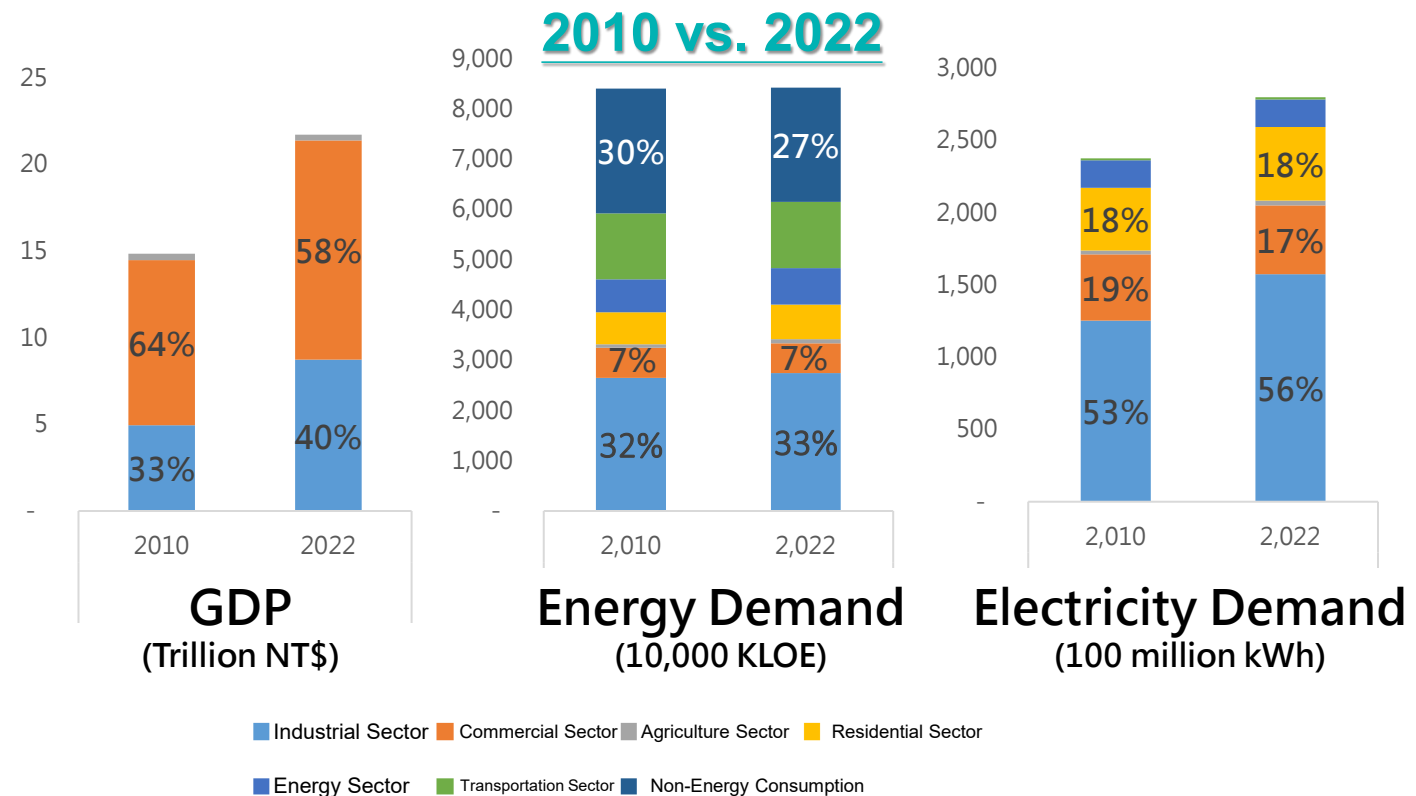
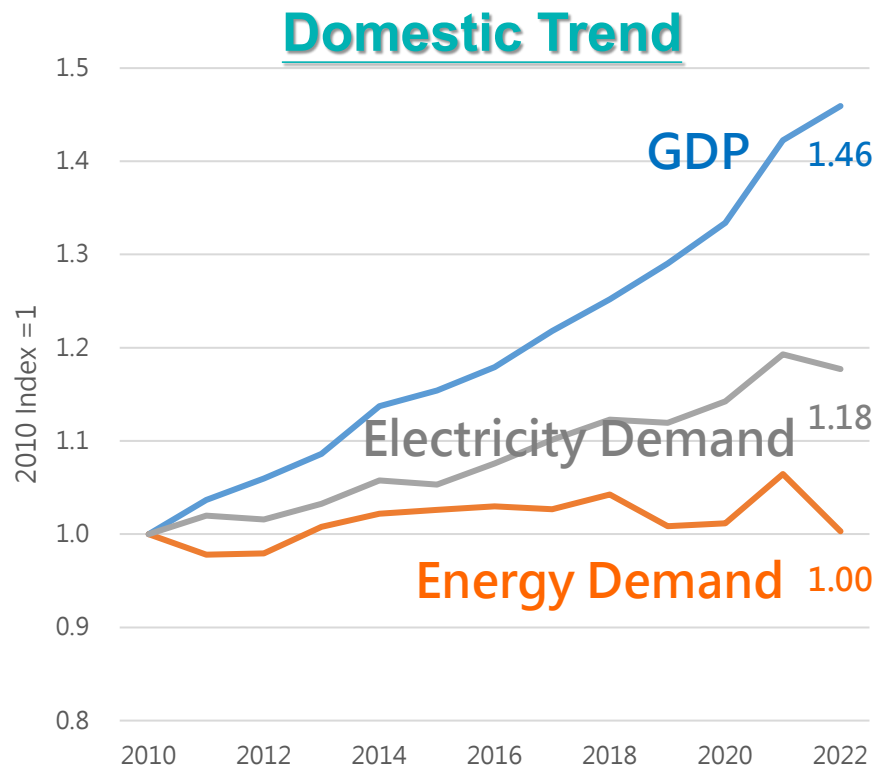
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- 1. Energy Demand in Chinese Taipei**
2. Energy Efficiency Policies for Industrial Sector
3. 2050 Net-Zero Strategy: “Strategic Plan of Energy Saving”
4. Conclusion

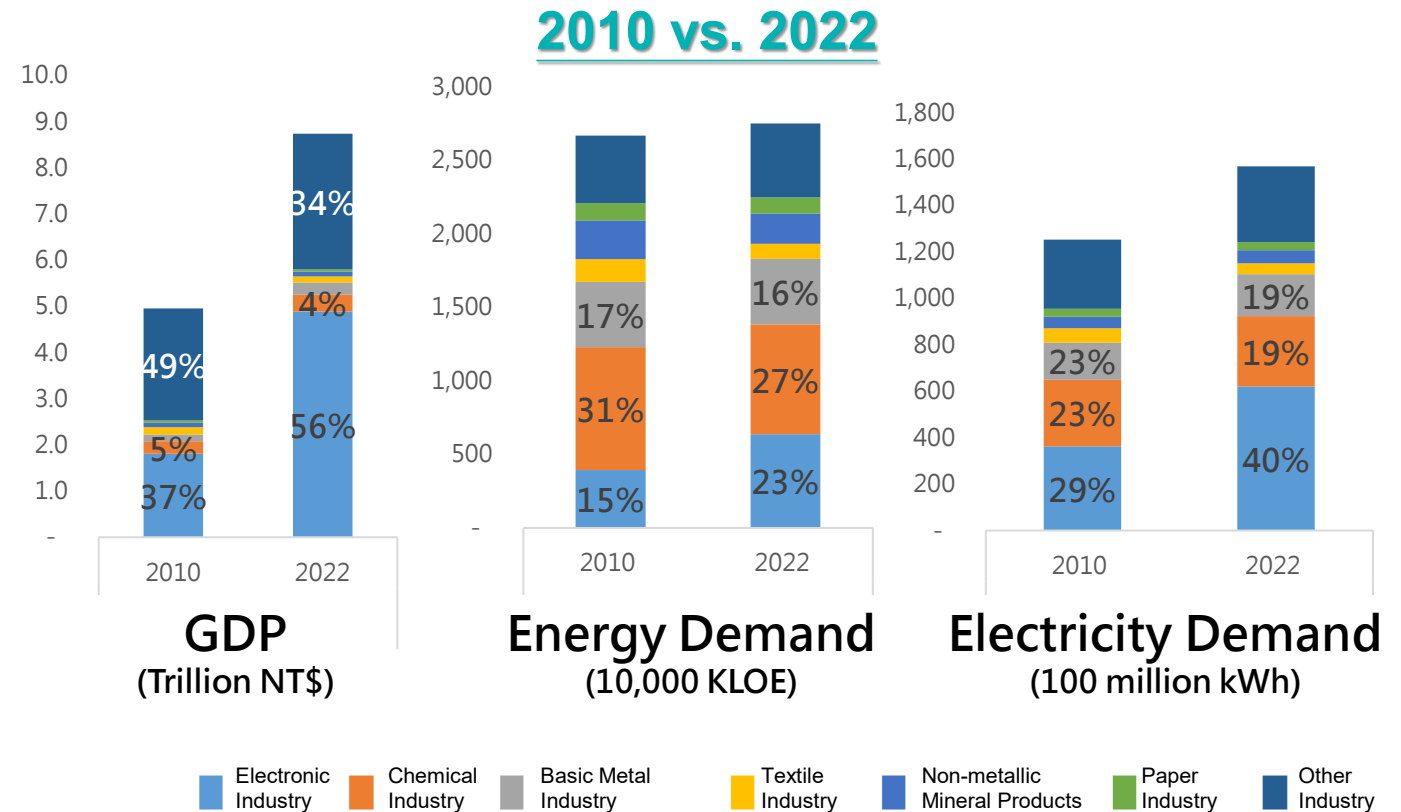
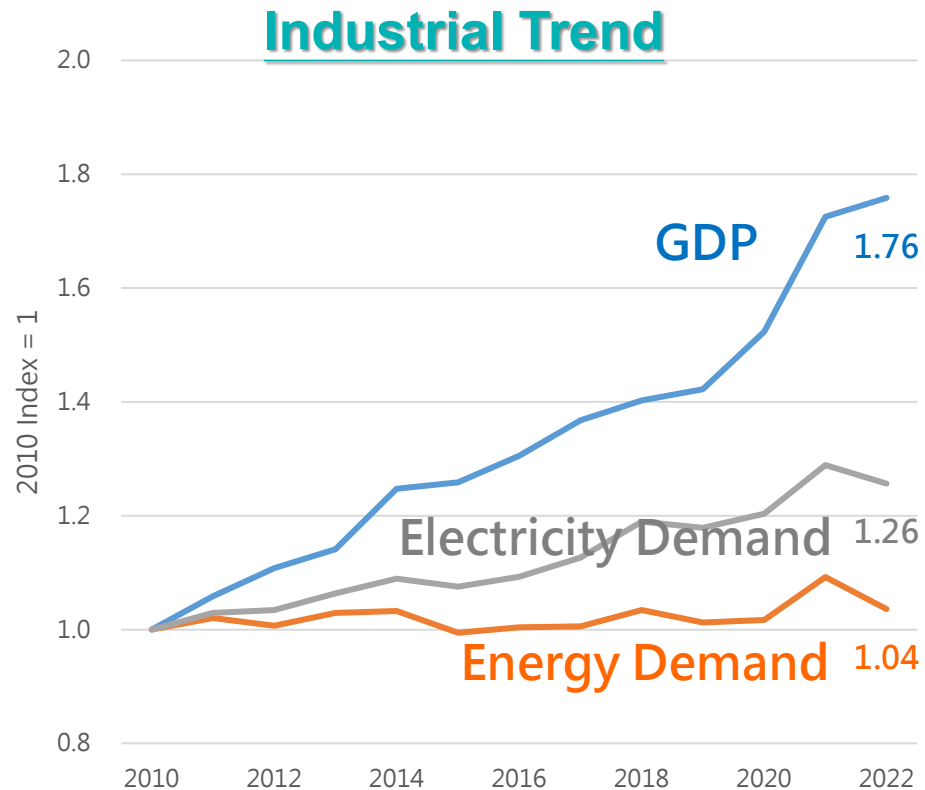
1-1. Domestic Trend in Economy and Energy

- Chinese Taipei's GDP is growing rapidly, leading to **increased electricity demand**, while **total energy consumption remains stable**.
- The **industrial sector's** share of GDP, energy usage, and electricity consumption has significantly increased.



1-2. Industrial Trend in Economy and Energy

- **Industrial GDP** growth surpasses electricity and energy use.
- **Electronic Industry** shows marked increases in GDP contribution, energy consumption, and electricity usage ratios.



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2-1. Energy Efficiency for Equipment and Appliances

• Minimum Energy Performance Standard (MEPS)

Equipment and Appliances	Issued Date	Energy Efficiency Improving (%)
Fan	2024/7/1	7~10
Rotodynamic pump	2023/1/1	5~8
Air compressor	2021/1/1	5~7
Water chilling packages using the vapor compression cycle	2020/7/1	2
Low-voltage three-phase squirrel-cage high-efficiency induction motors	2016/7/1	2~3 (IE3)

• Energy Efficiency Ranking Labeling

Water Chilling Packages		COP								
		3 rd			2 nd			1 st		
		< 528 kW	≥ 528 kW < 1758 kW	≥ 1758 kW	< 528 kW	≥ 528 kW < 1758 kW	≥ 1758 kW	< 528 kW	≥ 528 kW < 1758 kW	≥ 1758 kW
Water-Cooled	Displacement	4.45	4.90	5.50	4.80	5.30	5.90	5.15	5.70	6.35
	Centrifugal	5.00	5.55	6.10	5.40	5.95	6.60	5.80	6.40	7.10
Air-Cooled		2.70			3.00			3.20		
Air Compressors		3 rd			2 nd			1 st		
Proportional loss factor		d = -5 ~ 0			d = 0 ~ 5			Above d = 5		

2-2. Energy Audit Reporting Scheme

- **Large Energy User (LEUs)**: The energy user whose energy consumption meets the level stipulated by the Ministry of Economic Affairs, shall establish its own **energy audit system** and set objectives for energy conservation and execution.
- There are **3,500 industrial LEUs**, and they consumed about **75%** of industrial energy consumption

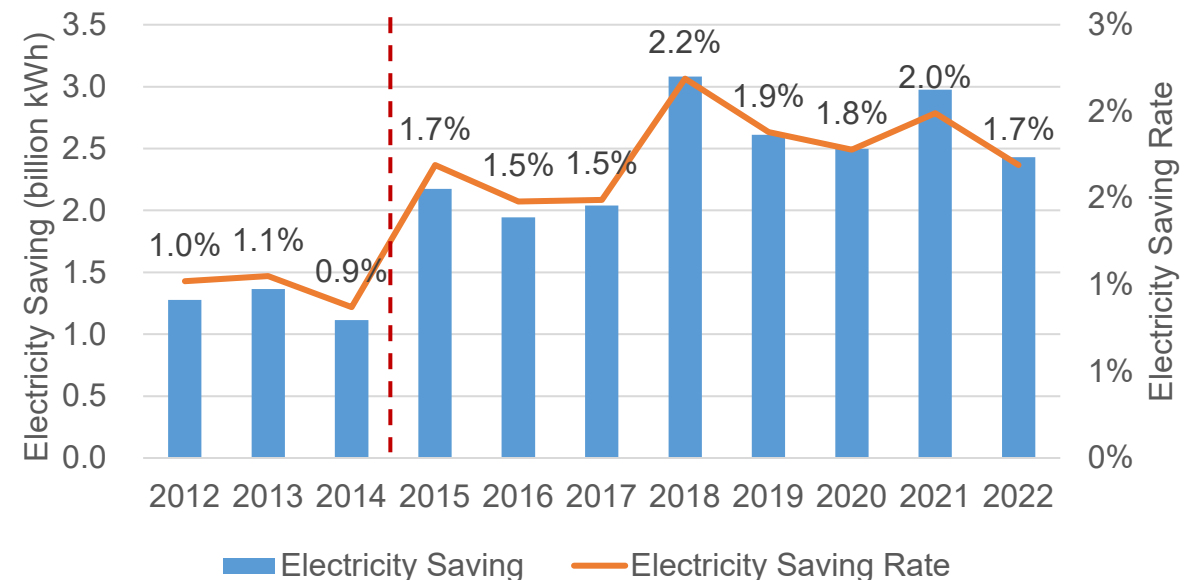
Energy Form	Basis for energy use	Mandatory Obligation
Electricity	Contract capacity > 800kW	1. Set energy management officer . 2. Report the energy audit and energy conservation plan annually .
Fuel oil	> 6,000 KL/y	
Natural gas	> 10,000,000m ³ /y	
Coal	> 6,000 Ton/y	

2-3. Electricity Saving by 1%

- The government mandated a target of 1% electricity saving for LEUs:
Annual average electricity saving (S_i) from 2015 to 2024 must exceed 1% of the annual average total electricity consumption (C_i).

$$\text{Annual average electricity saving rate} = \frac{\sum_{2015}^{2024} S_i}{(\sum_{2015}^{2024} C_i + \sum_{2015}^{2024} S_i)} \geq 1\%$$

- Electricity saving from one energy efficiency measure will be counted only in one year.
- If the LEUs' annual average saving rate less than 1% in 2024, the LEUs will be penalized by the government.



2-4. Regulations for Six Energy Intensive Industries

Industry	Start date	Regulation for Energy Efficiency
Cement	2015.1.1	Maximum allowed specific energy consumption (SEC)* for different manufacturing systems
Iron & Steel	2015.1.1	<ul style="list-style-type: none"> Blast furnace must install a blast furnace gas top pressure recovery turbine Maximum temperature and oxygen concentration in the flue outlet
Pulp & Paper	2015.1.1	Maximum allowed specific energy consumption (SEC)* for different paper types
Chemical	2015.1.1	Maximum temperature and oxygen concentration in the outlets of the furnace, cracker, and thermal oil boiler.
Electronic	2015.11.1	Operation condition for chiller, fan, and desiccant air dryer
Textile	2016.1.1	<ul style="list-style-type: none"> Limit of temperature difference between inlet and exit water in chiller; Maximum temperature and oxygen concentration in flue outlet of coal stoke

*Energy consumptions per product

2.5 Energy Efficiency Subsidies for Industrial Sector

Type	Name	Applicant Eligibility	Subsidy Item	Grant Amount
Equipment-Based	Motor-Driven Equipment Subsidy	All companies	Government provide a list of high efficiency equipment, including IE4 motor, air compressor, fan, and pump.	<ul style="list-style-type: none"> IE4 Motor: 700 NT\$/kW (≐ 22.4 USD/kW) Air Compressor: 700~5,000 NT\$/kW (≐ 22.4~160 USD/kW) Fan: 2,000~2,400 NT\$/kW (≐ 64~76.8 USD/kW) Pump: 2,000~4500 NT\$/kW(≐ 64~144 USD/kW) (dependent on different capacity and model)
Project-Based*	Energy Saving Performance Subsidy	Companies (Contract Capacity over 100 kW)	Energy-saving project with more than a 10% improvement in energy efficiency	<ul style="list-style-type: none"> Subsidy 20% of project total expenditure** Subsidy ceiling is NT\$5 million (160,000 USD).
	Waste Heat Recovery Subsidy	Companies (Contract Capacity over 100 kW)	Energy saving project with waste heat recycle	<ul style="list-style-type: none"> Subsidy 30% of expenditure of waste heat recycle equipment Subsidy ceiling is NT\$5 million (160,000 USD).

* The subsidy program has a fixed total budget, and each application competes with others. The review committee determines the priority order of applications.

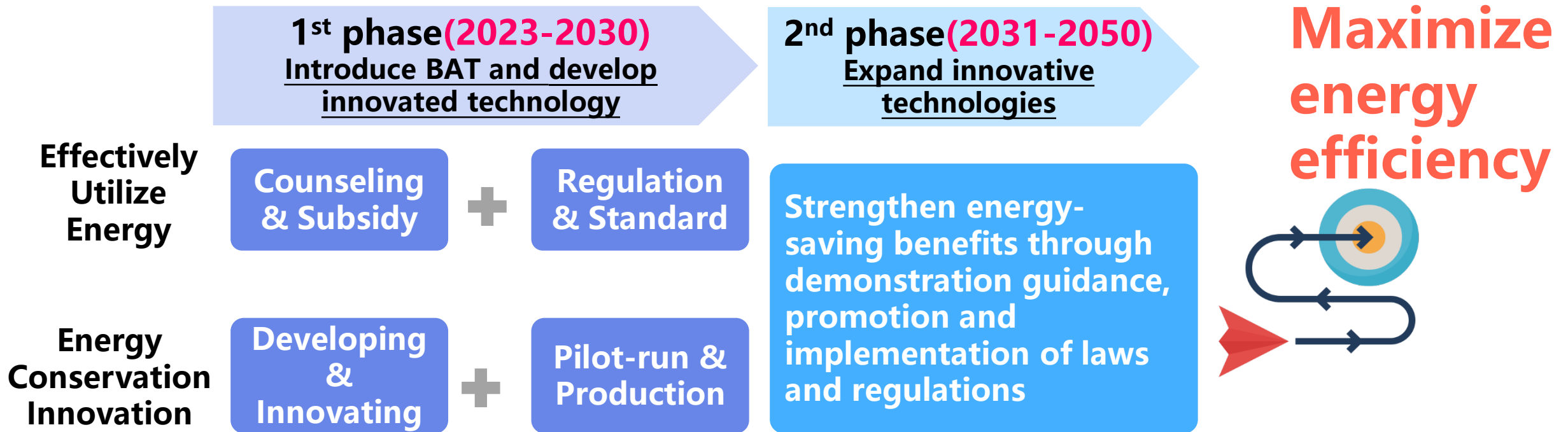
** If applicant is small-medium enterprises, the subsidy rate is 30%.

*** NT\$1 ≐ 4.55 ¥ ≐ USD 0.032

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3-1. Phases of Strategic Plan

Chinese Taipei's "Energy Saving Strategic Plan" consists of two phases:



3-2. Plan Targets and Path (Phase 1)

■ **Target:** Maximizing Energy Efficiency through the efforts of public and private sectors.

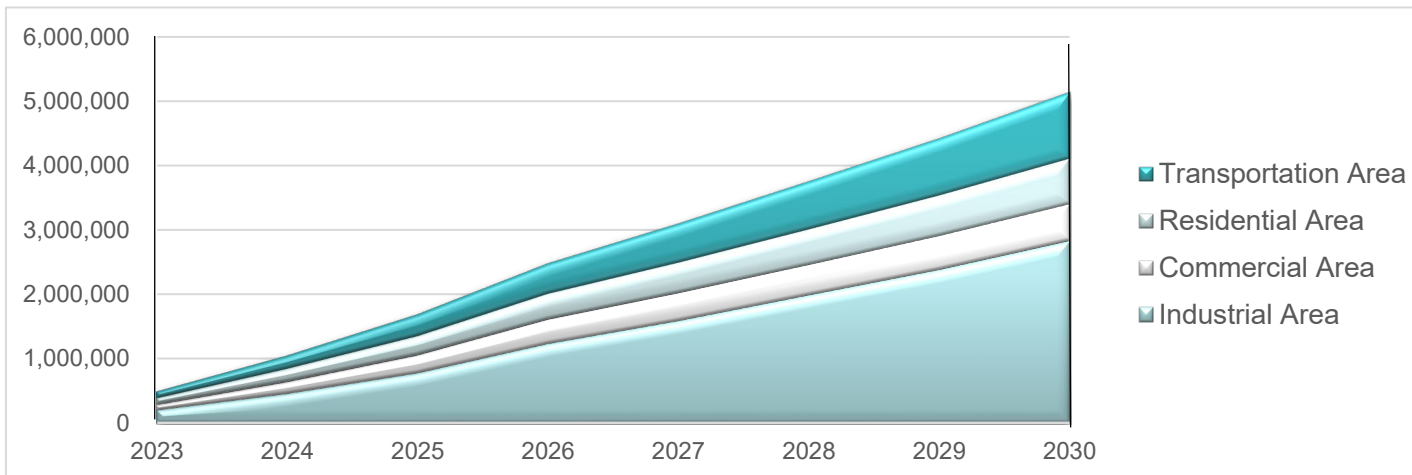
■ **Path:** “Energy Saving Strategic Plan” covers energy saving programs in industrial, commercial, residential, transportation sectors, and advanced technology research.

2025

- Gradually replace process equipment
- Large energy users (50% of the energy usage) is included in ISO 50001
- 700 new green buildings per year
- HVAC-R equipment to be the 1st energy-efficacy level
- Residential buildings efficiency increased by 5%
- Retail lamps 100% use LED.
- Include 2.5 tons+ light-duty trucks energy efficiency management

2030

- Implement high efficiency, low emission equipment
- 60% of the energy consumption of large energy users is included in ISO 50001
- 800 new green buildings per year
- New public buildings to be efficiency level 1 or ZEB.
- 30% of commercial large energy users adopt efficiency level 1 HVAC-R equipment. 100% lightings in commercial buildings use LED.
- Residential building envelope efficiency increased by 10%
- MEPS of AC and refrigerator reach level 3
- Energy efficiency of new cars increased by 30%



Industrial energy saving	<ul style="list-style-type: none"> • Improving manufacturing processes • Counselling on energy-saving measures • Raise corporate energy-saving target and efficiency improvement
Commercial energy saving	<ul style="list-style-type: none"> • Improve equipment operation efficiency or behavior • Low-carbon transformation of business • Green buildings
Residential energy saving	<ul style="list-style-type: none"> • Improve efficiency of new/existing buildings • Improve efficiency of home appliances • Social advocacy and communication
Transportation energy saving	<ul style="list-style-type: none"> • Expand the scope of vehicle energy efficiency management • Change fleet driving behavior • Strengthen the vehicle energy efficiency classification system
Advanced energy saving technology	<ul style="list-style-type: none"> • Develop innovative manufacturing processes • Develop high efficiency equipment • Develop and promote energy management system

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Conclusion

- The **industrial sector** in Chinese Taipei consumes **33%** of the total energy, a significantly higher share than other sectors.
- To enhance industrial energy efficiency, Chinese Taipei is implementing the following measures:

Equipment	Large Energy Users	Incentives
<ul style="list-style-type: none">• MEPS• Energy Efficiency Ranking Labeling	<ul style="list-style-type: none">• Energy Audit Reporting Scheme• Mandatory 1% Electricity Saving Target• Regulations for Six Energy Intensive Industries	<ul style="list-style-type: none">• Motor-Driven Equipment Subsidy• Energy Saving Performance Subsidy• Waste Heat Recovery Subsidy

- To achieve the **2050 Net-Zero**, Chinese Taipei has devised the “**Strategic Plan of Energy Saving**”.

