

The Evolution of Safety

**Peter S. Winokur, Ph.D., Chairman
Defense Nuclear Facilities Safety Board**

*Thanks to Doug Minnema, Monique Helfrich,
Neysa Slater-Chandler and Dan Bullen*

**2014 Decisionmakers' Forum
October 21, 2014**

In Memorium



Kenneth L. Mossman



Joseph F. Bader

Disclaimer



This PowerPoint presentation given by Dr. Peter S. Winokur, Chairman of the Defense Nuclear Facilities Safety Board, is for informational purposes only. The views expressed herein are solely those of Dr. Winokur, and no official support or endorsement by the Defense Nuclear Facilities Safety Board or the U.S. Government is intended or should be inferred. All references, conclusions or other statements regarding current Board activities are preliminary in nature and do not represent a formal adopted product of the full Board. Users of this presentation should also note that the contents were compiled solely for this presentation.

Objectives



- Recent changes at the Board
- Recent interactions with DOE
- The *evolution* of nuclear safety in DOE
- Areas of concern in nuclear safety at DOE

Recent Changes at the Board



The National Defense Authorization Act for Fiscal Year 2013 made significant amendments to the Board's enabling statute

§ 2286a(a). Mission.

The mission of the Board shall be to provide independent analysis, advice, and recommendations to the Secretary of Energy to inform the Secretary, in the role of the Secretary as operator and regulator of the defense nuclear facilities of the Department of Energy, in providing adequate protection of public health and safety at such defense nuclear facilities.

Recent Changes (cont.)



§ 2286a(b)(5). Recommendations.

The Board shall make such recommendations to the Secretary of Energy with respect to Department of Energy defense nuclear facilities, including operations of such facilities, standards, and research needs, as the Board determines are necessary to ensure adequate protection of public health and safety. **In making its recommendations the Board shall consider, and specifically assess risk (whenever sufficient data exists),** the technical and economic feasibility of implementing the recommended measures.

Recent Changes (cont.)



§ 2286d. Board Recommendations.

- Board staff develop a “draft” recommendation
- Board votes to send “draft” to Secretary of Energy, along with any related findings, supporting data, and analysis
- The Secretary has 30 days to provide comments on the “draft” recommendation to Board
- Board considers Secretarial comments and may:
 - Withdraw “draft” recommendation
 - Issues “final” recommendation without changes
 - Issue “final” recommendation that incorporates Secretarial comments
- Board votes to send “final” recommendation to the Secretary, and later publishes the recommendation in the Federal Register
- The Secretary has 45 days to accept/reject recommendation in whole or in part
- The Secretary has 90 days to develop Implementation Plan for each recommendation or part thereof that was accepted



Recommendation 2014-1

Emergency Preparedness and Response, was issued on September 3, 2014.

Addresses DOE's role as regulator of the emergency preparedness and response capabilities at its sites with defense nuclear facilities.

Due to inconsistent and ineffective implementation of requirements at these sites, the Recommendation is focused on DOE's:

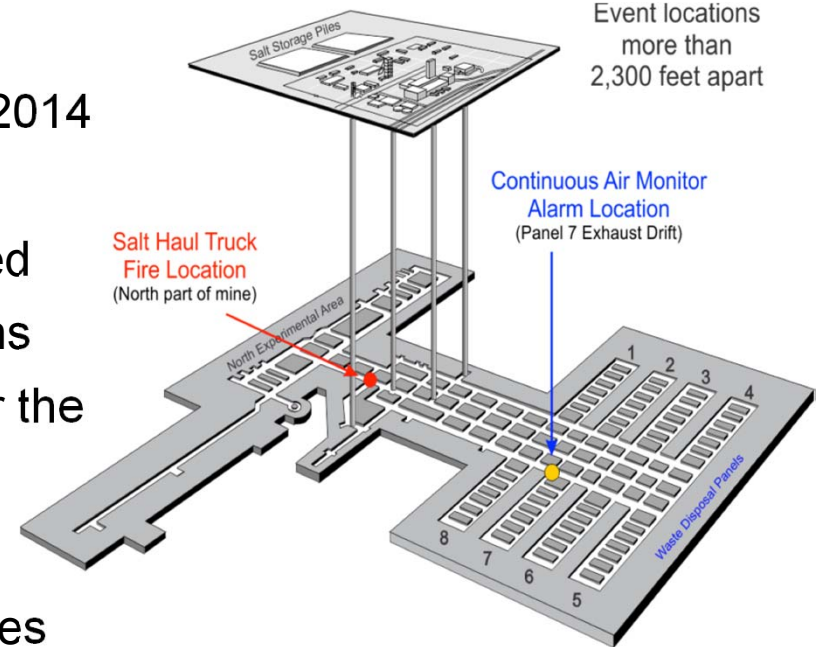
- Failure to conduct effective oversight
- Failure to update the requirements in its directives



Waste Isolation Pilot Plant



- Salt Haul Truck Fire, February 5, 2014
- Radiological Release Event, February 14, 2014
- Staff Activities
 - Immediately following truck fire, provided oversight on-site; continued for 4 months
 - Oversight of DOE AIB investigations for the fire and radiological release event
 - DNFSB Headquarters Team provided oversight of DOE and contractor activities
 - Frequent interactions with CBFO and contractor
- DNFSB Vice Chairman on-site week of July 7, 2014



The Board continues to track recovery work and efforts to determine the cause of the radiological release



Board Hearings on Safety Culture



- **Safety Culture, Part I, May 28, 2014**
- **Safety Culture, Part II, Aug 27, 2014**

The goal was to learn about safety culture, how it can be measured, how it can be improved, and how leaders influence it. Testimony by distinguished experts from industry, Federal agencies (NRC and NASA), current and former naval officers, Member of CSB, and academia.

- **Safety Culture, Part III, October 7, 2014**
Secretary of Energy Moniz,
Hon. M. Creedon, and Mr. Whitney
- **Safety Culture, Part IV?**





**“The only thing of real importance
that leaders do is to
create and manage culture ...**

If you do not manage culture, it manages you.”

– Edgar Schein, MIT

**“Culture eats [management] systems
for breakfast”**

– Gunningham and Sinclair, ANU

Evolution of Safety

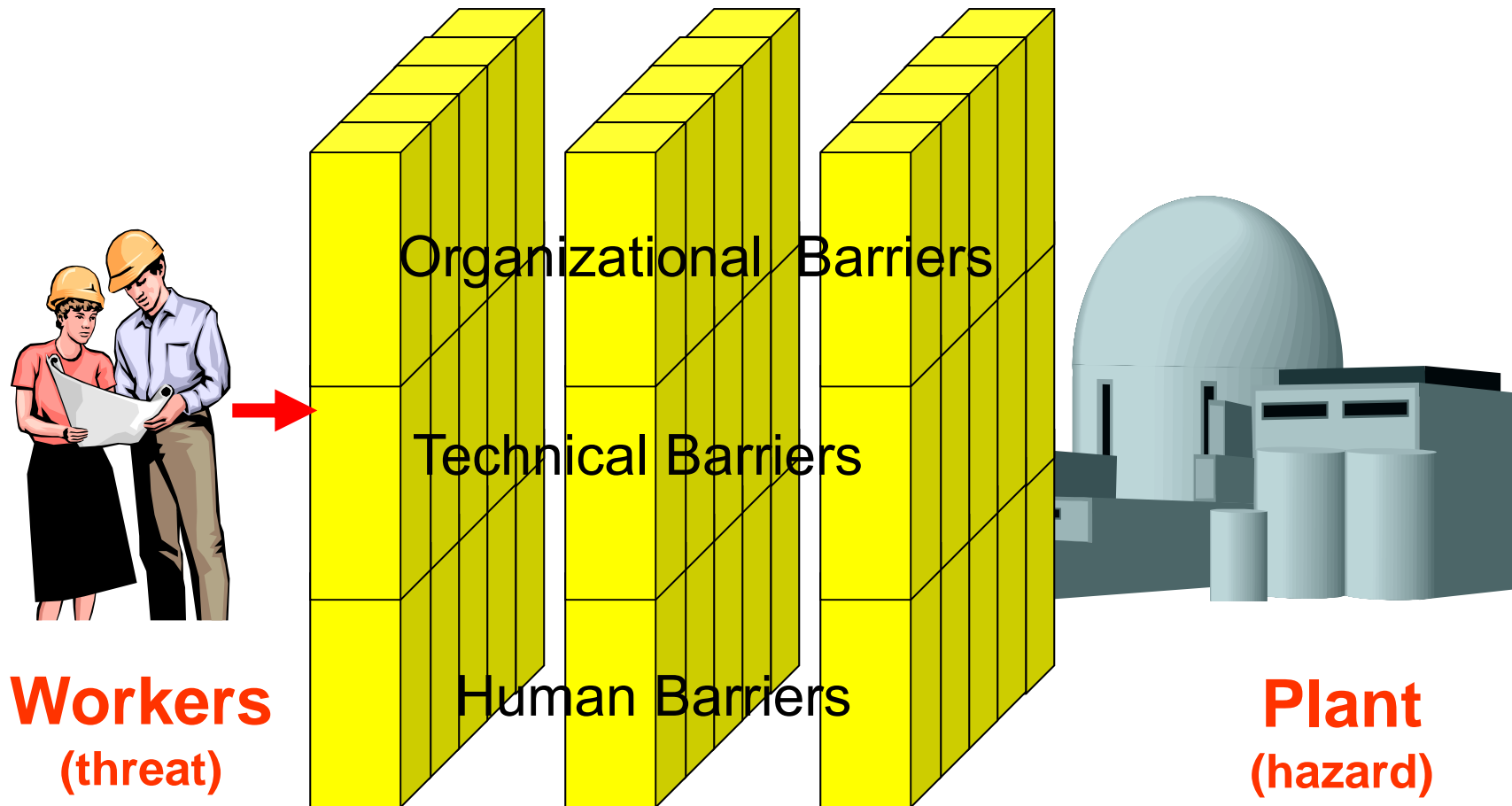


Things to consider in moving forward

1. Differentiate between personal safety versus process safety
2. Understand how organizational accidents occur; to prevent low-probability, high-consequence accidents, processes must be controlled within allowable limits
3. Emphasize transactional oversight versus system oversight for complex, high-hazard operations: “the devil is in the details”



Barriers Between Workers and Plant*



Defense-in-Depth

**High Reliability Operations, Hartley, Tolk, and Swaim, B&W Pantex, 2008.*

Evolution of Safety



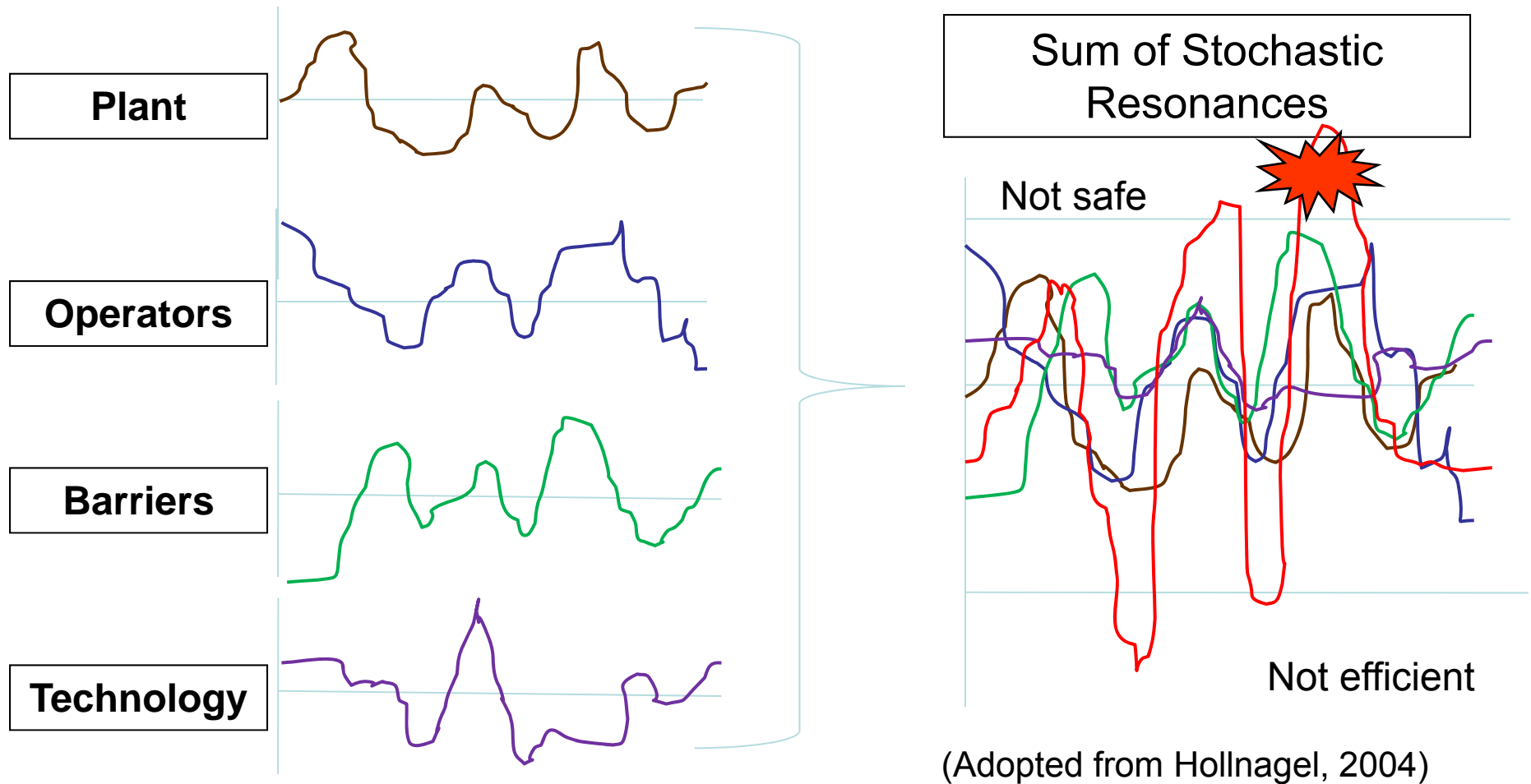
Things to consider in moving forward

1. Differentiate between personal safety versus process safety
2. Understand how organizational accidents occur; to prevent low-probability, high-consequence accidents, processes must be controlled within allowable limits
3. Emphasize transactional oversight versus system oversight for complex, high-hazard operations: “the devil is in the details”



Organizational Accident Model

Functional Resonance Accident Model





Why Major Accidents Occur

Major accidents occur when conditions are rife with

- Strong budget and production pressures
- Organizational changes that leave functional gaps
- Over-confidence that leads to complacency
- Persistent failure to follow the group's own rules
- Insufficient focus on oversight and resolution of issues
- Willingness to accept minimal standards of practice
- Inherent conflicts of interest
- Production-oriented priorities and rewards
- Unrecognized accumulated residual risks

Evolution of Safety



Things to consider in moving forward

1. Differentiate between personal safety versus process safety
2. Understand how organizational accidents occur; to prevent low-probability, high-consequence accidents, processes must be controlled within allowable limits
3. **Emphasize transactional oversight versus system oversight for complex, high-hazard operations: “the devil is in the details”**



**“Each decision, taken by itself,
seemed correct, routine, and indeed,
insignificant and unremarkable.**

**Yet in retrospect, the
cumulative effect was stunning.”**

(Columbia AI Board)



Evolution of Safety (cont.)

Things to consider in moving forward

4. Transition from lagging to leading indicators; don't wait for an accident to know the safety system is not working
5. Both deterministic and probabilistic approaches to safety add value, but both are vulnerable to uncertainty and complacency
6. Both federal oversight and contractor assurance systems are essential to nuclear safety; weakening oversight does not increase efficiency, it increases risk and uncertainty



Leading Indicators



- The value of a leading indicator is based on the strength of its association with the detriment to be avoided
- Leading indicators are best if they lead to “actionable” conclusions



Evolution of Safety (cont.)

Things to consider in moving forward

4. Transition from lagging to leading indicators; don't wait for an accident to know the safety system is not working
5. Both deterministic and probabilistic approaches to safety add value, but both are vulnerable to uncertainty and complacency
6. Both federal oversight and contractor assurance systems are essential to nuclear safety; weakening oversight does not increase efficiency, it increases risk and uncertainty



Evolution of Safety (cont.)

Things to consider in moving forward

7. Understand the overarching role of organizational culture; culture is a common-mode failure mechanism for engineered and administrative controls (*Managing the Risks of Organizational Accidents* by James Reason)
8. Strengthening DOE's culture of safety is an Enterprise-level challenge

Integrated Safety Management at the site, facility, and worker level provides a common-sense framework to protect the public and workers



Areas of Concern

- DOE's federal oversight capability needs to be strengthened
- Contractor Assurance Systems need to be strengthened
- DOE and contractor culture of safety needs to improve
- Criticality safety programs need to be improved
- DOE's regulatory framework is being challenged
- DOE is convinced that it is too risk adverse and conservative; not enough "chronic unease"
- Budget pressures constantly stress DOE and contractors
- Frequent organizational changes create anxiety



The Cost of Safety

- Ensuring that adequate resources are allocated to safety programs is always difficult – balance (integrate) mission and safety
- Measuring a safety program's effectiveness is also difficult, especially for preventing low probability, high-consequence accidents
- What is the cost of an accident avoided?
- An absence of accidents is often interpreted as an indication that the safety program is no longer needed; reducing FR's, SSO's, etc. is penny-wise and pound foolish

***Poor safety is “penalized” by gaining resources
and
Good safety is “rewarded” by losing resources***

The Cost of Accidents



Impacts on Environmental Management missions

- The Hanford S-102 high-level waste spill stopped operations for 18 months
- At INL's AMWTP, the failure of waste boxes during retrieval stopped operations for 26 months
- At SRS F Area, a contaminated puncture wound stopped operations for 4 months
- At SPRU, the inadvertent spread of contamination during demolition has contributed to delayed completion of D&D by more than 3 years
- At WIPP, fire and contamination event will stop operations until 2016.

***Safety is not opportunity lost,
Safety is opportunity's cost!***