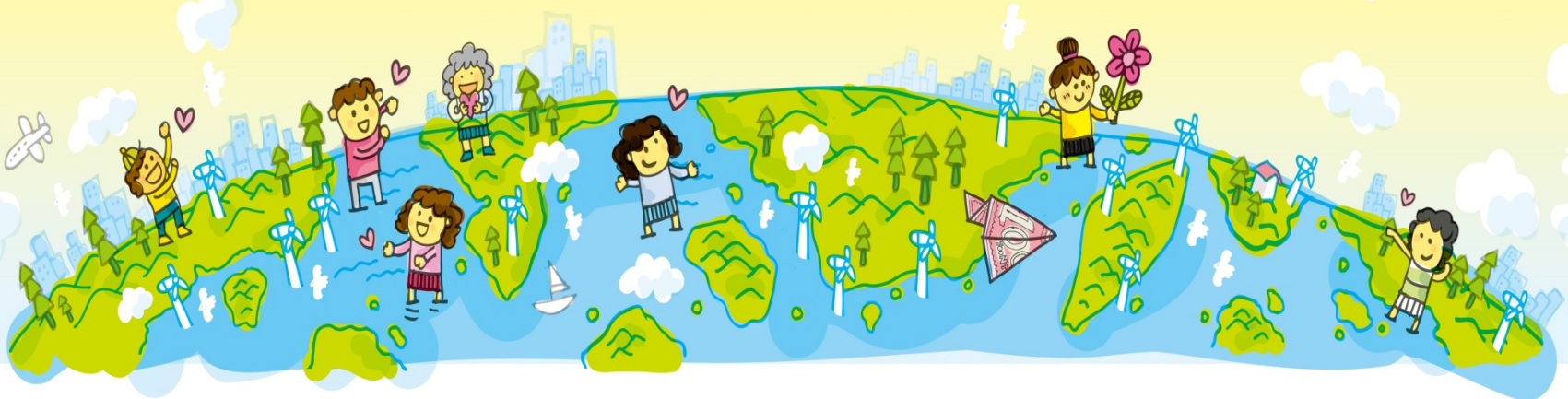


Ensure Nuclear Security
Steadily Reduce Nuclear Dependency
Create a Low-carbon Green Energy Environment &
Gradually Move Towards a Nuclear-free Homeland

November 3, 2011



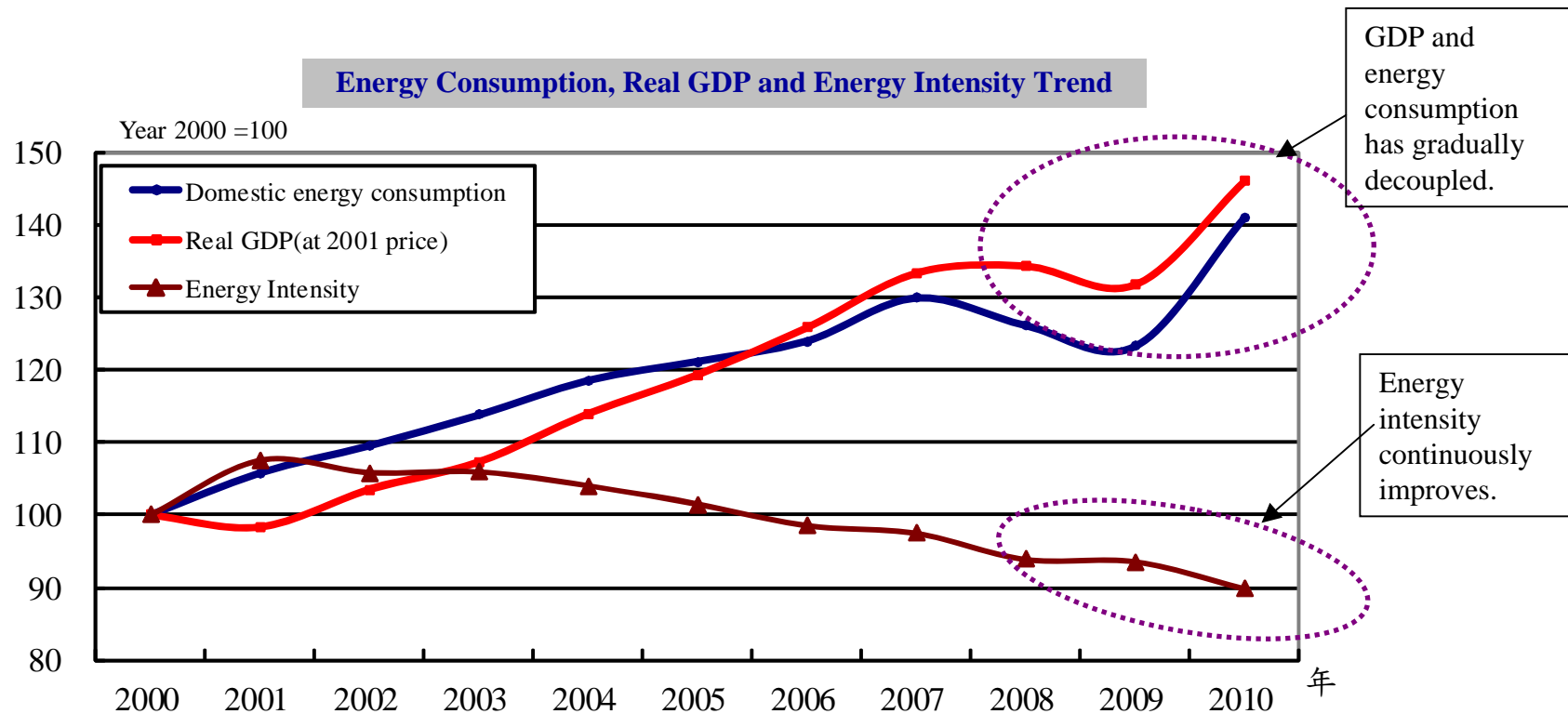
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I. The Implementation of National Energy Saving and Carbon Reduction Plan (1/4)

1. Energy Saving (2008-2010)

- (1) Slowdown Energy Consumption Growth:** The growth of energy consumption has been slowed down as compared to economic growth from 2008 to 2010, showing a decoupling trend.
- (2) Steady Improvement in Energy Efficiency:** Energy intensity was declining year by year, with an average reduction of 2.72% per year from 2008 to 2010. The energy cost saving in these 3 years was estimated to be NT D 300.7 billion.



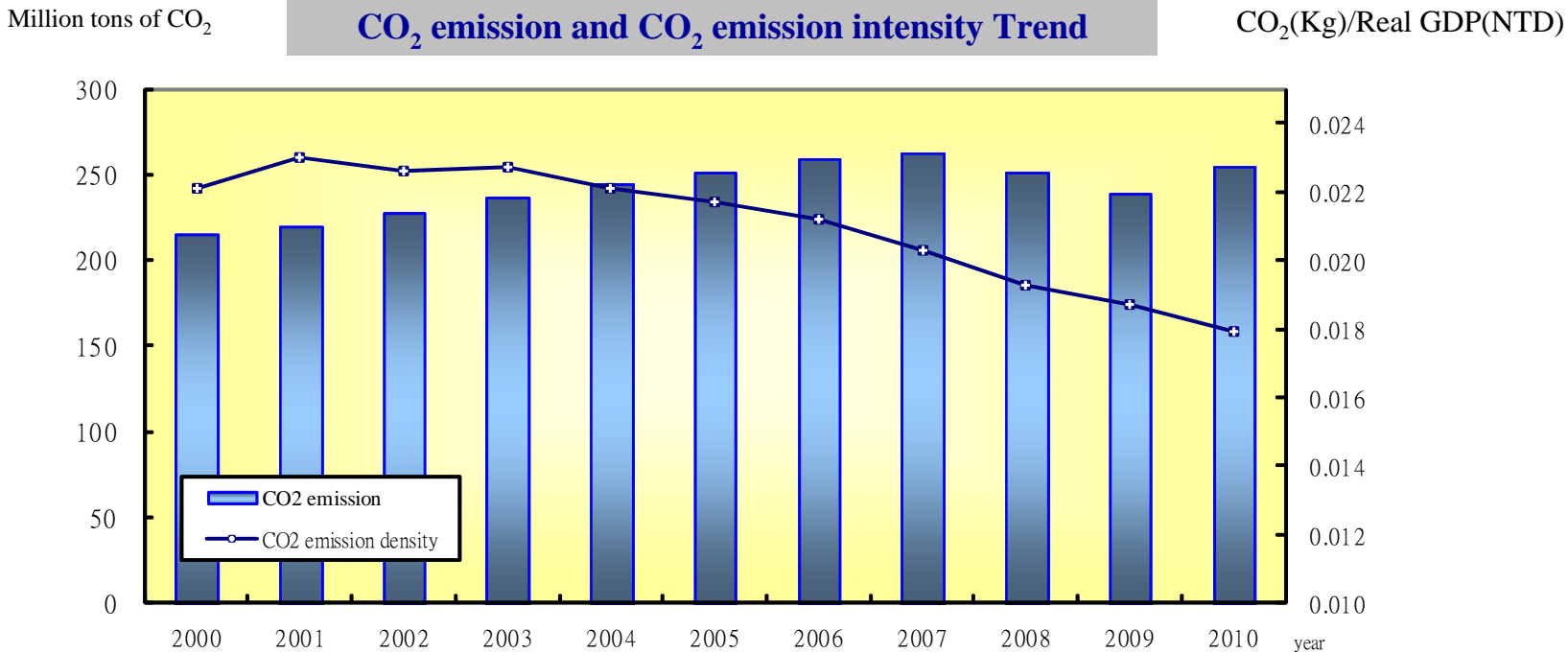
Source: 2010 Energy Statistics Yearbook, Bureau of Energy, MOEA, (2011).

Note: Energy intensity: energy consumption for producing every unit of real GDP within a certain time frame (i.e. energy consumption/real GDP, unit: liter of oil equivalent/NTD 1000)

I. The Implementation of National Energy Saving and Carbon Reduction Plan (2/4)

2. Carbon Reduction (2008-2010)

- (1) Negative Growth of Carbon Emission for the First Time:** for the first time in 20 years, the carbon emission had negative growth for two consecutive years (2008 and 2009). However, compared to 2009, the CO₂ emission has grown by 6.2% because of the economic recovery in 2010.
- (2) Continuous Decline of CO₂ Emission Intensity:** the CO₂ emission intensity continues declining with an average annual reduction of 4.11% from 2008 to 2010. In these 3 years, CO₂ emission relatively reduced 68.07 million tons (equivalent to the amount of CO₂ absorbed by 182,000 Da-An Forest Parks in one year). The CO₂ emission intensity of 2010, despite of the economic recovery, was also lowered by 4.28% over 2009. This is an indication of gradual improvement on the low-carbon energy structure and energy efficiency of Taiwan.

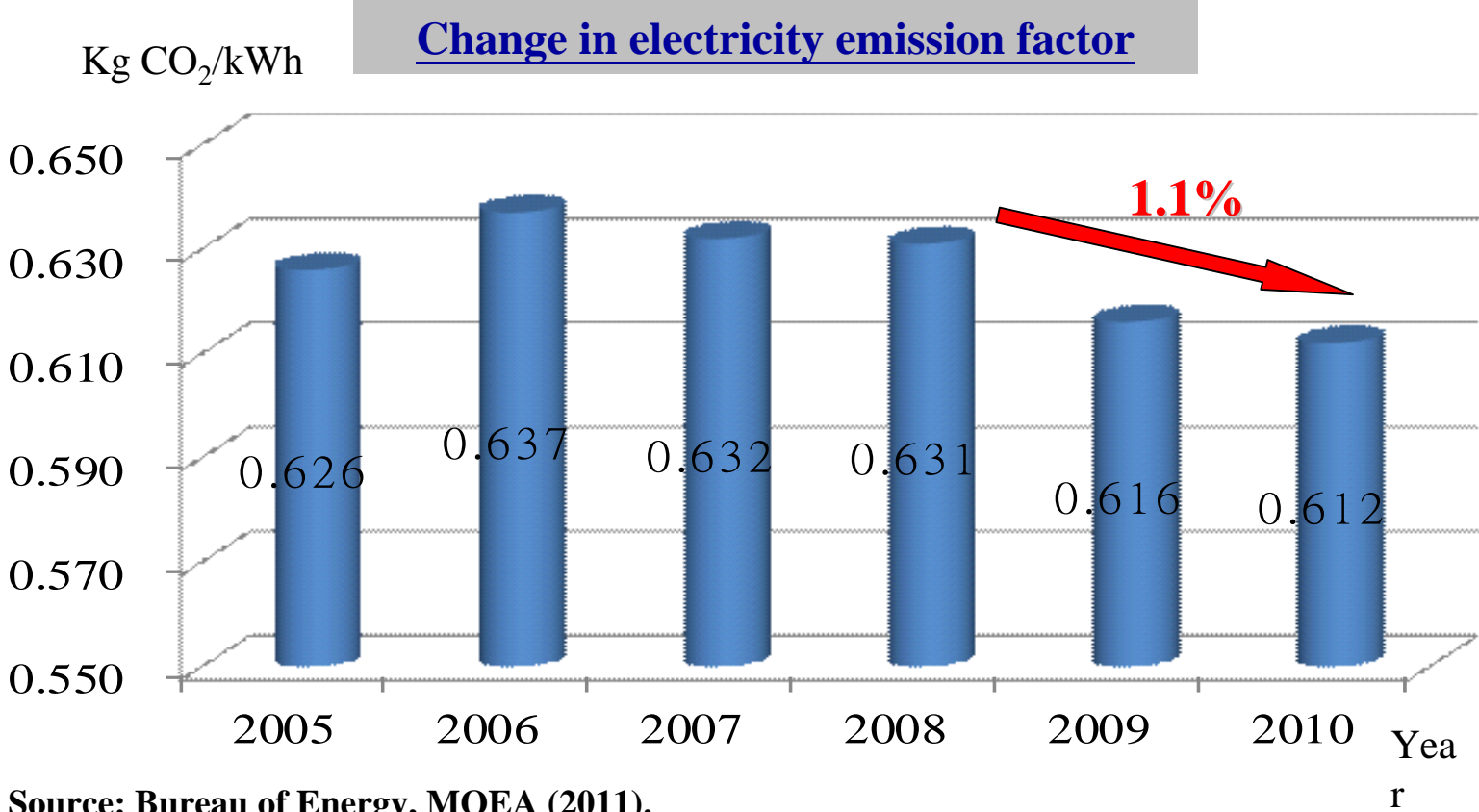


Source: Bureau of Energy, MOEA (2011).

I. The Implementation of National Energy Saving and Carbon Reduction Plan (3/4)

(3) Continuous decrease of electricity emission factors:

The CO₂ emission for generating 1 kWh of electricity (electricity emission factors) has been decreasing in the past 3 years (2008~2010) with an average annual decrease rate of 1.1% due to expansion of natural gas and renewable energy share, and the enhancement of nuclear power efficiency, which can reduce the carbon footprints of products and enhance the international competitiveness of our industries.



Source: Bureau of Energy, MOEA (2011).

I. The Implementation of National Energy Saving and Carbon Reduction Plan (4/4)

3. Milestones in Energy Saving and Carbon Reduction (till September, 2011)

(1) New era of renewable energy:

1. Fifth place in the world in terms of density of solar water heating system installation.
2. With the promotion of biodiesel advanced from B1 to B2 (2% of biodiesel added in diesel), we have become the first country in Asia with full scale promotion of biodiesel without any subsidy.

(2) National carbon reduction for a low carbon society:

1. The promotion of the world's first ever rewarding measure for electricity saving have resulted in a total electricity saving of 12.3 billion kWh since 2008 through September 2011 (equivalent to annual electricity consumption of 3.08 million households, accounting for 27% of the number of nationwide electricity consumption households).
2. Replacement of 690,000 LED traffic signals by September 2011, which made Taiwan the second country in the world to achieve the overall replacement (The first country is Singapore).

(3) Becoming the major industrial base of global green energy :

1. The second largest producer of solar cells in the world in terms of production volume.
2. The eighth country in the world with the capability of manufacturing large scale wind turbine (2MW).
3. The revenues of green energy industry is estimated to reach NT \$ 420 billion in 2011 while providing 42,000 employment opportunities.



II. Policy & Planning (1/8)

I. Mission

For the eternal well-being of citizens.

II. Purposes

Ensure nuclear **energy** security, steadily reduce nuclear **energy** dependence, create a **friendly** low-carbon green energy environment, and gradually move towards a nuclear-free homeland.

III. Principles and Supporting Measures

Principles: ensure no restrictions of electricity use, maintain reasonable electricity rate, and fulfill the international carbon reduction commitment.

Supporting measures: **actively implementation measures of** energy saving **and** carbon reduction, and stabilization of electric supply.

II. Policy & Planning (2/8)

Ensure Nuclear Security

- 1. Conduct a comprehensive nuclear security examination, reviewing the security items and assessment criteria in compliance with the international standards, and strengthen the complex disaster preparedness and response capabilities. The Atomic Energy Council has completed the first phase security examination and assessment of the nuclear power plant :**
 - (1) Strengthen the earthquake, landslides and floods, and tsunami resistance of the existing plants.
 - (2) For accidents within the designed basis, all plants have established emergency procedures and periodic drills, and integrated response to hazards .
 - (3) To cope with situations beyond the designed basis, all nuclear power plants have set forth specific reinforcement programs and drastic measures to avoid the reactor meltdown and radioactive leakage.
- 2. In response to Fukushima accident in Japan, the “10-year overall security assessment” for all plants have been implemented in advance, and stress tests in compliance with the EU nuclear power plant will also be performed.**
- 3. Newly constructed nuclear power plant must be assessed by World Association of Nuclear Operators (WANO), and experts from international nuclear security and control institutions will be invited to assist our Atomic Energy Council to carry out the survey and inspection.**
- 4. Follow the international norms of security reviews and measures of security reinforcement to adjust our regulatory approaches.**
- 5. Established a cabinet-level nuclear security supervision mechanism to oversee the implementation of nuclear security measures.**

II. Policy & Planning (3/8)

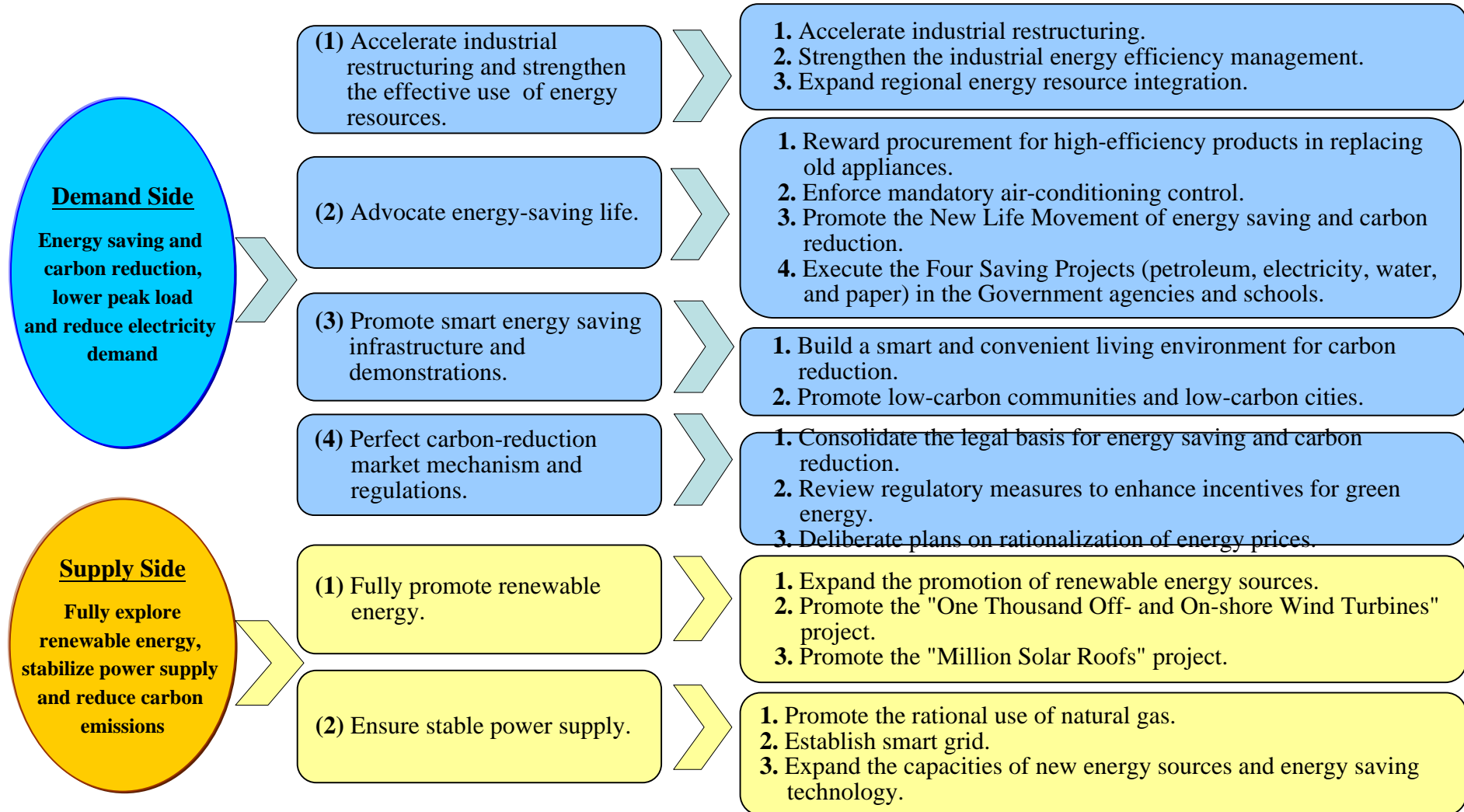
Steadily Reduce Nuclear Energy Dependence

- 1. Actively reduce electricity demand and peak load.**
- 2. Develop energy technology and promote the development of alternative energy resources to ensure a stable power supplies.**
- 3. No extension to life spans of existing plants, and the decommissioning plan should be launched as planned.**
- 4. The security of the 4th Nuclear Power Plant must be ensured prior the commercial operation.**
- 5. If the two reactor units of the 4th Nuclear Power Plant has steadily operated before 2016, the First Nuclear Power Plant will also stop operations in advanced.**

II. Policy & Planning (4/8)

Create a Low-carbon Green Energy Environment

- To further promote energy saving and carbon reduction and build a **low carbon green** energy development environment, both demand (energy saving) and supply side (low-carbon energy exploration) measures will be promoted.



II. Policy & Planning (5/8)

Create a Low-carbon Green Energy Environment (cont'd)

(I) Energy saving, carbon reduction, reduction of electricity demand and peak load

1. Accelerate industrial restructuring and enhance effective utilization of energy resources:

(1) Industrial restructuring

- Promote existing industries restructuring.
- Develop knowledge-based industry with low energy intensity so that the share of emerging industries (such as green energy, etc.) in total production value of manufacturing industry can be increased from 4% in 2008 to 30% in 2020.
- Improve the value-added ratio of manufacturing industry from 21% in 2008 to 28% in 2020.

(2) Enhance management of industrial energy efficiency

Promote of energy efficiency management for energy-intensive industry, and enhance counseling of comprehensive energy saving carbon reduction technology.

(3) Enhance recycle/integration/reutilization of waste heat and waste cool energy, and expand regional energy resources integration

2. Advocate energy saving lifestyle:

(1) Reward the replacement with high efficiency products:

People who purchase “air conditioners with Class 1 or 2 energy efficiency rating” to replace old air conditioners will be rewarded.

(2) Enforce mandatory temperature control for air conditioners:

Implementation of indoor average air conditioning temperature no less than 26°C with priority for nationwide energy users of non-production industry with contract capacity over 800kW.

II. Policy & Planning (6/8)

Create a Low-carbon Green Energy Environment (cont'd)

(3) Advocate of energy saving carbon reduction new life movement

“Replacement of incandescent bulbs with high efficiency bulbs”, “Time setting management for electricity appliances”, “Air conditioner temperature raised by 1 degree during summer months and frequent cleaning of filter”, “Shutdown of computer when long time idling”, “Unplugging the idle house appliances”, “Lights turned off for an hour during lunch breaks in public sectors and office buildings”, etc.

(4) Promote “Four-saving projects among government agencies and schools”.

The objective of 10% petroleum/water/electricity saving rate and 40% of paper saving rate is estimated to be achieved by 2015.

3. Promote intelligent energy saving infrastructure and demonstration

(1) Construction of an intelligent and convenient environment for energy saving and carbon reduction lives

Promotion of intelligent and convenient traffic network, popularization of green building, and establishment of infrastructure for energy saving and green energy development.

(2) Establishment of low carbon society and low carbon city

4. Improve the market mechanism and regulations contributing to energy saving and carbon reduction

(1) Promote the legislation of “Energy Tax Bill” for internalization of external cost, and planning of related supporting measures for improvement of synergy.

(2) Promote the legislation of “Greenhouse Gas Reduction Bill”, build up carbon reduction capability, and control over carbon emission.

(3) Cautious planning for rationalization of energy price, and review relevant laws and regulations to increase incentives for green energy.

II. Policy & Planning (7/8)

Create a Low-carbon Green Energy Environment (cont'd)

(II) Full scale promotion of renewable energy, stabilization of electricity supply and reduction of carbon emission

1. Full scale promotion of renewable energy:

- (1) **Expand promotions of all types of renewable energy:** total installation capacity of 9,952 MW (accounting for 14.8% of total power generation installation capacity) by 2025 has been planned with new installation capacity of 6,600 MW so that the goal set by “Renewable Energy Development Act” can be achieved 5 years in advance. By 2030 it will be further expanded to 12,502MW (accounting for 16.1% of total power generation installation capacity) and capable of generating 35.6 billion kWh of electricity, which is equivalent to annual electricity consumptions of 8.9 million households (accounting for 78% of the number of nationwide electricity consumption households).
- (2) **Promote the “1000 on- and off-shore wind turbines” project:** on-shore wind farms will be developed first, followed by the exploration of offshore wind farms. Total installation capacity of wind power generation units will reach 4,200MW by 2030.
- (3) **Promote the “Million solar roofs” project:** with slow start and speed up later, and it will start with roof installation followed by the ground installation. Total installation capacity of photovoltaic devices will reach 3,100MW by 2030.

2. Promotion of reasonable use of natural gas for security of electricity supply.

3. Construction of smart grid and development of low carbon high efficiency electric power system:

Distribute smart meters and promote smart grid, and efficiency enhance electric power system.

4. Expand the R&D of new energy technologies and energy saving technology to support the development of green energy industry:

Develop advanced energy technologies, energy storage, energy transformation, carbon capture and storage, carbon utilization, and energy saving technologies, and promote the application and demonstration of these technologies to explore new development field for green energy industry.

II. Policy & Planning (8/8)

Move towards a Nuclear-free Homeland

- 1. Review the progress of energy technology, effectiveness of implementation of energy saving and carbon reduction measures, and status of control over carbon emission annually. Actively create the conditions facilitating nuclear free homeland. Conduct an overall review of nuclear energy reduction schedule every 4 years to gradually reduce the dependence on nuclear energy, and move towards the nuclear free homeland vision promulgated on “Basic Environment Act”.**
- 2. Provide clean, healthy, and affordable electricity service.**
- 3. Effectively control over carbon emission to accomplish international carbon reduction commitment.**
- 4. Construct the intelligent energy saving and carbon reduction environment for the realization of sustainable living and consumption.**
- 5. Create green employment, drive green growth, and achieve sustainability development in Taiwan.**

III. Ensure safe operation in the 4th nuclear power plant (1/6)

1. Objective

safety first, and stable commercial operation

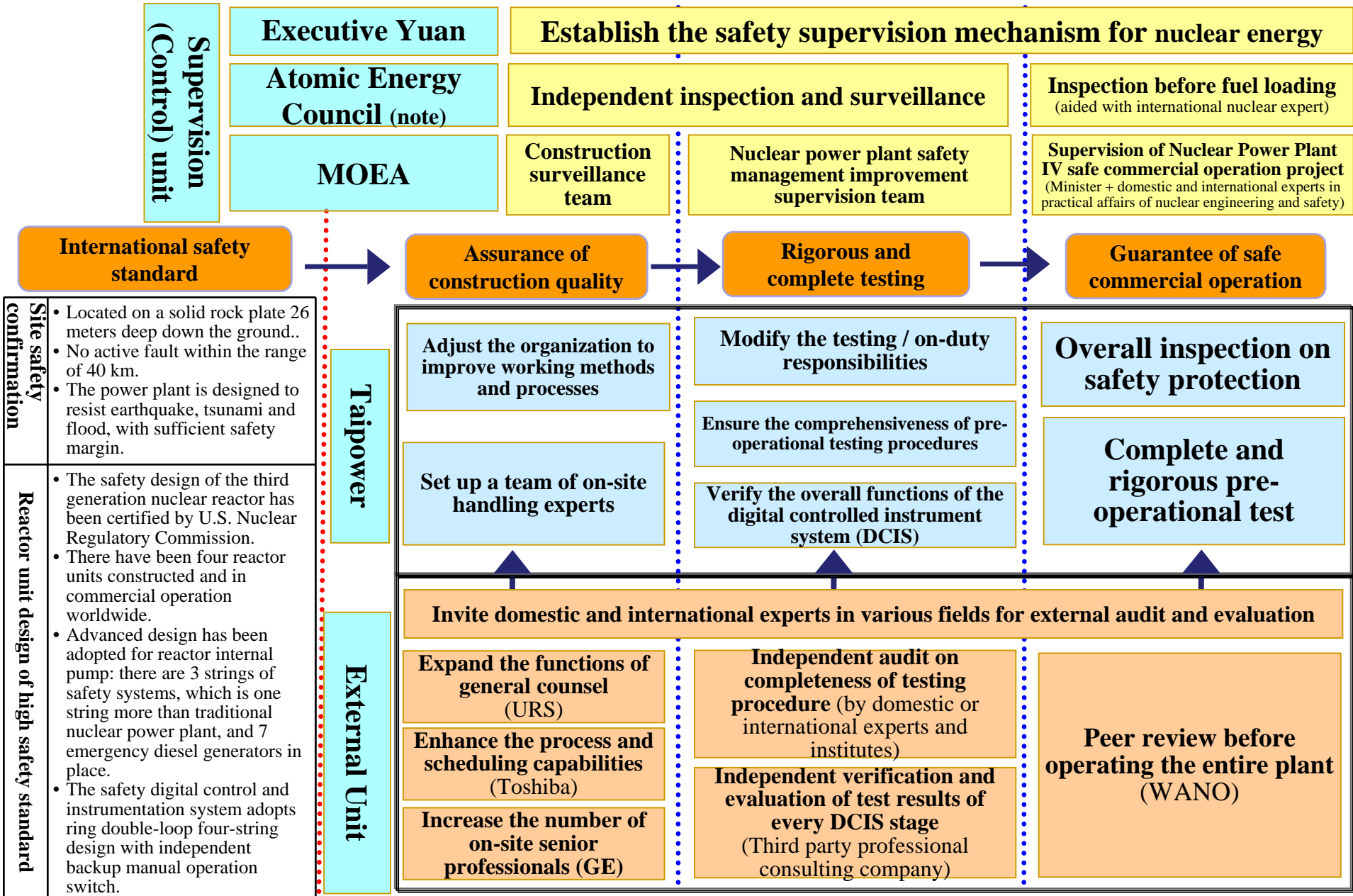
The 4th Nuclear Power Plant is a major national power generation construction project concerned by all citizens. Despite undergoing a halt causing the problems of schedule delays and system integration, for upholding a responsible attitude for to the national well-being, the Government has requested that the 4th Nuclear Power Plant must pass “complete and rigorous pre-operational test.” For achieving the objective of “safety first and stable commercial operation,” the 4th Nuclear Power Plant will be supervised by government agencies and inspected by international institutes.

2. Principles

- (1) International safety standards**
- (2) Engineering quality assurance**
- (3) Rigorous and complete testing**
- (4) Hierarchical supervision and management**
- (5) Guarantee of safe commercial operation**

III. Ensure safe operation in nuclear power plant IV (2/6)

3. Overall mechanism



(Note: after government reorganization, Ministry of Science (Nuclear Safety Agency) will be the control unit.)

III. Ensure safe operation in nuclear power plant IV (3/6)

4. Promotional approaches

A. International safety standard

a. Confirmation of sufficient safety margin for the power plant protection against earthquake, tsunami, and flood

- (a) The main plant is set on a solid rock plate 26 meters deep down the ground, to effectively reduce the impact of earthquakes on structures
- (b) There is no active fault within 40km from the project site.
- (c) The latest assessment report shows that power plant has sufficient safety margin of resistance to earthquake, tsunami and flood :

Automatic earthquake emergency shutdown	Design value of seismic protection of base plate	Measured value near plant site during 921 earthquake(note)	Tsunami run-up height simulated by NSC	Tsunami run-up height based on FSAR analysis	Design elevation of the plant building	Design rainfall for drainage of reactor unit plant building	Taiwan's maximum single-day rainfall (56.10.18 DongShan River, YiLan)
0.15g	0.4g	0.026g (Gongliao Elementary School)	3.4 meters	8.07 meters	12.0 meters	700mm/hour (16,800mm/day)	1,672mm/day

Note: according to the website announcement of Central Weather Bureau, the 921 earthquake took place on September 21, 1999 measuring 7.3 on Richter scale is the largest earthquake in Taiwan in the 20th century.

b. Reactor unit design of high safety standard

(a) Adopt Advanced Boiling Water Reactor (ABWR)

- **The safety design has been certified by U.S. Nuclear Regulatory Commission:** the design standard of GE's improved third-generation reactor is reviewed and awarded Design Certificate by the U.S. Nuclear Regulatory Commission (NRC).
- **Experiences of actual construction and operation:** there have been four reactors constructed and in commercial operations in Japan since 1996.
- **Advanced design within internal pump of reactor:** so that the risk of reactor core damage can be significantly reduced. There are 3 strings of safety systems, one string more than the traditional nuclear power plants, and the seven emergency diesel generators are installed.

(b) The safety digital control and instrumentation system uses the ring double-loop four string design, equipped with a separate backup manual switch.

III. Ensure safe operation in nuclear power plant IV (4/6)

B. Ensure the Construction Quality

- ⇒ **Taiwan Power Company's external practices** / bring in international professionals to strengthen the system integration
 - a. Enhance the General Counselor's functionality in order to oversee the overall project management
 - (a) Taiwan Power Company expands the functionality of the URS company's role as a General Counselor (AE), responsible for whole-plant integration (URS company was the General Counselor for the 1st Nuclear Power Plant; in addition, it has experience of halt-to-restore construction of 5 units in 4 nuclear power plants in the U.S.)
 - (b) Taiwan Power Company invites Toshiba Corporation of Japan – which has experienced with the ABWR plant construction – as a consultant to participate the joint commissioning test team.
 - b. Ask GE to send more on-site professionals in order to accelerate the processing of site construction issues
- ⇒ **Taiwan Power Company's internal practices** / propose schedules to ensure concrete improvement in each checkpoint
 - a. Establish a forward command post to improve working methods and smooth administration flow, and implement class 3 quality assurance operations.
 - b. Establish a coordination center with experts to test the nuclear safety, in order to accelerate on-site construction and commissioning issues.

C. Rigorous and Overall Tests

- ⇒ **Taiwan Power Company's external practices** / independent audit and verification to strengthen the rigorousness of test
 - a. Hire foreign "professionals and related organizations" to make independent verification on the integrity of the test procedure.
 - b. Hire experienced third-party professional consulting firms to make independent verification and assessment on the digital controlled instrument system (DCIS).
- ⇒ **Taiwan Power Company's internal practices** / pass rigorous and complete commissioning tests
 - a. Enhance the test / on-duty organizational responsibilities by transferring the such a duty from the plant director to a vice president to oversee the joint commissioning tests.
 - b. Re-examine the 310 commissioning procedure books to make sure the comprehensiveness and deliberation of operation procedures.
 - c. Based on the Japanese experience, draft 6 special test procedure books to verify the overall DCIS functions.

III. Ensure safe operation in nuclear power plant IV (5/6)

D. Hierarchical Supervision and Management

a. Executive Yuan (EY)/ supervise the nuclear safety

EY sets up the nuclear safety supervision mechanism to actively implement the nuclear safety.

b. Atomic Energy Council (AEC) / independently inspect and control the safety of the 4th Nuclear Power Plant

AEC performs independent inspections and controls – "site inspection", "security review" and "control conference" – to inspect the power plant deficiency. In addition, AEC supervises Taiwan Power Company to achieve improvement as required in order to meet the safety requirements.

c. Ministry of Economic Affairs (MOEA)/ strictly inspect and supervise the construction quality of the 4th nuclear power plant.

- (a) The Construction Inspection Team implements rigorous inspections and strict supervision to ensure the construction quality and safety of the 4th nuclear power plant.
- (b) To strengthen the supervision and auditing of the nuclear power plant, the "4th Nuclear Power Plant Construction Progress Control Team" was reorganized to "Supervising Team for the Safety Management and Improvement of Taiwan Power Company's Nuclear Power Plants" on April 22, 2011. In addition, such a team invites experts of nuclear plant, tsunami and earthquake for on-site examination and supervision, focusing on the overall safety examination of the 4th Nuclear Power Plant.

d. Taiwan Power Company

Depending on the construction progress of the 4th Nuclear Power Plant, domestic and foreign experts will be invited to perform an external assessment, immediately resolving the problems on various stages as well as making instant corrective adjustments.

III. Ensure safe operation in nuclear power plant IV (6/6)

E. Ensure Safe Operations

a. Taiwan Power Company

- (a) Conduct an overall inspection report on the 4th Nuclear Power Plant and submit such a report to the Atomic Energy Council.
- (b) Invite the World Association of Nuclear Operators (WANO) to perform an industrial assessment on the nuclear power plant prior to its commissioning.
- (c) Carry out "complete and rigorous commissioning tests " and closely scrutinize the test results as well as data validation to ensure the nuclear safety.

b. Ministry of Economic Affairs (MOEA)

MOEA invites domestic and foreign experts with practical experiences on nuclear power engineering and nuclear safety to survey the specific strengthening programs of the plant's construction; in addition, MOEA supervises Taiwan Power Company in order to ensure the safe operations of the 4th Nuclear Power Plant.

c. Atomic Energy Council

Before fueling No. 1 unit of the plant, Atomic Energy Council must invite the United States Nuclear Regulatory Commission (NRC) to send experts to Taiwan in order to assist safety inspection and surveillance.

Thanks for your attention!

