Reportable Event Report on Maanshan Nuclear Power Plant Unit 1
Reactor Scram Arising from the Low-Low Water Level of Steam Generator
(RER-94-31-001)

1. Description of Event

On March 25, 2005, Maanshan Nuclear Power Plant Unit 1 was operating at 100 % capacity generating 945 MWe. At 6:28 p.m. a reactor scram occurred, followed by trip of the main turbine and generator. After the reactor scram, the reactor safety systems and equipment functioned properly and no abnormality was found. This abnormal event was determined to have no safety significance and thus be classified as a level 0 event on the International Nuclear Event Scale (INES).

2. Cause of Event

The cause of the event was due to a loosening of the valve feedback arm of the primary control circuit of Steam Generator C's feedwater control valve (AE-FV498), causing a transient phenomenon of feedwater flow and water level of the steam generator, which in turn led to a low-low water level in Steam Generator C, thereby resulting in a reactor scram and actuation of safety systems, such as the Auxiliary Feed Water System and the Essential Chilled Water System, etc.

3. Cause Identification and Corrective Measures

a. Cause Identification

One month before the afore-mentioned event, an appearance of high-frequency oscillation of the feedwater control valve (AE-FV498) took place due to feedwater flow turbulence. In addition, set screws in the feedback arm of the newly replaced valve position indicator during the outage maintenance last November did not have loose-preventing devices. Thus, after a period of operation, the set

screws of the valve feedback arm came loose, leading to a loosening of the primary positioner feedback arm of the primary control circuit (see the attached photo), which in turn caused a loss of feedback signal on the positioner, the valve to be turned open, and the flowrate of the feedwater and water level of the steam generator to rise. During the period of abnormal rising water levels, the operator attempted to adjust water levels back to normal by manual intervention, but without success. Although the operator then tried to switch to the backup automatic control circuit, he could not put the system back to normal in time, so the reactor scram occurred on low water level of the steam generator.

b. Corrective Measures

Following the reactor scram, personnel at Maanshan Nuclear Power Plant already re-fastened the valve positioner feedback arm, spot-welded into a fixed position, and adjusted valve functions, as well as modified the other two circuits of the primary feedwater control valve, AE-FV478 and AE-FV488. Likewise, an inspection was carried out on Unit 2, making sure no screws have signs of coming loose. A plan has been underway to re-adjust on Unit 2 in the same way as Unit 1 refueling outage or proposing better setting alternatives. At the same time, maintenance personnel are scheduled to inspect the area -- where the primary feedwater control valves equipment are located – once every week. As to training of operators, plans have been mapped out to revise a part of operating procedures as well as enhance operation training in relevant equipment.

Besides, Taipower has proposed corrective measures in aspect of the system. In terms of refueling outage maintenance for Maanshan Nuclear Power Plant, the followings are outlined: (1) Operating personnel should lead equipment test runs following outage maintenance to ensure quality of repairs. (2) To prevent mistakes, during future outage maintenance, important equipment undergoing the first maintenance or newly added improvement should be brought up for careful review one by one to determine whether personnel from other sections should be

invited to join in the inspection and installation. (3) Work items of newly initiated projects are to be reviewed thoroughly to come up with a checkup list of key items for inspection and examination. The special task force of Taipower responsible for outage maintenance quality inspection will request nuclear power plants to list in their outage control documents the Q (safety-related) or R1 (reliability category I) work items with which suppliers are carrying out at nuclear power plants for the first time or those slated for initial maintenance, taking apart for repairs, and replacement. In this list of work items, the special inspection team for outage maintenance at Taipower will then assesses and underscores as items for inspection and review during outage maintenance through sampling, ensuring the operation quality.

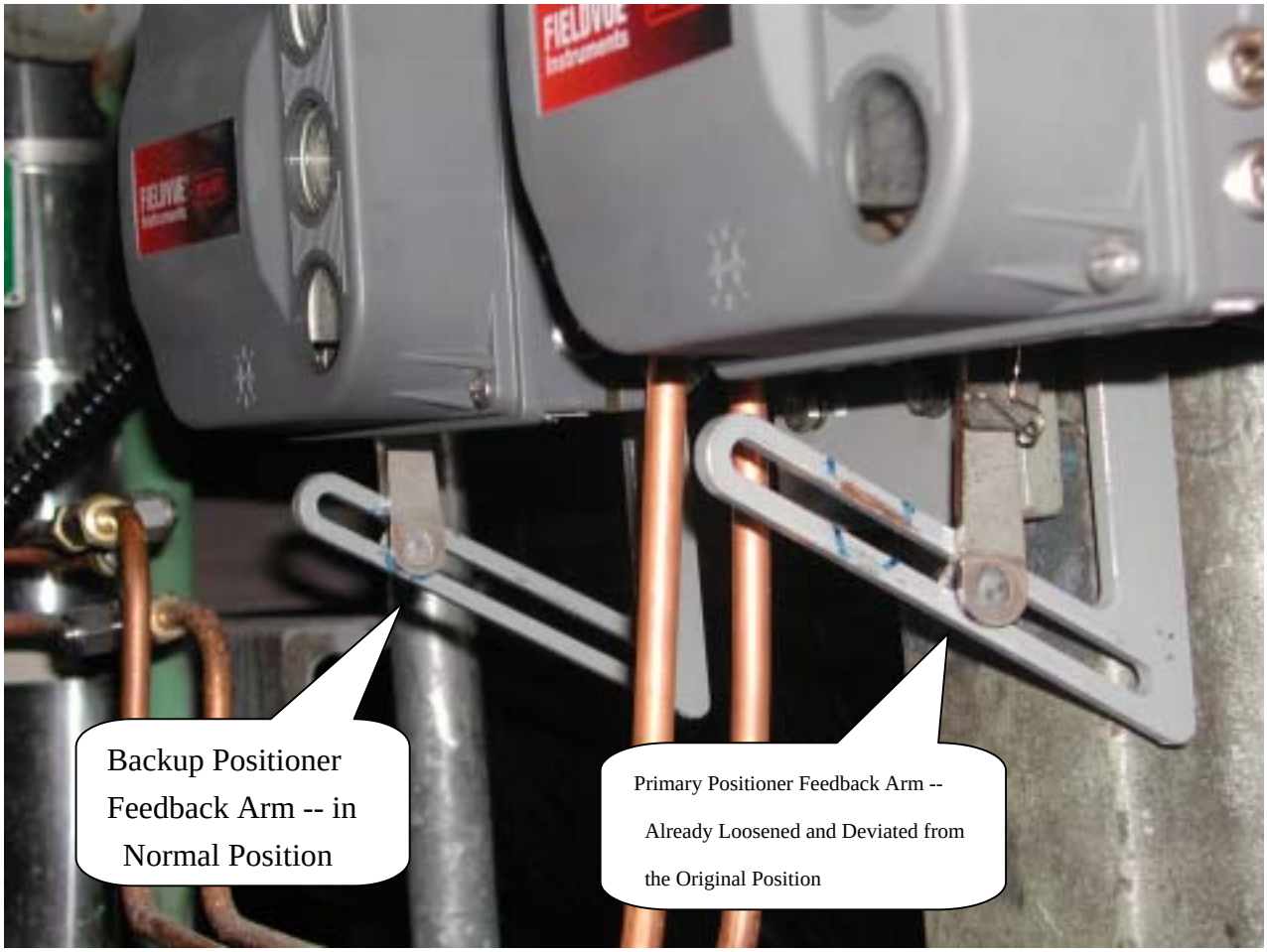
4. Operation of Safety Systems

Because of stringent requirements of nuclear safety regulation, AEC regards any automatic reactor scram as a significant event and requires approval for restart. As the process of automatic reactor scram involves numerous safety systems, each automatic reactor scram therefore becomes a good opportunity to examine functionality of the safety equipment. A detailed investigation on the involved safety systems and relevant parameters during the shutdown showed that the reactor safety systems were working properly, reactor was secured, and there were no environmental impact outside the nuclear plant.

5. AEC Regulatory Measures

On March 25, 2005, immediately after Taipower notified AEC of this incident by phone, the Council immediately inquired the condition of the reactor unit and ascertained that the unit had been safely shut down. Meanwhile, the AEC resident inspector was notified to get in the plant to understand situation and to investigate the cause of the reactor scram as well as follow-up corrective activities. After Taipower identified the cause of the reactor scram and took corrective measures, it

submitted a request to AEC for unit restart in accordance with established restart regulations. A review meeting was held at AEC headquarters on March 27. Based on the review results that there were no more safety concerns, AEC approved restart request for Maanshan unit 1 at 1:20 p.m. on March 27 with follow-up regulatory measures.



Loosening of the Feedback Arm of Primary Control Circuit Positioner of Feedwater Regulating Valve (AE-FV498)
(Photo taken after Reactor Scram)