

# Lessons from Japanese earthquake , tsunami and Nuclear disaster-4

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# Black Swan?- think again

- Federal safety regulator worried in 1972 that GE's Mark 1 reactors would fail in an emergency and urged a ban.
- Fukushima Daiichi had Mark 1 reactors
- USA has 23 Mark 1 reactors.
- A Vermont plant was relicensed for 20 more years the day before the disaster in Japan!
- In 2003 industry lobbyists beat back an NRC committee recommendation for new back-up power rules.
- Republicans have dismissed Japan's crisis as a once-in-a-lifetime fluke.
  - Note the words- **once in a life time**
- GOP Senator James Inhofe suggests: "once in 300 years , a disaster occurs'.

# One more basic flaw in Fukushima

- In older reactors like the one in Fukushima there was one more shortcoming in design.
- Spent fuel rods are stored inside the concrete reactor building for at least ten years.
- As long as water circulated constantly the pools remained stable.
- When power is lost circulation stops.

# Passive safety systems would have helped

- Reactors could be immersed in water at all times
- In the event of accidents the vessel could be opened to allow coolant to circulate on its own
- The problem is cost.
- But it is a fraction of the ultimate cost of the disaster.

# The reaction around the world

- Switzerland announced a freeze on new nuclear plants
- Germany shut down all its factories built before 1980
- US Congress called for hearings on nuclear safety

# Lesson-21

- In such high risk areas like Nuclear power
- Do not ignore warnings
- Go for latest technology and replace old ones at regular intervals even though costly
- When you have four diesel gensets and all four go out at the same time, it is not redundancy
- Cost should not be a factor when thinking of safety

# How prepared the Japanese were

- Only country in the world with earthquake early warning systems
- Only one with a successful tsunami alert system
- 300 earthquake sensors scattered in territorial waters can predict tsunami in minutes
- Tsunami evacuation plans posted everywhere
- Tsunami warning methods used:
  - Radio broadcasts
  - Text messages
  - Sirens
  - Door-to-door calls by firemen
  - Instinct honed by years of disaster drills at schools

Helped huge no. of people to move to higher ground and that is how the loss of lives in such a large scale disaster is so less!

# Lesson-21

- All companies should learn from Japanese how to react in an emergency.

# Fukushima is no Chernobyl

- Chernobyl
  - Had no containment vessels
  - Once the external building blew the radio active plume blasted out everywhere
  - Was used to process plutonium for weapons
  - That made it susceptible to explosions
  - The operators were testing a new safety protocol that spun out of control
- Thank God Fukushima is no Chernobyl
- Even then....

# The worst case scenario in Fukushima

- The worst case scenario is:
- Water cannot be pumped in fast enough
- Temperature in core will exceed 5000 degrees F
- Hundreds of fuel rods slump to the bottom of the containment vessel
- Fuel burns thru foundation of the plant contaminating water table
- Pressure in cores climbs to such level that they will erupt spreading deadly carcinogenic cloud across Japan and
- Depending on the **whims of the wind –around the world!**

# Lesson-22

- Is your factory a Chernobyl waiting to happen?
- How prepared is it for emergencies?
- What is the worst case scenario?
- For anyone who is looking at a capital project where the world's best safety systems are not in place or are being debated on grounds of cost, the best way to drive home the point may be to predict 'what will happen if' in such dreaded, gory detail as done in the last slide!

# Impact on global commerce

- Global Supply Lines at Risk as Shipping Lines shun Japan due to radiation fears. The fears have escalated after China detected radiation on a large container ship belonging to Mitsui O.S.K Lines and quarantined the ship. The ship had sailed around 80 miles near the damaged nuclear power plant.
- Japan's earthquake may cause global automotive production to fall by as much as 30 percent.
- However Toyota announced that it will resume Japanese production of vehicles like Prius , Lexus on Monday 28<sup>th</sup> Mar 2011! That is just 2 weeks from Mar 11 when the disaster struck.

# Wal-Mart response

- Within minutes of the earthquake in Japan Wal-Mart activated its emergency operations centre in Bentonville and command centres in Tokyo and Hong-kong
- A dozen of Wal-Mart's Seiyu stores in quake hit Sendai area restarted full operations on 27 mar 11!

# Lesson-23

- There must be lessons all of us can learn from Toyota/Wal-Mart for such an amazing springing back in the affected country itself!

# After natural disasters resilient countries come back

- Growth after natural disaster: China saw nearly half percent jump in GDP after the earthquake in 2008.
- After Kobe earthquake of 1995 manufacturing sector was back within a month and GDP in 1996 was 2.5 % against 2% for 1995.
- Now also Japan will come back

# Japan will come back

- Arthur Alexander economist , president Japan economic institute Washington for 10 years says in the NPR Planet money podcast:
  - Japanese economy is Tremendous and has great resilience , redundancy and robustness.
  - The affected part in Japan is a small part; the most hard hit prefecture produced 1.5% of total output of country
  - Also the Government may be able to raise taxes which they have not been able to do for 10 years.
  - Not considering the loss of wealth (which is not counted in GDP) Japan's GDP may go up
  - Also the country will get latest technology and new roads, bridge, cell phone powers- all more modern, more productive and more efficient!

# The FORCE

- The Quake was so powerful
  - It shifted the earth on its axis
  - Made earth spin faster
  - Shortened the day by 1.8 millionths of a second
  - Shoved Japan one parking space to the east
  - The tsunami wave speed in deep water, open ocean, is about the same as a commercial jet's ground speed!
- Man thinks he can conquer nature but he does not even understand it.
- Man has to ponder that the observable universe has a radius of 14 billion light years!

# Mother of all lessons

- No amount of planning, no skills or specs or spreadsheets , can stop a force that moves the plant.
- Ultimately we are all puppets in HIS hands.

# Sources for part 4

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