經濟部能源局
BUREAU OF ENERGY, MINISTRY OF ECONOMIC AFFAIRS






Developments in Taiwan's Electricity Market

August 1, 2017

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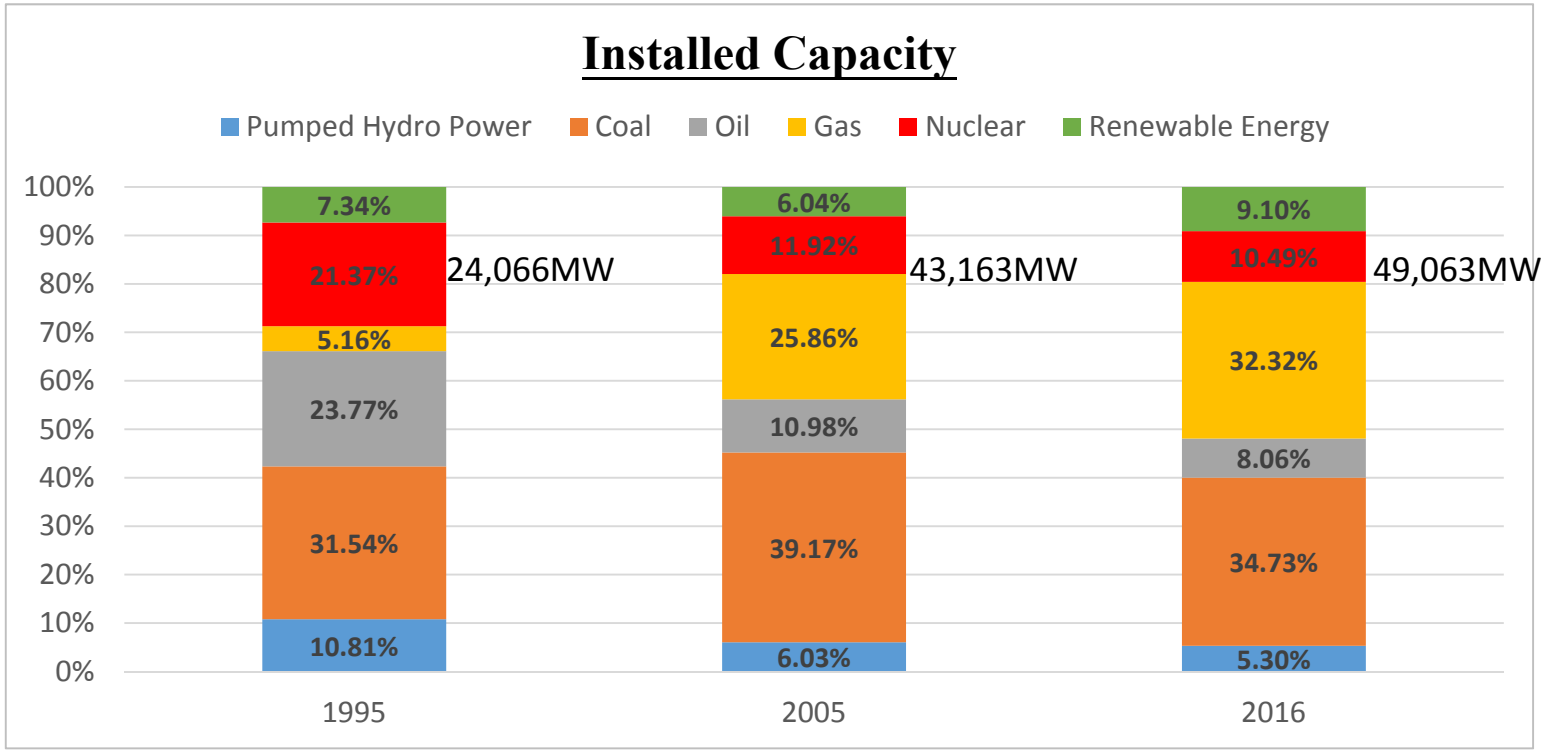
I. Overview of Taiwan Power System

Portfolio of Generation(1)

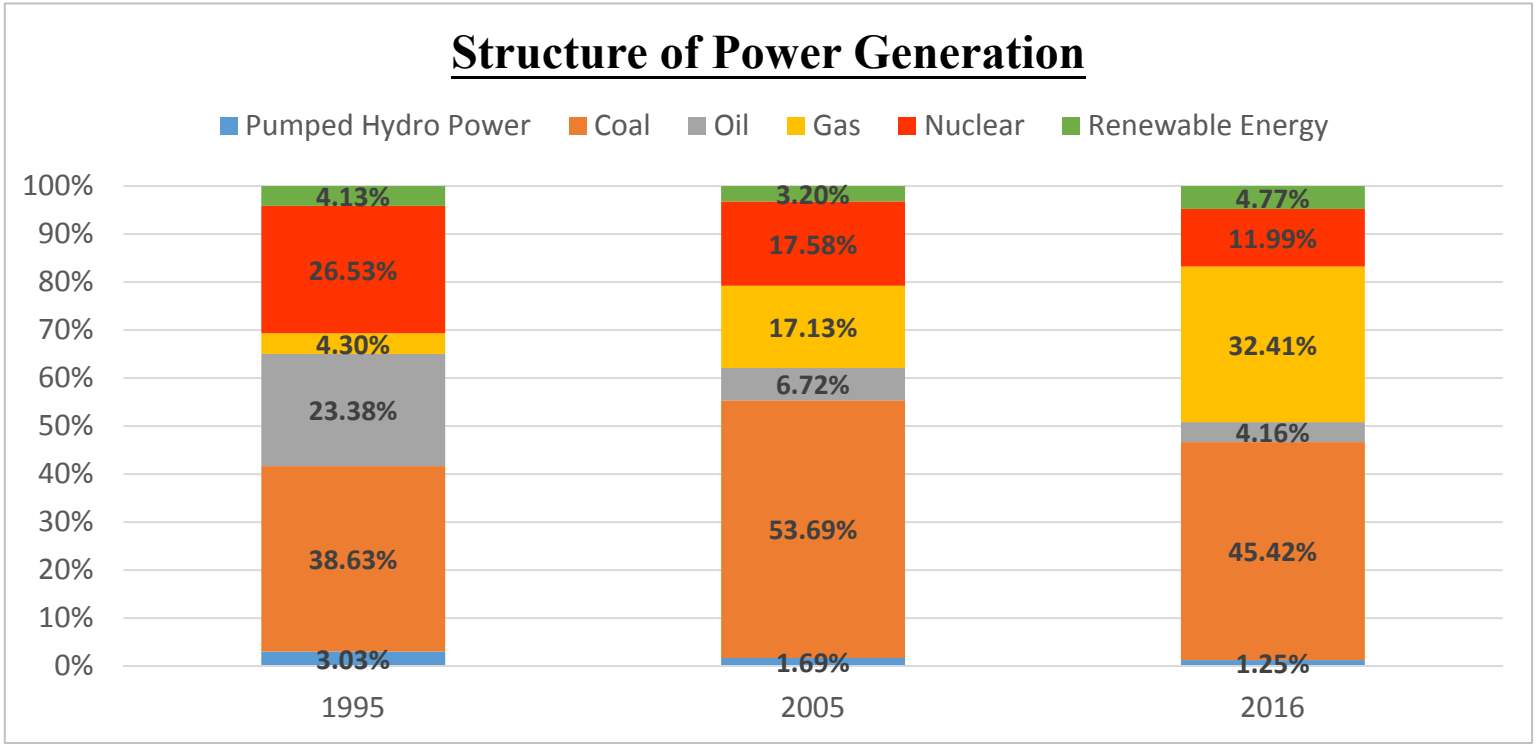
- Taipower Company is currently the only utility in Taiwan.
- 75% of total installed capacity comes from thermal power in 2016
  - Coal-fired~34.73%, Gas-fired~32.32%, Oil-fired~8.06%



Source: Energy Statistics Handbook(2016), Energy Statistics Monthly Report.

Portfolio of Generation(2)

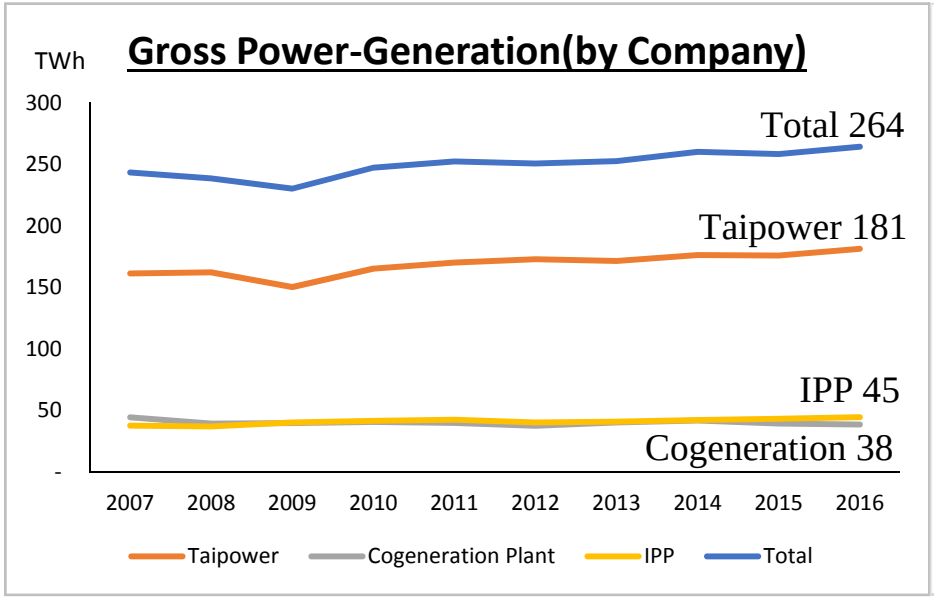
- 82% of total electricity comes from thermal power in 2016
  - Coal-fired~45.42%, Gas-fired~32.41%, Oil-fired~4.16%

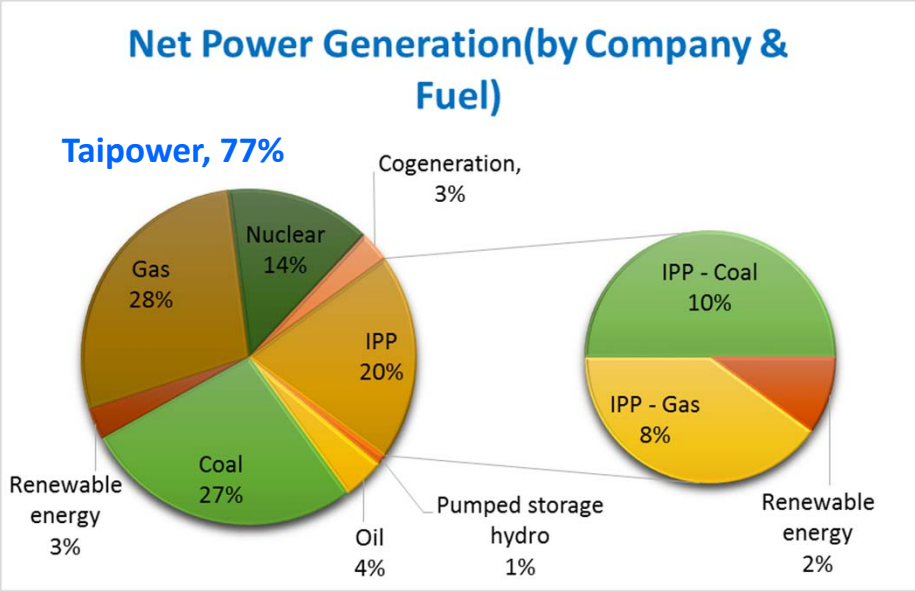


Source: Energy Statistics Handbook(2016), Energy Statistics Monthly Report.

Portfolio of Generation(3)

- Gross Power-Generation rises from 243TWh in 2007 to 264TWh in 2016.
- In 2016, approximately 23% of electricity is not generated from Taipower.



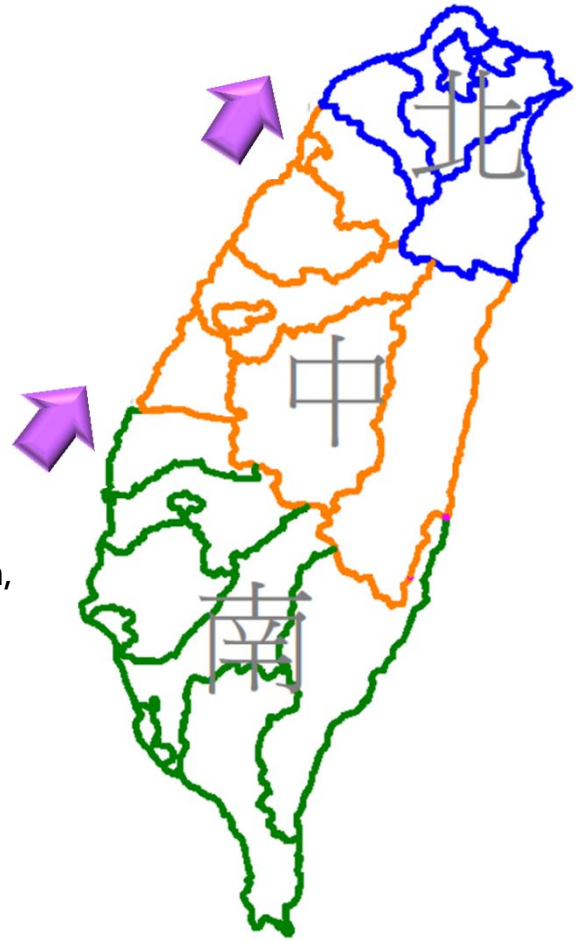


Source: Taipower annual report(2016), Energy Statistics Monthly Report.

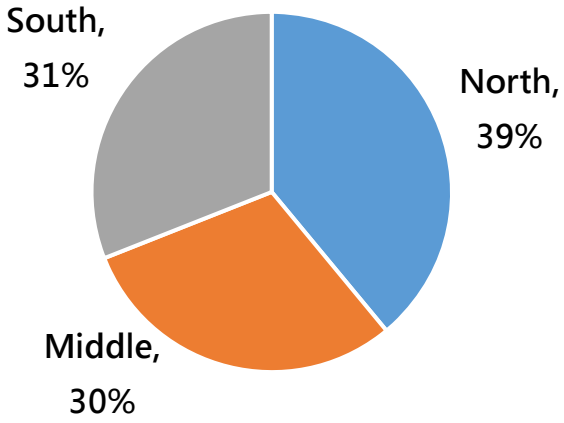
Problems of the Power System (1)

1. Supply-Demand Mismatch

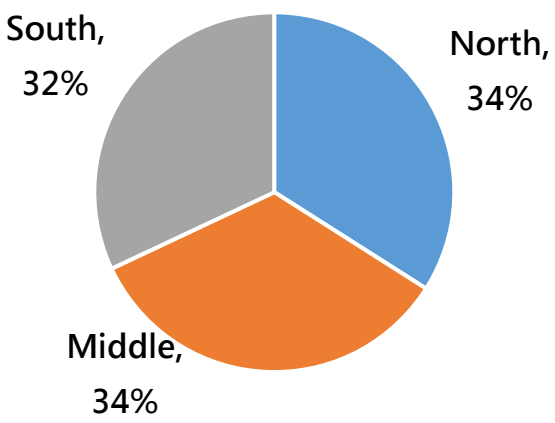
- Peak demand ~35.86GW in 2016
- Demand on the north exceeds the local generation
- Part of the power supply in the north comes from the middle and the south.



Peak Load(2016)



Supply Power Capacity(2016)

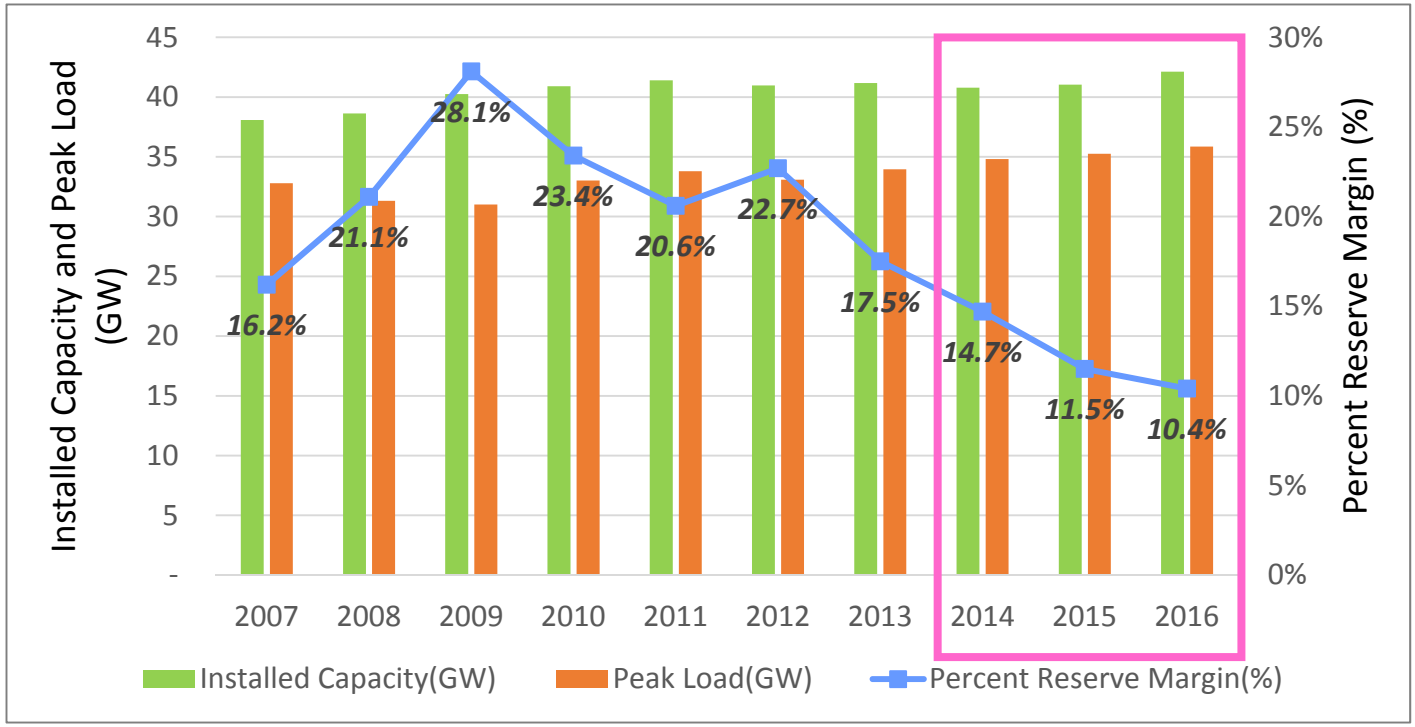


Source: Taipower Company Website.

Problems of the Power System (2)

2. Decreasing Reserve Margin

- Reserve margin is now lower than the statutory, 15%.
- It may become necessary in future to plan an alternative energy program.



Source: Taipower annual report(2016).

Solutions of the Power System (1)

1. Installing New Capacity

- Installing new capacity will increase 20,089MW from 2016 to 2026.
- One third of new capacity belongs to renewable energy.

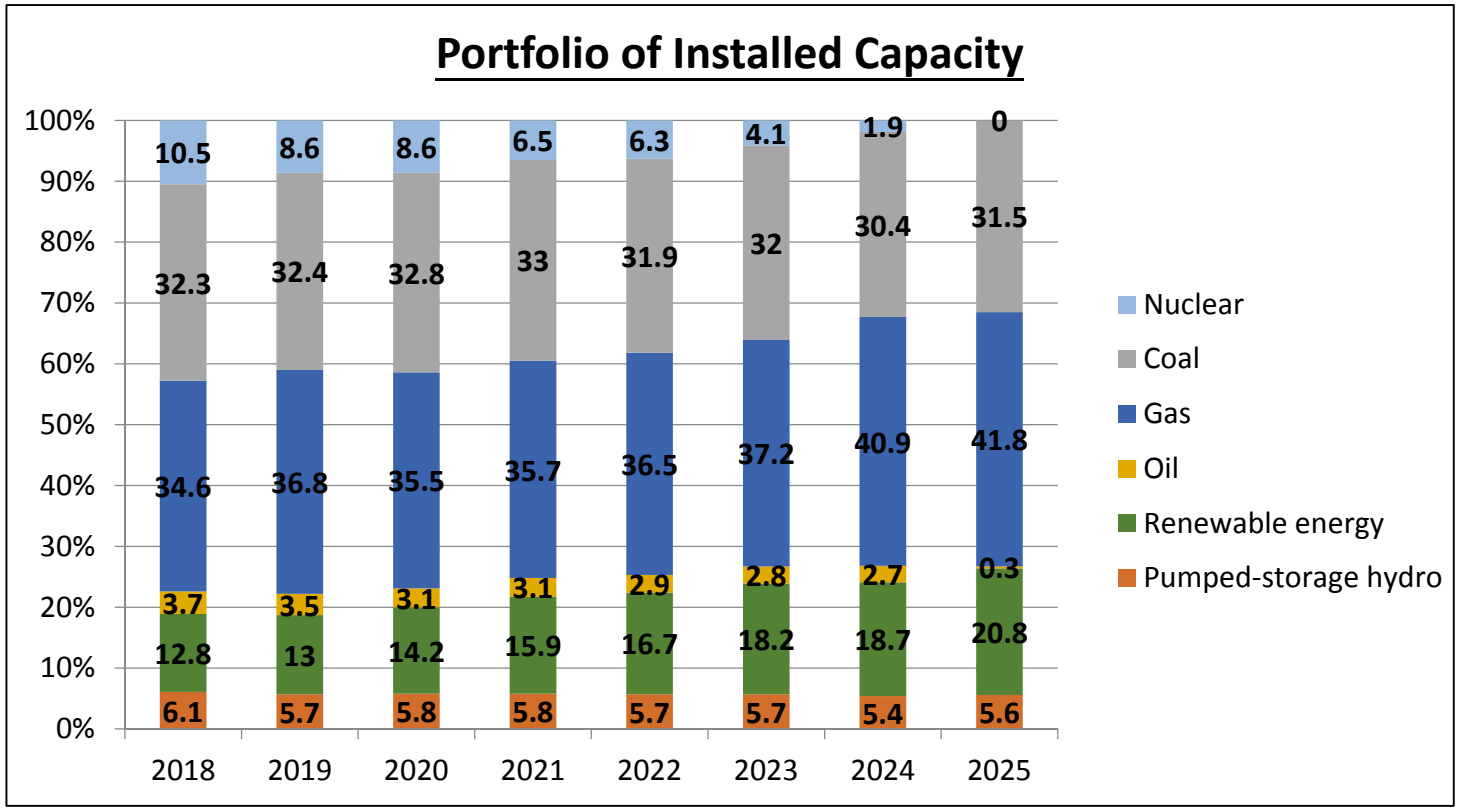
Unit Type	Under Construction by Taipower(MW)	Under Planning by Taipower(MW)	IPP(MW)	Total(MW)
Renewables	**33**	**164**	**6,119**	**6,316**
1. Hydro	0	20	0	20
2. Other	33	144	6,119	6,296
Thermal	**6,678**	**7,096**	**0**	**13,774**
1. Coal	4,000	1,200	0	5,200
2. Oil	0	28	0	28
3. LNG	2,678	5,868	0	8,546
Total	**6,711**	**7,260**	**6,119**	**20,089**

Source: Taipower Company Sustainability Reports(2016).

Solutions of the Power System (2)

2. Adjusting the Portfolio of Installed Capacity

- In 2025, renewable energy will be expected to reach 20.8% without nuclear power plant no.4.

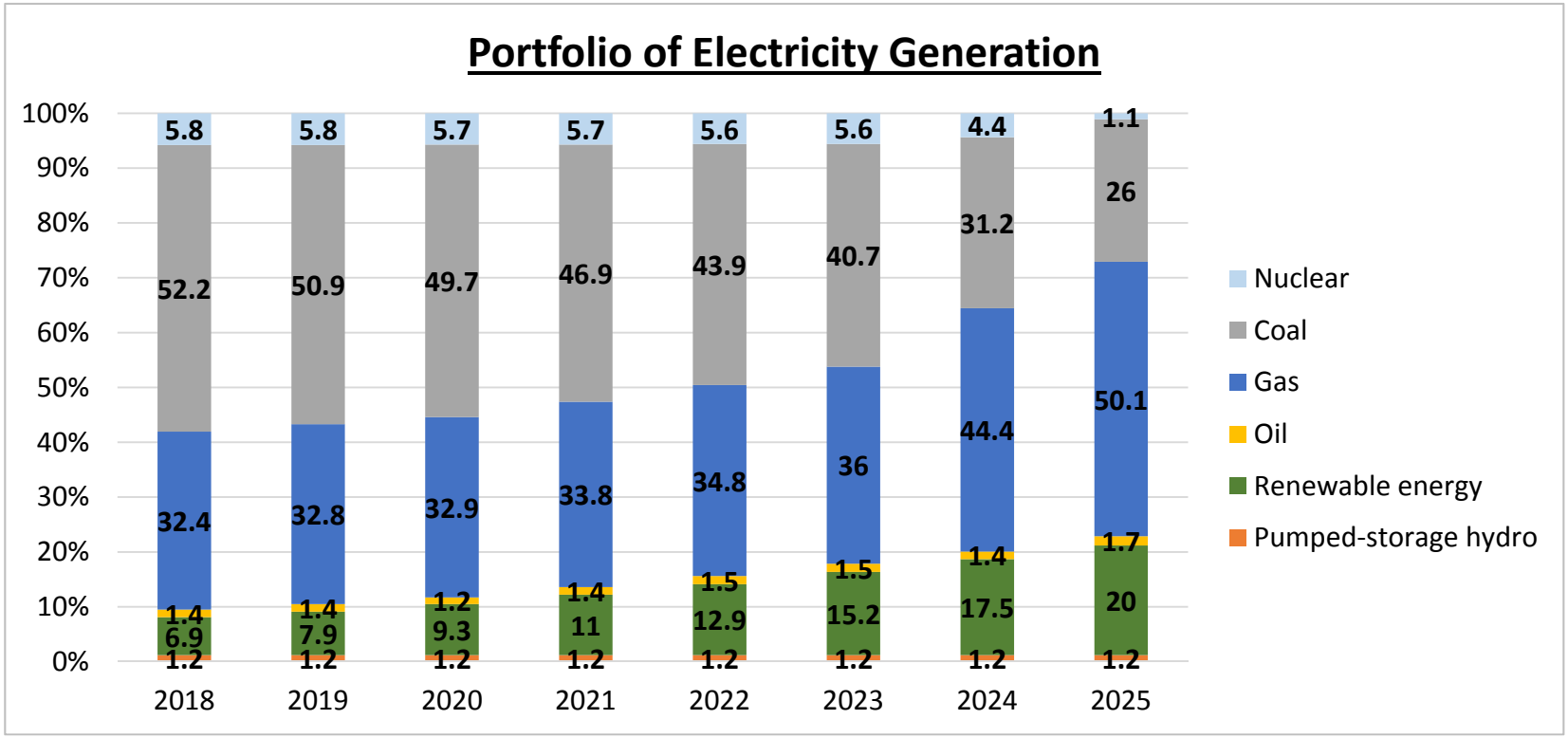


Source: Taipower Long-Term Power Development Plan 10302 - Without NPP4

Solutions of the Power System (3)

3. Adjusting the Structure of Electricity Generation

- Gradually increasing the renewable energy and gas power generation, and reducing the proportion of coal



Note: The estimations are based on the Taipower Long-Term Power Development Plan 10510 - Without NPP4.

II. Taiwan's Energy Transition & Renewable Energy Development Policy

The Milestones of Taiwan's Energy Policy

2015/07
Greenhouse Gases Reduction and Management Act

2050 GHGs (by 2005 level) **50%**

2015 | 2016 | 2017

2015/09/17
Intended Nationally Determined Contribution (INDC)

2016/06/06
Energy Transition Policy

2017/01/26
Amendment of Electricity Act

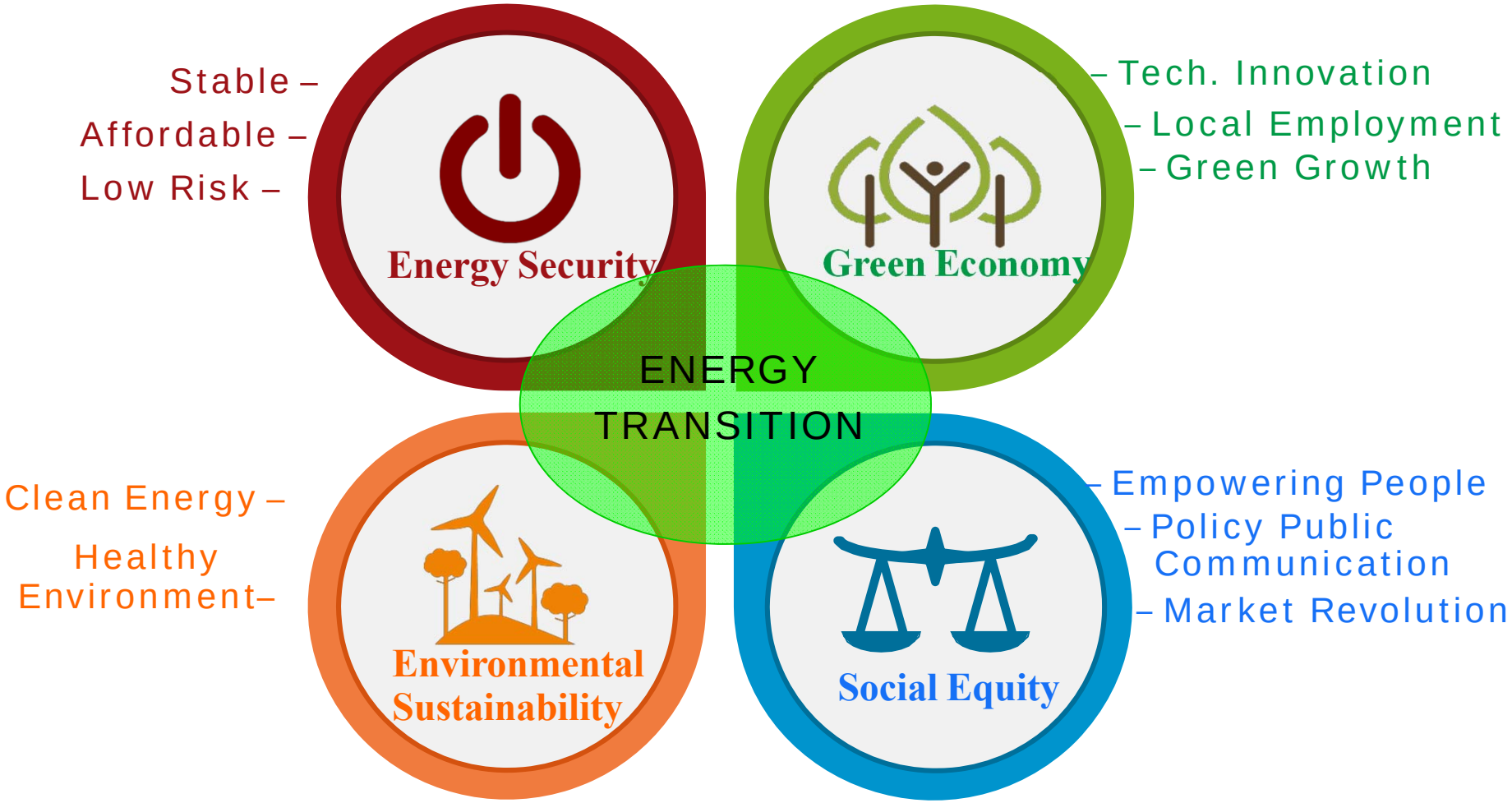
2030 GHGs **BAU** **50%**

Nuclear Free **2025**

- ✓ Open Market for Renewable Energy
- ✓ Introduction of Users Purchasing Option

The Vision of Energy Transition Policy (1)

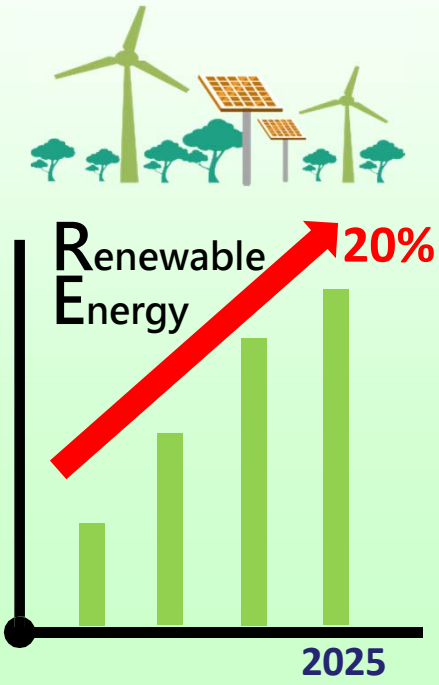
■ Core Value of Taiwan's Energy Transition

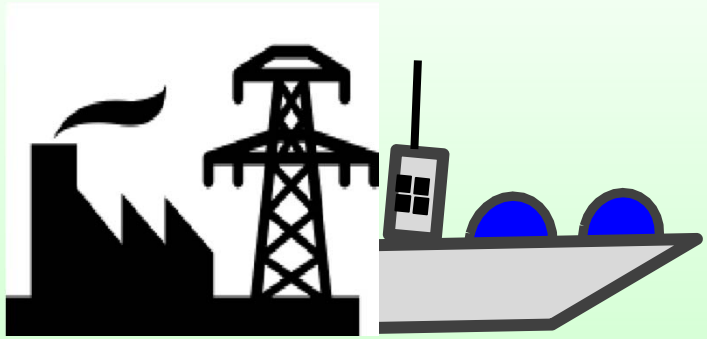


The Vision of Energy Transition Policy (2)

■ Launch Energy Transition and Power Market Reform in June, 2016

※ **Establish a low-carbon, sustainable, stable, high-quality and economically efficient energy system, and to achieve the "Nuclear-Free Homeland" vision and renewables 20%, coal-fired 30%, and gas 50% in the structure of energy distribution by 2025.**





- **Expansion NG Power Generation**
- **Building No.3 LNG Terminal**

Renewable Energy Development(1)

■ Renewable Energy Targets

- **Renewable energy development in Taiwan is toward increasing renewable energy supply and raising renewable energy target to achieve 20% renewable electricity generation by 2025.**

		Power Capacity (MW)			Electricity Generation (TWh)		
		2016	2020(f)	2025(f)	2016	2020(f)	2025(f)
Solar PV		1,210	6,500	20,000	1.1	8.1	25.0
Wind	onshore	682	800	1,200	1.4	1.8	2.6
	offshore	—	520	3,000	—	1.9	10.8
Geothermal		—	150	200	—	1.0	1.3
Biomass		741	768	813	3.6	5.6	5.9
Hydro Power		2,089	2,100	2,150	6.6	4.7	4.8
Fuel Cell		—	22.5	60	—	0.2	0.5
Total		**4,722**	**10,861**	**27,423**	**12.7**	**23.3**	**50.9**

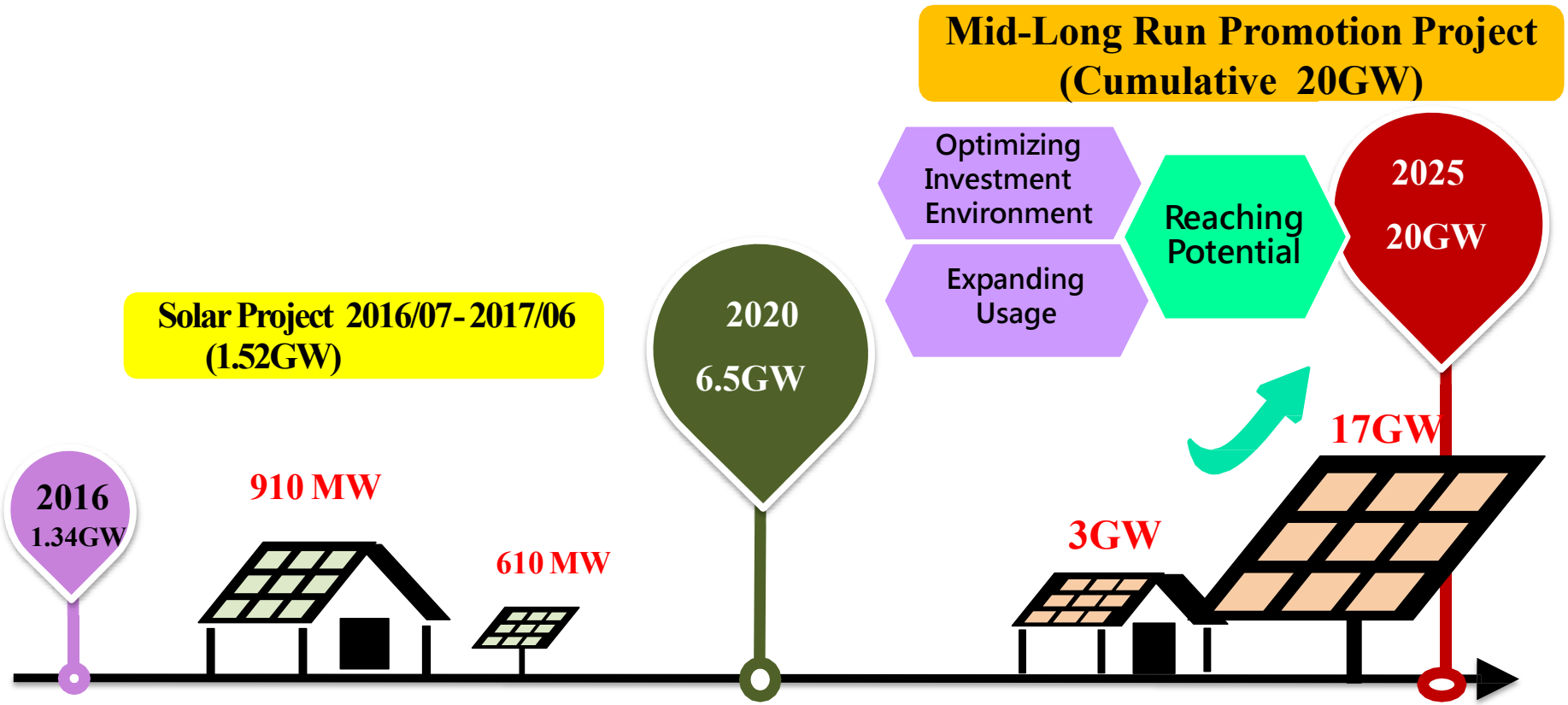
Source: Bureau of Energy

Renewable Energy Development(2)

■Solar Project Development Target

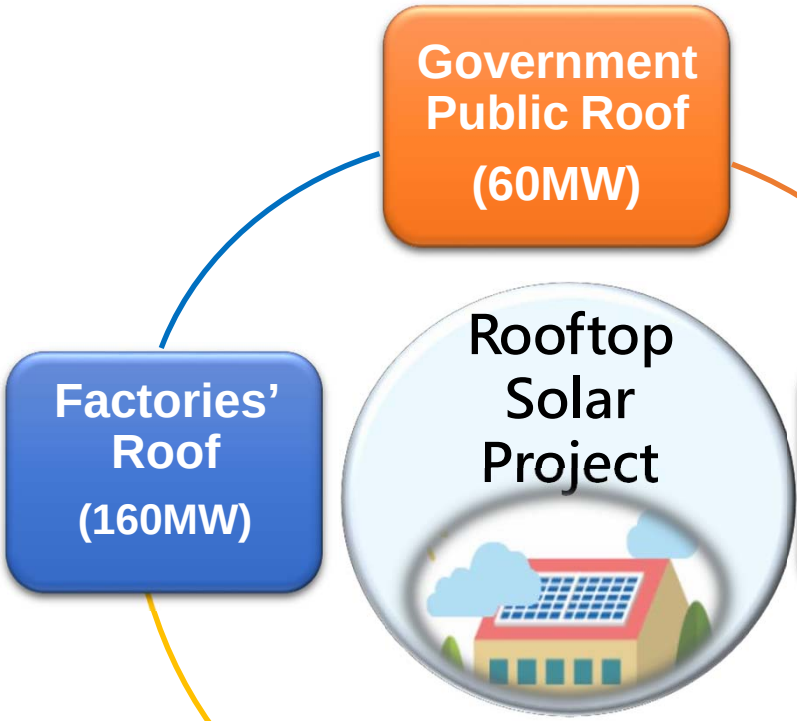
■ **Deployment Strategy**

The promoting strategy prioritizes the roof type and specific ground type ahead of the large scale of ground type.



Renewable Energy Development(3)

■2-Year Solar Project for Roof Type (910MW)



- central governmental bodies
- state-owned enterprise
- national educational institute
- affiliated legal bodies.

- factories' rooftop

- residential/ business rooftop

- combined solar project installation

Renewable Energy Development(4)

■ 2-Year Solar Project for Ground Type (610MW)

Salt industries' land (230MW)

- National salt lands (excluding wetlands) (535MW)

Severe subsided area (200MW)

- Council of Agriculture release 18 severe subsided area with total 1,253 hectares (835MW)

Water bodies (150MW)

- Applicable facilities (1,814MW)
  - ✓ dam (8%),
  - ✓ detention pond (40%)
  - ✓ ponds (40%)

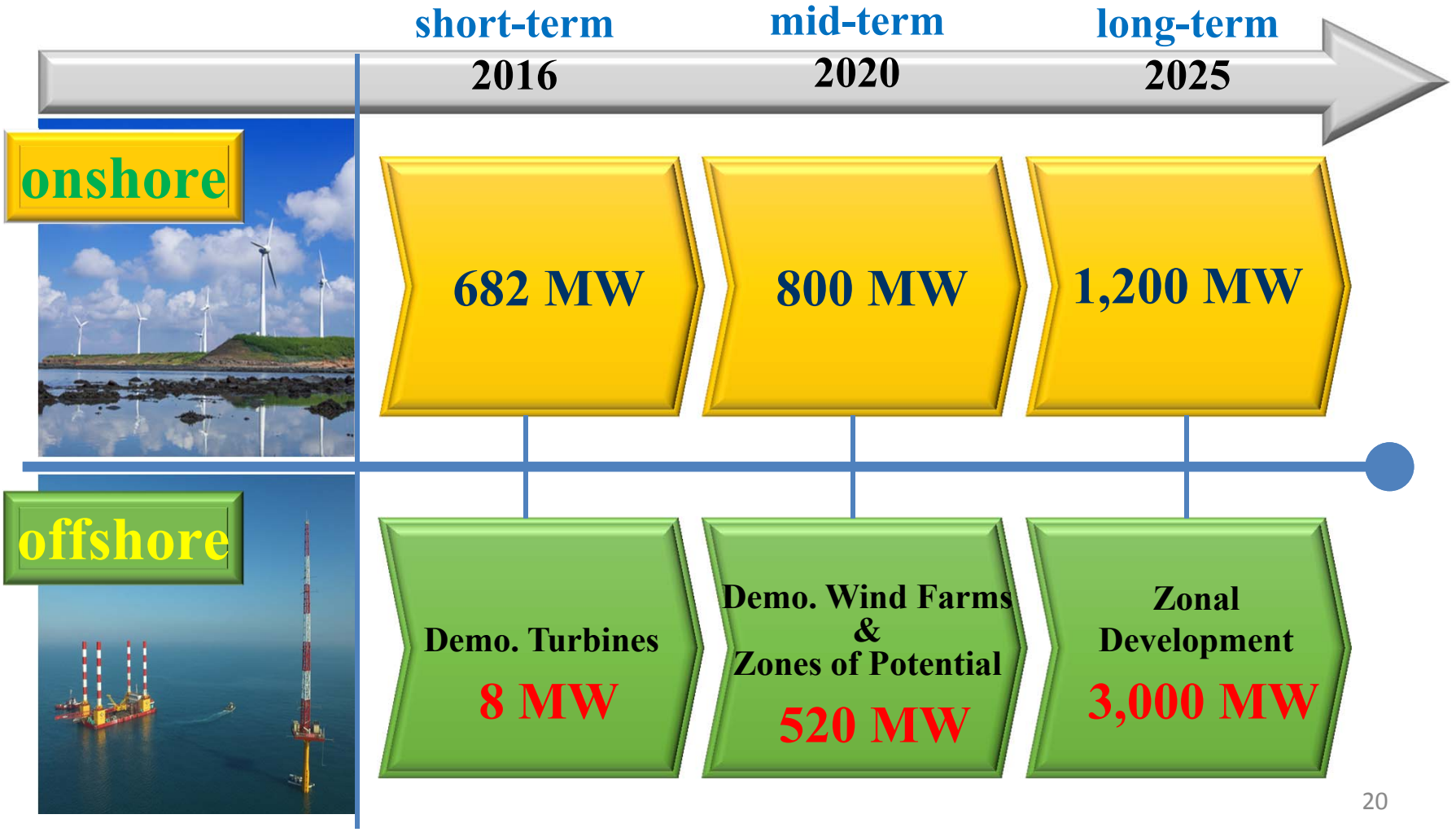
Landfill and brown field (30MW)

- Landfill which remain suspended, closed or restoration condition (622MW)
- Highly contaminated agricultural and industrial land (1,133MW)

Ground-Mounted Solar Project

Renewable Energy Development(5)

■Wind Power Development Target



Renewable Energy Development(6)

■ Current Status of Wind Power

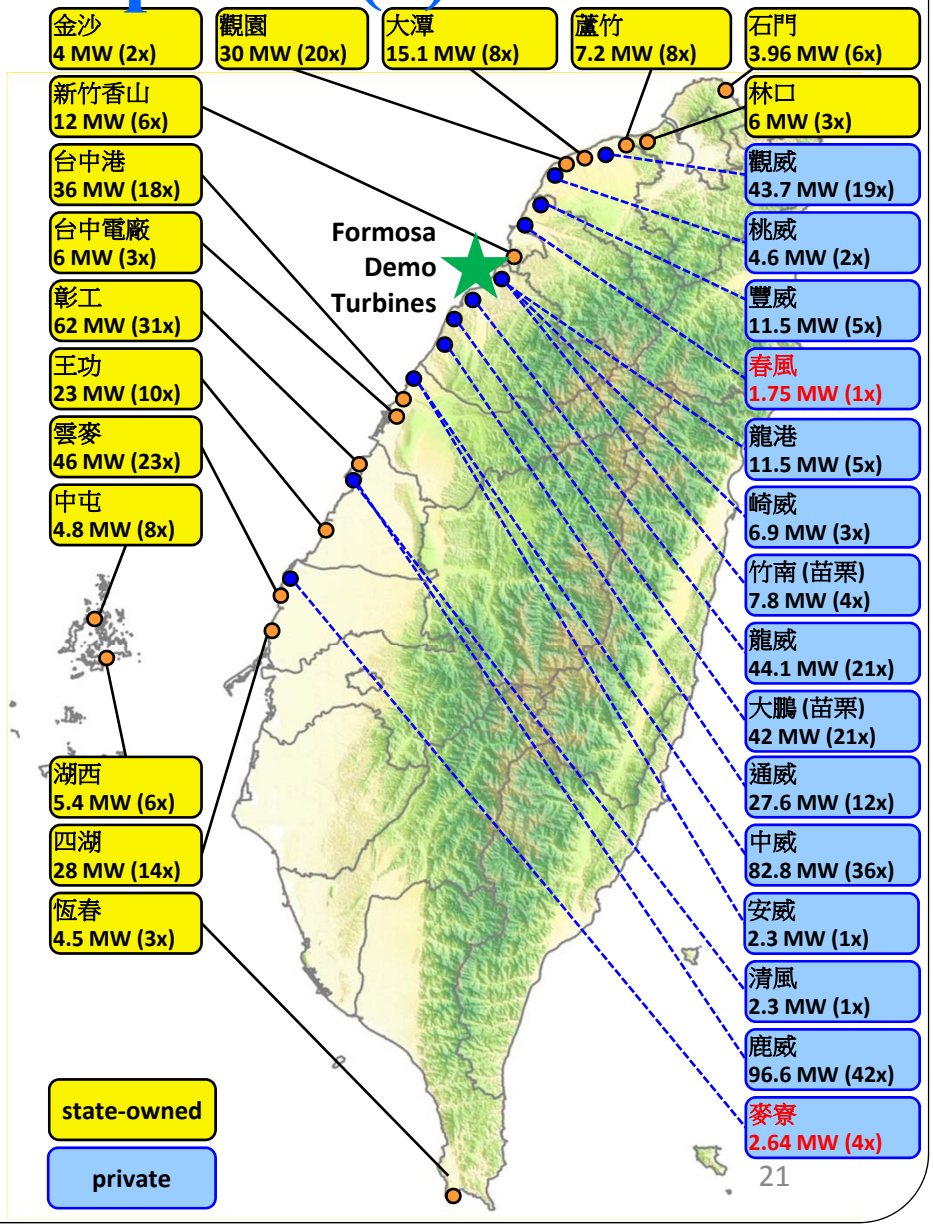
- **Onshore** (by the end of Jan 2017)

✓**State-owned:** 169 WTs / 294 MW

✓**Private:** 177 WTs / 388 MW

✓**Total:** 346 WTs / 682 MW
(14.3 % of all RE)

✓**2016 Production:** ≈ 1,445 GWh
(11.4 % of all RE)



Renewable Energy Development(7)

■ Off-Shore Wind Power (3000 MW)

Phase 1
Demonstration incentives

Phase 2
Explore potential site

Phase 3
Zonal development

■【Phase 1 】Demonstration Incentives for Offshore Wind Power System (2012)

- Accomplished 4 demonstration unit installation in 2016, 3 demonstration wind farm will be accomplished by 2020.

■【Phase 2 】Application for Selected Offshore Wind Power Site (2015)

- Release 36 potential sites for investment prior to zonal development phase.
- Installers must complete Environmental Impact Assessment process by the end of 2017, and acquire planning permit prior to December 31st 2019.

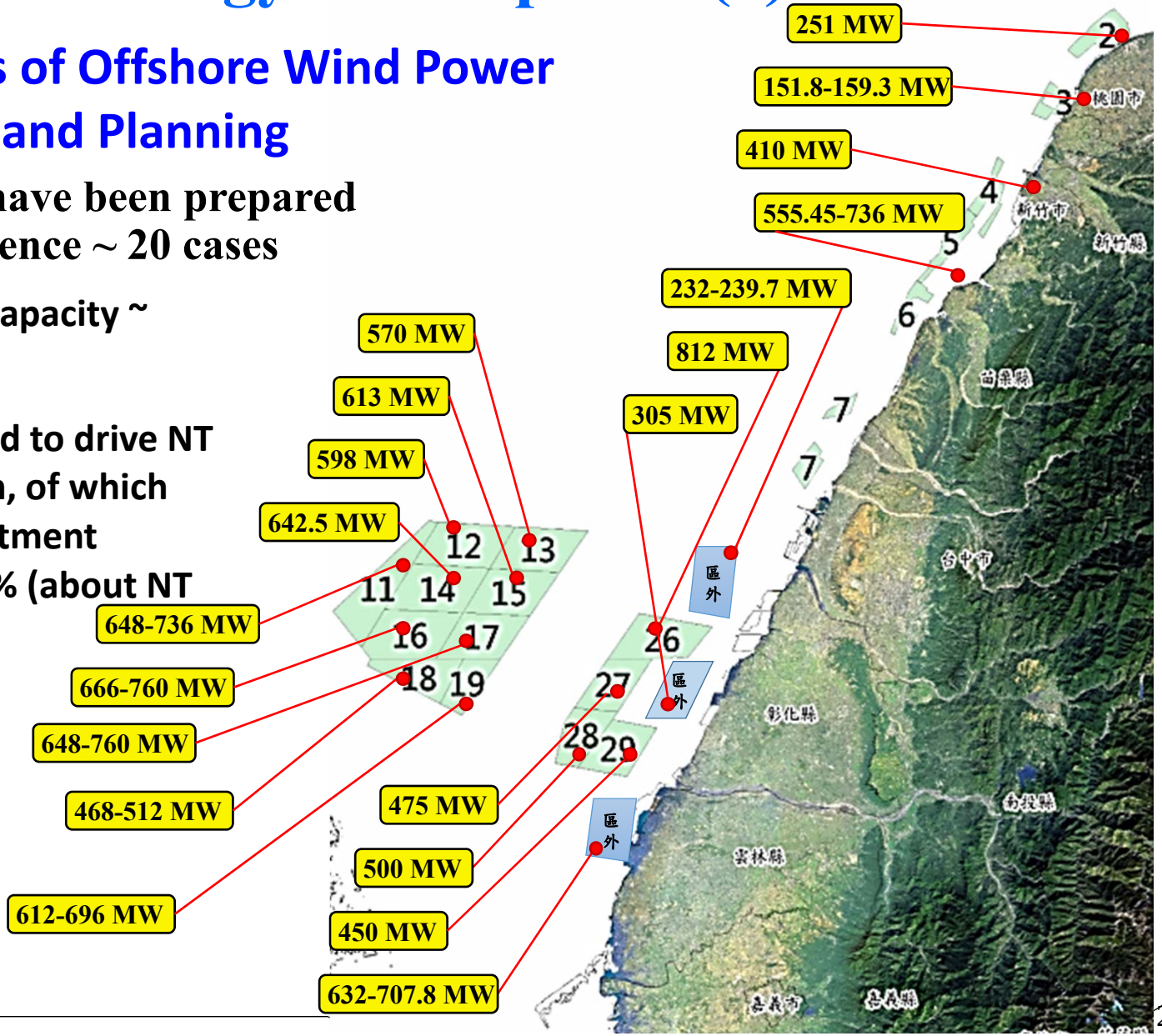
■【Phase 3 】Offshore Wind Power Zonal Development (planned to announce by Dec. 31st 2017)

- Stimulate technological and industrial development through projects with economic of scale.
- Encourage resources sharing inside developing zone to accelerate installation to bring down the cost.

Renewable Energy Development(8)

■ Current Status of Offshore Wind Power Development and Planning

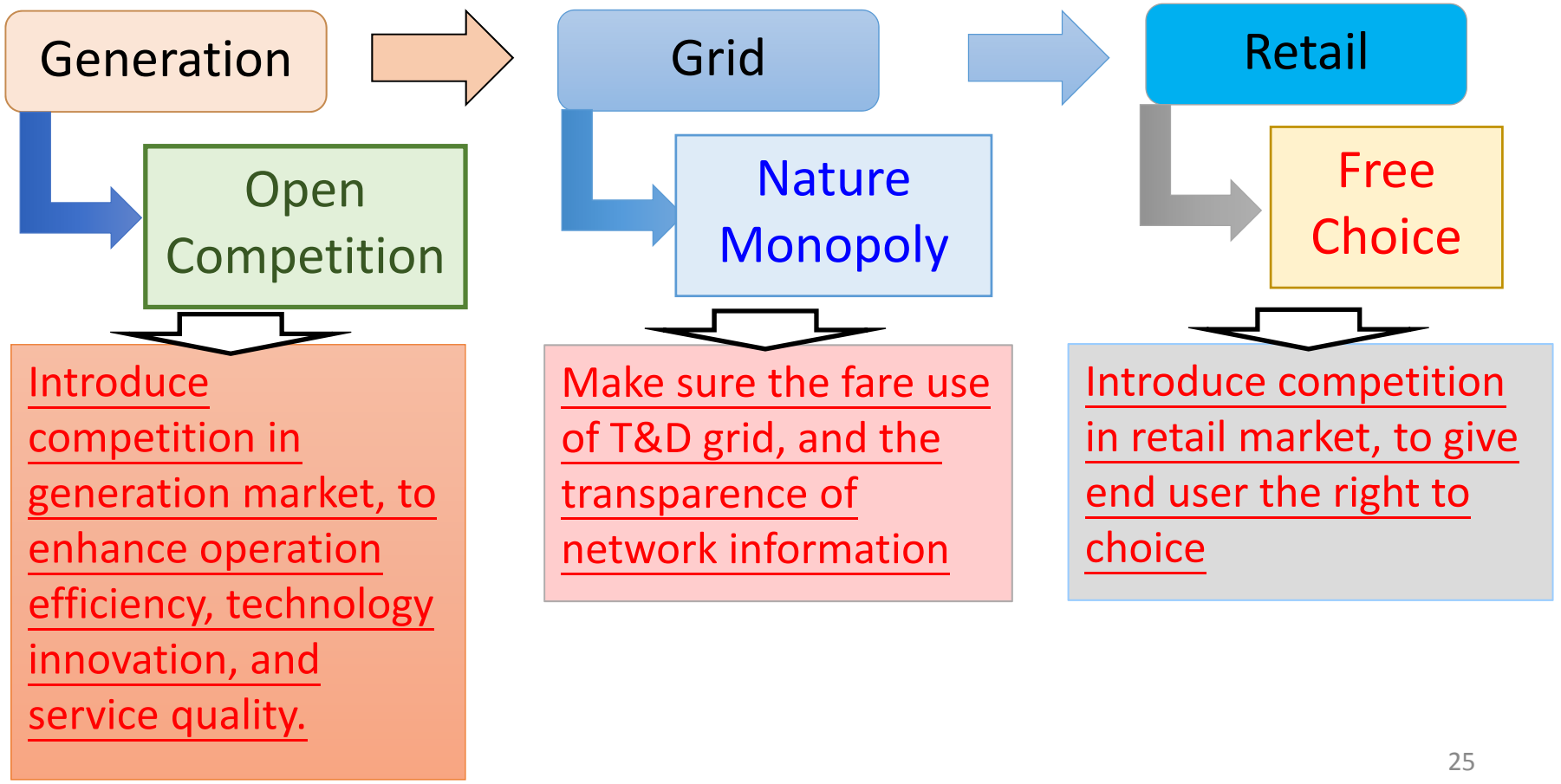
- **Potential sites have been prepared for future reference ~ 20 cases**
  - **total planned capacity ~ 10.2 GW**
  - **will be expected to drive NT $1,843.2 billion, of which domestic investment account for 53% (about NT $984.5 billion).**



III. Taiwan's Electricity Market Reform: Amendment of the Electricity Act

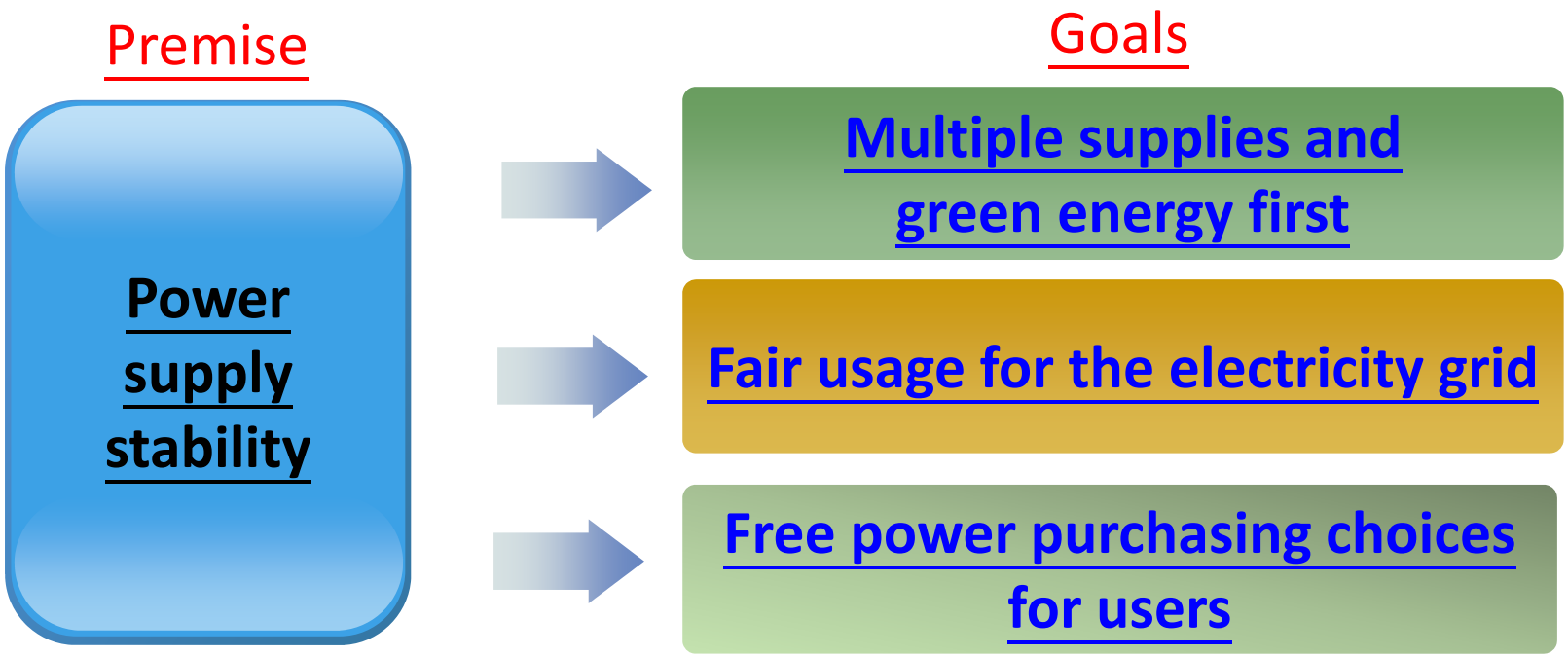
Purpose of the Amendment(1)

- International Practices



Purpose of the Amendment(2)

- One premise and three goals
  - "multiple supplies, fair usage, and free choices" market under the premise of power supply stability.



Planning of the Amendment(1)

- The Framework of Electricity Market (Before)

Taipower Company
Vertical Integrated Power Company
(Public utility)

Taipower Generations
- existing power plants (31,651MW)
- power plants in constructions
- approved power plants for construction

Independent Power Producer
- 9 IPPs, 7,710 MW
- renewable energy

Self-use Power Generation Equipment
(cogeneration, renewable energy, and others)

Power Grid

(Transmission & Distribution)

Electricity Supply Obligation

Common Users in Operation Regions
(Electricity Price Regulation)

(Operation regions：Taiwan、Penghu、Kimen、Martzu)

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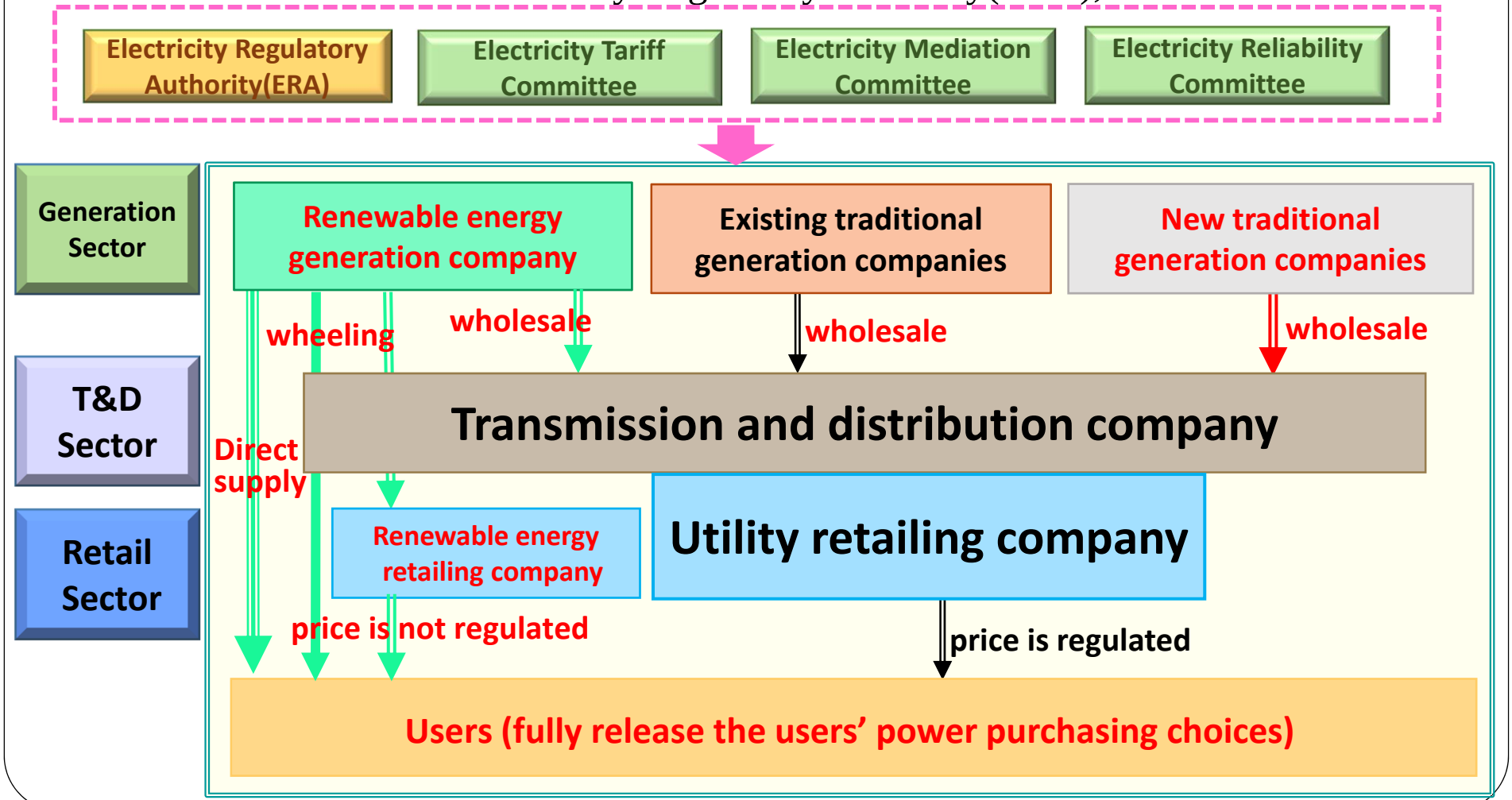
Planning of the Amendment(2)

- The Framework of Electricity Market (Amended)
  - Establish of the Electricity Regulatory Authority(ERA), and 3 committees



Planning of the Amendment(3)

■ Amendment of the Electricity Act

- **Green Electricity Comes First**
  - ✓ **Electricity generated from renewable energy can be sold in 3 different ways: wholesale, wheeling, and direct supply.**

    "Wheeling": transferred through transmission and distribution grids to the end user.

    "Direct Supply": connecting directly to the users and thereby supplying power.

- **Unbundling of Power Sector and Grid Sector**
  - ✓ **Taipower company should be transformed into a holding company.**
  - ✓ **The company of generation and the company of transmission, distribution, and retailing** (which have the transmission and public retailing utility licenses) **should be established under the holding company.**
  - ✓ **Unbundling should be completed in 6~9 years after the amendment.**

IV. Conclusion

Conclusion(1)

- Due to a lack of indigenous energy resources, Taiwan relies on imported energy resources for 97.53% of its needs in 2015. Fossil fuels play a major role in the energy supply structure, having a tendency of excessive concentration.
- As an isolated power system, Taiwan Power network has not yet been connected to other power systems. Taiwan face more challenges in balancing supply and demand, as well as the adoption of renewable energy.
- The structure of electricity generation in 2016: coal-fired 45.42%, LNG 32.41%, renewable energy 4.77%.
- Taiwan's current energy policy is developing clean energy and increasing the share of low carbon energy in electricity generation systems
  - will be expected to reach renewables 20%, coal-fired 30%, and gas 50% in 2025.

Conclusion(2)

- In order to achieve the goal of 20% renewables in the structure of energy distribution in 2025, the government have made the Electricity Act amendment to promote the electricity market reform.
- As well, "renewable energy precede" increase the flexibility of renewable energy generator's choice.
- Opening of the renewable energy may attract more foreign investment in renewable energy sector and the establishment of renewable energy.

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Thank You for the Listening