

Comments on Taiwan Stress Test National Report for NPPs

Submitted

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Here is a list of our comments to the Taiwan Stress Test National Report for the Nuclear Power Plants. Constraint by the tight schedule of stress test, our comment cannot be exhaustive, only represent our current findings. In the following discussion, unless stated, TWN Report refers to the Taiwan Stress Test National Report for NPPs prepared by Taiwan Atomic Energy Commission (AEC).

Fundamental issues:

1. Stress test looks hollow without considering whether NPPs meet ‘design base’ quality or not.

It is understandable that stress test ought to have a reference, and ‘design base’ probably is the most convenient one. Like automobile on the road, original ‘design’ is only one of many factors affecting car’s condition. Age, maintenance, driving habit and accident history are all equally important.

We suspect Taiwanese NPPs are below design base quality, due to defects, aging and obsolete instruments. All four NPPs undergo the stress test are either very old NPPs or one-off kind reactors, both types are prone to disasters as indicated by Three Mile Island, Chernobyl, and Fukushima incidences. It is impossible to enhance nuclear safety if instruments, system and related framework of NPPs are not thoroughly evaluated. A few examples are given below to illustrate our concern.

- i.** Two reactors of Chinshan NPP (CSNP) are GE BWR-4 with Mark - I containment, same one used in Fukushima Daiichi NPP. Numerous articles worldwide criticize the design of this type of reactor before and after Fukushima disaster.
- ii.** Two reactors at Kuosheng NPP (KSNP) are GE BWR-6. Several anchor bolts fixing reactor pressure vessels to the base were found broken in 2011 and 2012, which was never happened elsewhere. Inferior original parts, erosion by high sulfur atmosphere, or metal fatigue are possible culprit. Although broken bolts were quickly replaced, yet reoccurring cannot be precluded.
- iii.** Lungmen NPP (LMNP) is the first Taiwan NPP designed to be totally digital controlled. With prolonged construction delays, then ‘modern’ computers become obsolete now. How to operate and maintain the control system poses huge challenge for both plant operator and regulator. During its construction, LMNP allowed

thousands of unauthorized design changes, inferior parts, poor welding, insufficient steel, plastic bottles and newspapers in the nuclear containment concrete wall, etc. Our worries about its quality are well founded.

2. Role of Taiwan regulatory body, Atomic Energy Commission (AEC)

In TWN Report (p.13-14), AEC sent the required improvements to TPC in 24 regulatory orders. We do not find **time frames** of these regulatory orders. Without deadlines, all these requirements are meaningless.

AEC also provided sets of recommendations / suggestions at end of each chapter. Since those recommendations are voluntary, we are questioning what the purposes of having these recommendations / suggestions in the TWN Report are for.

We believe that AEC's responsibilities in the TWN Report are to inform the public the status of documents presented by licensee TPC, whether its contents are sufficient; to confirm the information and assessment provided by TPC, whether they meet ENSREG requirements, and re-evaluate TPC stated safety margins.

In this aspect, AEC behaves more like an onlooker than a regulator.

Insufficient, questionable content:

3. Missing assessments on volcanic activities and its interaction with seismic faults.

Belousov, et al¹ (2010) analyzed various volcanoclastic deposits of the Tatun Volcanic Group (TVG), found diverse explosive activities in this area. Signs of interactions between volcanic eruptions and seismic activity of tectonic faults were found. They concluded that TVG should be considered volcanically active. Study by Chen and Shen² (2004) suggested not only inland volcanic activities are important, since pumice particles from submarine volcanic eruptions also may pose potential threat to nuclear safety.

4. Missing assessment of impacts due to plane crash.

December 1991, cargo plane of China Airline crashed at mountain 2km from KSNP. It is necessary to evaluate possible large disturbances on AC electrical power grid due to plane crash.

¹ Belousov, A, M. Belousova, C.-H. Chen, and G. F. Zellmer (2010) "Deposits, character and timing of recent eruptions and gravitational collapses in Tatun Volcanic Group, Northern Taiwan: Hazard-related issues", *J. Volcanology & Geothermal Research* **191** p.205.

² Chen, Chang-Hwa and J. J. Shen (2004) "Discussions on the IAEA guidelines for assessing volcanic hazards at nuclear facilities" *J. Volcanology & Geothermal Research* **134** p. 339.

5. Possibility of garbage in garbage out. Erroneous inputs on faults.

AEC admitted in TWN Report for NPPs, that “...*the maximum potential earthquake caused by the Shanchiao fault and Henchun fault are still to be evaluated, as they are so close to the Chinshan/Kuosheng and Maanshan NPPs respectively*” (p.51 sect. 2.3, para 5). AEC expects their completion by December 2013.

Shanchiao fault spans right between CSNP and KSNP into East China Sea. Distances between Shanchiao fault and CSNP, KSNP are 7 km (not 8 km stated in p.16 of TWN Report) and 5 km (not mentioned at all), respectively. The length of Shanchiao fault increases over time. Before 2008, official length is about 20km. Survey³ discovered the original fault being part of a longer one, and its inland length almost doubled to around 40 km. Length written in TWN Report is 50.6km (34km inland plus 16.6km into sea, p.19). Report by Ministry of Economic Affairs (MOEA) to the Legislative Yuan (LY) on April 17th, 2013 stated a length of at least 74km. Several geologists suggested total length over 120km is possible.

MSNP faces similar problem. As indicated in the TWN Report, length of Hen(g)chun fault is 16km inland (p.20), does not extend to sea, and nothing about distance between MSNP and Henchun fault. MOEA report to LY stated at least 41km in total length, 16 km inland and 25 km in sea. The latter report stated that MSNP nuclear island is only 1.1 km away from Henchun fault. However, Prof. Wen-Shan Chen of Department of Geology, National Taiwan University found fault line 200m inside the MSNP main entrance. Prof. Chen suggested this newly identified fault is part of Henchun fault. Based on his own surveys, Prof. Chen also suggested that Henchun fault needs to extend 10 km further north, to about 50 km in total length.

In the MOEA report to LY, it is mentioned that LMNP is surrounded by Audi fault, Kungliao fault, Funchiao fault, and Chuchi fault, and they all inactive now. This report also downplayed the 11 submarine volcanoes nearby, stating that no damages recorded in history due to submarine volcanic eruptions. AEC statement at 2010 basically said that no need to worry since Funchiao fault was considered in original NPP geological survey at 1981. Neither faults nor submarine volcanoes were mentioned in the TWN Report. However, it mentioned “... *geological structure that does affect the site is the subducting slap in northeastern Taiwan*” (p.3).

Two powerful earthquakes struck central Taiwan this year, one on March 27th, 6.1 in

³ 邱俊穎, 胡植慶, 陳致言與劉桓吉 (2008) “山腳斷層再活動對台北盆地內地形變化之探討” 經濟部中央地質調查所特刊, 第二十號, p.97.

Richter scale and another one on June 2nd, 6.3 in Richter scale. Responsible officials suggested those two originated from one previously unknown fault. This indicates how little we know about our seismic condition.

6. Rely on immature, unrealistic Ultimate Response Guideline as the last resort.

TPE publicly claims that the established ‘Ultimate Response Guideline (URG)’ will be earthquake/tsunami - proof. However it does not bear slightest scrutiny. For example, once URG is tripped, TPC plans an immediate depressurizing with no regards of releasing large quantities of radioactive material into environment. TPC seems cannot distinguish emergency depressurization and controlled depressurization (P.154). Besides, TPC does not aware that it has to maintain a balanced “feed and bleed” in high pressure system in order not to damage the fuels and to prevent H₂ accumulation. In a May 31st statement, AEC indicated that URG WILL be evaluated.

7. Wrong Answers.

Sect. 2.2.2. needs discussion on “containment integrity”(p. 48), all descriptions are about “reactor building”.

Overlook Issues

8. Possibility of losing instrument signals.

Only mentioned in MSNP (p.133) that temperature and water level instruments are powered by non-safety related system. In case of losing offsite power, non-safety battery will supply power for 2 hours. If operator does not shift power supply to safety related system, control room will **lose signal after 2 hours**. In that case, there is no way of making proper decision.

9. Additional extreme nature event needed.

Only one type of extreme nature event considered (p.83, Sect. 4), the combined “typhoons, heavy rainfall and mudslides”. We suggest that at least one additional event on “**heavy rainfall + earthquake + mudslide**” shall be considered.

10. No emergency AC for SFP water makeup system.

The emergency AC will not supply SFP water makeup system (p.130 sect. 5.2). Where are the additional measures?

11. No consideration of filters when venting.

Numerous places mentioned using “atmosphere as ultimate heat sink’, or RPV being depressurized in order filling in water in an emergency. **No mention about filtering**

radioactive material before venting.

12. No attempt preparing a separate (backup) control room in case events beyond DBE or DBF.

Basic information missing:

13. Population density within 30 km radius of each NPP.

14. Operating temperature and pressure of RPVs (MSNP has).

15. Sizes of SFP.

Miscellaneous:

16. Except MSNP, other NPPs do not mention any prevention measures about the 90-tonne crane on top of SFP and RPV.

17. Drainage of LMNP may not working as stated. At its 29th Inspection report, AEC found “flood on LMNP floor as well leaking from roof” in reactor building. On August 16th, 2011 during a Suppression Pool test on reactor 1, a 30cm flood was found in the Reactor Building. Requiring all safety equipment to be installed 20cm above ground (p.30, 2nd paragraph) won't help.

18. Tsunamis history was mentioned in KSNP (p. 56), not in nearby CSNP!

19. It is said that ultimate heat sink of CSNP is “*a mixture of sea water and ChienHwa Stream water.*” (p.116, sect 5.1.4.1) In fact, ChienHwa Stream has very little water most of the time.