CAST Applied to Fukushima
Daiichi Nuclear Disaster

Horseback archery in Furudono Town, Fukushima

(Source) http://www.gimu.fks.ed.jp/shidou/jiten/

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1. Fukushima Daiichi Nuclear Disaster

*The Asahi Shimbun*

“Unit 2 Meltdown” (Mar. 15, 2011)
“Fukushima Daiichi Uncontrollable” (Mar. 16, 2011)


(Source) http://photo.tepco.co.jp/library/110316/110316_1f_chijou_2.jpg
2. Research Questions and Purposes

HOW and WHY did the safety control structure go wrong in managerial contexts?

[Purposes]
1. Identifying organizational constraints and unsafe control actions (UCAs) (Peacetime UCAs / Emergency UCAs)
2. Identifying the beliefs and contexts underlying these actions
3. Stakeholders, Safety Constraints and UCAs

National Government

Prime Minister's Office

METI

NSC

NISA (Regulator)

Off-site Center

Fukushima Pref.

Residents

Head Office

Operators

Fukushima Daiichi Nuclear Power Plant

Tokyo

Fukushima

TEPCO: Tokyo Electric Power Company

METI: Ministry of Economy, Trade and Industry
NISA: Nuclear and Industrial Safety Agency
NSC: Nuclear Safety Commission

TEPCO: Tokyo Electric Power Company (Nuclear Operator)
3-1. Tokyo Electric Power Company (TEPCO)

[Safety Constraints]
• Primarily responsible for nuclear safety

[Unsafe Control Actions] (Operators)
• Inadequate control of severe accidents

(Context) Loss of the main control room function, lighting and communication systems
3-1. Tokyo Electric Power Company (TEPCO)

[Unsafe Control Actions] (Head Office)

- Lack of NPP reinforcement against tsunamis
- Inadequate education, training and instruction

(Mental Model Flaws)

- “Huge tsunamis will not occur in the near future.”
- “Nuclear accident will not happen.” (Safety Myth)
3-2. Nuclear and Industrial Safety Agency (NISA)

[Safety Constraints]
- Nuclear regulation
- Disaster prevention and damage mitigation

[Unsafe Control Actions]
- Did not give TEPCO appropriate supervision
  (Mental Model Flaws)
  ➢ “Severe accidents will never happen.” (Safety Myth)
3-2. Nuclear and Industrial Safety Agency (NISA)

[Unsafe Control Actions]

- Did not prepare for severe accidents beforehand

→ Off-site Center did not function (disconnected communication)

→ NISA’s ineffective emergency response
3-3. Nuclear Safety Commission (NSC)

[Safety Constraints]

- Double check safety regulations and decide regulation policies
- Provide technical advice to the Prime Minister in case of an emergency
3-3. Nuclear Safety Commission (NSC)

[Unsafe Control Actions]
- Did not sufficiently check regulations and decide effective regulation policies

(Context) Influence of METI etc. / No right to investigate NISA and TEPCO

- Did not provide appropriate advice to the Prime Minister at the time of disaster
3-4. Prime Minister’s Office

[Safety Constraints]
- Play a pivotal role in the emergency response (e.g. protection of residents)

[Unsafe Control Actions]
- Caused confusion by unplanned decision making processes (e.g. direct intervention to TEPCO)
3-5. Fukushima Prefectural Government and Municipal Governments

[Safety Constraints]
- Protection of residents

[Unsafe Control Actions]
- Ineffective evacuation drills
- Did not dispatch personnel to the Off-site Center

(Contexts)
- Tied up with their response to the earthquake and tsunami disasters
Regulations didn’t work. Poor emergency response.
4. Underlying Beliefs and Contexts

- Unpreparedness for severe accidents
- Difficulty to take actions for system safety
- Unpreparedness for compound disasters (e.g.) earthquake AND nuclear accident
- Micromanagement of every aspect of hardware
- Past performance on plant robustness

(Symptoms)

(Explanations, Contexts)

“Safety Myth” (explanation on safety)
5. Administrative Issues

(TEPCO)

- Top management lacked attitude toward nuclear safety.

In contrast, Tohoku Electric Power Company:

- Was well aware of the risks of tsunamis
- Had top management firmly advocating safety
- Had a culture to prioritize safety above all

(Source) http://www.tohoku-epco.co.jp/

Onagawa NPP
(Tohoku Electric Power Co.)
5. Administrative Issues

(Government)

- Complex admin. structure for promotion and regulation

![Diagram showing the administrative structure with Cabinet Office, Ministry of Education Culture, Sports, Science and Technology (MEXT), Ministry of Economy, Trade and Industry (METI), Atomic Energy Commission (AEC), Nuclear Safety Commission (NSC), Research and Development Bureau, Science and Technology Policy Bureau, Agency for Natural Resources and Energy (ANRE), and Nuclear and Industrial Safety Agency (NISA).]
5. Administrative Issues

(Government)

- Bureaucracy
  - Reliance on precedent
    - Regulations rarely reviewed and updated
  - Document-based inspections ("Checklists")
    - Micromanagement of hardware
  - Periodic personnel rotation
    - Lack of expertise as a regulator
6. Conclusion

By using the CAST process,
• The control structure proved to have been ineffective for a severe accident or a compound disaster (NOT just TEPCO and NISA)

Administrative issues helped “Safety Myth” grow, which made it difficult to take further actions for system safety

Possible recommendations include:
➢ Administrative reformation ✔
➢ Periodic check by third-party scientists / IAEA
➢ Learning from this accident (e.g. preservation)
References


