Management of Change Systems:

What Does Good Look Like?

Purdue Process Safety and Assurance Center

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Outline

- Intent and Definitions
- Robust MOC Programs
- Effect of MOC on RBPS and vice versa
- Key MOC Principles - Incidents
- Changes to a Nuclear Power Plant
- Key MOC Performance Metrics
- Concluding Points

The Intent of an MOC System

To change processes safely, ensure that process, equipment, system, and organizational changes are evaluated and authorized, and that operational readiness reviews are conducted.

From Klein and Vaughen

Definition

Management of change (MOC)

is a process for evaluating and controlling modifications to facility design, operation, organization, or activities

- before implementation –

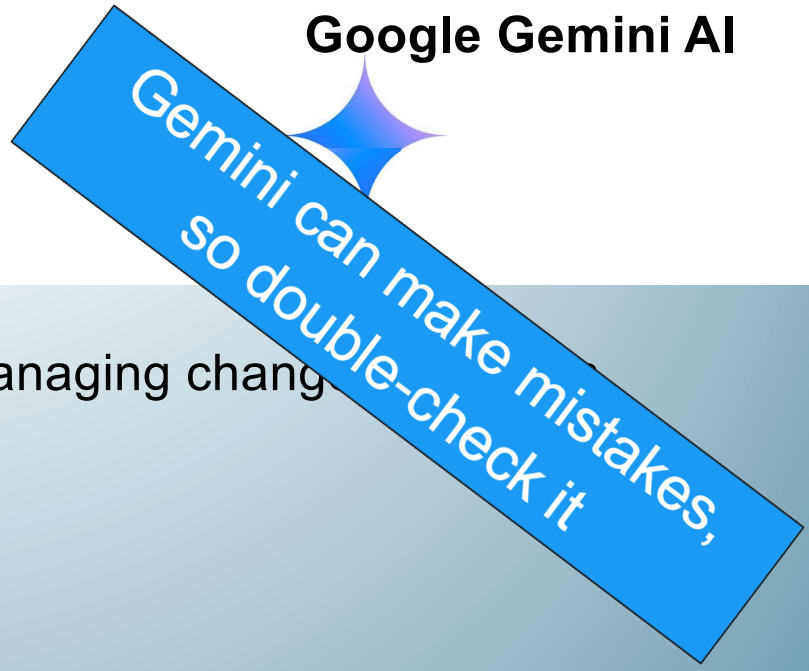
to make certain that no new hazards are introduced

and that the risk of existing hazards to employees, the public, or the environment is not unknowingly increased.

Another MOC Definition

Management of change (MOC)

Google Gemini AI



a structured process for implementing and managing chang
organization, including assessing

- the impact of those changes,
- developing mitigation strategies, and
- communicating effectively with stakeholders.

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Robust MOC Programs

Ensure that:

1) Proposals to make the changes are submitted to a formal review and approval process

2) Hazards and risks associated with the proposed changes are identified and analyzed

3) Decisions are made on whether to accept the change with the given constraints

Source: *CCPS Handbook for Process Safety in Laboratories and Pilot Plants: A Risk-based Approach*

Robust MOC Programs

Ensure that:

4) For approved changes, the risk controls are specified, approved, and implemented

5) All relevant process information, procedures, and training are updated, and communicated

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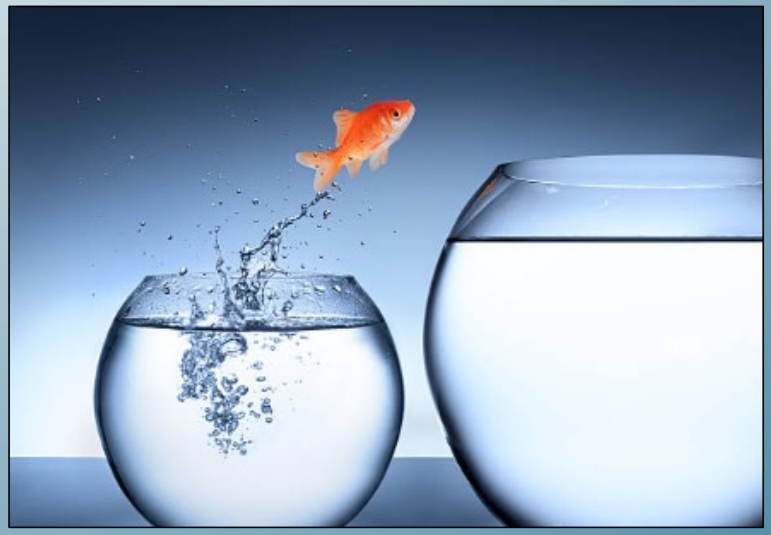
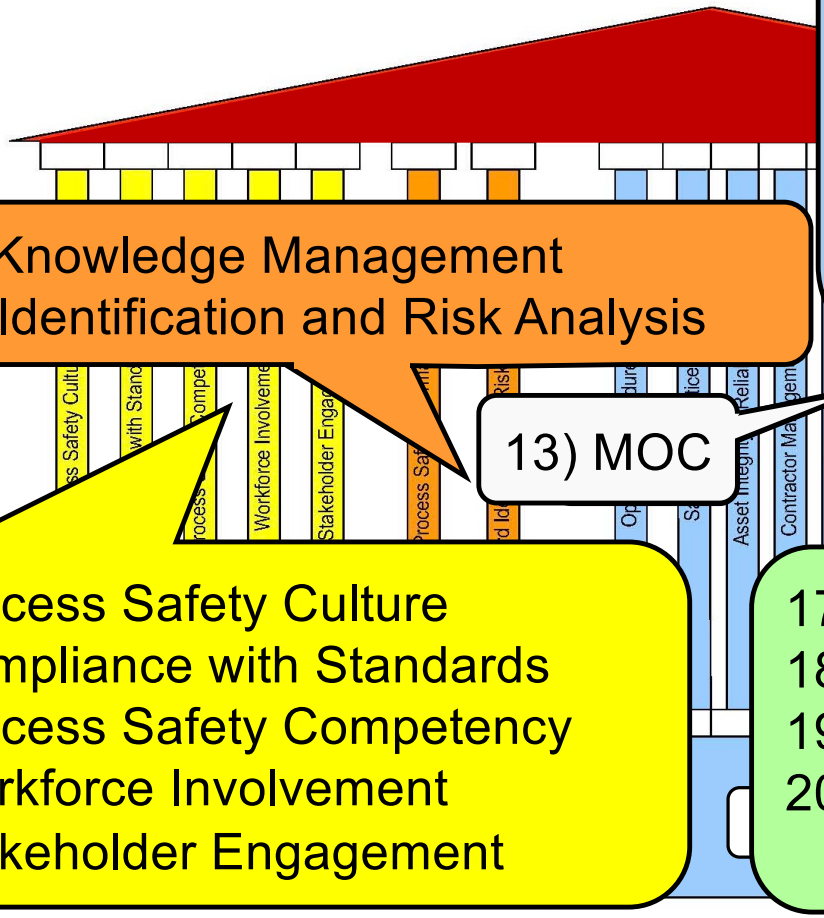


Risk Based Process Safety (RBPS



8) Operating Procedures
9) Safe Work Practices
10) Asset Integrity and Reliability
11) Contractor Management
12) Training
14) Operational Readiness
15) Conduct of Operations
16) Emergency Management

6) Process Knowledge Management
7) Hazards Identification and Risk Analysis

13) MOC

1) Process Safety Culture
2) Compliance with Standards
3) Process Safety Competency
4) Workforce Involvement
5) Stakeholder Engagement

17) Incident Investigation
18) Measurement and Metrics
19) Auditing
20) Management Review & Continuous Improvement

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Incidents

Key MOC Principles:

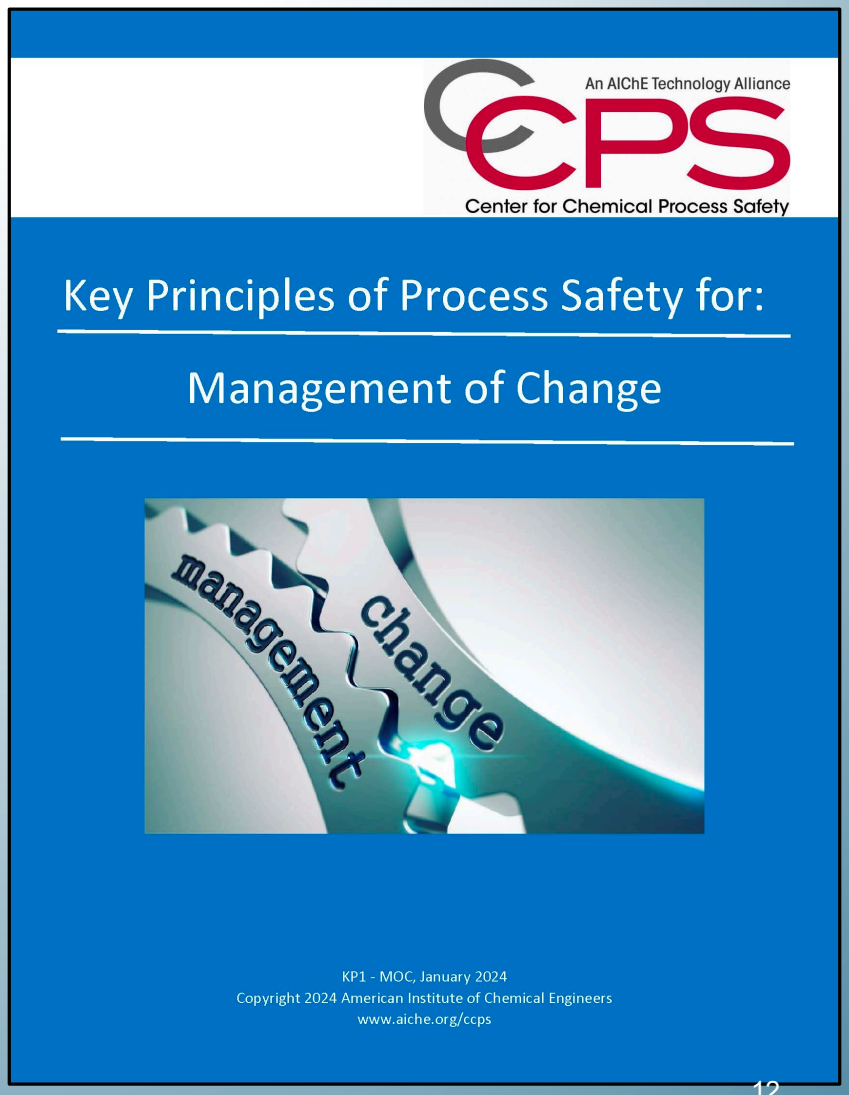
1) Know what constitutes a change

2) Follow the MOC procedure completely when creating, reviewing, approving, and managing an MOC

3) Evaluate the hazards or risks of the proposed change and identify needed risk controls

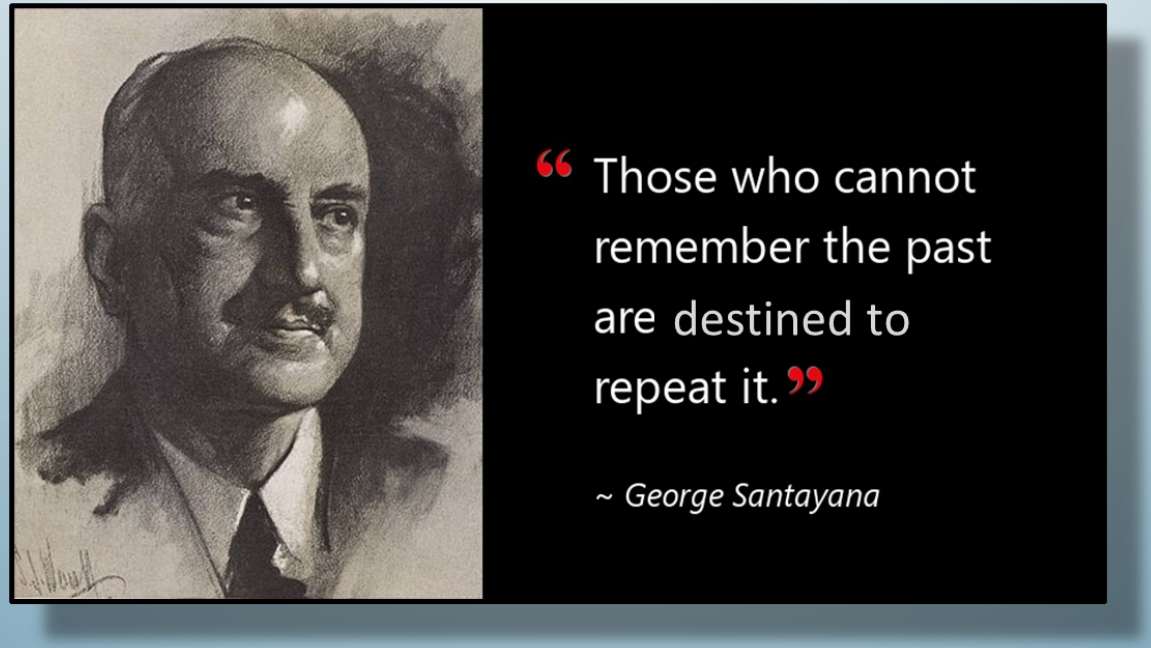
4) Use emergency MOCs sparingly

5) Communicate changes to personnel whose jobs are affected by the change




Looking Back....
Incidents

A Perspective on Learning



Events Linked to Key MOC Principles

1) Watson Grinding - January 2020
2) BP Texas City - March 2005
3) Formosa - April 2004
4) BP-Husky Toledo – September 2022

Watson Grinding

Modification:

- Changed copper tubing to Grade R rubber welding hose in its propylene process

Houston, TX
January 2020

Consequences:

- 3 fatalities (2 workers and 1 resident neighbor)
- The company was liquidated under bankruptcy

Watson Grinding

Basic Cause:

- Degraded and poorly crimped rubber welding hose that disconnected from its fitting, releasing propylene

Key Principle 1) Know what constitutes a change

Causes Included:

- No MOC review before replacing the rigid copper tubing with a flexible, rubber welding hose

BP Texas City

Refinery in
Texas City, TX
March 2005

Modification:

- Did not manage organizational change, including the impact of reduced staffing
- Changed refinery operations without an MOC for the changes from design specifications

Consequences:

- 15 fatalities
- 180 injured

BP Texas City

Basic Causes:

- Poor process safety culture within many levels of management:
  - Insufficient staffing to operate processes
  - Insufficient staffing to maintain equipment
  - Personnel were allowed to deviate from company policies and procedures

Key Principle 2) Follow the MOC Procedure

Causes Included:

- No MOC risk analyses with procedural changes
- Did not implement staffing increase recommendation from a 2001 MOC

Formosa:

Modification:

- The new facility owner reduced the staff

Consequences:

- 5 fatalities
- 3 injured
- Plant closed – 139 workers lost their jobs

Illiopolis, IL
April 2004

Formosa:

Basic Cause:

- Inadequate organizational change management when resources reduced

Causes Included:

- No MOC performed when an engineering control for a high-risk activity
- No MOC to understand the change in risk by relying on an administrative procedure to control the same high-risk activity

Key Principle 3) Evaluate hazards/risks; identify needed controls

BP-Husky Toledo

Modification:

- The water phase level indicator on an Overhead Accumulator Drum was changed as part of an MOC

Oregon, OH
September 2022

Consequences:

- 2 fatalities
- 36 seriously injured

BP-Husky Toledo

Basic Cause:

- The MOC was performed without understanding the effect on operations
- MOC introduced an unanalyzed risk that could not be shared with operations

Causes Included:

- No changes to the operating procedures let operations start up the process after the 2022 Turnaround using the out-of-date OPs

Key Principle 5) Communicate changes to affected personnel

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Changes to a Nuclear Power Plant

Vogtle Nuclear Power Plant: Units 1, 2, 3 & 4

- Single Purpose:
  + Nuclear reactor generates steam to produce electricity
- Nuclear Regulatory Commission (NRC) licenses the plant
- Changes are inevitable
- NRC authorizes licensee to make **SOME** changes without NRC approval
- Nuclear power plants have a robust change process

Nuclear Power Plant Updated/Final Safety Analysis Report

UFSAR Table of Contents

Changes to a Nuclear Power Plant

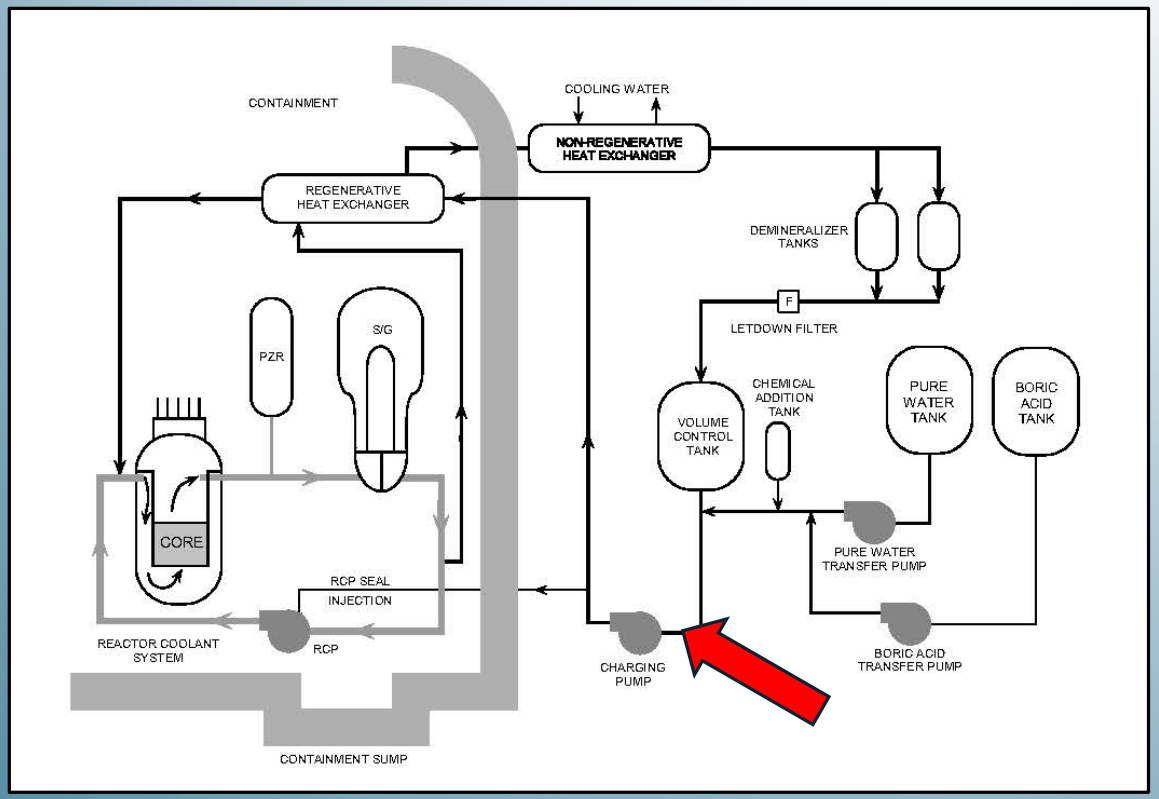
10 CFR 50.59 Changes, Tests, and Experiments.

- CHANGE means modification or addition to, or removal from, the facility or procedures that affect the design function, method of performing or controlling the function, or an evaluation that demonstrates intended functions will be accomplished
- CHANGE method of analysis, unless the method has been NRC-approved
- CHANGE to the facility as described in the UFSAR
  - Structures, systems, and components (SSC)
  - Design and performance requirements
- Tests or experiments not described in the FSAR

Does the Change Require Nuclear Regulatory Commission Approval of a License Amendment?

1. The Proposed Activity (Change)
2. Evaluate Activity to Ensure It is Safe & Effective
3. Does the Activity Require a Change to the Technical Specifications?
4. If YES, Request License Amendment
5. If NO, Screen per 10 CFR 50.59 “Changes, Tests, and Experiments”
6. If NO, Implement the Activity
7. If YES, Perform 10 CFR 50.59 Evaluation
8. If any answer is YES, NRC approval is required

Changing the Charging Pump



Simplified Scenario:

- Charging pump fails
- Replacement pump has a higher flowrate
- Other characteristics are the same
- Is it safe to change out?
- Does the licensee require NRC approval?

Questions in 10 CFR 50.59 Evaluation (3 of 8)

1. Result in more than a minimal increase in the **FREQUENCY** of occurrence of an accident previously evaluated in the Final Safety Analysis Report (FSAR), as updated.
2. Result in more than a minimal increase in the **LIKELIHOOD OF OCCURRENCE** of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the the Final Safety Analysis Report (FSAR), as updated.
3. Result in more than a minimal increase in the **CONSEQUENCES** of an accident previously evaluated in the the Final Safety Analysis Report (FSAR), as updated.

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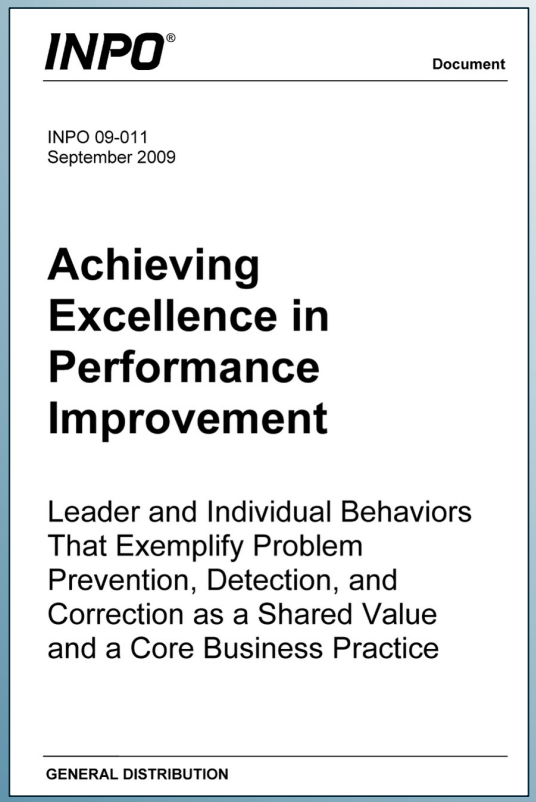
Key MOC Performance Metrics

- Percentage of sampled MOCs that satisfied all aspects of the site's MOC procedure.
- Percentage of identified changes that used the site's MOC procedure prior to making the change.
- Percentage of start-ups following plant changes where no safety problems related to the changes were encountered during re-commissioning or start-up.

Key MOC Performance Metrics


INPO® Document

INPO 09-011
September 2009

Achieving Excellence in Performance Improvement

Leader and Individual Behaviors That Exemplify Problem Prevention, Detection, and Correction as a Shared Value and a Core Business Practice

GENERAL DISTRIBUTION

Desired Outcomes:

1. The Picture of Excellence is Well Known
2. Problems are Prevented and Mistakes are Avoided
3. Performance Gaps are Thoroughly Analyzed and Efficiently Solved
4. Performance Improvement is Ingrained as a Core Business Practice

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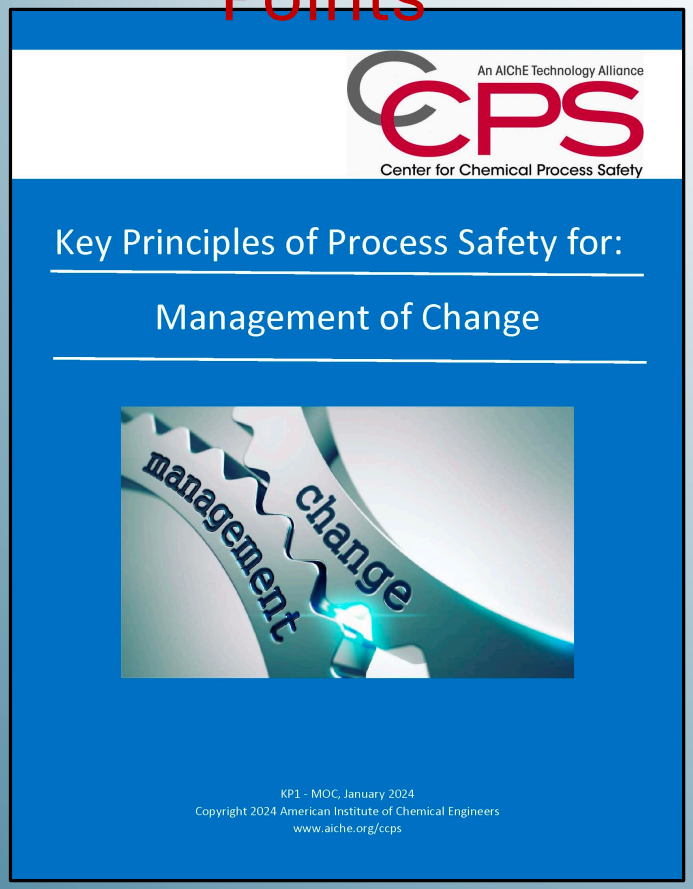
Concluding Points



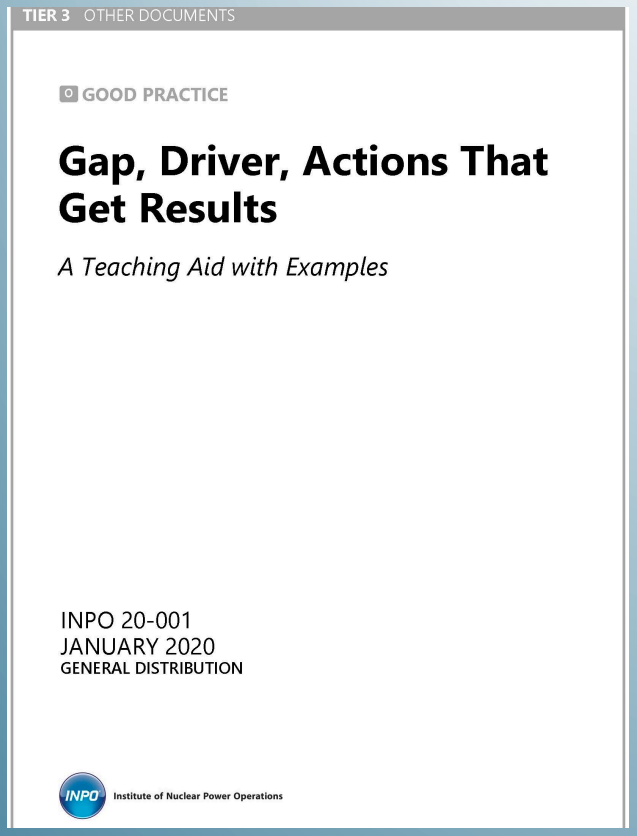
Recall the Key Principles:

1. Know what constitutes a change
2. Follow the MOC procedure completely when creating, reviewing, approving and managing an MOC
3. Evaluate the hazards or risks of the proposed change and identify needed risk controls
4. Use emergency MOCs sparingly
5. Communicate changes to personnel whose jobs are affected by the change

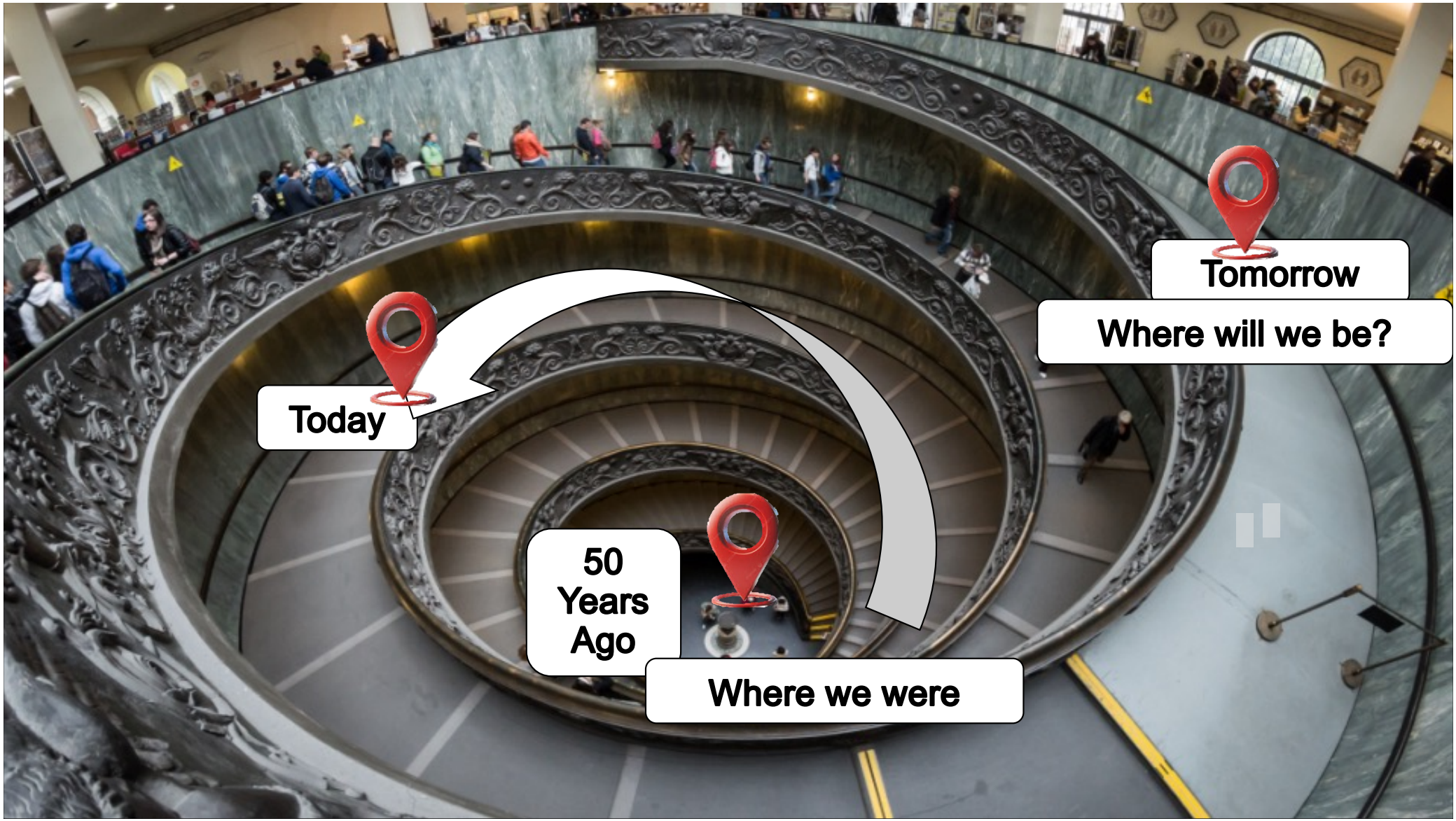
Principles of High Reliable Organizations (HROs)

1. Preoccupation with failure
2. Reluctance to simplify interpretations
3. Sensitivity to operations
4. Commitment to resilience
5. Deference to expertise

What Excellence Looks Like (WELL)



1. Gap
2. Driver
3. Action
4. Result


Tomorrow
Where will we be?
Today
50
Years
Ago
Where we were


What path are you on?
How will you manage your changes?
How will you conduct your operations?

Questions?