





Chinese Taipei

As the industry and commerce in Asia have become more and more inter-dependent, it is expected that Taiwan's economy will maintain a stable growing trend in the forthcoming years.

Electricity is one major driving force for economic development. It is closely related with people's livelihood. The average growth rate of energy sales for the past 3 years in Taiwan is 5.25%. Taipower estimated an annual average 4.20% growth of energy sales for the following 2 years because of slow regional economic expansion. In a long-term load forecast study, it is estimated that peak-load demand will grow by an average 4.1% per year from 30,375 MW in 2005 to 53,207 MW in 2019. The fastest growth in the load demand is the high tech industry, especially in the electronic and information technology industries.

GOVERNMENTAL CONTROLS & REGULATIONS Government Policy on Reform of the Energy Sector and Deregulation of the Power Industry in Taiwan

(1) Reform of the energy sector

In order to promote the liberalization and privatization of the energy sector, and to create a fair and reasonable competitive market, the government decided to adopt the following strategies:

- i. To revise laws and regulations related to energy management, including electricity and petroleum sectors.
- ii. To deregulate the electric industries, and

introduce competition of the generation sector through phasing in the direct access policy.

- iii. To promote liberalization of the petroleum industries to solicit private investors to engage in the petroleum refining business and import & export of oil products gradually.
- iv. To motivate development of the LNG industry and deregulate gradually public gas companies to run the gas business for industrial use.
- v. To promote privatization of state-owned public energy utilities.

(2) Deregulation of the power industry

1. Introduction of Independent Power Producers to the generation sector

In order to cope with the power shortage problem in 1993 and 1994, the government deregulated the generation sector based on the following phases:

Phase 1 & 2^oG

- The government deregulated the generation sector based on PPA in 1995 and 1997.
- After open biddings, 5 IPPs, in total 5,270MW, were approved and signed 25-year PPAs with Taipower in 1997.

Phase 3^oG

- 4 IPPs, in total 2,910MW, were approved in 1998 based on the rules: no limitation in capacity but with limitation in LNG units under consideration of CO2 emission issues.

PROFILE

Capital Area	Taipei	Installed Capacity	46,201MW
Population	35,980 km	Population Electrified	nearly 100%
GDP	22.60 million	Main Voltages (kV)	345, 161, 69
Currency	US\$576.2 billion	Natural Resources	small deposits of coal, natural gas
	New Taiwan Dollar (NT\$)		

- Of the above, 3 IPPs, in total 1,950MW signed 25-year PPAs with Taipower on September 2000.

The above 8 IPPs are all in commercial operation.

2. Revision of the Electricity Act

In order to deal with the issues from economic, political and social changes, the government decided to deregulate the power sector in the early 1990s. Then, several drafts of the Electricity Act Amendment were submitted by the Executive Yuan (Cabinet) to the Legislative Yuan (Congress) for review. However, the Draft was not passed by the Legislative Yuan because of a lack of consensus among political parties. The latest Draft was proposed by the MOEA, and submitted to the Executive Yuan for approval on October 13, 2005. According to current law, the new Draft will be resubmitted to the Legislative Yuan after approval by the Executive Yuan.

3. The main contents of the new draft of the Electricity Act Amendment

a. Deregulation of the Generation Sector

- It is to deregulate the generation sector to solicit private investors to engage in the generation market.
- IPPs can sell electricity to customers in three ways: wholesale, direct access, and bilateral contracts.
- Integrated utilities (including generation, transmission & distribution) are allowed in the power market, but they are regulated by the government in tariff and service quality.

b. Regulation of Integrated, T& D Utilities

- Integrated, transmission and distribution utilities are regulated by the government.
- Integrated and distribution utilities have obligations to serve in the system connection and power supply for customers within their business areas.
- The government will regulate the utility rates and ISO charges.

c. Phasing in Customer's Choice for Supply

- Customers can choose their energy suppliers by direct access through network or an exclusive transmission line with a long-term contract.
- The rule and scope of the customer's choice will be decided by the government based on available capacity of transmission system.



DEMAND AND AVAILABILITY

Item	peak load (MW)	net peaking capability (MW)	reserve margin (%)	power demand (GWH)	power supply (GWH)
Year					
2004	29,034	34,894	20.2	1,682	1,772
2005	30,943	36,001	16.3	1,760	1,851

- 3. The percentage of the population provided electricity is nearly 100% in Taiwan.
- 4. The rural electrification project was overall completed in 1994.



POWER GENERATION

Generation Capacity(MW)

Item	2001	2002	2003	2004	2005
Hydro	2,602	2,602	2,602	2,602	2,602
Thermal	20,568	22,258	23,633	24,940	26,448
Nuclear	5,144	5,144	5,144	5,144	5,144
Others(renewable)	1,822	1,911	1,911	1,912	1,928
All categories	30,136	31,915	33,290	34,598	36,122

Power Generation (GWh)

Item	2001	2002	2003	2004	2005
Hydro	4,070	3,604	3,852	3,338	3,830
Thermal	114,822	121,526	129,566	136,770	143,296
Nuclear	34,094	38,009	37,371	37,939	38,404
Others(renewable)	5,073	2,762	3,022	3,199	4,133
All categories	158,058	165,901	173,810	181,245	189,663

- Taiwan has little indigenous natural energy resources. In order to insure security and reliability of power supply, Taipower adopted a fuel security stockpile policy to maintain around 45 days stockpile for coal, 30 days for fuel oil, and 3 years for uranium, respectively.



Long-term Power Development Programme: Capacity Mix

Type Year	Hydro		Renewables			Nuclear		Coal		Oil		LNG		Total	
	MW	%	Conven- tional Hydro (MW)	%	Others (MW)	%	MW	%	MW	%	MW	%	MW	%	MW
2001*	2,602	8.6	1,820	6.1	2	0.0	5,144	17.1	10,800	35.8	4,637	15.4	5,131	17.0	30,136
2002*	2,602	8.2	1,909	5.9	2	0.0	5,144	16.1	11,197	35.1	3,579	11.2	7,482	23.4	31,915
2003*	2,602	7.8	1,909	5.7	2	0.0	5,144	15.5	11,197	33.6	3,563	10.7	8,873	26.7	33,290
2004*	2,602	7.5	1,907	5.5	5	0.0	5,144	14.9	11,197	32.4	3,522	10.2	10,221	29.5	34,598
2005*	2,602	7.2	1,910	5.3	18	0.0	5,144	14.2	11,747	32.5	3,609	10.0	11,092	30.7	36,122
2006	2,602	6.9	1,936	5.1	331	0.9	5,144	13.7	12,297	32.7	3,609	9.6	11,706	31.1	37,625
2007	2,602	6.6	2,010	5.1	922	2.3	5,144	13.1	11,897	30.2	3,613	9.2	13,155	33.4	39,344
2008	2,602	6.4	2,077	5.1	1,422	3.5	5,144	12.7	11,897	29.3	3,633	8.9	13,880	34.1	40,655
2009	2,602	5.9	2,151	4.9	1,912	4.4	6,494	14.8	11,897	27.2	3,627	8.3	15,095	34.5	43,777
2010	2,602	5.6	2,168	4.7		5.2	7,844	16.9	12,697	27.3	3,649	7.9	15,095	32.5	46,457
2011	2,602	5.5	2,208	4.6	2,492	5.2	7,844	16.5	13,697	28.8	3,657	7.7	15,095	31.7	47,596
2012	2,602	5.3	2,208	4.5	2,593	5.3	7,844	15.9	15,297	31.0	3,666	7.4	15,095	30.6	49,305



III. Taiwan is an isolated island, neither importing nor exporting electricity.

IV. Power Plants in Taiwan (as of December 31, 2005)

Power plants	Installed capacity (MW)	Generation (GWH)	Fuel
Pumped Storage			
• Takuan _	1,000	1,174	Hydro
• Mingtan	1,602	2,656	Hydro
Renewables			
• Storage	1,487	2,216	Conventional Hydro
• Pondage	271	901	Conventional Hydro
• Run-of-river	152	937	Conventional Hydro
• Wind power	18	79	Wind
Thermal			
• Shenao #1-#3	400	2,908	Coal
• Linkou #1-#2	600	3,593	Coal
• Talin #1-#2	600	4,482	Coal
• Talin #3-#4	750	2,831	Oil
• Talin #5-#6	1,050	1,337	LNG
• Hsiehho #1-#4	2,000	6,546	Oil
• Hsinta #1-#4	2,100	14,358	Coal
• Taichung #1-#9	4,950	36,815	Coal
• Nanpu Combined Cycle #1-#4	1,118	3,779	LNG
• Tunghsiao Combined Cycle #1-#6	1,707	6,840	LNG
• Hsinta Combined Cycle #1-#5	2,226	10,427	LNG
• Tatan CC #1-#2 Gas Turbines	872	190	LNG
• Linkou Gas Turbines	300	13	Oil
• Taichung Gas Turbines	280	16	Oil
• Islets	279	682	Oil
Nuclear			
• 1st Nuclear #1-#2	1,272	9,104	BWR
• 2nd Nuclear #1-#2	1,970	14,888	BWR
• 3rd Nuclear #1-#2	1,902	14,412	PWR
IPPs			
• Mailliao #1-#3	1,800	12,836	Coal
• Hoping #1-#2	1,297	7,765	Coal
• Everpower #1-#2	900	3,341	LNG
• Hsintao	600	2,473	LNG
• Kuokuang	480	1,724	LNG
• Chiahui	670	2,297	LNG
• Star Energy	490	1,812	LNG
• Sun Ba	980	3,466	LNG
Total	36,123	176,900	-

V. Long Range Power Development Program

Project	Capacity (MW)	Operation Year
First Phase Wind Power	99	2005
Taichung #9-#10(Coal)	2*550	2005~2006 (#9 commercial in 2005)
TatanCC #1-#6(LNG)	4,384	2005~2008 (#1GT_#2GT commercial in 2005)
Offshore Islets(Oil)	63	2005~2016
Yun Lin Biomass(IPP)	4	2006
Shin Feng Wind Power (IPP)	20	2006
Hsikou Hydro(IPP)	12	2006
Ming Jian Hydro(IPP)	17	2006
Photovoltaic System	1	2006~2011
Purchased Renewable Energy(IPP)	2,395	2006~2016
Fengping Creek Hydro(IPP)	37	2007
Penghu Huhsi Wind Power #1-#6	5	2007
Second Phase Wind Power	126	2007
Kukuan rehabilitation	33	2007
Choshui Replacement	4	2007
Chumen Replacement	3	2008
Bihai Hydro	61	2008
Matsu Ju-Shan #1~4	14	2008
Dong Jiin Hydro(IPP)	3	2008
Third-fourth Phase Wind Power	140	2008~2011
Starbuck (IPP)	490	2009
Shibao Hydro	74	2009
Fourth Nuclear #1-#2	2*1,350	2009~2010
Changgong #1-#2(Coal)	2*800	2010~2011
Purchased Hydro(IPP)	30	2010~2015
Wanta Extension & Sunclin	41	2011
Linkou Rebuild #1-#2(Coal)	2*800	2011~2012
Shenao Rebuild #1 (Coal)	800	2012
TPC Planning Renewable	123	2012~2016
Total	15,979	



Meter Rate Lighting Service

Unit : NT\$

CLASSIFICATION				Summer (Jun 1 ~ Sep 30)	Non- Summer (All other days of the year)
Regular Service (Non-TOU) Rate	Non-com mercial	First 110 KWh per month	Per KWh	2.100	2.100
		Next 220 KWh per month		2.730	2.415
		Next 170 KWh per month		3.360	2.730
		Over 500 KWh per month		3.465	
	Commerical		Per KWh	3.465	2.730

*There is no variation between 2004 and 2005.

Latest Change in Tariff Rates

Complying with the government policies to take care of low-income customers and to encourage energy conservation, Taipower cut down on the monthly prices of the Regular Service (non-TOU rate) for non-commercial usage^o]below 500 KWh^o^from June 1, 2003.

Tariff Subsidies

As one of the state-owned public utilities, Taipower is directed by the government and the Electricity Act. Under current government policies, Taipower provides the following customers with preferential rates (i.e., subsidized rates):

- Electrified railway power
- Public waterworks power
- Public street lightings
- Low- tension school lightings
- Agricultural power
- Military family lighting
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4. Pricing Policy of the Tariff

Taipower proposes the tariff and submits it to the government for approval based on the following principles:

- i. Economic aspect: to reflect supply cost and to promote power use efficiency.
- ii. Financial aspect: to keep a sound financial structure based on a reasonable rate of return.
- iii. Social aspect: to take care of low-income customers and minorities based on public interests and public purpose.

TRANSMISSION AND DISTRIBUTION

4. Range of Transmission Voltages

Taipower's transmission network is composed of three voltage levels of substations and transmission lines:

- i. 345KV in the main trunk system with EHV substations and transmission line (E/S: 345/161KV).
- ii. 161KV in the primary transmission system with primary and distribution substations (P/S: 161/69KV, D/S: 161/22.8/11.4KV).
- iii. 69KV in secondary transmission system with secondary substations (S/S: 69/34.5/22.8/11.4KV).

VII. Length of the Installed Backbone Network (ckt-km)

Voltage	Dec. 1981	Dec.1991	Dec.2001	Dec. 2004	Dec. 2005
345KV	1,113.7	2,338.4	3,345.6	3,567.6	3,567.6
161KV	3,094.1	3,751.6	4,684.4	5,366.8	5,636.9
69KV	3,859.1	5,298.6	5,894.4	6,003.3	6,069.0
34.5KV	207.2	25.4	0	0	0
22.8KV	112.4	1,914.5	6,740.8	7,955.3	8,409.6
11.4KV	41,921.3	62,045.7	94,642.3	103,452.5	105,603.3
Distribution Line	110,047.9	177,383.1	274,467.1	296,800.9	303,587.0

IX. Substations

Item	Year 2001-2002	Year 2003-2004	Year 2005-*2006
Step up			
(a) Number	37	50	57
(b) Aggregate capacity	9,175	9,365	7,530
Step down			
(a) Number	11	9	10
(b) Aggregate capacity	501	502	600
Distribution Transformers	(until 2002.12)	(until 2004.12)	(until 2006.4)
(a) Number	1,176	1,272	1,328
(b) Aggregate capacity	38,532	44,626	48,360

Taipower completed 29 new substations, with a total capacity of 3,765 KKVA, in 2005 and planned to step up 28 new substations in 2006.

VIII. Expansion of Transmission Lines and Facilities

In order to response to long term power development program and regional load growth, Taipower has proposed "The Sixth Transmission and Substation Project," which was approved by the government, and started its construction on July 2001. The project will be completed by December 2009. Major construction works include Ö@23 EHV substations (E/S), ÖA6 primary substations (P/S), ÖB234 primary distribution substations (D/S), and ÖC708 ckt-km 345kV, 2609 ckt-km 161 kV, 868 ckt-km 69kV transmission lines.

ENVIRONMENT

X. Environment

1. In order to decrease the generation cost and to promote energy efficiency, Taipower adopted main strategies and schemes as follows:

- i. Reducing average heat rate of thermal power plants.
- ii. Reducing loss rate of T&D lines.
- iii. Increasing energy utilization control within the power plants.
- iv. Promoting various energy conservation educations and propogandas.
- v. Holding annual energy saving exhibition activities.



2. Strengthen energy conservation service to the customers with contracted capacities of above 100 KW.
3. Distribute various educational publications and release information related to energy conservation to the public.
4. Install a toll-free telephone line for customer consultation on energy conservation.

In the future, Taipower will focus on issues of environmental protection and energy efficiency promotion. The key activities of the energy efficiency promotion will be interconnected closely with social caring and mass media will be used to urge public to conserve energy.

Promotion of energy efficiency

- In order to cut down the generation cost and to promote energy efficiency, Taipower follows "Energy Conservation Label" to guide the public to purchase high efficiency electric appliances. The ways to promote energy conservation are as follows:
 - Holding large-scale energy conservation activities once every year, including nationwide energy conservation workshops, composition/painting contests for elementary and secondary school students, etc.
 - Organizing and participating in various promotion activities every year.
 - Distributing brochures to customers for energy conservation of electric appliances.
 - Visiting 500 over 100KW customers every year to suggest improvement in the efficient use of electric appliances.
 - Installing a toll-free telephone line for customer consultation on energy conservation.
 - In the future, our promotion will focus on the consciousness of environmental protection and energy conservation; promotion campaigns will connect closely with social caring; mass media will be used to urge the public to conserve energy.
 - Counter-measures to deal with the Kyoto Protocol
 - As a member of the global village, Taiwan has an obligation to respect the

Kyoto Protocol in international society. Presently, Taipower will adopt the following countermeasures to reduce relevant greenhouse gas emissions:

- Increasing the heat rate of thermal power plants.
- Strengthening transmission and distribution system to reduce energy consumption.
- Raising the low-carbon and renewable energy generation percentage.
- Promoting energy conservation measures.
- Enhancing maintenance work for the generators in thermal and nuclear power plants.
- Reinforcing controls on the facilities that contain SF6 emissions.
- Promoting trees planting, environmental greenification and beautification
- Studying the application of renewable energy technologies.
- Checking and controlling the greenhouse gas emissions of all the company's facilities.
- Following-up on the development of relevant international issues.

XI. The Performance of the Environmental Protection Policy

1. Taipower must comply with the regulations of the Environmental Impact Assessment Act (EIA Act) to undertake its power projects planning. In 2005, six development projects passed governmental reviews: Linko Power Plant Rebuilding Projects, Shibao Hydro Power Project, Wind Power Project(second phase) of Tatan Natural Gas-fired Combined-cycle Project, the Second Phase Ash Pond of Linko Power Plant Project, Chumen Hydro Replacement Project and Upgrade of Gas-Turbined Blade of the Forth and Fifth Units in Tungshiao Combined-cycle Project.
2. Taipower will continuously promote effective use of energy and environment preservation based on its corporate responsibility for environmental protection. In addition, Taipower is deeply concerned about the issues regarding the ecological environment, biodiversity, exclusive fishing

- rights, marine environmental protection areas, etc., in the areas surrounding power plants.
3. Under the regulations of “the Emission Standards of Air Pollutants for Stationary Sources,” “Standards Governing Emission of Air Pollutants Produced by Power Equipment,” and “Environment Protection Act (EPA),” Taipower adopts various protective strategies and emission control programs to ensure that emissions of the existing thermal power plants meet requirements of the regulations.
 4. Taipower consistently makes the following efforts based on its non-regrettable strategies to fulfill the global responsibility of mitigating GHG emissions:
 - i. Improving power generation efficiency of the existing thermal power units.
 - ii. Adopting high efficient super-critical units in new coal-fired power plants.
 - iii. Strengthening network systems of power transmission and distribution to reduce power loss.
 - iv. Increasing the ratio of low carbon and/or no carbon power options except nuclear.
 - v. Promoting the measures of power saving and load management by demand-side management.
 - vi. Enhancing the operation and maintenance of nuclear and hydro power units to maximize their output.
 - vii. Enhancing the management and control of SF6 to reduce GHG emissions.
 - viii. Enhancing the work of afforestation and reforestation.
 - ix. Implementing GHG investigation task to control the quantity of CO2 emissions.
 - x. Keeping track of the trend of the international GHG development.
 5. In order to achieve effective use of resources and resolving environmental pollution problems, Taipower has established a “waste reduction counseling group” to plan and promote industrial waste reduction and participate in competitions for environmental protection technologies. In 2005, Taipower won the top prize in “the 14th Enterprise Environmental Protection Award” held by the Environmental Protection Administration, Executive Yuan. The production rate of fly ash was about 1,800 thousand tons annually, of which 1,240 thousand tons were recycled and reused, which implied that the approximate utilization rate of fly ash was about 69%.
 6. Taiwan has been actively promoting ISO 14001¹]Environmental Management System, EMS^o which was issued in September 1996. 26 units of Taipower passed ISO 14001 certification. In the future, in accordance with the principles of “Pollution Prevention” and “Continuous Improvement” of ISO 14001, Taipower will keep its efforts in generating and supplying clean electricity.
- ## XII. Research & Development on Environment Protection
1. Studies on Technologies for Flue Gas Clarification & CO2 Reduction in Thermal Power Plants:
 - i. Studies on Technologies for Separation and Fixed Technology of CO2 Using Chemical Method.
 - ii. Studies on the Characteristics of De-NOx Catalyst & Regeneration in Thermal Power Plants.
 - iii. Studies on the Properties of Carbon Dioxide-Fixation with Oceanic Micro Algae & its Application.
 2. Determination of Mercury Concentration Distribution in Thermal Power Plants.
 3. Studies on Technologies for Water Treatment in Thermal Power Plants:
 - i. Study on Recovery of Wastewater of Thermal Power Plants by Reverse Osmosis Method.
 - ii. Development & Application of the Pretreatment Process for Recovering Boiler Blowdown.
 - iii. Development of the Technology for Seawater Desalination Reverse Osmosis Membrane Backwash.
 - iv. Application of Nanofiltration Membrane on Wastewater Treatment in Thermal Power Plant.
 - v. Study on seawater FGD Discharge Quality & Biological Test Monitoring.