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# APCChE 2012 PSM Seminar Feb 2012

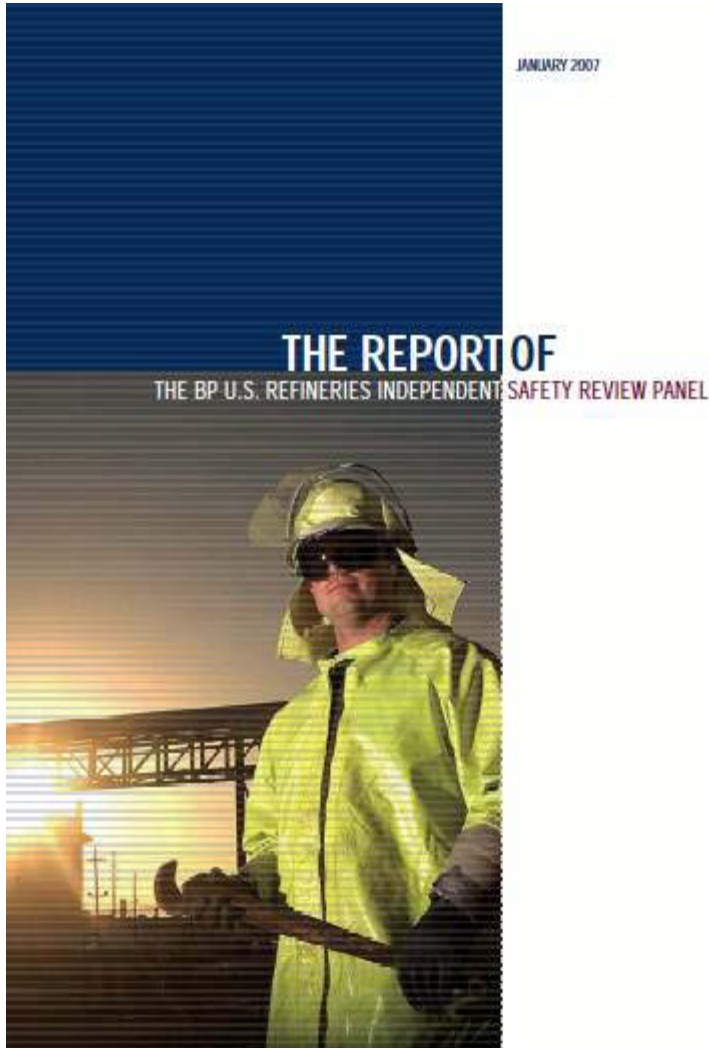
## Critical role of leadership in preventing Major Accidents in the Chemical Process Industry

# The impact of major accidents

On site Fatalities	Public Health and Safety	Environmental Impact	Financial Loss (Insured)	Reputation
	>50 fatalities Mexico City 1984 Bhopal 1984 Chernobyl 1986	Regional Chernobyl 1986	>\$10 billion Chernobyl 1986	Global Piper Alpha 1988 Texas City 2005 Flixborough 1974 Seveso 1976
>50 fatalities Piper Alpha 1988	>10 fatalities Toulouse 2001	Extensive Sandoz 1986 Seveso 1976	\$1 – 10 billion Texas City 2005 Piper Alpha 1988	Regional Three Mile Island 1979 Buncefield 2005
>10 fatalities Flixborough 1974 Feyzin 1966 Texas City 2005 Petrobras 2001 Pasadena 1989	> 1 fatality	Major	\$100 million - \$1 billion Pasadena 1989 Toulouse 2001 Flixborough 1974 Petrobras 2001 Grangemouth 1987 Longford 1998	National Longford 1998
>1 fatality Longford 1998	Major injuries	Reportable	\$1 - \$100 million Milford Haven 1994	Local

Source: Incidents that Define Process Safety, CCPS, 2008, Page 2

# Baker Report



“... BP has not provided effective **process safety leadership** and has not adequately established process safety as a core value across all its five US refineries”

“... a **corporate safety culture** that may have tolerated serious and longstanding deviations from good safety practice”

# Buncefield 2005

“.... a **culture** where keeping the process operating was the primary focus and **process safety** did not get the attention, resources or priority that it required.”

**COMAH** Control of Major Accident Hazards

## Buncefield: Why did it happen?

The underlying causes of the explosion and fire at the Buncefield oil storage depot, Hemel Hempstead, Hertfordshire on 11 December 2005

the Competent Authority



# Buncefield - Leadership issues

- Site owned by Hertfordshire Oil Storage Ltd (HOSL) and operated by Total
- SMS did not reflect what actually happened on the site
  - Over focus on personal safety
- Insufficient expertise and resources for site management
- No adequate framework to set process safety performance indicators
  - E.g. number of times tanks filled beyond target
- ‘Hands-off’ approach by HOSL Board
  - Did not act as an ‘intelligent customer’ with contractors
  - Failure to provide finance for essential improvements

# £6.2M Fine for Total

## NEWS ENGLAND

16 July 2010 Last updated at 16:37



### Firms ordered to pay almost £10m over Buncefield blast

Five firms have been ordered to pay almost £10m between them in combined fines and costs for their parts in the Buncefield oil depot explosion.

French energy giant Total must pay £6.2m for failing to protect workers and the public over the 2005 explosion.

Hertfordshire Oil Storage Limited (HOSL) must pay £2.4m and British Pipeline Agency Ltd must pay £780,000.

TAV Engineering Ltd and Motherwell Control Systems were told at St Albans Crown Court they must pay £1,500 each.

Total were fined £3.6m with £2.6m costs, Hertfordshire Oil Storage Limited received a £1.45m fine with £1m costs and British Pipeline



Forty-three people were injured in the Buncefield depot blast on 11 December 2005

### Top Stories



Renewed clashes hit Libya capital

MI5 'was not responsible for 7/7'

Bahrain GP off after civil unrest

Network Rail admits crash guilt

Halifax to pay £500m to customers

### Features & Analysis



'Gaddafi is finished'

UK embassy protesters believe their wait is coming to an end



Clock change

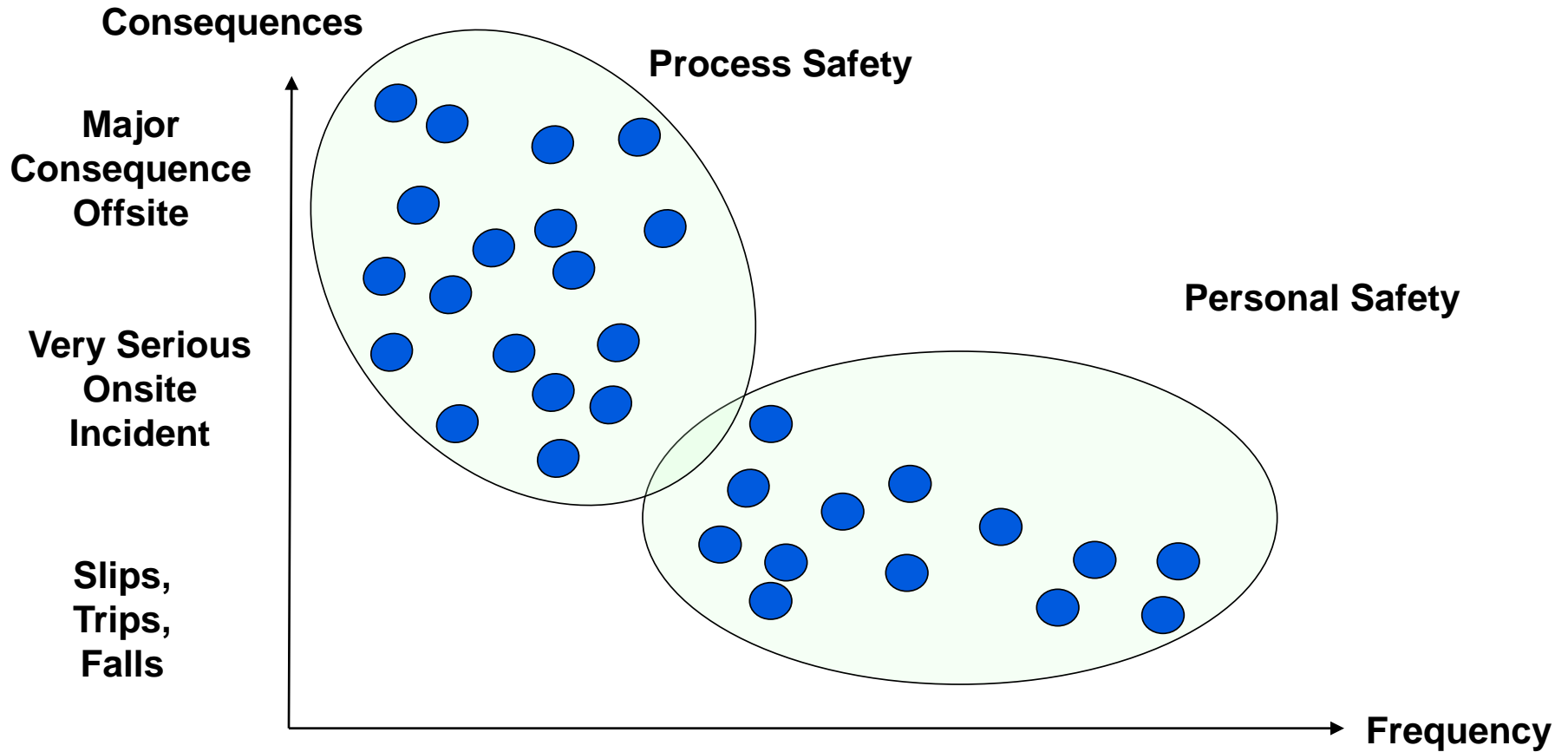
When would it get dark where you live under 'double summertime'?

### Related stories

# Developments in UK since Buncefield

- Guidance on principles from cross industry task force
  - Buncefield Process Safety Leadership Group
- Leadership stated as key issue by Regulator (UK HSE)
- Leadership incorporated into developing PSM standards
  - Energy Institute 20 Elements
- Training programmes for Senior Executives
  - Development of training standard by cross industry 'Expert panel'
  - Approval of training providers against standard
  - Q4 2011, roll out of training to COMAH 'top tier' companies driven by Regulator

# Why a lack of focus on Process Safety?





# Characteristics of process safety culture After Reason

- **Cognisant** organisation
  - understands the nature of the process safety war – “a long guerrilla struggle with no final victory”
- **Reporting (communicating)** organisation
  - Doesn't forget to be afraid – “mindful”
- **Just** organisation
  - Atmosphere of trust, required to be informed
- **Disciplined** organisation
  - Operational discipline
- **Learning** organisation
- **Flexible (adaptable)** organisation

# High reliability organisations (Ref PSLG Standard)

- Chronic sense of unease, i.e. they lack any sense of complacency
- Make strong responses to weak signals, i.e. they set their threshold for intervening very low
- Clear understanding and definition of roles and responsibilities, and assurance of competence in those roles
- Effective control room design and ergonomics, as well as alarm systems
- Appropriate staffing, shift work arrangements and working conditions
- Setting and implementing a standard for effective and safe communication at shift and crew change handover
- Effective management of change, including organisational change as well as changes to plant and processes

# Principles of Process Safety Leadership

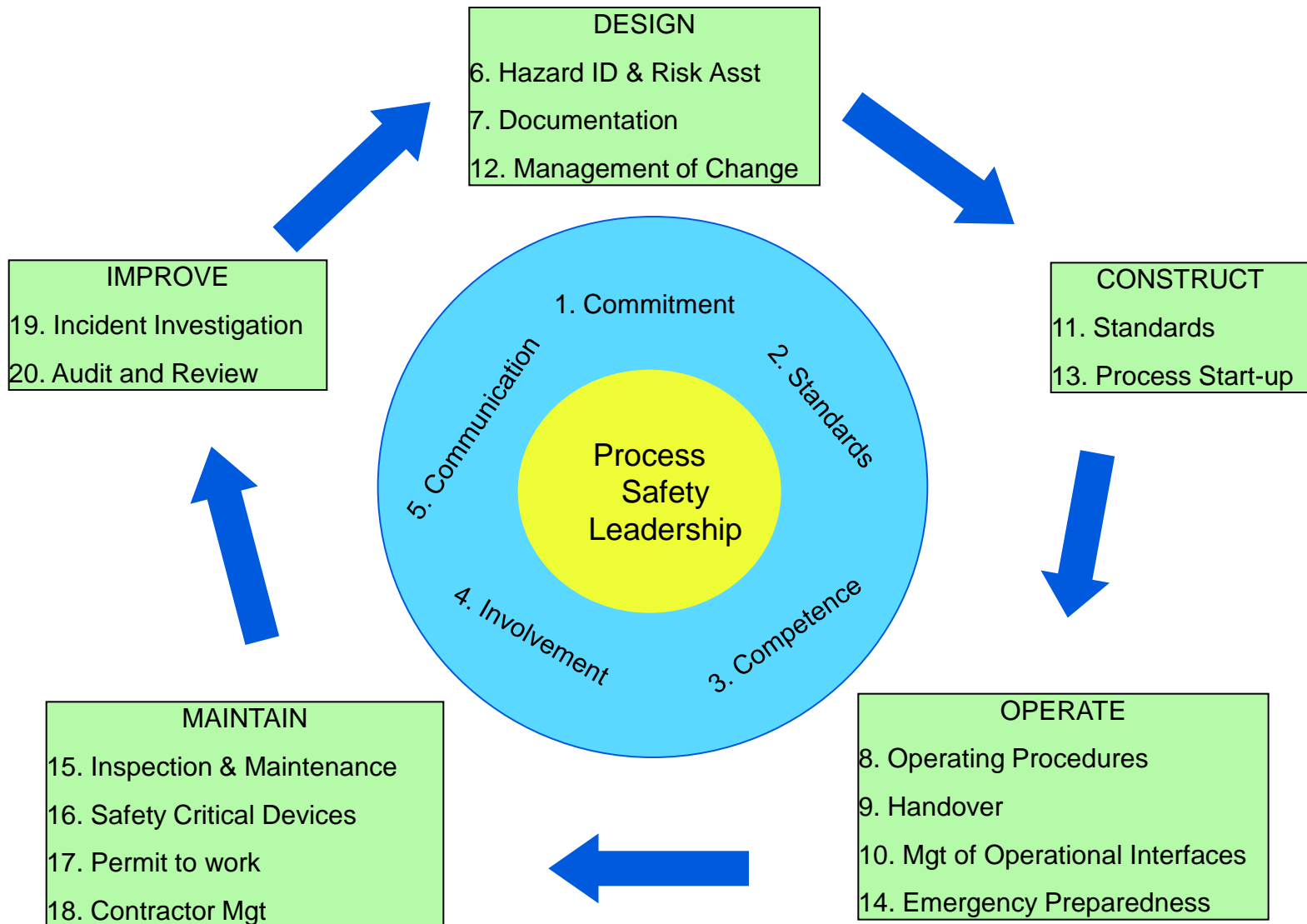
- Clear and positive **leadership** core to managing risks
- Board level **involvement** and **competence**
- Good PSM requires constant active **engagement**
- Board level **visibility** essential for positive safety culture
- **Engagement** of the workforce is needed
- **Monitoring** performance with leading and lagging indicators
- **Publication** of performance provides public assurance
- **Sharing** best practice and **learning** from incidents to maintain corporate knowledge and competence



POLL



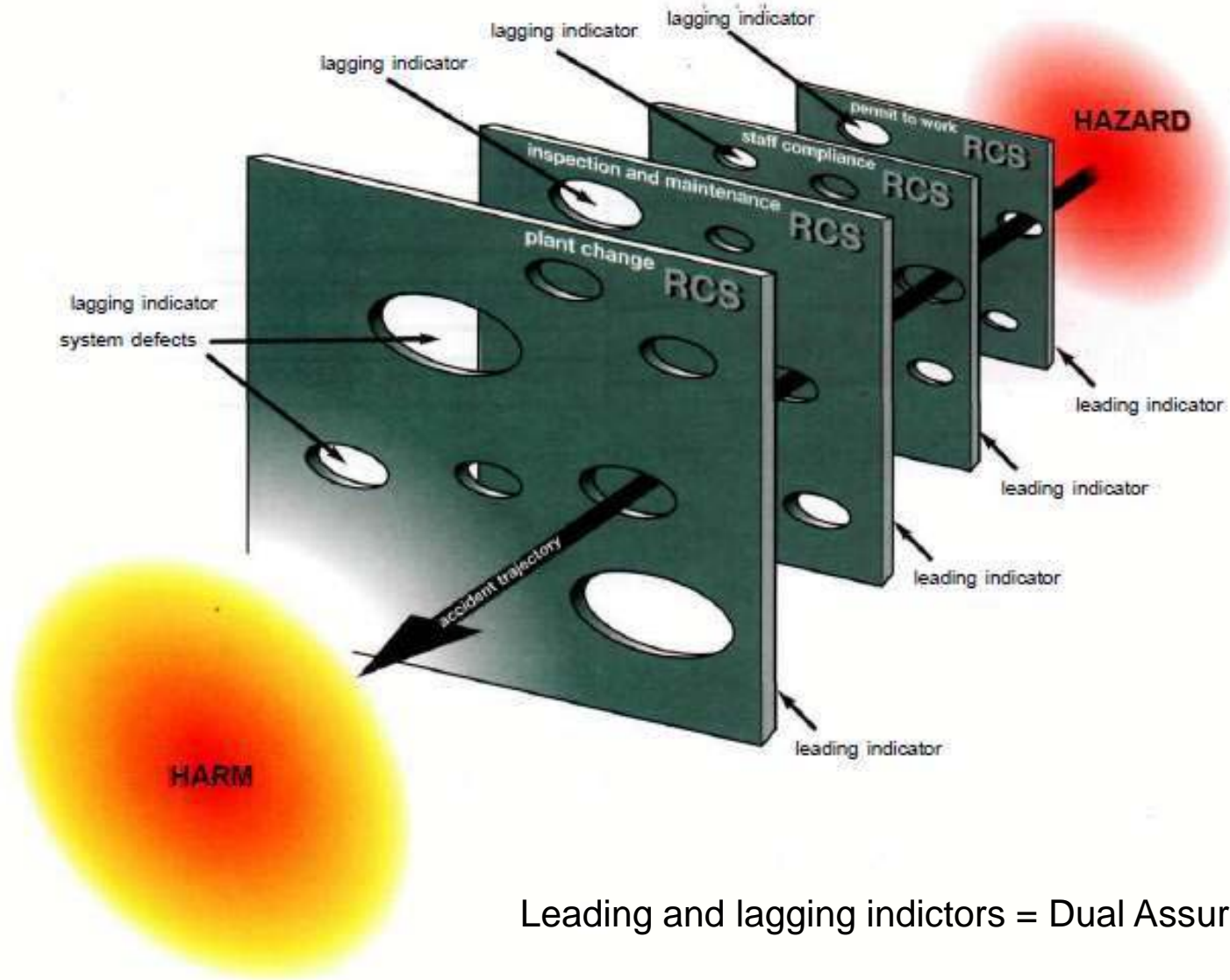
# Energy Institute PSM Framework



# Strategy to improve Process Safety Leadership

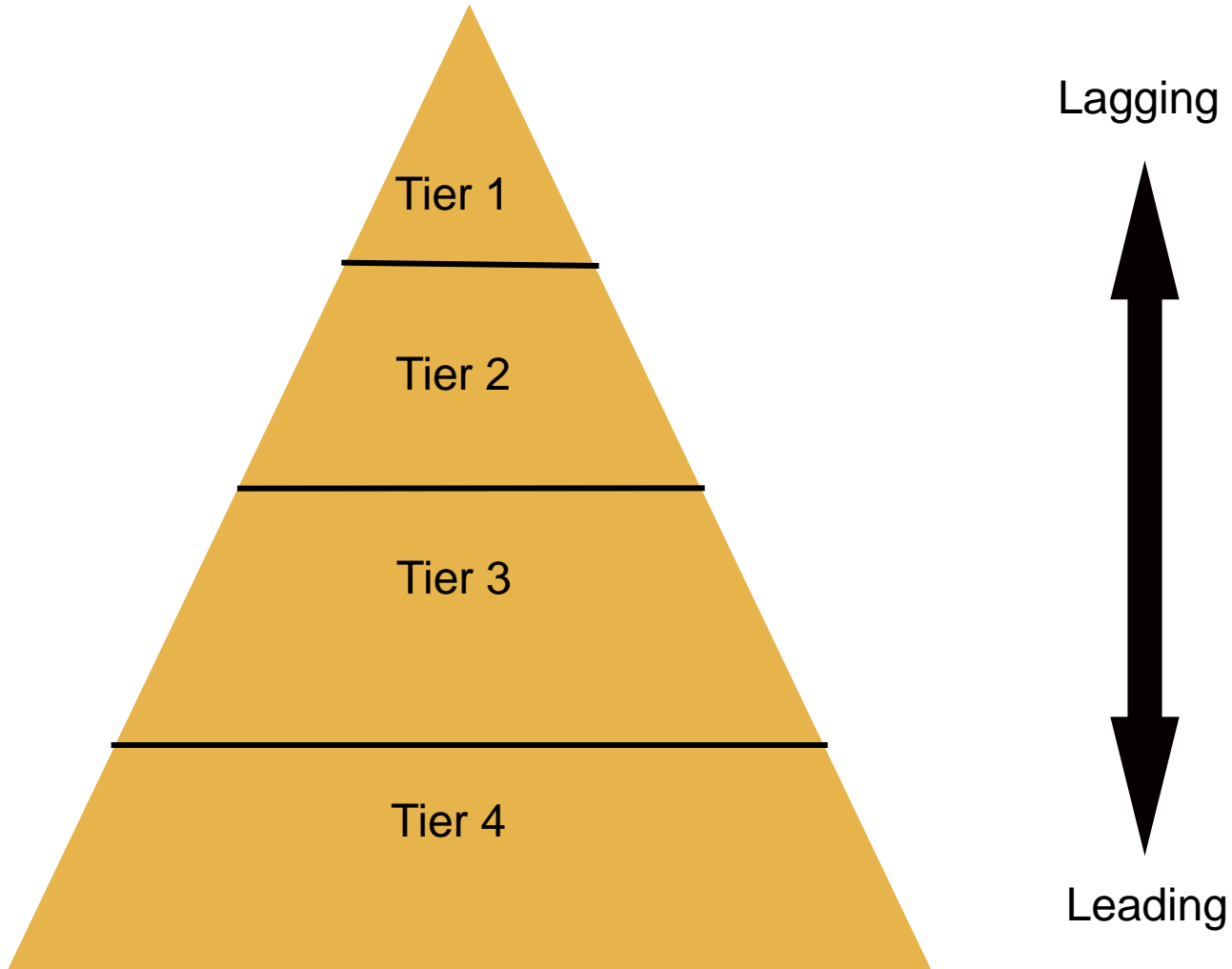
- Set clear policy and responsibilities for Process Safety
- Process Safety culture survey
  - Address issues and repeat survey
- High level audit of PSM systems vs best practices
- Re-validate Process Hazards Analysis
  - Understand what MAH could occur
  - Check robustness of risk control systems
- Investigate PS accidents and near misses
  - Find root causes in PSM system
- Monitoring of leading PS performance indicators
  - Ensure selection of 'SMART' indicators

# UK HSG 254 Layers of Protection Model



Leading and lagging indicators = Dual Assurance

# API 754 Process Safety Pyramid



# Definition of Tiers

Tier	Type	Report Level	Description	How Detected
1	Lagging	Corporate	Process Safety Accident	Significant harm to people or environment
2	Lagging	Country	Process Safety Incident	Loss of containment or release of energy above threshold level
3	Lagging/ Leading	Site	Demand on critical risk control system	Plant trips or action taken by operators to restore control
4	Leading	Facility	Failure of risk control system	Weakness in RCS detected by observation or audit



# Buncefield UK: HSE Report 2011

- “The measurement of a number of relatively **simple indicators** would have alerted management to the underlying problems that led to the incident”
  
- “Safety management systems at COMAH sites should specifically focus on **major hazard risks** and ensure that appropriate **process safety indicators** are used and maintained”

**COMAH** Control of Major Accident Hazards

## Buncefield: Why did it happen?

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# Summary

- Serious Process Safety accidents continue to occur
- Senior managers need to understand costs and risk to business
- Technical safety MUST be supported by effective leadership/culture
- Current focus on Leadership in Process Industry
- Major accident hazards and risks must be understood at all levels
- Process Safety requires continuous organisational vigilance
  - PSM systems need to meet good practice and be routinely updated
- Near misses to be treated as 'learning opportunities'
  - But must identify root causes as well as immediate causes
- Current challenge to develop effective and risk based leading indicators

# Are you leading Process Safety?

- Do you understand PSM and the difference with personal safety? Does your leadership team?
- Do you understand the process hazards? What's the worst thing that could happen?
- Is a serious process safety incident factored into your business risk management strategy?
- Is there an up-to-date PHA in place and budget/plan to re-validate it?
- Do you know the worst events that have happened on your assets over their history? What assurance do you have that they won't happen again?
- What PSPIs are in place? Do they give you an insight into how PSM is being managed?
- What is the reputation your sites have with regulators and the public?
- Do you have adequate process safety expertise or access to it?
- Do you have independent technical authorities in place for engineering and process safety?
- Do you have a PSM system and is it audited?
- What do your insurers think of the quality of your risks?
- What is the age/experience profile of the people on your assets? Are the assets older than the people?
- Is your leadership team worried about a PS incident? (should be mindful!)
- Do you know what a HRO is and how close is your organisation?

# Critical questioning on site visits

- What was the last serious PS incident and what has been done to prevent recurrence?
- What measures can you show me that PS is being managed properly?
- What safety systems are out of service or overridden?
- What safety-critical equipment inspections or proof tests are overdue?
- What equipment is running outside of design limits or inspection recommendations?
- What is the biggest PS risk on site...can you show me why the process is safe?
- What independent assessment have you had to show you're managing PS properly
- Show me how you have learned from a recent major incident outside of the company?
- Show me how you manage PS competence
- How many safety systems have operated in anger recently? Why and what have you done?
- Have you had any PS incidents that have been prevented from being worse by human intervention?
- What PS experience and expertise do you have on site?

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