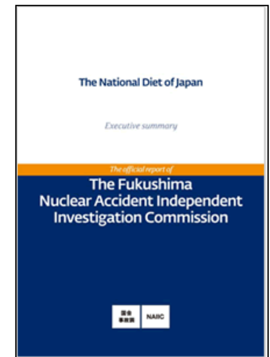
Fukushima nuclear accident



On 11 March 2011, the Great East Japan Earthquake, which killed around 19,000 people and destroyed the lives of many more, triggered a nuclear accident at the Fukushima Daiichi nuclear power plant.

An animated timeline of the event may be found on the BBC website.

The series of failures, meltdowns, and radioactive releases was ultimately declared a 'Severe Accident' (Level 7) on the International Nuclear Event Scale (INES).

The report by the Fukushima Nuclear Accident Independent Investigation Commission highlighted some worrying failings in the nuclear industry from which we can all learn.

Learning points for the wider rail industry

The Commission's report contains the following learning points that could be of relevance to the rail Industry and may warrant consideration in the context of your company and its safety management system:

- Reluctance to ask questions
- Insularity
- 'Self-interest' vs 'public interest'
- 'Not invented here' syndrome
- Failure to learn
- Low levels of knowledge
- Flawed training materials and manuals
- Poor crisis management co-operation
- Interference by politicians
- Confused chain of command
- Poor regulation
- Lack of transparency
- Ignoring potential risk to public health and welfare

Overview and background

The Commission's investigation found that, while triggered by 'cataclysmic events', the Fukushima accident 'was a profoundly manmade disaster – that could and should have been foreseen and prevented. And its effects could have been mitigated by a more effective human response.'

The report lists 'a multitude of errors and wilful negligence that left the Fukushima plant unprepared for the events of March 11'. It also examines 'serious deficiencies in the response to the accident' by owner-operators TEPCO (the Tokyo Electric Power Company), industry regulators and the government.

'What must be admitted,' the report goes on, 'is that this was a disaster "Made in Japan". Its fundamental causes are to be found in the ingrained conventions of Japanese culture: our reflexive obedience; our reluctance to question authority; our devotion to "sticking with the program"; our groupism; and our insularity.'

…reluctance to question authority…

…insularity…

After the oil crises of the 1970s, Japan accelerated the development of nuclear power. It was embraced as a policy goal by government and business alike, and pursued with 'the same single-minded determination that drove the country's post-war economic miracle'.

'With such a powerful mandate,' says the Commission, 'nuclear power became an unstoppable force, immune to scrutiny by civil society. Its regulation was entrusted to the same government bureaucracy

Produced by RSSB
Author: Greg Morse, Operational Feedback Specialist; email: enquirydesk@rssb.co.uk

responsible for its promotion. At a time when Japan's self-confidence was soaring, a tightly knit elite with enormous financial resources had diminishing regard for anything "not invented here".'

The Commission believes the root causes of this accident 'cannot be resolved and that the people's confidence cannot be recovered as long as [it] is seen as the result of error by a specific individual. The underlying issue is the social structure that results in "regulatory capture," and the organizational, institutional, and legal framework that allows individuals to justify their own actions, hide them when inconvenient, and leave no records in order to avoid responsibility.'

The Commission found 'a disregard for global trends and a disregard for public safety'. It found 'a habit of adherence to conditions based on conventional procedures and prior practices, with a priority on avoiding risk to the organization', and 'an organization-driven mindset that prioritized benefits to the organization at the expense of the public.'

Findings

'A man-made disaster'

'…decisions based on…self-interest, and not in the interest of public safety…'

The Commission says the accident was the result of 'collusion between the government, the regulators and TEPCO, and the lack of governance by said parties'. It concludes that the accident was 'man-made', and that the root causes were 'the organizational and regulatory systems that supported faulty rationales for decisions and actions'.

The operator (TEPCO), the regulatory bodies (NISA and NSC) and the government body promoting the nuclear power industry (METI), 'all failed to correctly develop the most basic safety requirements – such as assessing the probability of damage, preparing for containing collateral damage from such a disaster, and developing evacuation plans for the public in the case of a serious radiation release.'

'They either intentionally postponed putting safety measures in place, or made decisions based on their organization's self-interest, and not in the interest of public safety.'

'TEPCO and the Nuclear and Industrial Safety Agency (NISA) were aware of the need for structural reinforcement in order to conform to new guidelines, but rather than demanding their implementation, NISA stated that action should be taken autonomously by the operator.'

In addition, although NISA and the operators were aware of the possibility of core damage from a tsunami, 'no regulations were created, nor did TEPCO take any protective steps against such an occurrence.'

…'not invented here'…

…failure to learn…

The regulators and TEPCO had been aware since 2006 of the risk that a total outage might occur at Fukushima if a tsunami were to reach the level of the site. They were also aware of the risk from reactor core damage from the loss of seawater pumps in the case of a tsunami larger than assumed in the Japan Society of Civil Engineers estimation. NISA knew that TEPCO had not prepared any measures to lessen or eliminate the risk, but failed to provide specific instructions to remedy the situation.'

The Commission 'found evidence that the regulatory agencies would explicitly ask about the operators' intentions whenever a new regulation was to be implemented'.

'The regulators also had a negative attitude toward the importation of new advances in knowledge and technology from overseas.' In brief, if NISA had passed on to TEPCO lessons from 9/11, and if TEPCO had put measures in place, 'the accident may have been preventable.'

The Commission also feels that TEPCO 'was too quick to cite the tsunami as the cause of the nuclear accident and deny that the earthquake caused any damage'.

In fact, there is 'a possibility that the earthquake damaged equipment necessary for ensuring safety, and that there is also a possibility that a small-scale 'loss of coolant accident' occurred'.

Produced by RSSB
Author: Greg Morse, Operational Feedback Specialist; email: enquirydesk@rssb.co.uk

Fukushima nuclear accident

Evaluation of operational problems

> …low levels of knowledge…
>
> …flawed training materials and manuals…

The Commission concludes that there were 'organizational problems' within TEPCO.

'Had there been a higher level of knowledge, training, and equipment inspection related to severe accidents, and had there been specific instructions given to the on-site workers concerning the state of emergency within the necessary time frame, a more effective accident response would have been possible.'

Recovery work should have been conducted swiftly because of the loss of DC power, but was not. TEPCO did not plan measures for the emergency operation, and had no manual or training regimens.

On top of this, sections in the diagrams of the severe accident instruction manual were missing. Workers not only had to work using this flawed manual, but they were pressed for time, and working in the dark with torches as their only light source.

'[G]given the deficiencies in training and preparation – once the total station blackout occurred, including the loss of a direct power source, it was impossible to change the course of events.'

Emergency response issues

The situation continued to deteriorate because 'the crisis management system of the Prime Minister (the 'Kantei'), the regulators and other responsible agencies did not function correctly'. The boundaries defining the roles and responsibilities of the parties involved were 'problematic, due to their ambiguity'.

> …poor crisis management co-operation…
>
> …interference by politicians…
>
> …confused chain of command…

'In the critical period just after the accident,' says the Commission, 'the Kantei did not promptly declare a state of emergency.'

The Kantei 'made his way to the site to direct the workers who were dealing with the damaged core. This unprecedented direct intervention […] diverted the attention and time of the on-site operational staff and confused the line of command.'

'While TEPCO headquarters was supposed to provide support to the plant, in reality it became subordinate to the Kantei, and ended up simply relaying [his] intentions.'

'This was a result of TEPCO's mindset, which included a reluctance to take responsibility, epitomized by President Shimizu's inability to clearly report to the Kantei the intentions of the operators at the plant.'

'The Kantei, the regulators and TEPCO all understood the need to vent Unit 1. TEPCO had been reporting to NISA, as was the standard protocol, that it was in the process of venting. But there is no confirmation that the venting decision was conveyed to senior members of METI, or to the Kantei. This failure of NISA's function and the scarcity of information at TEPCO headquarters resulted in the Kantei losing faith in TEPCO.'

Evacuation issues

'The Commission concludes that the residents' confusion over the evacuation stemmed from the regulators' negligence and failure over the years to implement adequate measures against a nuclear disaster, as well as a lack of action by previous governments and regulators focused on crisis management.'

'The crisis management system that existed for the Kantei and the regulators should protect the health and safety of the public, but it failed in this function.'

Produced by RSSB
Author: Greg Morse, Operational Feedback Specialist; email: enquirydesk@rssb.co.uk

Fukushima nuclear accident

Reforming the regulators

> …poor regulation…
>
> …lack of transparency…

The Commission concluded that 'the safety of nuclear energy in Japan and the public cannot be assured unless the regulators go through an essential transformation process. […] Japan's regulators need to shed the insular attitude of ignoring international safety standards and transform themselves into a globally trusted entity.'

The regulators did not monitor or supervise nuclear safety. 'The lack of expertise resulted in "regulatory capture," and the postponement of the implementation of relevant regulations. They avoided their direct responsibilities by letting operators apply regulations on a voluntary basis. Their independence from the political arena, the ministries promoting nuclear energy, and the operators was a mockery. They were incapable, and lacked the expertise and the commitment to assure the safety of nuclear power.' Moreover, they 'lacked transparency.'

Reforming the operator

'TEPCO did not fulfil its responsibilities as a private corporation, instead obeying and relying upon the government bureaucracy of METI, the government agency driving nuclear policy. At the same time, through the auspices of the FEPC, it manipulated the cozy relationship with the regulators to take the teeth out of regulations.'

'The risk management practices of TEPCO illustrate this. If the risk factors of tsunami are raised, for example, TEPCO would only look at the risk to their own operations, and whether it would result in a suspension of existing reactors or weaken their stance in potential lawsuits. They ignored the potential risk to the public health and welfare.'

> …the operator 'ignored the potential risk to the public health and welfare'…

'Problems with TEPCO's management style, based on the government taking final responsibility, became explicit during the accident.'

'TEPCO's behavior [sic] was consistently unclear.' After the accident, it 'continued to avoid transparency in disclosing information. It limited disclosure to confirmed facts, and failed to disclose information that it felt was uncertain or inconvenient.'

Reforming laws and regulations

'The Commission concludes that it is necessary to realign existing laws and regulations concerning nuclear energy. Mechanisms must be established to ensure that the latest technological findings from international sources are reflected in all existing laws and regulations.'

'Laws and regulations related to nuclear energy have only been revised as stopgap measures, based on actual accidents. They have not been seriously and comprehensively reviewed in line with the accident response and safeguarding measures of an international standard.'

'As a result, predictable risks have not been addressed. The existing regulations primarily are biased toward the promotion of a nuclear energy policy, and not to public safety, health and welfare. The unambiguous responsibility that operators should bear for a nuclear disaster was not specified. There was also no clear guidance about the responsibilities of the related parties in the case of an emergency.

Further information

The Commission's full report may be found here:

http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naiic.go.jp/en/

Produced by RSSB
Author: Greg Morse, Operational Feedback Specialist; email: enquirydesk@rssb.co.uk