

PLANNING FOR THE WORST: ORGANIZATIONAL APPROACHES TO SEVERE ACCIDENT RESPONSE

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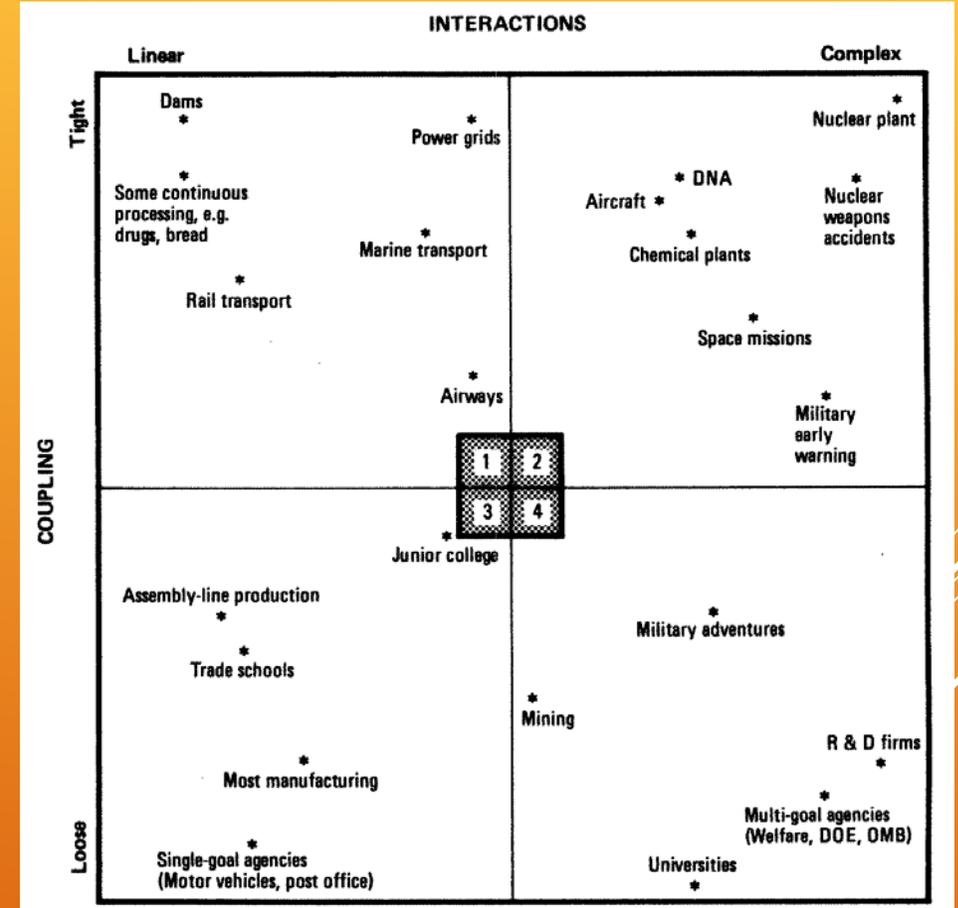
1. Introduce organizational theories of disaster
2. Discuss challenges for nuclear emergency response
3. Review examples of national strategies to address “beyond design basis” accidents after Fukushima
 - ▶ FLEX
 - ▶ “Stress tests”
 - ▶ French rapid response teams

OUTLINE

- ▶ Normal Accident Theory
- ▶ High Reliability Organizations
- ▶ Normalization of Deviance
- ▶ Culture of Control

1. ORGANIZATIONAL THEORIES OF DISASTER

- ▶ Accidents as “normal” outcome of a system’s high complexity and tight coupling
- ▶ TMI as paradigmatic case (Perrow 1984/1999)
- ▶ Chernobyl was “an accident waiting to happen”
- ▶ Fukushima as “envirotechnical disaster” (Pritchard 2013)



NORMAL ACCIDENT THEORY

Organizations that have succeeded in “avoiding catastrophes in an environment where normal accidents can be expected due to risk factors and complexity.” (Roberts, Weick, LaPorte, Rochlin)

Characteristics:

- ▶ Preoccupation with failure
- ▶ Reluctance to simplify interpretations
- ▶ Sensitivity to operations
- ▶ Commitment to resilience
- ▶ Deference to expertise

HIGH RELIABILITY ORGANIZATIONS

Diane Vaughan (esp. 1996, 1999, 2003)

- ▶ “Dark side of organizations”: mistakes, misconduct, disaster
- ▶ Emphasis on organizational (not just individual) failures
- ▶ When “deviant” behavior is no longer recognized as such
- ▶ Significance of hindsight
- ▶ History *as* cause

NORMALIZATION OF DEVIANCE

Constance Perin (1998, 2005)

- ▶ Division of labor, responsibilities
- ▶ Standardization of designs, procedures, protocols
- ▶ Formalization of workforce training
- ▶ Definition of guidelines ("safety culture")

Joy Parr (2006, 2010)

- ▶ Self-awareness
- ▶ Understanding reasons for rules

CULTURE OF CONTROL

What are the main challenges for nuclear emergency response?

- ▶ Technical interoperability
- ▶ Legal compatibility
- ▶ Transparency and accountability beyond traditional industry notions of community resilience or public engagement
- ▶ Expert improvisation
- ▶ International governance

2. NUCLEAR EMERGENCY RESPONSE

- ▶ Good-bye to “zero-risk mindset”: not the last nuclear disaster
- ▶ Accidents are part and parcel of complex, large, high-risk technologies.
- ▶ Doing our best to avoid disaster may not be enough: we must also prepare to deal with it
- ▶ How to set up “a robust, highly capable response team” and find “the sweet spot between national sovereignty and international accountability” (Ellis 2011)

AFTER FUKUSHIMA

IAEA

- ▶ 1986: Convention on Early Notification of a Nuclear Accident
- ▶ 1986: Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- ▶ 1994: Convention on Nuclear Safety
- ▶ 2006: RANET
- ▶ 2011: Post-Fukushima Action Plan

But: under-resourced, dual mission

EXISTING ORGANIZATIONS

IAEA Response and Assistance Network

Incident and Emergency Centre

DATE EFFECTIVE: 1 JANUARY 20

Expertise

Nuclear/Radiation safety

- Decontamination techniques
- Design and operation of NPP
- Design and operation of radiation devices
- Design and use of sources (Industrial, medical)
- Emergency management
- Intervention in high dose rate area
- Radiation protection
- Radioecology
- Sampling strategies
- Shielding
- Source recovery techniques
- Waste management

Measurement techniques

- Airborne dose rate monitoring
- Airborne gamma spectrometry
- Alpha spectrometry
- Biological dosimetry
- Contamination monitoring (ground, surface, personal)
- Environmental monitoring
- Gamma dose rate monitoring
- Gamma spectrometry
- Gross alpha/beta measurements
- In vitro bioassay
- In vivo bioassay
- In-situ gamma spectrometry
- Organ monitoring (thyroid)
- Personal dosimetry - external
- Plutonium analysis
- Sample preparation techniques
- Sampling techniques (environ., biological samples)
- Source monitoring
- Strontium analysis
- Tritium analysis
- Whole body monitoring

Evaluation and assessment

- Atmospheric dispersion modelling
- Biokinetic modelling
- Dose assessment predictions
- Dose reconstruction techniques
- External dose assessment
- Gamma mapping
- Ground contamination assessment
- Health impact assessment
- Internal dose assessment

Radiation medicine

- Decorporation therapy
- Haematology
- Management of acute radiation syndrome
- Prevention of long-term radiation effects
- Public health issues
- Management of local radiation injury
- Collection and dispatch of biological samples
- Treatment of contaminated person

Other

- Communication technology
- Use of robots (surveillance, source recovery, etc.)
- Use of unmanned aerial survey systems

A

Remark: If the expertise to be registered is not in the list, please add under 'Other'.



IAEA

International Atomic Energy Agency

WANO

- ▶ International infrastructure
- ▶ MOU with IAEA on incident reporting and analysis system
- ▶ April 2011 commission: develop global integrated response strategy

But: under-reporting, lack of learning

Neither agency has an executive mandate, nor the technical capabilities for an effective nuclear emergency response team; both lack public trust.

EXISTING ORGANIZATIONS (CONT.)

INPO

- ▶ Est. post TMI, 1979, to improve operational safety at U.S. nuclear power plants
- ▶ Peer inspections, events analysis and information exchange, confidential system of reporting safety violations, industry self-regulation, “best practices” (Rees 1994)
- ▶ Ex-CEO James Ellis proposes an international nuclear emergency response organization (May 2011)

EXISTING ORGANIZATIONS (CONT.)

Organizational transformation of global nuclear industry after Fukushima

- ▶ FLEX
- ▶ “Stress tests”
- ▶ French Nuclear Rapid Action Force (FARN)

3. POST-FUKUSHIMA STRATEGIES

- ▶ A “diverse and flexible coping capability” addressing loss of power and reactor cooling capability
- ▶ Stationing vital emergency equipment — generators, battery packs, pumps, air compressors and battery chargers — in multiple locations *and* “secure offsite locations”
 - ▶ Portable equipment providing power and water
 - ▶ Reasonable staging and protection of portable equipment
 - ▶ Procedures and guidance for ER personnel use of FLEX capability
 - ▶ Programmatic controls to assure viability and reliability of FLEX capability (maintenance, testing, training)

FLEX

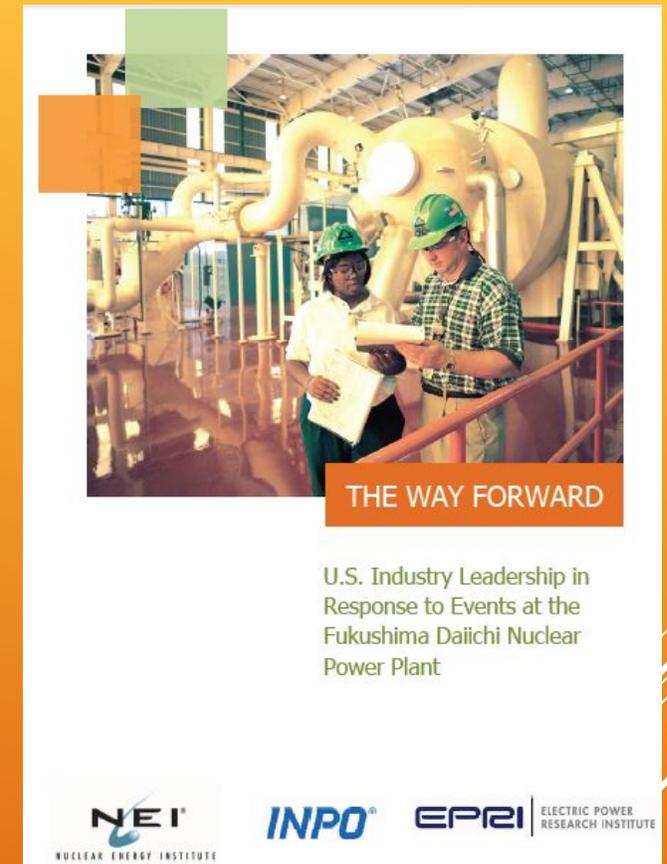


- ▶ *National initiative, June 2011* (INPO, NEI, EPRI)
- ▶ Outline of an integrated emergency response approach
 - ▶ Strategic goals
 - ▶ Guiding principles
 - ▶ Key stakeholders

But:

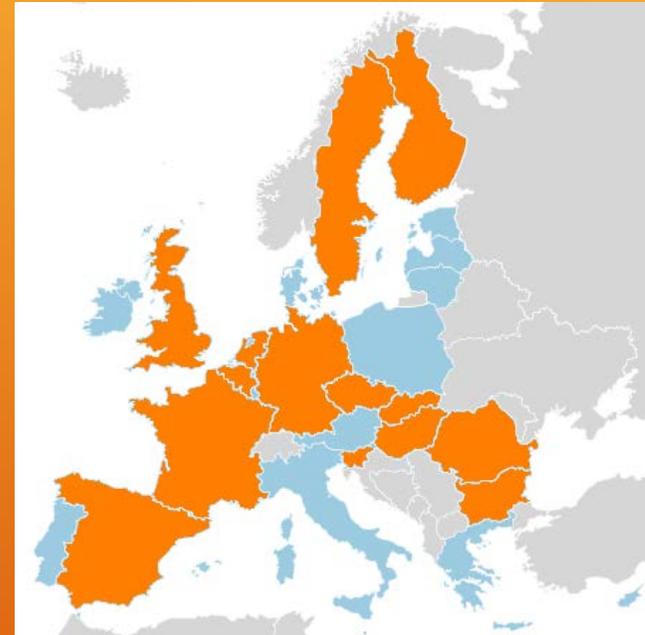
- ▶ Proposals rely exclusively on industry and private capital
- ▶ Look for a “technical fix” to reduce risk of a nuclear disaster
- ▶ Miss social expertise and improvisational skills

“THE WAY FORWARD”



Post-Fukushima European Council mandates:

1. Carry out EU-wide comprehensive risk and safety assessments of nuclear power plants (“stress tests”)
2. Review legal and regulatory framework for safety of nuclear installations and propose improvements



“STRESS TESTS”

- ▶ Special force created in the immediate aftermath of Fukushima
- ▶ Four regional bases (Civaux, Bugey, Paluel, and Dampierre)
- ▶ 150 specially trained employees with day jobs at nuclear power plants
- ▶ Tasked with providing emergency support (personnel and equipment) at any nuclear power plant in France within 24 hours

But:

- ▶ Scalable to other nations?
- ▶ Requires technocratic, centralized, paramilitary organization?

NUCLEAR RAPID ACTION FORCE (FARN)

- ▶ Fukushima “explained away” as “made in Japan” — could not happen here
- ▶ Strategies to plan for the worst, to address “beyond design basis” accidents (which *will* happen) still emphasize standardization, regulation, and routine: are we simply creating better “fantasy documents” (Clarke 1999)?
- ▶ Are organizational transformations happening?
 - ▶ Struggle for more control continues; so will normalization of deviance
 - ▶ Nuclear disasters as “Normal Accidents”
 - ▶ Nuclear power plants are still far from being HROs
 - ▶ Reflexive organizations
 - ▶ Transparent processes
 - ▶ Expert improvisation

CONCLUSIONS

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THANK YOU!