

Lecture L.2.3

SAFETY CULTURE IN AN OPERATING ORGANIZATION

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OBJECTIVES

This lecture deals with the fundamentals of Safety Management and examines how the basic safety elements are implemented in a working organization. It also examines how the daily activities of every group in an organization can enhance or degrade plant safety.

BACKGROUND AND FUNDAMENTALS

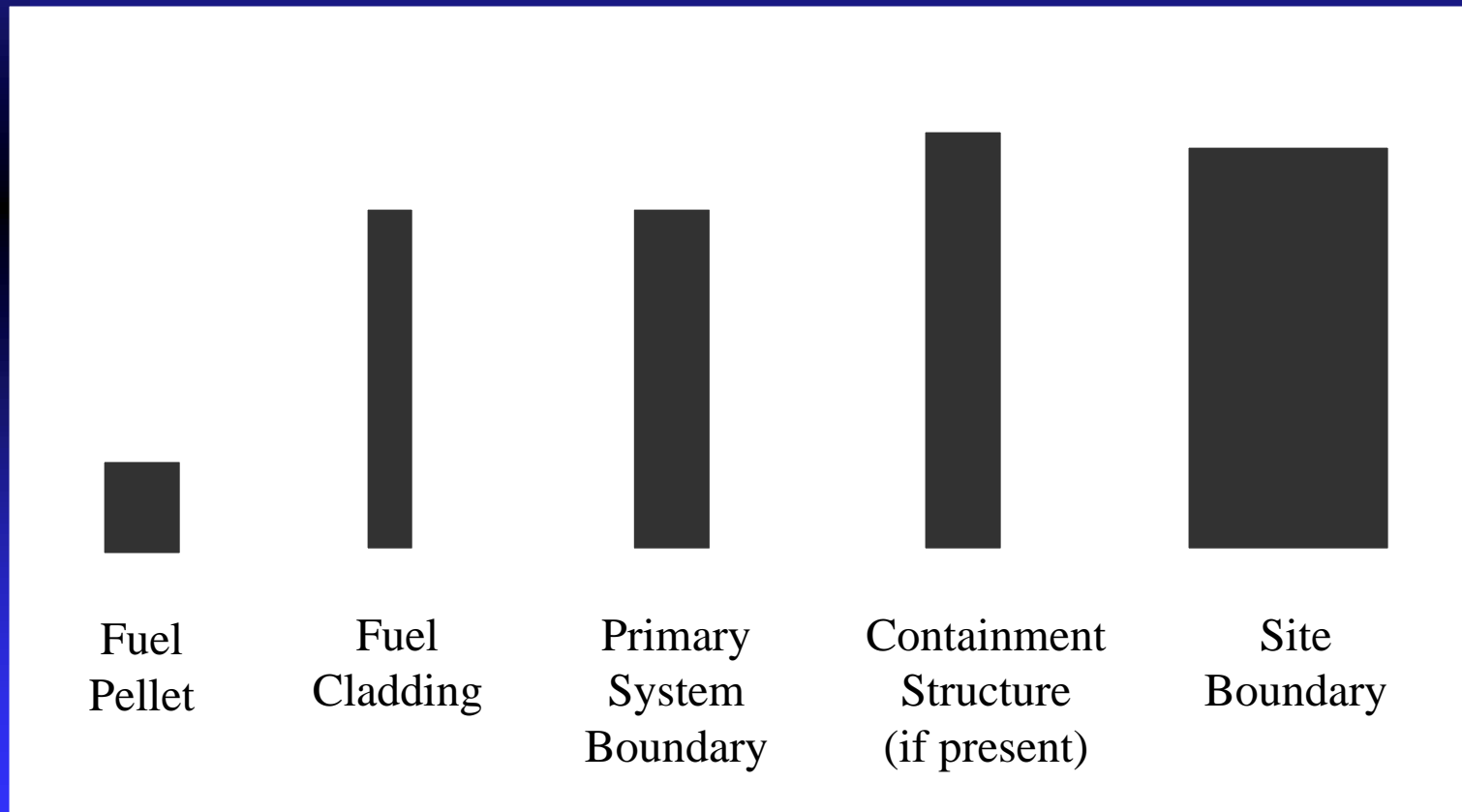
- The objective of reactor safety is that reactors will be built and operated to pose no undue risk to public health and safety.
- Reactor safety, therefore, is an essential prerequisite of reactor operation.
- It is important that nuclear safety experts continue to improve their understanding of the risks from nuclear reactors and communicate that information to plant operators and to the public.

HISTORICAL DEVELOPMENT

- In the early years the primary focus was on development of basic physics and engineering principles, safety system design features, codes and standards, and general design criteria governing such matters as redundancy and diversity of safety systems.
- Actual operating experience has shown the importance of human performance aspects of safety, including operator qualifications and training, emergency operating procedures, accident mitigation measures, and emergency planning.
- In recent years, the importance of operational safety culture has come into clear focus. A strong safety culture is important to ensure the integrity of the multiple barriers of the entire defense-in-depth safety concept. That is, the basic safety values, norms and attitudes of an entire operating organization are just as important as the basic design and construction of the reactor.

DEFENSE-IN-DEPTH

Very early thinking – Physical barriers



DEFENSE-IN-DEPTH

Later thinking: A series of physical barriers and multiple levels of action to avoid or reduce damage and minimize impact on public health and safety.

- Achieved through design/construction/operation/maintenance

Levels of Action:

Preventive
Actions

Mitigative
Actions

Containment
Actions

Emergency
Response
Actions

SAFETY CULTURE

■ DEFINITION:

“Safety Culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.

IAEA – INSAG-4

- ◆ Involves all aspects of organization
- ◆ Attention/effort proportional to potential consequences
- ◆ Implies a process of continuing vigilance, improvement
- ◆ No room for complacency
- ◆ For professionals – a lifelong learning process.

BASIC SAFETY ELEMENTS

- #1. A solid foundation of knowledge of the basic physics, chemistry and engineering of nuclear reactor technology.
- #2. A robust and proven design using established codes and standards that embody design margins, qualified materials, and redundant and diverse safety systems.
- #3. Adherence to a defense-in-depth safety philosophy that rigorously maintains multiple barriers, both physical and procedural, to protect the public and workers from harm.
- #4. A program for ensuring that the reactors are constructed and tested in accordance with the design specifications and safety analyses.
- #5. Highly qualified and trained personnel who operate the reactor, maintain the equipment and conduct the radiation protection program.

BASIC SAFETY ELEMENTS (cont'd)

- #6. An operating staff that has a profound respect for the reactor core and radioactive materials, keeping them under absolute control at all times.
- #7. Technical specifications that define and control the safety operating envelope of the reactor.
- #8. A strong engineering function that maintains plant, systems and equipment in accordance with the plant design basis, analyzes technical issues as they arise, and provides support to operations and maintenance.
- #9. A safety culture that has been instilled throughout the operating organization based on the highest safety values and that fosters an attitude toward conservative operation.
- #10. Effective Quality Assurance, Self-Assessment and Corrective Action programs.

BASIC SAFETY ELEMENTS (cont'd)

- #11. Emergency plans, which have been thoroughly reviewed and tested, to enable operators to take actions to protect both onsite workers and offsite populations in the event of a nuclear accident.
- #12. A program of operating experience analysis and feedback to operations.
- #13. Access to a continuing program of nuclear safety research that is designed to add to our basic knowledge of safety fundamentals.
- #14. A strong management organization that maintains all these activities and makes available adequate financial resources, and
- #15. A safety regulatory authority that is responsible for independently assuring that nuclear reactors are designed, built and operated safely.

TYPICAL OPERATING ORGANIZATION OF A POWER PLANT

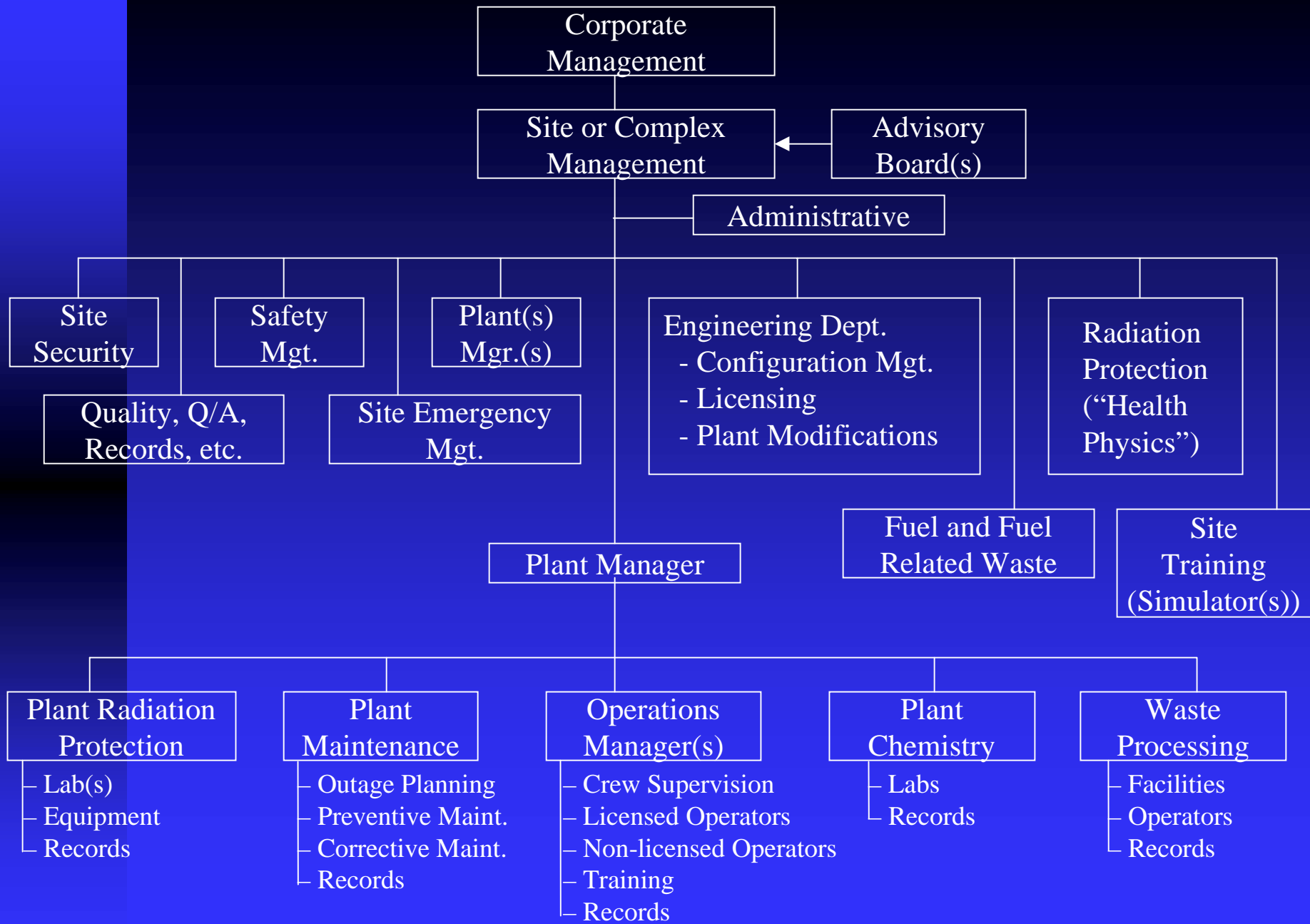
- Company or Concern (Overall Operating Entity) Management
 - ◆ Oversight and financial management of all facilities, e.g., plants/ transmission lines/ local distribution networks.

At each Station (site) –possibly several plants nuclear and/or fossil

- General Site Director or Manager
 - ◆ Radiation Protection Management
 - ◆ Quality Management and Records Management
 - ◆ Safety Management/ Experience Analysis
 - ◆ Site Emergency Management
- Engineering/ Configuration/ Licensing Management

TYPICAL OPERATING ORGANIZATION OF A POWER PLANT (cont'd)

- Plant Maintenance/Outage Management
- Operations Management
 - ◆ Licensed Operators (Control Room and Facility)
 - ◆ Non-Licensed Operators, e.g. certain site equipment operators (certified, but not formally licensed)
- Fuel and Fuel related management
- Waste Management
- Security Management
- General Site Maintenance and Management



OPERATING ORGANIZATION EXERCISE

- On the following sheet draw the operating organization for your facility or a research or power reactor that you know about.
- Show where you fit onto the organization chart.
- Assign the 15 basic safety elements to the different positions on the chart of this organization.
 - ◆ Are there any safety elements that can not be placed on your chart?
 - ◆ Are there any boxes on your chart without a safety element assigned to them?

First Try

PARENT
ORGANIZATION



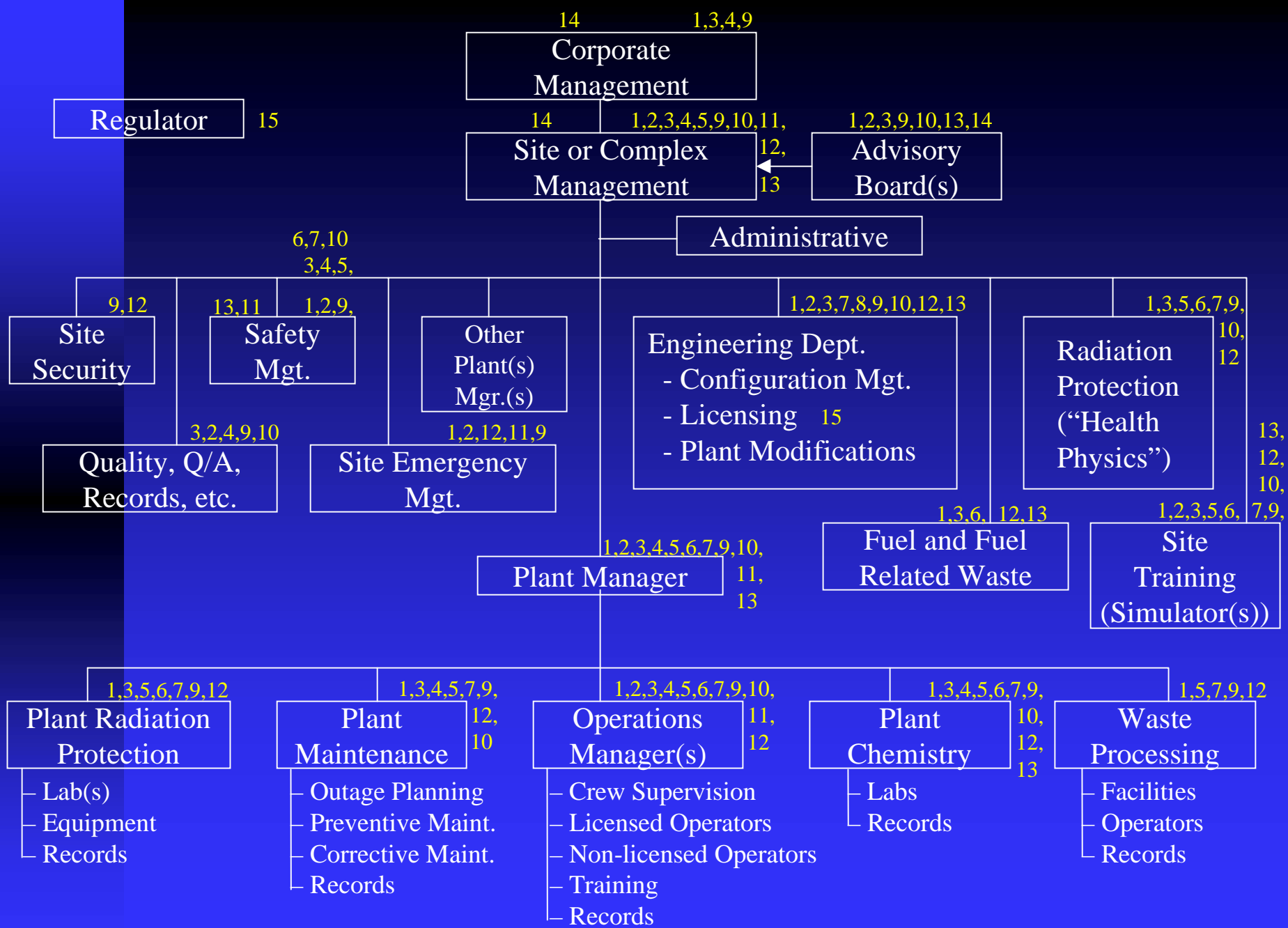
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graph TD; A[PARENT ORGANIZATION] --- B[ ]
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Second Try

PARENT
ORGANIZATION



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graph TD; A[PARENT ORGANIZATION] --- B[ ]
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OPERATING ORGANIZATION

■ ITEMS FOR DISCUSSION

- ◆ Select any division, department or working group on the organization charts shown in the lecture or the one that you created in the exercise.
- ◆ What basic safety elements is this group involved with?
- ◆ How could plant safety be affected if this group did not perform these functions? Give an example of how a plant or component failure could occur if this group did not do its job.

OPERATING ORGANIZATION (cont'd)

■ ITEMS FOR DISCUSSION: (cont'd)

- ◆ Consider the effect of the following items on the ability of a work group to perform the basic safety elements assigned to it:
 - ❖ Group workload
 - ❖ Group attendance
 - ❖ Group compensation and morale
 - ❖ Group professionalism
 - ❖ Animosity between individuals in a group
 - ❖ Level of knowledge and training
 - ❖ Group financial resources, budget and staffing level
 - ❖ An employee in the group who shows up drunk for work
 - ❖ An employee in the group who shows up physically ill for work

OPERATING ORGANIZATION (cont'd)

■ ITEMS FOR DISCUSSION: (cont'd)

- ◆ What things can be done to help a group perform its safety functions more thoroughly and reliably?

Consider:

- ◆ Attitude of group leader
- ◆ Examples set by managers and group leaders
- ◆ Daily decisions of managers and group leaders
- ◆ Example set by individuals in a group
- ◆ How the group responds to difficult situations

OPERATING ORGANIZATION (cont'd)

■ ITEMS FOR DISCUSSION: (cont'd)

- ◆ Imagine that you worked for the national regulatory agency in your country and were newly assigned to a facility in your country. What kinds of things would you look for in the operating organization of that facility? Who would you talk to? What questions would you ask?

OPERATING ORGANIZATION (cont'd)

■ ITEMS FOR DISCUSSION: (cont'd)

- ◆ Imagine that an electrician was nearly electrocuted while working on a breaker cabinet in your facility. The plant manager asks you to conduct an “independent” investigation. He says: “How could we have let such a thing happen?” How would you approach your investigation?

OPERATING ORGANIZATION (cont'd)

■ ITEMS FOR DISCUSSION: (cont'd)

- ◆ Safety upgrades. For a research or power reactor that you are familiar with identify the following:
 - ◆ Three or more organizational upgrades that will improve safety.
 - ◆ Three or more hardware upgrades that will improve safety.
 - ◆ Estimate the cost of each upgrade.
 - ◆ Estimate the “safety improvement” from each upgrade (high, medium, or low).
 - ◆ Rank your upgrades in terms of benefit vs cost.