EGNRET and EGEE&C Joint Meeting

Energy Situation in Chinese Taipei

Bureau of Energy
Ministry of Economic Affairs

13 April, 2016 Chinese Taipei

Outline

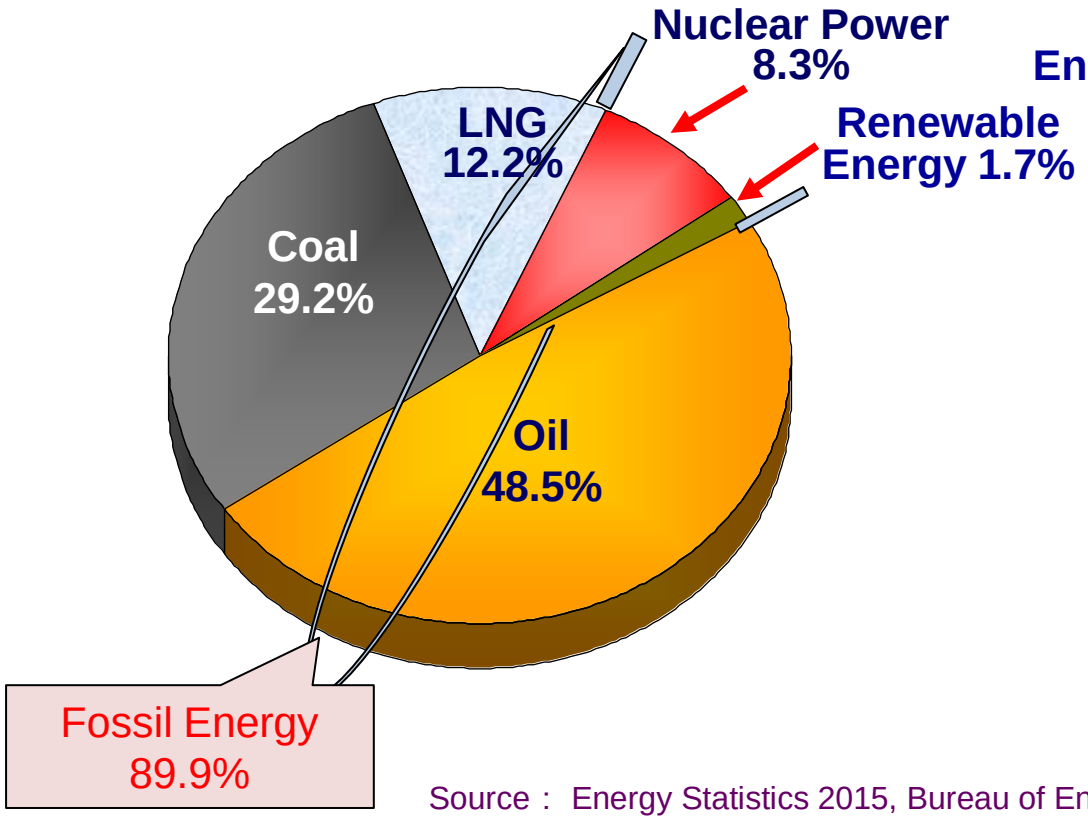
1. Energy Situation
2. Energy Policy Framework
3. Renewable Energy Development
4. Energy Efficiency Management
5. Concluding Remark

Energy Situation

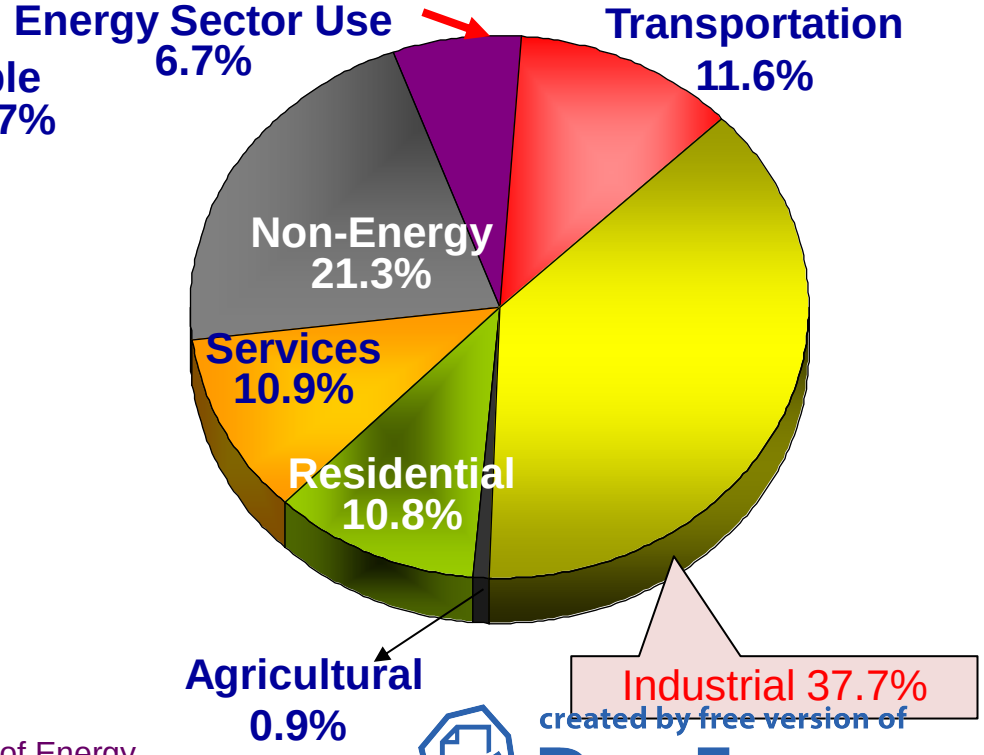
1. Energy Situation (1/4)

◆ Structure of Energy Supply and Consumption

Energy Supply Structure in 2014
(147.45 MKLOE)



Energy Consumption Structure by Sector in 2014
(115.32 MKLOE)

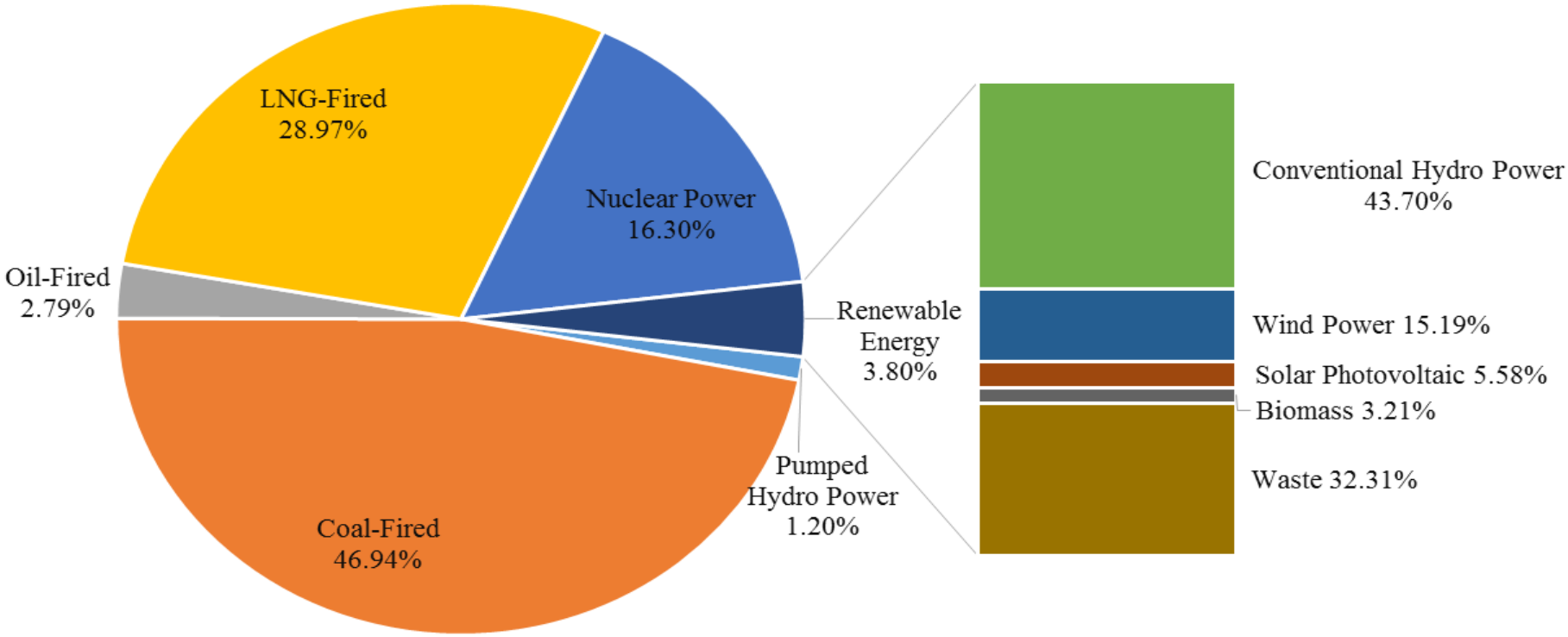


Source： Energy Statistics 2015, Bureau of Energy.

1. Energy Situation (2/4)

◆ Structure of Electricity Generation in 2014

Structure of Electricity Generation (by Fuel) in 2014
(Total 260,026.7 GWh)

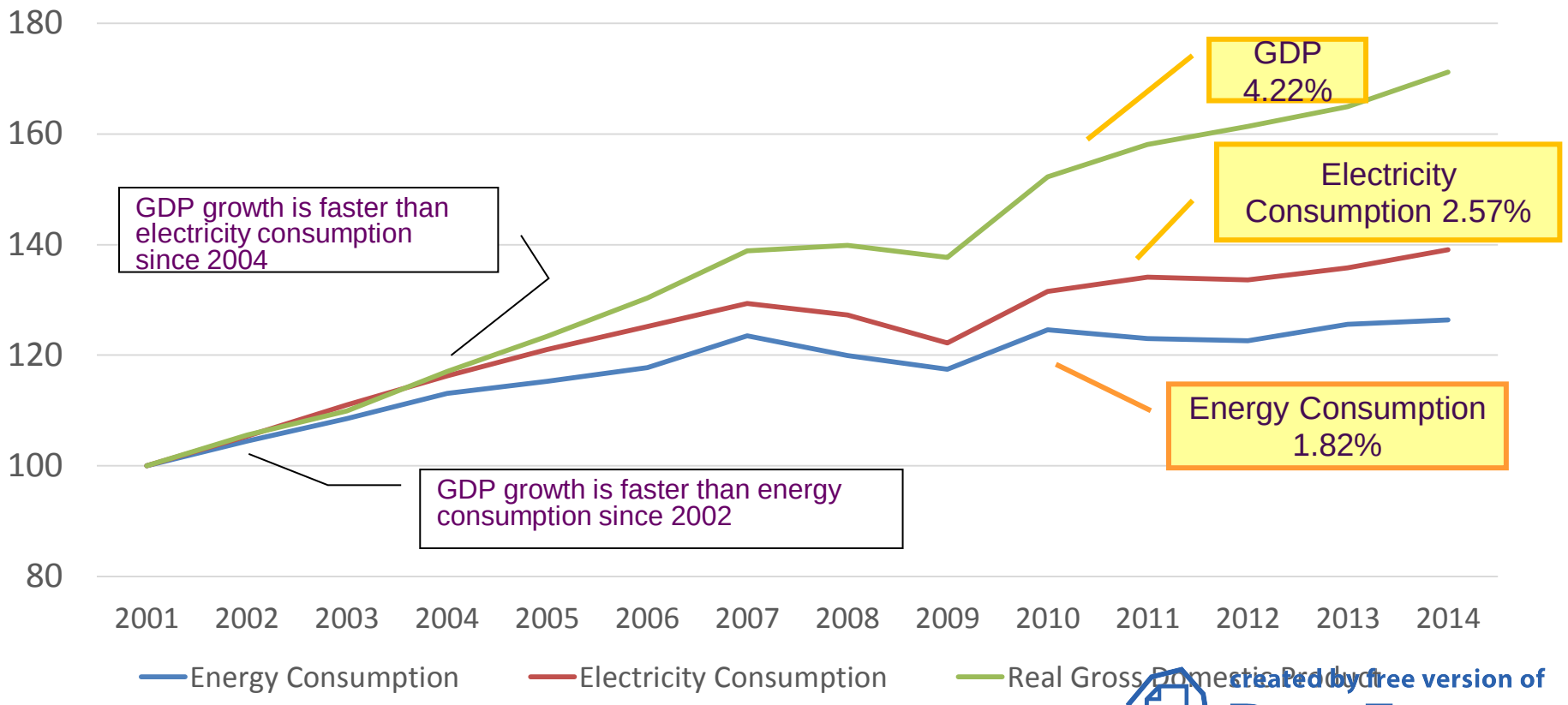


Source： Energy Statistics 2015, Bureau of Energy.

1. Energy Situation (3/4)

◆ Trend of GDP and Energy Consumption

Trend of GDP, Energy and Electricity Consumption Growth

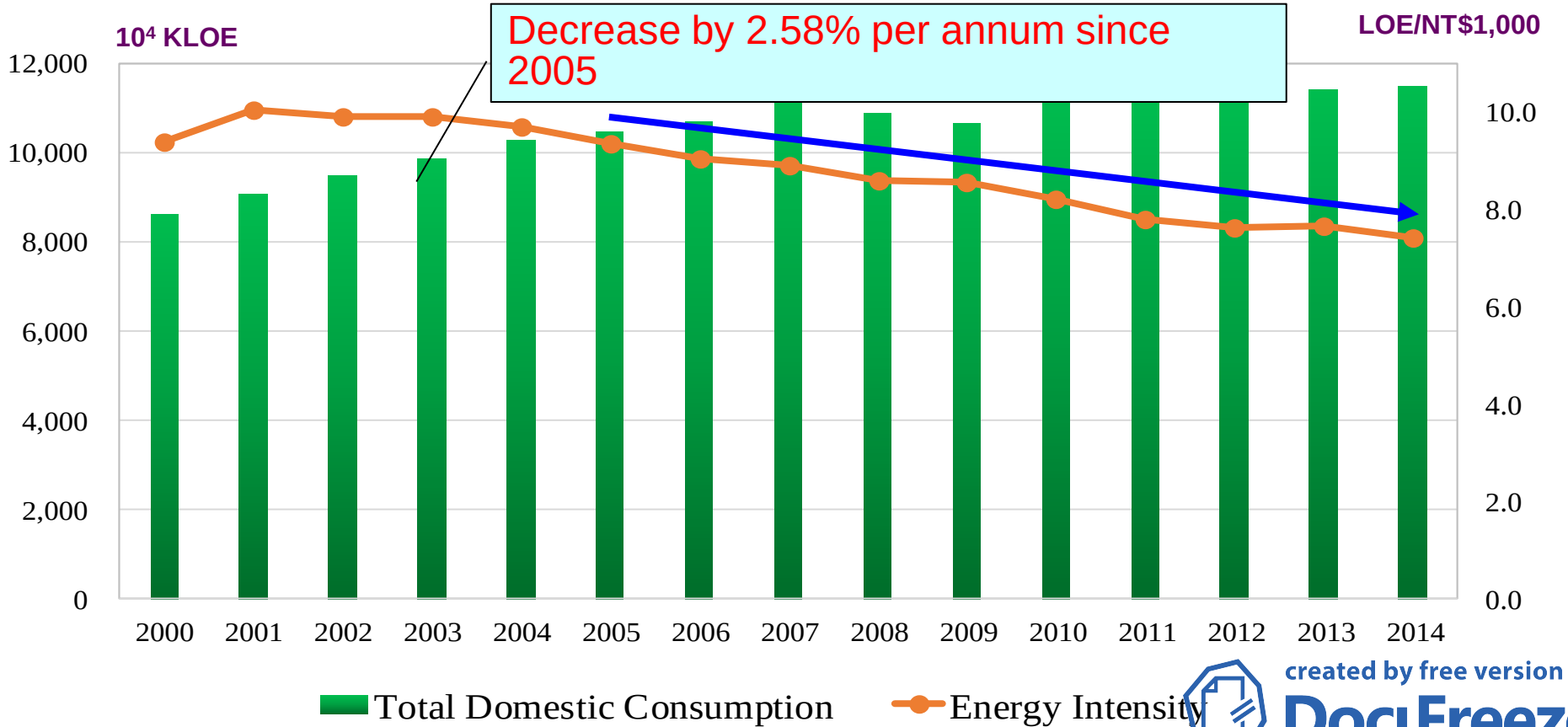


Source： Energy Statistics 2015, Bureau of Energy.

1. Energy Situation (4/4)

◆ Trend of Energy Consumption and Energy Intensity

Energy Consumption and Energy Intensity from 2000-2014



Source： Energy Statistics 2015, Bureau of Energy.

Energy Policy Framework

2. Energy Policy Framework (1/4)

◆ **"New Energy Policy" was approved in Nov. 2011.**

1. Policy objectives

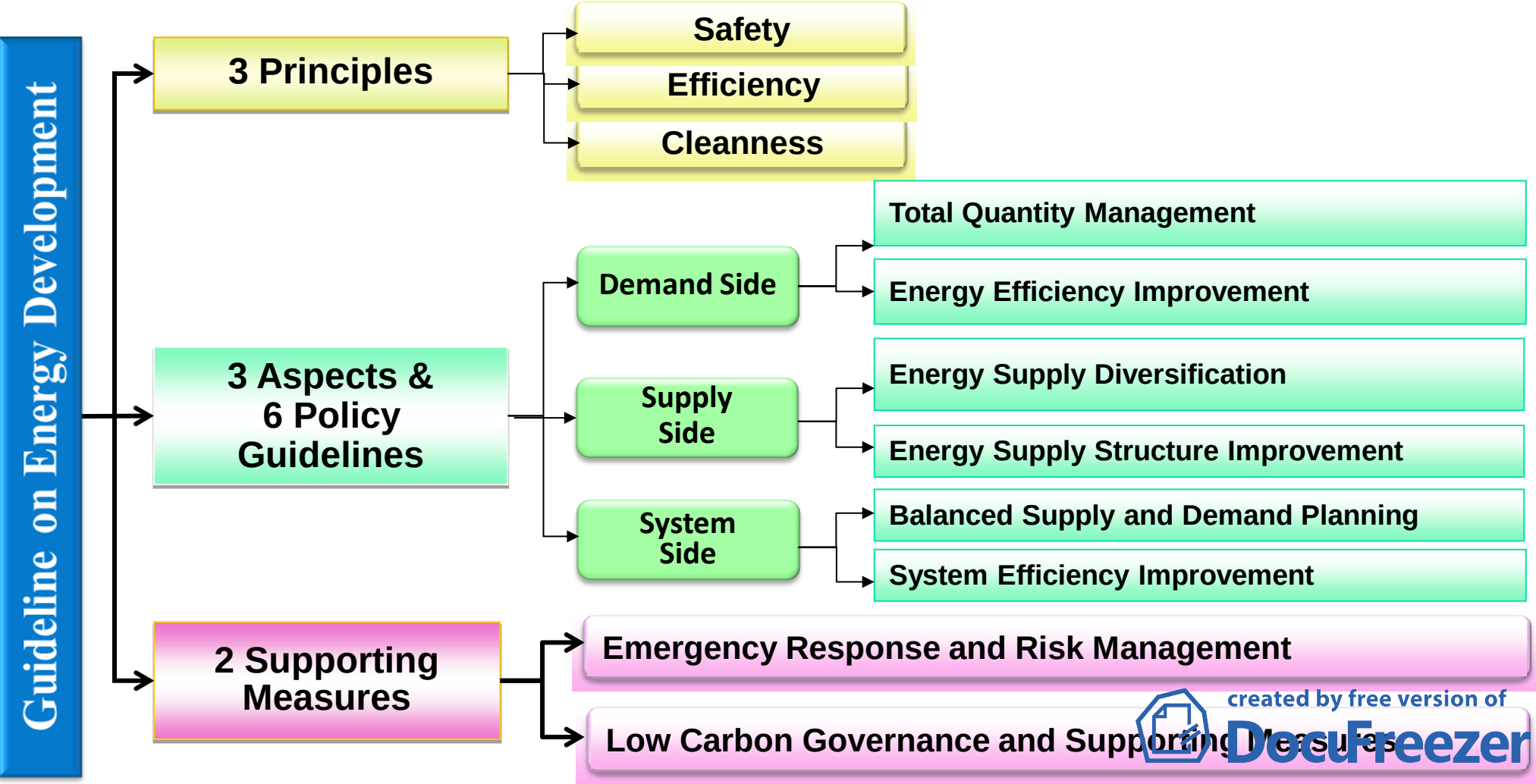
- ◆Ensure nuclear safety
- ◆Steadily reduce nuclear energy dependence
- ◆Create a friendly low-carbon green energy environment
- ◆Gradually move towards a nuclear-free homeland

2. Principles

- ◆Ensure no restrictions on electricity use
- ◆Maintain reasonable electricity tariff rates
- ◆Fulfill the international carbon reduction commitment

2. Energy Policy Framework (2/4)

◆ Guideline on Energy Development (2012)



2. Energy Policy Framework (3/4)

◆ Carbon Emission Reduction Target

1. Greenhouse Gas Reduction and Management Act (2015)

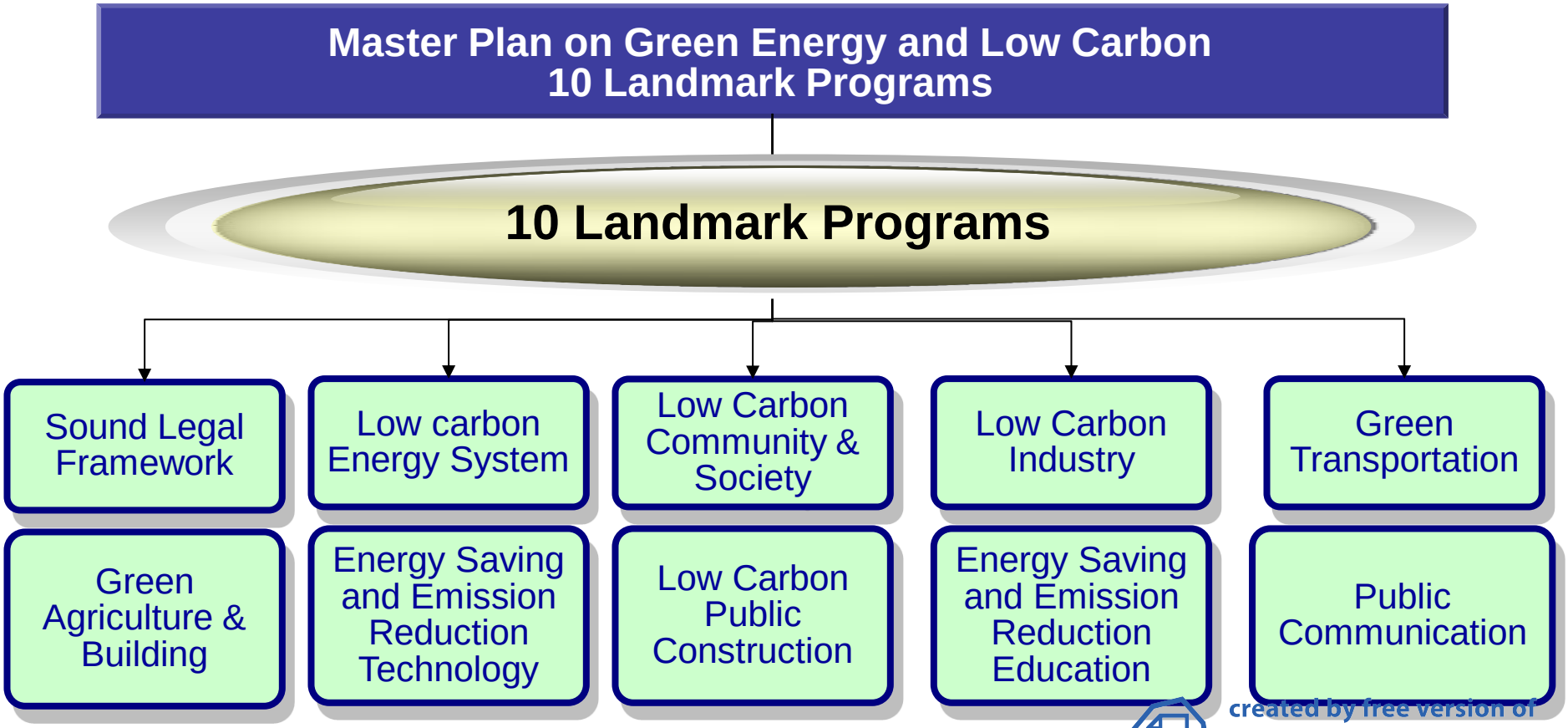
- Corresponding to the latest progress of **United Nations Framework Convention on Climate Change (UNFCCC)**, the Greenhouse Gas Reduction and Management Act was passed in June, 2015.
- **Greenhouse Gas Reduction and Management Act (2015):**
  Emission target will be reduced (baseline 2005) 50% by 2050, which means that GHGs emission will be regulated to reduce from 249 million tonnes to 125 million tonnes.

2. Intended Nationally Determined Contribution (2015)

- In supporting the **21st Conference of the Parties (COP21) to UNFCCC**, and in response to the **Lima Call for Climate Action**, the Intended Nationally Determined Contribution (INDC) target was announced in November, 2015.
- **Intended Nationally Determined Contribution (2015):**
  The economy-wide emission target is to reduce the GHGs emission (214 $MtCO_2eq$) by 50% from the business-as-usual level (428 $MtCO_2eq$) by 2030, equivalent to a reduction of emission by 20% below the 2005 level.

2. Energy Policy Framework (4/4)

◆ Master plan on Green Energy and Low Carbon



Renewable Energy Development

3. Renewable Energy Development(1/11)

(1) Renewable Energy Targets

- The Ministry of Economic Affairs raised the renewable energy target to 17,250 MW for 2030 (was 10,858 MW set in 2010), which is its third-time upward adjustment for the renewable energy target.

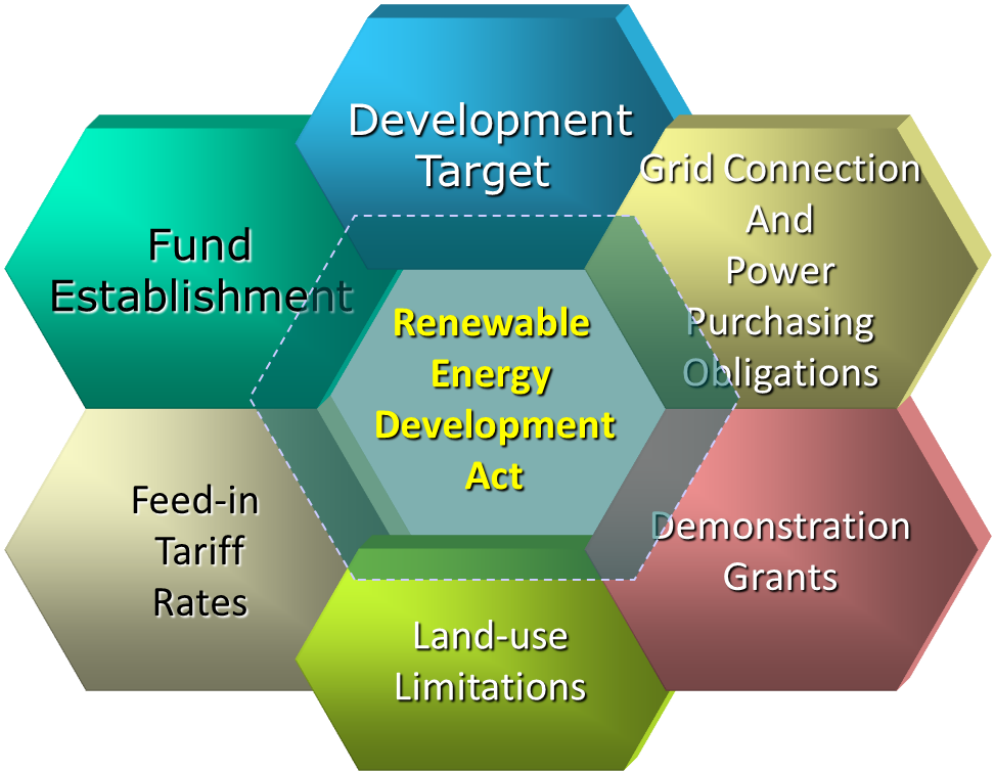
	Capacity of Renewable sources (MW)					
Year	2013	2014	2015	2020	2025	2030
On-shore Wind	614	637	737	1,200	1,200	1,200
Off-shore Wind	0	0	0	520	2,000	4,000
Hydro Power	2,081	2,081	2,089	2,100	2,150	2,200
Solar PV	392	620	1,115	3,615	6,200	8,700
Geothermal	0	0	0	100	150	200
Biomass	741	741	741	768	813	950
Total	3,828	4,079	4,682	8,303	12,513	17,250
Share of Total System	7.8%	8.4%	9.6%	15.0%	20.6%	27.1%

	Electricity generated from renewable sources (GWh)					
2013	2014	2015	2020	2025	2030
1,600	1,500	1,800	2,900	2,900	2,900
0	0	0	1,800	6,800	13,600
5,400	4,300	4,600	4,700	4,800	4,900
300	600	1,400	4,500	7,800	10,900
0	0	0	600	1,000	1,300
3,400	3,500	5,400	5,600	5,900	6,900
10,800	9,900	13,200	20,100	29,200	40,500
4.3%	3.8%	5.0%	7.0%	9.5%	12.6%

3. Renewable Energy Development(2/11)

(2) Renewable Energy Development Act

- In order to systematically promote renewable energy, in July of 2009, Chinese Taipei promulgated the ***Renewable Energy Development Act***.
- **The core strategy of the Act is a Feed-in-Tariff system**.



3. Renewable Energy Development(3/11)

(3) Mechanism of Feed-in Tariffs

- Current, only Solar PV tariff rates are set on date when generating equipment installations are completed. Other technologies have tariff rates set on the Power Purchasing Agreement (PPA) signing date.
  - ➔ **tariffs applied for 20 years**
  - ➔ **PPA is a very important credit for banks to provide project financing**
- **announces PV capacity quota every year.** PV systems > 100 kW are subject to a bidding procedure to decide tariffs. Developers proposing higher discount rates receive the priority to get the quota.
- **The installed capacity of PV systems has been increased by more than 60 times in 5 years after the implementation of FIT**

3. Renewable Energy Development(4/11)

(4) Principles of Renewable Energy Ddevelopment

- Five principles have been considered to expand our renewable energy development and maximize potentials：

1. **Subject to technological maturity and feasibility**
2. **Cost effectiveness**
3. **Development in phases**
4. **Acceptable increase in electricity price**
5. **Facilitating development of related industries**

3. Renewable Energy Development(5/11)

(5)Development Strategy

- To prompt solar PV and offshore wind power, Thousand Wind Turbines and Million Solar Rooftop PVs promotion programs were approved in 2012.

3. Renewable Energy Development(6/11)

(5)Development Strategy

Thousand Wind Turbines Program - Strategies for Offshore Wind

- **Feed-in Tariff** (tariffs for 2015 as below)
  - **Option #1:** US$ 0.1794 / kWh for 20 years
  - **Option #2:** US$ 0.2221 / kWh for the first decade and US$ 0.1081 / kWh for the second
    (assuming exchange rate: US$ 1 = NT$ 32)
- **Offshore Demonstration Incentive Program (DIP)**
  - **4 Demonstration Turbines by 2016, 3 Demonstration Wind Farms by 2020**
  - **Government provides subsidy for both equipment & developing processes.**
- **Directions of Zone Application for Planning (ZAP)**
  - **36 Zones of Potential revealed for preparation in advance of Zonal Development**
  - **Applicants must acquire EIA consent by 2017 and Preparation Permit by 2019.**
- **Offshore Zonal Development**
  - **To be announced by 2017 while SEA is currently in progress**
  - **Commercial scale for cost reduction**

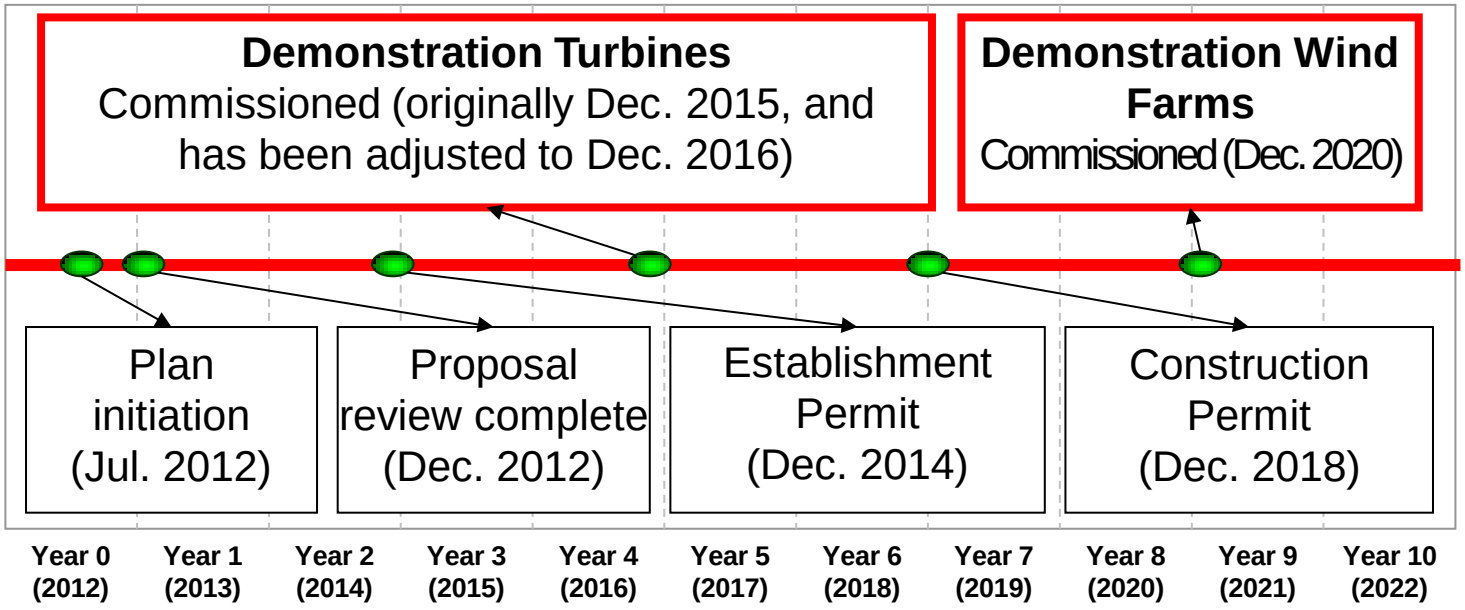
3. Renewable Energy Development(7/11)

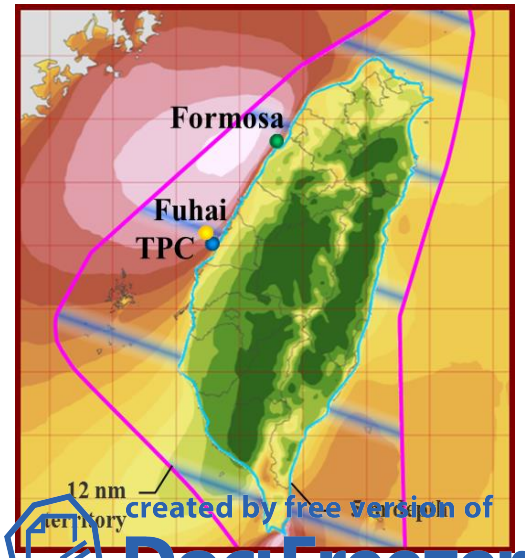
(5)Development Strategy

Thousand Wind Turbines Program – Offshore Demonstration Incentive Program

◆ Demonstration Wind Farms

- 3 demonstration projects (Fuhai, Formosa & TPC) officially announced on 9th January 2013
- To subsidize 50 % cost of the Demonstration Turbines (FIT advances/interest-free loan)
- To subsidize NT$ 250 million for preparatory (wind mast, EIA, etc.) expense
- To confirm feasibility in terms of administration, technology and finance



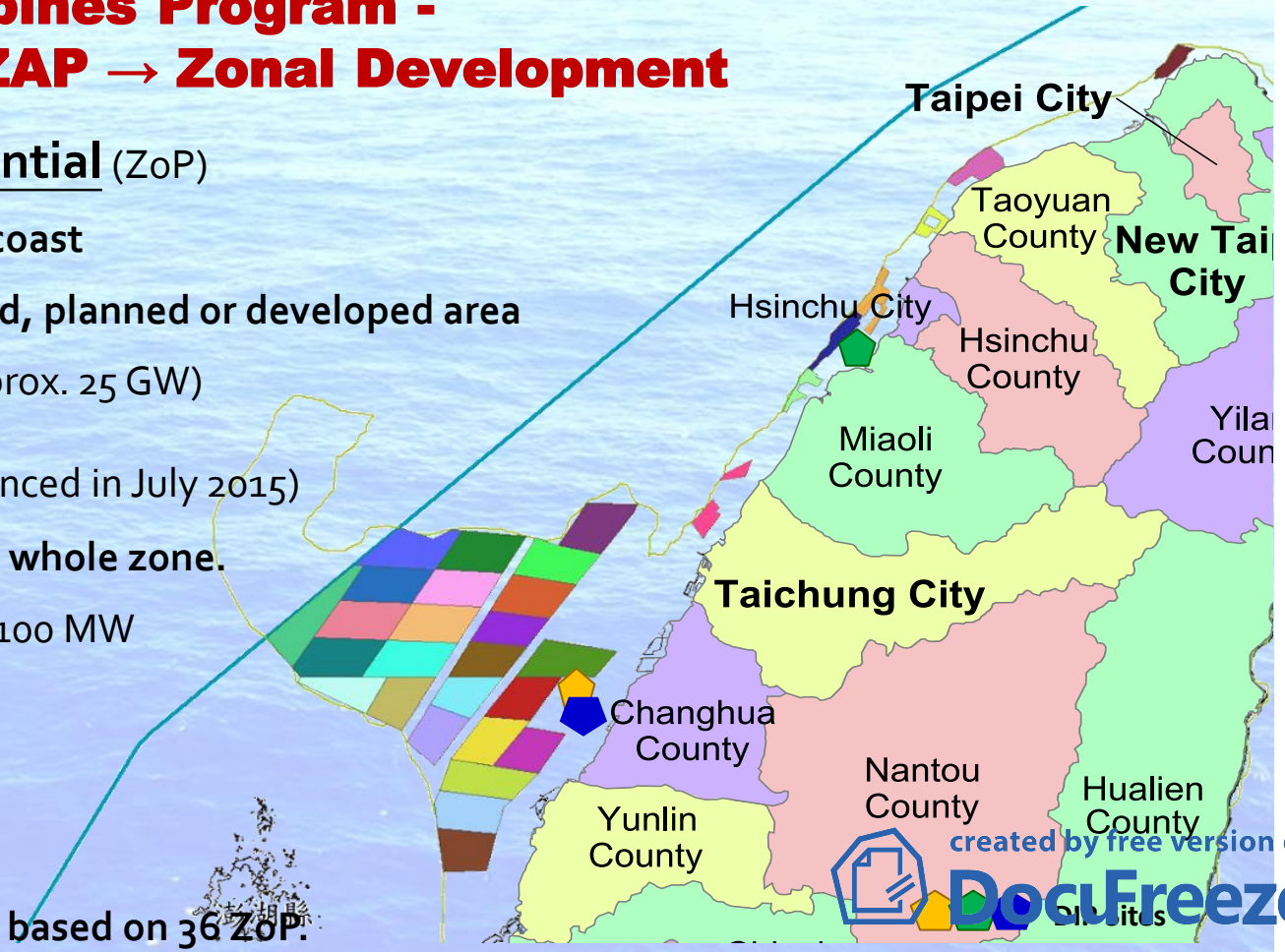


3. Renewable Energy Development(8/11)

(5)Development Strategy

Thousand Wind Turbines Program - Potential Zones → ZAP → Zonal Development

- **Siting for Zones of Potential** (ZoP)
  - Within 50 m isobath off west coast
  - Excluding protected, restricted, planned or developed area
  - 36 ZoP: total 3,084.5 km² (approx. 25 GW)
- **Directions of ZAP** (announced in July 2015)
  - Applicants should plan for the whole zone.
  - Total capacity of each case: > 100 MW
  - Capacity density: > 5 MW/km²
- **Zonal Development**
  - SEA & inter-department negotiation will be conducted based on 36 ZoP.



3. Renewable Energy Development(9/11)

(5)Development Strategy

Million Rooftop PVs Program

- **Goal： 8,700 MW developed by 2030**
  - Roof-top (3,000 MW)
  - Ground (5,700 MW)
  - Priority placed to contaminated agricultural farmlands and severe land subsidence areas, with 6.5% open to PV installation as the current target.
- **Strategy:**
  - The Feed-in Tariff as a strategy to achieve annual targets for roof-top and ground installations.
  - A cap quota is decided annually, while expecting large scale expansion after grid-parity is reached.
  - PV ESCO
- **Development Target**

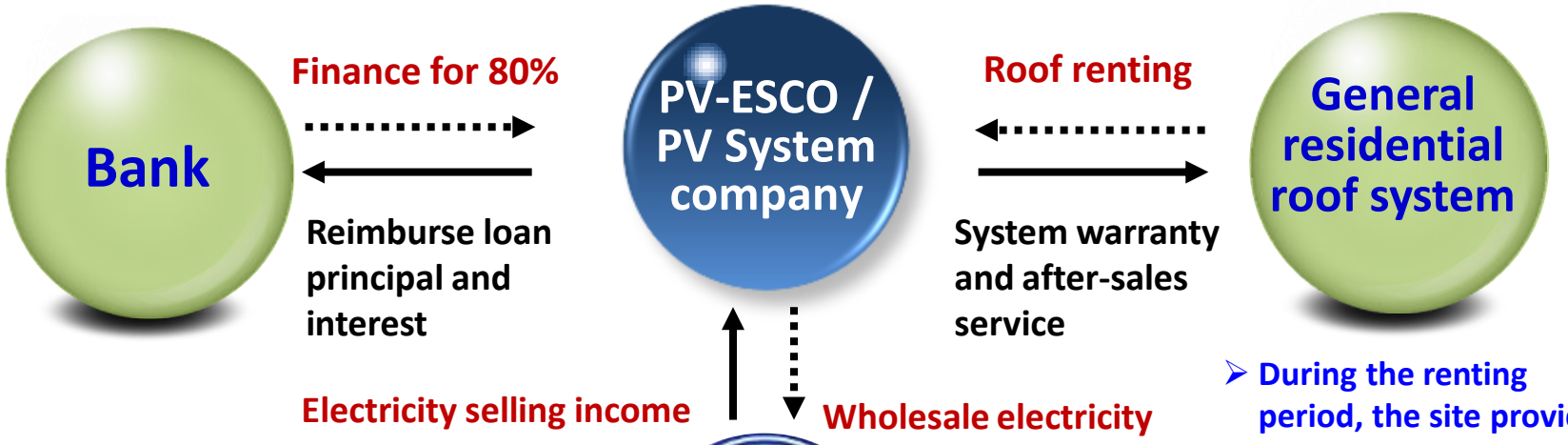
Year	2015	2020	2025	2030
Total	885 MW	2,120 MW	4,100 MW	6,200 MW

3. Renewable Energy Development(10/11)

(5)Development Strategy

◆ Establishment of PV-ESCO Mechanism

Encouraging banks to participate in project financing and to provide soft loans to PV-ESCO players.



Example Model: Zero financing burden for the site provider

- During the renting period, the site provider get the rent.
- The ownership of system after the rent expiring should be discussed by the PV-ESCO and the site provider.

3. Renewable Energy Development (11/11)

(5)Development Strategy

◆ Achievements of PV-ESCO: Green Financing

- 16 banks now provide PV system financing support, green energy investment funds grows from USD 1.6 to 222 million from 2011 to 2013.
- USD 222 million funds could generate USD 317 million in system installation value, about 170 MW of domestic demand, and create more than USD 0.5 billion in industry chain value.
- PV-ESCO assists in installations for all buildings including solar community, public roof, solar farm, solar terminal, solar factory, solar rail, solar MRT, solar campus, etc.
- ESCO model plays an important role in Chinese Taipei PV installation. PV capacity ratio increase from 48% (2012), 63% (2013), and up to 80% (2014).

Energy Efficiency Management

4. Energy Efficiency Management(1/10)

The Policy Tools of Energy Efficiency Management in Chinese Taipei

◆Mandatory Programs

- Minimum energy performance standard (MEPS)
- Energy efficiency ranking labeling
- Energy management and audit

◆Voluntary programs

- Energy conservation labeling
- Public awareness, education & promotion
- ESCO

4. Energy Efficiency Management (2/10)

Policy	Minimum Efficiency Performance Standard(MEPS)	Energy Efficiency Ranking Labeling	Energy Conservation Labeling	
Type	Mandatory	Mandatory	Voluntary	
Promoting Date	Dec, 1999	July, 2010	Dec, 2001	
Purpose	Manufacturers and importers are obliged to apply in advance for compliance certification	To provide the consumers with useful information when they choose among various models	To encourage the consumers to buy high-efficiency products and to enhance the high-efficiency products market penetration	
Items	**20** product categories	**12** product categories	**47** product categories	
Product	1. Air Conditioners 2. Refrigerators 3. Dehumidifiers 4. Fluorescence Lamps 5. Ballast for Fluorescent Lamps 6. Compact florescent lamps 7. Fluorescent Lamps with embedded ballasts 8. Incandescent bulbs 9. LED Lamps 10. Electric Hot Water Pots 11. Electric Storage Tank Water Heaters 12. Warm-Hot Drinking Water Dispensers 13. Chilled-Warm-Hot Drinking Water Dispensers 14. Vehicles 15. Motorcycles 16. Fishing vessel engines 17. Low-voltage single-phase induction motors 18. Low-voltage three-phase squirrel-cage induction motors 19. Air-condition systems 20. Boilers	1. Air Conditioners (2010.7.1) 2. Refrigerator/Freezer (2010.7.1) 3. Automobiles (2010.7.1) 4. Motorcycles (2010.7.1) 5. Dehumidifiers (2011.3.1) 6. Self-ballasted fluorescent lamps(2011.7.1) 7. Instantaneous Gas Water Heaters(2012.12.6) 8. Gas Stoves(2012.12.06) 9. Electric hot water pots (2015.01.01) 10. Electric Storage Tank Water Heaters (2015.10.01) 11. Warm-Hot Drinking Water Dispensers(2016.12.01) 12. Chilled-Warm-Hot Drinking Water Dispensers (2016.12.01)	1. Air Conditioners 2. Refrigerators 3. Dehumidifiers 4. Circulaiton Fans 5. Washing Machines 6. Clothes Dryers 7. Fluorescence Lamps 8. Hand Dryers 9. Hair Dryers 10. Warm-Hot Drinking Water Dispensers 11. Chilled-Warm-Hot Drinking Water Dispensers 12. Chilled-Warm-Hot Water Fountain Machines 13. Warm-Hot Water Fountain Machines 14. Vehicles 15. Motorcycles 16. Fluorescent Lamps with embedded ballasts 17. Gas burning cooking appliances 18. Instantaneous Gas Burning Water Heaters 19. Electric Cookers 20. Electric Storage Tank Water Heaters 21. Electric Hot Water Pots 22. Exit Lights and Emergency Direction Lights 23. Televisions	24. Displays 25. DVD Recorder and Player 26. Indoor Light Fixtures 27. Integrated Stereos 28. Compact Fluorescent Lamps 29. Copy machines 30. Printers 31. Air Cleaners 32. Luminaires for road and street lighting 33. Ventilating Fans for Bath Room Use 34. Ventilating Fans for Window Type 35. Notebook Computers 36. Desktop Computers 37. Air Source Heat Pump Water Heater 38. Range Hoods 39. Microwave Ovens 40. Axial flow Fans 41. Centrifugal fan 42. Ballast for Fluorescent Lamps 43. Electric Ovens 44. Electric Storage Tank Boiling Water Heaters 45. LED planar lamp 46. LED lamps 47. VFI UPS

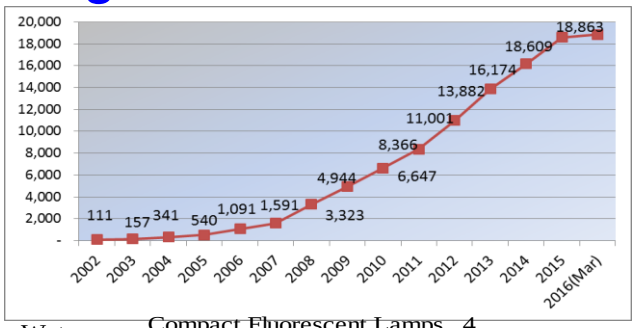
4. Energy Efficiency Management (3/10)

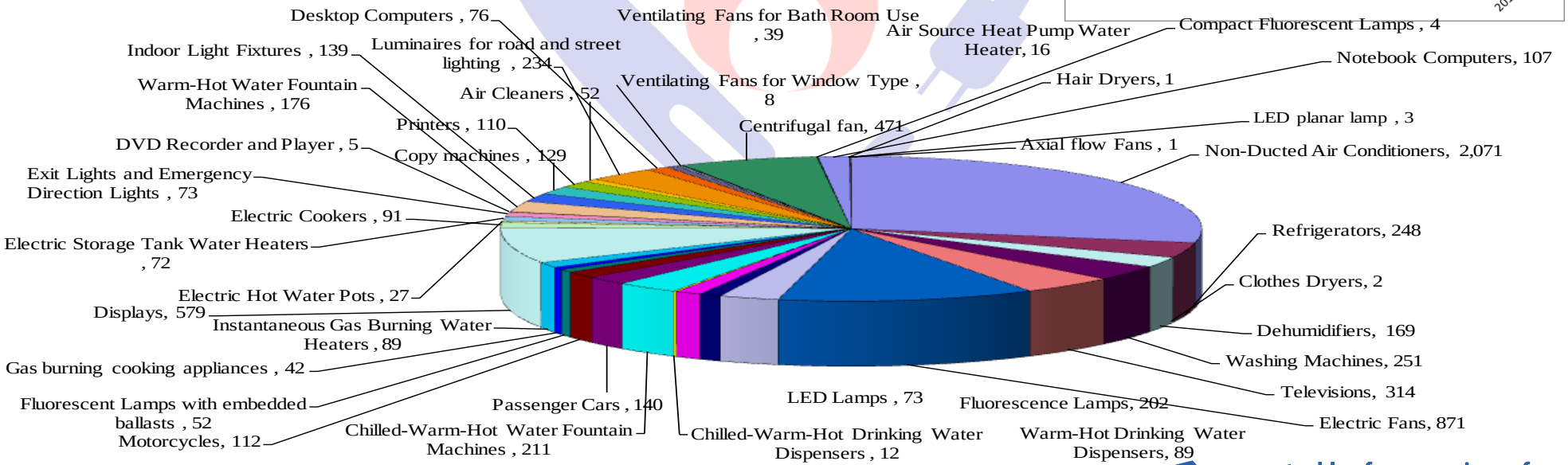
The Policy Tools of Energy Efficiency Management in Chinese Taipei

◆ Achievements of Energy Conservation Labeling

No. of Energy Conservation Label Endorsed Product Models

Over 211 million Energy Conservation Label endorsed models have been purchased as of March. 2016.





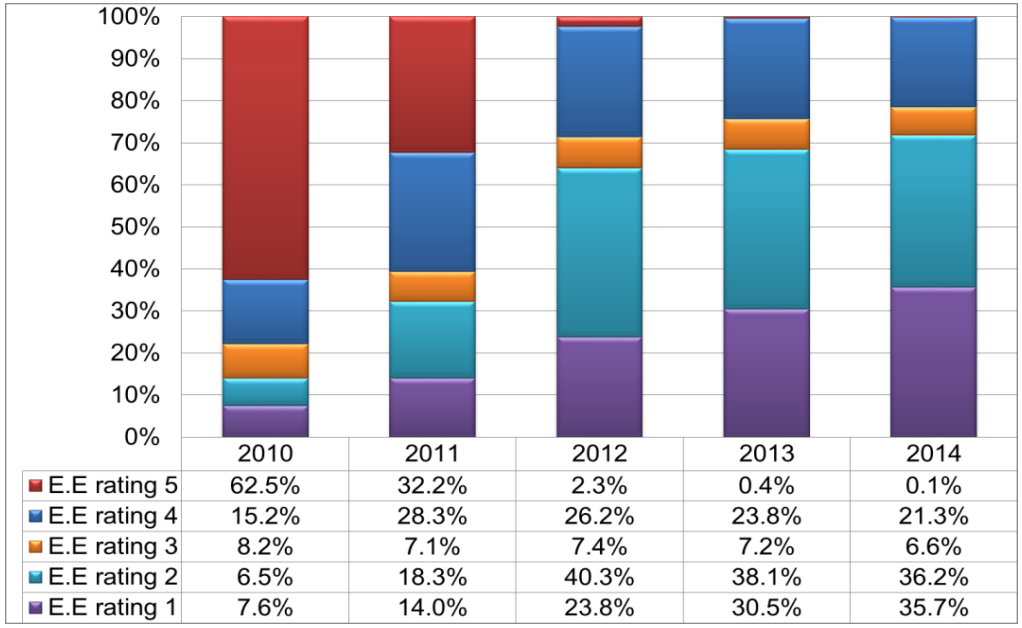
47 product categories are available for label application. As of 2016, the effective labels amount to 319 manufacturers and 7,361 products.

4. Energy Efficiency Management (4/10)

Achievements of EE Ranking Labeling Program

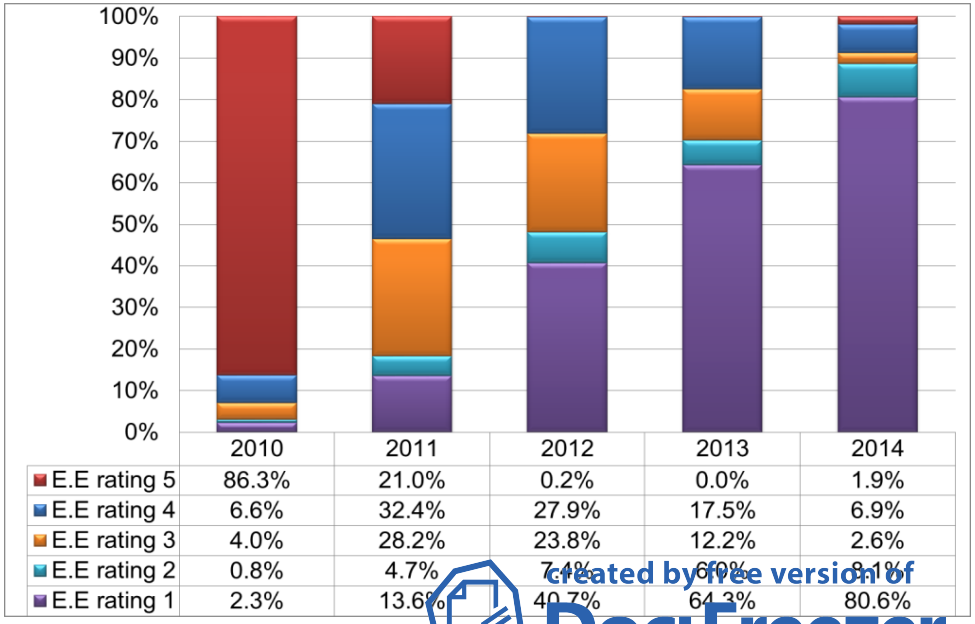
(AC and refrigerator as an example)

- The rating 1and 2 product's market share for AC increase dramatically from **14.1%** on 2010 to **71.9%** on 2014.
- The rating 1and 2 product's market share for Refrigerator increase dramatically from **3.1%** on 2010 to **88.7%** on 2014.
- The **rebate program** boosted the market share of high efficient products in 2011 and 2012.



	2010	2011	2012	2013	2014
E.E rating 5	62.5%	32.2%	2.3%	0.4%	0.1%
E.E rating 4	15.2%	28.3%	26.2%	23.8%	21.3%
E.E rating 3	8.2%	7.1%	7.4%	7.2%	6.6%
E.E rating 2	6.5%	18.3%	40.3%	38.1%	36.2%
E.E rating 1	7.6%	14.0%	23.8%	30.5%	35.7%

market share of ACs



	2010	2011	2012	2013	2014
E.E rating 5	86.3%	21.0%	0.2%	0.0%	1.9%
E.E rating 4	6.6%	32.4%	27.9%	17.5%	6.9%
E.E rating 3	4.0%	28.2%	23.8%	12.2%	2.6%
E.E rating 2	0.8%	4.7%	7.4%	6.0%	9.1%
E.E rating 1	2.3%	13.6%	40.7%	64.3%	80.6%

market share of Refrigerators

4. Energy Efficiency Management (5/10)

Energy Management and Audit

Industrial sector shares around 37% of energy consumption

→ the significant object of energy conservation implementation

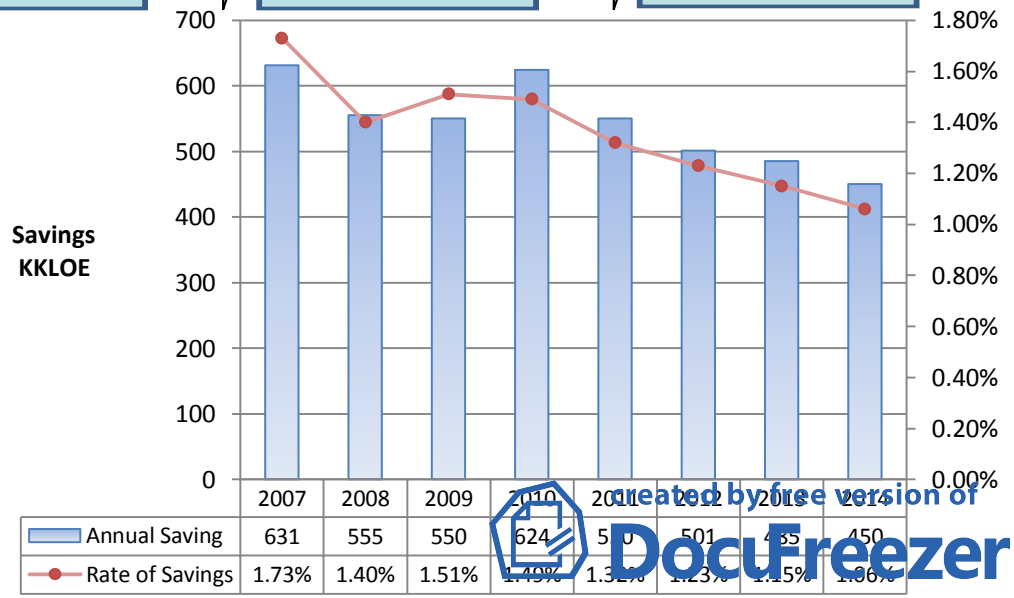
☐ The process of energy audit for Industry sector

Expert Group for Energy Audit

→ Databank of Energy Report → Databank of Energy Audit → Databank of Energy Saving Assessment → Databank of Energy Saving Promotion

Benefits

- From 2007~2014, average annual saving was 543 KKLOE with 1.35% annual saving rate
- An effective strategy can be developed to cope with the situations in different industries



	2007	2008	2009	2010	2011	2012	2013	2014
Annual Saving	631	555	550	624	5[illegible]	501	4[illegible]	450
Rate of Savings	1.73%	1.40%	1.51%	1.49%	1.32%	1.23%	1.15%	1.06%

4. Energy Efficiency Management (6/10)

Public awareness, education & promotion(1/2)

1.Promoted Energy Saving Campaign in Summertime

- **Built up a website dedicated to the campaign and organized online activities for raising the public's energy-saving awareness.**
- **Resumed "Cool Style for Summer Dresses" from 2014, co-operated with 22 garment companies by promoting cool feeling textiles in more than 300 physical and virtual outlets.**
- **Assisted 11 kinds of commercial businesses to manage the indoor temperature setting staying permanently above 26℃ by "Cool Style for Summer Dresses".**

2.Connected social resources to promote the network for energy saving volunteer

- **Worked with environment groups and scientific and technology museum system to cultivate volunteers and promote energy saving.**
- **Trained 497 volunteers, organized 1,636 activities, which attracted 55thousand people's attendance in total.**

Launching ~~"Energy Saving Campaign in Summertime"

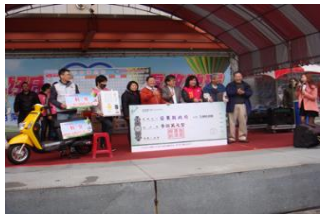
4. Energy Efficiency Management (7/10)

Public awareness, education & promotion(2/2)

3.Conducted Contest of "Power Saving in Summer Months" Among 22 Cities and Counties.

- Contest of "Power Saving in Summer Months" among 22 cities and counties was firstly held in 2012; the contest is based on 5 pools of index, such as government, household, service sector, energy education and policy administration.
- Compared with the reference year of 2011, the electricity saved respectively was more than 2.45 billion kWh (9.1%) in 2012, 1.20 billion kWh (4.78%) in 2013 and 1.05 billion kWh (4.22%) in 2014.
- Promoted campaign identity of "Power Saving in Summer Months“ for 11 designated businesses which consume significant electricity. There were more than 21 thousand physical stores, equal to 97.2% stores in Chinese Taipei taking part in the event.
- For promoting high energy efficiency household appliances, 7 cities and counties organized special deal events or subsidized energy-saving appliance purchase. In aggregate, more than 200 thousand items were sold, equal to 1.25 billion NTDs.










4. Energy Efficiency Management (8/10)

Award and Demonstration for Energy Saving

- **Promoted Energy-efficient Performance Award**

  For promoting entrepreneur's voluntary energy saving and encouraging public, private sector and schoo energy saving, Ministry of Economic Affairs yearly holds Energy-efficient Performance Award.

- **Organizing Demonstration of Energy Saving for Award Winner**

  Invited Excellent Energy-Saving Performance Award winners to share successful cases and experiences. Around 596 entrepreneurs attended live demonstration of energy saving technologies annually.

- **System for promotion**

  Constructed sharing platform for successful cases and technologies, produced e-book (More than 2,200 cases have been compiled) from industries' successful cases and organized demonstration.

- **The Result of Energy Saving in 2014**

  In 2014, 22 winning corporations, governmental institutions and schools conserved 42 thousand kiloliters of oil equivalence, saved 420 million NTDs and reduced 97 thousand tons emission of carbon dioxide.

4. Energy Efficiency Management (9/10)

Improve the environment for industrial development

- Formulate industrial development strategy and policy measures
- Set up an all-around industrial services system
- Strengthen industry related laws and risk management
- Establish sound energy-saving performance measurement and verification system
- Promote ESCO servicing capacity registration system
- Set up a third impartial office for measurement verification
- promote strategic alliances between equipment manufacturers, engineering companies and financial institutions

Expand the industrial market

- Promote the energy conservation performance guarantee program promotion subsidies
- promote public sector to ESCO
- Promote Groups and enterprises to perform initial diagnosis and introduce ESCOs
- Promote LED street lights and ESCO subsidies
- Commend of excellence ESCOs
- Energy audit of colleges and universities
- Promoting PV-ESCO

Promote ESCO development

Nurture industry talent

- Promote talent certification system
- Introduce IPMVP energy saving performance measurement and verify the licenses of specialists
- "ESCO Project Development Technology" training course
- Promote the inclusion of ESCO courses in college curriculum

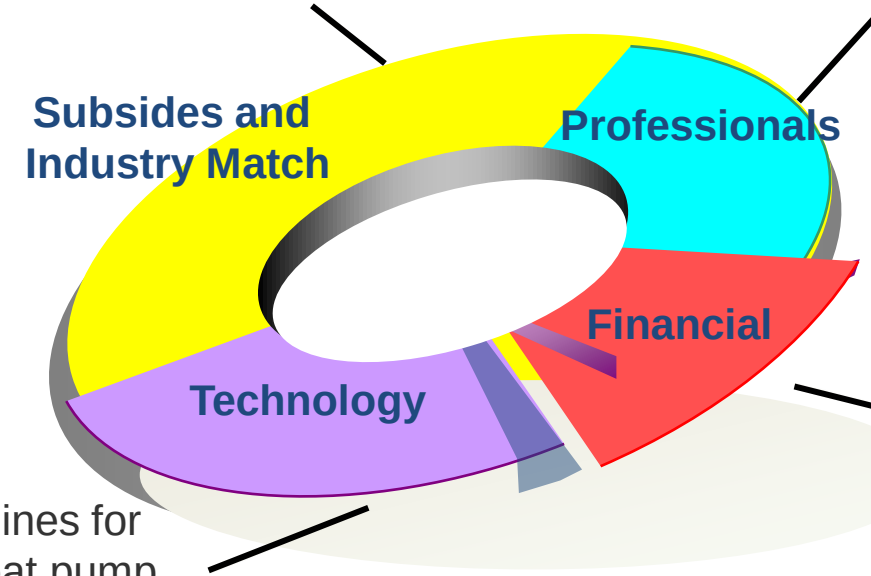
Develop project financing system

- Establish credit guarantee financing system
- Promote low-interest loans
- Promote industry project financing
- Promote the Industry Revolving Fund

4. Energy Efficiency Management (10/10)

Achievement of ESCO Promotion

- Subsidize ESCO project during 2006-2014 for 103 projects with NTD 515 million
- The six provinces using the ESPC model set up lighting reached 60.5 thousand, around NTD 800 million output values.
- Subsidy 102 universities to perform ESCO energy conservation initial diagnosis, predicting saving electric power 549.2 hundred kilowatts



- Organize M&V training workshop during 2006-2014 with more than 2,000 participants.
- Provide credit guarantee fund for 5 cases with NTD 265 millions..
- Provide NTD 20 billions for project finance by local bank.
- Government provide low interest rate loans (3.825%) for energy saving equipment procurement, total loan is NTD 2,590 million.
- Publish 21 guidelines for M&V (lighting, heat pump, A/C, and cooling system)

Concluding Remark

5. Concluding Remarks

- The promulgation of Renewable Energy Development Act and related regulations has paved the way for a sustainable long-term development of renewables in Chinese Taipei.
- Not only renewables energy and energy conservation are important elements in Chinese Taipei ’s energy policy, the pursuit of world-class green energy industries is also a cornerstone while moving towards low-carbon economy.
- We will devote itself for the continuous growth of green energy, and welcome international cooperation to foster the development of green energy in global society.

Thank you for your attention