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Press Release

What should we learn from the severe accident at the Fukushima Dai-ichi Nuclear Power Plant?

Regarding the Project

● **Background**: Upon uploading the "Business Breakthrough (BBT)" TV program broadcasts for BBT members regarding the severe accident at the Fukushima Dai-ichi Power Plant through YouTube on March 12th and 19th, we have received over 2.5 million views. I continued to broadcast information through my publications such as, "Japan: The Road To Recovery" published by Bungei Shunju Co. I was concerned that the government had been conveying the facts regarding the accident. So I made the following proposal to Accident Prevention Oversight Minister Goshi Hosono, who was an aide to the Prime Minister at the time;

1. As a 'second opinion from a neutral position' on the stress tests and the NISA's operations, I would like to start a project and summarize the proposals on the accident analysis and recurrence prevention within three months.
2. This project would be implemented from a taxpayer/citizen's standpoint on a volunteer basis, and the only request is for access to the information necessary for the investigation.
3. Since the data will be analyzed from an objective viewpoint, the research result may not be always what the government or electric power providers expect.
4. The project's existence should be handled in a confidential manner until the report is finalized.

● **Project team**: Dr. Kenichi Ohmae, held PhD in Nuclear Engineering at MIT and has an experience on design of high-breeder nuclear reactors at Hitachi Co. Ltd., is the Deputy Executive of this project. Mr. Iwao Shibata, who has an experience on project management, and another person served as secretariat.

Two members from Tokyo Electric Power Co Inc. as experts in nuclear reactor operations, two from Hitachi GE Nuclear Energy Co Ltd and four from Toshiba Corporation as experts in nuclear reactor design, cooperated for the interviews, hearings, and information gathering.

● **Research Method**: The Fukushima Dai-ichi, Fukushima Dai-ni, Onagawa, and Tokai Dai-ni Nuclear Power Plants were investigated with a focus on BWR-type.

1. What happened?: Regarding all plants, the details concerning what happened and how it happened since the earthquake were pursued to develop a timeline (chronology).
2. What were the causes and inducements?: Comparisons and variation analyses were

conducted between the four reactors that suffered severe accidents: Fukushima Dai-ichi Units 1, 2, 3 and 4, and those which could reach cold shutdown: Fukushima Dai-ichi Units 5 and 6, Fukushima Dai-ni, Onagawa, and Tokai Dai-ni.

3. What are the lessons learned?: Analysis of the cause and effect relationship was conducted between the design philosophy, design guideline, and development of the accident (chronology).
4. Organization/Risk management: Problems in the organizational management for severe accidents were examined (accident, radiation, evacuation instructions, relations with local municipalities, etc).
5. Information disclosure: Information disclosure to public, and its issue are examined.

Conclusion

- **Lesson**: **The biggest lesson is not that the "predictions on tsunami were too low", but that there was no "design philosophy and guideline" that indicates "no matter what happens, a severe accident will not be allowed to occur from the reactor"** - In that sense, the severe accidents at the four reactors at Fukushima Dai-ichi were not natural disasters, but man-made disasters.

1. There was an error in the design philosophy: The containment vessel myth, probability theory.
2. Design guideline was wrong: No consideration of long-term loss of all AC power, and no distinction between normal and emergency use equipments.
3. The generation and scattering of large quantities of hydrogen and fission products caused by core meltdown were beyond the scope of the design assumptions: No devices for hydrogen detection or safety measures to prevent hydrogen explosions.
4. There are multiple cases of 'coincidences' that prevented major accidents that were not in the original designs: Unit 6's air cooling generator, etc.

- **Proposal**: **For recurrence prevention, and for logical discussions on pros/cons of re-operations of the power plant.**

1. Clarification of the responsibility of regulatory authorities: Regardless of this man-made disaster, no one has taken their responsibility for the accident.
2. No matter how high the prediction is set, there is always a possibility of an event that exceeds it. The design concept should be revised to secure power and coolant (the ultimate heat sink) under any circumstances. Those nuclear reactors that can not fulfill these conditions should not be brought back into operation.
3. 'Multiplexing with differing principles' instead of 'multiplexing with the same mechanism' is needed.
4. Three independent systems of "normal, emergency, and extreme emergency use" must be established in the system design and operation.
5. A structure must be constructed to share information in real time with local officials, and

perform mutual decision making when accident mode (Accident Management) occurs.

6. Upon the management of extreme accidents, not only those on-site and power companies, but also central/local governments must take part in such as utilizing shared off-site devices and facilities, or the support from self-defense force.
7. Share this report with the world, as most nuclear reactors have the same design philosophy.

Important Findings

- **Power loss**: External AC power sources were greatly damaged by the earthquake (securing on-site power is a key) and was followed by long-term loss of all power sources (both DC and AC) which proved fatal.

・ Emergency diesel generators were submerged.
・ Emergency cooling pumps and motors placed on the sea side were damaged.
・ Direct current power sources (batteries) were submerged.
・ Electrical boards for external power intake were submerged.

・ These damages were all caused by a huge tsunami that exceeded all predictions. However, the reason of such a major accident was not because the predictions on tsunami were too low.
  － Even with a smaller tsunami, the emergency cooling water intake on the coast would have been destroyed.
  － The air-cooling emergency generator that was not submerged spelled the difference between the life and death of the reactors.

- **Design philosophy**: As long as the design philosophy is to secure power and cooling sources (and methods) in any event, 'cooling down' of a shutdown reactor could be operated, and severe accidents would be prevented.

・ It must be said that the design philosophy represented by the Nuclear Safety Commission's guideline, 'long-term loss of all AC power sources needs not to be considered', disregarded this extremely important point. This is the direct cause of the major accident in Fukushima Dai-ichi.

- **Was the message given to the public at the time of the accident appropriate?**

・ The government must have known that at the Fukushima Dai-ichi Unit 1 meltdown had occurred on March 11th. But even after over a month had passed, their announcement was still 'a meltdown has not occurred'. The divergence between the facts and the contents of their announcement is large.
・ The question still remains whether the information disclosure to the public and international society at-large was appropriate or not.

- **Regarding the speculation and rumors at the time**: As far as our project investigated,

there was no evidence that confirms the followings;

1. Event progression at Fukushima Dai-ichi Unit 1 was significantly accelerated because sea water injection and ventilation was delayed.
2. The event progression of Unit 1 was significantly accelerated because a large-scale pipe rupture occurred due to the earthquake.
3. The event progression of Unit 1 was significantly accelerated because the type of primary containment vessel was Mark I.
4. Event progression was accelerated because extreme operational mistakes occurred at the Fukushima Dai-ichi Plant.
5. The hydrogen explosion at Fukushima Dai-ichi Unit 4 occurred mainly because of spent fuel meltdown within the plant.

The main cause lies with the fact that the safety concept and design philosophy, "under any circumstances, power and cooling sources must be provided to the plant" were not sufficiently implemented. We should focus on this point for future prevention.

- **Facts that should be recognized justly and fairly**:

・ Even in the major earthquake, all nuclear reactors successfully performed emergency shutdown (scram), and no large scale pipeline rupture had occurred.

・ The on-site operation team at Fukushima Dai-ichi performed above and beyond just following the manual on and after March 11th, under the worst conditions and in an extremely dangerous environment.

Release of reports and contents

1. This report (full document) is viewable on the website at: http://pr.bbt757.com/2011/1028.html
2. This press conference and the detailed explanation (120 minutes) are available at the website below:
   - http://pr.bbt757.com/2011/1028.html
   - UStream live broadcast (from 18:00 today) Business Breakthrough 757ch Annex http://www.ustream.tv/channel/business-breakthrough-757-annex
3. Ongoing research results such as for the PWR (Pressurized Water Reactor) etc will be released.
4. Individual media interviews are not available.
5. For any questions regarding the facts, please contact: secretary@work.ohmae.co.jp

End of the release.