



Lessons Learned from the Fukushima Dai-ichi Accident regarding Safety Culture of Regulatory Body

Toyoshi Fuketa
Nuclear Regulation Authority



The 6th International Symposium and Seminar
on Global Nuclear Human Resource Development
for Safety, Security and Safeguards,
Tokyo Institute of Technology, Tokyo, Japan
February 20, 2017

In lieu of Introduction

Report of Japanese Government
to IAEA Ministerial Conference on
Nuclear Safety, June 2011

XII. Lessons Learned From the Accident Thus Far (28) Thoroughly foster **safety culture**

- All those involved with nuclear energy should be equipped with safety culture. ... **Without safety culture, there will be no continuous improvement** of nuclear safety.
- (The operators) ... should take a hard look at whether they have been serious in introducing appropriate measures for improving safety, **when they are not confident that risks ... remain low.** ➔ Priority to safety
- Also, (the regulators), ... as those who responsible for ... safety of the public, should take a hard look at whether they have been serious in **addressing new knowledge in a responsive and prompt manner, not leaving any doubts in terms of safety.** ➔ Agility
- ... Japan **will establish a safety culture** .., namely that **pursuing defenses-in-depth** is essential for ensuring nuclear safety, ... and by maintaining an attitude of trying to identify weaknesses as well as room for safety enhancement.



Diet and Government reports wrote:

National Diet's Report [1]:

- The TEPCO Fukushima NPP accident was the result of **collusion between the government, the regulators and TEPCO**, and the lack of governance by said parties. They effectively betrayed the nation's right to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly “manmade.”
 - **Lack of regulatory independence** ➔ “Regulatory Capture”

Government's Final Report [2]:

- ... reveals a fundamental problem of the inability to capture such crises as a reality that could happen in our lives; **this, in turn, is the result of a safety myth** that existed among nuclear operators including TEPCO as well as the government, that **serious severe accidents could never occur in nuclear power plants in Japan.**

[1] Report from **NAIIC** (the National Diet's Fukushima Nuclear Accident Independent Investigation Commission), July 5, 2012

[2] Final Report from The Government's Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, July 23, 2012

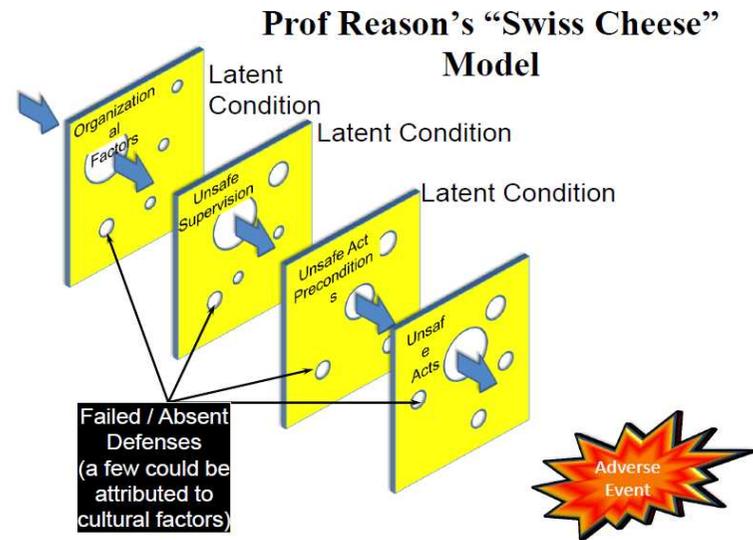
Cultural Bias

Message from NAIC Chairman

National Diet's Report

- For all the extensive detail it provides, what this report cannot fully convey – especially to a global audience – is **the mindset that supported the negligence behind this disaster.**
- What must be admitted – very painfully – is that this was a disaster “Made in Japan.” Its fundamental causes are to be found in the **ingrained conventions** of Japanese culture:

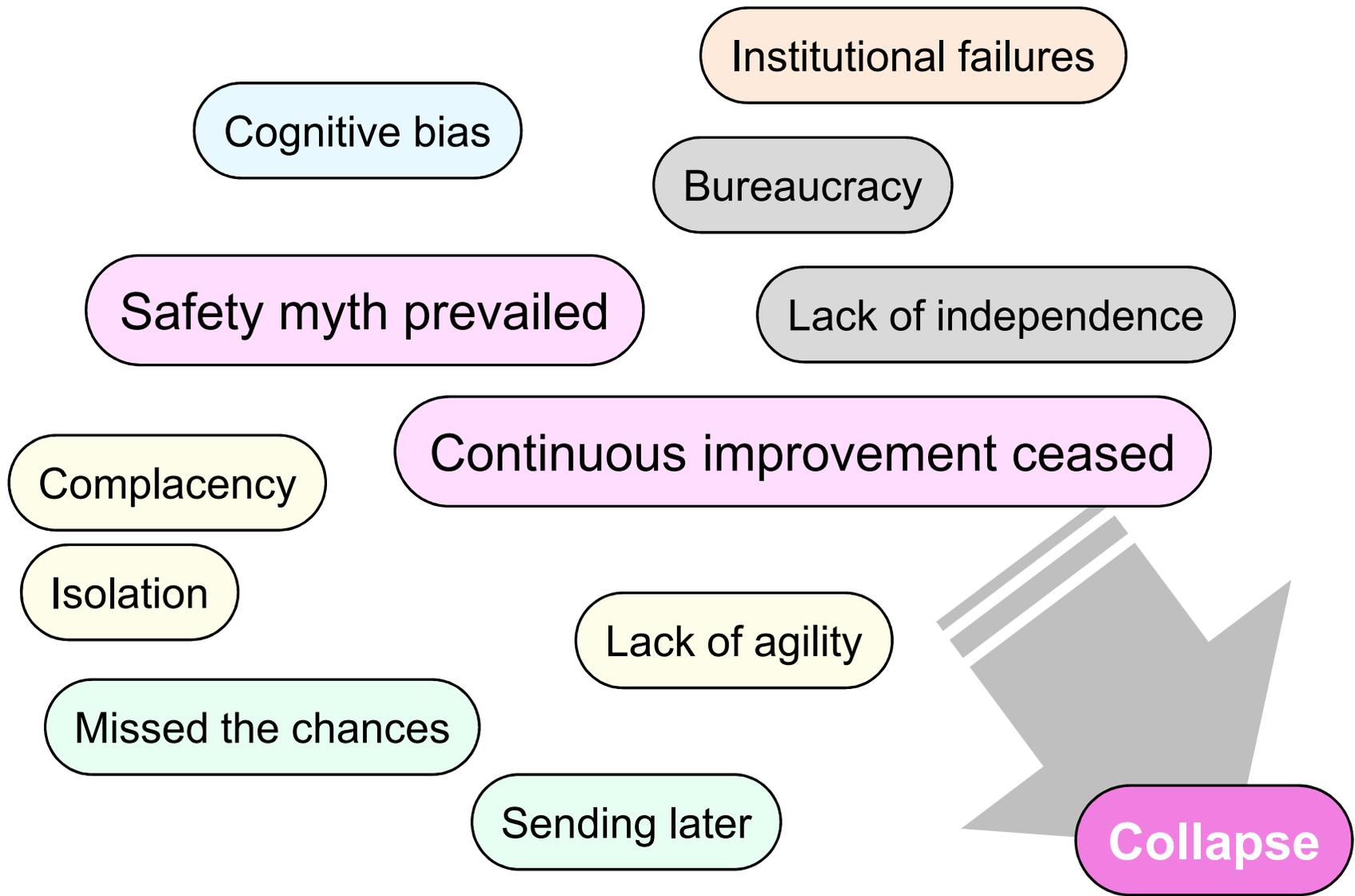
- our **reflexive obedience**;
- our **reluctance to question authority**;
- our devotion to ‘sticking with the program’;
- our **groupism**; and
- our **insularity**.



✓ Look universal ✓ May produce another safety myth



“Complacency” together with “Bureaucracy” allow “Safety myth” to prevail, letting “Continuous improvement” cease.





Cognitive Bias

- ✓ We tend to have **positive illusions** that lead us to conclude that a problem doesn't exist or is not severe enough to merit action.
- ✓ We overly **discount the future**, reducing our courage to act now to prevent some disaster that we believe to be quite distant.
- ✓ The fact is that decisions concerning the future will always contain some degree of uncertainty. **Uncertainty allows for wishful thinking**, but reality is too often deaf to our wishes.



Safety Myth

- ✓ Zero risk illusion
 - Easiest way that started to persuade stakeholders
 - Regulators became involved, though they should not have been done.
 - They themselves trapped by “Safety myth” and captured to think consistently with it.

- ✓ Safety myth brought about:
 - “Sending later” attitude, Lack of agility
 - Go the easy way, easy option
 - Loss-of-self criticism, complacency
 - Loss-of learning attitude, Isolation
 - Lack of comparison, avoid lift each other up
“all the facilities are equally safe”

- ✓ “Safety myth” goes with “Bureaucracy”

“Safety myth” brought about, e.g.

- Following the approval of the draft **IAEA safety guide GS-G-2.1**, the NSC held the first meeting of the WG for Reviewing the EPR Guide in March in 2006
- The WG initially aimed to introduce the concept of **PAZ (Precautionary Action Zone)**. However, the WG met with a strong opposition from NISA... :
 - ... in Japan it was extremely unlikely that a serious accident leading to a release of large amount of radioactive materials would occur; ...there was no need to immediately evacuate residents within a 5-km radius... ➔ **“Safety Myth”**
 - ... if IAEA’s approaches ... are introduced, ... the local residents there would be forced to consider relocation ... ; this would cause significant social confusion and foster a perception that the existing ... measures based on EPZ is insufficient ... ➔ **“Don’t wake a sleeping child”, “Bureaucracy”, etc.**



Easy Option

- ✓ From number of years ago, some experts in the field of severe accident and emergency preparedness and response keep questioning the decision-making system in taking protective actions under emergency by overly relying on source term prediction and dose projection systems.
- ✓ “Source term prediction at emergency is precise and reliable enough” was another safety myth. Those systems were an easy option for many.



Missed the Opportunities

✓ Against SBO

National Diet's Report

- Following the implementation of new regulations in the U.S. in 1988..., the NSC in 1991 set up the WG on SBO under the NSC's Committee on Operating Experience Feedback
- ... concluding that the probability of an SBO occurring was low... The report did not make any recommendations on incorporating SBO in the Safety Design Guide ...

Lack of Agility

- Merriam-Webster “Agility”
 - marked by ready ability to move with quick easy grace
 - having a quick resourceful and adaptable character

<http://www.merriam-webster.com/dictionary/agile>

✓ Tsunami risk recognized

National Diet's Report

- By 2006, NISA and TEPCO shared information on the possibility of a SBO occurring at the Fukushima Dai-ichi plant They also shared an awareness of the risk of **potential reactor core damage from a loss of seawater pumps** ...
- ... NISA was aware of **TEPCO's delaying of countermeasures**, but did not follow up with any specific instructions or demands. **Nor did they properly supervise the backcheck progress.** ➔ **Lack of Agility**
- When new findings indicate the possibility of a tsunami exceeding previous assumptions, the operator... is required to **quickly implement countermeasures**, rather than taking time to clarify the scientific basis...



Omission Bias and the Status Quo

- ✓ We tend to maintain the status quo, and refuse to accept any harm that would bring about a greater good.
- ✓ As a society, we are much more prone to make errors of omission (doing nothing) than errors of commission (causing harm).

Bazerman, M. H., and Watkins, M. D., "Predictable surprises", Harvard Business School Press, 2004.

- They (operators and regulatory agencies) chose instead to go the easy way, with the attitude: "Don't disturb a sleeping baby." They ... were meek in their efforts to tackle the issues...with a sense of urgency.
- Altogether, this was nothing less than **bureaucratic inertia** - which is incompatible with a safety culture.



Institutional Failures

- ✓ **Incentive failures** occur when people in the organization have the requisite insight needed to prevent emerging problems, but fail to do so ... because they lack an incentive to take action ...
- ✓ **Prioritization failures** arise when leaders and organizations recognize potential threats but do not deem them sufficient to warrant serious attention.
 - ➡ Failure to devote necessary resources

Bazerman, M. H., and Watkins, M. D., "Predictable surprises", Harvard Business School Press, 2004.

Structural Problems

- ... promotion of nuclear power came first in importance. ... Therein lies the fundamental reason why the formulation and development of a sound safety culture was hampered.
- ... for Japan's regulators, "promotion" considerations took priority over introducing new regulatory measures. They feared that new regulations might call into question the validity of the safety measures that were in place, raise the risk of defeat in lawsuits by anti-nuclear advocates, or draw the unwelcome attention....
- They stuck to their belief of infallibility so much that they were reluctant to improve safety regulations...



Oblivious

- ✓ Criticality accident at JCO plant in 1999

The root of this accident was **lack** or **erosion of “crisis awareness”** of criticality accident. ...it is important to keep it in mind... To prevail this **crisis awareness** in our society, we must change our consciousness from "**safety myth**" or "**absolute safety**" into "**risk informed safety assessment**".

NSC's Report on JCO criticality accident at Tokai-mura, Dec. 1999

- ✓ Loss of institutional memory

Lapses in capturing lessons-learned, and **long-term erosion** of the fabric of **institutional memory** due to **personnel losses**

Bazerman, M. H., and Watkins, M. D., “Predictable surprises”, Harvard Business School Press, 2004.



NRA's Efforts to foster Nuclear Safety Culture

- ✓ NRA's Core Values and Principles, Jan. 2013
- ✓ Transparency through live video on the web and disclosure of documents
 - Clear message from NRA Chair on “no more safety myth”.
 - Attitude to seek for safety improvement through conformance review meetings with licensees
- ✓ Enhancement of technical infrastructure within the NRA
 - Operational feedback with agility, e.g., the loss of one of the three phases of the offsite power circuit at Byron Station.
 - Human resource development: recruit and training, regulatory research programs
- ✓ International peer reviews:
 - IPPAS in Feb. 2015 and IRRS in Jan. 2016: use as opportunities for identifying the areas for further improvement

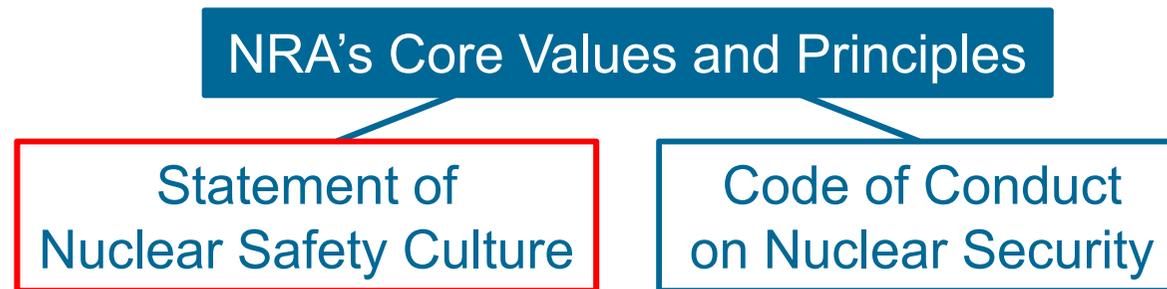


NRA's Statement of Nuclear Safety Culture

Issued on May 27, 2015

16

Structure of NRA's Mission Statements in its Management System



Eight Traits of Nuclear Safety Culture in NRA's Statement

1. Priority to Safety → Break with "safety myth"
2. Decision-making prioritized by safety
3. Fostering, sustaining and strengthening safety culture
4. Organized learning → Seek out "opportunities for improvement"
5. Communication → Get rid of "isolation"/"self-righteousness"
6. Questioning attitude → Avoid "complacency"
7. Rigorous and prudent judgment and action with agility
8. Harmonization with nuclear security



Closing remarks

The NRA was designed and established as an independent regulatory body in Japan based on lessons learned from the Fukushima Dai-ichi accident. The NRA has been working intensively with thorough transparency, and recently issued a statement of nuclear safety culture.

The accident keeps being a distinct memory at present. All the NPPs are still shut-down status, and nation-wide, furious discussions about re-start are going on. Accordingly, activities in the NRA get a lot of attention, and sense of mission, sense of responsibility in NRA members is quite vivid in their mind.

We, however, acknowledge we are oblivious. We must incorporate lessons-learned into the “institutional memory” of the NRA.

Numerous sprouts of safety myth reappear already. We still face problems and difficulties in incentive and prioritization. It is absolutely inevitable for us to keep having self-questioning attitude for safety culture.

We must create an environment where a gene letting us think “safety first” can survive.



That's all for my talk regarding **safety culture of regulatory body...**

In addition, the following slides describe our on-going reform of **inspection**, particularly about licensee's safety culture



IRRS Mission

The Integrated Regulatory Review Service (IRRS) team performed a mission (Jan. 11-22, 2016) to assess the regulatory framework for nuclear and radiation safety in Japan.



Good Practices

The IRRS team identified good practices:

- ✓ The swift establishment of a legal and governmental framework that supports a new independent and transparent regulatory body with increased powers.
- ✓ NRA's prompt and effective incorporation of lessons learned from the Fukushima Dai-ichi accident in the areas of natural hazards, severe accident management, emergency preparedness and safety upgrades of existing facilities, into Japan's new regulatory framework.



Examples of Recommendations and Suggestions

- ✓ The NRA should work to attract competent and experienced staff, and enhance staff skills relevant to nuclear and radiation safety through education, training, research and enhanced international cooperation.
- ✓ Japanese authorities should amend relevant legislation to allow NRA to perform **more effective inspections** of nuclear and radiation facilities.
- ✓ The NRA and all entities it regulates should continue to **strengthen the promotion of safety culture**, including by fostering a questioning attitude.

Recommendation on Inspection

- ✓ The government should improve and simplify the inspection framework to:
 - Increase NRA flexibility to provide for efficient, **performance based**, less prescriptive and **risk informed** regulation of nuclear and radiation safety;
 - Ensure NRA inspectors have formal rights for **free access** to all facilities and activities at any time;

- ✓ NRA should develop and implement a program of inspection specifying types and frequency of regulatory inspections (including scheduled inspections and unannounced inspections) in accordance with a graded approach.



Bill for Amendment of Relevant Acts on Inspection, etc.

Submitted to the Diet on Feb. 7, 2017

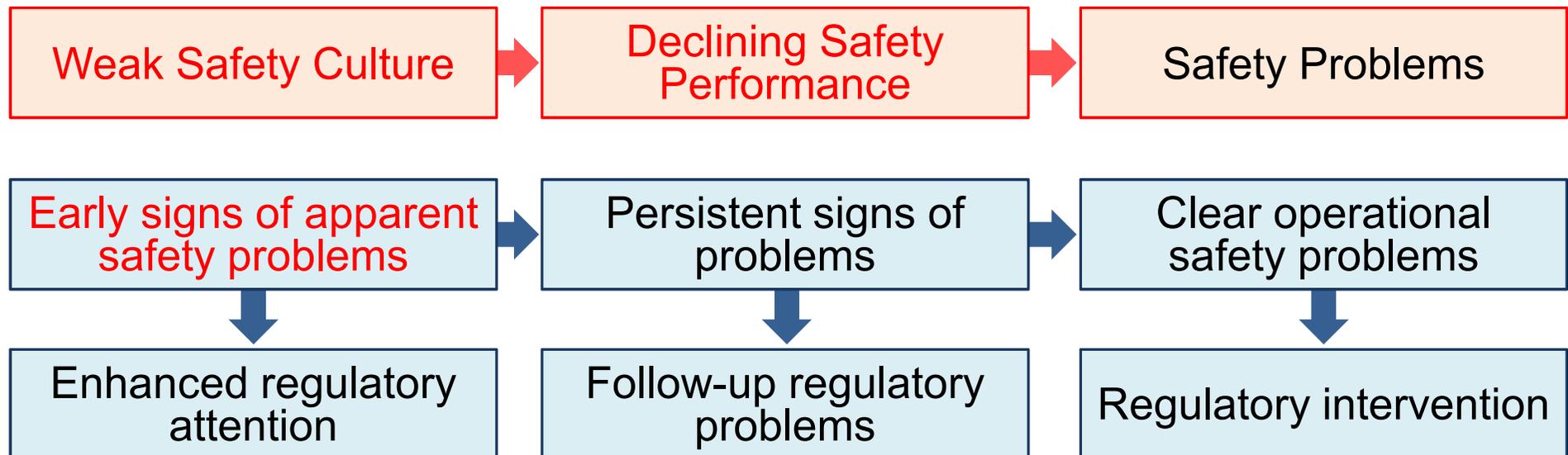
Aiming at

- ✓ Inspection framework leading to **continuous improvement of safety** through the licensees' efforts for enhancing safety even beyond the regulatory requirements
 - Clarification of **licensee's prime responsibility** for safety
 - **Performance-based** approach,
- ✓ **Comprehensive regulatory oversight/assessment** and taking actions based on its results, not checking every detail of pre-determined items
 - Assess licensee's activities anytime and anywhere
 - Unify/simplify current various inspection categories

How to Evaluate Licensee's Safety Culture

OECD/NEA CNRA Green Booklets, Improving Nuclear Regulation, 2009

- ✓ Importance to capture early warning sign of declining safety culture. One of the most difficult challenge in assessing the safety performance is to recognize the early signs of declining safety performance, before ... a serious incident or accident occurs.
- ✓ The indicators are at such a high level that they give few clues regarding the underlying weaknesses causing the declining performance.



Safety Culture Guide

Guide for regulatory body to evaluate the licensee's efforts to prevent degradation of safety culture and organizational climate (Dec. 2007)

- ✓ Licensee has been required to describe its activities for fostering safety culture in its Operational Safety Program since December, 2007.
- ✓ The Operational Safety Inspection is being done every quarter of year to check licensee's compliance with its Operational Safety Program where the Safety Culture Guide is being used.
- ✓ Revision of the Guide is in progress:
 - Consistency with GSR Part 2 (Leadership, management, integrated management system (IMS), etc.)
 - More emphasis on role/responsibility of management



Safety Culture Traits Used in the Guide

1. Commitment of top management
2. Clear policies and performances of senior managers
3. Measures to avoid wrong decision-making
4. Persistent questioning attitude
5. Reporting culture
6. Good communication
7. Accountability and transparency
8. Compliance
9. Learning organization
10. Organization making efforts for preventing accidents/minor events
11. Self-assessment or third-party review
12. Work control and management
13. Change management
14. Attitude and motivation

M. Makino, Y. Ishii, International Congress on Advances in Nuclear Power Plants (ICAPP 09), Tokyo Japan, May 12, 2009



Evaluation Process of Licensee's Activities for Fostering Safety Culture

- ✓ Based on the licensee's plan and indicators for capturing the symptom of safety culture degradation at beginning of a year, monitor the licensee's activities and accumulate the findings throughout the year
- ✓ At the end of the year, analyze the findings based on the 14 traits, and **identify the weaknesses** of the organization (Step 7)
- ✓ Through the discussion with the licensee, decide the items requiring for further efforts (Step 8)
- ✓ Identify good practices from the findings (Step 9)
- ✓ **Perform comprehensive evaluation** throughout the year (Step10)

Stage	Step	Actions
Preparation Stage	1	Check the licensees' action plan and indicators for safety culture activities
	2	Check the licensee's indicators for capturing the symptom of safety culture degradation
Inspection Stage	3	Identify, if any, the symptoms of safety culture degradation during daily patrol, etc.
	4	Identify, if any, the symptoms of safety culture degradation from results of root cause analyses
Evaluation Stage	5	Review the results of licensee's activities for fostering safety culture
	6	Review the results of indicators for capturing the symptom of safety culture degradation
	7	Elicit the items necessary to enhance licensee's efforts
	8	Taking into account the discussion with licensee, decide and present the licensee the items requiring for further efforts
	9	Identify good practices
	10	Consolidate comprehensive assessment

Thank you for your attention!

With thanks to

Masashi Hirano

Shuichi Kaneko

Shinya Ito

NRA