



Leading vs Lagging Metrics

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EPSC Process Safety Indicators Meeting

6th August 2008

Independent Panel recommendations- Metrics

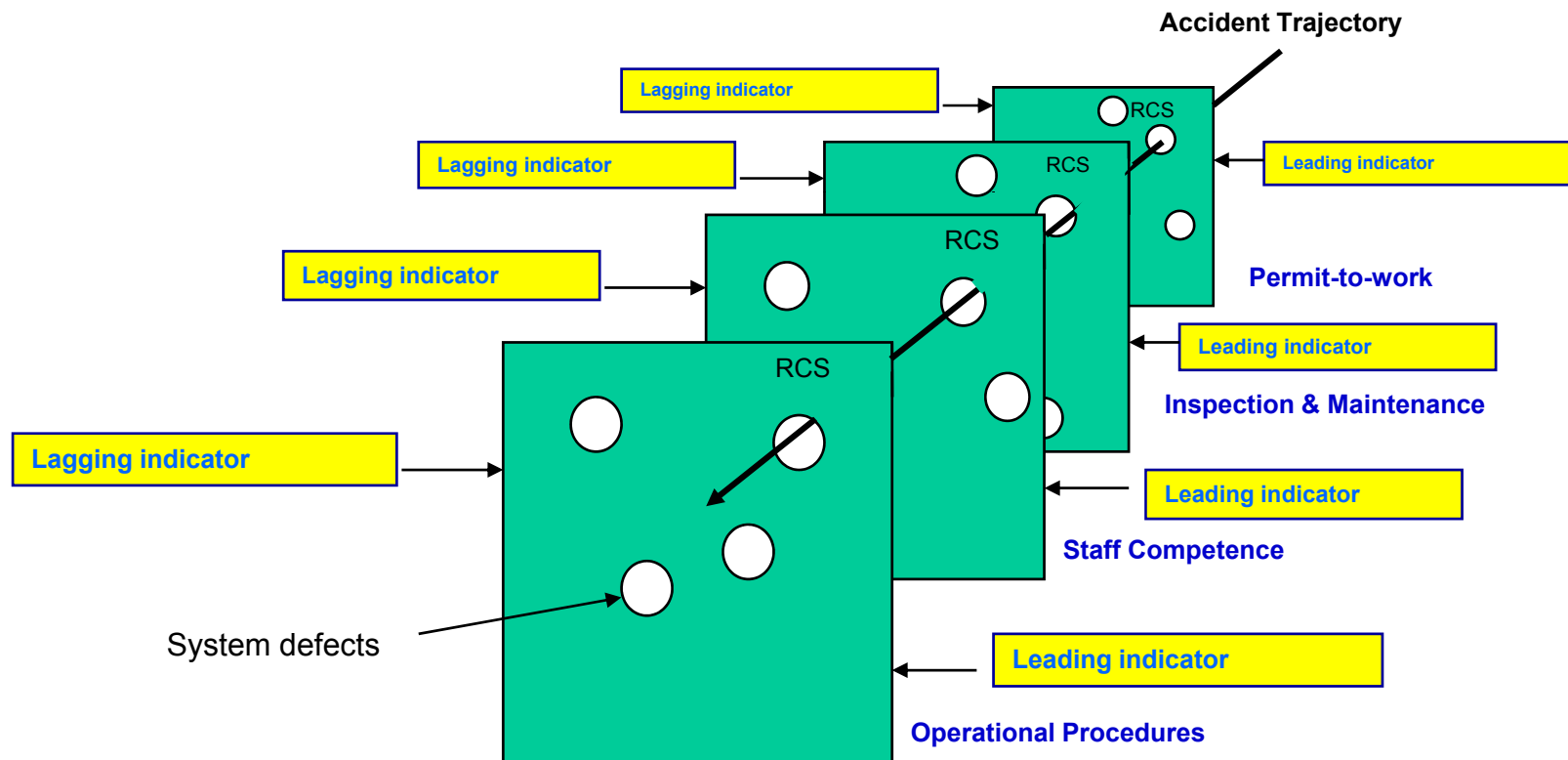


- Lagging PS metrics are needed to address long-wavelength major accident risks, but are insufficiently utilised by Industry
- General lack of corporate - but especially site - management focus on leading safety indicators, and especially on PS risks
- Combination of Leading & Lagging provides “Dual Assurance” (UK HSE) – reinforcing the importance of developing risk specific KPIs at site level
- The Panel calls for BP to :
 - Initially introduce a lagging index addressing fires, explosion, releases and PS injuries/fatalities
 - Develop an integrated set of lagging & leading PS indicators ahead of industry and work with industry to gain consensus on PS metrics
 - Make this part of a systematic review & improvement process



Indicators set to identify defects in risk control systems.

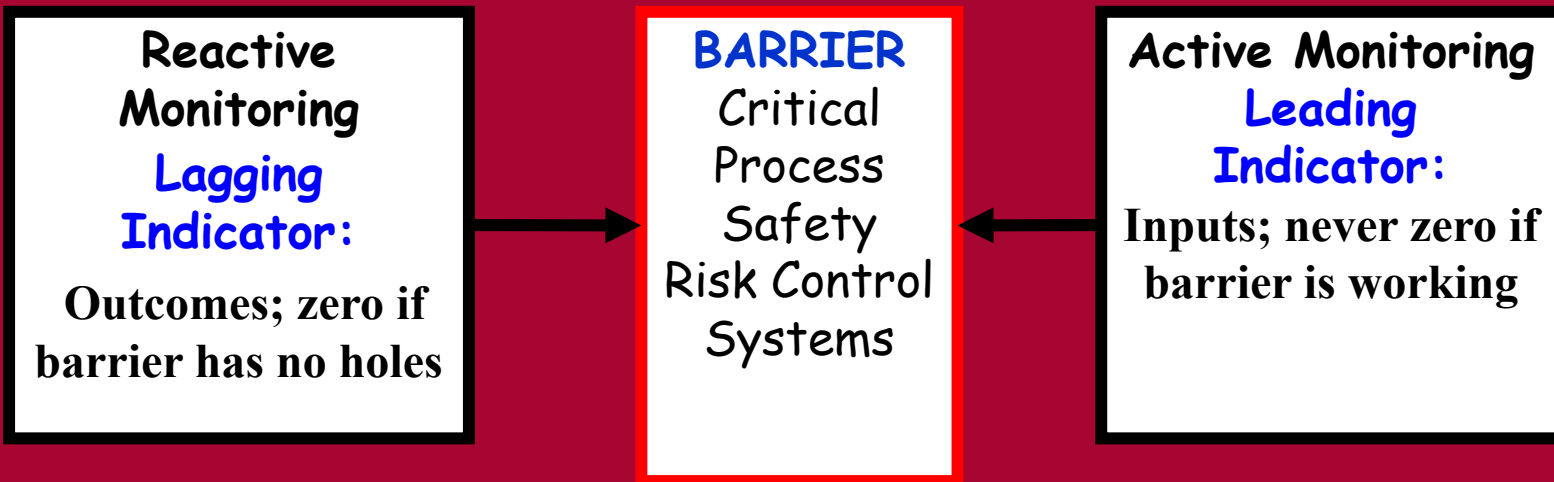
After J. Reason – accident trajectory model



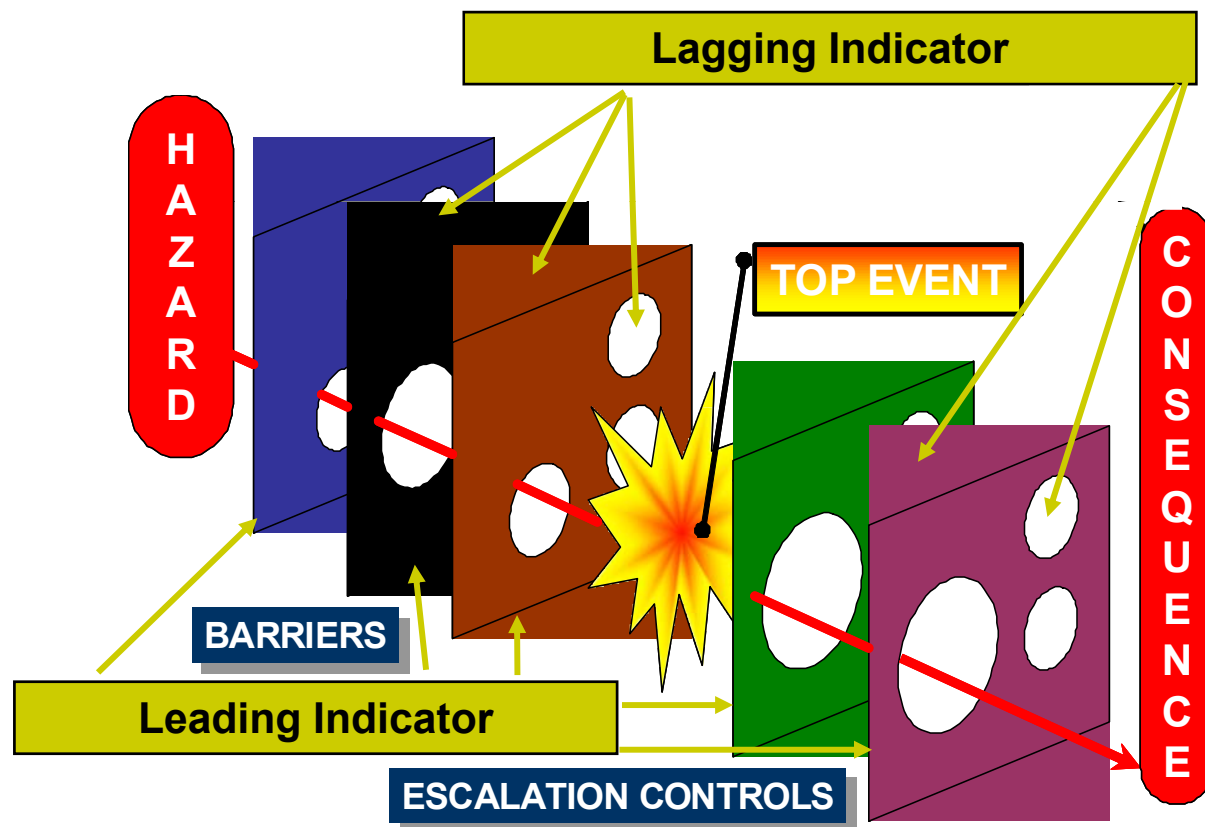
Baker Panel supported this dual assurance approach



Dual Assurance - leading and lagging indicators measuring performance of each critical element of a Process Safety Management System



Improving the Process – 3 approaches to Identifying leading & lagging indicators for each key barrier

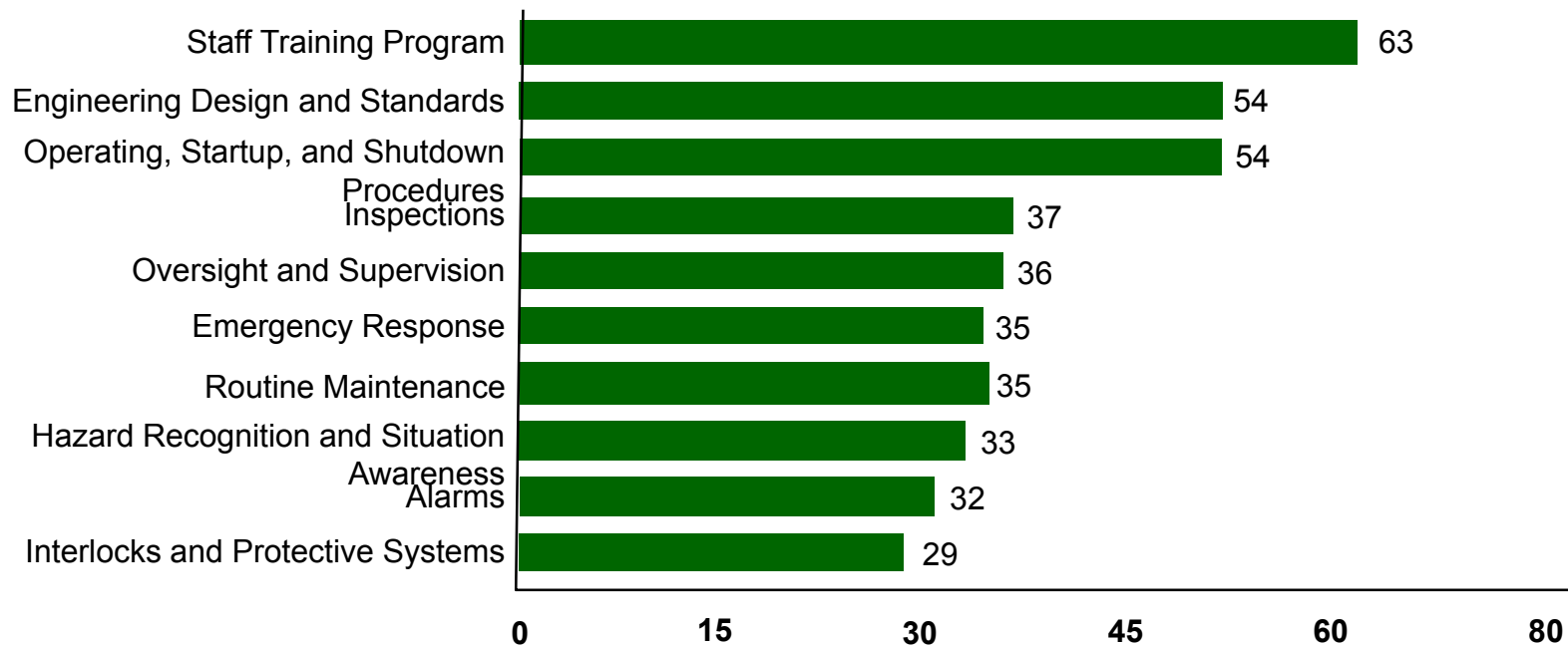


Top Control Themes



- 107 Process Safety incidents were analysed by PWC to identify Barriers (Controls)
- Training, procedures, and engineering design and standards were the most prevalent risk controls / barriers which failed

Top 10 Control Themes – # of Incidents



Identifying metrics



- Metrics were then matched to key controls / barriers, based on existing metrics from :
 - Texas City, Hull, BP “Orange” Book, and Governance Compliance & Ethics efforts
 - CCPS, API, HSG 254 and others
 - Review and research of 14 scientific journals & 13 industry and professional organization websites
 - Additional metric information was obtained through conversations with representatives of the Chemical Industry, Air Traffic Control Industry, and the British Nuclear Group

Process Safety: initial ideas from the process - leading and lagging indicators (work in progress)



Risk Control	Leading Indicator	Lagging Indicator
Inspections, Equipment Tests, Preventative Maintenance	Number of Inspections and Tests (OK) Number of Inspections and Tests Requiring Remedial Actions (hard but important)	Number of Inspections and Tests (OK) Overdue Inspections and Tests Orange Book (OK)
Engineering Design and Standards, Site Technical Practices (STP)	Number of ETPs (OK) Number of High Priority STPs assessed and approved for alignment with the group ETPs (OK)	Number of High Priority STPs (OK) Equipment in Compliance (Fully meets STP or authorized by EA) with High Priority STPs (Difficult but important)
Staff Competency and task understanding	Number of people in safety critical roles (Medium difficulty but important) Number of people assessed to be competent in safety critical roles (Challenging but important)	
Management of change	Process in place that complies with minimum requirements in Group Policy (Not as urgent—captured by S&O Audit)	Number of open MoC Process Safety actions (Not as urgent) Number of overdue MoC Process Safety actions (Not as urgent)
Operating, Start-up, and Shutdown Procedures	Number of Procedures Documented/Up To Date (Important—check in 2008) Number of Procedures Not Documented/Up To Date (Important—check in 2008) Procedures in Place Meeting Quality Criteria (more work required)	Number of Incidents where inadequate procedures is a contributing factor or cause (Relatively easy)
Institutional Learning Process	Percentage of 1 and 2 with Lessoned Learned Report (Overdue by greater than 30 days) (relatively easy) Percentage of Lessoned Learned that Meet Quality Criteria (relatively easy)	“Traction Repeat Indicator” rolling year versus previous three years (to be tested) Number of practices, procedures or standards updated as a result of High Value Learnings (relatively easy)

In summary



- BP plan to improve lagging indicators to generate a Process Safety Index, which will include:
 - Uncontrolled Releases / Loss of Primary Containment
 - Fires & explosions
 - Process Safety Related Fatalities / Injuries
- BP have been testing out a process at site and group level for developing Process Safety Indicators
 - The UK Health & Safety Executive HSG254 is a good model but can be improved eg to benefit from learning from incidents and external metrics, as well as standardised risk assessment processes
 - Expect this work to be useful input to CCPS who will prepare a guide in 2008
- As a result of applying this process, BP is considering introducing lagging and leading indicators for Process Safety into their Group-level (corporate) reporting based on key risk controls, such as
 - Competency, Learning, Inspections, Procedures and Engineering Practices