

The logo of the Defense Nuclear Facilities Safety Board (DNFSB) is a circular emblem. It features a central shield with a globe, surrounded by a wreath. The text "DEFENSE NUCLEAR FACILITIES SAFETY BOARD" is written around the perimeter of the emblem. The shield itself contains the text "UNITED STATES OF AMERICA".

# DNFSB Perspective on Metrics and Safety Reform

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*Thanks to Doug Minnema*

# Pop Quiz

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**What do the following companies have in common?**

- British Petroleum (BP)

BP Texas City, Deepwater Horizon

- Massey Energy

Upper Big Branch Mine

- Tesoro Corporation

Anacortes Refinery

- Murray Energy

Crandall Canyon Mine

# Pick One

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- A. All have won safety awards
- B. All have better than industry-average rates for Days Away, Restricted, or Transferred from Work cases
- C. All have better than industry-average rates for Total Recordable Cases
- D. All had large organizational accidents resulting in significant loss of life and environmental impacts
- E. All of the above

# Answer: E. All of the above

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*Safety Awards That Endanger Workers' Lives*, Leo W. Gerard, USW International President, May 28, 2010.

*"The prizes congratulate corporations for reducing incidents such as slips and falls, which promote complacency ... [but] fail to implement process safety management to eliminate workplace catastrophes that kill."*

*Testimony of the Carolyn W. Merritt, Chairman, Chemical Safety Board, House Committee on Energy and Commerce, Subcommittee on Investigations and Oversight, May 16, 2007.*

*BP focused on safety efforts dealing with slips, trips, falls, and vehicle accidents, even as catastrophic process risks were overlooked or not controlled.*

# Initial Thoughts on Metrics

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It's time to reduce reliance on DART/TRC as a primary metric for demonstrating the effectiveness of DOE's safety programs.

DART/TRC is not a meaningful metric of safety at defense nuclear facilities!

It does not fully provide the safe working environment we seek.

***We need better use of metrics!***

# Definitions

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**LAGGING INDICATORS** measure events that have already taken place and past trends

**LEADING INDICATORS** predict the likelihood of an accident before it occurs, prevent accidents, and support productivity and quality

Some lagging indicators, when they occur repetitively or in certain combinations, can serve as leading indicators

# Some leading indicators

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- **People**

- Staffing and resource levels; turnover and overtime rates
- On-time completion of training and qualification requirements
- Rate and nature of employee concerns and minority opinions

- **Processes**

- Rate and nature of procedural violations
- Currency of procedures; frequency of procedure reworks
- On-time completion of routine tasks and surveillances
- On-time completion and effectiveness of corrective actions

- **Plant/Equipment**

- Effectiveness and on-time completion of routine maintenance
- Quality of housekeeping; adequacy of supplies and material
- Frequency of unexpected maintenance or equipment failure
- Frequency of challenges to engineered controls and barriers

# Analyzing Leading Indicators



The value of a metric as a leading indicator is directly related to the strength of its association with the detriment to be avoided



# Balancing mission and safety

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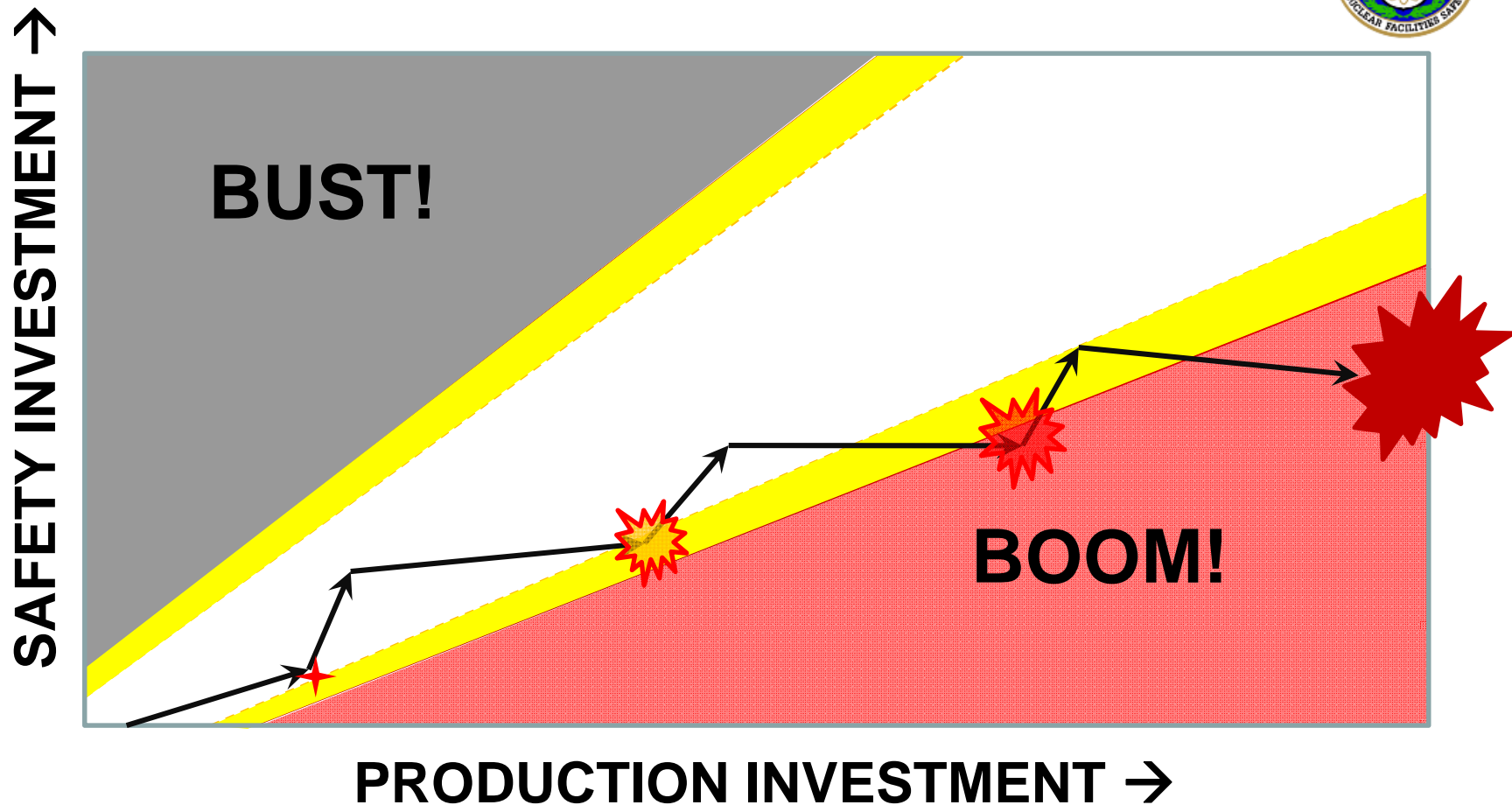


Operating a performance-based program while avoiding high-consequence accidents requires an effective set of metrics and leading indicators

Metrics should

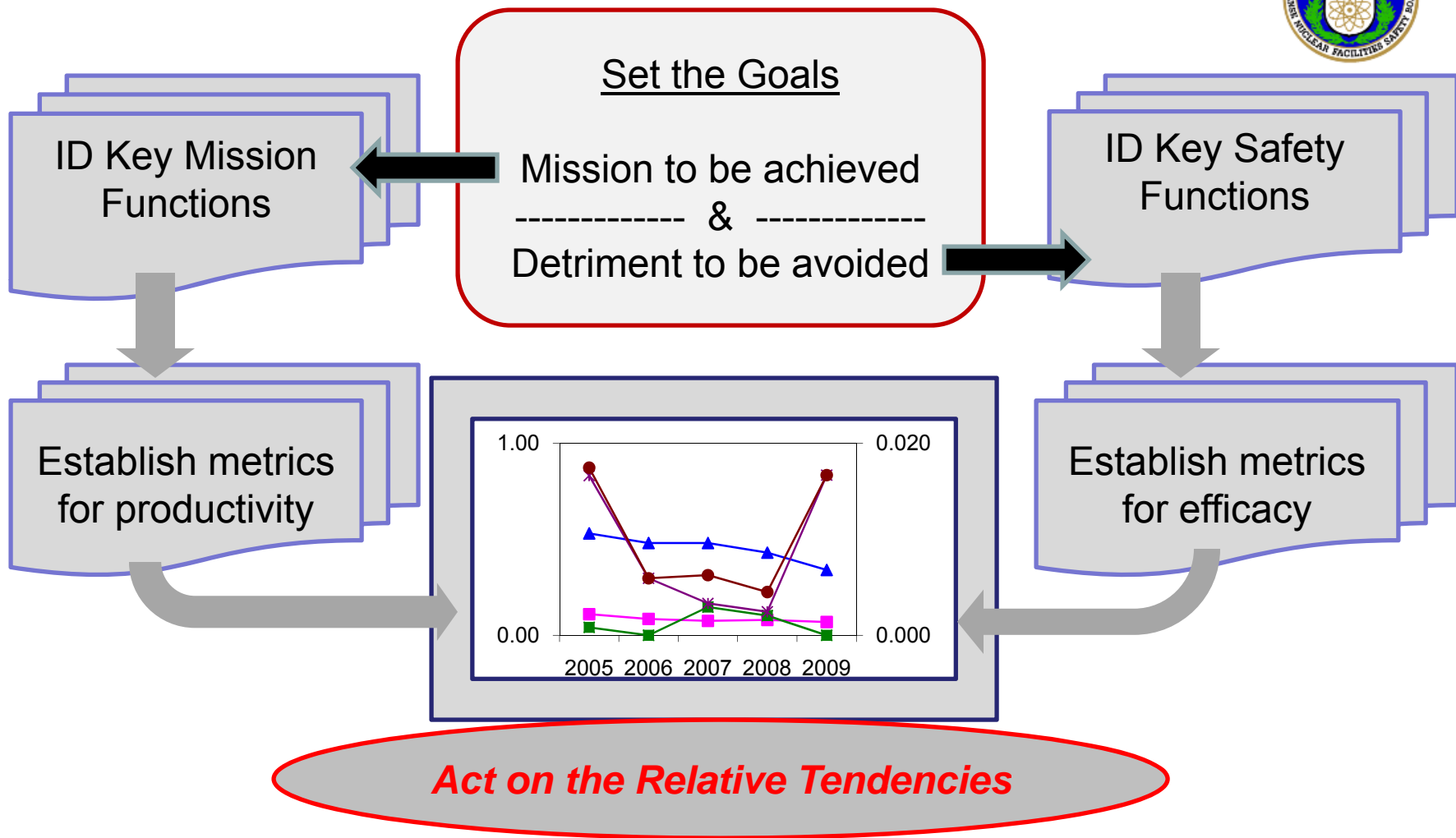
- Monitor the allocation and expenditure of resources
- Monitor schedule and budget pressures on the organization
- Track the functionality and effectiveness of key safety programs
- Consider relative trends between safety and production metrics
- Be directly linked to both mission and detriment-to-be-avoided
- Receive frequent senior management attention and support
- **Represent parameters that lead to “actionable” conclusions**

# Is safety an overriding priority?



A modified "Reason Model" -- from Reason, 1997 and Starbuck, 1988.

# A Simple Process for Leading Indicators



# Some Final Thoughts on Metrics

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- Individual metrics should have preset action levels
- Contradictory trends (mission improves & safety declines) need prompt attention
- Recurring imbalances between safety and mission metrics indicate need to adjust priorities and resources
- Leading indicators encourage early identification and intervention to prevent low-probability, high-consequence accidents

*If it ain't measured, then it ain't managed*

# DNFSB's Perspective on Safety Reform in DOE

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In March 2009, the Board shared with Secretary Chu its view on the state of nuclear safety at DOE's defense nuclear facilities

- Preserve an effective nuclear safety directives system and maintain the existing margin of safety
- Preserve and enhance the Central Technical Authority function
- Improve federal technical staff capabilities
- Implement cross-cutting Recommendations in the areas of nuclear safety R&D and nuclear material packaging
- Integrate nuclear safety early in the design of new facilities
- End reliance on unsound facilities

# DNFSB's perspective on Directives Reform

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**March, 23, 2009 Letter to Secretary Chu from A. J. Eggenberger**

**Preserving an Effective Nuclear Safety Directives System:**

*Preserve the DOE requirements and guidance essential to ensuring safety within the DOE defense nuclear complex.*

DOE has developed a system of nuclear safety directives enumerating a comprehensive set of nuclear safety requirements, garnered from 60 years of operating experience in both the commercial and defense-related arenas...

The Board is maintaining an intense level of oversight over the revision to the directives system and the vitality of the directives being revised to ensure that the margin of safety embodied in DOE's directives is maintained or increased. It is essential that the senior leadership of DOE and NNSA do the same, or many years of progress in development and refinement of the directives system could be undone.

# Safety Reform is not Easy



## Oversight & Governance Changes

- 1991** SEN-35-91 issued, initiating modern nuclear safety within DOE
- 1994** 1<sup>st</sup> DOE Nuclear Safety Rule issued
- 1995, 2009** DOE studies external regulation
- 1995, 2002, 2005, 2010** DOE pilots new governance models
- 2000** NNSA formed
- 2005, 2010** EH/HSS new oversight models

## Selected DNFSB Recommendations

- 90-2, *Codes & Standards*
- 91-1, *Safety Standards Program*
- 92-2, *Facility Representatives*
- 94-5, *Integration of Rules, Orders, etc*
- 95-2, *Safety Management*
- 98-2, *Safety Management at the Pantex Plant*
- 04-1, *Oversight of Complex, High-Hazard Nuclear Operations*

## Major Directives Reforms

- 1991** SEN-35-91 issued, initiating modern nuclear safety within DOE
- 1994** 1<sup>st</sup> DOE Nuclear Safety Rule issued
- 1995** DOE considers shift of orders to rules
- 1995** Directives shift: 4-digit to 3-digit
- 2001, 2002, 2007, 2009** Major HQ-led streamlining reviews
- 2010** DOE Safety & Security Reform

# Directives Reform

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- A large fraction of “Orders of Interest to the Board” are scheduled for revision
- The Board is closely monitoring the directive reform effort to ensure that the existing margin of safety at defense nuclear facilities is not compromised
- The Board has been assured that nuclear safety requirements are “fenced” from substantive changes
- The Board is always interested in strengthening safety and oversight at defense nuclear facilities and views this as an opportunity to do so
- The elimination of Guides has drawn the Board’s attention



# Thoughts on Directives Reform

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Concerns with current directives from DOE perspective:

- **Contradictory** There is no disagreement that existing contradictions in requirements need to be fixed
- **Redundant & Duplicative** Is this necessarily bad if it adds clarity without causing duplicative actions? Each directive should be able to stand alone.
- **Overly Prescriptive, Excessive, Burdensome** Is this possible when protecting the public from high consequence accidents?

*Are we fixing implementation problems by changing directives and requirements?*

# Review Criteria

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A primary Board concern is the criteria to be used during directive reviews. These should be clear and consistent

- Does the need for the requirement still exist? Why? Or why not?
- Can the existing margin of safety be maintained without it?
- Has the requirement been overcome by events?
- Can the requirement be tailored?
- Is the requirement duplicative or contradictory to others?

This requires

- Careful tracking of requirements across the suite of directives
- An adequate cadre of subject matter experts
- Sufficient time, and many checks and balances.

# NNSA Reform Efforts

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NNSA is reforming its non-nuclear governance model, based on the “KCP Oversight Model”

- The KCP model is based on
  - ▶ Substituting industrial management systems and consensus standards for DOE directives to the extent possible
  - ▶ Relying heavily on the contractor and its parent companies to self-assess compliance with those alternative requirements
  - ▶ Modifying the Federal oversight role to “system oversight”
- The primary goal is to reduce burden on the site offices
- The Board’s concern is with unintended consequences at defense nuclear facilities

# Conclusions

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- The Board is concerned that an overreliance on DART/TRC can lead to complacency and distract from preventing low-probability, high-consequence accidents
- The Board is encouraged with the current focus on metrics and leading indicators, but progress is too slow
- More attention is necessary to ensure that top-level metrics clearly align with the underlying safety concerns
- The Board is concerned with the turmoil generated by frequently changing directives, but agrees that if done well the effort can improve both safety and productivity
- Oversight is an important part of *managing* facilities, especially in times of change; it should not be disdained as a burden but rather welcomed as a tool for improvement