

Nuclear Energy Renaissance

National Research Council and
NCSR Demokritos

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PRESENTATION SUMMARY

- Objectives of Nuclear Power Regulation
- Major Functions
- Organizational Structure
- “What” and “How” is Regulated
- Examples of Regulatory Actions
- TMI 2 Summary
- Conclusions

NRC's MISSION

Protect People and the Environment

From Radiation Hazards

Through Regulation

TO BE ACCOMPLISHED THROUGH:

- **REGULATIONS, REQUIREMENTS, AND ACCEPTANCE CRITERIA**
- **LICENSING OF NUCLEAR FACILITIES FOR POSSESSION, USE, AND DISPOSAL OF NUCLEAR MATERIALS**
- **INSPECTION OF FACILITIES, PROCESSES, AND USERS, TO ENSURE COMPLIANCE WITH REGULATIONS AND REQUIREMENTS**

HISTORICAL MILESTONES

- **The NRC was created by the Energy Reorganization Act of 1974**
- **Began operation in January 1975 when it split from the AEC**
- **The AEC was created by the Atomic Energy Act of 1954**
- **The NRC has about 3500 employees**

MAJOR FUNCTIONS

- **Licensing nuclear power plants, fuel cycle facilities, nuclear materials for medical, industrial, educational, research, etc.**
- **Inspection and enforcement to assure compliance with regulations**
- **Regulatory research; regarding technical aspects for the resolution of regulatory issues**

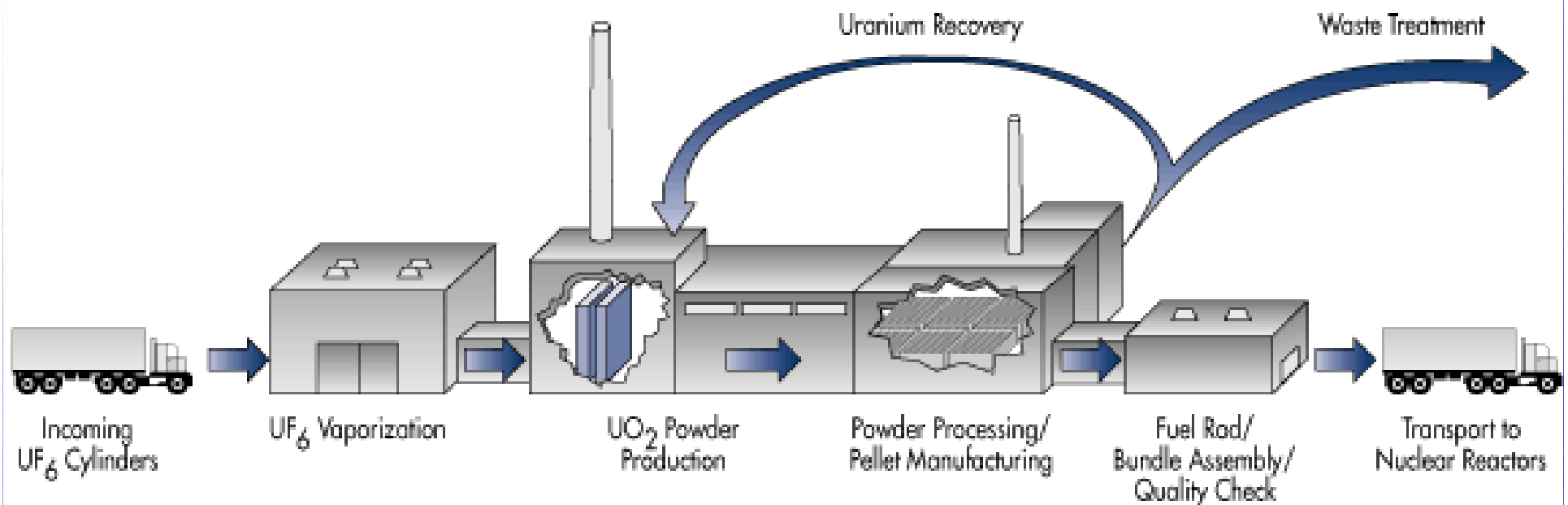
ORGANIZATIONAL **IMPLEMENTATION OF FUNCTIONS**

- **Office of Nuclear Reactor Regulation**
- **Office of New Reactors**
- **Office of Nuclear Materials Safety and Safeguards**
- **Office of Federal and State Materials and Environmental Management Program**
- **Office of Nuclear Regulatory Research**
- **Office of Nuclear Security and Incident Response**
- **Office of Investigations**
- **Office of the Inspector General**

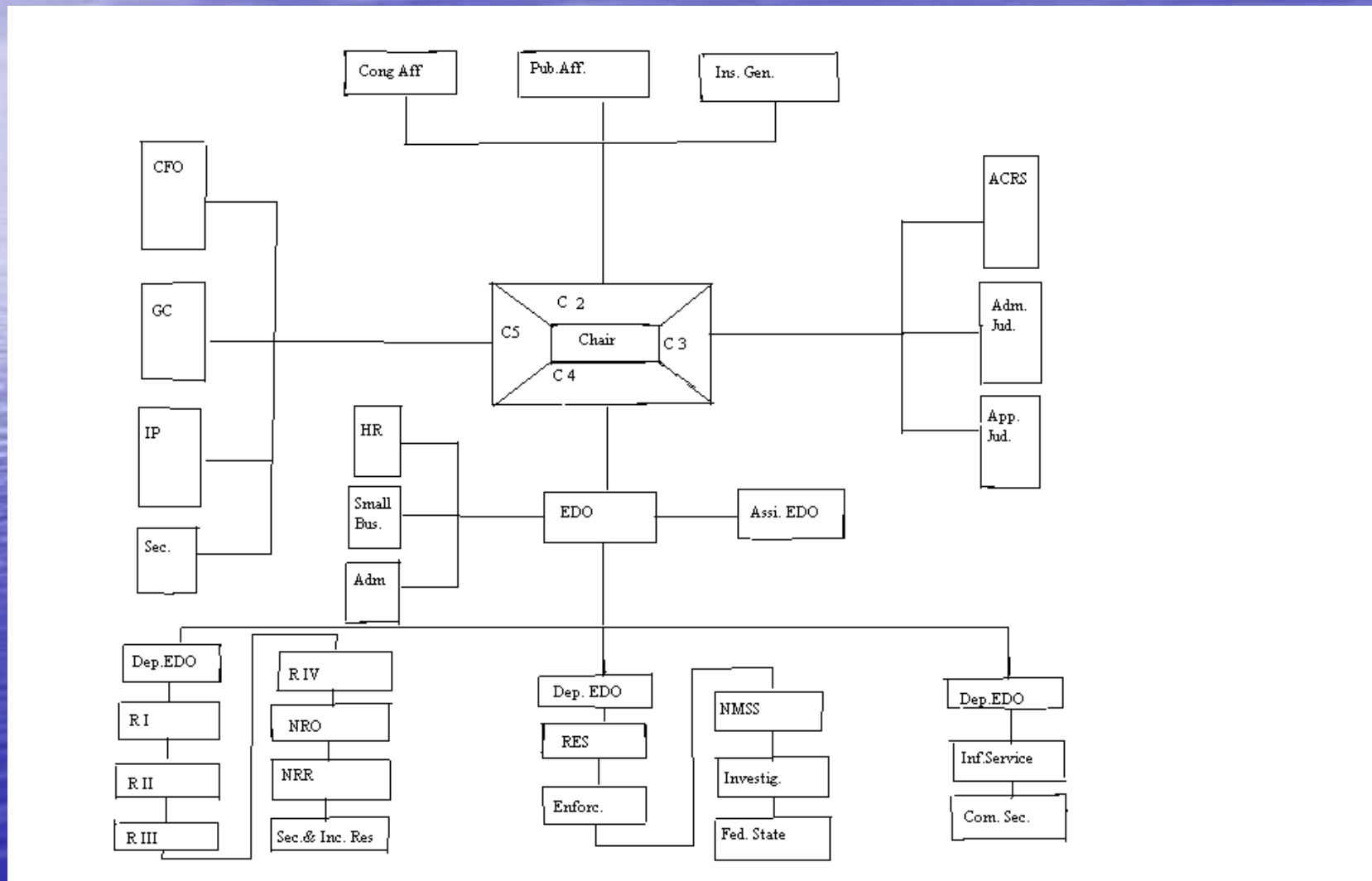
INDEPENDENT COMMITTEES

- **Advisory Committee on Reactor Safeguards**
- **Advisory Committee on Nuclear Waste**
- **Advisory Committee on Medical Uses of Isotopes**
- **Atomic Safety and Licensing Board Panel (Appeals)**

FUEL CYCLE



ADMINISTRATIVE STRUCTURE



OPERATIONAL AND EVOLUTION FEEDBACK



CONNECTION TO OUTSIDE STAKEHOLDERS

- **The NRC is acting in concert with other organizations such as:**
 - **The Environmental Protection Agency**
 - **The Congress**
 - **The Department of Energy**
 - **Agreement States**

MAJOR LICENSING ACTIONS

- **Certification: for new plant designs**
- **COL: Combined Operating License; for a plant of a certified design to be located on a specific site**
- **License Extension: Extending existing plant's 40 (calendar) year license to 60 years**
- **Power Uprates; Minor (< 5%) or major (> 5 and up to 20%) power uprate for existing (40 year) plants**
- **Site Reviews**

"TYPICAL" STEPS IN LICENSING ACTIONS

- Major Actors: Licensee (LC), Project Manager (PM), Reviewer (Rev), Branch Chief (BC), Management (MG), General Counsel (GC)
- LC: Submittal on the Docket
- PM: Assigns all or parts to a Branch or Branches
- BC: Assigns one or more reviewers

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- **Rev: Identifies applicable regulations for the requested Change**
- **Rev: Performs acceptance review; cursory examination for completeness vs. the request and the pertinent regulations**
- **Rev: Studies the submittal and if he/she finds missing information or has questions, submits a request for additional information (RAI) or rejects the submittal**
- **Rev: At this point the particular review is halted until the requested information is provided**

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- **Rev:** If the reviewer is satisfied proceeds, otherwise repeats the last round
- **Rev:** The reviewer writes a safety evaluation report (SER) and justifies his/her conclusion on technical reasons based on the applicable regulations
- **PM:** Collects the reviewer contributions and assembles an Overall SER for the submittal
- **MG:** Reviews the SER and if found adequate goes to GC
- **GC:** Reviews the SER and if found adequate is issued to the licensee

- **Note:** The above steps do not include the important (but infrequent) side-steps of a public hearing and/or an ACRS presentation by the staff and the licensee.

THREE MILE ISLAND, UNIT 2

- **March 28, 1979, 3:00am**
- **Sequence of events:**
- **FW pump failure >> > turbine trip >>> reactor trip and shutdown >>> primary pressure increase >>> PORV opened (as required) >>> but did not re-close >>> resulting in a small break LOCA >>> operators did not realize the LOCA and thought that the vessel was going water solid >>> reduced primary flow >>> resulting in partial core melt.**

THREE MILE ISLAND, UNIT 2

- Noble gases (Kr, Xe) were vented from the reactor building.
- Evacuation of pregnant women and children under 5 was ordered in a 5 mile radius.
- Max dose at the site boundary was about 100 mrem, average population dose was 1 mrem.
- (Average X-ray is about 6 mrem and annual background is about 100 mrem)

CORRECTIVE ACTIONS **RESULTING FROM TMI**

- **Upgraded plant design and equipment requirements**
- **Human performance was identified as a major component**
- **Operating instructions were improved**
- **Restructured “Emergency Response” particularly communication with all stakeholders**
- **Established a new program regarding licensee performance and effectiveness into a public report**
- **Established regular plant performance analysis**
- **Expanded the NRC inspection program to at least two Inspectors/plant**
- **Expanded performance oriented inspections**

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- **Enforcement became a separate organization at the NRC**
- **Establishment of INPO industry's approach to regulation**
- **Installation of additional equipment to mitigate accident conditions and measure radiation levels**
- **Initiated activities of identifying, collecting, evaluating and disseminating operational experience, and**
- **Expanded international programs of sharing safety information worldwide.**

POST TMI-2 IN PLAIN LANGUAGE

- Increased inspection and enforcement
- Emphasis on preventive maintenance
- Change of safety culture
- Increased communications
- Post TMI-2 results

GENERAL COMMENTS AND OBSERVATIONS (Conclusions)

- Regulation covers the entire fuel cycle
- Regulation is an ever evolving activity because of operational experience feedback, technological innovations, new and evolutionary designs, etc.
- Regulation involves public participation, that requires communication of risk
- Regulation requires “regulatory infrastructure” that involves: a legal framework, financial arrangements (insurance), provisions for decommissioning, educational programs, international cooperation, etc.

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- The cornerstone of successful regulation is the technical competence of the staff and management.
- A well-regulated nuclear power plant is a safe, productive, and profitable plant.

