

Commissioning Concepts to Craftsmanship

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RIVER POINT





GMC

AIE
ADAMS INDUSTRIAL ELECTRICAL
SERVICE, INC.

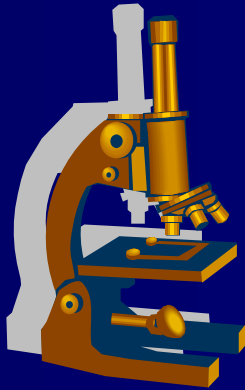
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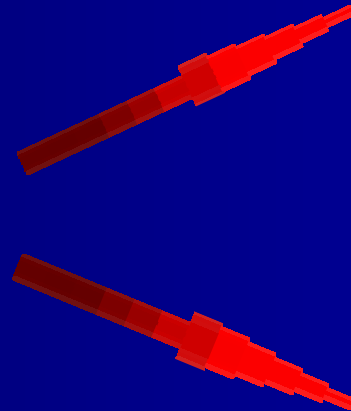
Keep Your Eye on the Ball

Commissioned



Performance =

\$



Risk

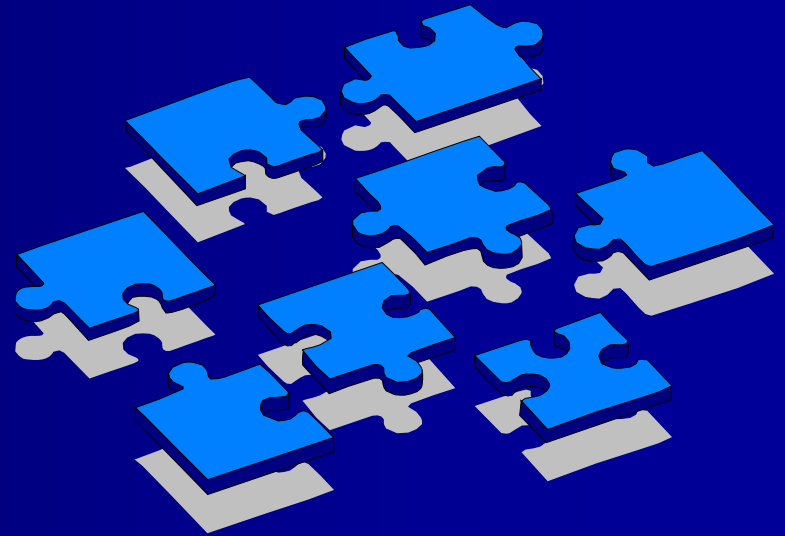
Life Cycle

What is Reliability?

- Reliability can be defined as the probability of successful performance
- What does a customer want when they say "I want a Reliable System."?
- Availability: theory of "nines"

Reliability Requirements

- Sample Guidelines
 - Minimal Single Point Failures
 - N+1 Redundancy for All Critical Operations
 - At Least 99.9% Availability



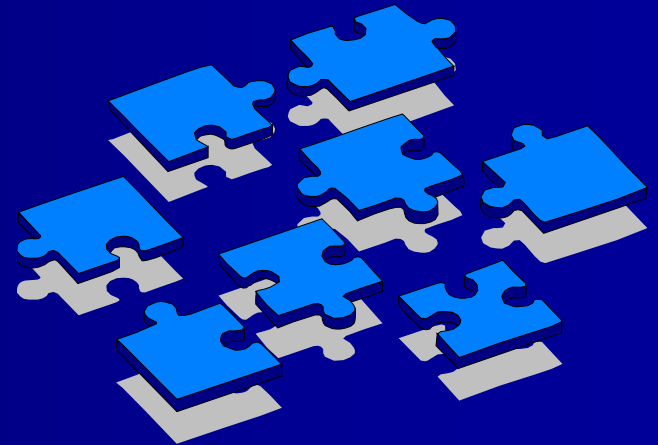
What are Life Cycle Costs?

- Life Cycle Costs are the sum of all costs incurred throughout the useful technical life of the plant.
- Which Life Cycle Costs are impacted through commissioning?

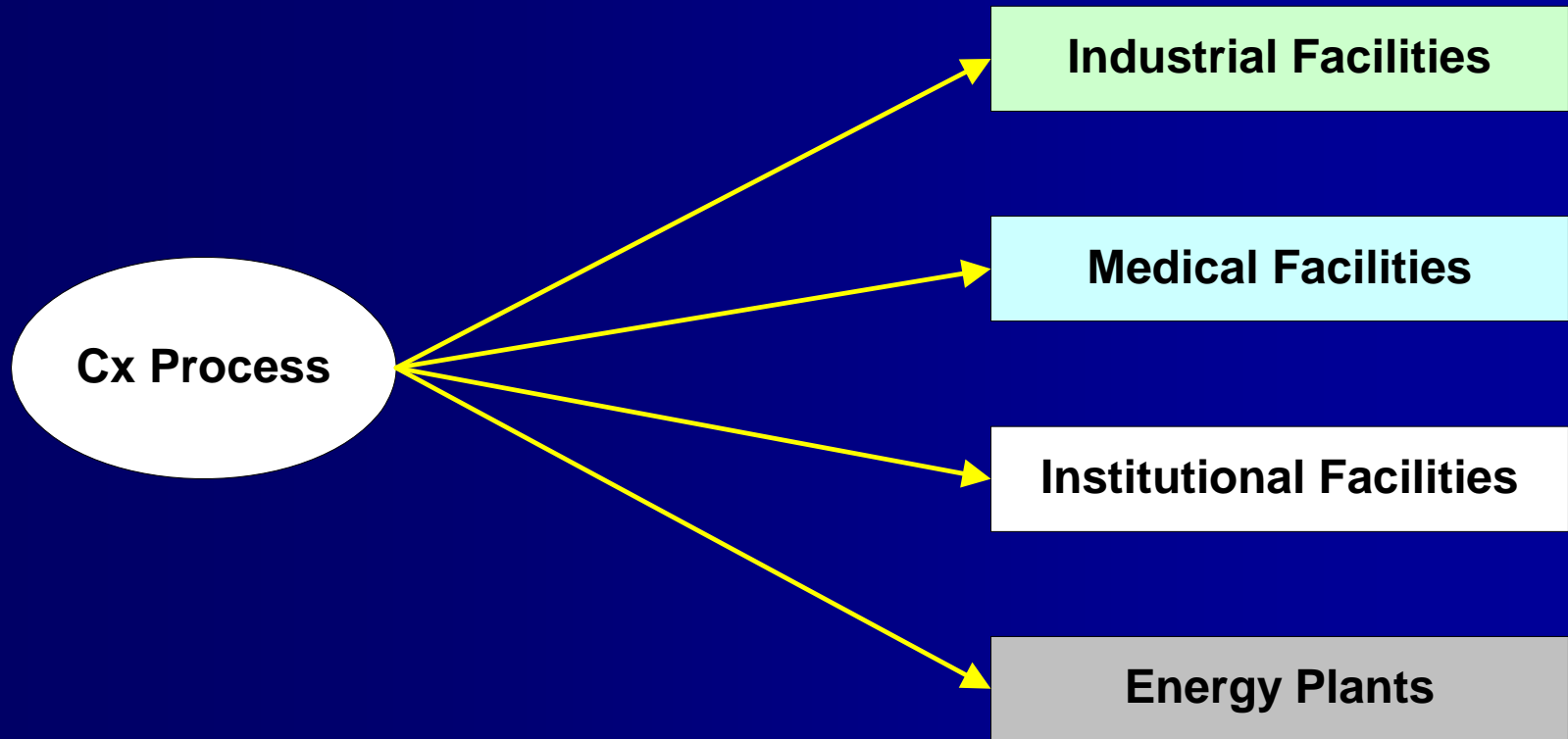
Life Cycle Costs

■ Guidelines

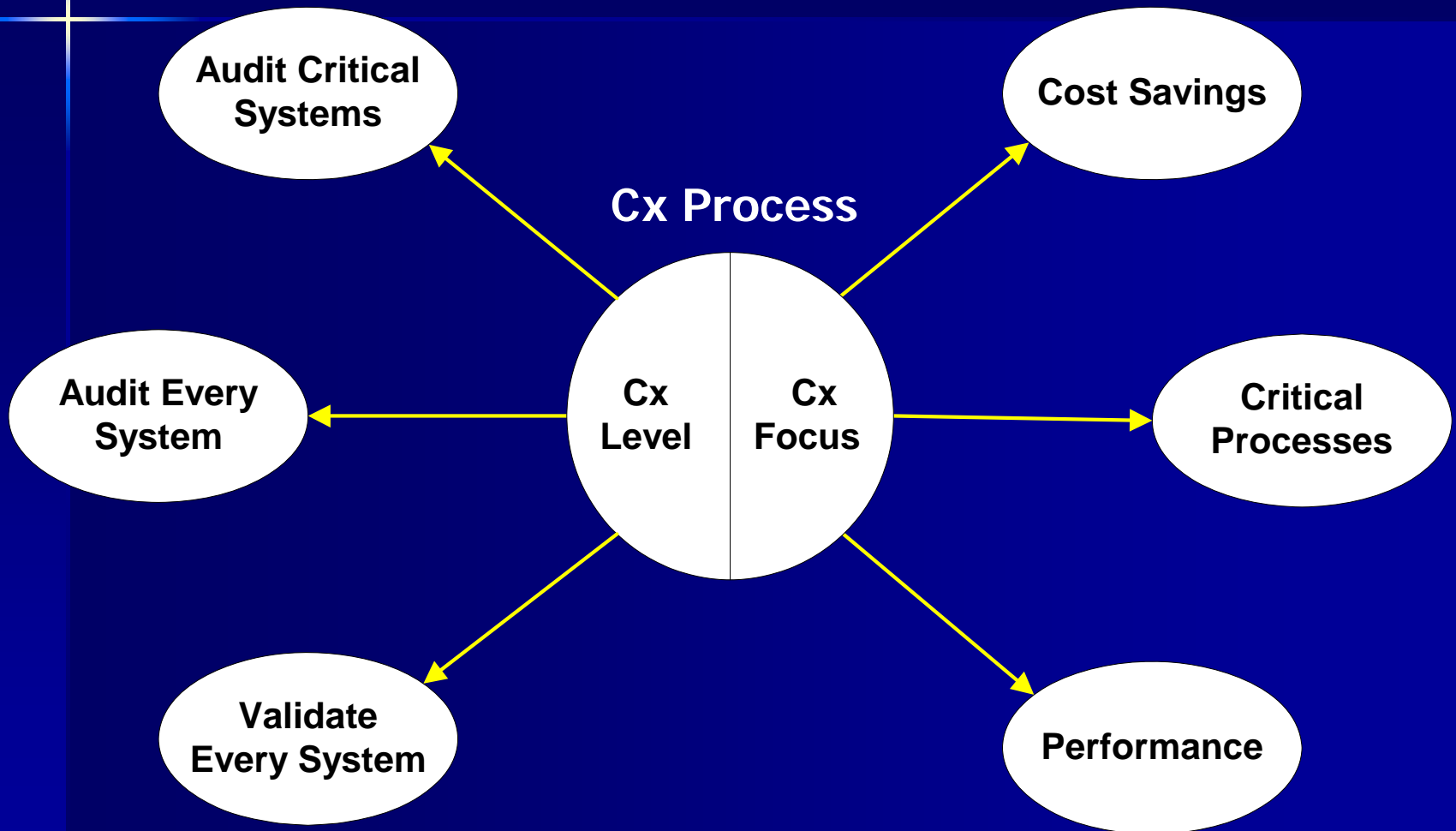
- Procurement Costs
- Installation Costs
- Commissioning Costs
- Operational Costs
- Maintenance Costs
- Disposal Costs



Applying the Commissioning Process

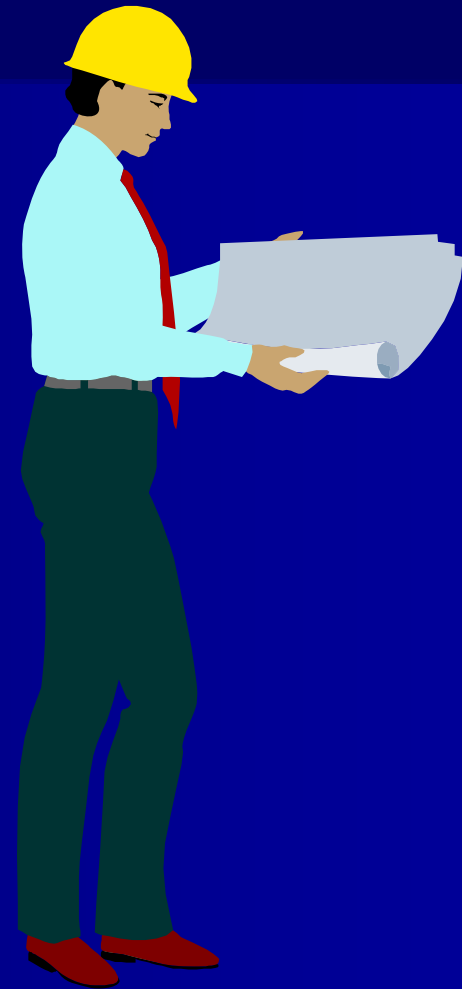


Commissioning Level of Detail & Focus



Breaking Down the Process

- Six Phases
 - Program Phase
 - Design Phase
 - Construction Phase
 - Acceptance Phase
 - Turnover Phase
 - Operations
- Continuous Cx



Program Phase

- Cx Tasks
 - Design Intent
 - Begin Cx Plan
 - Attend critical meetings



Program Phase (Cx Focus)

1. Expected hours of operation.
2. Life expectancy of the plant.
3. Ability to meet load requirement.
4. Diversity expectations for load.
5. Energy rebate opportunities.
6. Project feasibility.
7. Reliability requirements.

Program Phase

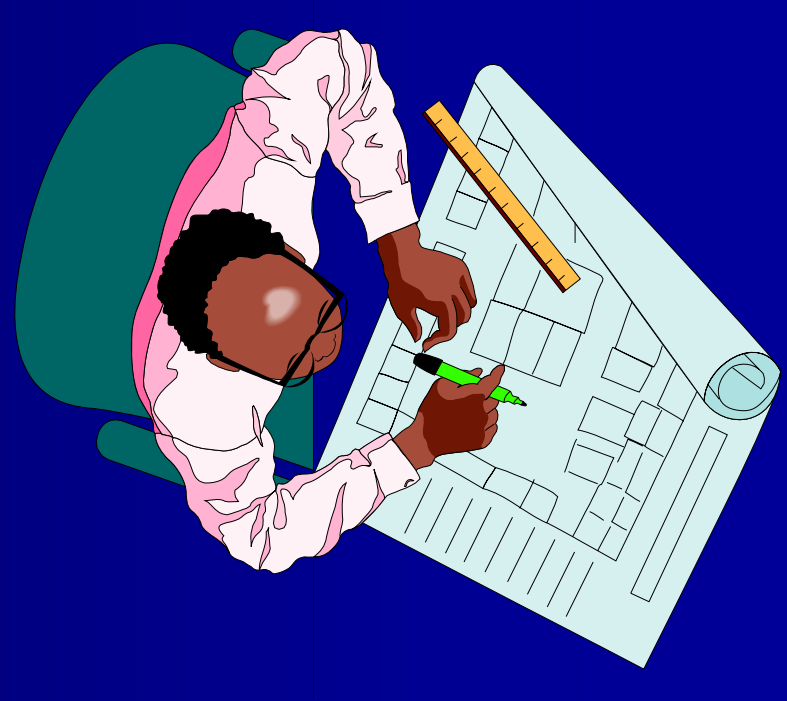
■ Reliability and LCC Focus



Design Phase

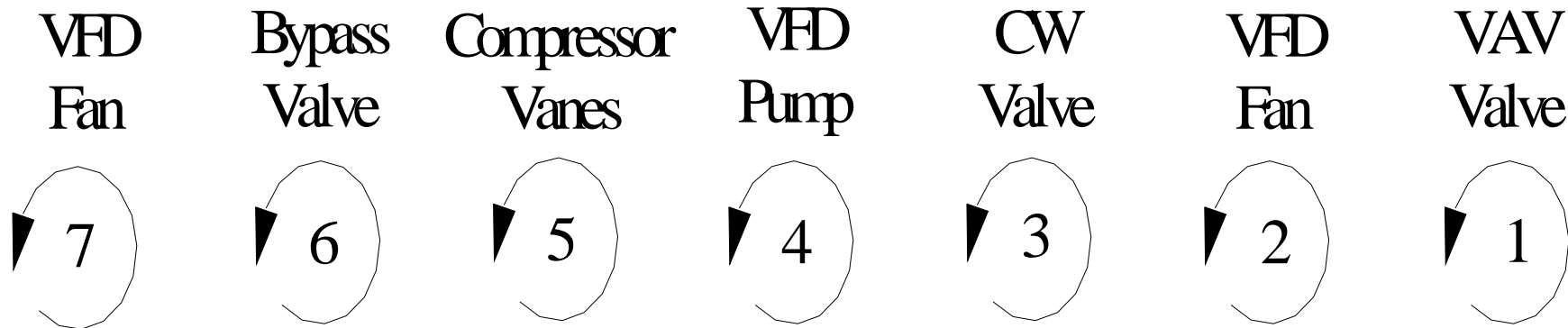
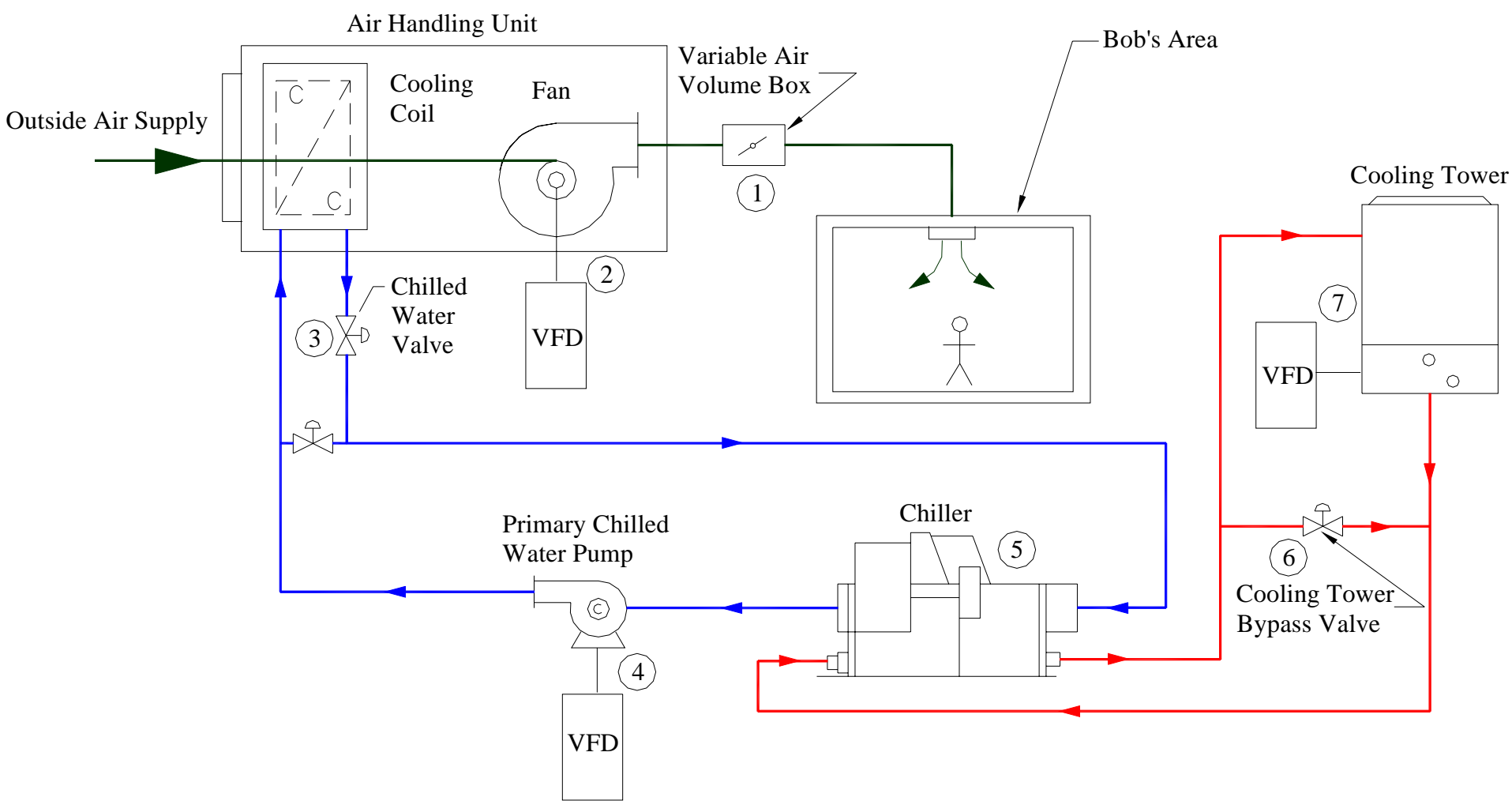
Cx Tasks

- Attend Design Meetings
- Review Design Documents
- Develop Commissioning Plan (Cx Plan)
- Provide Cx Specifications
- Initiate Systems Manual



Design Phase (Cx Focus)

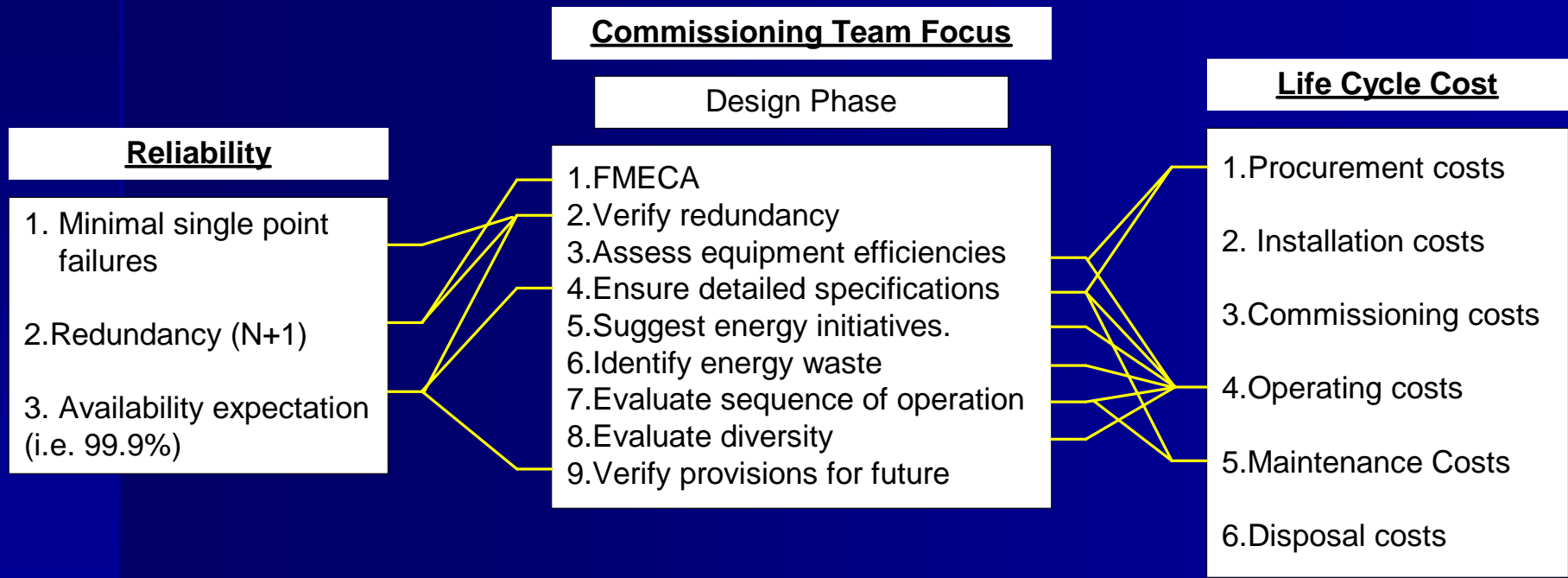
1. Verify redundancy.
2. Failure Modes and Effects Analysis (FMEA).
3. Assess equipment & system efficiencies.
4. Examine Heat Transfer & Hydraulic assumptions.
5. Ensure detailed test specifications.
6. Suggest energy initiatives.
7. Identify energy waste.
8. Evaluate sequences of operation.
9. Evaluate diversity.
10. Verify provisions for future expansion.





Design Phase

■ Reliability and LCC Focus



Construction Phase

Cx Tasks

- Attend Construction Meetings
- Coordinate Cx Activities
- Site Visits
- Review Construction Documents
- Produce Test Plans
- Develop Test Procedures
- Witness Component Testing



Construction Phase (Cx Focus)

1. Factory tests.
2. Document installation.
3. Witness equipment start-up.
4. Develop functional performance tests.
5. Catalog Operation and Maintenance (O&M) Manuals.
6. Review training program.
7. Track construction issues.

Construction Phase

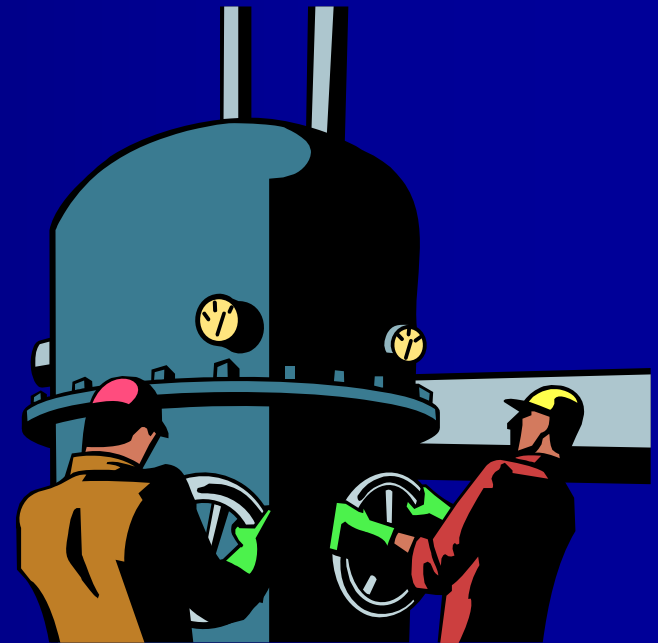
■ Reliability and LCC Focus



Acceptance Phase

Cx Tasks

- Participate in System Start-up
- Supervise Testing, Adjusting and Balancing
- Manage Functional Testing
- Coordinate Training
- Project Completion
- Cx Records and Reports



Acceptance Phase (Cx Focus)

1. Functionally test systems.
2. Test diversity.
 1. Document actual Heat Transfer Characteristics
 2. Document actual Hydraulic Characteristics
3. Verify all failure modes and validate redundant systems performance.
4. Trend data, trend data, trend data.
 1. Perpetual trending including trending meters.



GOODYEAR

N4980R



Small identification tag on the man's chest.

acuar

KENNY

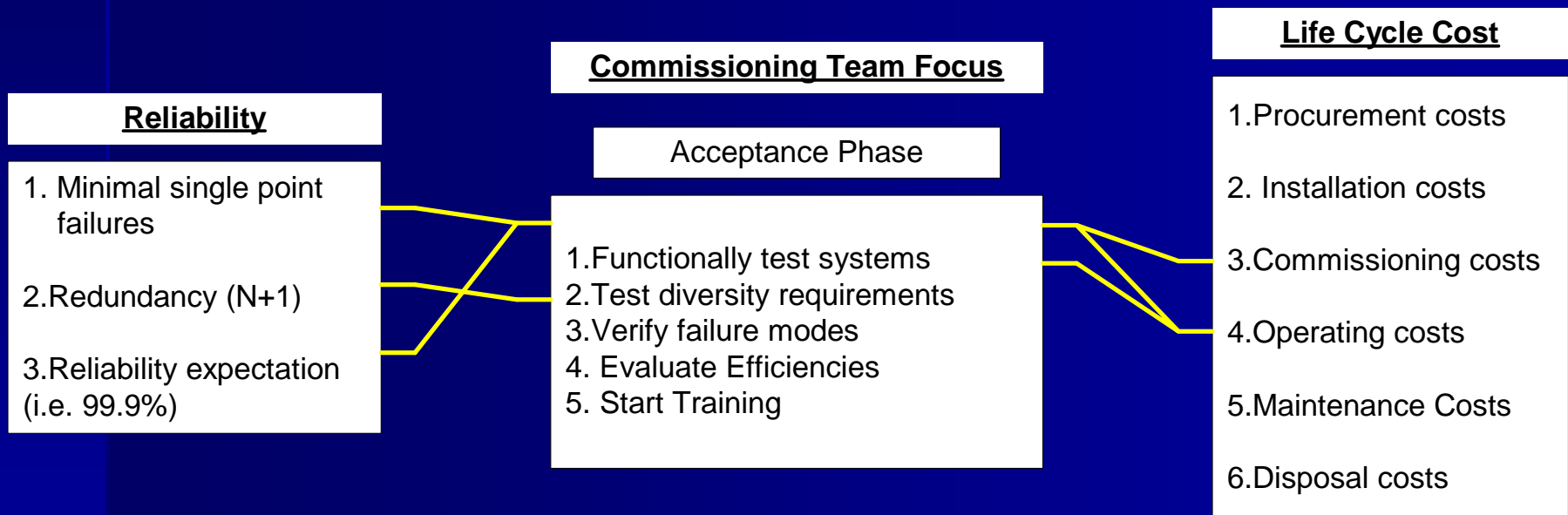
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Acceptance Phase

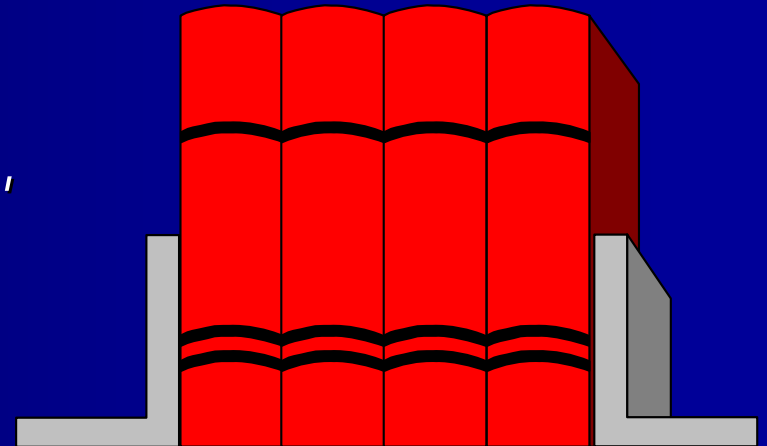
■ Reliability and LCC Focus



Turnover Phase

■ Cx Tasks

- Conclude Training
- Project Completion
- Commissioning Records and Reports
- Witness Seasonal or Deferred Testing
- Systems Manual (O & M's, etc.)
- Final Cx Report
- Warranty Site Visit

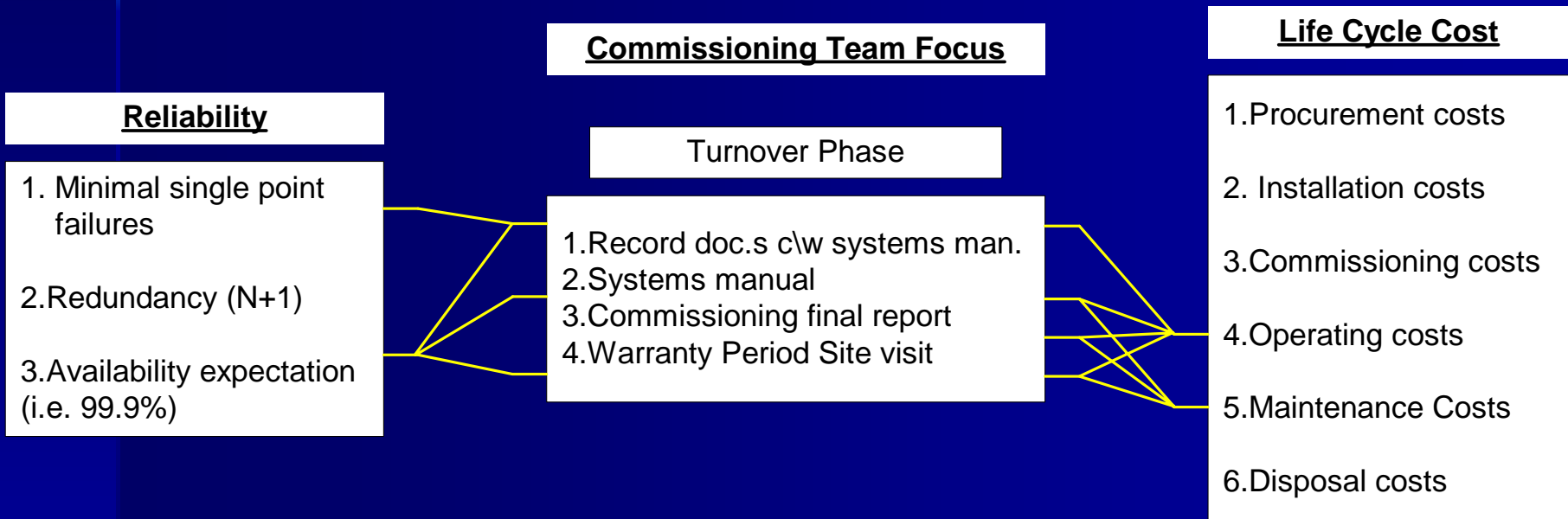


Turnover Phase (Cx Focus)

1. Systems manual.
 1. Include comprehensive list of optimum system control points.
2. Commissioning final report.
3. Warranty Site Visit.

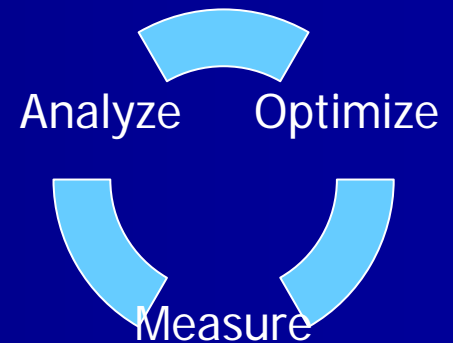
Turnover Phase

■ Reliability and LCC Focus



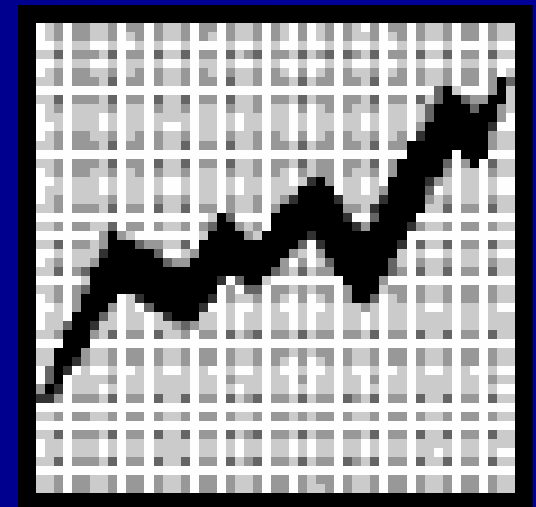
Sharpen the Saw

- Continuous Commissioning
 - “Sharpen the Performance Saw” through continuous observation.
 - Many enhancements can be found during construction.
 - Insular to think optimization stops with turnover.



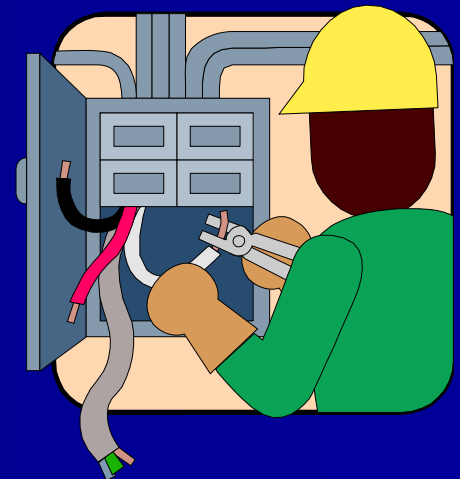
Continuous Commissioning

- Continuous review of Facility Monitoring System control points.
 - This will evaluate the actual loaded system performance
 - This identifies potential reliability issues



Continuous Commissioning

- Continuous review of additional points tracked by metering devices.
 - This will identify additional future optimization points in the systems.
 - As systems get older, opportunities for performance enhancements are not lost.



Commissioning Supports District Plant Success

- Commissioning focuses on Goals
- Focus is continuous throughout all construction process phases
- Documented proof of meeting goals to increase customer confidence.
- Optimization continues after construction to enhance benefits to owner and customers.

