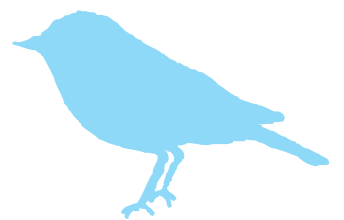
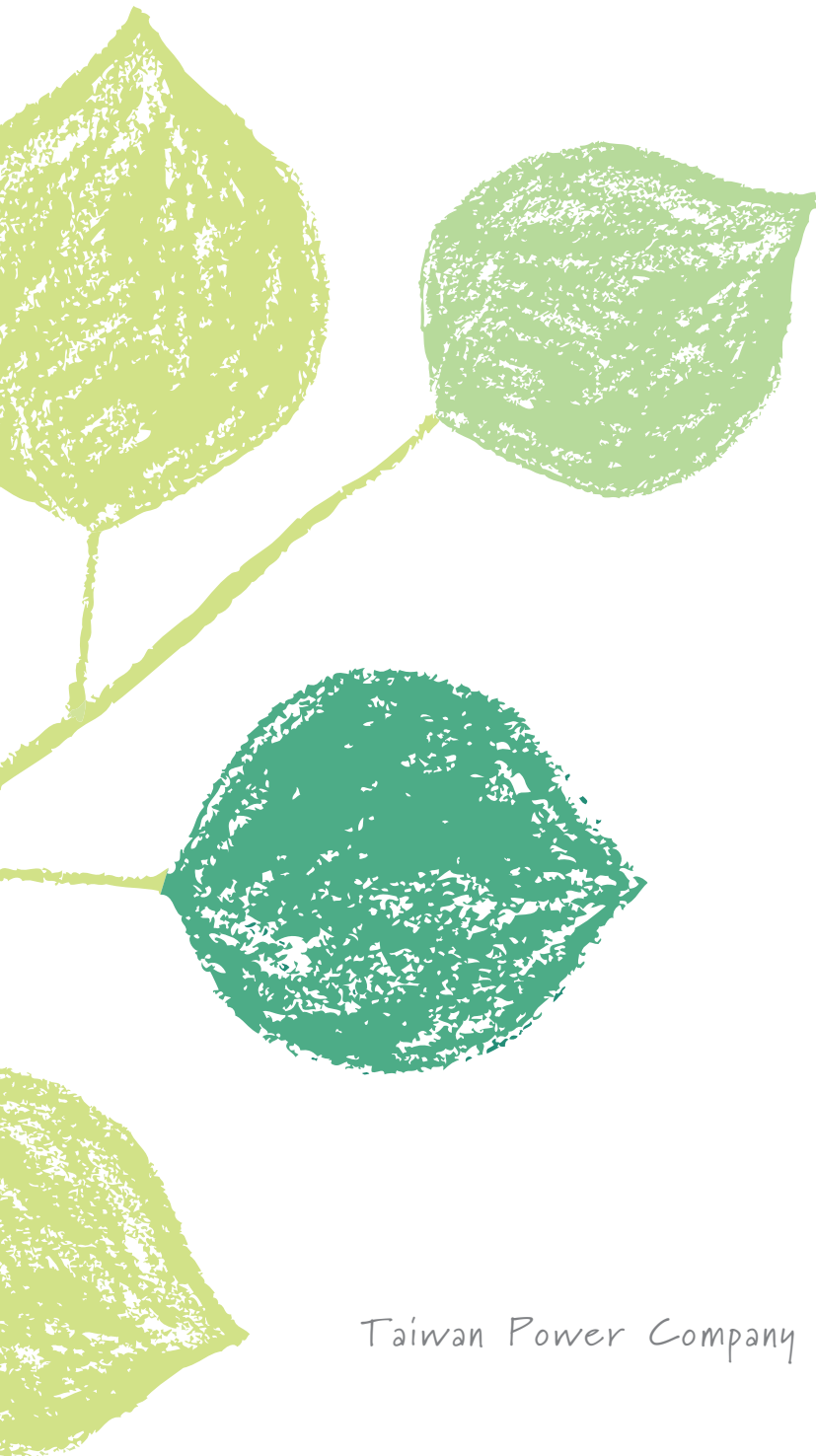




Taiwan Power Company Sustainability Report

2009



Taiwan Power Company Sustainability Report

# Editorial Policy

## About the Report

This report follows the Global Reporting Initiative (GRI) guidelines for application level A. The purpose of this sustainability report is to communicate with the society how we, the Taiwan Power Company (Taipower), strive in fulfilling our social duties of sustainable development.

## Period Covered by the Report

January to December 2008

## Scope of the Report

This report contains data and information regarding sustainability issues and achievements within financial, environmental and social aspects of Taipower.

This report conforms to GRI level A guidelines.

## Inquiries

This report can be found both in English and in Chinese. Both versions are downloadable at our website (<http://www.taipower.com.tw/>) as PDF files. Our next sustainability report is expected for publication in the second quarter of 2010.

Taipower sincerely hopes that the publication of this report may allow further understanding of our efforts in sustainability. If there are any suggestions or comments regarding this sustainability report, Taipower will gladly accept them through any of the following contact methods:

### Taiwan Power Company

- Contact: Department of Corporate Planning
- Address: No. 242, Sec. 3, Roosevelt Rd., Zhongzheng District, Taipei, Taiwan (R.O.C.)
- Telephone: (02)2366-6462
- E-mail: [d00303@taipower.com.tw](mailto:d00303@taipower.com.tw)
- Company Website: <http://www.taipower.com.tw/>

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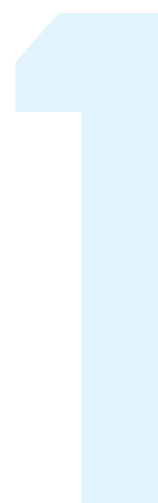
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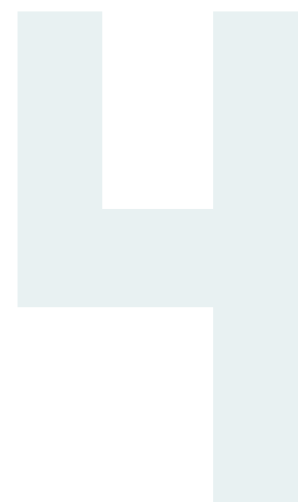


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# Introduction

## Profile of Taipower

Taipower was established in May of 1946. It is a vertically integrated power utility provider. Since its establishment, Taipower has devoted itself to providing sufficient and stable electricity to Taiwan and the offshore islets of Kinmen, Matsu and Penghu.

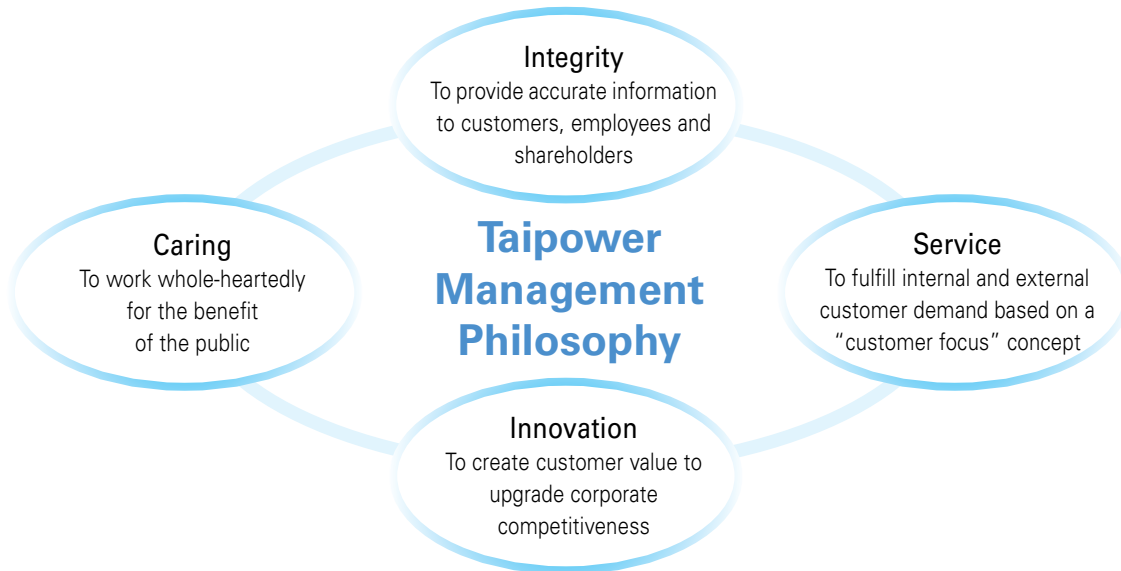
Up to the end of 2008, Taipower and IPPs provide 38,634 MW of total installed capacity, with nuclear and thermal plants generating the majority of power. Our comprehensive electrical grid, composed of 564 substations and 340 thousand kilometers of power lines, is inseparable from people's daily lives. We improve their living standards by providing reliable electrical services.

In the very near future, the power market will be privatized. Taipower understands quite well that the company will confront the pressures of management restrictions and market competition. The ability to have an international vision, incorporate efficient management techniques, and adopt a management strategy that embodies social responsibility and sustainable development will be an important key for Taipower to maintain growth and progress in the 21<sup>st</sup> century.

What is taken from the community should be used to give back to the community. A corporation will not survive without support from the society. Therefore, Taipower is devoted to fulfilling its role as a corporate citizen. In order to maintain the trust and support of the society, we have eagerly established our business ethic, stayed involved in charity work, and increased our efforts in environmental protection.



The Hengchuen solar energy pilot system



Taiwan Power Company's corporate culture is "people-first" and "the pursuit of excellence":  
 "Integrity" and "caring" are the management philosophy of "people-first".  
 "Innovative" and "service" are the management philosophy of "the pursuit of excellence".

### Taipower Mission

To offer diverse services to satisfy our customers' demands, to promote the nation's competitiveness, and to protect the interests of our employees and shareholders.

### Taipower Vision

To become a prestigious and world-class power utility group.



Taipower Headquarters

Founded: May 1, 1946

Coverage: Taiwan, Penghu, Kinmen, Matsu areas

Capital: NT\$ 330 billion

Stock: 96.92% government-owned, 3.08% public-owned

Total assets: NT\$ 1,555 billion

Employees: 26,584

Customers: 12.23 million

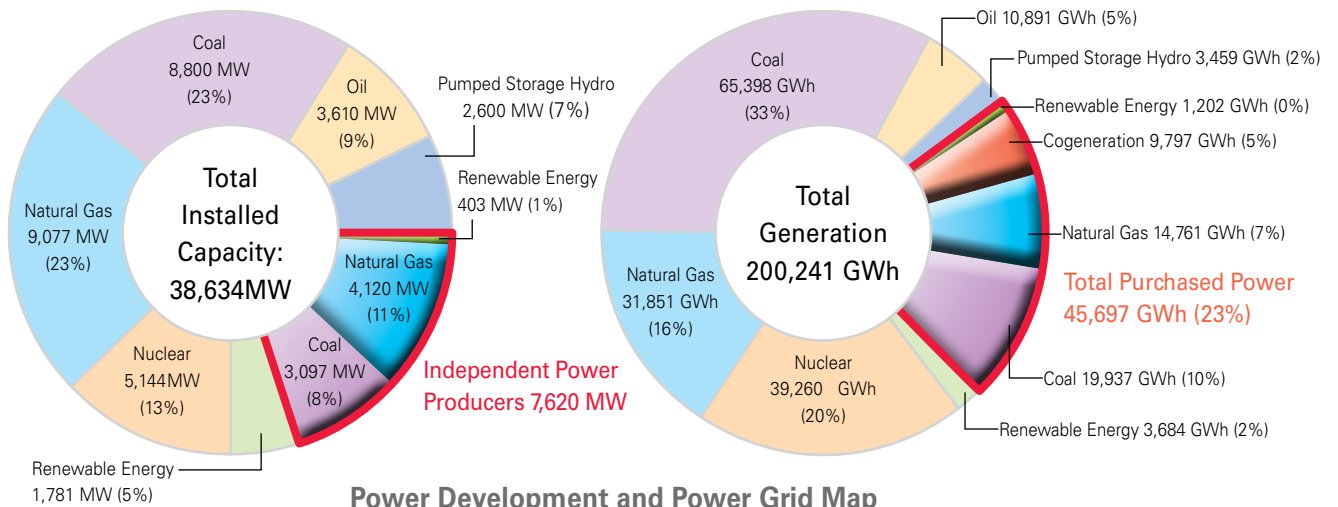
Installed capacity: 38,634 MW (Taipower + Independent Power Producers)

31,013 MW (Taipower)

Generated and purchased power: 200,241 GWh

Note: Calculated as of December 31<sup>st</sup>, 2008

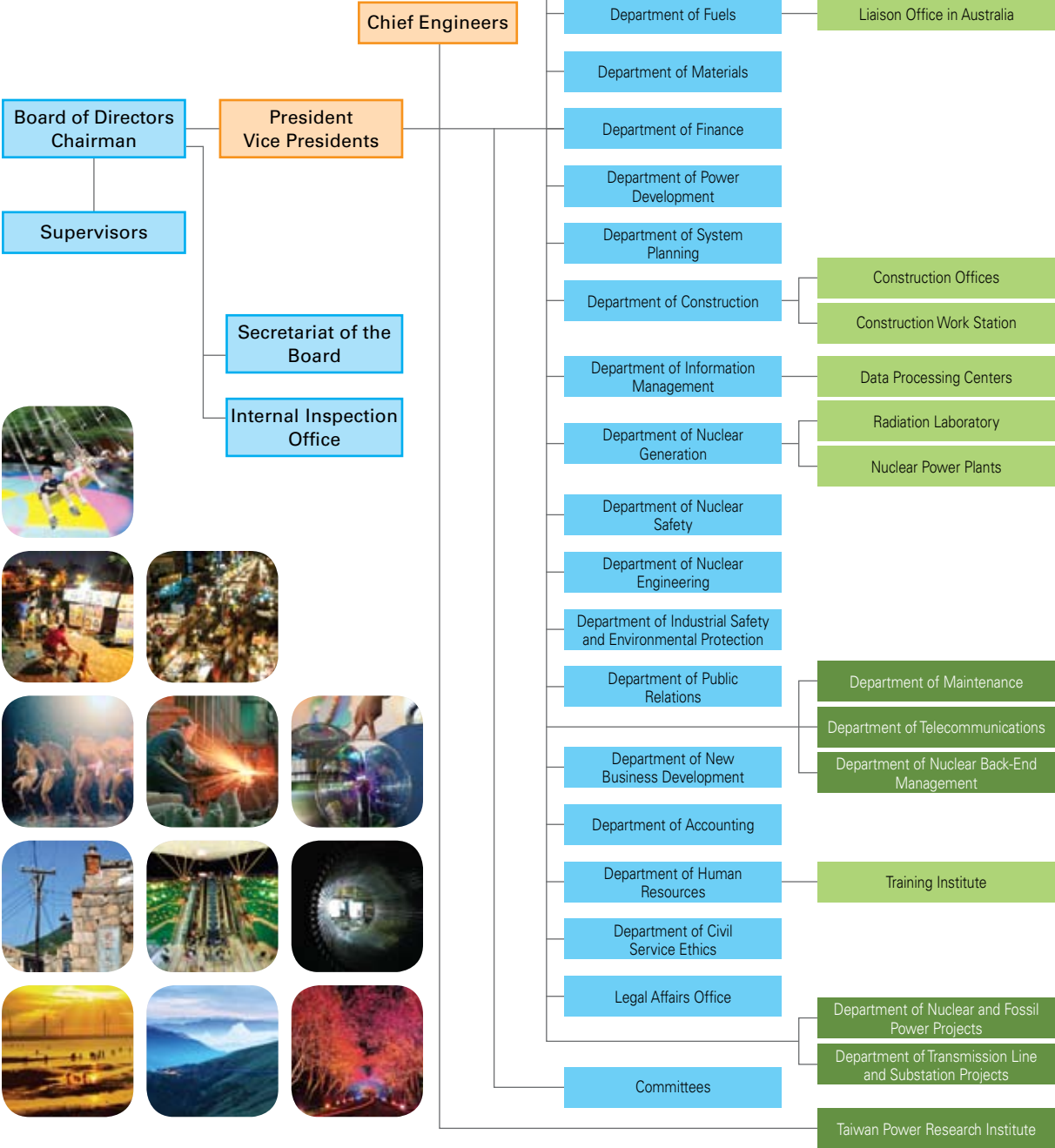
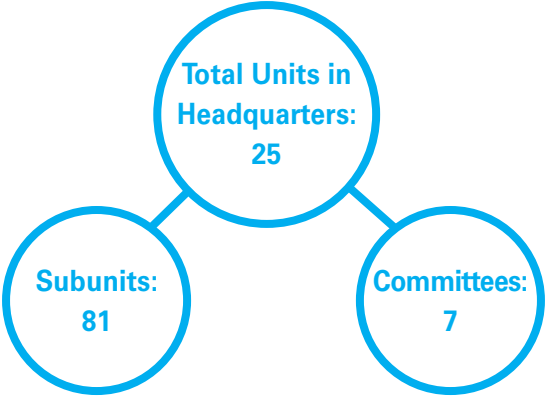
## Installed Capacity and Generation Mix in 2008



## Power Development and Power Grid Map



# Organization Chart





## Letter from the Chairman

Thank you for reading this Taipower Sustainability Report. Providing reliable, reasonably priced electricity and maintaining the sustainable development of the power industry are the duties of Taipower. Other than reporting on the continuous development of management and technology, Taipower uses this sustainability report to inform our stakeholders about the key issues we face. To further actualize the promise of sustainable development, Taipower established the “Sustainable Development Committee” in 2008, with me being the chairman, to prepare corresponding strategies.



We all know that electricity is an important element for industrial and economic advancement as well as a driving force for sustainable development. Providing inexpensive and reliable electricity has been the main objective of Taipower. After years of effort, the average installed capacity in Taiwan is 1,244 KW per square kilometer. Along with the transmission and distribution system, the density of electrical infrastructure in Taiwan is the highest in the world. However, this also indirectly limits the space for future development. Recently, the issue of global warming has created an even harder obstacle for the power industry around the world. To face these new challenges, Taipower realized that due to the limited resources in our country, building one power plant after another does not fit the ideal of sustainability. Therefore, Taipower’s objective has been to reduce the density of electricity consumption without interfering with economic development. To achieve this goal, we need to improve the efficiency on both the supply and demand sides of electricity. Taipower has launched several projects to increase the efficiency of power generation, transmission, and distribution, as well as projects to reduce electricity consumption.

In 2008, the government issued the “Guidelines for Sustainable Energy Policy,” which promotes the energy consumption patterns and the energy supply system of high efficiency, high value, low emission, and low dependence. Along with the “Renewable Energy Policy,” we expect to adjust the ratio of each energy source and establish a distributed generation system. Taipower will devote its efforts to technology advancement, promoting low-carbon renewable energy, increasing the usage of natural gas, using nuclear generation as a low-carbon option, and accelerating the pace of mechanical replacement. We will also strive to improve our performance and maintain our reputation.

In this regard, we will continue to promote and work on the following tasks:

### **Reinforce Management Strength and Upgrade Productivity**

In response to society’s expectation of excellent operating performance from state-owned enterprises, Taipower will continue to actively adopt various measures to increase income and reduce expenditure. It will implement the “Productivity Enhancement Program,” which includes adjustment of generation mix, enhancement of unit efficiency and improvement of supply capacity and efficiency. In addition, it involves reducing operating costs, promoting demand-response mechanisms and energy conservation, and enhancing customer satisfaction as short-to-medium-term plans. Along with promoting streamlined organizations and manpower, this program will also strengthen the company’s business structure and enhance operating performance.

## ■ Improve Energy Source Mixture and Balance Regional Power Supply

In order to maintain a reliable power supply and balance regional supply and demand, Taipower will expedite its 4<sup>th</sup> Nuclear, Linkuo, and Shenao Thermal Power Projects. Additionally, the Changgong, Talin, and Tunghsiao Thermal Power Retrofit Projects are also underway. These projects aim to improve the base, medium, and peak load structures and further balance regional electricity supply.

## ■ Enhance Power Reliability and Construct a Smart Grid

After the completion of the 5<sup>th</sup> and 6<sup>th</sup> Transmission Projects, Taipower will proceed to launch the 6<sup>th</sup> and 7<sup>th</sup> Distribution Projects to construct a comprehensive power grid. The goal will be to improve the stability and reliability of the power supply. Furthermore, to construct a high quality, highly efficient, and service-oriented power grid, Taipower will continue to install the advanced metering infrastructure (AMI), the demand-response mechanism, and the distributed generation system.

## ■ Promote Energy Conservation, Reduce Carbon Emissions and Enhance Energy Efficiency

The Executive Yuan issued the “Guidelines for Sustainable Energy Policy” in June of 2008. The guidelines not only disclosed the goal of the CO<sub>2</sub> emission reduction, but also stated the goal of raising non-carbon generation from 40% to 55% before the year 2025. To adjust the proportion of energy sources and improve efficiency, the following measures will be implemented:

- Actively develop no-carbon renewable energy, raising the ratio to 8% by 2025.
- Increase the usage of low-carbon natural gas to 25% by 2025.
- Increase the diversity of energy, using nuclear power as a low-carbon option.
- Expedite the pace of old machine replacement, raising the heat efficiency above 42%.
- Introduce coal cleaning technology and CO<sub>2</sub> capturing schemes.

Taipower will comply with the guidelines and actively execute these measures.

## ■ Fulfill Corporate Social Responsibility and Strive for the Support of Society

Taipower recognizes that the corporation needs to coexist with society. The development of our company relies on the support of our customers and society. Therefore, Taipower is committed to fulfilling its role as a “corporate citizen,” improving our relationship with stakeholders, stimulating community prosperity, and protecting the environment in order to gain the approval and support of the public.

In the 21<sup>st</sup> century, the power industry is facing the trends of high energy prices, high electrification, and low carbon emissions. Improving energy efficiency, adjusting the mixture of energy sources, and striving for conservation are going to be the objectives of Taipower. Taipower will also make long-term investments not only in the construction of hardware, but also in our employees, society, education, and the environment. Taipower will continue to assist with the economic development of Taiwan. We hope that the people of Taiwan will be proud of Taipower’s accomplishments.

Sincerely,



Chairman, Taiwan Power Company

## Sustainable Development Philosophy

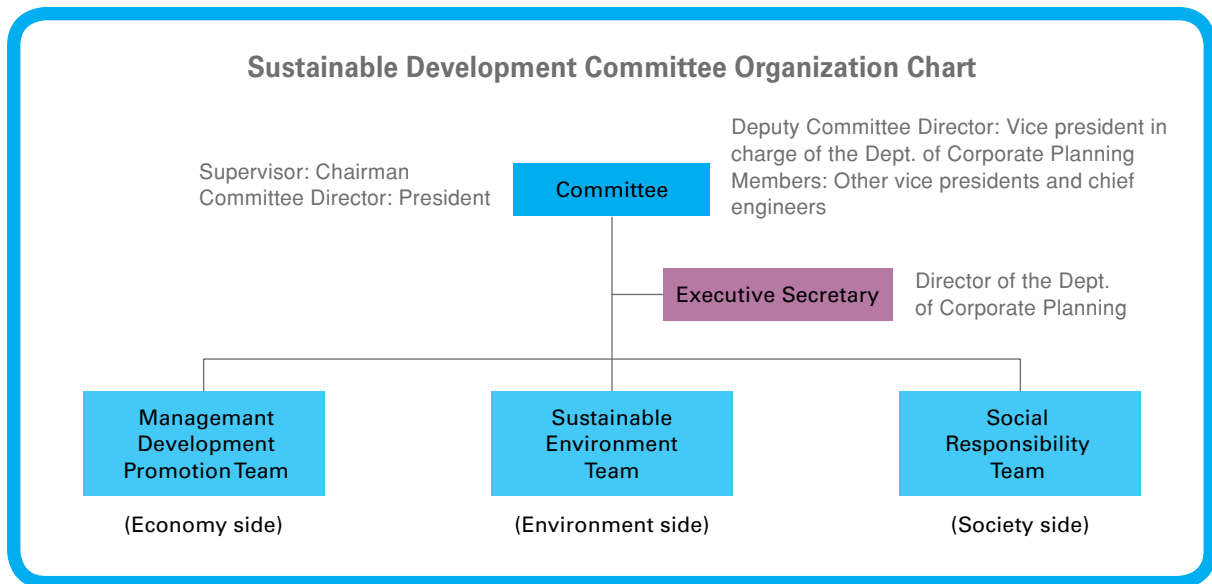
- Utilize the limited natural resource efficiently.
- Balance the energy safety, economy, and the environment during power development.
- With integrity, caring, innovation, and service in mind, fulfill our social responsibilities and create a bright future with our stakeholders.

## Sustainability Committee

To promote business development, safeguard the ecological environment, fulfill our corporate social responsibility, and encourage sustainable development-related work, Taipower set up the Sustainable Development Committee, its mission and organization chart are as follows:

### Mission:

- Long-term corporate strategic planning and integrated management improvement.
- Environmental protection and ecological maintenance strategic planning.
- Corporate social responsibility strategic planning and promotion.
- The reports on 10-year corporate strategic planning and sustainability.
- Other resolutions and follow-up management and control.



### Notes:

- The work of the Management Development Promotion Team, the Sustainable Environment Team, and the Social Responsibility Team will be executed by the Department of Corporate Planning, the Department of Industrial Safety and Environmental Protection, and the Department of Public Relations, respectively, and led by the vice president in charge of each department.
- The routine business will be handled by each team individually. The leader of each team should negotiate with other department if the agenda involves other departments. Any agenda involving corporate strategy and future development should be submitted to the committee.

## Key Issues of Sustainability

Because electricity is vital to economic development and national security, its adequacy, stability, safety, and diversification are matters that we need to address. To prevent problems to the society, in 2008 the Sustainability Committee has identified the following issues that Taipower needs to overcome:

### Insufficient Baseload

The ratio of baseload from 2006 to 2008 were 48.2%, 46.3%, and 45.6%, respectively. They were all lower than our goal of 55%~65%. To increase the amount of baseload, Taipower has devised a long-term project that increases the amount of baseload between 2009 and 2010. The project includes the construction of Units 1~2 of the 4<sup>th</sup> Nuclear Power Plant, Units 1~3 of the New Linkuo Thermal Power Plant, Units 1~2 of the New Shenao Thermal Power Plant, Units 1~2 of the Changgong Thermal Power Plant, Unit 1 of the New Talin Thermal Power Plant, and Units 11~12 of the Taichung Thermal Power Plant. The installed capacity should increase to 26,530 MW in 2020, which is 51.5% of the total installed capacity. Taipower will continue to develop baseload power plant to reach our goal.

### Power Facilities Construction Delayed

Due to the global economic recession, the growth of electricity demand is stagnant. However, with the government's economic revival programs, the electricity demand is expected to rise continuously. Therefore, the power construction, including nuclear, thermal, hydro, wind, and solar, is necessary and urgent.

However, the construction of electric facilities frequently encounter doubts and protests from the public. Having been given the responsibility of the national electricity supply, Taipower will reduce the public concerns toward our projects and keep pace with social and national needs of sustainable development through the following strategies:

- Improve communication with local government to accelerate the speed of construction sites acquisition, urban planning modification, license application, and water right reviews.
- Prepare pre-project planning and environmental impact assessment to reduce the concerns of environmental groups, elected representatives, and local residents.
- Develop rigorous construction monitoring plans and countermeasures to reduce the impact on the environment and ecology.
- Work to strengthen good-communities, encourage local participation, create job opportunities, and to establish good interaction among local residents in order to resolve the resistances.
- Establish a public communication group that is responsible for communication and promotion on impeded projects and public-focused issues to solicit public support.

## Radioactive Material Handling

The Ministry of Economic Affairs reached a preliminary result for the selection of location for the final disposal of low radioactive waste (radwaste). However, the local government, representatives, and the public at the selected site expressed their opposition and refused to comply with follow-up operation.

The Central government should communicate with the local government about the construction of the dry storage of spent nuclear fuel. Taipower should assist the Ministry of Economic Affairs with the process of site selection and persuading the local leaders and representatives to support the construction.

## Limitation of Renewable Energy

The use of renewable energy sources reduces our dependence on foreign energy and reduces CO<sub>2</sub> emissions. It also helps with environmental protection and sustainable development. Moreover, it stimulates local economic development and creates employment opportunities.

Currently, wind power and solar energy are more applicable in Taiwan. Ocean energies such as ocean thermal, tidal and wave require much more manpower and capital to be profitable.

Due to the constraints of weather, the amount of electricity generated by wind power and solar energy is unstable. These methods can't replace the traditional power generation methods to become the primary power sources.

In the future, wind power units are more likely to be built offshore. Relevant research is being conducted. Due to the area constraints in Taiwan, photovoltaic panels are more likely to be installed on rooftops. Taipower is also seeking more construction sites for large scale development.

## Greenhouse Gas Reduction

Being the primary power provider in the nation, Taipower faces several uncertainties and difficulties in the task of greenhouse gas reduction including:

- The lack of an economical CO<sub>2</sub> reduction strategy for thermal power plants impacts the development of thermal power.
- The government has not formulated complete and reasonable reduction mechanisms and measures.
- Retrofit projects of power plants have often been impeded, when old units are forced to continue operation, overall efficiency and CO<sub>2</sub> emission concentration can not be improved.
- The expansion of natural gas and renewable energies is limited (by price or environmental factors). This makes it difficult to adjust the power source ratio and reduce CO<sub>2</sub> emissions.
- Development of the two major baseload, coal-fired power and nuclear power, is limited. This could have a serious impact on Taiwan's future power construction and economic development.

## Training of Electrical Professionals

- To comply with the government policy, Taipower reduced the amount of employees by 20.91% between 1992 and 2008. Total no. of employees dropped by 17.24% (5,539 people), resulting in manpower shortage, aging and difficulties in passing on valuable technology and experience.
- In 2008, the average age of employees was 47.5 years old, the average year of service was 24.2 years, and 67.12% of employees were older than 45 years old. In the next decade, 7,236 employees will be retiring, accounting for 27.22% of current manpower.
- In order to alleviate the aging of manpower, plans have been devised to increase the amount of employees since 2005, to strengthen human resources management and enhance employee productivity and corporate competitiveness.



The Penghu Chungtun Wind Power Station



# Management and Performance

*The Taiwan Power Company is a government-owned company. Its mission is to provide sufficient, safe, stable, clean, and sustainable electricity. To achieve the highest economical, social and environmental value, Taipower needs to improve management standards, reduce business risk, and increase service quality.*

*Regarding management strategy, other than complying with government guidelines, we continuously improve our management structure and standards. Regarding business, we strive to provide customer-oriented service and transparent operational and financial information, in the hope of becoming a “prestigious and world-class utility group.”*

## Company Management

In addition to strengthening the functions of the board of directors and supervisors and respecting the rights and interests of stakeholders, Taipower has established a comprehensive system to present relevant operation and financial information to the board of directors and shareholders and others. The goal is to enhance the transparency of company information.

### Strengthening the Functions of Directors and Supervisors

- Increasing the function and effectiveness of the board of directors and establishing an independent director system.
- Exercising supervisor’s function

Monitoring the operation of the company, regularly checking the company’s financial and business condition, checking reports made by the board of directors and reporting the views of the shareholders.

- Strengthening the effectiveness of the shareholder meeting

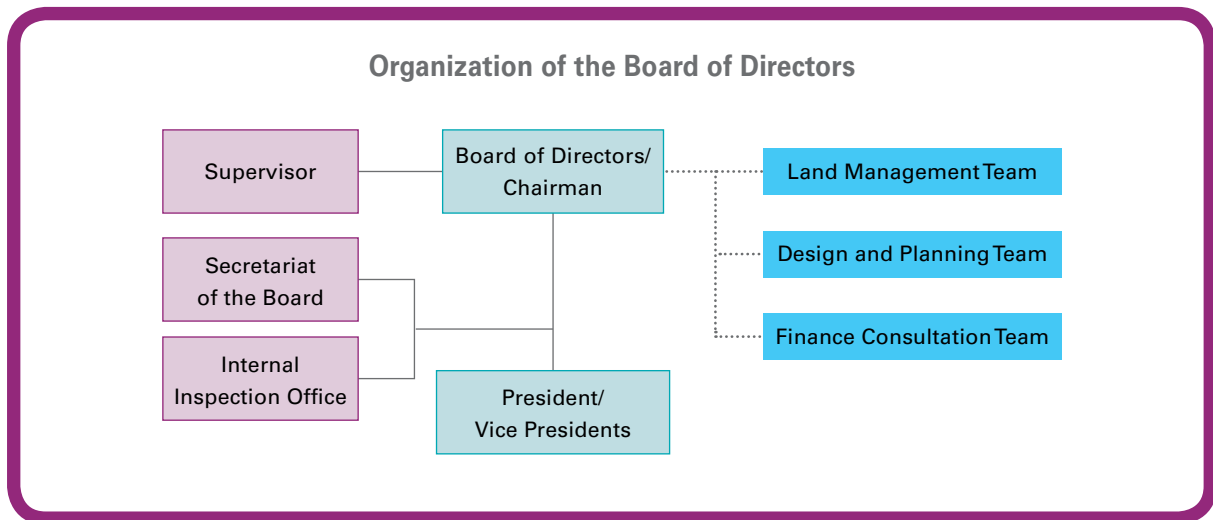
The shareholder meeting has the rights of participation and decision-making in major company affairs. Shareholder meetings should be recorded and presented to all shareholders.

### Improving the Internal Auditing Structure

- Each unit and project group should emphasize internal management and inspection to improve efficiency.
- Each unit should prepare annual reports regarding effectiveness of internal auditing to the company and the Financial Supervisory Committee (FSC).
- Timely adjustment should be made to the internal auditing system design and implementation in response to changes in government policies and the environment.
- Information security (IS) auditing should be undertaken to ensure that each unit is executing IS management properly.

## Strengthening the Information Disclosure System

According to the policy issued by the FSC Securities and Futures Bureau, a public information network is established. The financial report, internal personal and stock movement, and shareholder meeting records should be reported monthly. Company's basic information, acquisition or disposal of assets, and corporate debt issuance should also be updated on the network appropriately.



### Taipower Outreach– Taiwan Business Council for Sustainable Development (BCSD-Taiwan)

Joining Date: July, 2003

Founded in May of 1997 and a member of the World Business Council for Sustainable Development (WBCSD). The World Business Council for Sustainable Development is the most influential non-governmental organization, including 150 multinational corporations and BCSD's from 24 developing countries. Having members in 36 countries and more than 20 kinds of major industries, the WBCSD is a great place for seeking cooperation opportunity and exchanges of experience and technology.

The BCSD-Taiwan is involved in various work groups which provide latest international trends of practical experience, management tools, and technology to corporations in our country.

Taipower joined the BCSD-Taiwan on July 10<sup>th</sup>, 2003. We have attended its meetings and activities. Joining the council enhances our company image and increases our communication channel with the Environmental Protection Department.



# Risk Management

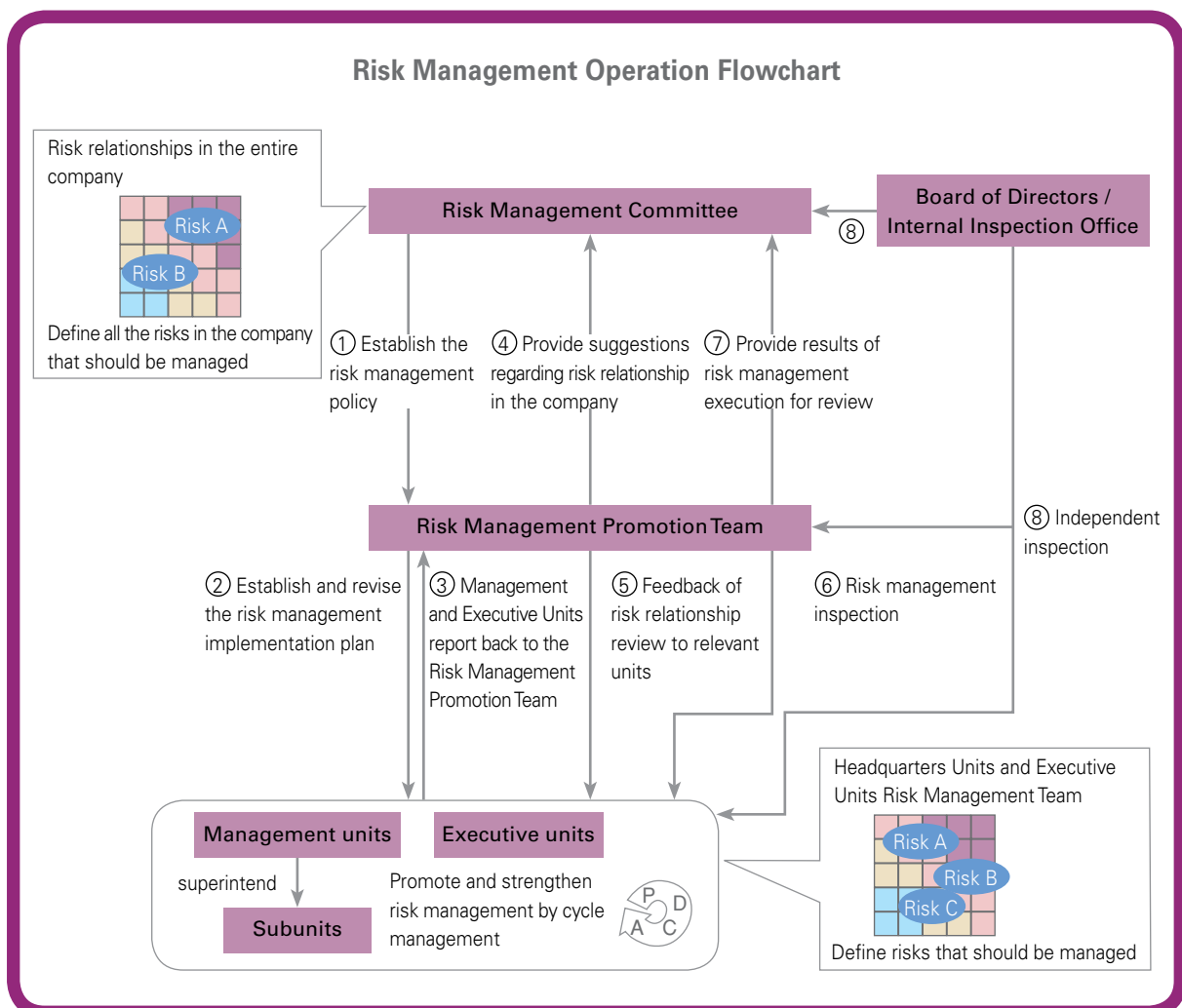
In 2008, Taipower formulated a risk management implementation plan which instructs each department for its own risk management policy to reduce the impact of unexpected events.

## Risk Management Policy

- Provide resources for the establishment, maintenance, and improvement of risk management policies.
- Establish a risk management promotion organization to continuously implement risk assessment, management, monitoring and communication operation.
- Ensure the staff's capability to carry out the risk management policy.
- Improve the communication between staff and stakeholders to enhance the full awareness of risk management.

## Risk Management Promotion Organization and Flowchart

To promote risk management policies, Taipower established a risk management organization, which includes a risk management committee and risk management promotion team to execute, inspect, review and improve our risk management policies.



## 2008 Business Performance

Due to the dramatic increase in fuel prices and the global economic turmoil, Taipower was unable to overcome the high cost of energy generation. In 2008, Taipower sustained a deficit of NT\$ 100,896 million. The 2008 key performance indicators and 2006~2008 operation statistics are listed below:

### Financial Performance of Taipower

Unit: NT\$ million

Item	Year	2006	20 07	2008
Operating revenues		389,264	408,742	437,031
Operating costs		374,956	419,430	506,480
Operating expenses		10,121	10,788	10,287
Other income		8,478	6,517	7,764
Other expenses		15,480	16,116	28,924
Profit before tax		-2,815	-31,075	-100,896
Profit after tax		-338	-23,132	-75,220
Effect of change in accounting principles		138		
Net profit		-200	-23,132	-75,220

### Key Performance Indicators Handling

Taipower devised its performance indicators according to the company's goal, economic condition, government policies and other world-class companies' performance indicators.



The Taichung Thermal Power Plant



Installation of insulators in transmission lines

## Key Performance Indicators in 2008

Item	Year	2007	2008		Accomplishment
		Actual	Target	Actual	
Pre-tax Profit (in millions of NT\$)		-31,243	≥-114,274	-100,896	😊
Fuel Cost Control (%)		-9.94	≤-7.00	1.03	😞
Power Purchase Expenditure Control (NT\$/KWh)					
• Coal-fired Plants		1.55	≤1.69	1.67	😊
• Gas-fired Plants		3.03	≤3.94	3.85	😊
• Co-gen		1.58	≤1.66	1.81	😞
Line Loss (%)		4.75	≤4.85	4.58	😊
Customer Satisfaction (points)		85.3	≥84	86.3	😊
Power Supply Reliability					
• SAIDI (min./cus.·yr.)		23.909	≤22.832	20.810	😊
• SAIFI (freq./cus.·yr.)		0.333	≤0.424	0.354	😊
Industrial Safety Performance					
Total Injury Index		12.06	≤9.70	8.74	😊
Nuclear Safety Performance					
No. of Nuclear System Trips (freq./unit)		2	≤1	2	😞
Environmental Protection					
• PM Emissions (kg/GWh)		21	≤33	21	😊
• SO <sub>x</sub> Emissions (kg/GWh)		330	≤360	292	😊
• NO <sub>x</sub> Emissions (kg/GWh)		298	≤345	279	😊
• Greenhouse Gas Control (g/KWh)		543	≤573	537	😊
• Tree Planting (m <sup>2</sup> )		60,452	≥105,000	173,300	😊
Renewable Energy Development(MW)					
• Wind Turbine Installed		30	≥30	48	😊
• Wind Turbine Permit Acquired		54	≥40	40	😊
Energy Conservation					
• Reduce Units Heat Rate, Increase Efficiency (g/KWh)		2,327	≤2,305	2,310	😞
• Self-used Electricity Reduction (GWh)		118.244	≥0	131.974	😊
Capital Expenditure Execution Rate(%)		95.04	≥94	92.25	😞
Innovation					
• No. of Employee Proposals		6,249	≥4,436	6,004	😊
• Average Training Hours of Employees Per Year (hr./employee)		41.4	≥40	48.96	😊
Research and Development (in thousands of NT\$)					
• Increase Income		157,178	≥150,120	150,450	😊
• Decrease cost		1,520,719	≥1,118,260	1,122,927	😊

Note: 😊 represents objective achieved; 😞 represents objective not achieved.

## Operation Statistics for the Past 3 Years

In spite of facing tremendous difficulty in operation due to high fossil fuel prices, Taipower still had outstanding performance in many sectors. However, the total electricity supplied, electricity sold and peak demand decreased due to the slowed economy.

### Production and Sales

Item	Year	2006	2007	2008	Description
Total Production (GWh)		196,567	201,856	200,241	Even though, the total supplied amount decreased by 1,615GWh (-0.8%), the amount supplied by Taipower increased by 1,065 GWh (0.7%).
• Generated by Taipower		148,851	153,475	154,544	
• Purchased		47,716	48,381	45,697	
Energy Sales (GWh)		181,593	187,075	186,931	Negative growth of 0.08% compared to 2007.
Peak Load (MW)		32,060	32,791	31,320	Negative growth of 1,471 MW(-4.5%). First ever negative growth.
Customers (thousand)		11,739	11,985	12,226	Increased by 241 thousand.

### Employee Productivity

Item	Year	2006	2007	2008	Description
No. of employees		26,300	26,047	26,584	To improve the problem of aging employees, the no. of employees was increased to 26,584 in 2008. However, it is still 5,539 people less than the peak number of 32,123 people in 1992.
Productivity					
• Production/ Per Employee (MWh)		6,932	7,098	7,117	Increased by 19 MWh since 2007.
• Sales/ Per Employee (MWh)		8,456	8,652	8,608	Decreased by 44 MWh with the decrease of electricity sold since 2007.
• Revenue /Per Employee (in thousands of NT\$)		18,126	18,903	20,125	Increased by NT\$ 1,222 thousand (6.5%).



The Techi Hydro Power Plant



Steam turbine maintenance

## Power Supply Quality

Item \ Year	2006	2007	2008	Description
Frequency Quality (%)	97.23	97.51	98.72	Record best.
Line Loss (%)	4.85	4.75	4.58	Record best, second comparing to other major courtiers in the world, saved 330 GWh.
Power Supply Reliability				
• SAIFI (freq./cus. yr)	0.394	0.333	0.354	Record second best.
a. Scheduled Outage	0.100	0.094	0.080	
b. Forced Outage	0.294	0.238	0.274	
• SAIDI (min./cus. yr.)	29.267	23.909	20.810	Record best, a 144.59 min decrease from 165.4 min in 1992.
a. Scheduled Outage	21.547	18.275	15.198	
b. Forced Outage	7.720	5.634	5.613	

## Operation Performance

Item \ Year	2006	2007	2008	Description
Thermal Power Plant Net Efficiency (%)	36.58	36.95	37.23	Record best.
Thermal Power Plant Incidents (freq./unit)	1.09	0.76	0.70	Record best.
Nuclear Power Plants Generation (GWh)	38,317	38,961	39,260	Record high and the depreciation is almost gone. It produces electricity at NT\$ 0.62 per KWh, significantly reducing the total generation cost.
Nuclear Power Plants Scram (freq./unit)	0.33	0.33	0.33	The average scram occurrence is unchanged.

### Taipower Outreach– The Association of the Electricity Supply Industry of the East Asia and the Western Pacific (AESIEAP)

Joining Date: April, 1988

AESIEAP is a non-governmental organization founded by electricity providers in the area in 1975. Its purpose is to promote cooperation of electricity providers in the area and provide a platform for exchange of experience and technology. Its Conference of Electrical Power Supply Industry (CEPSI) has become the largest conference for the electrical providers in the East Asia and Western Pacific area.

Taipower will be the main organizer for the 2009~2010 AESIEAP events. On October 14th -16th, 2009, the "2009 CEO Conference" will be held in Kaohsiung. October 25th -29th, 2010 the 18th CEPSI will be held in Taipei International Conference Center.

## The Trend of Sustainable Development

With the arrival of the high energy prices and a low carbon emission era, Taipower is facing the challenges from the shareholders, environment, and society to provide sufficient electricity for economical development and reduce CO<sub>2</sub> emissions. To overcome this challenge, Taipower came up with the following strategies to ensure the sustainable development of the company.

### Energy Source Mixture

Taipower needs to consider the government energy policy, sustainability, greenhouse gas emission reduction, and energy diversification while developing more energy projects. If nuclear power is adopted as a non-carbon emission energy source in the future, Taipower will adjust the ratio of nuclear power to reduce the CO<sub>2</sub> emissions.

Before that, the amount of coal-fired units should be moderately increased. The emissions from the modern highly efficient coal-fired units are way below the regulated level. The stable supply of coal makes the coal-fired units an economical and stable source of energy.

### Demand-Side Management

Demand-side management uses different electricity prices to reduce demand during peak hours. It includes load management and energy conservation measures.



A bird's-eye view of the Tatan Thermal Power Plant

## Load Management

Taipower reduced the peak load during the summer of 2008 by 4,608 MW which is extremely beneficial for balancing the system load.

### Load Management

Measures	Description	2008 Results
Time-of-Use (TOU) Rates	Implemented in 1979 to increase the price difference between peak and off-peak hours and encourage users to use electricity during off-peak hours instead of peak hours.	Chosen by 78,614 users, the contracted demand on Saturday partial-peak and off-peak hours was increased by 1,110 MW. The peak load was reduced by 3,246 MW.
Seasonal Rates	Reduce the consumption during summer by setting different prices for different seasons.	In 2008, 12.139 million customers applied for the seasonal rates and the average load in the summer was reduced by 297 MW. The accumulative reduction was 3,246 MW.
Interruptible Rates	Since 1987, Taipower has been encouraging customers to reduce peak-hour demand through shifting the demand to off-peak hours (such as through shifting automatic manufacturing processes to off-peak hours), thus reducing the peak-hour demand and system peak load.	1,151 customers chose to participate in this measure and applied for 2,008 MW contracted reduction load. During the peak day (July 24, 2007), the peak load was clipped by 1,146 MW.
Ice-Storage Central Air Conditioning System	The ice-storage central air conditioning system can make use of off-peak load to store ice in the system and thus reduce the peak load. The electricity consumption during the off-peak hours receives 40% off the regular rate. (25% before 2009)	236 customers installed the ice-storage central air conditioning system with a total capacity of 209 thousand horsepower.
Central Air-Conditioner and Package Air-Conditioner Duty Cycling Load Control Measure	The measure can reduce the power consumption for air conditioning during peak hours.	104 customers applied and compressor capacity reached 24,000 tons.
Demand-Response Program	Starting in June of 2008, the supply to the contracted customers will be reduced when the demand is high.	7 customers applied for this measure, with total contracted capacity of 25 MW. The maximum demand reduction achieved during the peak month (July) was 32MW.

## Energy Conservation Measures

To reduce the energy conservation within Taipower, the energy conservation promotion team was established in 1990 along with "Energy Conservation Implementation Guidelines" and "Energy Conservation Assessment Guidelines" to control the monthly consumption of electricity, water, and oil. Units with excellent performance are awarded with citation and bonus.

To promote energy conservation to the general public, Taipower held about 1,200 promotional activities and following activities:

- Holding an annual regional Energy Conservation Exhibition since 1991.
- Each business branch continues to hold annual activities such as energy conservation promotion for large customers and schools, classes for repair and maintenance of in-house electric equipment, etc. The branches also participate in various activities held by schools, farming and fishing co-ops, neighborhood offices, and civil societies to promote the concepts and provide useful tips in energy conservation.

- Actively visiting large customers (over 100 KW) to offer free consulting service in improving energy efficiency.
- Starting on July 1<sup>st</sup>, 2008, Taipower began the “Energy Conservation Discount Measure”, giving households, middle and elementary schools 5~20% electrical bill discounts if they use 0~10% less electricity than the previous year in a given month.
- Providing consulting services on energy related questions through the toll-free Energy Conservation Hotline (0800-031212, extension 2).

## Construction of a Smart Grid

To progress to the completion of the smart grid, Taipower is actively promoting the distribution feeder automation and the installation of advanced metering infrastructure (AMI) for the high-voltage customers. At the end of 2008, 2,268 automated feeders had been installed, accounting for 26.42% of the 8,584 total feeders. In 2009, 1,159 automated feeders will be installed especially in major industrial districts and metropolitan areas bringing the cumulative amount of the automated feeders to 3,427.

To move toward another milestone of the smart grid, Taipower launched the 7<sup>th</sup> Transmission Project, introducing new power transmission technology and equipment to strengthen the existing transmission grid system structure and safety measures, building towards the diversification of smart grids, and reaching our goal of sustainable development.

For medium-term development, the smart grid will be a combination of electricity, telecommunications, IT and the Internet. The establishment of the industry, government, and academic circles will support the new smart grid-related industries and improve power system reliability and flexibility.

In the long run, the incorporation of the applied advanced communications, computing and electronic technology will help the existing electricity infrastructure develop as a cost-effective system, providing safe, reliable electricity and high-quality services. The smart grid combined with the wind, solar and other renewable energy, and the distributed generation will achieve the goal of energy conservation and CO<sub>2</sub> emission reduction.



A radiant night view of Taipei City



Distribution dispatching control center



## Energy Efficiency Upgrading

### ● Replace Old Generators

By replacing the old thermal generators in Shenao, Linkuo, Talin, and Tunghsiao Thermal Power Plants with the new supercritical coal-fired generators and combined-cycle natural gas generators the efficiency should increase by 39% (LHV Gross).

### ● Upgrade Current Equipment

The following upgrades were made in 2008: gas turbine blade upgrade, generator cooling system upgrade, advanced process control (APC) installation, high-pressure turbine blade replacement, and condenser piping replacement. There are also plans to improve the boiler in the Hsinta Thermal Power Plant. With all these improvements, the coal consumption will be reduced and the efficiency will be increased.

### ● Best Available Technology for New Thermal Power Systems

The currently planned super-critical steam turbines can achieve an efficiency of 44.4% (LHV Gross), 4 to 5% more efficient than the sub-critical units. The developing super-critical technology has increased superior performance in reliability, carrying capacity and economy, which enhance the efficiency of energy use.

### ● Increase Efficiency of Nuclear Power Operation

- Slightly increase the output of the nuclear units.
- Improve the project management of renovations to reduce construction duration.
- Replace traditional nuclear fuels with more advanced fuel types to increase effectiveness.



The retrofit project of the Shenao Thermal Power Plant

## Promotion of Using New Energy Sources for Generation

To promote the application of renewable energy, in addition to introducing foreign technologies and construction of renewable energy facilities, Taipower also put a lot of resources and effort into a variety of clean energy technology developments and demonstrations. Currently our projects include: the construction, monitoring, and analysis of solar energy pilot systems, research of hydrogen cell application, and the design of hydrogen storage, etc. Taipower will continue to introduce new technologies and gradually increase the amount of power generation by alternative energy.

Before having more breakthroughs in other renewable energy sources, wind power and solar energy are still the focus of Taipower. Due to the limitation of the land area, the future development is bound to be off-shore. Taipower is now conducting the feasibility study of Changhua offshore wind facility. It is estimated there will be more than 300 wind turbines and 30~36 generators. With respect to the solar energy, the current electricity generation costs are still a lot higher than current prices. However, with the technology development and increasing supply of silicon material, the costs have been reduced year by year. In the future, Taipower will progressively increase the development and application of solar energy depending on the situation.

Taipower has completed the following to increase the supply of renewable energy:

● **Wind Power**

Up to the end of 2008, 82 wind power generators were operational with an installed capacity of 131.76 MW. 80 more generators are in construction with an installed capacity of 157 MW. It is estimated that all the generators can achieve a installed capacity of 288.76 MW and generate 820 GWh of electricity per year when the construction is completed in 2011.

● **Solar Energy**

Solar Energy: Currently Taipower has installed photovoltaic panels in various locations generating a total of 233.5 KWp. Additionally, Taipower has completed the feasibility study of “The First Solar Energy Project,” hoping to achieve an installed capacity of 10 MWp in 2011.

● **Ocean Thermal Energy**

Ocean Thermal Energy: A feasibility study of a 100 W experimental ocean thermal plant is being conducted according to the government’s policy. The study is expected to be completed in October of 2009. The project can be started in 2010 if it is feasible.

**Fuel Supply Security and Stability**

To ensure the safety and stability of power supply, a stable supply of fuel is necessary. Due to the limited supply of fossil fuels and the increasing demand from developing countries like China and India, the fuel supply in the Asia-Pacific area is becoming more uncertain. Taipower has prepared the following countermeasures:

Short-Term	Medium-Term	Long-Term
<ul style="list-style-type: none"> <li>● Diversify the source of fuels.</li> <li>● Construct a safe storage.</li> <li>● Get supply from long-term contracts.</li> </ul>	<ul style="list-style-type: none"> <li>● Increase foreign coal mine investment.</li> <li>● Have Taipower ship the natural gas, if the government permitted it.</li> <li>● Execute the 2<sup>nd</sup> and 3<sup>rd</sup> phases of the coal ship building project.</li> </ul>	<ul style="list-style-type: none"> <li>● Create our own coal transport fleet to reduce the cost.</li> <li>● Construct an automatic natural gas import and receiving station.</li> </ul>



Coal unloading operation

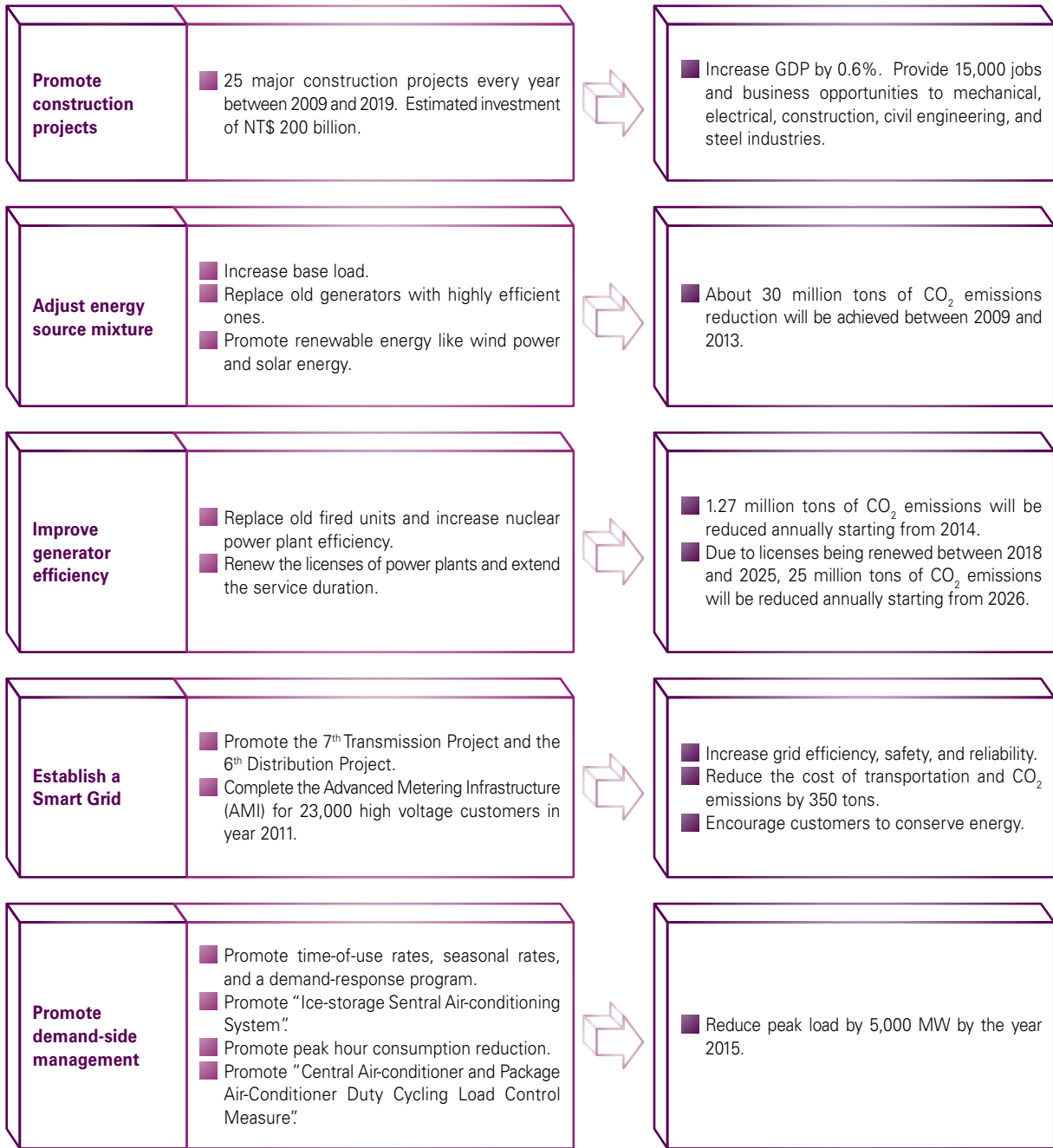


Taipower’s coal ship–Taipower Prosperity I



A bird’s-eye view of the Bengalla coal field, Australia

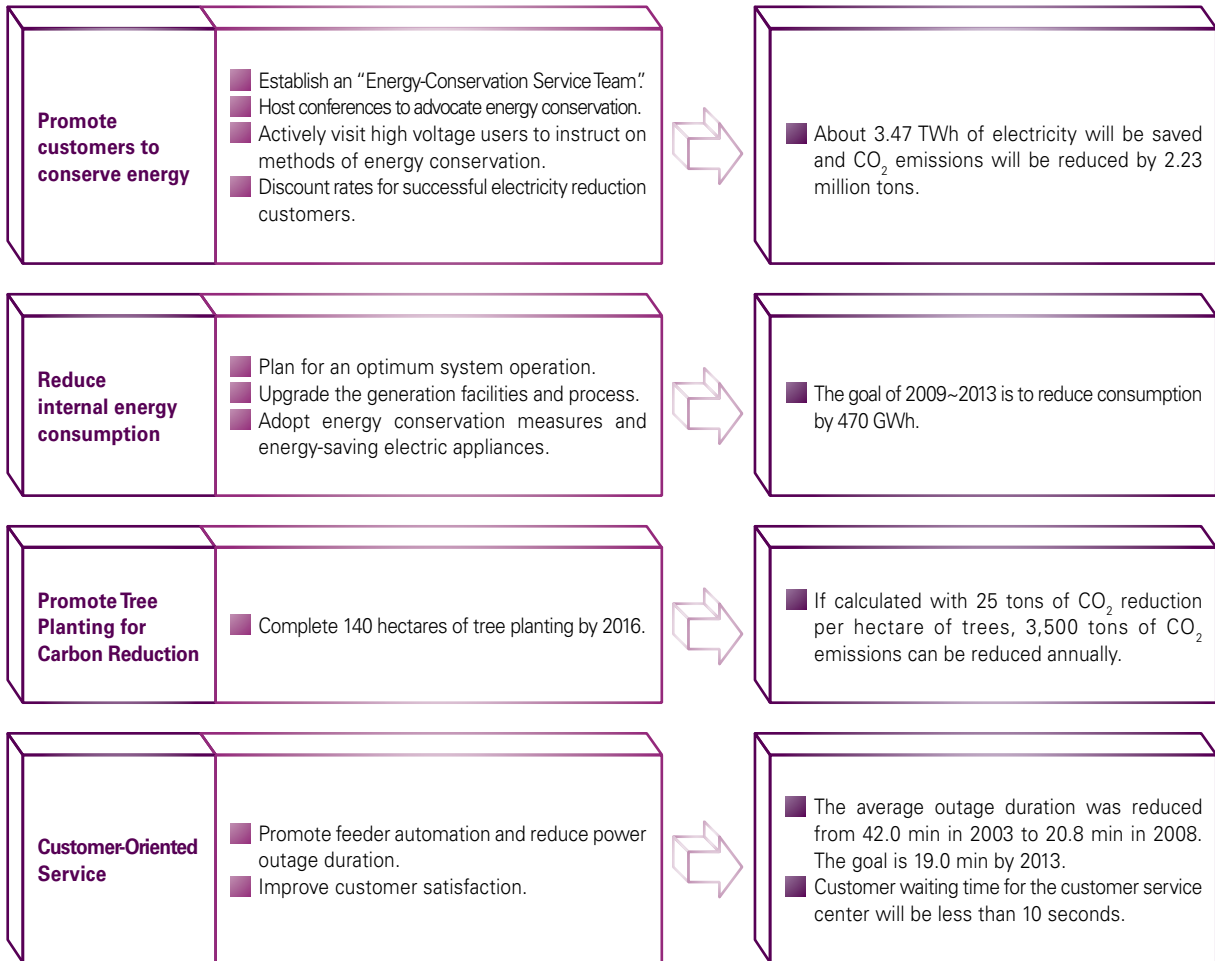
## Strategies and Expected Results for the Sustainable Development



The New East-West Transmission Lines



The Longmen Nuclear Power Plant



Overhead power line installation

# Social Responsibility

*A safe and stable supply of electricity is the key to the development of our nation and the economy. Other than providing electricity, Taipower also works to promote industrial and social progress while taking into account the needs of shareholders.*

*To become an excellent corporate citizen, Taipower provides high quality electricity, strengthens the safety mechanism, creates opportunities for employees, and care for the safety of contractors. We also actively participate in community works and charities.*

## Serving Customers with Care

### Protecting Consumer Rights

Serving customers is Taipower's management philosophy. To provide comprehensive and instant services, we have established 24 branches, 24 service centers, and 279 service offices scattered over every counties and towns. The number of complaints in 2008 was significantly reduced due to our employees' efforts.

### Instant and Transparent Information

Each year we publish the Taipower Customer Service White Paper to show our commitment of integrity, caring, innovation and service. It can be downloaded at <http://www.taipower.com.tw>.

The Taipower website also provides various information useful for the customers, such as the service locations, rate schedules, etc.



Taipower corporate website homepage



Repair and maintenance operation at night

## Process of Complaints

Taipower has worked hard in the area of customer complaints. In 2008, 2,985 complaints were recorded (of which 2,271 were complaints received via e-mail). Most complaints related to areas such as lines relocation (607 cases, 20.3%), bill collections (423 cases, 14.2%), electricity application (267 cases, 8.9%) and quality of electricity (354 cases, 11.9%).

Customers can file complaints by calling 1911 to the Taipower customer service center, sending the e-mail to <service@taipower.com.tw>, or calling the toll free number 1911.

## Customer Satisfaction Survey

Satisfaction of customers is important to Taipower. We target three levels of customers: regular users, medium users (100~1,000 KW) and large users (more than 1,000 KW) and we perform telephone surveys regularly.

The overall satisfaction rates have been over 85% in the past 5 years, but Taipower is still striving to provide better service.

### Satisfaction Rates in the Past 3 Years

Year	Satisfaction rates
2006	86.1
2007	85.7
2008	86.3

## Continuous Research to Reduce Inconvenience

Other than continuing the installation of underground distribution cables, Taipower negotiates with the users on the locations of the electricity distribution equipment and reduces the inconvenience brought to traffic and pedestrians.

If the electricity cannot be connected on time due to inability of equipment installation, Taipower should inform the customer honestly and look for ways to resolve it. Taipower is committed to providing high quality electricity. Other than increasing the coverage area and installing more underground cables, the current network is renewed and well-maintained.

## Confidentiality of Customer Information

To protect the confidentiality of customer information, Taipower established a comprehensive security mechanism for different groups.

### Employees

Raising the awareness of information security through guidance and training.

The accessibility to computer database is controlled according to the employees' rank in the company and the usage of laptop and portable storage is strictly regulated.

### Contractors

The company and related personnel should all sign contracts that agree not to leak any information to outsiders.

### Public

Correct password, name and case number should be entered before accessing any information online.



Customer service at the counter



Information Security Q&A prize awarding activity



Information Security promotion poster

## Communication Between Taipower and Its Stakeholders

Methods	Details
Customer Direct Communication	Visit customers who used more than 100 KW of electricity and village offices to provide suggestions.
Promotion Activities	Host various activities to promote energy conservation.
Energy Conservation Service Team	Provide free energy saving information to communities.
Public Hearings	<ul style="list-style-type: none"> <li>• “Shenao Thermal Power Plant Expansion Project” public hearing (Jan.31, 2008).</li> <li>• “Sanlu High Voltage Substation” public hearing (Mar.14, 2008).</li> <li>• “Yungan Solar Project” conference (Aug.25, 2008).</li> </ul>
Exhibition	<ul style="list-style-type: none"> <li>• Summer elementary and middle school teacher learning camp.</li> <li>• Power plant visiting trips.</li> </ul>
Broadcast	Inform the public about the difficulties and risks of underground transmission and distribution system.
Customer Satisfaction Survey	Use professional surveying company to assess the public's opinion towards Taipower.
Customer Mailbox	Customers can provide opinions on the company website. Their opinions will be processed by relevant departments.
Government Agencies	<p>Communicate and work closely with relevant government agencies.</p> <p>Hosted the “New Generation Electricity Grid Technology” expert conference with the National Science</p>
Technical Exchanges	Council, which was beneficial to the process of construction and personnel training (Mar.10, 2008).



Summer elementary and middle school teacher learning camp



Promotion of energy conservation



## Improving Service Quality

With the changes in the economy, Taipower needs to consider the impact of internationalization, liberalization, and privatization. We need to provide customer-oriented services to secure our current customers and expand our business.

In Taiwan, including Penghu, Kinmen and Matsu area, Taipower has 24 branches, 24 service centers and 279 service offices, creating a complete service network and providing an array of services for our customers. To focus on the opinions of the people and to protect consumer rights, we often re-evaluate our policies. We hope to fulfill the user needs and provide rapid, convenient services.

### Customer Needs

To raise our service quality and understand customer satisfaction with various applications, we have offered online satisfaction surveys on our website. At every service center and office, we provide satisfaction surveys for customers to complete. The statistical results are periodically revealed to improve our facilities for consumers to peruse.

### One-Stop Service Desk

The service desks at every service center and service office process all types of applications, allowing one location to provide full service.

### Online Application Service

Taipower makes efforts in providing diversified and convenient channels of application for customers. Besides using telephone and mail, customers also can apply for electricity on the Internet.

### Diverse Bill-Paying Options

Taipower has 12.23 million customers. In order to allow them to pay their bills easily, except for the more than 2000 customers in Matsu where the bill payment was collected by Taipower personnel, we have provided more multiple options for the customers to pay electricity bills through:

- Financial institutions and post offices
- Convenience stores
- Taipower service units



The Taipei Branch Service Center

## Call Centers

Taipower has established north and central call centers, servicing our users 24 hours a day. Customers can call the 1911 hotline for inquiries including billing information, electricity applications, distribution grid maintenance, and complaints.

## Special Customer Service

To establish means of direct communication with customers, Taipower introduced special customer service in 2002. The designated Taipower employees will periodically and actively visit high voltage customers and village offices to understand their needs, provide them with technical consultations, and solve their problems. This is in an attempt to win the customer support and trust.

## E-Mail Notification Service

To satisfy customer needs in the age of information, Taipower started to provide e-mail service to high voltage and over users in August of 2005. Currently 19,366 ultra and high voltage users use this service, accounting for 80% of the high voltage users. Taipower will continue to monitor user needs and expand our service content.

## Customer Opinion Box

Taipower's e-mail inbox provides a channel for customers to express opinions through the company website. All suggestions are collected by a responsible department, which then send the suggestions out to related units. Replies are then written and automatically analyzed by the system. In 2008, 5,813 e-mails were processed and the number is increasing annually.



The Northern Call Center



Extra high voltage customers technical seminar



Energy conservation exhibition

# Caring for the Society

## Providing a Stable Power Supply

A stable power supply is a necessity for the development of the nation's industry and the prosperity of people's livelihood. Taipower has been making efforts to reduce the duration of power outage to reach the international standard level for outage duration hoping to increase the reliability of power supply.

Taipower implements the following guidelines to raise supply quality:

- Evaluate the power system structure, balance the power supply between regions, execute the 6<sup>th</sup> Transmission and Substation Project and the 6<sup>th</sup> Distribution Project, establish a comprehensive electricity grid, control the quality of electricity, and increase the reliability of electricity supply.
- Look for risk factors that may affect the supply of electricity and implement risk management to ensure the stability and reliability of electricity supply.
- Enhance the maintenance of the existing units, perform periodic inspections, and supervise IPPs.

### Reducing Scheduled Power Outage Duration and Forced Power Outage Frequency

#### Reducing Scheduled Power Outage

- The generators and transmission system need to be turned off for inspection maintenance, and to perform multiple tasks at the same time to reduce the need for multiple shutdowns.
- To reduce the inconvenience caused by a power outage, the power outage is planned according to the specified guidelines.
- Scheduling all works that need to be done on the same day to reduce the frequency of power outage.
- Proper arrangement of manpower and scheduling can reduce the area and duration of power outage.
- Adopting a safe and applicable "uninterruptible work" method can reduce power outage frequency and duration to upgrade power supply quality and the company's competitiveness.

#### Reducing Forced Power Outage

- Conduct monthly "Electro-Mechanical Systems Accident Review Meeting", to discuss the cause for the failure in generation, transmission and distribution systems and come up with improvement strategies.
- Look for risk factors that may affect the supply of electricity and implement risk management to ensure the stability and reliability of electricity supply.
- Collect information of forced power outage. Computer analysis is performed monthly and improvement plans are proposed.
- Undertake regular checks and maintenances on key equipment.
- Inspect the main transformer and distribution facilities with high-tech equipment, make sure all the operators are certified, and improve the loop feeder automation system.
- Accelerate the installation of underground distribution cables in highly populated metropolitan areas.

## Constructing a Power Grid

To expand and improve the transmission and distribution (T&D) lines, reduce line loss, and provide high-quality and reliable electricity, the 7<sup>th</sup> Transmission and Substation Project was planned after the 6<sup>th</sup> Transmission and Substation Project is completed in 2009. The 7<sup>th</sup> Transmission and Substation Project will span from 2010 to 2015, including the installation of 2,280 ckt-km of new transmission lines and a total capacity of 26,221 MVA of new and expanded substations. The 6<sup>th</sup> Distribution Project is also underway. 8,972 ckt-km of distribution lines and transformers with a capacity of 10,529 MVA are expected to be completed in 2011.

## Insuring Power Supply in Science Parks

Science parks are essential to the economy and competitiveness of our nation. Decreasing the occurrence of blackouts and sudden voltage decreases is a main objective for Taipower. By improving the electrical system, increasing the standards of operation and management procedures, and establishing a special management team, the quality of power supply in the science parks should be enhanced.

## Promoting Total Quality Control

Taipower has a “Quality Control System Standard” as a basis for quality control along with other management techniques and schemes to insure the high standard of our services. Taipower also took part in a national quality control competition to observe and learn from other enterprises thus inspiring the continuous improvement of our company.



Extra high voltage (EHV) substation at the Southern Science Park

## Taipower Outreach– World Association of Nuclear Operators (WANO)

Joining Date: March 14<sup>th</sup>, 1989

To increase the performance and safety of the nuclear power plants, Taiwan joined the World Association of Nuclear Operators (WANO). Currently having 36 members, the WANO has the most comprehensive technological database regarding nuclear operation and safety.

By holding conferences, professional meetings, and training sessions, the WANO provides a platform for the exchange of experiences, operational data, and techniques.

Through the WANO, Taipower can communicate with the nuclear power industries around the world without the political barriers and keep up with the international standards.

## The 9<sup>th</sup> Public Construction Golden Awards

Continuously improving construction quality is Taipower's goal. Taipower received 7 awards for our superb construction, design quality and personal achievement. The "Kaokang-Wuchia-Kaohsiung 345 KV underground cable route, Fonglin Rd. Section, shield tunnel and Kaokang (class C) cooling facility turkey project" received the "Best Design Award" and the "Best Construction Quality Award". The special construction methods reduce the impact to local traffic and the environment.

Additionally, Taipower finished the "Tachiachi Hydro Power Plant Kukuan Branch Recovery Project" in spite of the obstacles of the 921 earthquake and numerous typhoons. That project also received the "Best Construction Quality Award" in October of 2008. The CO<sub>2</sub> emissions were reduced by 340 tons annually.



The Tachiachi Hydro Power Plant Kukuan Branch

## Ensuring the Safety of Nuclear Power Operation

The secure operation of the nuclear generators is a key aspect for providing long-term, stable electricity. To safeguard the health and property of the public, meltdown of the nuclear core and abnormal leaks of radioactive materials should be prevented. Nuclear safety is the very first priority for the operation of nuclear power plants.

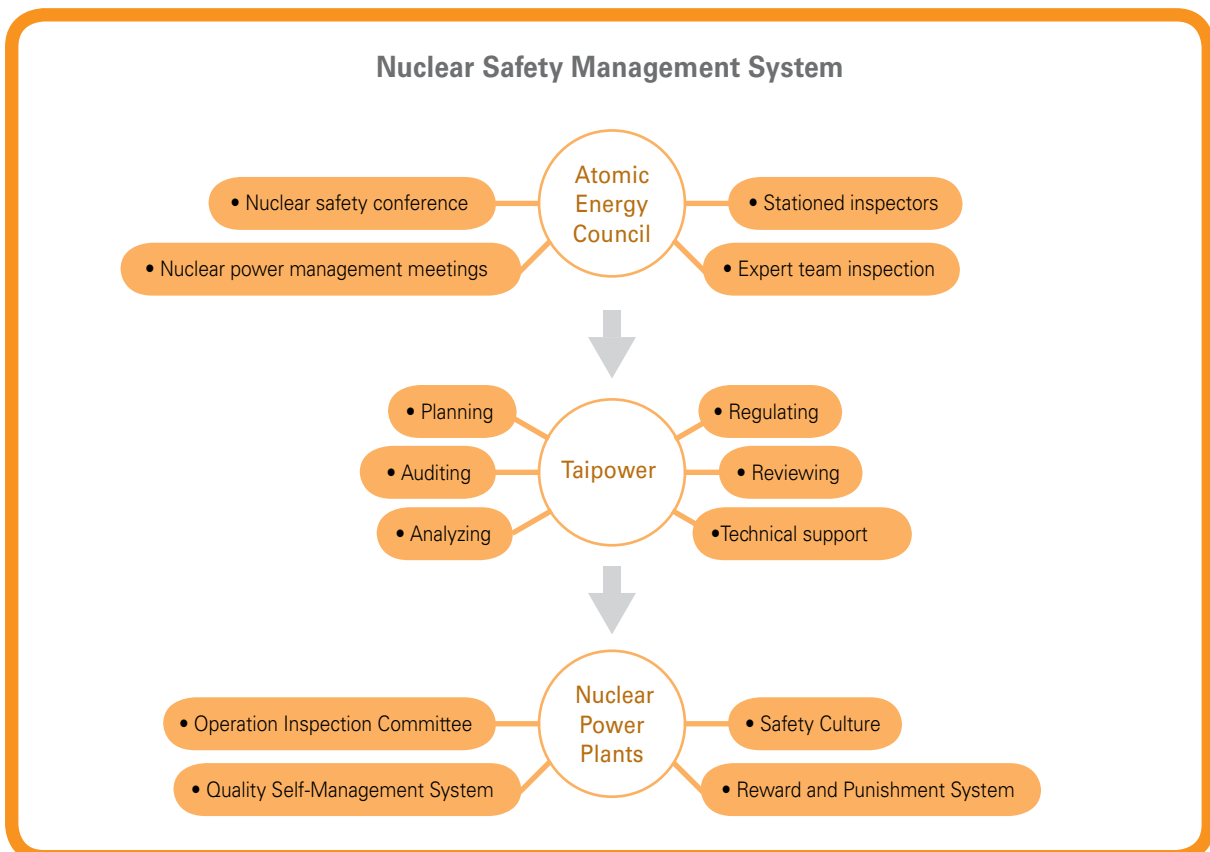
Taipower announced the following nuclear power operation safety policies:

- Nuclear safety culture is the responsibility of all the related workers including operators, managers, and regulators.
- Strictly follow the regulations, standards, guidelines, and operation procedures.
- Promote nuclear safety culture and establish self-evaluation and self-control mechanisms to discover and solve problems in advance.
- Through full effort, prevent the occurrence of abnormalities and violations.
- Strive to exceed the minimum requirements.

### Nuclear Safety and Control

#### Safety Management

The Nuclear Safety Dept. was established on Sep.1<sup>st</sup>, 1992. Its duty is to regulate, review, audit, and evaluate the operation of the nuclear power plants. It's also responsible for regulation, reviewing, auditing and check on delivery for nuclear facilities construction.



### 2008 Nuclear Power Generation Unit Performance

- Capacity: 39,260 GWh (historic highs)
- Capacity Factor: 90.36% (historic highs)
- Scrams : 2 freq./6 units (historic second highs, same as 2007)
- Generation Cost: NT\$ 0.623/KWh

### Disclosure of the Nuclear Power Plant Operation Safety Information

Since Q4 of 2001, Taipower has been evaluating the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Nuclear Power Plants with the presence of inspector from the Atomic Energy Council according to the stipulation of the “Guidelines for Evaluation of Nuclear Performance Indicators”.

The performance indicators are based on the risk-informed concept. The rating criteria uses 10 reactor performance indicators to illustrate the safety of nuclear power plants.

The results of the evaluation were reported to the Atomic Energy Council and posted on its website. <[http://www.aec.gov.tw/www/control/effect\\_index.php](http://www.aec.gov.tw/www/control/effect_index.php)>

### 2008 Nuclear Safety Performance

Indicator		Unit	1 <sup>st</sup> Nuclear Power Plant		2 <sup>nd</sup> Nuclear Power Plant		3 <sup>rd</sup> Nuclear Power Plant	
			1	2	1	2	1	2
Initiating event	Unscheduled scrams per 7,000 hours (automatic or manual)		●	●	●	●	●	●
	Unscheduled scrams with loss of natural heat removal		●	●	●	●	●	●
	Unscheduled power changes per 7,000 hours > 20% rated power		●	●	●	●	●	●
Support system	Safety System Unavailability of High Pressure Core Injection System/ High Pressure Core Spray System.(HPCI/ HPCS)		●	●	●	●	●	●
	Safety System Unavailability of Reactor Core Isolating Cooling System or Auxiliary Feed Water System (RCIC or AFW)		●	●	●	●	●	●
	Safety System Unavailability of Residual Heat Removal System (RHR)		●	●	●	●	●	●
	Safety System Unavailability of Emergency Diesel Generator (EDG)		●	●	●	●	●	●
	Safety System Function Failures		●	●	●	●	●	●
Barrier	Reactor Cooling System Activity		●	●	●	●	●	●
	Reactor Cooling System Identified Leakage		●	●	●	●	●	●

Note: Green light: no safety significance, white light: low-level safety significance, yellow light: medium level safety significance, red light: high-level safety significance.

## Nuclear Safety Enhancement

### Enforcing the Rigorous Quality Guarantee System

An employee is assigned to monitor the quality of design, purchasing, construction, experiment, training, etc. A complete standard operation procedure (SOP) has been set up to continue monitoring the implementation results.

### Implementing Comprehensive Nuclear Safety Regulation Measures

Each nuclear power plant should govern itself, along with the review from the main office, the Atomic Energy Council, and international peers. Together, Taipower uses objective observation to discover areas that can be improved.

### Strengthening the Nuclear Safety Culture

Through continuous training, accident analysis, and experience feedback, Taipower is trying to sharpen the employee self-evaluation and self-regulation abilities.

### Increasing the Reliability of Machinery

With proper maintenance, upgrades and experience from peers in the industry, Taipower optimizes performance from generation machinery and strengthens self-maintenance ability.

## The 9<sup>th</sup> National Company Standardization Prize

The 2<sup>nd</sup> Nuclear Power Plant received the “9<sup>th</sup> National Company Standardization Prize” in 2008. The 2<sup>nd</sup> Nuclear Power Plant has passed various certifications of international standards. It has never experienced scrams in the past 5 years.

To pursue a higher quality of electricity, Taipower has improved all 3 nuclear power plants to meet international technology and management standards.



The Second Nuclear Power Plant



## Radioactive Materials Management

Nuclear Power Plants can generate low-level radioactive waste (radwaste) and spent nuclear fuel. These byproducts should be disposed of properly and kept away from humans.

The low-level radwaste can be incinerated, compressed or solidified and stored properly in zinc coated barrels.

Since the toxicity of the low-level radwaste is lower than most of the other industrial hazardous waste and the toxicity decreases through time, it is easier to handle and control.

### Handling of Low-Level Radwaste

Before the final disposal, the low-level radwaste is incinerated, compressed or solidified and temporarily stored in the power plant.

#### ● Processing and Storage

To account for the demand of storage space and further improve the condition of the storage facilities, each nuclear power plant should improve its waste processing system and install incineration, compression and solidification facilities. In addition, the amount of waste generated should be reduced from the starting point. The amount of low-level radwaste was reduced from over 10 thousand barrels to 253 barrels in 2008. (Each barrel contains 200 liters of waste.) Also, the large modern storage facilities constructed in the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Nuclear Power Plants can replace the old facilities, reduce the stress of storage space, and improve the storage quality.

#### ● Final Disposal

The nuclide half-life of the low-level radwaste is short. After 100 to 300 years of isolated storage, it should not be harmful to humans and the environment. The multi-barrier disposal facilities for low-level radwaste have been constructed throughout the world by the United States, France, Sweden, England, Japan, Spain and Finland. These facilities exhibit no harm to public health and the environment.

According to the "Nuclear Materials and Radioactive Waste Management Act", Taipower has been looking for sites of final disposal. On May 24<sup>th</sup>, 2006, the Legislative Yuan passed the "Act on Sites for Establishment of Low-Level Radioactive Waste Final Disposal Facility". It would take at least 5 years to complete site selection, conduct environmental impact assessment, and investment feasibility study, then another 5 years for the design, construction and application for operation permits.

## Management of Spent Nuclear Fuel

Taipower applies the three-stage strategy for the management of spent nuclear fuel that is used internationally: pool storage, dry cask storage, and final disposal.

- Pool Storage

After the spent nuclear fuels are removed from the reactor, they are temporarily stored in a storage pool that cools the fuel and provides shielding from radiation. The storage pool at each of the 1<sup>st</sup> and 2<sup>nd</sup> Nuclear Power Plants can accommodate the spent nuclear fuel produced in a 30-year operation of each reactor, while that of the 3<sup>rd</sup> Nuclear Power Plant can accommodate up to 40-year operation.

- Dry Cask Storage

Taipower plans to construct a dry cask storage facility at each of the 1<sup>st</sup> and 2<sup>nd</sup> Nuclear Power Plants before the pools are full. The combined capacity of these facilities and the storage pool would be sufficient for storing spent fuel produced during the 40-year operation of the reactors. On-site dry storage will also provide Taipower with ample time and flexibility to adopt the alternative of recycling spent fuel when it becomes feasible to Taipower in the future.

- Final Disposal

Taipower has continuously conducted geological surveys and technology development according to the regulation of the “Nuclear Materials and Radioactive Waste Management Act”. After several years of research, it is confirmed that there are suitable rock beds for the storage of spent fuels. Additionally, reprocess of the spent nuclear fuels can reduce the volume and activity of the fuels. The United States government started the Global Nuclear Energy Partnership, the GNEP, in February of 2006, advocating the reprocessing strategy of the spent fuels. So far, 25 countries including France, Japan, Russia, China, and United Kingdom have joined the partnership. The reprocessing of spent nuclear fuel is going to become mainstream. Taipower will trace the international development continually and seek opportunities for international cooperation.

## Preparation for the Decommission of Nuclear Power Plants

According to the “Nuclear Reactor Regulation”, nuclear reactors need to be retired after 40 years of operation. Units 1 and 2 of the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Nuclear Power Plants came online on December of 1978 and July of 1979, December of 1981 and March of 1983, July of 1984 and May of 1985, respectively. Units 1 and 2 of the 1<sup>st</sup> Nuclear Power Plant are going to be retired in 2018 and 2019. Taipower should propose the retirement plan in 2015 to meet the deadline.

## Improving Emergency Response Mechanisms

Electricity is essential for modern society. Power outage brings inconvenience in the life of the public and economic loss for the industry. Other than maintaining normal power supply, Taipower has established a comprehensive emergency response mechanism in case of accidental power outage. Taipower pays close attention to the daily preparation, so that when an emergency happens, the technicians can be mobilized quickly and minimize the magnitude of the effect.

### Identification of Disaster Level and Response

When an emergency strikes, Taipower should have the ability to evaluate the situation and execute proper reaction. Therefore, Taipower established the “Emergency Identification and Response Measures”.

#### Emergency Identification and Response Measures

Type	In-charge Unit	Grade	Description	Response Measure
Public Gas and Oil Pipeline Disaster	Ministry of Economic Affairs (MOEA) and Taipower	Time for the establishment of a Central Disaster Response Center	By estimation, more than 15 people are injured, dead or missing, or more than 1 km <sup>2</sup> of land is polluted, or social wellbeing is affected.	Establishing Central Disaster Response Center and MOEA Emergency Response Team
	State-owned Enterprise Commission (SEC) and Taipower	Grade A	More than 10 people are injured, dead or missing and the situation is getting worse and can not be effectively controlled.	Notifying Executive Yuan, National Disaster Prevention and Protection Commission, Government Information Office, and National Fire Agency
	SEC and Taipower	Grade B	More than 5 people are injured, dead, or missing and the situation is getting worse and can not be effectively controlled.	SEC and Taipower establishing emergency team
	Taipower	Grade C	Not reaching grade B scenario and the situation is under control.	Taipower undertaking emergency response
Transmission System Disaster	MOEA and Taipower	Time for the establishment of a Central Disaster Response Center	By estimation, more than 15 people are injured, dead, or missing, and more than 10 primary substations (including distribution substations) have power outage, normal power supply is not expected to be restored within 48 hours, and the situation is getting worse and can not be effectively controlled.	Establishing Central Disaster Response Center and MOEA Emergency Response Team
	SEC and Taipower	Grade A	By estimation, more than 10 people are injured, dead, or missing, and more than 10 primary substations (including distribution substations) have power outage, normal power supply is not expected to be restored within 24 hours, and the situation is getting worse and can not be effectively controlled.	Notifying Executive Yuan, National Disaster Prevention and Protection Commission, Government Information Office, and National Fire Agency
	SEC and Taipower	Grade B	By estimation, more than 5 people are injured, dead, or missing, and more than 10 primary substations (including distribution substations) have power outage, normal power supply is not expected to be restored within 24 hours, and the situation is getting worse and can not be effectively controlled.	SEC and Taipower establishing emergency team
	Taipower	Grade C	Not reaching grade B scenario and the situation is under control.	Taipower undertaking emergency response

## Improvement of Natural Disaster Prevention and Response Mechanism

To prevent the damage of natural disasters and wars, Taipower formulated the “Special Disaster Prevention and Handling Guidelines”, which include pre-season preparations for the typhoon, procedures after the typhoon warning, management of the typhoon aftermath, war disaster prevention and management, and special disaster reporting procedures.

Typhoons and flooding are the most common natural disasters in Taiwan, Taipower gets prepared before the typhoon and rainy season by following the “Special Disaster Prevention and Handling Guidelines”.

## Nuclear Power Plant Emergency Response

In the event of nuclear accidents, nuclear power plants will release of radioactive substances. In order to prevent accidents and the protection of the damage to public life and property, emergency measures must be taken to identify the cause of the incident and prevent the spread of disaster. The measures are as follows:

### Response Procedure Drills

Drills are held annually to simulate serious nuclear accidents. Central and local government, military, and medical facilities are mobilized to cooperate with the drills. The Atomic Energy Council (AEC) and hired experts are present at the drills and provide opinions to improve the response measures.

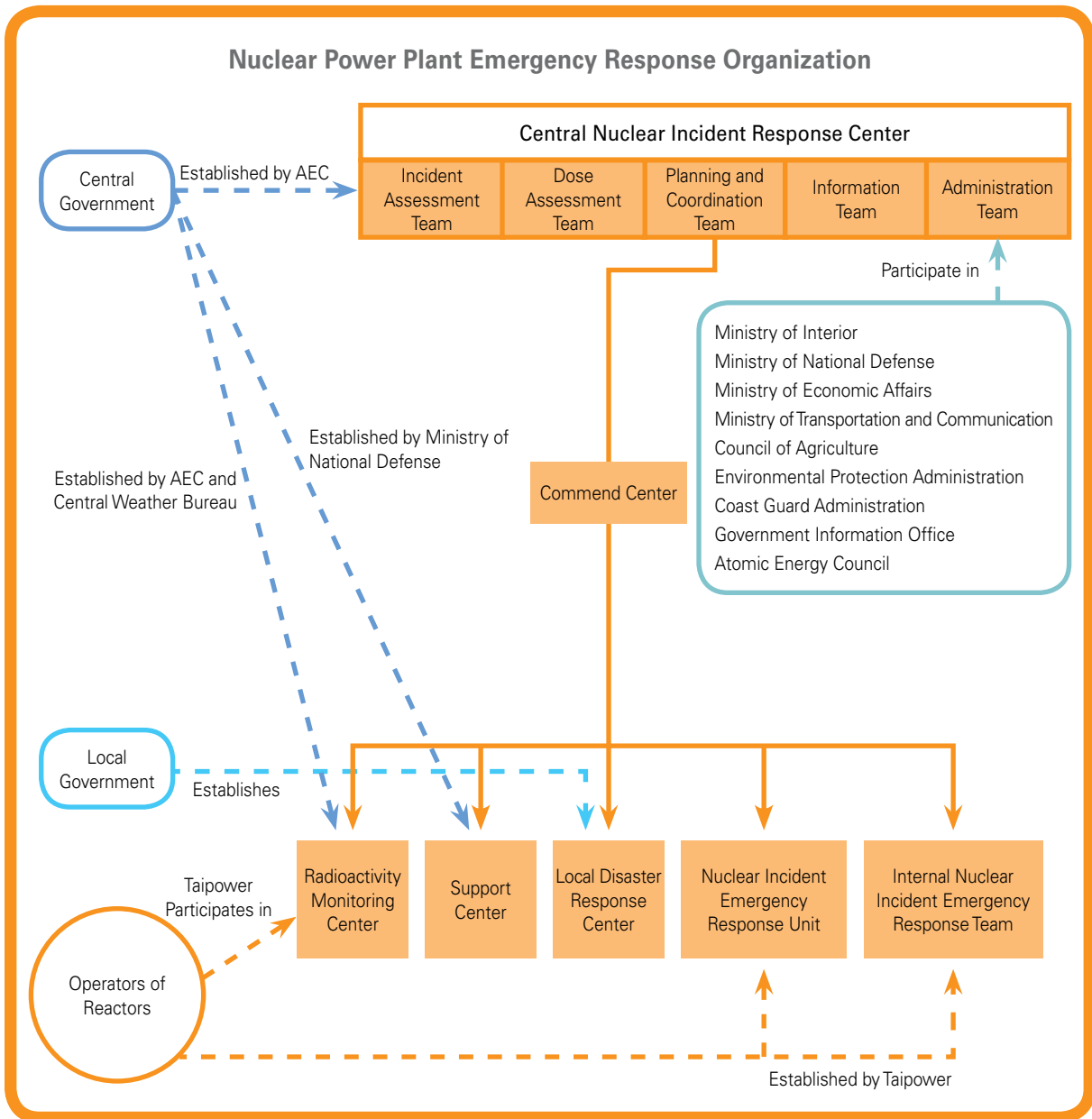
### Emergency Response Preparedness Indicators

Since 2009, each nuclear power plant has the following three emergency preparedness indicators, and the results are quarterly reported to the AEC. To ensure that in the event of radioactive substances release, appropriate steps are taken to protect the public health and safety. They are as follows:

- Practice and drill performance.
- Participation in the emergency response organization.
- Reliability of the warning and reporting systems.

### Emergency Measures

To deal with the possibility of nuclear power plant emergencies, the central government has established the central nuclear disaster response center, each local government a local nuclear disaster response center, and the Ministry of National Defense a support center, and Taipower will help to deal with nuclear disasters. A detailed organizational chart is shown as follows.



### Taipower Outreach— Institute of Nuclear Power Operations (INPO)

Joining Date: January 12<sup>th</sup>, 1982

All nuclear power providers in the United States are members of the Institute of Nuclear Power Operations. The publications and the database of INPO are one of the most credible references in the nuclear power industry.

The INPO has members from 16 different countries. Since the nuclear generation units owned by Taipower are all American units, learning from American companies can help us increase the reliability, performance, and safety of nuclear power plant operations.

## Engaging in Social Care Activities and Local Public Construction

“Caring” is a Taipower management philosophy. Not only does Taipower provide electricity to everyone’s modern life style, but also we expect ourselves to be a good “corporate citizen” by fulfilling our social responsibility to the community. In 2008, Taipower hosted charity events including “Light of Love-Year’s End Senior Attentive Care”, “Seeds of Hope Program”, and “Firefly, Children’s Reading Plan”. These activities target seniors who live alone and aboriginal children, letting love spread like electricity, going where it’s needed.

### Light of Love—Year’s End Senior Citizens Attentive Care

Chinese New Year is the time when families get together. However, for seniors who live alone, it’s the loneliest time of the year. Taitung County has the highest percentage of elderly population in Taiwan. Among them, majority of the seniors live alone and have low income. Taipower, Taitung Christian Hospital, and the A Kernel of Wheat Foundation have gathered manpower and funds to host the “Light of Love—Year’s End Senior Attentive Care” activities since 2005.

In 2008, 157 seniors were invited to dinners, New Year’s supplies were also sent to numerous people. Taipower Chairman Eadward K.M.Chen and 20 volunteers joined these activities.

### Seeds of Hope Program

A lot of aboriginal families in the eastern regions cannot afford for their children to finish their education. Other than taking care of the elderly, Taipower helps the poor aboriginal children with their education. Taipower, Hualien Mennonite Christian Hospital, Mennonite Christian Foundation, Taitung Christian Hospital, and A Kernel of Wheat Foundation, provide internship opportunities for the low income aboriginal college students to perform charity work in their hometowns.

Other than serving in hospitals, hired students help in health surveys, elderly meal deliveries, elderly household cleanings, elderly daycare, and tutoring for elementary school students.



“Light of Love” dinner party



“Seeds of Hope” graduation group photo



“Seeds of Hope” having fun with senior citizens

## Firefly, Children's Reading Plan

Educational resources in the Taitung and Hualien regions are very scarce. Minority students are in need of assistance. Taipower and the A Kernel of Wheat Foundation started the "Firefly, Children Reading Plan" in September of 2007, established 10 children's classes, promoting character education and teacher training. With mobile book carts, summer reading camps, and a year's end meeting, Taipower tried to raise children's reading and learning ability.

The children's classes target minority children from grades 1 to 6. The mobile book cart is moved to remote tribal villages every two weeks. Additionally, a children's library is set up in 7 locations, and books are exchanged every 6 months.

## Learning Center and Reading Room

In response to the demand of the community and Taipower's management philosophy of "Caring" and "Innovation", Taipower has set up learning centers and reading rooms to equip citizens for the Information Age.

The centers and rooms are open from 8 am to 9 pm every day except for national holidays and scheduled cleaning and maintenance. Anyone can apply for a study card and use it for a seat at the center.

Currently, there are 24 centers and rooms located in the Taiwan and Penghu area providing more than a thousand seats (more than three times that of the national library). These centers and rooms provide a perfect learning environment with comfortable chairs and appropriate lighting and air conditioning. The centers and rooms not only provide a location for learning but also raise the spirits of the public.



"Firefly, Children Reading Plan"- mobile book cart



"Learning Center and Reading Room" in branches



Promotion of energy conservation in aboriginal villages



Taipower soccer team

## Low-Carbon Aboriginal Campus

On December 12<sup>th</sup>, 2008, Taipower funded the replacement of old lamps with energy-saving lamps in Tatong Elementary School in Tatong Township, Yilan County. A lighting ceremony was held by the school principle and Taipower Chairman Edward K.M Chen to celebrate the effort of saving energy and reducing CO<sub>2</sub> emissions.

With the principle of “energy saving, rational lighting, and caring for aboriginal students”, Taipower started the “Illumination Revolution” to replace the traditional T9 lamps that has been used for more than 3 years with T5 lamps in elementary and middle schools in aboriginal townships.

So far 7 townships including Yilan County Tatong Township, Taipei County Wulai Township, Miaoli County Taian Township, Taichung County Heping Township, Nantou County Renai Township, Hualien County Sioulin Township, and Pingtung County Mudan Township, with a total of 59 schools have joined the “Illumination Revolution.” It is estimated that 610 MWh of electricity has been saved, and 390 tons of CO<sub>2</sub> emissions have been reduced annually. This is equivalent to the reduction power of three Taipei Ta-an Forest Parks (19 thousand trees).

## Taipower Sports Teams

Since the foundation of Taipower, we do not only provide quality electricity, we also support various sporting activities. For example, the Taipower baseball, basketball, badminton, volleyball, and soccer teams are all excellent non-professional league A teams. In 2008, the male volleyball and soccer teams both won the national championship. The male soccer team even won 10 consecutive championships in National Division A Contests.

## Regional Public Expenditures

To accelerate the development of electricity, enhance the well-being of residents around the power plants and substations, and to elevate Taipower corporate image, “The Approval Committee of Power Development Foundation” was founded on January 1<sup>st</sup> of 2003. The committee approves the funding for areas around the power facilities according to the given guidelines.



Special scholarship award activity

### The Power Development Foundation Expenditures in the Past 3 Years

Unit: NT\$ million

Year	Amount
2006	2,687
2007	3,006
2008	2,878



# Respecting Employees

## Workplace Safety

Electricity can not be generated and supplied without the effort of our employees and contractors. Therefore, Taipower pays extra attention to our employees' and contractors' safety and health. We follow relevant regulations to provide a safe and healthy workplace.

### Employees

Taipower has devised several prevention measures and action plans to lower the number of workplace injuries.

#### Labor Safety and Health Organization

Taipower has established the "Labor Safety and Health Committee," providing a platform for the communication between the workers and the employer. The president was appointed as the chairman of the committee and the vice president in charge of the Dept. of Industrial Safety and Environmental Protection was appointed as the vice chairman of the committee. The committee consists of 31 other members, with 14 representatives from the union.

#### Training and Incentives

Training sessions were held for all the employees to promote a safe working environment. More than 20 thousand people participated in training sessions in 2008.

Additionally, workers with excellent performance was awarded and recognized in the company publication.

#### Enhancement of Disease Prevention and Healthy Concepts

To enhance the employees' and the contractors' concepts of disease prevention, 8 lectures were held in 2008. The Taipower Clinic also held health lectures on every Saturday to promote good health concepts.

#### Establishment of an Occupational Safety and Health Management System

In order to reduce the risks of workplace injuries, Taipower actively assists each unit to establish an occupational safety and health management system meeting the requirements of OHSAS 18001. While adhering to the system requirements of continuous improvement, legal compliance and policy fulfillment, Taipower also wishes to reduce the risks of workplace injuries through risk assessment, risk control, etc., mandated in the system. As of the end of 2008, a total of 22 Taipower units were OHSAS 18001 certified.

## Contractors

Historically, Taipower has always considered removing unsafe working conditions and reducing occupational injuries as our most important safety and health responsibilities. In order to ensure that occupational safety and health management for contractors are effectively enforced, Taipower listed contractor injury as one of its performance indicators. Relevant mechanisms include:

- Stipulate occupational safety and health requirements in contracts and follow-up on their implementation.
- Organize safety and health promotion meetings and invite safety and health experts and government officials to deliver relevant speeches.
- Establish Industrial Safety and Health Group to establish communications between Taipower and contractors and assist them in implementing safety and health measures.
- Promote on-site injury prevention activity and tool box meeting (TBM) to inform workers of the site-related hazard factors and safety and health measures which should be taken.
- Implement three-tier inspection system truthfully and penalize non-compliance severely; conduct unscheduled inspection on key operations or tasks with potential safety risks.
- Promote "Safe Partners Project" and implement injury reduction measures.

## 2008 Performance

Employees: 49 injuries (including 21 commuting injuries) with a total injury index of 8.74.

Contractors: 22 injuries.

Taipower will continue its efforts in reducing workplace injuries.

### **Taipower Outreach– World Safety Organization (WSO)**

Joining Date: June 1991

Taipower joined the World Safety Organization (WSO) in June of 1991. The WSO is an international organization which provides information regarding workplace and environment safety. It shares information about the technology, experience and equipment for preventing injuries with its members.

By joining WSO, Taipower is able to join the annual meetings and enhances the company images. Taipower can also join the various meeting of the labor committee to increase the chance of international cooperation and exchange of experience and technology. With the information provided by the WSO, Taipower should be able to increase the performance in workplace safety.

## Fair Employment Environment

Taipower provides equal opportunity and benefits to employees who dedicate their life and enthusiasm. We also respect our employee rights of speech and assembly.

### Employee Rights and Benefits FAQ

For the instant access of the information about employee rights and benefits, Taipower posted an FAQ on the internal network.

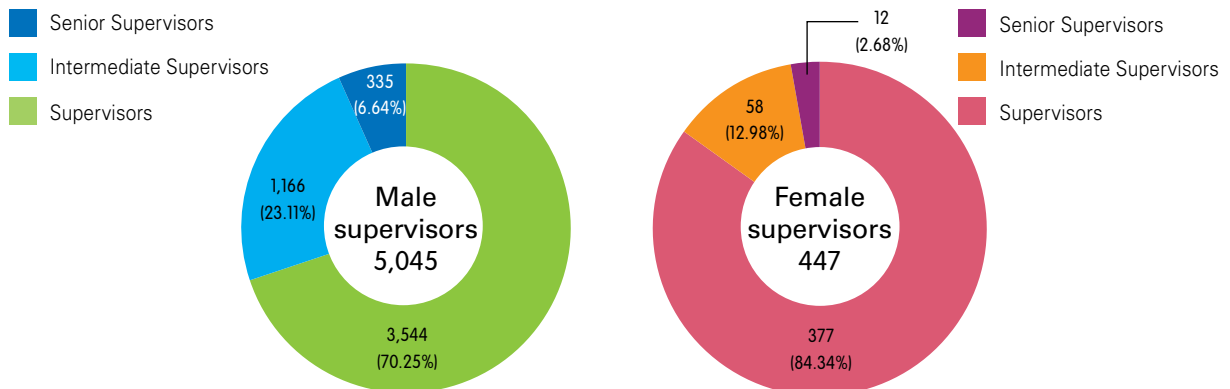
Due to the constant change of rules and regulations, Taipower has established an online inquiry system which offers the latest information for the needs of the employees.

### Gender Equality

According to "Employment Services Act," the employer should not discriminate against applicants or employees by their gender for the sake of equality in employment. Therefore, Taipower obeys the spirit of the Act for recruitment, entrance test design and career planning without any restriction of gender.

The Ratio of Male and Female Supervisors 2008

Unit: person



Total supervisors: 5,492

### Employment of Disabled and Aboriginal People

For the equal opportunity of minorities, Taipower has hired 680 (2.56%) employees with disabilities and 150 (0.56%) employees of aboriginal descent. Both ratios are more than the requirements set by the government.

## Implementing Systematic Personnel Training

Taipower regards the employees as the most important asset of the company and emphasizes personnel training. Taipower provides training courses continuously to satisfy employees' sense of self-promotion and increase the competitiveness of the company.

### Employment and training

At the end of 2008, Taipower had 26,584 employees, with a personnel turnover rate of 3.2%. To prevent the loss of experience and knowledge, 498 people were hired to 12 departments in 2008. They received a concentrated 2 week pre-job training, and were assigned to each department for a 6-month probation. Each new employee was assigned according to his/her specialties and talents. Internship assistance and long-term career planning were also given to each new employee.

In addition, 446 employees received 3-6 months of training, including general and technical courses, in Taipower training centers. They will be sent to where they are needed and undergo a one-year probation.

### On-the-job Training

To strengthen employees' competitiveness, promote manpower resource development and enhance management performance, Taipower undertook the following local and overseas training programs in 2008: 48,928 employees participated in on-the-job and off-the-job training; 130 went for overseas research on special topics; 12 studied for master's and doctoral degrees.

To cope with the impact of the future privatization of Taipower and liberalization of the power industry, retraining programs were held to cultivate employee's second professional specialties. There were 430 participants. Taipower helped employees to obtain 1,822 electricity-related certificates.

### E-Learning

For the purpose of lifelong learning, Taipower established an online college which offers more than 420 courses and allows its employees to take lessons without constraints of time and location. In 2008, the average online reading hours were 6.3 hours per employee. The average learning time per employee was 48.96 hours, which exceeded targeted hours.

## Knowledge Groups

Since 2003, Taipower has set up the Taipower Blog, the QuickPlace, and the Taipower Think Tank, which includes personal blogs, 109 QuickPlace, 237 knowledge groups, 7,586 knowledge experts, and 13,761 knowledge entries.

To further increase the function of knowledge management, 2 more knowledge groups were formed in 2008, in the hope that the experience of senior employees could be passed on.

### Knowledge Experts Q&A Group

It is a interactive platform for the employees to communicate with knowledge experts. Through one-on-one communication channel, these groups should increase the interaction between employees and help the spread of knowledge.

### Taipower New Generation Knowledge Groups

These groups provide a platform for newcomers to think, learn and share ideas.

## Corporate Ethics and Work Discipline

Corporate ethics and corporate image are closely related. A company won't become prestigious without discipline. As a state-owned public utility, Taipower should strive for the support of the society for its power construction and win the trust of its customers for its management activities. Therefore, corporate image is significant for the company's sustainable management.

### Setting Examples by Executives to Shape a High Quality Culture

Executives should set examples of integrity and self-discipline to bring a good climate to their units. An ideal corporate culture of the company will thus take shape. Through awarding integrity, the employees' loyalty, responsibility, pride, etc., will be enhanced.

### Enhancing Work Discipline and Upgrading the Company's Corporate Image

Work discipline should be taken into the consideration of assessment, promotion, and rotation. This can foster good working discipline and enhance the company's corporate image.

### Operating in Accordance with the Law and Adhering to Moral Integrity

The company should strengthen the law and ethical advocacy, establish the law-abiding spirit of the staff, and uphold business administration according to the principles of law.

### Strengthening Corporate Governance to Gain Public Trusts

Taipower has been actively strengthening the company governance, including disclosing company information, strengthening the functions of board of directors, thoroughly promoting the functions of supervisors, and respecting the rights and interests of stakeholders.

## Caring and Communication with Employees

Taipower is a large corporation with a tremendous amount of employees. In order to encourage them, an effective management system is important. Before asking full efforts from the employees, Taipower needs to satisfy their demands. Therefore, establishing an assistance system that serves and helps the employees is helpful to form a win-win situation.

### Regular Labor and Management Meeting

Taipower holds labor-management meetings regularly according to regulations. In 2008, the headquarters units and 72 subunits held 388 meetings. 141 proposals were sent to the headquarters for processing.

### Executive-Employee Communication Meeting

To inspire good communication between the management level and the workers, Taipower gives out three awards each year to the departments with the highest rating of labor-management relationship.

### Heart to Heart Counseling Center

Since 1988, enthusiastic employees have been taking on the roles of counseling and helping other employees with their issues in life, work, and emotions through the "Heart to Heart" counseling centers. Currently, there are 74 "Heart to Heart" counseling centers and 590 counselors.

Our effort was recognized by the Ministry of Economic Affairs in the beginning. In 1990 we were appointed to assist other MOEA agencies with counseling affairs and awarded the "Outstanding Achievement" medal. "Heart to Heart" bimonthly magazine has been awarded many times by the Taipei City government and the Council of Labor Affairs.

### Employee Assistance Programs Mechanism

According to "the Executive Yuan Employee Assistance Programs Plan" announced on October 25, 2007, Taipower set forth a "Taipower Employee Assistance Programs Plan" on December 31<sup>st</sup>, 2007, hoping to change the consulting mechanism to the "Employee Assistance Program", matching up with the world standard.

# Environmental Sustainability

*The development and the operation of the electricity industry is strongly related to the environment and ecology. Being the primary electricity provider in Taiwan, Taipower is going to face the problem of reducing environmental impact and lowering the emissions of pollutants to maintain sustainable development and competitiveness in the 21<sup>st</sup> century.*

*To reduce the extent of global warming, Taipower has been developing various types of renewable technology and upgrading our equipment to reduce emissions during the generation processes. We have also hosted numerous activities to increase our employees' and the public's awareness of environmental protection.*

## Global Warming

Being the primary electricity provider in Taiwan, Taipower bears not only the responsibilities of electricity safety and quality, but also the responsibility of environmental protection. The emission control mechanisms should be planned in advance and executed thoroughly.

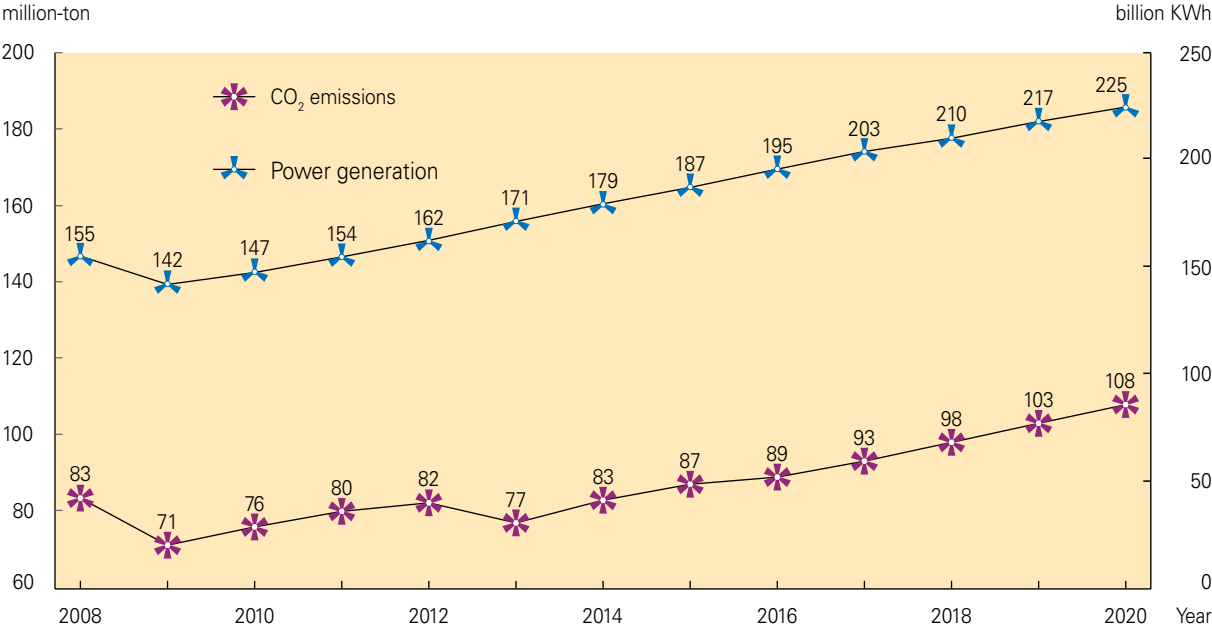
### Emissions and Affects of Greenhouse Gases

The GHG emissions from the power industry are mostly from thermal power generation. Because Taipower still relies mostly on thermal power, we understand that the CO<sub>2</sub> emissions issue will incur higher risks for the power industry than other industries in future GHG emissions control schemes.

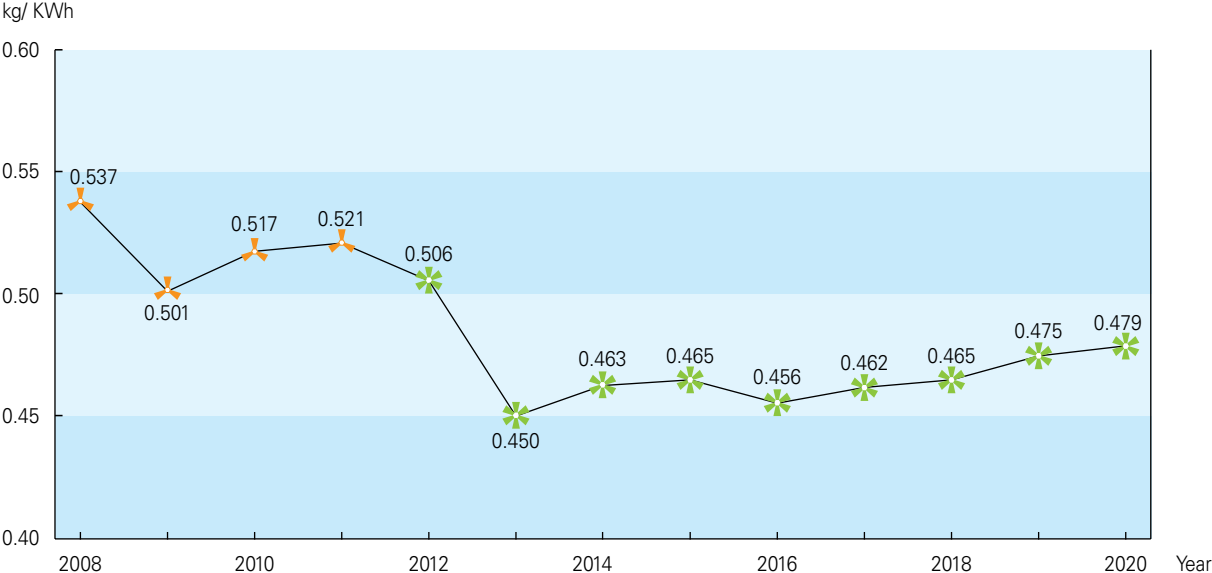
In Taiwan, the power supply from renewable energy is unstable due to weather conditions. It can only serve as auxiliary power source. Moreover, the ratio of power generation from natural gas-fired power plants in Taiwan is already high, and is unlikely to be greatly expanded due to energy security concerns. As for nuclear power, under the government's Nuclear-free Homeland policy, only the construction of the 4th Nuclear Power Plant is being considered in Taiwan. In the future, if nuclear power is considered as a better electrical energy option, Taipower will adjust the ratio of nuclear power to total power generation in accordance with government policy and effectively reduce GHG emissions from power generation.

Since electricity cannot be stored, its supply depends on the demand. Therefore, the emission regulation should aim for the emission concentration. The 21<sup>st</sup> century will be a low carbon era. Under the requirement of GHG reduction, Taipower power development will follow the spirit of sustainability to promote economic development and protect the living environment for future generations.

**CO<sub>2</sub> Emissions and Power Generation**  
(based on 06/2009 Power Development Program)



**CO<sub>2</sub> Emission Concentration 2008-2020**  
(based on 06/2009 Power Development Program)



Note: CO<sub>2</sub> emission concentration = CO<sub>2</sub> emissions / power generation



## GHG Regulation Strategies and Action Plans

To effectively manage the emissions of GHG, Taipower planned 7 regulation strategies and 17 action plans shown as follows:

**GHG Regulation Strategies and Action Plans**

Regulation Strategies	Action Plans	Measures	Notes
Supply-side management	<ul style="list-style-type: none"> <li>• Adopt the best available technologies for new generating units.</li> <li>• Improve the average efficiency of existing thermal power generating units.</li> <li>• Increase the ratio of natural gas power.</li> <li>• Increase the ratio of renewable energy.</li> <li>• Complete the Lungmen Project.</li> <li>• Increase the ratio of nuclear power.</li> <li>• Participate in voluntary emission reduction program.</li> </ul>	<ul style="list-style-type: none"> <li>• Adopt supercritical coal-fired generating units with efficiency of 44.4% (LHV Gross).</li> <li>• Gradually improve efficiency of the existing units.</li> <li>• Ratio of natural gas power generation will reach 25% in 2025.</li> <li>• Ratio of renewable energy generation will reach 8% in 2025.</li> <li>• Start the commercial operation of the Lungmen Nuclear Power Plant.</li> <li>• Extend the service of nuclear units according to the "Guidelines for Sustainable Energy Policy".</li> <li>• Starting in 2006, 8 units have participated in the reducing emission project voluntarily.</li> </ul>	<ul style="list-style-type: none"> <li>• New units for Shenao, Linkuo, Changgong, and Talin Thermal Power Plants.</li> <li>• Improvement plan for Hsinta Units 1-2 and Taichung (Units 1-8).</li> <li>• Based on the "Guidelines for Sustainable Energy Policy".</li> <li>• Based on "Guidelines for Sustainable Energy Policy."</li> <li>• The two units in Lungmen Nuclear Power Plant will produce 18 TWh of electricity annually.</li> <li>• Extend the service period of current nuclear units to 60 years. The average electricity will be 39 TWh per year.</li> <li>• 6 units passed the reduction certification; Tungshiao and Hsinta Thermal Power Plants have reduced 56,338 and 12,607 tons of CO<sub>2</sub>e, respectively.</li> </ul>
Demand-side management	<ul style="list-style-type: none"> <li>• Promote energy conservation to reduce customer power load.</li> </ul>	<ul style="list-style-type: none"> <li>• Continue to promote internal energy conservation and participate in external promotional activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Promoted energy conservation to 366,800 people, and visited 5,236 large consumers (over 100 KW) in 2008; 1.94 million tons of CO<sub>2</sub> emissions were reduced due to the discounted electricity policy between July of 2008 and February of 2009. The installation of energy-saving appliances can reduce the electricity consumption by 29 GWh and CO<sub>2</sub> emissions by 18,000 tons per year.</li> </ul>
Improve power transmission and distribution system	<ul style="list-style-type: none"> <li>• Improve transmission and distribution efficiency and reduce line loss.</li> <li>• Step up SF<sub>6</sub> control to cut down its dissipation.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain transmission loss at a level below 5%.</li> <li>• Establish SF<sub>6</sub> management system, improve recycling and reuse.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintained transmission loss to below 5% in the last three years (4.58% in 2008). Continue to improve system supply capacity and reliability to achieve transmission efficiency.</li> <li>• Establish SF<sub>6</sub> management system before the end of 2008.</li> </ul>
Smart Grid	<ul style="list-style-type: none"> <li>• Effectively control the loading and distributed generation.</li> <li>• Integrate green energy.</li> <li>• Continuously upgrade the automated dispatching system.</li> </ul>	<ul style="list-style-type: none"> <li>• Install an advanced metering infrastructure (AMI) and a customer service system.</li> <li>• Construct an integrated distributed generation system.</li> <li>• Automation of substations and feeders.</li> </ul>	<ul style="list-style-type: none"> <li>• Complete the installation of 1,200 AMI for important customers in 2009 and gradually increase the number in 2010.</li> <li>• Reduce the impact of the distributed generation on the power grid. Maximize the benefit of combining renewable energy and existing power grid.</li> <li>• Reduce gasoline consumption of the maintenance people traveling to and from power facilities.</li> </ul>

Regulation Strategies	Action Plans	Measures	Notes
Research and development	<ul style="list-style-type: none"> <li>Develop technologies for GHG reduction and renewable energy.</li> </ul>	<ul style="list-style-type: none"> <li>Actively promote research and development of relevant technologies (renewable energy, new energy, CO<sub>2</sub> recovery and reuse, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Microalgae CO<sub>2</sub> fixation technology; reserve CCS facility space for new coal-fired power plant(s).</li> </ul>
Greenification	<ul style="list-style-type: none"> <li>Continue planting trees.</li> </ul>	<ul style="list-style-type: none"> <li>Continue planting in existing sites. 0.1% of funding in new thermal power plant development is designated for greenification.</li> </ul>	<ul style="list-style-type: none"> <li>Completed 278 hectares of planting in 2008. Taipower cooperated with local governments to plant 50 hectares of trees in Taichung, 30 hectares of trees in Kaohsiung, and 60 hectares in Miaoli.</li> </ul>
Management, supervision, certification, and cooperation	<ul style="list-style-type: none"> <li>Promote GHG management system; increase ability to build and plan training mechanism.</li> <li>Transparent environmental protection information.</li> </ul>	<ul style="list-style-type: none"> <li>Complete the ISO 14064-1 GHG certification in all the power plants and the annual training project.</li> <li>Establish the environmental accounting system and publish the sustainability report.</li> </ul>	<ul style="list-style-type: none"> <li>All the plants (thermal, nuclear, hydro, and outlying island branches) and distribution system passed the ISO 14064-1 certification in 2008.</li> <li>The environmental accounting system has already started and the publication of the sustainability report is underway.</li> </ul>

## 2008 Asian Power Awards

The Hsinta Thermal Power Plant in Kaohsiung Yungang Township is the second largest thermal power plant in Taiwan. Its excellent equipment won the R.O.C. Enterprise Environmental Protection Awards for 3 consecutive years from 2005 to 2007. In 2008, it was exalted among 50 other power plants in Asia and won "the Best Environmental Performance Power Plant of the Year"



The Hsinta Thermal Power Plant coal-unloading pier

## GHG Inventory and Reduction

Responding to the question of climate change is a long-term and arduous effort. Before the regulations take effect in our nation, the surveying and reduction of GHG can reduce the impact on our company and allow us to meet with the international standards.

Regarding GHG inventory, all the activities and equipment that are under Taipower's control including direct emissions and indirect sources are surveyed. The survey boundaries are described as follows:

- Direct Emissions (Scope 1): Emissions from smoke stacks, production processes, ventilating systems, and vehicles under the control of Taipower.
- Energy Indirect Emissions (Scope 2): Quantify the indirect GHG emissions from the electricity, heat and steam outside of Taipower.
- Other Indirect Emissions (Scope 3): Emissions outside of the operation of each unit, such as outsourcing, employee business trips, products made elsewhere, transportation of raw materials and wastes, waste processing, and employee commuting.

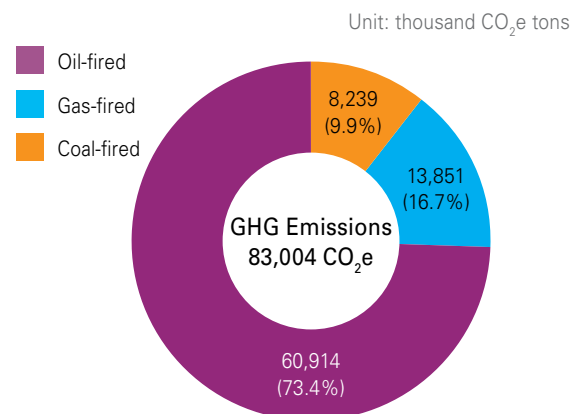
Taipower's main GHG emissions sources are the thermal power generating processes, coal storage, transportation, vehicles, other fuel-consuming equipment, insulation fluids used in switchgears, and refrigeration and air conditioning equipment. Based on the 2008 GHG survey results, Taipower emitted 83,493 thousand tons of CO<sub>2</sub> equivalent of GHGs, of which 99.4% are from the thermal power generation processes.

In order to improve the transparency and credibility of reported GHG data, third party certification organizations were commissioned by Taipower starting in 2007 to conduct ISO 14064-1 validation audits of each unit's reported GHG emissions. As of 2008, 33 units had passed the validation and we will continue to do so in the future.

**Taipower 2008 GHG Emissions**

GHG	Emissions (thousand CO <sub>2</sub> e tons)
Carbon dioxide (CO <sub>2</sub> )	82,929
Methane (CH <sub>4</sub> )	137
Nitrous oxide (N <sub>2</sub> O)	311
Sulfur hexafluoride (SF <sub>6</sub> )	110
Hydrofluorocarbons (HFCs)	7
Perfluorocarbons (PFCs)	-
Total	83,493

**2008 GHG Emissions from Thermal Power Plants**



Starting from 2006, Taipower has been participating in Bureau of Energy's "Voluntary GHG Reduction for Energy Industry Project". In 2008, 6 units passed the certification. It's estimated that 27.55 million tons of CO<sub>2</sub> emissions will be reduced over the course of 7 years. Among them, the Tunghsiao, and Hsinta Thermal Power Plants both had their emissions validated by an independent certification organization in accordance with the requirements of ISO 14064-2, and are expected to be able to reduce 68,945 tons of CO<sub>2</sub> emissions.

With the guidance and assistance of the government, Taipower will gradually adjust its generation mix and increase energy efficiency moving toward a low carbon society.

## CO<sub>2</sub> Capture and Storage Technology

Based on the UNFCCC (United Nations Framework Convention on Climate Change) recommendations, the present CO<sub>2</sub> emission crisis may be resolved through three approaches:

- Reduce CO<sub>2</sub> emissions through improvement in energy efficiency and increase energy conservation efforts.
- Develop low-carbon or non-carbon energy to replace existing energy sources.
- Capture and store emitted CO<sub>2</sub> in order to reserve enough time for the human beings to search for a final solution to the CO<sub>2</sub> crisis.

If CO<sub>2</sub> can be captured, liquefied, and stored in underground facilities, the rate of global warming will be reduced. The design of our existing thermal power plants allowed them to be retrofitted with a post-combustion CO<sub>2</sub> capturing facility. Therefore, in the future these plants will be capable of separating the low concentration CO<sub>2</sub> from the flue gas using suitable separation technology and then storing the captured CO<sub>2</sub> in suitable underground sites.

However, the current separation technology is too expensive to be used commercially. A lot of countries are actively conducting relevant research hoping to reduce the cost. Besides conducting research on low-cost CO<sub>2</sub> separation technologies, Taipower is also closely watching the international development so that when the CO<sub>2</sub> separation technologies are mature, such suitable technologies can then be introduced to Taiwan.



Microalgae CO<sub>2</sub> reduction pond in the Talin Thermal Power Plant

## Management of SF<sub>6</sub>

In addition to safety and reliability, current substation facilities need to be aesthetic in structure, safe for operation, easy for maintenance, low in noise, and clean in appearance. In order to address environmental concerns on insulation fluids, we have widely adopted the SF<sub>6</sub> gas-insulated switchgear (GIS) equipment. However, there is a need for refilling of some SF<sub>6</sub> when leakage occurs or during equipment maintenance. As SF<sub>6</sub> is a highly potent GHG, Taipower has adopted the following measures to address this issue:

### ● SF<sub>6</sub> Usage and Refilling Amount in Substations and Switchyards in 2008

- A total of 13,209 GIS were in use of SF<sub>6</sub>.
- 1,389,233 kg of SF<sub>6</sub> were used.
- 16,152 kg of SF<sub>6</sub> were used for added or expanded facilities.
- 4,217.84 kg of SF<sub>6</sub> were added to existing facilities during maintenance to counter leakage.

### ● Means to Reduce SF<sub>6</sub> Leakage

- Conduct SF<sub>6</sub> testing with leakage detection meter periodically.
- Prior to conducting maintenance service on GIS equipment, pump SF<sub>6</sub> into storage tank with recovery vehicle first. Before opening the switchgear cover for maintenance, make sure no leakage of SF<sub>6</sub> will occur.
- If SF<sub>6</sub> leakage is found to have exceeded the designated amount during inspection, the electricity transmission to the equipment should be cut immediately for repair.

### ● Recycle and Reuse

Prior to conducting maintenance service on GIS equipment, the SF<sub>6</sub> recovery vehicle should be used to pump SF<sub>6</sub> from the GIS into the storage tank and reduce the internal GIS pressure to vacuum. After the completion of maintenance, SF<sub>6</sub> is pumped back into the GIS again.

### ● SF<sub>6</sub> Detection

During inspection or after maintenance service, if the maintenance personnel discovers that leakage of SF<sub>6</sub> exceeds regulation, an SF<sub>6</sub> leak detection meter should be used immediately to detect if SF<sub>6</sub> is leaking.

## Development of Renewable Energy

The arrival of a high oil price era stimulates the rush toward development of green or renewable energy. Thus the use of renewable energy is an inevitable trend. In accordance with the planning of the Bureau of Energy, in 2025, 15% of the total installed capacity in Taiwan will come from renewable energy. To achieve this goal, an additional 8,450 MW of installed capacity using renewable energy will be needed.

As a state-owned enterprise, Taipower has been following the government's "Renewable Energy Development Policy" and has initiated the development and assessment of various forms of renewable energy, including small hydro, wind power, solar photovoltaic, ocean thermal gradient and wave energy in recent years to assess the feasibility of further development. Taipower installed capacity of renewable energy (including conventional hydro power) at the end of 2008 amounted to 2,184 MW, accounting for 5.7% of system capacity; its net peak capability totaled 1,326MW, accounting for 3.4% of the net peak capability of the system.

## Renewable Energy Development

	Current Status	Future Outlook
Small hydro	<ul style="list-style-type: none"> <li>Replacement of the Kaoping Hydro Power Plant Chumen Branch.</li> <li>Replacement of the Mingtan Hydro Power Plant Choshui Branch.</li> <li>Construction of the Bihai Hydro Power Plant at the mid-stream of Hopingnan river.</li> <li>The Wanda Hydro Power Plant Extension (1 unit) and Sunglin branch (2 units).</li> </ul>	<ul style="list-style-type: none"> <li>Recovery of the Tachiachi Hydro Power Plant Chingshan Branch.</li> <li>Promotion of the Shibao Hydro Power Project.</li> </ul>
Wind power	<ul style="list-style-type: none"> <li>Installed 8 generating units at Chungtuan, Penghu, during 2001~2005, total capacity of 4.8 MW.</li> <li>Implemented the First-phase Wind Power Project at Shihmen, Hengchun, Tatan, Guanyuan, Taichung, Hsiangshan, and Taichung Harbor 2003; 60 units with a total capacity of 98.96 MW.</li> <li>Implemented the Second-phase Wind Power Project in Changong, Mailiao, Linkou, and Sihhu in 2005; 58 units with a total capacity of 116 MW.</li> <li>Implemented the Third-phase Wind Power Project; 28 units in Changong, Wanggong, Mailiao, and Tatan in 2007 with a total capacity of 59.6 MW.</li> <li>Taipower planned to install 8 generating units at Penghu and Kinmen with a total capacity of 9.4MW.</li> <li>82 units in operation in 2008 with a total capacity of 131.76 MW.</li> </ul>	<ul style="list-style-type: none"> <li>The First-phase Wind Power Project is completed in 2008.</li> <li>The Second- and Third-phases Wind Power Projects will be continued. Taipower is carrying out the feasibility study of the "Changhua Offshore Wind Power Project," and planning the Fourth-phase Wind Power Project. It is estimated that there will be a total of 162 wind turbines with a total capacity of 288 MW by the end of 2011.</li> </ul>
Solar energy	<ul style="list-style-type: none"> <li>Taipower starts gathering sunshine and meteorological data at Hengchuan and Penghu in 1993~1999 respectively to prepare for feasibility study of plant construction at a later date.</li> <li>Taipower has completed 9 solar energy pilot projects in 9 locations with a generating capacity of 233.5 KWp in 2008.</li> </ul>	<ul style="list-style-type: none"> <li>Taipower's goal is to have solar photovoltaic installed capacity of 10 MWp by 2011, and annual electricity generation of 12 GWh.</li> </ul>
Geothermal	<ul style="list-style-type: none"> <li>There are close to 100 areas in Taiwan with potential for geothermal heat reserve capacity of 6,000 MW. The actual available capacity for development is around 1,500 MW.</li> </ul>	<ul style="list-style-type: none"> <li>In support of the development plan of the Lan Government, Taipower provided geothermal generating units free of charge and rendered assistance to its Chingshui Geothermal Power Project.</li> </ul>
Biomass	<ul style="list-style-type: none"> <li>Taiwan has two kinds of biofuels, i.e. refuse incineration and biogas.</li> <li>The total capacity of the Neihu Incineration Plant and other incineration plants is 547.6 MW.</li> <li>Under the assistance of the Council of Agriculture, the pig waste can be processed to produce biogas which can be directly used for burning and power generation.</li> <li>The biogas power generation systems of landfills in Taipei (Shangzhuku, Fudekang), Taichung (Wenshan), and Kaohsiung (Shichingpu) with a total capacity of 21.8 MW.</li> </ul>	<ul style="list-style-type: none"> <li>Taipower has committed to purchasing biomass energy.</li> </ul>
Marine Energy	<ul style="list-style-type: none"> <li>The potential electrical capacity of ocean power produced with tidal, current, waves and temperature difference is 44,000 MW. About 200 MW can be developed.</li> <li>In 2007 Taipower started the feasibility and preliminary design of a hybrid OTEC (ocean thermal energy conversion) pilot power plant.</li> </ul>	<ul style="list-style-type: none"> <li>If the pilot project is feasible, Taipower is going to cooperate with the Water Resource Agency with the Deep Seawater Low Temperature Utilization, Research and Development Project in 2010.</li> </ul>

## Wind Power

Among all the renewable energy, wind power is the most mature and commercialized energy. Each KWh of wind power can reduce the consumption of 0.25 L of oil or 0.37 kg of coal. Developed countries like United States, Japan, United Kingdom, and Demark all have developed wind power to reduce CO<sub>2</sub> emissions.

Under the influence of the northeast monsoon, Taiwan is suitable for wind power development. It is estimated that over 2,200 MW of wind power capacity may be developed in Taiwan, which certainly makes wind power the first choice for renewable energy projects in Taiwan.

To comply with the government's green energy policy, Taipower developed the "Ten-Year Wind Power Development Program" in 2002. The goal of the program is to install 200 wind power units in 10 years and increase the total wind power capacity to 300 MW. By the end of 2008, there were a total of 141 wind power units in operation, including 6 units for private electricity supply (4 Formosa Plastics units and 2 Tenlong units) and 135 commercial units (82 for Taipower and 53 for Infra Vest corporation). The commercial units had generated a total of 602 GWh of electricity by the end of 2008.

## Small Hydro

Hydro power has the functions of flood prevention, irrigation and drinking water supply. However, it also has an impact, to some extent, on environment, society and humanity. Therefore, Taipower undertakes seriously the Environmental Impact Assessment task before developing a hydro power plant to reduce the impact on environmental ecology.

Taiwan has well over 100 years of experience in hydro power generation. However, due to the topographical, geological and hydrological limitations, there are very few good sites for hydro power generation and most of them are already developed. In the future, Taipower will focus on small to medium hydro power units for its new hydro power development projects.

For the existing hydro power plants, only the Takuan and Mingtan Hydro Power Plants are of the pumped storage type. Together both plants have a total installed capacity of 2,602 MW which is 6.7% of the total system capacity. As of the end of 2008, the total installed capacity of conventional hydro was 1,938 MW, 5.0% of the power system.

## Solar Energy

Even though Taiwan has a sub-tropical climate, the weather conditions, insufficient sunshine and frequent typhoons, in addition to the high cost of photovoltaic investment, have all severely limited the development of solar energy in Taiwan.

However, in recent years the global photovoltaic industry has been growing at an annual rate of about 30% due to the strong promotion of solar energy power in developed countries. As Taiwan has a well developed semiconductor and electronics industry, it can be expected that solar energy industry will have great growth potential as a form of renewable energy in Taiwan.

In line with the international trend, Taipower has completed 9 solar energy pilot projects in 9 locations around the island with a total generating capacity of 233.5 kWp in 2008. Taipower also plans to invest NT\$ 3.57 billion in additional funding to complete “the first phase photovoltaic project,” and is expected to reach 10,000 kWp of capacity in 2011 to generate 12 GWh and reducing 8,375~12,325 tons of CO<sub>2</sub> emissions per year.

Taipower plans to invest about NT\$ 1.16 billion in constructing a solar energy plant at a 131-hectare salt flat site near the Hsinta Thermal Power Plant in southern Taiwan. Once completed, this plant will install a capacity of 4200 kWp. The first phase of this project will involve 9.5 hectares of land.

Other than developing renewable energy itself, Taipower, complying with the government policy, announced “Taipower Renewable Energy Purchasing Guidelines” on Nov. 11, 2003, as a transition measure to purchase renewable energy from the private sector.

### Purchase of Renewable Energy

	Private power producer	Energy type	Capacity(MW)	Total capacity (MW)
With purchase contract	Infra Vest/Chunan Wind Farm	Wind	7.8	270.98
	Chianan/Hsikou Hydro Power	Small Hydro*1	11.5	
	Judien/Peinan Hydro Power	Small Hydro	1.98	
	Mingchien Hydro Power	Small Hydro	16.7	
	Infra Vest/Tapeng Wind Farm	Wind	42	
	Chungwei/Taichung Wind Farm	Wind	48.3	
	Luwei/Lugang Wind Farm	Wind	48.3	
	Luwei/Changbin Wind Farm	Wind	55.2	
	Tungchin Co.Small Hydro	2.7		
	Chuwei/Chubei Wind Farm	Wind	11.5	
	Kaosheng Electricity	Biomass(RDF <sup>2</sup> )	25	
Approved to be on-line with the Taipower System	14 Wind power	Wind	784~993 <sup>3</sup>	829~1,038 <sup>3</sup>
	1 Biomass	Biomass (RDF <sup>2</sup> )	45	
Total			109.998~130.898 <sup>3</sup>	

Notes: 1. Small hydro denotes installed capacity less than 20 MW.

2. RDF means Refuse Derived Fuel.

3. Numbers in parentheses are due to flexible capacity application for wind power.



The Shihmen Hydro Power Plant

### Solar Energy Pilot Projects

Location	Commercial Operation Date	Capacity (kWp)
Taiwan Power Research Institute Shulin Branch	01/2002	20
Taipei Branch	10/2002	20
Nanto Branch	11/2003	10
Talin Thermal Power Plant	08/2003	10
Kaohsiung Training Center	10/2005	10
Kinmen Branch	06/2004	10
The Southern Visitors Center	09/2006	50
Taichung Thermal Power Plant	12/2007	72
Hualien / Taitung Branch	02/2009	31.5
Total		233.5



## Thermal Power Efficiency Upgrading

Taipower's existing thermal power units are operated at an average efficiency of about 39% (LHV-Gross). In order to increase generation efficiency, Taipower plans to use more advanced power generating units which can operate at a supercritical steam condition and generate with high efficiency.

The supercritical-steam generating units currently under planning for new coal-fired power plants by Taipower are designed to have an efficiency of about 44.4% (LHV Gross). This is much higher than that of existing subcritical units. These new power units will also be characterized by operational reliability, load-following, economic effectiveness, and energy conversion efficiency. The CO<sub>2</sub> emissions will be reduced by 58,132 tons.

## Tree Planting

In facing the increasingly serious global warming issue, CO<sub>2</sub> reduction has become every corporation's responsibility. As the largest power supplier in Taiwan, Taipower has decided to take the lead in balancing power generation and environmental protection to care more about the Earth and the environment of Taiwan.

Thus, Taipower considers tree planting an important measure to reduce CO<sub>2</sub> emissions. In the past, Taipower has practiced tree planting on sites of thermal power plants, branches, construction offices and training centers.

### CO<sub>2</sub> Reduction of Tree Planting

	Area (hectares)	Number of Trees	Reduction (tons of CO <sub>2</sub> / year)	Budget (NT\$ thousand)
Existing plants	261	287,100	7,178	
Cooperation with local governments	151	244,527	6,113	202,163
Thermal power plants	53.8	59,210	1,480	236,840

Note: The reduce benefits were calculated by absorbing 25 tons of CO<sub>2</sub> per large broad-leaved tree per year.



Greenification-tree planting activity (1)



Greenification-tree planting activity (2)

## Energy Conservation

All the power industries in the world need to face the challenge of improving energy efficiency, reducing energy consumption and lowering the energy loss to meet the demands of consumers. To be in line with this international trend, in 2008 Taipower conducted short-mid-and long-term R&D in major areas such as "The Establishment and Application of Energy Saving Surveying System," "The Energy Consumption of Electrical Equipment during Standby," "The Effects of Replacing All Incandescent Lamps in Taiwan," and "The Networking of Distribution Line Loss Calculation."

Moreover, Taipower also strives to maintain the generating units at optimal operating conditions, through the strategies of improving generating unit efficiency, installing new and more efficient generating units and applying timely technological improvements.

### ● Results of Energy Conservation

In addition to conducting R&D on energy conservation technologies, Taipower has also established an internal energy conservation team to promote and implement energy conservation measures with remarkable achievements.

#### Results of Energy Conservation Measures

Year	Electricity consumption in power plants, substations and offices		Gasoline consumption in offices		Water consumption in offices	
	Electricity saved (GWh)	Saving rate (%)	Gasoline saved (1000L)	Saving rate (%)	Water saved (1000L)	Saving rate (%)
2006	104.2	1.54	145	5.4	436	15.0
2007	118.2	1.69	307	11.9	87	3.5
2008	132.0	1.85	70	3.3	127	5.5

Note: The above figures were compared with targeted figures. (The consumption of power plants and substations was based on the average of past 3 years. The consumption of electricity, gasoline and water in the office was based on the targeted figure of the previous year.)

### ● Promoting Power Conservation Concept and Providing Technical Services

Each year, Taipower has plans to promote energy conservation through various channels to make people aware of the rarity and preciousness of electricity. It is in an attempt to establish a energy conservation concept to the public. The accomplishments of promotion activities were as follows:

Measures	Accomplishments
<ul style="list-style-type: none"> <li>Energy conservation promotion activities for large customers, schools, classes for repair and maintenance of in-house electric equipment, etc.</li> </ul>	A total of 1,420 activities, with 367,000 attendants.
<ul style="list-style-type: none"> <li>Technical consultations for high voltage (over 100 KW) customers.</li> </ul>	5,236 customers.
<ul style="list-style-type: none"> <li>Capacitor installed after technical consultations.</li> </ul>	93,803 kVAr.
<ul style="list-style-type: none"> <li>Air conditioning advice to convenience stores, department stores, hospitals, and banks.</li> </ul>	2,814 customers.
<ul style="list-style-type: none"> <li>Power energy- conservation exhibits.</li> </ul>	562,000 visitors.
<ul style="list-style-type: none"> <li>2008 energy conservation competition.</li> </ul>	A total of 24.61 GWh of electricity saved, which is equivalent to 15,680 tons of CO <sub>2</sub> emissions being reduced.
<ul style="list-style-type: none"> <li>Electrical bill discounts.</li> </ul>	11.98 million users reduced their electricity consumption between July and December of 2008. 2.59TWh of electricity was saved, which is equivalent to 1.65 million tons of CO <sub>2</sub> emissions being reduced. NT\$ 3.84 billion was discounted. This discount is still in practice.
<ul style="list-style-type: none"> <li>Assisting the government's promotion of Purchasing Energy Label Electric Appliances.</li> </ul>	As of the end of 2008, 75,000 appliance buyers applied for subsidies at an amount of NT\$ 150 million. This activity ended on March 31, 2009.

## Regional Environmental Issues

Taipower is striving to provide clean energy. We continue to reduce the emissions of SO<sub>x</sub> and NO<sub>x</sub>. We also reuse the byproducts of power generation. In 2008 we increased the funding for environmental protection significantly to meet the demands of a clean homeland.

### Relationship between the Power Industry and the Environment

Electricity is a driving force for economic development. It is also an energy source essential to maintaining a high quality of life. As the global warming and regional environmental issues become more important, taking account of environmental protection in the development of the power industry has been our goal. Taipower has been taking feasible measures to balance the development of the power industry with environmental protection.

#### Vision of a Sustainable Environment

- Taipower will continue to seek solutions to environmental problems, respond to expectations from the public, and fulfill our social and corporate responsibilities.
- Taipower will endeavor to reduce management risks due to environmental issues, and cope with energy and climate change challenges. Moreover, Taipower will continue to improve our environmental management system and air pollution control measures, as well as reduce CO<sub>2</sub> emissions, recycle waste materials and promote the concept of energy and resource conservation.
- Taipower will also continue to integrate our records for operational environmental information, and through disclosure of such information pursue sound communication and interaction with our regulators, customers, supply chain and stakeholders.



Green eco-pool in the Tatan Thermal Power Plant



Environmental monitoring

#### Strategies and Goals

- Comply with environmental protection laws and regulations that are also in line with the capacity of the environment.
- Carry out Environmental Impact Assessments to increase the environmental feasibility of our power development projects.
- Improve pollution control measures and maintain the quality of the environment.
- Increase public participation and strengthen promotion and communications.
- Focus on the quality of the environment and increase planning of tourist sites.
- Stress ecological conservation and restoration.
- Establish a complete environmental monitoring system.
- Focus on social work for communities.
- Formulate responses for the handling of environmental pollution disputes.
- Train personnel in environmental protection and establish comprehensive environmental protection groups.
- Promote Environmental Management System (ISO-14001).



Extracting samples

## Action Plans for Sustainable Environment

Taipower will strive to use the best available technologies, work with our employees to reduce environmental impacts, and demonstrate our determination to become a green corporation through the following actions:

- Establish environmental management system.
- Introduce environmental accounting.
- Cope with climate change and global warming.
- Improve environmental efficiency.
- Enhance health, safety and environmental education.
- Advance environmental conservation and biodiversity.

## Power Development and Environmental Impact Assessment

The Environmental Impact Assessment Act stipulates that prior to the construction of a power facility that exceeds a certain size, an Environmental Impact Assessment (EIA) process is required. Taipower not only thoroughly designs the development projects, but also carefully assess the influences on the environment, scenery, monuments, society, and economy brought by our projects.

Our environmental impact assessments are completed by professional third parties for the purpose of objectivity. We also consult with government agencies, experts, and public representatives to ensure the comprehensiveness of our reports.

At the end of 2008, 51 Environmental Impact Assessments had passed the review by the relevant environmental protection agencies. 51 analysis reports on the difference of the environmental impact were also completed. We were also able to follow our promises in these reports and passed the follow-up examinations.

Due to various reasons, the progress of our EIA preparation was fairly slow. Taipower will continue its efforts to move forward in this area.

## Environmental Protection of Hydro Power Plants

While developing a new hydro power plant, the focus of the assessment is in detailing impact to the environment in order to reduce such impacts.

## Environmental Protection of Thermal Power Plants

While developing a thermal power plant, the focus of the EIA is incorporating pollution control measures into the plant planning process. Besides introducing innovative pollution control measures, improvements shall also be made to fuel, equipment and operating procedures in order to reduce environmental impacts comprehensively.

## Environmental Protection of Nuclear Power Plants

The EIA Act stipulates the completion of the EIA process prior to the development of any nuclear power plant or radwaste storage and processing site. Therefore, besides incorporating impact mitigating measures into the development planning of new nuclear power plants, an environmental monitoring program will also be implemented to ensure minimal impact to the environment during construction. In 2008, 15 EIAs were reviewed and 14 of them passed.

For installation of new generating units, in addition to formulating detailed assessment plan, Taipower will also develop countermeasures for potential environmental impact factors based on requirements of relevant regulations. For key environmental issues in development projects, Taipower will enlist the service of external professional institutions to conduct related studies, so that the assessment results can be more objective and thorough.

## Establishment of Environmental Management Systems

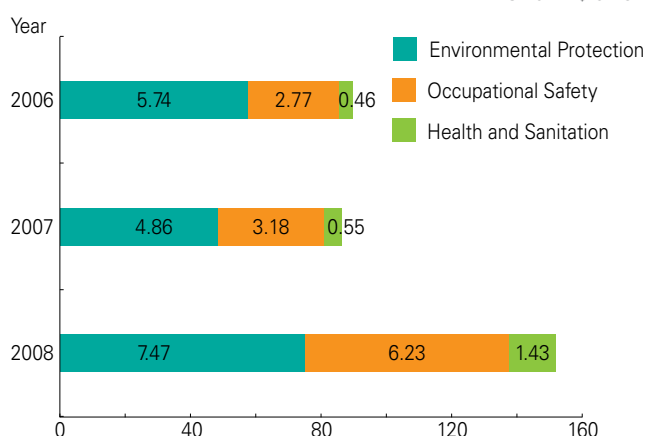
### Environmental Accounting System

In 2003, Taipower started to help each unit in establishing the environmental accounting system and the registration of environmental accounting information.

Taipower's environmental accounting system is special in that it includes not just environmental expenditure information but also occupational sanitation and safety expenditure information. Through expanding the scope of the system, we are able to quantify the costs of all environmental related activities (including environmental protection, occupational safety and sanitation), and this capability has enabled Taipower to become one of the few companies in Taiwan which can conduct real-time statistics and analysis of environmental expenditures.

### 2006~2008 Total Environmental Expenditures

Unit: NT\$ billion



In 2008, Taipower's total environmental expenditures include NT\$ 7.47 billion in environmental protection, NT\$ 6.23 billion in occupational safety, and NT\$ 1.43 billion in health and sanitation.

### Environmental Cost and Performance at Taipower's Thermal Power Plants in 2008

Unit: NT\$ million

	Hsiehho	Linkou	Tunghsiao	Taichung	Hsinta	Nanpu	Talin	Tatan	Chienshan
Business operation cost	86.110	81.414	7.864	705.727	239.891	20.138	10.009	99.891	58.155
Cost involved in linking upstream and downstream suppliers and customers	1.556	0.020	0	0.246	2.173	0.148	0.087	0.002	0
Managerial cost	155.710	114.532	26.975	491.362	337.449	43.413	66.735	18.852	6.673
Research and development cost	0	0	0	0	0	0	0	0.480	0
Social activity cost	3.814	0.053	10.510	34.909	3.549	3.245	2.840	1.107	0.043
Losses and compensation cost	0	0	0	0.100	0	0	0	0	0
Official fees and taxes and other expenses like carbon taxes	127.681	18.293	0.480	90.005	69.271	0.019	99.006	0.019	13.273
<b>Total</b>	<b>374.871</b>	<b>214.313</b>	<b>45.829</b>	<b>1,322.349</b>	<b>652.334</b>	<b>66.964</b>	<b>178.677</b>	<b>120.349</b>	<b>78.143</b>

Note: The charge in environment.

## International Standards - Environmental Management System

The core purpose of the ISO-14001 environmental management system is to encourage the companies to pursue voluntary and continuous environmental performance improvement to improve their operational efficiency, as well as to enhance their competitiveness and corporate image through reducing environmental pollution.

In order to effectively manage and improve environmental performance, Taipower has been promoting the establishment of the environmental management system (EMS) since 1997. The establishment of EMS within Taipower was initiated from the units with the most significant environmental impacts, such as generation, construction, system maintenance and branches, and further extended to the rest of other units.

Taipower's environmental management system is to promote environmental protection activities through PDCA (plan, do, check and act) cycle. It will enable each unit to march for the clear goals for environmental management. Linko, Taichung and Talin Thermal Power Plants were the first three units that were certified by ISO-14001. As of the end of 2008, 56 units passed ISO-14001 certification.

In order to ensure that ISO-14001 certified units actually achieved continual improvement, Taipower published the "Guidelines for Performance Evaluation of Taipower Units Environmental Management System" to serve as the guidance for conducting internal review of EMS. In 2008, 48 ISO-14001 certified units were reviewed in accordance with the Guidelines and the requirements of pollution prevention and continual improvement. No major non-conformances were found.

## Promotion of Environmental Conservation

The greatest threat to biodiversity is in the destruction of the natural environment. Biodiversity is an important indicator of a healthy natural environment. If the environment is impacted or destroyed, biodiversity will be influenced. If the environment encounters a great change, the preservation of genetic diversity will be difficult.

Taipower has always been concerned about the ecological environment, and environment protection-related issues. Not only has Taipower conducted long-term environmental studies and monitoring, but has also promoted a series of ecological research and tree planting, marine preservation projects. It is hoped that power plants can co-exist with the natural environment and that our future generations can continue to enjoy a beautiful natural environment.

## New Homes for Fish – Artificial Reefs

Artificial reefs can provide breeding grounds and habitats for fish. First, artificial reefs offer habitats for fish in originally barren sandy areas. Secondly, they also provide fish with places to search for food and reproduce. Thus, these reefs have played an important role in increasing the number of fish such as grouper, perch, etc., thus enriching the fishery resources and benefiting fishermen.

Every year, Taipower has retired many old cement electricity poles. These poles were smashed into pieces and used for road-paving or filling material for building foundations. Taipower has started to utilize used electricity poles to build artificial reefs in coastal areas around power plants. Over the past 12 years, Taipower has set up 17,617 artificial fish reefs in offshore areas around power plants. The effectiveness of modifying fishing grounds and creating resources has been positively received by the public.

## Number of Artificial Reefs Released by Taipower

Year	Amount	Release Location
2006	1,600	Aoti, Taipei; Tawuluen, Keelung; Yungan Taoyuan; Tunghsiao, Miaoli; Wangkung, Changhua; Haikou, Pingtung.
2007	1,120	Wanghai Port, Keelung; Shinao, Taipei; Aoti, Taipei; Yehliu, Taipei.
2008	813	Tawuluen, Keelung; Shinao, Taipei; Paihsin, Miaoli; Yungan, Kaohsiung.

### Fry Release – Sending Fry to the Ocean

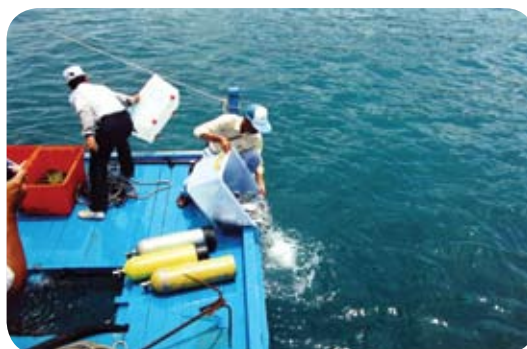
Taiwan's coastal fishery resource has been increasingly scarce in recent years. Taiwan is an island nation. Taipower understands the importance of marine resources and the reliance of Taiwanese people on these resources. Since 1997, while supporting the government's fishery policy of extending the cultivation and restoration of fishery resources, Taipower has been collaborating with the fishery administrations in the work of fry release. Over the course of 12 years, more than 12.11 million fry have been released.



The building of artificial reefs

### Coral Preservation

Coral reefs are the most productive and biologically diverse ecosystems of the seas and are often called the "tropical rainforests of the seas." Inside these ecosystems, the structure formed by the continuing growth of the corals creates habitats for many marine organisms. The symbiotic relationship between corals and the unicellular algae zooxanthellae also produces food source for many marine animals. Sponges, coelenterates, worms, crustaceans, mollusks, echinoderms and many species of fish are all common inhabitants of the coral reefs.



A release of fry

For the past several years, in addition to participating in the Kenting National Park's "Hengchun Peninsula Coral Reefs Comprehensive Conservation Program," Taipower has also commissioned the Academia Sinica to conduct the "Coral Reefs Ecology Monitoring Project at the 3<sup>rd</sup> Nuclear Water Inlets and Outlets" and has installed three underwater remote monitoring systems (since 2003) at the water intake of the 3<sup>rd</sup> Nuclear Power Plant. These remote monitoring systems allow Taipower to monitor the status of the coral reefs around the clock, and project live images of the reefs at Taipower's Southern Exhibit Hall to the public.



The beautiful coral, *Dendronephthya* sp. - strong currents and rich foods in the intakes are favorable to its growth.

## Implementation of Environmental Education

The issues of environmental protection cannot be solved only by technologies but also by a long-term and in-depth education that changes the value and behaviors of the population. Taipower has implemented the following training and education programs:

- Taipower has established special training centers for new and existing employees.
- In 2008, 508 employees joined the training regarding the environmental management system, environmental protection regulations, waste management, and GHG surveying in our own training centers or outside training classes. Also, 9,550 people joined the seminars from environmental protection experts.

## Reduction of the Environmental Burden

### Air Quality Monitoring

To lower the effect of the power plants on the air quality, Taipower installed the continuous emission monitoring system (CEMS) on each of the thermal power plant smoke stacks in 1988, way before the regulation was implemented. The CEMS not only helps us get a hold on the concentration of the emissions, but also help us to maintain the pollution prevention devices at optimum condition.

To further understand the air quality around the power plants, Taipower also started the air quality monitoring networks in 1988. Currently, there are 51 monitoring stations around the thermal power plants to provide data for the government agencies and for research.

**Air Quality Monitoring Data Surrounding Thermal Power Plants in 2008**

Power Plant	No. of monitoring stations	SO <sub>2</sub> (ppm)	NO <sub>2</sub> (ppm)	PM <sub>10</sub> (µg/m <sup>3</sup> )
Shenao	4	0.0025~0.0037	0.0079~0.0096	32.8~62.4
Hsiehho	3	0.0044~0.0055	0.0114~0.0129	38.1~56.1
Linkou	8	0.0031~0.0071	0.0105~0.0159	39.0~88.0
Tunghsiao	8	0.0032~0.0079	0.0098~0.0137	56.0~89.0
Taichung	11	0.0040~0.0066	0.0127~0.0180	50.2~74.0
Hsinta	6	0.0040~0.0080	0.0162~0.0197	69.2~84.8
Nanpu	3	0.0073~0.0093	0.0267~0.0276	74.1~76.5
Talin	5	0.0099~0.0131	0.0238~0.0279	78.8~84.0
Chienshan	3	0.0023~0.0038	0.0035~0.0057	31.4~42.3
Air quality standards		0.0300	0.0500	65

Note: The above data are annual average figures from the thermal power plants' air quality monitoring stations.



## Air Pollution Prevention

Due to the increasing demand of better air quality, Taipower has implemented a series of measures to reduce air pollution.

### ● SO<sub>x</sub> Emissions

In order to reduce the amount of SO<sub>x</sub> in the flue gas of thermal power plants, Taipower has increased consumption of sulfur-free natural gas. In addition, coal-fired and oil-fired power plants have all adopted low sulfur fuels. If space is available on-site, flue gas desulfurization (FGD) units are installed which can remove over 90% of SO<sub>x</sub> emissions.

### ● NO<sub>x</sub> Emissions

Taipower has already installed advanced low-NO<sub>x</sub> burners on all new and existing generating units, in order to reduce the NO<sub>x</sub> emissions from the source. In addition, high efficiency equipment (Selective Catalytic Reduction SCR) was also installed, which can further reduce the concentration of NO<sub>x</sub> emissions.

### ● Particulate Matter

Thermal power plants generate two different kinds of particulate matter, one from the thermal combustion process and the other from the coal yard. Each requires a different treatment approach.

- Thermal power plants: Steam generating units are all equipped with high efficiency electrostatic precipitators (ESP) which are capable of removing 90-99.8% of particulate matter. In addition, oil-fired units are also equipped with oil ash incinerators to incinerate the collected oil ash. The flue gas desulfurization (FGD) equipment installed on coal-fired units to remove the SO<sub>x</sub> is also capable of removing some particulate matter.
- Coal yard: Taipower has spent NT\$ 1 billion to build a wind-shielding fence around the coal yard, and installed a sprinkler system to prevent coal dust from contaminating the surrounding area. Transportation and unloading of coal is also conducted in a closed environment with the coal heap compacted and roads cleaned. For long term storage of coal, chemical is used to stabilize the coal surface, and trees have been planted around the yard to prevent spreading of coal dust.

In the future, Taipower won't use coal yards any more in the thermal power plants. It will use coal domes and closed conveyor belts to further reduce coal dust. Currently, there are 4 coal domes installed and in operation in the Hsinta Thermal Power Plant.

### Reduction of Air Pollutant Emissions in the Past 3 Years

Unit: kg/ GWh

Item \ Year	Year	2006	2007	2008
SO <sub>x</sub>	Actual	533	493	443
	Regulated	1,544	1,488	1,455
NO <sub>x</sub>	Actual	460	446	423
	Regulated	1,051	1,027	1,007
PM	Actual	34	31	33
	Regulated	117	115	114

## Rain Water Collection and Wastewater Reuse

While adhering to the concept of water conservation, Taipower has been actively pursuing the goal of zero wastewater discharge. Rain water collection (power plants and dormitory) and wastewater reuse projects are being promoted and integral planning has been implemented to reduce the use of tap water inside the power plants.

## Waste Treatment and Resource Reuse

Taipower generates a great variety and amount of industrial waste. Therefore, the reduction, proper reuse and treatment of waste to render it harmless, thus maintaining the ecological balance has always been the goal for Taipower.

Besides applying advanced waste processing technologies, conducting detailed evaluation during the planning stage of a waste reduction facility, and implementing 4R (reduction, recycle, reuse, research) policy after its establishment, Taipower also set up the Waste Reduction Consultation Task Force in 1997 to promote and plan for company-wide industrial waste minimization efforts. Taipower has also emphasized the education and promotion of industrial waste minimization measures, so that every Taipower employee understands the importance of waste minimization and can practice environmental protection on a daily basis.

### ● Reuse of Coal Ash

The majority of waste generated from Taipower's thermal power plants is coal ash. According to the regulation of MOEA, the reuse of coal ash can be categorized into the following:

- Fly ash: raw materials for furnace, cement, concrete additives, tile, granule thermal insulation materials, and artificial aggregate.
- Bottom ash: raw materials for cement, concrete aggregate, tile, granule thermal insulation materials, artificial aggregate, land filling material, and gradation materials.

As fly ash has the characteristic of pozzolan, it can replace part of cement to mix with concrete to raise the quality of concrete and reduce GHG emissions. Bottom ash can be used in CLSM (controlled low strength materials) to replace natural aggregates for ditch repaving project. According to research, bottom ash can replace natural aggregates up to 90%.

### ● Reuse of Gypsum

During the combustion process in the coal-fired power plant, the sulfur contained in the coal is converted into  $SO_x$ , and then emitted with the flue gas. To reduce air pollution, Taipower has installed exhaust desulfurization facilities at three major coal-fired power plants, namely Linko, Taichung and Hsinta Thermal Power Plants, which use limestone slurry to transform  $SO_x$  in flue gas into gypsum. The resulting 600 to 700 thousand tons per year of gypsum produced by Taipower is then sold to local cement makers and fire retardant board makers through open bidding process.

### ● Other Waste

Other industrial waste such as cables, metal scrap materials, etc., are being recovered and processed by waste disposal contractors through an open bidding process. In accordance with the Environmental Protection Administration (EPA) regulations, bidding contractors should be a qualified Industrial Waste Processor and be willing to subject to inspection by the EPA and local environmental protection bureaus.

### Generation and Reuse of Coal Ash

Unit: thousand tons

Item \ Year	2006	2007	2008
Generation	1,766.217	1,785.052	1,882.133
Reused	1,141.254	1,095.866	918.969
Reuse rate (%)	64.6	61.4	48.8

### Generation and Reuse of Gypsum

Unit: thousand tons

Item \ Year	2006	2007	2008
Generation	538.8	555.3	671.8
Reuse	529.7	486.3	562.5
Reuse rate (%)	98.3	87.6	83.7

### Reuse of Wastewater in 2008

Unit: tons

Item	Amount
Domestic wastewater	67,096
Industrial wastewater	12,121,037
Rain water	385,077
Total	12,573,210

### Waste Recovery Statistics in 2008

Unit: tons

Item	Amount	Item	Amount
Cable	638,064	Ceramics	4,222
Scrap iron	1,086,870	Scrap copper	62,472
Scrap aluminum	182,782	Others	233,586
Total	2,207,996		



Coal ash silo facilities of the Talin Thermal Power Plant

### Management of Ozone Depleting Substances

According to the 2006 report of the United Nations, current emissions of ozone depleting substances (ODS) still has significant influences on the recovery of the ozone layer. If all the areas comply with the Montreal Protocol, the ozone hole is estimated to be recovered between 2060~2075.

To be in line with the international trend, Taiwan has voluntarily followed the restriction of the Montreal Protocol in 1990 and set our goal for the consumption of HCFC to be 25% of the base amount (159.539 ODP tons) starting from 2010. Currently, Taipower still uses HCFC in fire extinguishers. The consumption was 111.58 tons in 2008. To comply with the government policy, Taipower will gradually reduce the use of that specific type of fire extinguisher.

Note: Ozone Depleting Potential, ODP.

## Environmental Protection Fines and Improvement Measures

Description \ Year	2006	2007	2008
Units fined or disciplined	Taipei County, Taichung City, Taichung County, and Kaohsiung County EPA	Taipei County, Taichung City, Taichung County, Hsinchu City, Tainan City, Taoyuan County, Hsinchu County, Kaohsiung County EPA	Taipei County, Taichung County, Pingtung County, Hualien County, Taoyuan County, Lienchieng County, Kaohsiung County, Penghu County EPA
Penalties	<ul style="list-style-type: none"> <li>• Ocean pollution: Fine NT\$ 400,000</li> <li>• Air pollution: Fine NT\$ 4,401,200</li> <li>• Water Pollution: Fine NT\$ 60,000</li> <li>• Waste pollution: Fine NT\$ 54,000</li> </ul>	<ul style="list-style-type: none"> <li>• Ocean pollution: Fine NT\$ 400,000</li> <li>• Air pollution: Fine NT\$ 11,000,000</li> <li>• Water Pollution: Fine NT\$ 120,000</li> <li>• Waste pollution: Fine NT\$ 44,000</li> </ul>	<ul style="list-style-type: none"> <li>• Ocean pollution: Fine NT\$ 700,000</li> <li>• Air pollution: Fine NT\$ 2,540,000</li> <li>• Water Pollution: Fine NT\$ 130,000</li> <li>• Waste pollution: Fine NT\$ 71,000</li> <li>• Environmental Impact Assessment: NT\$ 1933.5 million, of which appeals account for NT\$ 1933.2 million</li> </ul>

### ● Improvement Measures:

- Strengthening environmental protection measures and reviewing the items which have the risk of being fined. To develop and implement preventive measures to avoid being punished by regulating authority.
- Formulating environmental protection inspection guidelines to strengthen inspection.
- Formulating the guidelines for fines on contractors violating contracted environmental protection regulations to prevent fines on Taipower due to contractor violations.

## Electromagnetic Fields

Taipower's transmission and distribution lines cover every corner of Taiwan and its outlying islands. Therefore, we pay extra attention to the electromagnetic (EM) fields. Other than trying to lower the intensity of the EM fields in relevant power facilities, Taipower also tries to lower the public's concern.

- Conduct a series of activities and hold relevant classes for an overall promotion and communication with the public on the issue of the EM fields.
- The detected figures of the EM fields are way lower than the EPA's standard (833.3 micro Gauss).
- Provide free measurements to the public to raise the public's confidence.
- Comply with the government policy and power demand to promote underground transmission and distribution projects in metropolitan areas.

## Green Buildings

To lower the burden on the environment, it is important to construct healthy and environmentally sustainable buildings that fulfill their functions while preserving the environment. The idea of green buildings is implemented into the project from the design to the construction and maintenance of the buildings. The use of recyclable and energy-saving materials and the compliance of environmental protection policies leads to the creation of “energy conservation, carbon reduction” buildings.

### ● Future Objectives:

- Introduction of new green building techniques: Continuously develop new techniques for green buildings to improve the energy conservation of new and existing buildings.
- Intelligent energy conservation buildings: Utilization of energy control software that integrates the control of power, HVAC, elevators, lighting, automated control system. This control system can effectively increase the efficiency of power consumption and reduce CO<sub>2</sub> emissions.

In 2008, 24 buildings were selected as candidates for green building certification. So far, 11 buildings have acquired the green building certification.



Green building – the Hsinnan Substation



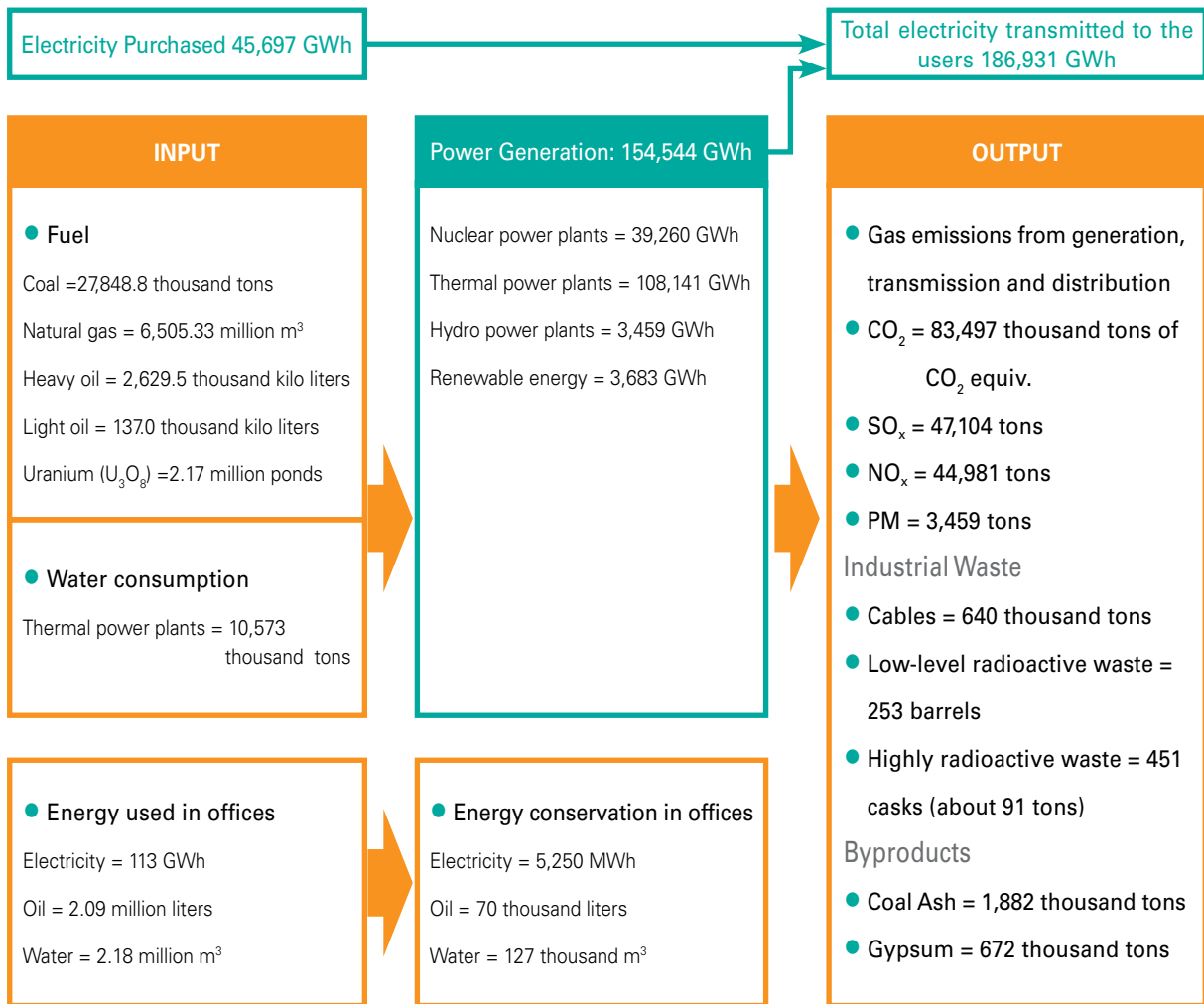
Green building- the Hualien Branch Hsincheng Service Center

## Green Purchase

For the realization of the concept of co-existence and co-prosperity of environmental protection and economic development, EPA implemented the “Government Agency Green Purchase Program” in January of 2002. This program urges the government agencies to purchase merchandise with less environmental impact and promotes green purchases in the public.

To comply with this policy, Taipower has overseen each unit for green purchases of office paper, electronics, appliances and other items. After several years of efforts, the outcome of Taiwan's green purchase performance has increased year by year promoting "clean, recyclable, and energy-saving".

## Environmental Aspects in Operation



Caring for local communities and bringing light to Taiwan

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