



APEC Workshop on Small Hydro and Renewable Grid Integration

Smart Grid Master Plan in Chinese Taipei

Bureau of Energy, MOEA



April 5, 2013



Outlines



I. Introduction

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Power System in Chinese Taipei



	Install Capacity	Power Generation
Pump Hydro	5.34%	1.15%
Coal	39.65%	49.47%
Oil	7.70%	3.27%
LNG	32.54%	25.84%
Nuclear	10.55%	16.70%
Renewable Energy	6.92%	3.56%
Conventional Hydro	4.19%	1.59%
Wind	1.07%	0.59%
PV	0.15%	0.03%
Biomass	0.23%	0.13%
Waste	1.28%	1.23%

Power System (2011)

**Power Capacity
48,750 MW
Power Generation
252,173 GWh**

Source: Bureau of Energy, Ministry of Economic Affairs



Hydro Power System



- Total 15 hydro power plants contribute 9.52% of total installed capacity and 2.74% of power generation in 2011.
- One pump hydro contributes 36.4% of total hydro power capacity.
- The others are conventional hydro power plant. 2 of them with capacity > 1 GW; 3 of them with capacity between 100 ~ 200 MW, the other 9 less than 100 MW.

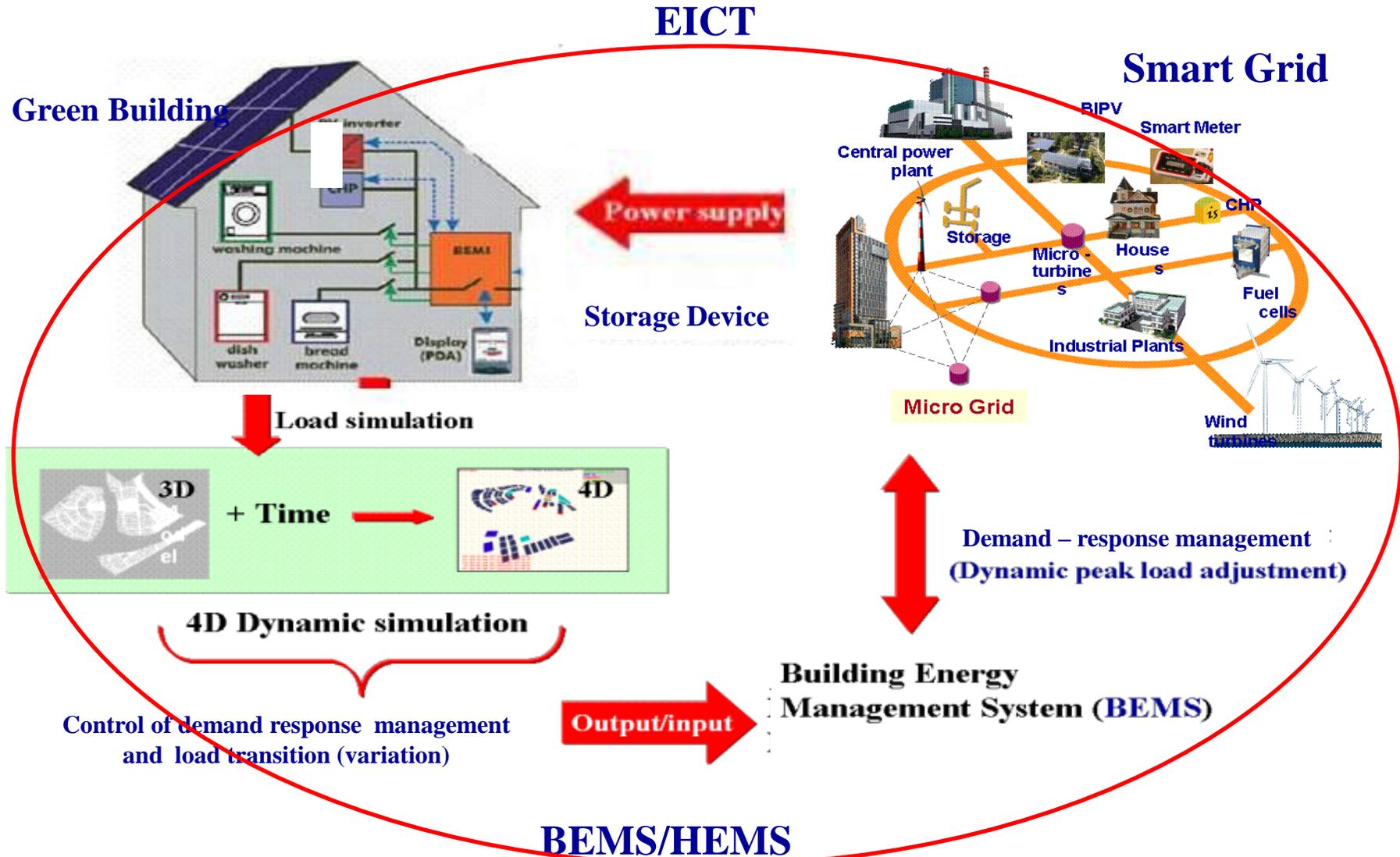
Target of Renewable Energy

- The installed capacity of renewable energy was 3,683 MW in Dec 2012.
- Targeted renewable power generation capacity is 12.5 GW by 2030.

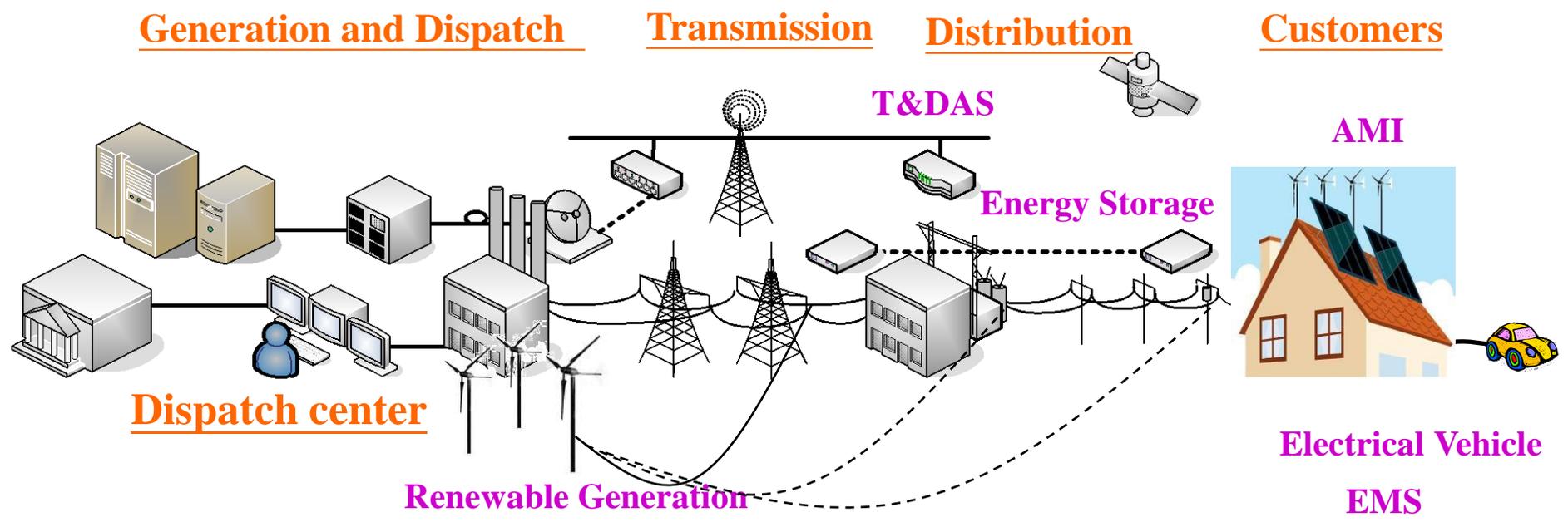
Energy Source	2012	2015	2020	2025	2030
On-shore Wind	621	866	1,200	1,200	1,200
Off-shore Wind	0	15	600	1,800	3,000
Hydro Power	2,060	2,052	2,112	2,502	2,502
Solar PV	201	492	1,020	2,500	3,100
Geothermal	0	4	66	150	200
Biogas	9	29	29	31	31
Waste to Energy	792	848	925	1,369	1,369
Ocean Energy	0	1	30	200	600
H2&Fuel Cells	0	7	60	200	500
Total	3,683	4,314	6,042	9,952	12,502
Percentage of installed capacity	7.7%	10.0%	10.6%	14.8%	16.1%

Source: Bureau of Energy, Ministry of Economic Affairs

Why Smart Grid & Energy Storage?

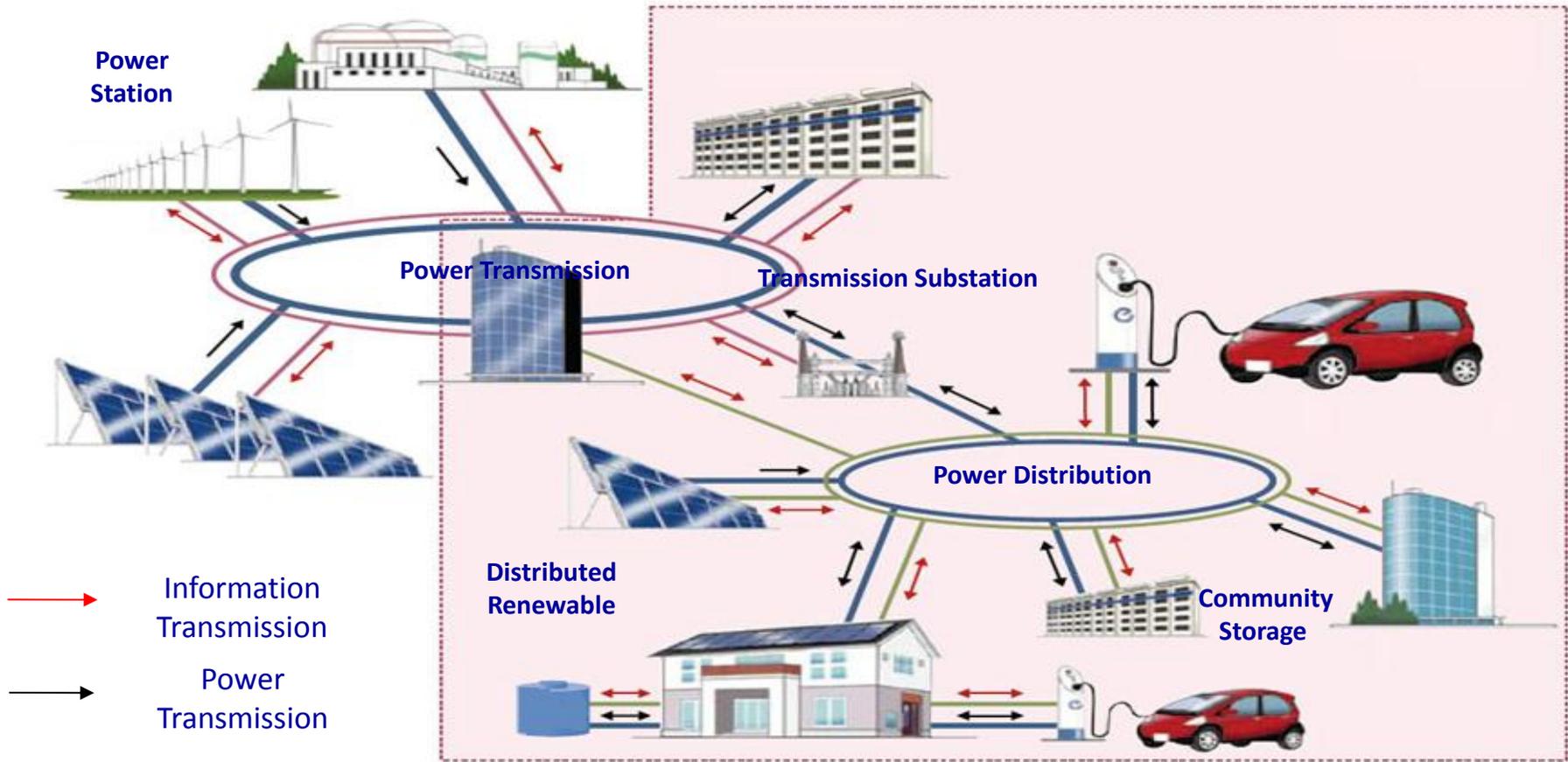


Scope of Smart Grids



Scenario of Energy Storage

- Larger scale renewable source balancing
- Substation ride-through
- Community storage (commercial, industrial, residential)
- Distributed renewable resources
- V2G storage



Source: 技術在線, 2009 ; ITRI , 2010



I. Introduction

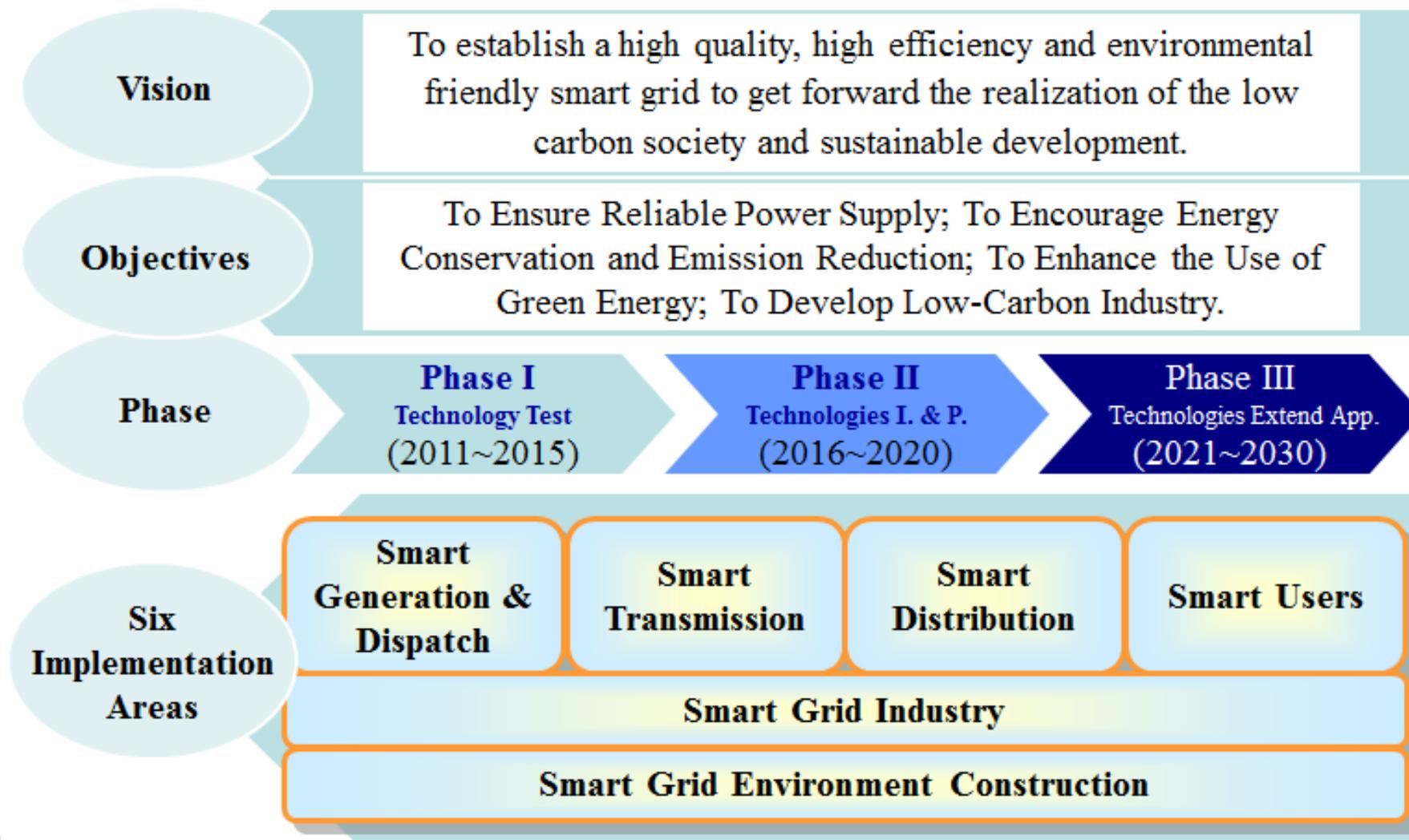
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Smart Grid Master Plan

- Bureau of Energy initiated the planning of “Smart Grid Master Plan”
- “Smart Grid Master Plan” is announced on 3 Sept. 2012.



(1) Ensure Reliable Power Supply:

- The **SAIDI** (System Average Interruption Duration Index) should be maintained on the top five of the world in 2030. (**2030:15.5min./year**)
- Reducing the power transmission loss from 4.8% to 4.4% in 2030.

(2) Encourage Energy Conservation and Emission Reduction:

- Reducing 100 million ton CO₂ emission per year in 2030.

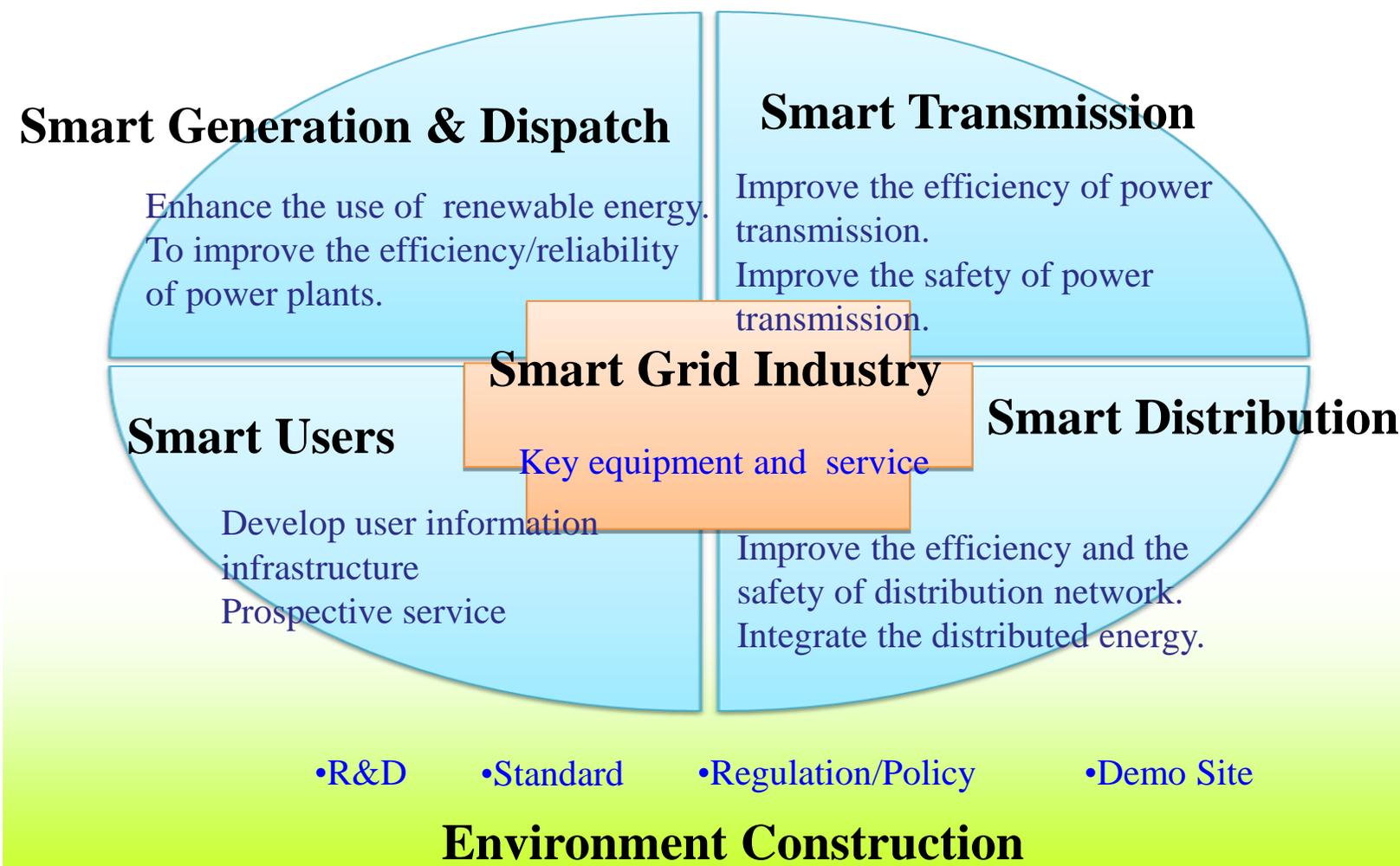
(3) Enhance the Use of Green Energy:

- Improving the renewable power interconnection capability to 30% in 2030.

(4) Develop Low-carbon Industry:

- Driving smart grid industry to create NTD 700 billion value in 2030.

Six Implementation Areas





I. Introduction

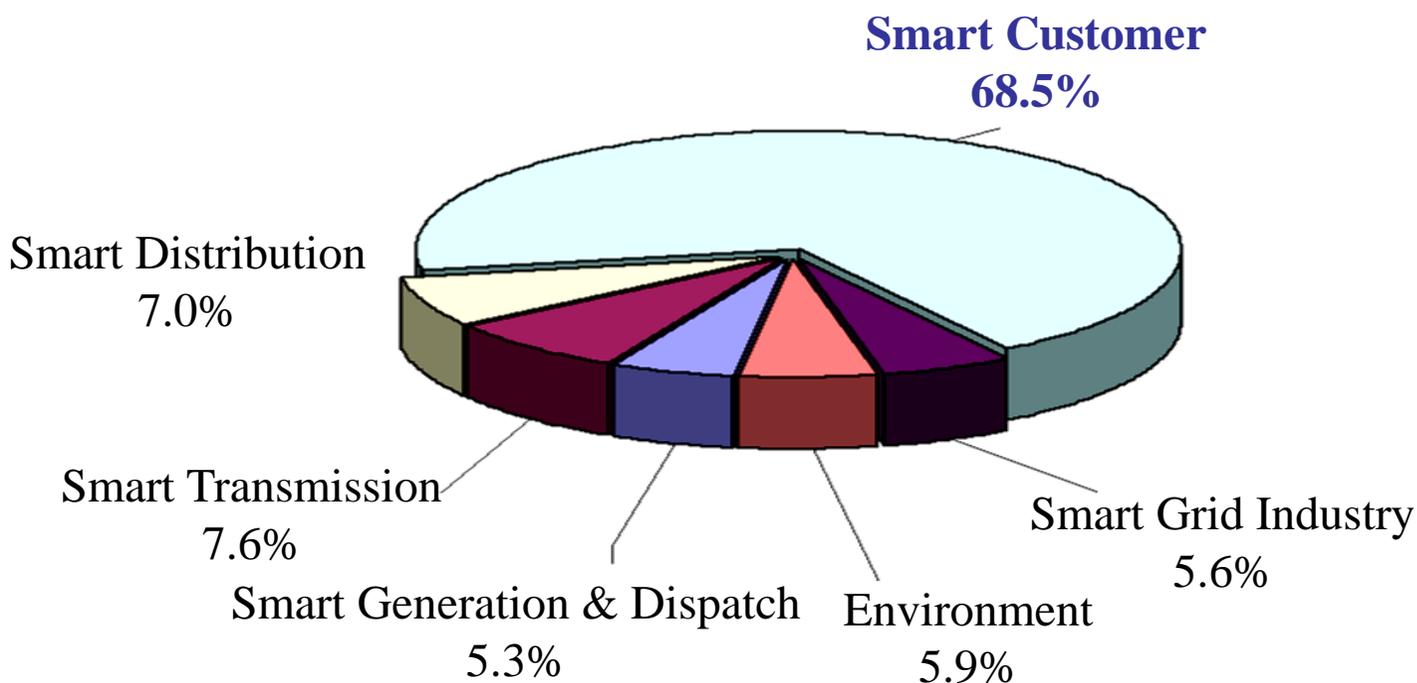
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Investment

➤ The total investment is around USD \$4 billion during 2011-2030



Expected Benefits (1/2)

Objectives		Phases	Current-2011	Phase I 2012-2015	Phase II 2016-2020	Phase III 2021-2030
Ensure Reliable Power Supply	SAIDI (min/customer · year)		21	17.5	16	15.5
	Reduced transmission loss (%)		4.72	4.64	4.54	4.42
	Improve power supply bottleneck		64item	solve 20%	solve 40%	solve 80%
	Smart Substation		-	25 stations	303stations	583 stations
	DAS		70%	80%	88%	100%
	AMI (meters)		HV 1,200	HV 23,000 LV 1 million	LV 6 million	national wide deployment



Expected Benefits (2/2)

Objectives		Phases	Currently 2011	Phase I 2012-2015	Phase II 2016-2020	Phase III 2021-2030
Energy Conservation and Emission- Reduction	Emission- Reduction (million To ton./year)		-	11.78	35.99	114.71
Enhance the Use of Green Energy	Improving renewable power interconnection capacity (penetration)		10% under	15%	20%	30%
Develop Low-carbon Industry	Smart Grid Revenues (NTD)		25 billion	100 billion	300 billion	700 billion



Summary

- The expectations of Smart Grid Master Plan are not only to upgrade existing power grids, but also to enhance the supplementary schemes including regulations and policies.
- Following work:
 - A supra-ministerial mechanism is required to coordinate the resources and manage the progress of different departments.
 - Establish a rolling review mechanism to adjust objectives of each phase.



Thank you for your attention

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