

## The Human Aspect of the Fukushima Daiichi Accident

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Recognizing itself as the main party involved in the nuclear accident triggered by the Tohoku-Chihou-Taiheiyo-Oki Earthquake on March 11, 2011, Tokyo Electric Power Company (TEPCO) has performed accident investigation from various aspects. Results of the investigation are reported mainly in two reports; (1) Fukushima Nuclear Accident Analysis Report (June 20, 2012), which identified the timeline and the proximate causes of the accident, and (2) Summary of Fukushima Nuclear Accident and Nuclear Safety Reform Plan (March 29, 2013) to set forth the results of the investigation and provide an analysis of the background factors surrounding the accident and countermeasures taken.

This presentation will first provide overview of the accident response at Fukushima Daiichi and Daini Nuclear Power Stations. Voices from the first responders at the sites will be introduced in order to share thoughts of individuals involved in the emergency response. Summary of retrospective study of the accident by one of the shift supervisors at the time of the accident will be presented in order to share the facts that happened at main control rooms.

The shift supervisor and his crew had to manage the situation for extended period of time that exceeded the scenarios that they had been trained, in a situation with no lightning and high radiation condition. During the accident response, shift supervisors had to decide to dispatch some of his crew members to the field to open valves, check the status of equipment etc., in the situation where the high radiation exposure is foreseen. The presentation will include conflict of shift supervisors and crew focusing on the human aspects.

In addition, actions being taken at the Emergency Response Centers (ERC) set up at the seismic-isolated building on-site and the Headquarters in Tokyo will be shared focusing on the human aspects related to the accident progress. This includes difficult decisions to dispatch first responders to the field, in the situation where a large number of aftershocks were observed and associated tsunami cautions were announced from time to time. Due to the occurrence of the SBO (Station Black Out), first responders had to engage in field works in the complete darkness while the field were scattered with damaged equipment, vehicles and other debris caused by the tsunami and explosions. Eventual loss of effective communication tools such as paging and PHS also hampered communication between the field, main control rooms and the ERC. In spite of the loss of effective communication tool and other equipment prepared for emergency response, the ERC personnel and shift crew members had to deal with concurrent event progress at six units at the same time; where sometimes the accident progress at one unit (e.g., explosion of the reactor building) also inversely affected the accident response at the adjacent units.

Communication within the ERC and between the site and the Headquarters as well as outside the company (e.g., Cabinet, regulatory authority) became more and more complicated and caused further confusion as the progress of accident at 6 units in Fukushima Daiichi and 4 units in Fukushima Daini NPSs. The presentation will describe actions and decisions

being taken in such extreme circumstances, to highlight the key lessons learned; such as importance of establishing strong command and control functions, data sharing system etc.

Learning from the accident, TEPCO has introduced new command and control system and staff are being trained with the new system. Also, reflecting the lessons from the accident response by shift crew at main control rooms and the field, training program for shift workers and first responders has been revised and more extensive and frequent emergency drills are conducted. In the presentation, such activities currently performed by TEPCO will be addressed.