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# Work Planning and Control Improvement Project

*Achieving Excellence in Facilities Maintenance and Sustainability*

**Fred Berl**  
**Los Alamos National Laboratory**

**Donna Governor**  
**Lawrence Livermore National Laboratory**

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UNCLASSIFIED

## Objective

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- This Project Plan was developed to provide consistency in WPC expectations across the National Nuclear Security Administration's (NNSA) Nuclear Security Enterprise (NSE) and Environmental Management (EM) sites.
- This project will interface with EFCOG groups focused on Human Performance Improvement (HPI); Quality Assurance; Environment, Safety and Health (ES&H); Contractor Assurance and Work Management to pursue improvement and integrated solutions.
- The Project Plan builds on existing WPC programs already in place at EM and NNSA Sites with the intent to further incorporate practices from the Institute of Nuclear Power Operations (INPO) and other sources; and effectively implement and improve existing programs.

# Project Organization

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The project's Executive Committee includes:

- Mr. Frank Russo, NNSA ES&H Safety Advisor (NA-3.6);
- Mr. James McConnell, NA-10 Assistant Deputy Administrator for Nuclear Safety, Nuclear Operations and Governance Reform (NA-17);
- Mr. Ken Picha, EM Acting Deputy Assistant Secretary for Safety and Security Program (EM-20);
- Mr. Robert Milazzo, (Future) Chair of EFCOG Integrated Safety Management/QA Working Group; and
- Mr. Kevin Hall, Savannah River Site Office Deputy Manager and Human Performance Improvement Working Group Chairman.

The Project Managers for this initiative are:

- Mr. James Hutton, EM-20 Chief Nuclear Safety Advisor,
- Mr. James Winter, NA-10 ISM Technical Lead, and,
- Mr. Timothy Flake, Work Planning and Control Manager, Savannah River Nuclear Solutions.

# Tasks

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- Develop WPC performance measures to evaluate M&O/Prime Contractor's performance (Focus Area 1);
- Establish a comprehensive WPC toolbox and guidance to address WPC activities and related assurance systems (Focus Area 2);
- Improve the assessment planning and performance for WPC (Focus Area 3);
- Communicate and share best practices (Focus Area 4); and
- Recommend changes to existing DOE directives and Federal direction relating to WPC (Focus Area 5)

## Task 1 - Performance Measures

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- Currently, I have measures from DOE sites and external sources.
- You will be a focus group
- Need your feedback on WP&C standard performance measures versus the Institute of Nuclear Power Operations (INPO) use of warning flags.
- Will review measures after briefing the rest of the tasks

# Metrics

Indicator	LANL	Y-12	LLNL	WIPP	SRS	Kansas City	Nevada Test Site	BBWI (Idaho)	CHPRC	DNFS B Reactor	New DOE G43	2001 EFCO G Wh	INPO	EPRI	Intel	SMRP	TVA	Exelon	Desired Range (TBD in Task 3)	
<b>SAFETY</b>																				
TRC Rate	X	X	X		X	X	X		X		X	X	X	X	X			X		
DART Rate	X	X	X		X	X	X		X		X	X	X	X	X			X		
Near Misses									X		X		X	X				X		
<b>PLANNING/SCHEDULING</b>																				
PM Completion %	X	X	X	X			X	X		X			X	X	X	X	X	X	X	> 98%
PM Deferrals	X				X		X				X	X	X	X	X		X	X	X	< 5%
Ratio of critical PM/PM tasks overdue or in grace period to total													X	X						
PMs in last 50% of Grace Period													X				X	X		< 5 PMs
% PM vs Total Maintenance	X		X	X								X	X	X	X	X	X	X		> 60%
Schedule Performance	X	X		X	X		X			X			X	X	X	X	X	X		> 80%
Schedule Resource Loading				X	X		X						X		X		X	X		> 80%
Scope Stability/Schedule Consistency					X								X	X			X	X		
Work Package Production/Completion	X	X		X	X							X	X	X	X	X	X	X		
% of Emergent Work Orders	X												X	X			X	X		< 5%
Work Package Cycle Time	X					X	X								X					< 21 days
CM Backlog Total	X		X		X	X	X			X			X	X		X	X	X		
CM Backlog in Crew Weeks	X	X			X		X					X		X	X			X		4 - 8 weeks

# Metrics

Indicator	LANL	Y-12	LLNL	WIPP	SRS	Kansas City	Nevada Test Site	BBWI (Idaho)	CHPRO	DNFSB Rec. League Int.	New DOE G43	2001 EFCO G. White	INPO	EPRI	Intel	SMRP	TVA	Eselon	Desired Range (TBD in Task 3)
Dispatch/Minor Backlog			X																
CM Backlog Age	X			X									X	X		X	X	X	
Planned Backlog	X												X			X			
Backlog as % of last years backlog				X															
Work Comp FIN/Expedited/Minor Maint	X	X			X								X	X			X	X	
Number of add on tasks	X				X								X	X			X	X	
Estimating Accuracy	X	X			X	X	X								X				90 - 110%
Craft % Overtime	X										X		X	X	X		X	X	< 10%
Manpower Utilization		X			X								X	X	X			X	
Work Control Perf Index (see Note 1)								X											
Equipment & Test Inspection		X																	
Total Field Calibration Performance		X											X	X	X				
% Rework		X									X		X	X	X	X	X	X	
False Starts		X																	
Job Package Quality		X					X												
Planning Errors							X					X						X	
Maintenance Quality (See Note 2)							X											X	
Work Order Feedback			X																
Percent of Issues coded affiliated with Work Management/Operations/Elec Safety/Rigging Reports Trends									X										
<b>HUMAN PERFORMANCE</b>																			
Total # of HPI events (per 10,000 labor													X	X			X	X	
HPI Event Clock Resets													X	X			X	X	
Human Performance Training (hrs per													X						8 hours
Human Perf Supervisory Observations (per mo)													X						4
Open Procedure Revision Requests													X	X					
Open Corrective Actions													X	X					
Self-Identified Human Performance Problems													X	X					



# Metrics

Indicator	LANL	Y-12	LLNL	WIPP	SRS	Kansas City	Nevada Test Site	BBWI (Idaho)	CHPRC	DNFS B Rec. Lead. q In	New DOE G43	2001 EFCO G Whi	INPO	EPRI	Intel	SMRP	TVA	Ezelon	Desired Range (TBD in Task 3)
<b>OTHER LEADING INDICATORS</b>																			
<i>On-time Training Completion</i>	X		X				X			X	X		X	X					
<i>Staffing resource levels and turnover</i>										X									
<i>Rate and nature of procedure violations</i>										X			X	X					
<i>Frequency of Procedure reworks</i>										X			X	X					
<i>Frequency of Unexpected Equip. Failure</i>										X			X	X					
<i>Frequency of challenges to controls</i>										X			X	X					
<i>Continuing Training Participation</i>							X						X	X					
<b>OTHERS</b>																			
CONOPS OPRS Reports												X							
Worker Effectiveness - Number of work activities performed on a per-person, per-week basis.													X	X					
<i>Expediting Cost - Costs associated with expediting materials to support work activities.</i>													X	X					
Work on Hold for Engineering	X						X						X	X					
Contamination Events											X								
PPE Infractions											X								
Engineering Backlog													X	X					

# Metrics

Indicator	Desired Range (TBD in Task 3)	Total LANL Weighted Performance Score	LANL Performance Measures Rank on a scale of 1 to 5			
			Effectiveness of Measure	Cost/Difficulty of Gathering	Implementation Time Required	Breadth
<b>SAFETY</b>						
TRC Rate		100%	25%	25%	25%	25%
DART Rate		4.75	4.0	5.0	5.0	5.0
Near Misses		4.50	4.0	5.0	4.0	5.0
		3.75	5.0	2.0	3.0	5.0
<b>PLANNING/SCHEDULING</b>						
PM Completion %	> 98%	4.50	5.0	4.0	5.0	4.0
PM Deferrals	< 5%	4.50	5.0	4.0	5.0	4.0
Ratio of critical PM/PdM tasks overdue or in grace period to total		3.50	4.0	3.0	3.0	4.0
PMs in last 50% of Grace Period	< 5 PMs	3.00	3.0	3.0	3.0	3.0
% PM vs Total Maintenance	> 60%	4.50	5.0	4.0	4.0	5.0
Schedule Performance	> 80%	4.75	5.0	5.0	5.0	4.0
Schedule Resource Loading	> 80%	3.50	4.0	4.0	3.0	3.0
Scope Stability/Schedule Consistency		3.75	5.0	3.0	3.0	4.0
Work Package Production/Completion		4.75	5.0	5.0	5.0	4.0
% of Emergent Work Orders	< 5%	3.75	4.0	3.0	4.0	4.0
Work Package Cycle Time	< 21 days	3.50	4.0	3.0	3.0	4.0
CM Backlog Total		4.75	5.0	5.0	5.0	4.0
CM Backlog in Crew Weeks	4 - 8 weeks	4.75	5.0	5.0	5.0	4.0
Dispatch/Minor Backlog		2.75	3.0	3.0	3.0	2.0
CM Backlog Age		3.75	4.0	4.0	4.0	3.0
Planned Backlog		3.75	4.0	4.0	4.0	3.0
Backlog as % of last years backlog		2.75	3.0	3.0	3.0	2.0
Work Comp FIN/Expedited/Minor Maint		4.00	5.0	4.0	4.0	3.0

# Metrics – Sites Ranking Their Indicators High and New Indicators Low

Total DOEAL Weighted Performance Score	Evaluated of Options				Total NTS Weighted Performance Score	Evaluated of Options			
	Y Performance Measures Rank on a scale of 1 to 5					Z Measures Rank on a scale of 1 to 5			
	Effectiveness of Measure	Cost/Difficulty of Gathering	Implementation Time Required	Breadth		Effectiveness of Measure	Cost/Difficulty of Gathering	Implementation Time Required	Breadth
100%	25%	25%	25%	25%	100%	25%	25%	25%	25%
4.75	5.0	4.0	5.0	5.0	4.50	3.0	5.0	5.0	5.0
4.75	5.0	4.0	5.0	5.0	4.50	3.0	5.0	5.0	5.0
3.75	4.0	3.0	3.0	5.0	3.00	3.0	3.0	1.0	5.0
3.25	4.0	3.0	3.0	3.0	3.75	4.0	5.0	5.0	1.0
3.25	4.0	3.0	3.0	3.0	3.75	4.0	5.0	5.0	1.0
3.00	4.0	3.0	3.0	2.0	2.00	3.0	3.0	1.0	1.0
3.00	4.0	3.0	3.0	2.0	2.25	4.0	3.0	1.0	1.0
3.25	4.0	3.0	3.0	3.0	2.00	3.0	3.0	1.0	1.0
3.25	4.0	3.0	3.0	3.0	3.50	3.0	5.0	5.0	1.0
3.25	4.0	3.0	3.0	3.0	3.75	4.0	5.0	5.0	1.0
3.00	4.0	3.0	3.0	2.0	1.75	2.0	3.0	1.0	1.0
2.25	5.0	1.0	1.0	2.0	2.25	2.0	3.0	1.0	3.0
3.25	5.0	3.0	3.0	2.0	2.50	3.0	3.0	1.0	3.0
2.00	4.0	2.0	0.0	2.0	3.75	4.0	5.0	5.0	1.0
1.50	4.0	0.0	0.0	2.0	3.75	4.0	5.0	5.0	1.0
1.50	4.0	0.0	0.0	2.0	3.75	4.0	5.0	5.0	1.0
1.50	4.0	0.0	0.0	2.0	2.25	2.0	3.0	1.0	3.0
1.50	4.0	0.0	0.0	2.0	2.00	3.0	3.0	1.0	1.0
1.50	4.0	0.0	0.0	2.0	2.75	4.0	3.0	1.0	3.0
1.50	4.0	0.0	0.0	2.0	2.50	3.0	3.0	1.0	3.0
1.25	3.0	0.0	0.0	2.0	1.75	2.0	3.0	1.0	1.0
1.75	5.0	0.0	0.0	2.0	2.25	2.0	3.0	1.0	3.0
1.50	4.0	0.0	0.0	2.0	3.75	4.0	5.0	5.0	1.0
1.50	4.0	0.0	0.0	2.0	1.75	2.0	3.0	1.0	1.0
1.25	3.0	0.0	0.0	2.0	2.00	3.0	3.0	1.0	1.0
0.00	0.0	0.0	0.0	0.0	2.25	4.0	3.0	1.0	1.0
1.25	3.0	0.0	0.0	2.0	1.75	2.0	3.0	1.0	1.0

# Warning Flags

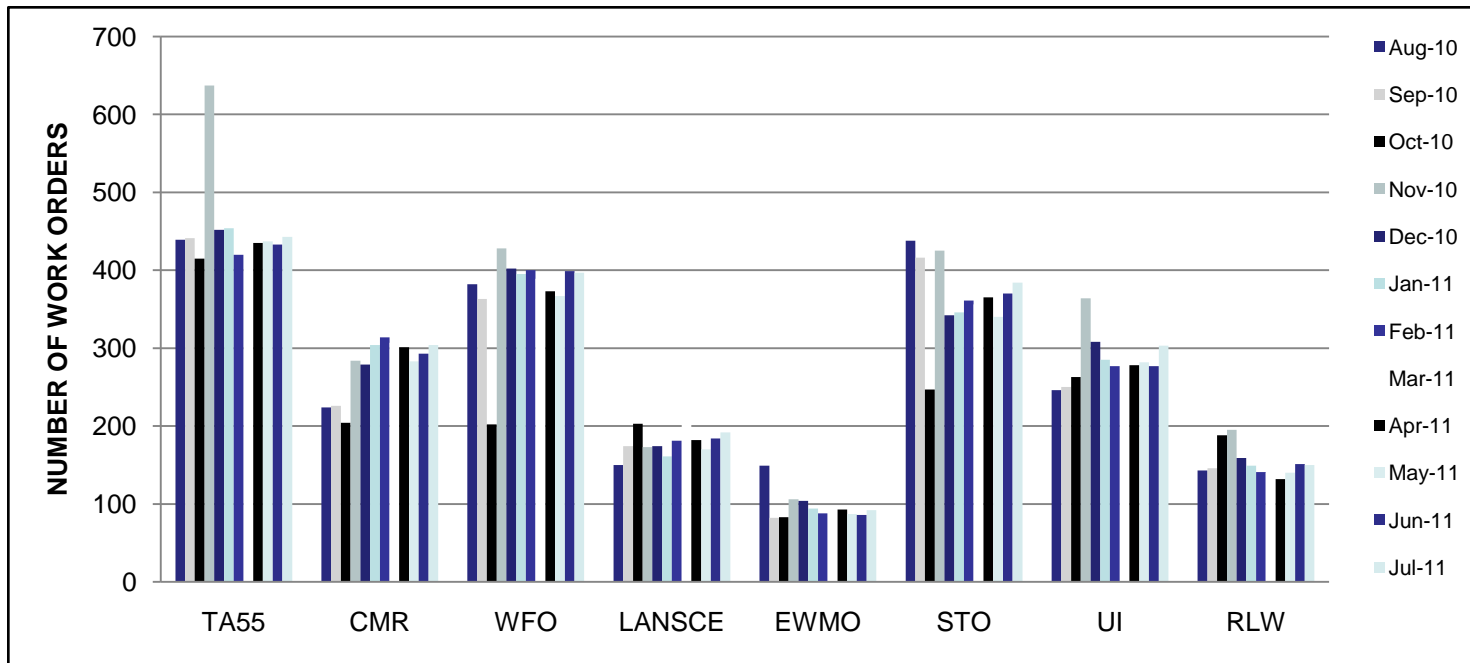
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- Rather than discreet indicators, INPO uses Warning Flags
- Most sites use performance indicators to monitor site performance; however, these indicators sometimes lag declining performance.
- The following are a number of "Work Management Warning Flags" that may be used, in addition to performance indicators and facility assessments, to identify degradation of the site work management process or its implementation.
- These flags should not be used solely to conclude that a problem exists, but instead are used to initiate a more in-depth assessment and a broader analysis.

# Examples – Metrics vs. Warning Flags Backlog

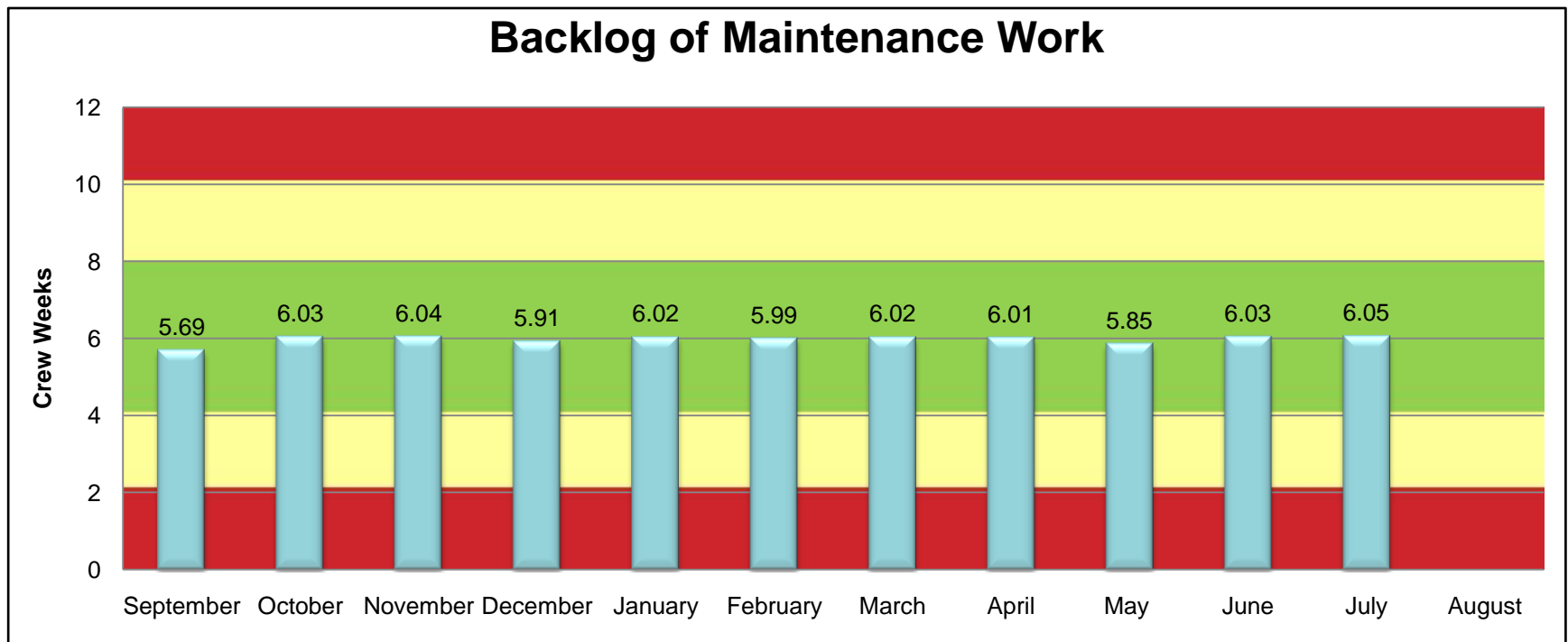
What is the correct amount of backlog that we should be judged to?

Large sites vs. small sites (e.g. LANL backlog is 2,265)



# Examples – Metrics vs. Warning Flags Backlog

Even the crew weeks measure is dependent on staffing, and very few site measure backlog in crew weeks.



# Examples – Metrics vs. Warning Flags Backlog

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With Warning Flags, your CRADs would read something like:

- Corrective maintenance backlog trending up greater than >10% per site. CM backlogs are trending up and opportunities to correct these deficiencies are missed when equipment or systems are taken out of service for scheduled preventive or corrective maintenance.
- The average age of the CM backlogs is increasing.
- Productivity is low as indicated by preventive maintenance not being completed as scheduled or by corrective maintenance backlog increasing.

# Examples – Metrics vs. Warning Flags

## Schedule Performance

Most Sites use Schedule Compliance

There are different ways to calculate (how to count add on work), weekly, daily etc. Can everyone agree to a threshold (e.g. 80%)?

How do we measure R&D? Do we need to measure R&D?

FOD #	FOD (RDL)	Previous Month Compliance Average	Current Month Compliance Average
1	TA-55/RLW	92.97%	87.35%
2	CMR	90.46%	92.95%
3	WFO	70.47%	87.23%
4	LANSCCE	88.77%	84.92%
5	EWMO	83.16%	69.03%
6	STO	98.54%	94.77%
8	IFCS/UI	98.12%	98.92%
Overall Status		88.93%	87.88%
Performance Measure		Definition	
Green	>80%	This metric measures POW schedule compliance. The denominator is all work orders that were part of the scope freeze on the Thursday of the previous week. The numerator is how many of those scheduled work orders were completed. Emergent work and add-ons are <b>not</b> counted as completions.	
Yellow	>70 to 80%		
Red	<70%		
Analysis			

# Examples – Metrics vs. Warning Flags

## Schedule Performance

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With Warning Flags, your CRADs would read something like:

- Work scope changes of greater than 10% occur after schedule freeze, which may indicate a problem with the work identification process or with the control of emergent work.
- A multidiscipline team is not used to challenge the necessity of adding emergent work to the schedule or to verify that an emergent equipment problem is an immediate threat to reliable facility operation before adding the work to the frozen work scope or schedule.
- Scheduled work activities are removed from the schedule without adequate challenge. Work activities that are removed are not analyzed to identify programmatic shortcomings.
- Schedule durations are typically in multiples of 8 hours, indicating individual work activities for important equipment are not rigorously scheduled to minimize out-of-service time.
- Scheduling more work than can be accomplished by available resources may indicate that work durations are inflated or that the work schedule is not credible.

## Metrics vs. Warning Flags

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Warning Flags that metrics cannot measure:

- Managers do not demonstrate support for the work management process by reinforcing schedule development milestones or adhering to the work prioritization process.
- Managers circumvent the work control process by adding work to the frozen work scope that normally would not be classified as important per site procedures.
- Simple jobs having narrow scope and minimal cost take extraordinary effort and time to plan, schedule, and complete.
- Site departments supporting scheduled work activities use different work schedules.

## Metrics vs. Warning Flags

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Warning Flags that metrics cannot measure:

- Roles and responsibilities for implementing the work management process are not well understood by facility staff, supervisors, and managers.
- Clear expectations have not been communicated in written format or are not routinely reinforced.
- Required attendees for schedule development and workweek implementation meetings are absent, or if present, are not prepared to accurately present schedule development issues or work execution problems.

## HPI Metrics

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- Total # of HPI events (per 10,000 labor hours)
- HPI Event Clock Resets
- Human Performance Training (hrs per employee)
- Human Performance Supervisory Observations (per mo)
- Open Procedure Revision Requests
- Open Corrective Actions
- Self-Identified Human Performance Problems

# DNFSB

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Per Peter Winokur, Chairman, DNFSB:

- 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.

## Leading Indicators

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- On-time Training Completion
- Staffing resource levels and turnover
- Rate and nature of procedure violations
- Frequency of Procedure reworks
- Frequency of Unexpected Equip. Failure
- Frequency of challenges to controls
- Continuing Training Participation
- On time completion of corrective actions
- Average age of uncompleted corrective actions

## Leading Indicators (cont.)

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- PM Completion %
- PM Deferrals Ratio of critical PM/PdM tasks overdue or in grace period to total critical PM/PdM tasks.
- PMs in last 50% of Grace Period
- %PM vs. Total Maintenance
- Schedule Performance
- % Rework
- Expediting Cost – Costs associated with expediting materials to support work activities.

# Summary

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- Indicators still in development
- Benchmarking has provided a lot of metrics
- All sites measure different metrics
- Warning Flags are a new concept in the DOE Community
- Looking for volunteers who won't just defend their metrics.