

Status and Challenges of Nuclear Power in Taiwan

A. Nuclear Power and Performance

Electricity Statistics. Over 99% of Taiwan's energy sources relied on imports. In 2013, electricity generation totaled 252.2 terawatt-hours (TWh), 0.7% higher than that of 2012, and was contributed by: coal 34.4%, co-gen 15.9%, LNG 26.9%, oil 2.3%, nuclear 16.5%, hydro 3.4% and wind & solar PV 0.8%. The three nuclear power plants at Chinshan, Kuosheng and Maanshan, operated by state-owned utility TPC, with two operating units at each site, generated 41.64 terawatt-hours (TWh) of electricity (gross) in 2013 – a recovery of 3% from 2012 (with extended shutdown for repairs of Kuosheng-1). This is reflected in the nuclear share of electricity generation which dropped from 16.7% in 2011 to 16.1% in 2012, then back to 16.5 in 2013. Meanwhile, LNG share, which accounted for 59.3 TWh (24%) electricity generation in 2010, further increased from 63.4 TWh (25.1%) in 2011 to 65.5 TWh (26.2%) in 2012 and 67.7 TWh (26.9%) in 2013.

NPP Performance. Although there were 4 reactor scrams and one month delay in refueling outage due to generator refurbishment at Chinshan-1, the average capacity factor for all six units in 2013 was 91.77%, ranking number three among all 30 nuclear power countries. Other performance records include: refueling outage completed in 24.89 and 27.95 days at Kuosheng-1&2, respectively, and 43.4 days at Maanshan-1, all ahead of schedule by 4-7 days without any violations or safety incidents. Chinshan-1 also celebrated a record of 22-year continuous operation without any fuel damage.

B. Challenges of the Lungmen Plant

The Lungmen Nuclear Power Plant. Construction of the Lungmen Plant started in 1999. As the fourth nuclear power station located on northeastern coast of Taiwan, it houses two ABWR units, each of 1,350 MWe. The project has encountered numerous difficulties as led by suspension in 2000, and followed by subsequent restart in 2001 and associated problems with rising price of construction materials, rehiring and interface of subcontractors, resulting in repeated delays and requests for additional budget allocation. As of end of March 2014, Unit 1 of Lungmen was 97.7% complete on construction, and 64.7% on pre-op testing.

Referendum. In February 2013, the Government proposed to launch a national referendum to decide the fate of the Lungmen plant. The proposal was debated at the Legislative Yuan during its spring session, and later withdrawn during the fall legislative session in 2013.

Initial Fuel Loading. Since the onset of the Fukushima Daiichi nuclear accident in 2011, public concerns over safety of the Lungmen plant escalated and eventually led to a national rally on 9 March 2013 calling for halting of the project. An estimate of 200,000 protestors turned out for the event nationwide. To alleviate public concern, the Ministry of Economic Affairs (MOEA) has organized a safety evaluation group to conduct re-inspection of the plant's reliability since May 2013. Completion of the work with a report is anticipated in mid-2014. TPC's application for initial fuel loading of Lungmen-1 won't be submitted to AEC until both the reliability re-inspection and the pre-op testing are completed.

C. Radioactive Waste Management

Process Continues for Siting LLW Repository. As required by law, a candidate site for a low-level waste final disposal facility will be determined through local referendum on each of the

multiple recommended candidate sites. In July 2012, the Ministry of Economic Affairs (MOEA) announced two recommended candidate sites located in Nantien of Taitung County and Wuchiou of Kingmen County, which were determined by its site selection committee in 2011. The MOEA has since been collaborating with the local governments to conduct referendum, however, without significant progress. Meanwhile, to streamline the siting process, the AEC drafted amendments to the siting law in 2012, which is still being reviewed and commented by the MOEA, the ministry solely responsible for the siting process after the Government reform completed in 2014.

On-site Dry Storage of Spent Nuclear Fuel. For Chinshan NPP, the concrete pad was laid in 2012, a hot test with two loaded casks anticipated by end of 2013, and a license for operation in 2014. The project, however, has been delayed pending approval of TPC's Water and Soil Conservation Plan (WSCP) by the New Taipei City government. For the Kuosheng plant, the TPC submitted a Preliminary Safety Analysis Report (PSAR) to the FCMA in March 2012. A pre-hearing conference and a public hearing were held in July 2012. The FCMA has completed review of the PSAR, and will issue its conclusions together with a construction permit upon receipt of TPC's submittal of an approval document on its environmental impact report issued by the central government Environmental Protection Administration. TPC, however, can not commence with the construction until the approval of a WSCP, which is not yet accepted by the New Taipei City government.

Host Rock Investigation for Spent Nuclear Fuel Repository. According to TPC's Spent Nuclear Fuel (SNF) Disposal Plan (Edition 2010, approved 2011), the operation of a repository is projected to start in 2055, with the 50-year (2005~2055) project life divided into five stages, the first stage being the investigation and evaluation of potential host rocks. In 2012, the drilling of a deep hole into granite bedrock for host rock investigation in Hualien country was halted due to protests of local residents. During 2013, host rock investigation in a set of 6 holes drilled into granite bedrock in Kingmen was also interrupted due to protests of local residents for fear that the county would become the site for the final spent fuel repository facility. As a result, TPC has transferred these wells to the National Taiwan University for teaching and research in groundwater resources.

D. Government Reform

In January 2010 the Legislative Yuan passed a set of four laws paving the way for a reform of the Executive Yuan that would reduce the number of cabinet-level agencies from 37 to 29. The AEC and its affiliated organizations are among those affected by this reform. According to an earlier plan, the AEC was to be transformed into a nuclear safety regulatory entity of a lower tier under the Ministry of Science and Technology (MOST). The Ministry of Economic Affairs (MOEA) will become the Ministry of Economy and Energy (MOEE), under which AEC's research arm the Institute of Nuclear Energy Research (INER) would become the Institute of Energy Research (IER). Only a small fraction of INER would stay under the new nuclear regulatory authority. However, the Fukushima nuclear accident in March 2011 prompted reconsideration of the importance and therefore independency and capability of the nuclear safety regulatory authority. Consequently the Executive Yuan revised its plan to pull the nuclear safety authority out of the MOST, and make it a more independent entity. As currently planned, the AEC would become a nuclear safety commission, directly under the Executive Yuan, but at a lower tier. The reform is awaiting final debate and approval at the Legislative Yuan.

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