

Taiwan's Energy Conservation and Carbon Reduction

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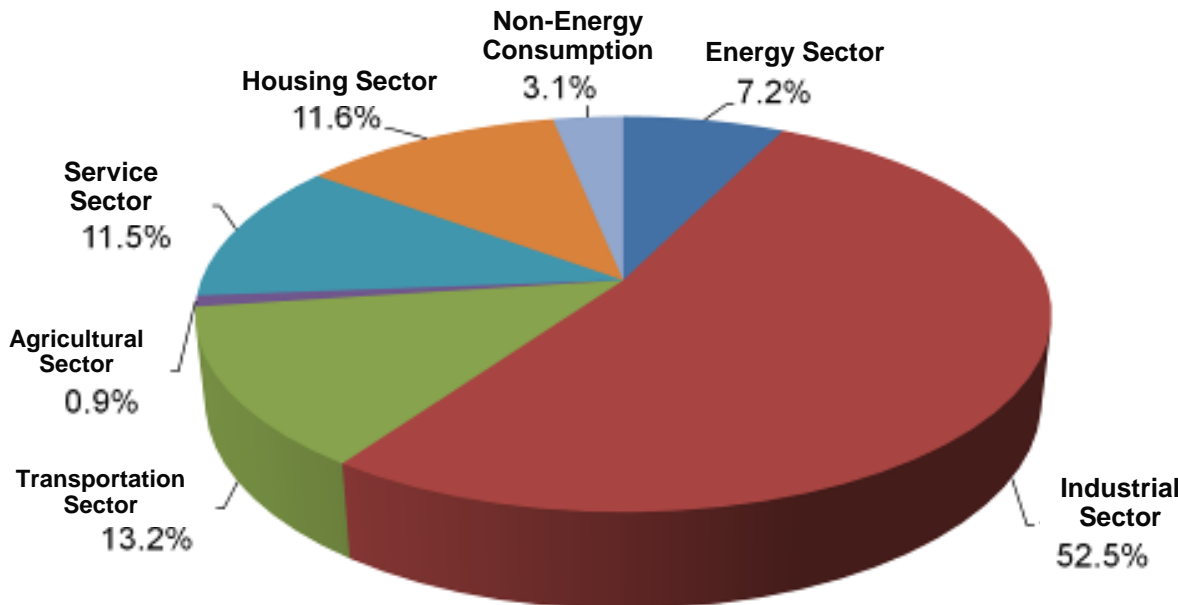
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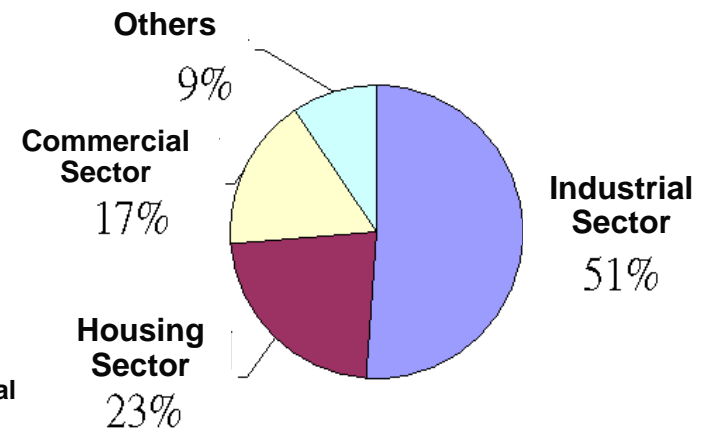
1. Taiwan's Current State of Energy and Green House Gas Emission

- In the 2009 Taiwan final energy consumption, transportation sector, housing sector, and service sector (commercial sector) consist 13.2%, 11.6%, and 11.5% respectively.
- In the 2009 Taiwan's electric power consumption, industrial sector consists 51% of the total power consumption. Housing and commercial sectors consist 23% and 17% respectively.



2009 Energy Consumption Percentage by Sector

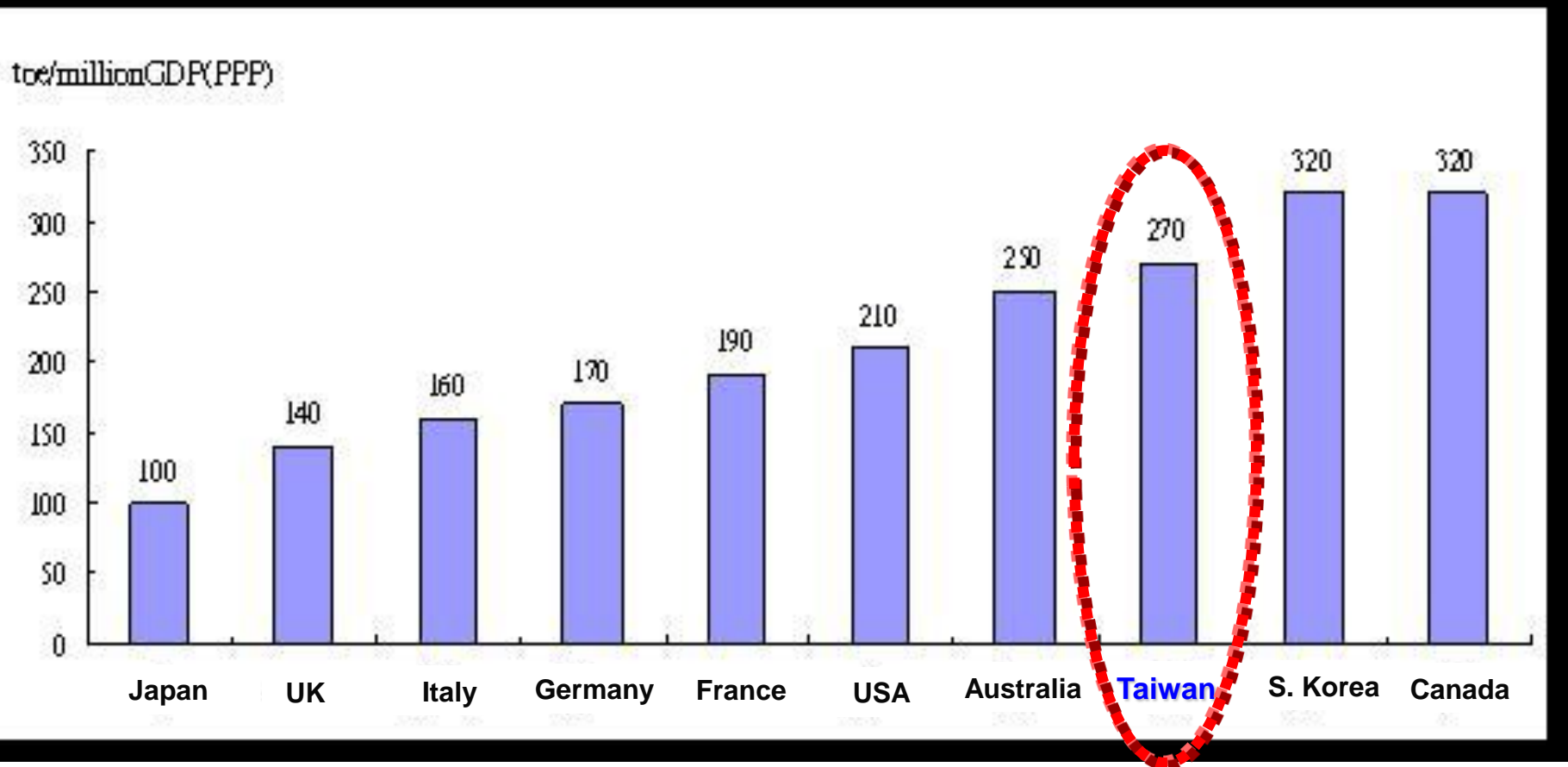
(nationwide energy consumption was 113.1 million kiloliter equivalents)



2009 Electrical Power Consumption by Sector

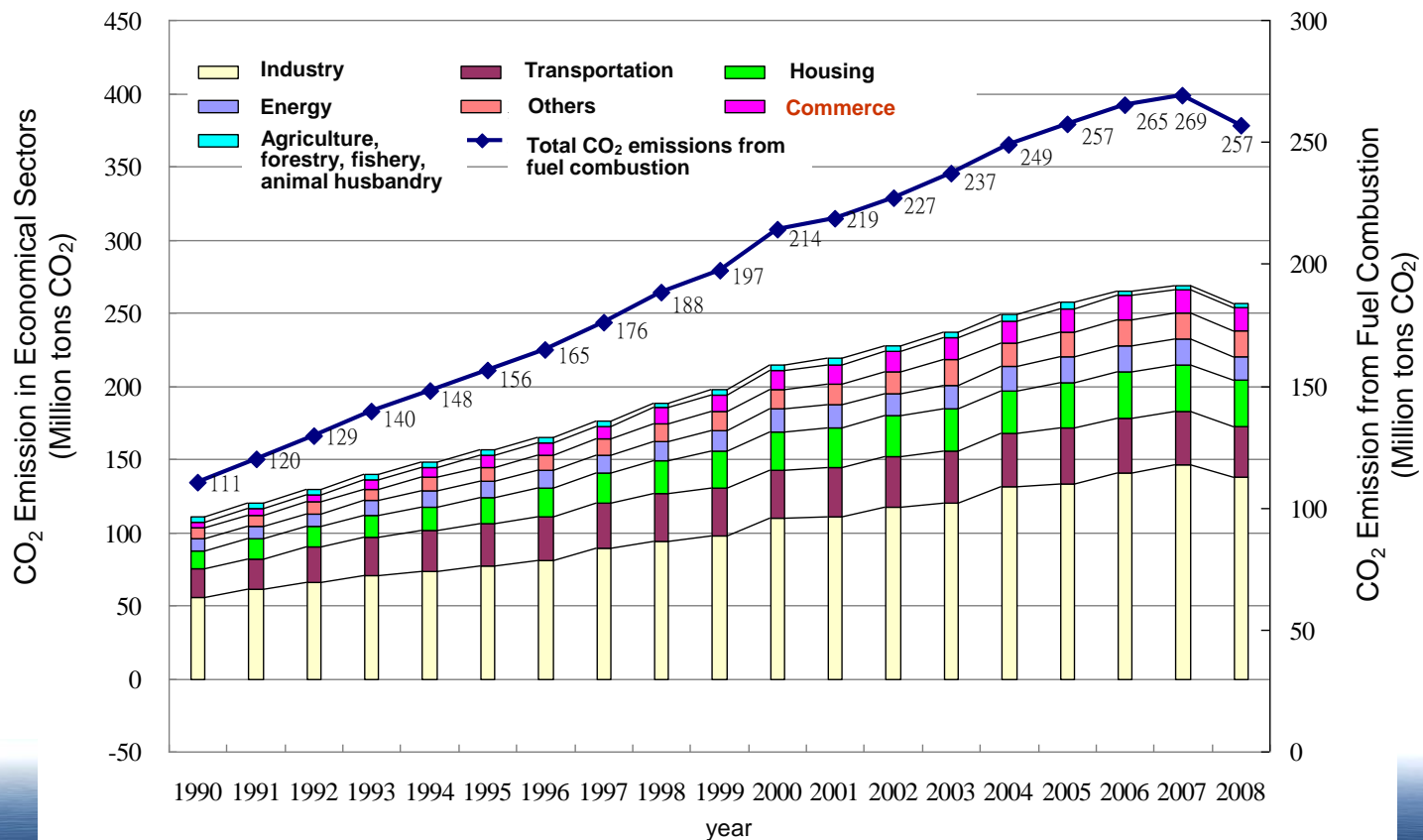
- Taiwan's energy-intensity is comparatively higher than other nations.

Comparison of the Nations (without adjusting purchasing power)



Source : IEA/OECD, KEY WORLD ENERGY STATISTICS, 2008.

- Taiwan's CO₂ emission from fuel combustion between 1990~2008.
- ✚ CO₂ emission between 1990~2008 increased by 132.3%.
- ✚ Taiwan's annual CO₂ emission growth rate from fuel combustion for 2008 became negative for the first time (-4.4%). This can be attributed to:
 - Global financial crisis created an economic recession.
 - After reasonably adjusting Taiwan's energy prices, decreased energy demand is reflected.
 - Government is actively promoting relevant measures on carbon reduction and energy conservation.



2. Taiwan's Policy on Energy Conservation and Carbon Reduction

- **Since taking the office, President Ma has been promoting Taiwan to be a low carbon society as a priority policy.**
 - The Sustainable Energy Policy Guideline was raised in June 2008.
 - The third National Energy Conference was convened in April 2009.
 - The amendment draft of Energy Management Law was announced on 7/8/2009 to promote energy efficiency regulation and create an energy efficiency classification system to promote energy saving technology and products.
 - Statute for Renewable Energy Development was promulgated in 7/8/2009 to promote the development of renewable energy.
 - Greenhouse Gas Reduction Act is currently in the Legislative Yuan, and the Energy Tax Statute is being drafted in the Executive branch.
 - Executive Yuan established the cross-ministry Energy-Saving and Carbon-Reducing Promotion Committee and New Energy Development Promotion Committee in the end of 2009.

Sustainable Energy Policy Framework (2008 / 6 / 5)

Efficient

Improve Energy Efficiency

- Energy efficiency raised annually by 2% for the next 8 years; energy intensity reduced by 20% by 2015 from 2005.
- Reduced by more than 50% via technical breakthrough and complementary measures

Clean

Develop Clean Energy

- CO2 emission reduced to 2008 level between 2016~2020, reduced to 2000 by 2025, and reduced to 2000's 50% by 2050
- Among power generators, low carbon energy increased from 40% to over 55% by 2025.

Stable

Ensure Stable Energy Supply

- Establish a safe energy supply system for future economic development
- Increase dependence on domestic energy sources

The 2 Highs and 2 Lows Energy Consumption Model and Energy Supply System

High Efficiency

Increase energy utilization and generation efficiency

High Value

Increase added value in energy utilization

Low Emission

Pursue low-carbon and low-pollution energy supply and consumption

Low Reliance

Reduce reliance on fossil and imported energy

Sustainable Energy Policy Framework

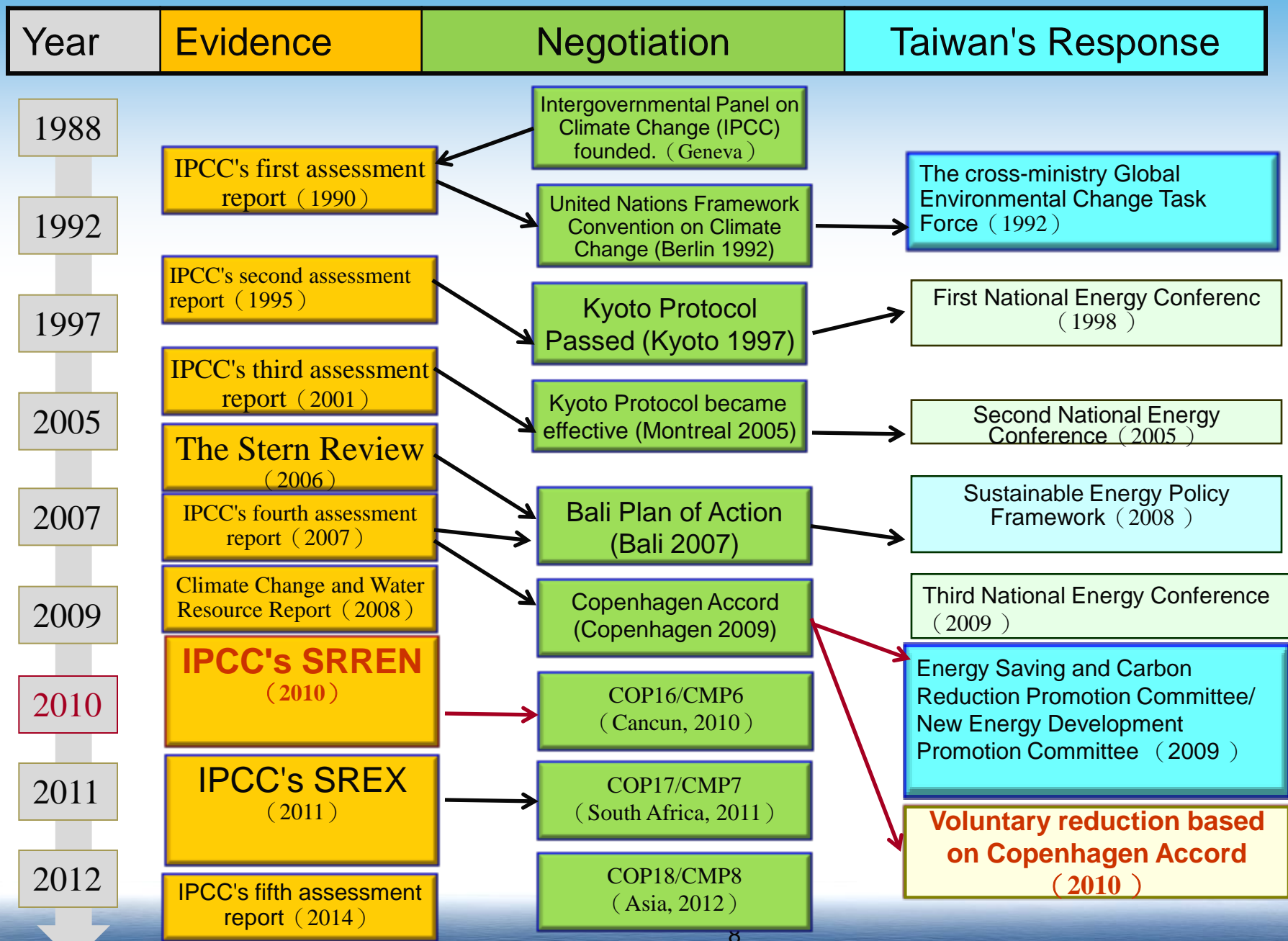
Clean Source

Supply Side

Reduce Consumption

Demand Side

International Climate Negotiation History and Developmental Trend

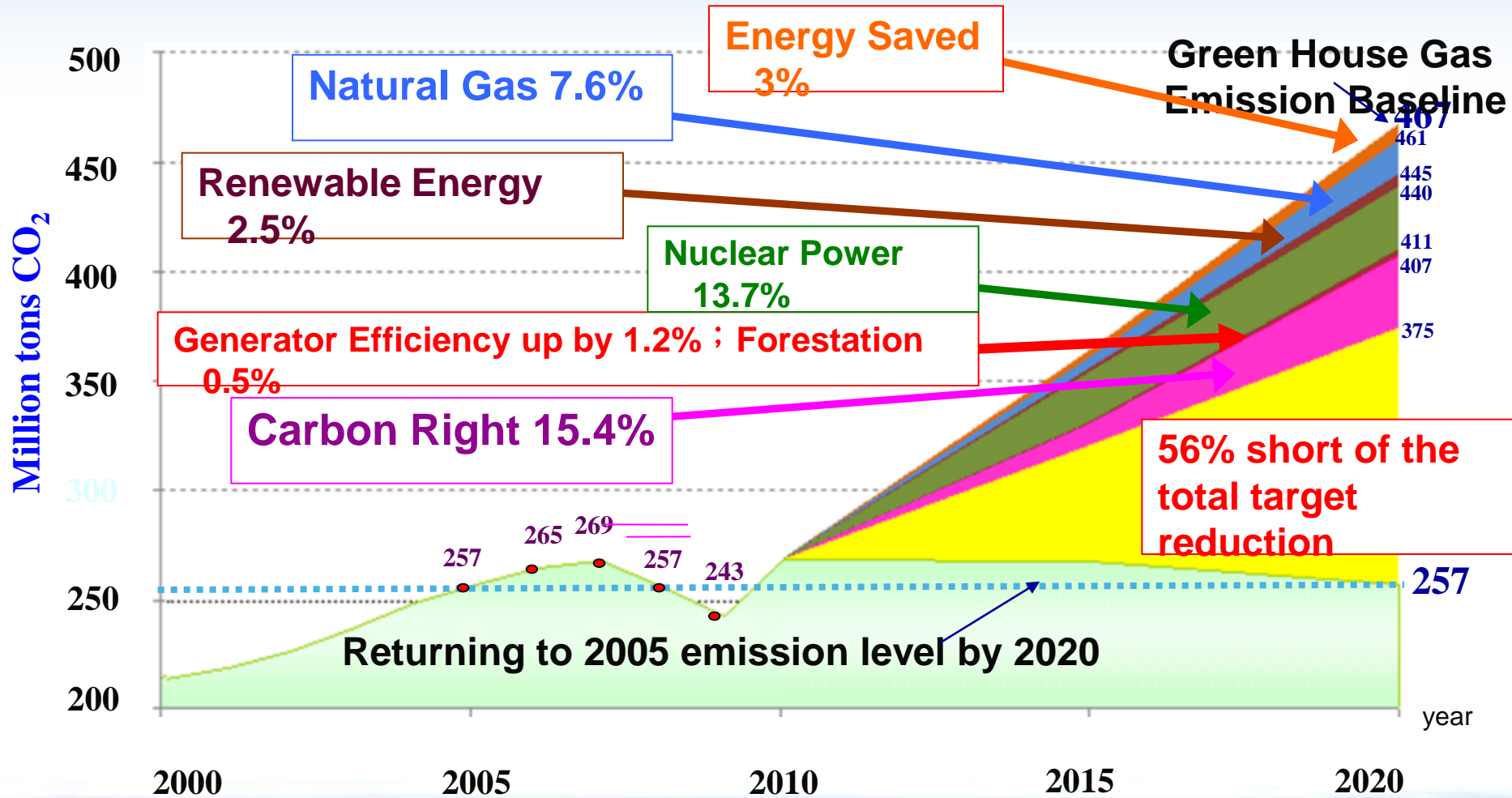


❖ Taiwan's 2010 Announcement of CO2 Reduction Target by 2020

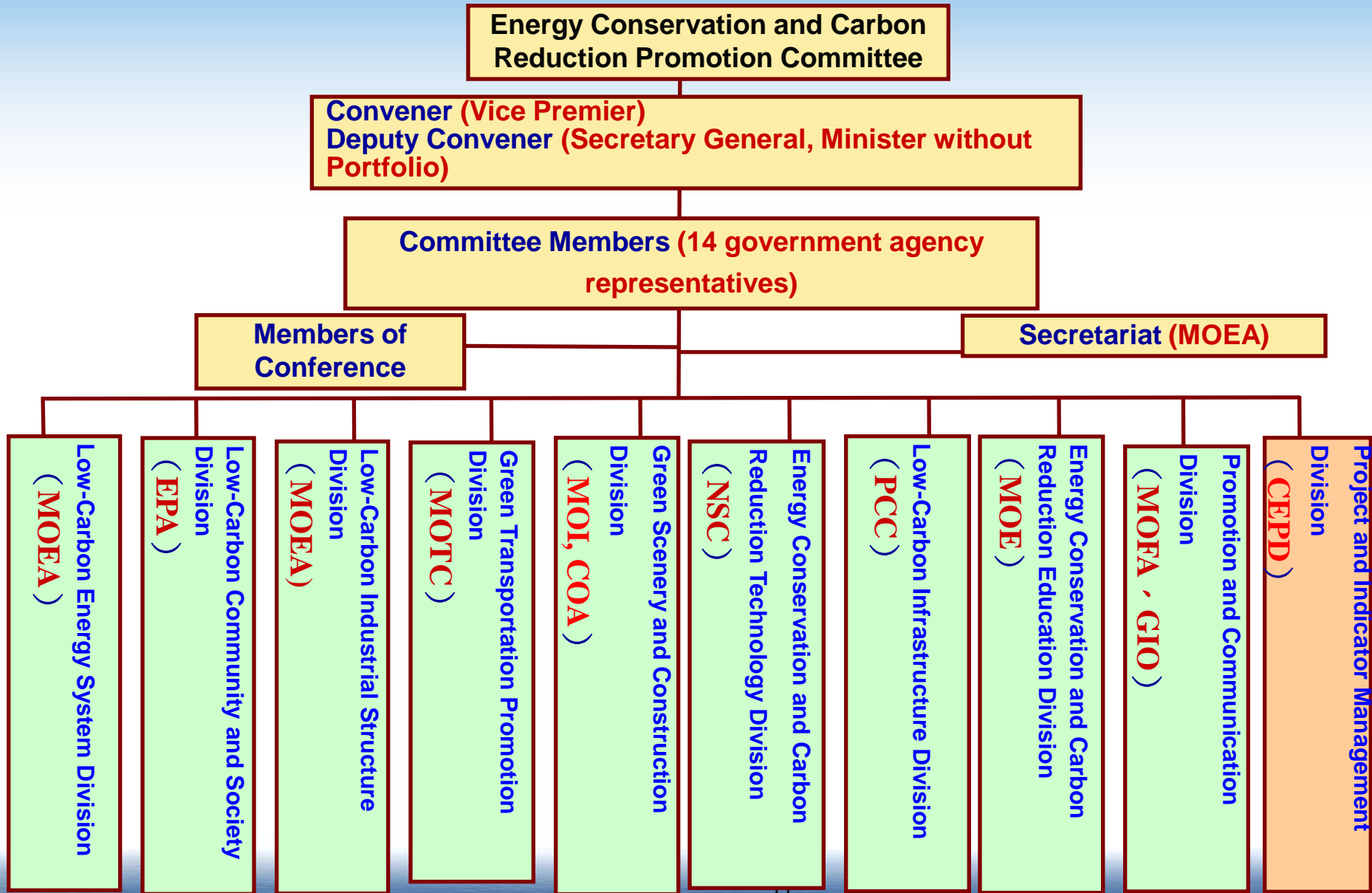
- EPA estimates under the condition of business as usual (BAU), CO2 emission by 2020 will reach 467 million tons.
- Government has announced that 2020 CO2 emission will be maintained at 2005 level of 257 million tons. Thus, Taiwan's actual CO2 emission needs to be reduced by 210 million tons by 2020, approximately 45%.
- South Korea and Singapore, both Taiwan's main competitors, have carbon reduction targets of 30% and 16% respectively. And IPCC recommends 15~30% reduction for developing nations. Thus, Taiwan voluntarily promised to reduce by over 30% according to UNFCCC in June 2010.

Taiwan's Challenge in Energy Conservation and Carbon Reduction

- The ministries could only promise energy saving plans which would reduce CO2 emissions equal to 3% of the reduction target by 2020.

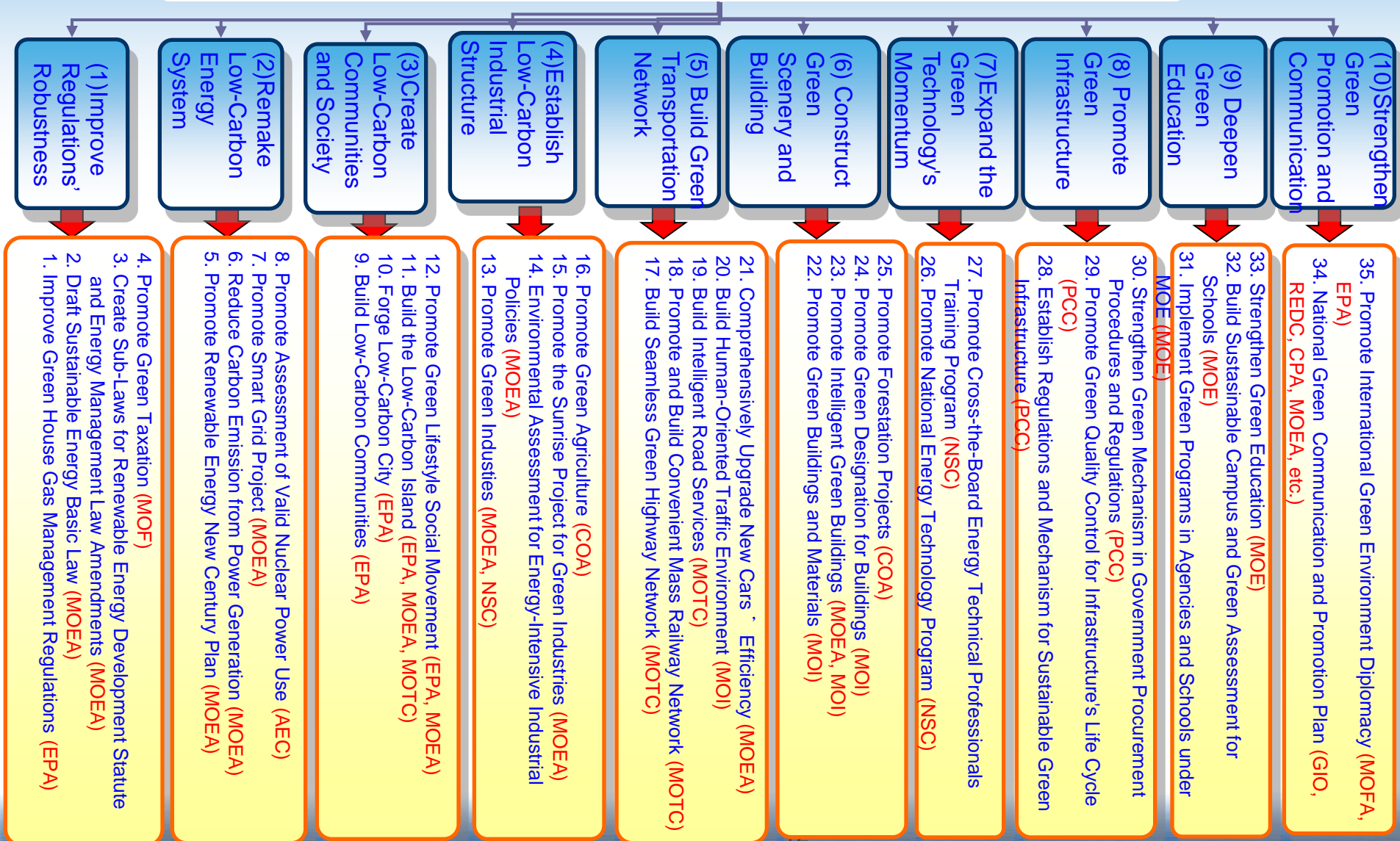


Organization of the Energy Conservation and Carbon Reduction Promotion Committee



- MOEA raised the National Energy-Saving and Carbon-Reducing General Plan in the Promotion Committee in March 2010.

National Energy-Saving and Carbon-Reducing General Plan: 10 Major Benchmark Projects/35 Benchmark Plans



Objectives

1. Energy Conservation

Energy efficiency increased by over **2%** annually for the next 8 years; energy intensity reduced by over **20%** from **2005** level in **2015**; reduced by over **50%** by **2025** via technical breakthroughs and complementary measures.

2. Carbon Reduction

The national CO₂ emission will return to the **2005** level between **2016~2020** and return to **2000** level by **2025**.

Result of Taiwan's Current Energy Conservation and Carbon Reduction

- 1. Since taking the office, President Ma has actively promoted energy conservation and carbon reduction. As a result, Taiwan's annual energy intensity average was reduced by 2.68% between 2007~2010.**
- 2. Growth of national demand for electrical power has been negative for the past 3 years, a 7% save.**
- 3. 2010 is the Year of Energy Conservation and Carbon Reduction; 2010's energy intensity was a record low, a 3.97% drop from 2009.**
- 4. President promoted the 4-Saves Movement in 2011, saving electricity, oil, water, and paper.**

Taiwan's Energy Intensity Fluctuations between 1980~2010

	Annual Change (%)
1980-1999	-1.91
1999-2007	-0.01
2007-2009	-2.03
2007-2010	-2.68

The Golden Decade: the Sustainable Environment

Chapter

1. On 10/6, Taiwan's government announced the Sustainable Environment vision of its Golden Decade planning. 4 green energy and carbon reduction objectives were raised:

- (1) Nationwide CO2 emission to return to 2005 level by 2020.
- (2) Energy efficiency raised by over 2% annually; energy intensity reduced by 12% of the 2010 level by 2016 and by 18.3% of the 2010 level by 2020.
- (3) Renewable energy deployment capacities for 2016 and 2020 will be 4580,000 kw and 6040,000 kw respectively. Annual generations will be 12.2 and 16.1 billion kwh (approximately the annual consumption of 4030,000 households).
- (4) Promote low-carbon homes and push for green new lifestyle and consumption.

❖ Primary strategies for CO2 emission reduction are:

- (1) Efficient use of Taiwan's natural resources, expand the promotion of various renewable energy, and develop sustainable energy.
- (2) Popularize wind power, develop land wind fields first, and then expand to offshore.
- (3) Methodically expand photovoltaic deployment under the principles of slow first and quick second as well as roof first and ground second.
- (4) Encourage valid low-carbon natural gas utilization.

The End
Thank You!

Key Information regarding Taiwan's LCS

- Taiwan's CO₂ emissions is about ¼ of Japan's CO₂ emissions.
- Taiwan's energy intensity is 2.5 times of Japan's energy intensity.
- CO₂ emission in 2010 was about 255 million metric tonnes.
- CO₂ emission has increased by 130% from 1990 to 2010, but has no significant increase from 2005 to 2010.
- CO₂ emissions will reach 467 million metric tonnes by 2020 under the condition of BAU.

Key Information regarding Taiwan's LCS

(Kyoto Protocol announced-1997)

- First National Energy Conference - 1998

(Kyoto Protocol became effective-2005)

- Second National Energy Conference - 2005

(Bali Action Plan-2007)

- Sustainable Energy Policy Guideline - 2008
- Third National Energy Conference - 2009

〔 develop *Low carbon, sustainable homeland plan* 〕

(Copenhagen Accord-2009)

- Energy Saving and Carbon Reduction Promotion Committee (chaired by Vice Premier) - 2009
- Carbon Reduction Target (over 30% by 2020) - 2010
- National Energy-Saving and Carbon-Reducing General Plan in the Promotion Committee (10 major benchmark projects/ 35 benchmark sub-projects) - 2010
- The Sustainable Environment Chapter of the Goden Decade Vision: Green energy and carbon reduction objectives - 2011

Key Information regarding Taiwan's LCS

*Taiwan's Low Carbon, Sustainable Homeland
Plan developed since 2009*

- Establish 50 low-carbon communities in 2011.
- Establish 6 low-carbon cities (including 2 low-carbon islands) in 2014.
- Establish 4 low-carbon, sustainable life-cycles cover the whole Taiwan in 2020.

Taiwan's Model Activities

Dynamic Generalized Equilibrium Model of Taiwan (DGEMT)

- Developed by Dr. Liang, Chi-Yuan (Chairman, CIER)
- DGEMT consists of the following four sub-models: (1) the producer's model; (2) the consumer's model; (3) the macroeconomic model developed by Directorate-General of Budget, Accounting and Statistics; and (4) ITRI's MARKAL engineering energy model.

Several CGE models for energy research have been developed by Taiwan's universities

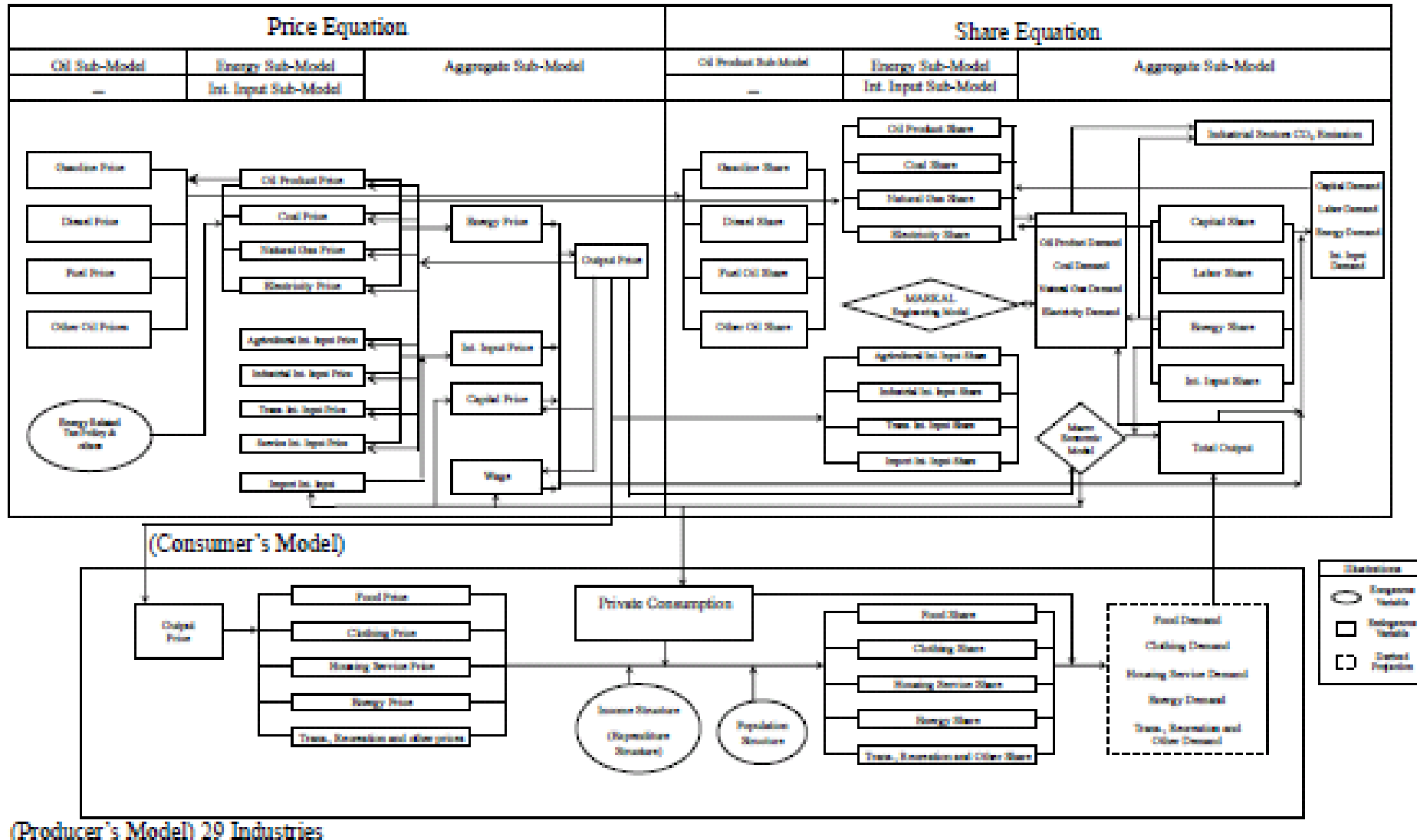
MARKAL engineering energy model

- ITRI
- INER

Taiwan's Model Activities

Dynamic Generalized Equilibrium Model of Taiwan (DGEMT)

Diagram 1 The Simulation Framework of the DGEMT Model



Taiwan's Model Activities

Taiwan's two bottom-up GHG abatement cost curve projects in 2011

- The Chun-Hua Institution for Economic Research (CIER) has cooperated with the McKinsey Co. to develop a 2030 GHG abatement cost curve including 113 technological measures.
- The Industrial Technology Research Institute (ITRI) has also developed a 2030 GHG abatement cost curve including 79 technological measures.
- All measures did not include the measures for behavior changes
- Less than 1/3 of measures were studied by both research groups, thus their works should be reviewed and updated in the future.