

PSM Metrics Made Meaningful and Useful

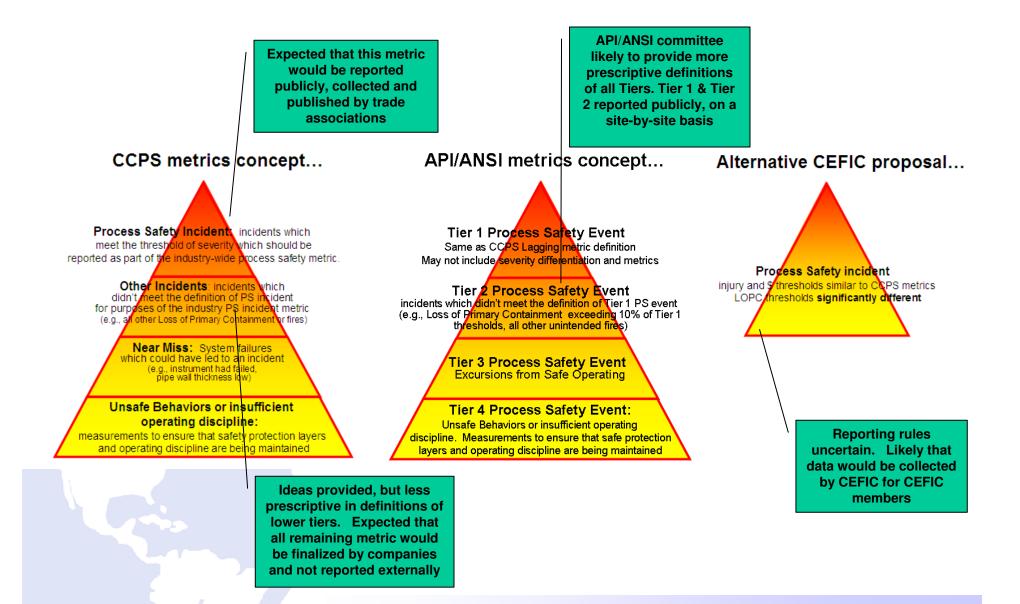
Singapore Chemical Industry Council Society of Loss Prevention Singapore October 13, 2009



It is not the end of the tunnel.

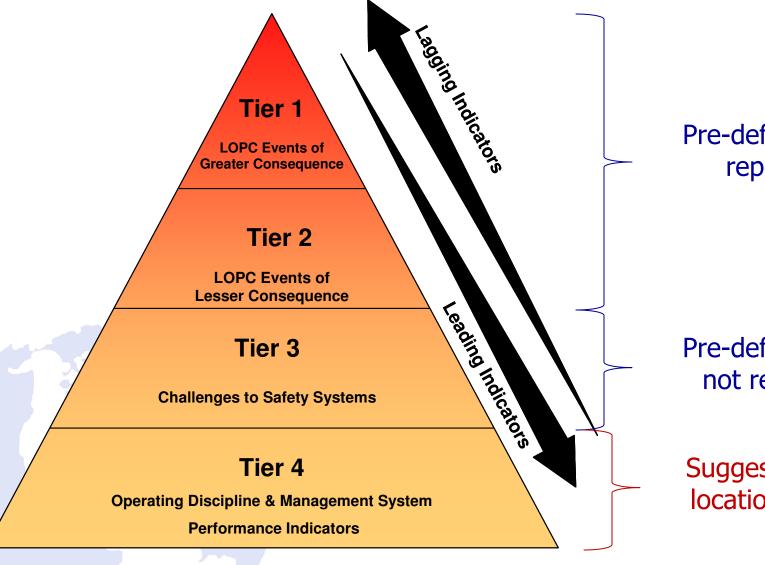
Current International Efforts





API/ANSI 754 Metrics Concept





Pre-defined and reported

Pre-defined and not reported

Suggestions, but location-specific

ANSI/API 754 Tier 4 Indicators



- 1. Process Hazard Evaluations Completion
- 2. Process Safety Action Item Closure
- 3. Training Completed on Schedule
- 4. Procedures Current and Accurate
- 5. Work Permit Compliance
- 6. Safety Critical Equipment Inspection
- 7. Safety Critical Equipment Deficiency Management
- 8. Management of Change (MOC) and Pre Start-up Safety Review (PSSR) Compliance
- 9. Completion of Emergency Response Drills 10. Fatigue Risk Management

Why Use Metrics?



- Process Safety Management "the application of management systems to the identification, understanding, and control of process hazards to prevent process-related injuries and incidents." -CCPS (1989)
- That which is not be measured, cannot be managed
- That which is not be measured, cannot be improved

Metrics create value for the organization by monitoring performance

Performance Measurement



A business process that periodically quantifies and tracks selected indicators of an enterprise's performance relative to its stated objectives.

Performance Indicator



A performance indicator is a quantifiable aspect of an enterprise's business processes that characterizes the potential contributions of these activities toward the enterprise's strategic objectives.

 A <u>metric</u> defines a specific means of measuring and tracking an indicator.



Performance Measurement



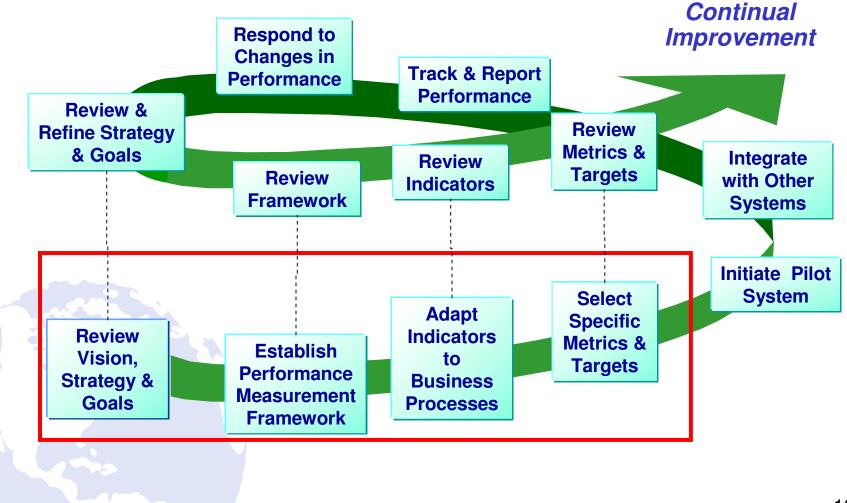
✓ Performance Indicator

- Quantifiable Attribute of Company Activity

- ✓ Metric
 - Means to Measure & Track Performance Indicator
- ✓ Target
 - Desired Behavior with Respect to Metric

Performance Measurement Process





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Vision, Strategy & Goals



Stakeholder Considerations

- Senior Mgt. & Board of Directors
- Customers (direct & indirect)
- Employees
- Suppliers (& contractors)
- Financial community (stockholders, lenders, insurers)
- Interest groups
 (communities, NGOs)
- Media (print, electronic)
- Regulators
- Future generations

Possible objectives

- Assurance
- Differentiation
- Pride & satisfaction
- Commitment
- Confidence
- Trust
- Favorable image
- Compliance
- Sustainability

Vision, Strategy & Goals



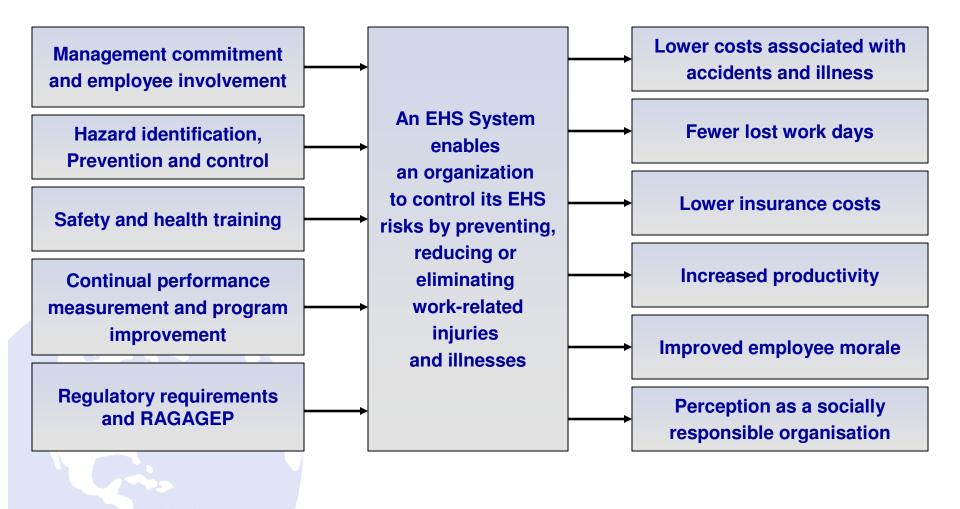
Basis of Performance Management



Establish Framework



EHS Management Systems



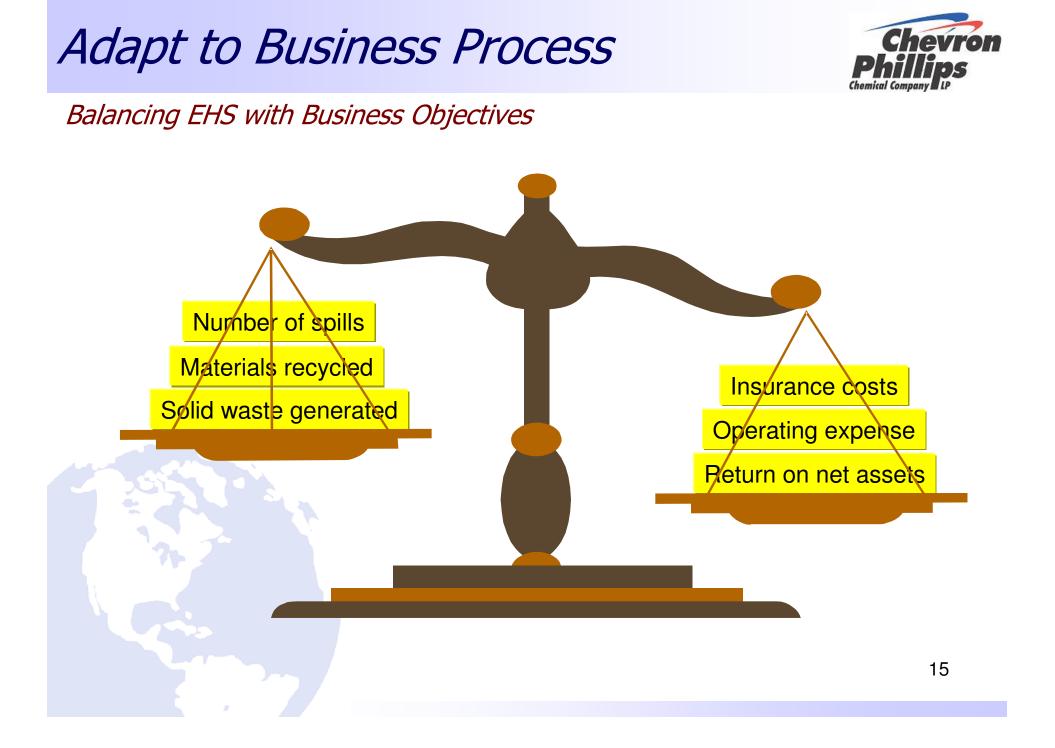
Establish Framework

Business Indicators Linked to EHS

- ✓ Reliability improvement
- ✓ Downtime reduction
- Yield improvement
- ✓ O&M cost reduction
- ✓ Liability reduction
- Insurance cost reduction
- Resource productivity increase
 - Customer satisfaction







Adapt to Business Processes



Creating Value with EHS Systems

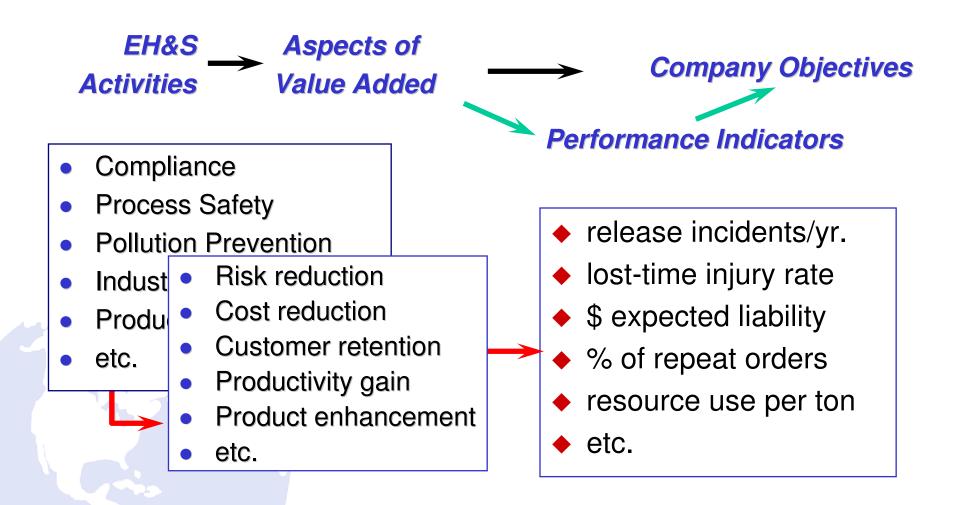
 Identify and quantify how EHS resources add value to the business

- Align EHS resource allocation with corporate strategic objectives
- Establish EHS performance goals and metrics relevant to value creation
- Strive for continual improvement

Adapt to Business Processes



Quantification of Value Added





Criteria for KPIs/Metrics

- Relevant to strategic enterprise goals, including:
 - EH&S responsibility across the supply chain
 - Achievement of competitive advantage
- ✓ Effective for process improvement:
 - Measure both process and outcome performance
 - Support establishment of employee goals
- Support stakeholder communication:
 - Consistent with policy and principles
 - Meaningful and easy to understand
- Cost-effective to implement
- Suitable for intra-industry comparison
- Consistent across sites and over time
- ✓ Few in number
- Appropriate normalization factors



Enterprise vs. Operational Indicators

Enterprise KPI examples

- ✓ PSM compliance
- ✓ Corporate CO_2 emissions/yr.
- Corporate average mass throughput per \$ revenue

Intermediate KPIs at sector level

Operational KPI examples Outcome indicators Number of incidents CO₂ emissions

Mass throughput

Process indicators

- Maintenance backlog
- Emergency drills

Communication & tracking of broad goals and targets

Establishment of sector-specific goals & key performance indicators

Monitoring of performance for individual products



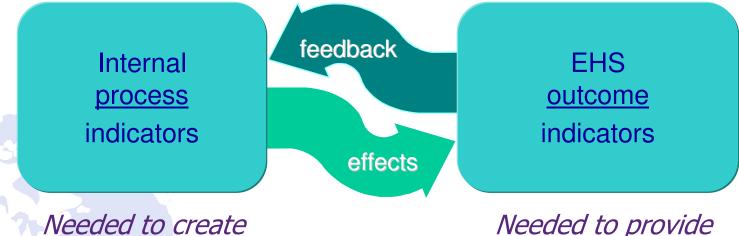
Process vs. Outcome Indicators

Process examples

No. of hazard analyses No. of emergency drills No. of audit findings

Outcome examples

Incident frequency No. of off-site releases Notices of violation

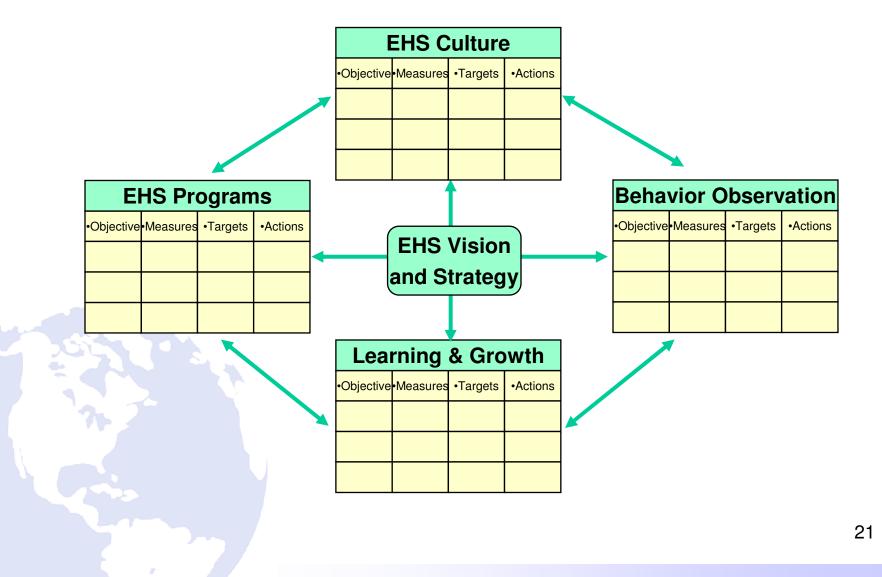


behavioral changes

Needed to provide evidence of results

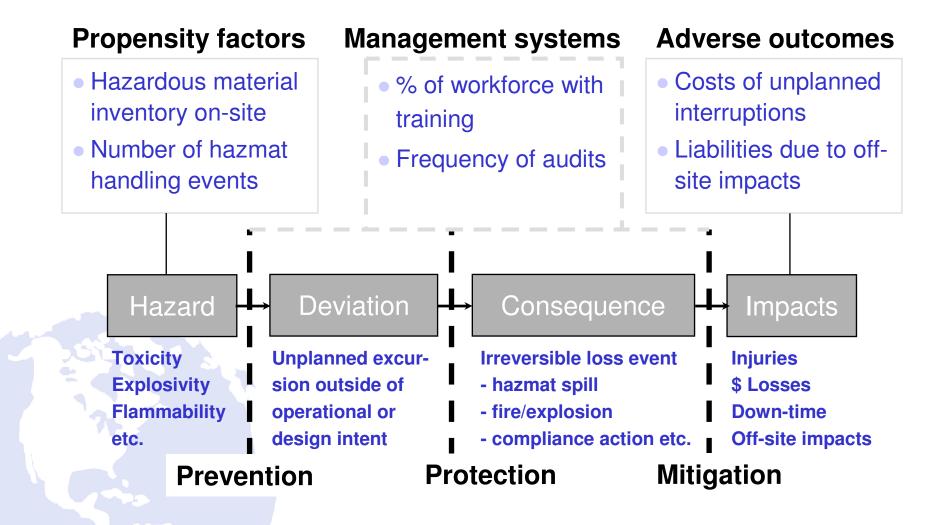


Balanced Scorecard Framework





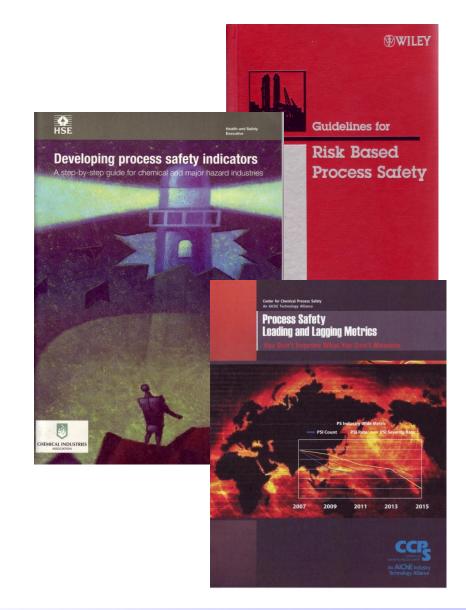
Incident-Derived Metrics





Sources of PSM Metrics

- ✓ Guidelines for Risk
 Based Process Safety
 (CCPS 2007)
- Process Safety
 Leading and Lagging
 Metrics (CCPS 2008)
- Developing Process
 Safety Indicators (UK HSE 2006)



Example Performance Measurement Implementation



Aspect Modification	Performance Indicator	Metric	Target
Eliminate incidents	Process safety incidents	Process safety severity index	Zero
Reduce precursors to incidents	Process safety near miss	Number of losses of primary containment	Reduce the number by 10%
		Number of unplanned flames	Be in the top 10% among peer companies for lowest number
	Challenges to safety systems	Number of pressure relief device challenges	Reduce the number by 30%
		Number of safety instrumented system challenges	Reduce the number by 10%
		Number of process deviations or excursions	Reduce the number by 10%
Reduce the number of equipment failures	Completion of maintenance activities	Number of PMs past due	Reduce the number by 50%
		Number of corrective actions on MI equipment or systems past due	Reduce the number by 50%
	Maintenance of up-to- date procedures	Number of maintenance procedures past due scheduled review	Zero
Expeditiously address action items	Action items past due	Number of action items past due by month	No action item older than 3 months
		Number of action items past due	Reduce the number by 50%

Suggested Approach

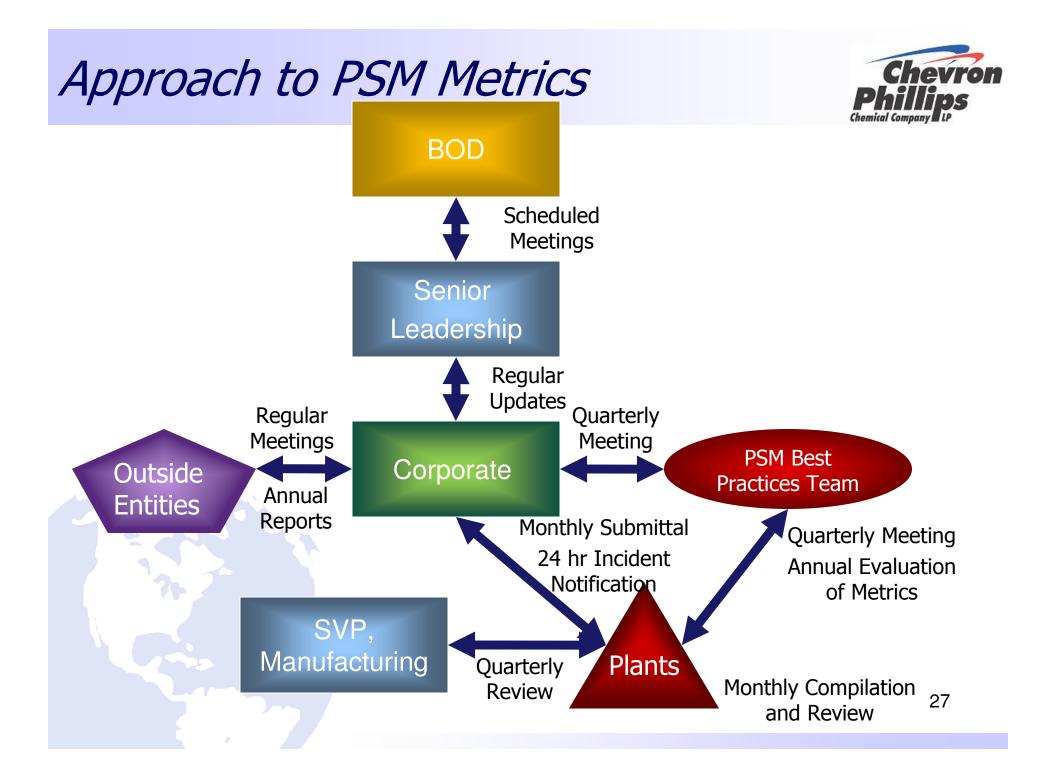


- ✓ Phase 1 Development of KPIs
 - Identify stakeholder objectives
 - Develop value aspects for performance
 - Establish performance goals or standards
 - Determine KPIs
 - Develop performance metrics
 - Develop approach and protocols
- Phase 2 Implementation of the KPIs
 - Identify and locate the raw data
 - Identify responsible parties
 - Collect sample data
 - Train personnel in the KPI application
 - Analyze/report actual performance

Continual Improvement Strategies



- Evaluate performance using Key Performance Indicators
- Stay in touch with stakeholders
- Perform value assessments
- Annual review and assessment
- Revise and implement, as necessary



CPChem PSM Metrics



✓ Tier 1

- Process Safety Incidents (CCPS definitions)
- PSI Rate
- Process Safety Severity Index
- ✓ Tier 2
 - Process Safety Near Misses
 - Loss of Primary Containment
 - Unplanned Flame
 - Tier 3
 - Challenges to Safety Systems
 - PRD
 - SIS
 - Process Excursion

CPChem PSM Metrics



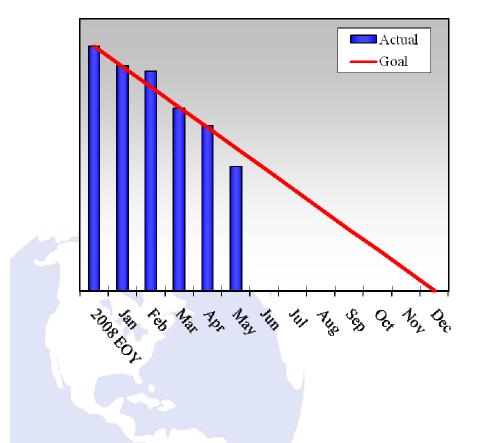
✓ Tier 4

- MI/PMs Past Due
- Corrective Recommendations Past Due
- Maintenance Procedure Reviews Past Due
- Action Items Past Due
- Action Items Past Due by Year
- Total Action Items
- Number of Open MOCs
- Permanent MOCs Past Due
- Temporary MOCs Past Due
- Contractor Performance Monitoring Past Due
- Scheduled Training Courses Past Due
- Others (Plant Specific)

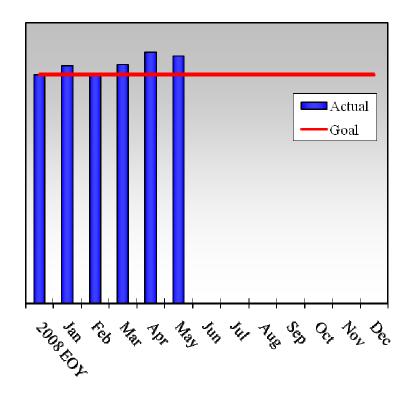




Metrics with Targeted Reduction



Metrics with Targeted Level



What's Next



- Continue to monitor and participate in industry activities
- Continue to monitor and evaluate metrics
 - Culture survey
 - Incident investigation
 - Mechanical reliability
 - Safe work practices
- Support plants through positive reinforcement rather than punitive actions





Value often comes from just shining the light.







