



**2011 WiN Global Annual Conference**  
**Country Report**  
**WiN Taiwan**  
**Jessie J. Chiu, Atomic Energy Council**

## **1. Introductory of WiN Taiwan**

*Number of WiN Member (national/global): 140/39. Chapter founded in 1994.*

WiN Taiwan operates as a special division under the Chung-Hwa Nuclear Society. Since its founding in 1994, members of WiN Taiwan have grown from 132 to 140 (among them, 39 are global members) over the past year. WiN Taiwan has nine steering committee members by election, including chair and vice chair (i.e. president and vice president). The current (2010–2012) president and vice president are Dr. Tsai-yueh Luo, associate researcher of the Institute of Nuclear Energy Research (INER), and Ms. Lora Chung, Division Head of the Nuclear Information Center (NIC), respectively. Past presidents who do not wish to be included in the ballots for biannual elections are invited to serve as advisors to WiN Taiwan.

## **2. Nuclear Situation in Taiwan**

*Number of NPP`s: 6 units in operation; 2 units under construction.*

*Number of Research Reactors: 1 – Tsing Hua University Open-pool Reactor (THOR).*

General. In 2010, 99.4% of Taiwan’s energy sources relied on imports. Electricity generation totalled 247.1 terawatt-hours (TWh) which was contributed by: coal 36%, co-gen 16.4%, LNG 24%, oil 3.3%, nuclear 16.9%, hydro 3% and wind & solar PV 0.4%.

The three nuclear power plants at Chinshan, Kuosheng and Maanshan, operated by state-owned utility Taiwan power Company (TPC), with two operating units at each site, generated 41.63 terawatt-hours (TWh) of electricity (gross) in 2010 – setting a new record high for the fourth consecutive year. Nuclear power accounted for 16.9% of the total supply, compared to 18.1% in 2009. The decrease in nuclear share is mainly due to significant increase of power generated by LNG, from 46.22 TWh (20.2%) in 2009 to 59.29 TWh (24%) in 2010.

NPP Performance. Performance wise, the average capacity factor for all six units in 2010 was 92.32%, best record ever in Taiwan’s nuclear power operation, and also ranked second place globally according to WANO statistics. Other new records include: no automatic scram at any unit, only 5 abnormal events for all six units, and a refueling outage of only 24.48 days at Kuosheng-1.

Construction of Lungmen Plant. Construction continues at the fourth nuclear power plant “Lungmen” housing two ABWR units with 97% completion for construction and 38% completion for test runs as of 31 March 2011. The project has encountered significant delays first due to the suspension in 2000, then the rising price of construction materials, finding new subcontractors to replace the bankrupted and negotiating new contracts to succeed the expired.

Completion and testing of the integrated distributed control and information system (DCIS) has been one of the greatest challenges of the project. After the onset of the Fukushima accident, higher level of safety scrutiny is expected for the testing of the new plant, and commercial operation dates are open until the units pass all the testing successfully.

Nuclear Regulatory Activities. The AEC continued its rigorous safety review on the 20-year license renewal application submitted by the TPC for the Chinshan plant during 2010. The process has been suspended first waiting for new information then due to the Fukushima accident. Some of other major regulatory activities for reactor safety include: safety reevaluation and enhancement plan for seismic resistance, underground water and piping monitoring, risk-informed application review, BWR ECCS suction strainer inspection, domestic fire protection standards for NPPs, and . For the Lungmen plant, focuses were on inspections for the Lungmen ABWR construction and initial test program inspection. In the area of radiation protection, significant efforts were devoted to the implementation of the computed tomography (CT) quality control program, safety and security control of high-risk (Class I&II) radiation sources, and strengthening of self management in NDT radiation safety.

Nuclear and Related R&D Focuses. Major research focuses of the Institute of Nuclear Energy Research (INER) include: the development of methods for treatment and disposal of radioactive waste; the development of green energy technology such as solid oxide fuel cells, cellulosic ethanol, high concentration photovoltaic (HCPV) systems, wind power generation systems, and the integrated model of energy technology and macro-economy; and confirmatory research and technical support to AEC's in areas such as comprehensive safety assessment, power uprate, and license renewal for operating NPPs, and the Lungmen construction project. In addition, the INER has also been very active in the development and commercialization of radiopharmaceuticals. The successful development of intravenously administered nano-scale liposomes that deliver rhenium-188 radioisotope atoms to cancerous tumors is one of its recent achievements.

Government Reform. On 12 January 2010 the Legislative Yuan passed a set of four laws paving the way for a reform of the Executive Yuan that will reduce the number of cabinet-level agencies from 37 to 29. The AEC and its affiliated organizations are among those being affected by this reform. According to the current plan, the AEC is to be transformed into a nuclear safety regulatory entity, the Nuclear Safety Authority (NSA), of a lower tier under the Ministry of Science and Technology (MOST). The Ministry of Economic Affairs (MOEA) will become the Ministry of Economic and Energy Affairs (MOEEA), under which AEC's research arm INER will become an administrative corporation. However, to ensure that the NSA continues to receive much needed technical support for regulating nuclear safety and radiation protection, the reform regarding atomic energy affairs is being reconsidered in light of the Fukushima accident. The reorganization will take effect on 1 January 2012, and a two-year transition ending in December 2013 will allow all agencies to adjust themselves to the new operations.

### **3. Situation of Waste Management**

*Repository for L&ILW: in site selection phase. Repository for spent fuel: in planning phase.*

On-site dry storage prior to final disposal has been recognized as a favorable option for the spent nuclear fuel management. An application for constructing a spent fuel dry storage facility at Chinshan plant was submitted by the TPC in March 2007. A construction license was issued by

the Fuel Cycle and Materials Administration (FCMA) in December 2008. In October 2010, the TPC commenced the construction work upon approval of its water and soil reservation plan by the county government, and hoped to submit an application for the operation license by the end of 2012.

As required by law, a candidate site for a low-level waste final disposal facility will be determined through a referendum on multiple recommended candidate sites. In March 2009, the Ministry of Economic Affairs (MOEA) announced two recommended candidate sites, as determined by its site selection committee, located in Nantien village of Taitung County and Donguiyu Islet of Pescadores. However, the county government of Pescadores subsequently claimed the site as a natural reserve, which by law must be excluded in the siting process. The siting committee has since recommended an additional potential site “Shiao-Chiou”, an offshore islet, to re-establish a list of multiple recommended candidate sites. Meanwhile, amendments to the siting law are being drafted to streamline the process.

#### **4. Taiwan’s Response to Fukushima Accident**

One day after the onset of the March 11 Fukushima accident, the AEC formed a special taskforce to monitor the daily situation at Fukushima through various channels and post the plant conditions on the website. The AEC also cooperated with other government agencies to take a series of actions such as monitoring the environmental radiation level, sampling import goods from Japan, and screening contamination of air and sea travelers from Japan, etc. Frequent press conferences have been held to keep the public informed of the evolvement of, and government’s response to, the accident. A special webpage was set up on AEC’s website since March 15 to provide information related to the event.

As for the domestic nuclear power plants, the AEC requested that the TPC verify the capability of NPPs in response to both the DBA and beyond-DBA accidents. This includes 11 near-term and 1 medium-term actions for three operating NPPs. The near-term actions are to be completed by the end of June, 2011, including: reexamination of capability for loss of all AC Power (Station Black Out, SBO), reevaluation of flooding and tsunami protection, ensuring integrity and cooling of the spent fuel pool, assessment of heat removal and ultimate heat sink, reexamination and retraining of emergency operating procedures (EOPs), establishing procedures for abandoning the reactor, support between different units, considerations for compound accidents, mitigation beyond DBA events, preparedness and backup equipment, and manpower, organization, safety culture. The medium-term action is to include a new chapter on coping capability of Fukushima Accident into the periodic integrated safety assessment plan, which is to be submitted to the AEC for review by the end of 2011.

In addition, enhancement of nuclear emergency preparedness capability has been in progress. This includes improving integration and collaboration with relevant ministries and local governments, planning for evacuation beyond the EPZs, and establishing reactor abandonment procedures in case of a catastrophe. An expanded annual nuclear emergency exercise was conducted in phases during the month of May, which was given a great opportunity for inter-agency communication.

On April 30, thousands of anti-nuclear protesters demonstrated at major cities in Taiwan for an immediate halt to the construction of Lungmen project, the island’s fourth NPP. The protesters were also opposed to TPC’s plans to extend operating life of the three existing plants beyond the

original 40-year lifespan. Amid Japan’s ongoing crisis, nuclear energy is emerging as a contentious issue for next year’s presidential election in Taiwan, as opposition leader Tsai Ing-wen declared her intention to phase out nuclear power by 2025 if elected.

President Ma Ying-jeou held an energy policy meeting at the Presidential Office on May 20. Two decisions were reached: 1) The government would not consider building a 5<sup>th</sup> nuclear power plant and the existing nuclear power plants must be operated with paramount priority given to safety; and 2) Taiwan's future energy policy would be based on the principles of no power rationing, carbon emissions reduction, and reasonable electricity rates. On May 22, Economics Minister Shih Yen-shiang stated for the first time that the government was inclined not to consider extending the life of the existing NPPs. Furthermore, the Lungmen plant, currently under construction, would not become operational unless its safety could be guaranteed, so its operation date could be postponed.

## **5. Highlights of WiN Taiwan Activities during May 2010 ~ April 2011**

*This part of the report has been prepared based on the four key elements of WiN Global’s strategic plan. WiN Taiwan’s activities and achievements as summarized below may fall under more than one of the key elements.*

### **Organization** – structure and sustainability

WiN Taiwan holds Steering and Advisory Committee meetings approximately once every two months. As a special division of the Chung-Hwa Nuclear Society, WiN Taiwan reports to the Society at every board meeting. Currently, two of the 15 board members and one of the five supervisors of the Society are (female) WiN members.

WiN Taiwan finances itself, and as such seeks sponsorship for implementing special projects or activities. Following successful implementation of a research project on communication and education in 2009, WiN Taiwan received another grant to continue further research activities on the same subject during 2010-11. The project was also selected as one of the excellent research projects funded by AEC/NSC for 2010.

### **Benefits and Development** – networking, training and education

**WiN Taiwan Annual Meeting – 29 July 2010.** WiN Taiwan and ANS-Taiwan Section held a Joint Annual Meeting at TPC’s Guay-Shan Training Center in southern suburb of Taipei. Highlights of the two separate business meetings were: 1) at the ANS-TS side, a briefing by Secretary Wei-wen Yeh summarizing public outreach programs conducted in various nuclear organizations, and 2) replay of the WiN Global Photo Panorama with Mozart’s Eine kleine Nachmusik and the video messages from WiN kids shown at the opening ceremony of the Busan WiN Global Annual meeting.

The business meetings were followed by a joint seminar attended by both assemblies totaling over 90 people. The speech “the Social Basis of Innovation–Challenges and Responses” was presented by Professor Chyuan-yuan Wu, Director, Institute of Sociology, National Tsing Hua University. He urged our entrepreneurs and policy makers to implement pedagogical reforms to cultivate both transgressive cognition and craft-based dexterity that will pave the way for the social and industrial upgrades of Taiwan.

Two parallel sessions were held in the afternoon: 1) presentations of four "Young Generation" representatives at the ANS-TS session, and 2) a round-table discussion allowing every participant to express her thoughts on benefits and development of the organization at the WiN Taiwan session.

The full-day program also includes two field visits: the Feitsui reservoir early in the morning, and the Chihtan Water Purification Plant later in the afternoon.

**WiN Global Annual Meeting – 9~14 May 2010.** A delegation of nine members, led by WiN Taiwan President Ms. Jyi-lan Wu, attended the 18<sup>th</sup> WIN Global Annual Meeting held in Busan, Korea. The delegation was represented by members from the utility (TPC), government authority (AEC), research (INER), industry (AREVA Taiwan) and information service (NIC). Jessie Chiu of AEC also represented WiN Taiwan to attend the post-conference tour to Aomori, Japan which was hosted by WiN Japan in celebration of its 10<sup>th</sup> anniversary.

**Networking with Women Scientists – 9-12 December 2010.** Dr. Byung-joo Min, WiN Global Executive and President of the Association of Korean Woman Scientists and Engineers (KWSE), was invited to take part in a series of activities associated with promotion of women in science and technology fields in Taiwan. She started her trip by visiting the INER and the AEC where she also had a networking meeting with representatives of the local WiN chapter in Taipei. As a keynote speaker at the National Conference on Woman Scientists held in Taichung, B.J. delivered her speech entitled "New Paradigm for Korean Science and Technology Development, Role of KWSE", which attracted over 200 participants. Most of them were women and over half were high school and college students.

Dr. Min also gave a presentation "Networking and Accomplishments of Women Scientists and Engineers in Korea" at the Center for Condensed Matter Sciences of the National Taiwan University. The discussion was focused on various details and challenges of founding and operating a female scientists and engineers organization such as KWSE with the hope that the Taiwan Female Scientists and Technologists MentorNet may become a formally registered organization in the near future.

The visit of B.J. Min was one of the collaborative activities developed through networking between WiN Taiwan members and female scientists in the academia in Taiwan.

**New Year Celebrations – 20 January and 19 February 2011.** To welcome the new year of the Hare while bidding farewell to the year of the Tiger, a lunch-time party was held in mid January with light meal and karaoke at INER. About 15 members from the Institute attended the party. Then as a similar networking event, 19 members (including a few significant others) in Taipei area celebrated the new year by spending a Saturday in February together walking and talking in the woods, dipping in a hot spring and enjoying a delicious late lunch together.

**Spring Seminar – 16 March 2011.** Ching-Hwa Chang, renowned female architect in bio-architecture, was invited to give a talk entitled "Mutual benefits and sustainable maintenance between people and the environment". She used her award winning works as examples to deliver the idea of keeping people and their living environment in harmony. Nearly 100 attended the seminar.



## **Communication** – strategies, tools and channels

**Science Fair** – 27 July ~01 August 2010. At the “Science Education Week of the 50<sup>th</sup> Science Fair”, WiN Taiwan, sponsored by the AEC, operated two stands “Who’s the Nuclear Knowledge King” and “Monsters Inc” at the week-long science fair held at the Taipei County Hsin Chung Gymnasium. A lecture and demo session entitled “How much do you know about radiation?” was also presented twice a day for a total of 12 times. The fair was one of the summer K-12 activities organized by the National Science Education Center (NSEC).

**Energy and Science Camps** – July ~ October 2010. A total of four camps were conducted for K-12 teachers and students at remotely-located schools for a total of 150 students and 50 teachers. These include a 3-day summer camp on energy at each of two junior high schools for 30 and 80 students, respectively, in August. Two others were one-day camps held at primary schools, one for 40 students on July 20, and the other for 50 teachers on October 27. The 3-hour teaching module “Nuclear Power–our invisible friend” developed by WiN Taiwan in 2009 was used during each camp. A similar but longer (5-day) camp will be held for 40 high-school students in July 2011.

**Fall Seminar** – 26 November 2010. Prof. Min-Fung Tai, Physics Department of the National Tsing Hua University, served as WiN Taiwan’s “Fall Seminar” speaker and made a lively show-and-tell appearance at the Institute of Nuclear Energy Research on “Physics: Revealing the Magic in Everyday Life” to over 100 scientists and researchers. The audience walked away greatly impressed by how science, especially physics, can be communicated with the general public using interesting examples, easy-to-understand language and simple demonstrations.

**Seminars on Energy and Atomic Science** – throughout 2010. Through the channels established for K-12 physics education programs, 70 seminars were delivered by WiN members to over 10,000 K-12 students and teachers at their schools throughout the year of 2010. Over 20 nuclear energy and radiation related subjects were available for the school to specify under the project named “Let’s talk about energy and atomic science!”. Similar efforts continue into 2011.

**Education Website** – on going. As part of a research project conducted by a team of WiN Taiwan members, two nuclear and radiation websites are being set up for reaching out to a greater number of the public. The first one named “Yuan Lai Ru Ci – So that’s what it is all about” has been initiated to provide general knowledge of atomic energy applications and green energy technology to children, school teachers as well as the general public. The second one, a front runner, has become home to all the information generated by the “Seminars on Energy and Atomic Science”, including announcements, photos, work sheets and feedback of activities held for K-12 students and teachers ([http://www.phys.nthu.edu.tw/~gen\\_sci/2010energy/index.html](http://www.phys.nthu.edu.tw/~gen_sci/2010energy/index.html)).

**WiN Taiwan Newsletters** – Since January 2010. WiN Taiwan launched the publication of monthly or bimonthly newsletters as a new project for 2010. Thirteen issues of electronic WiN Taiwan Newsletter have been published as of April 2011.