



United States Nuclear Regulatory Commission

Protecting People and the Environment

Emergency Preparedness for Small Modular Reactor (SMR) Designs

Office of New Reactor

Advanced Reactor Program

Office of Nuclear Security and Incident Response

July 28, 2010

What is the overall objective of Emergency Preparedness?

- To ensure the **capability** of implementing **adequate measures** to protect public health and safety in the event of a radiological emergency

Why Prepare?

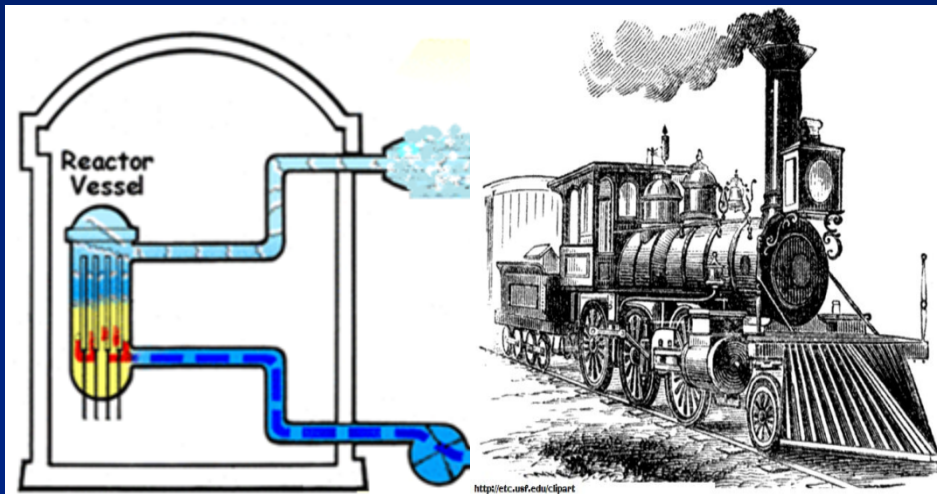
- Prudence
 - to prepare for a radiological release, regardless of how unlikely it may be
- Planning
 - to have a strategy (with supporting infrastructure) in place to be activated during an event
- Training and practice
 - to maintain the human expertise needed to conduct a well organized response

Introduction

- Previous workshop (2/3/10)
- SMR vs. LWR Comparisons
- Generic implication of SMRs on EP
- Status of RIS-2010-03 Questions
- Future Workshops on SMR EP
- Stakeholder Participation
- Many questions- answers welcomed!

SMR Emergency Preparedness

What's the difference?

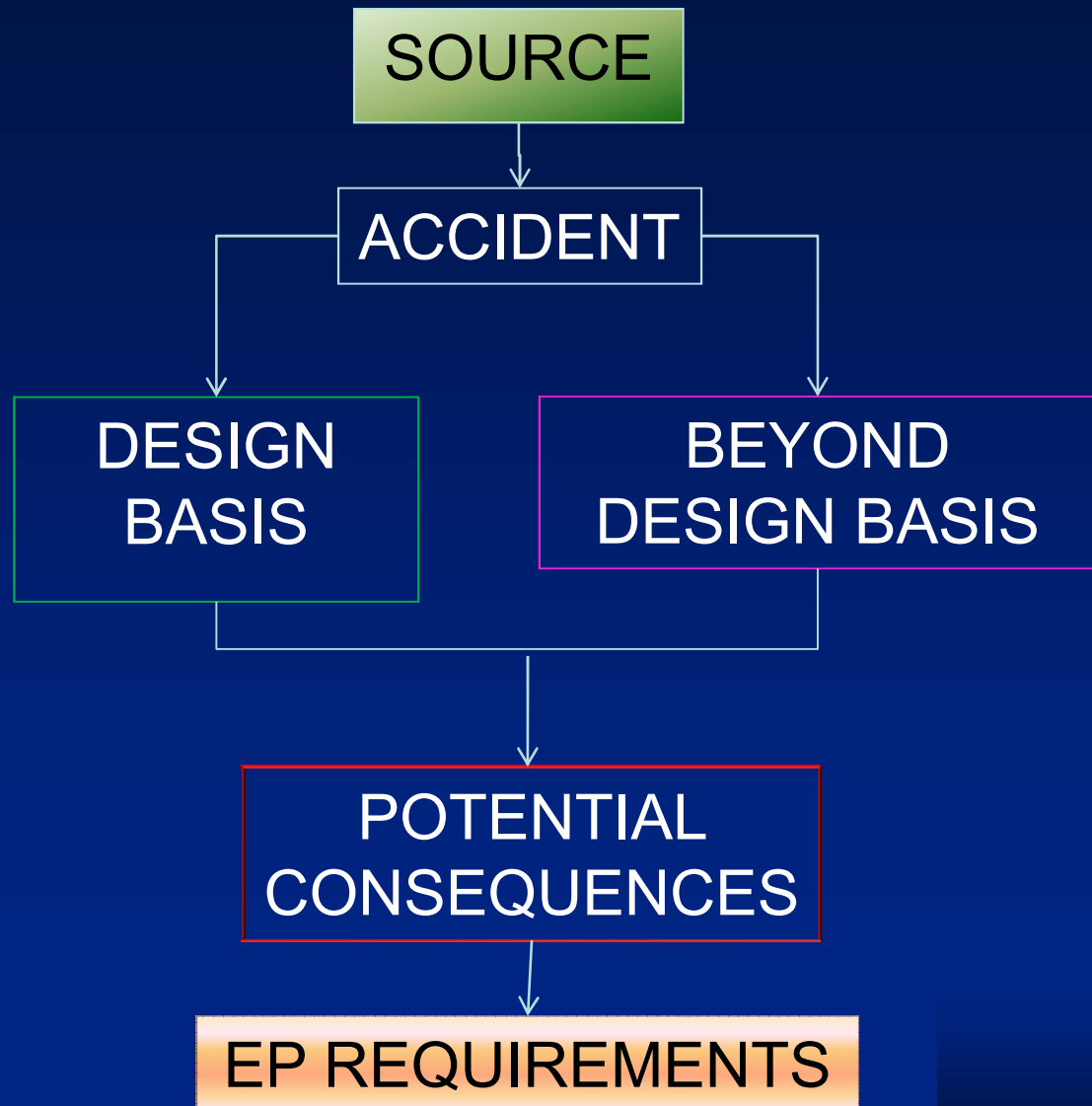


THE RADIOACTIVE **SOURCE** OF ENERGY IN ALL NUCLEAR REACTORS REQUIRES THE DESIGN OF A UNIQUE EMERGENCY PLAN SUCH “THAT THERE IS REASONABLE ASSURANCE THAT ADEQUATE PROTECTIVE MEASURES CAN AND WILL BE TAKEN IN THE EVENT OF A RADIOLOGICAL EMERGENCY”* AT THE FACILITY.

*Reasonable Assurance: 10 CFR 50.47a

SMR Emergency Preparedness

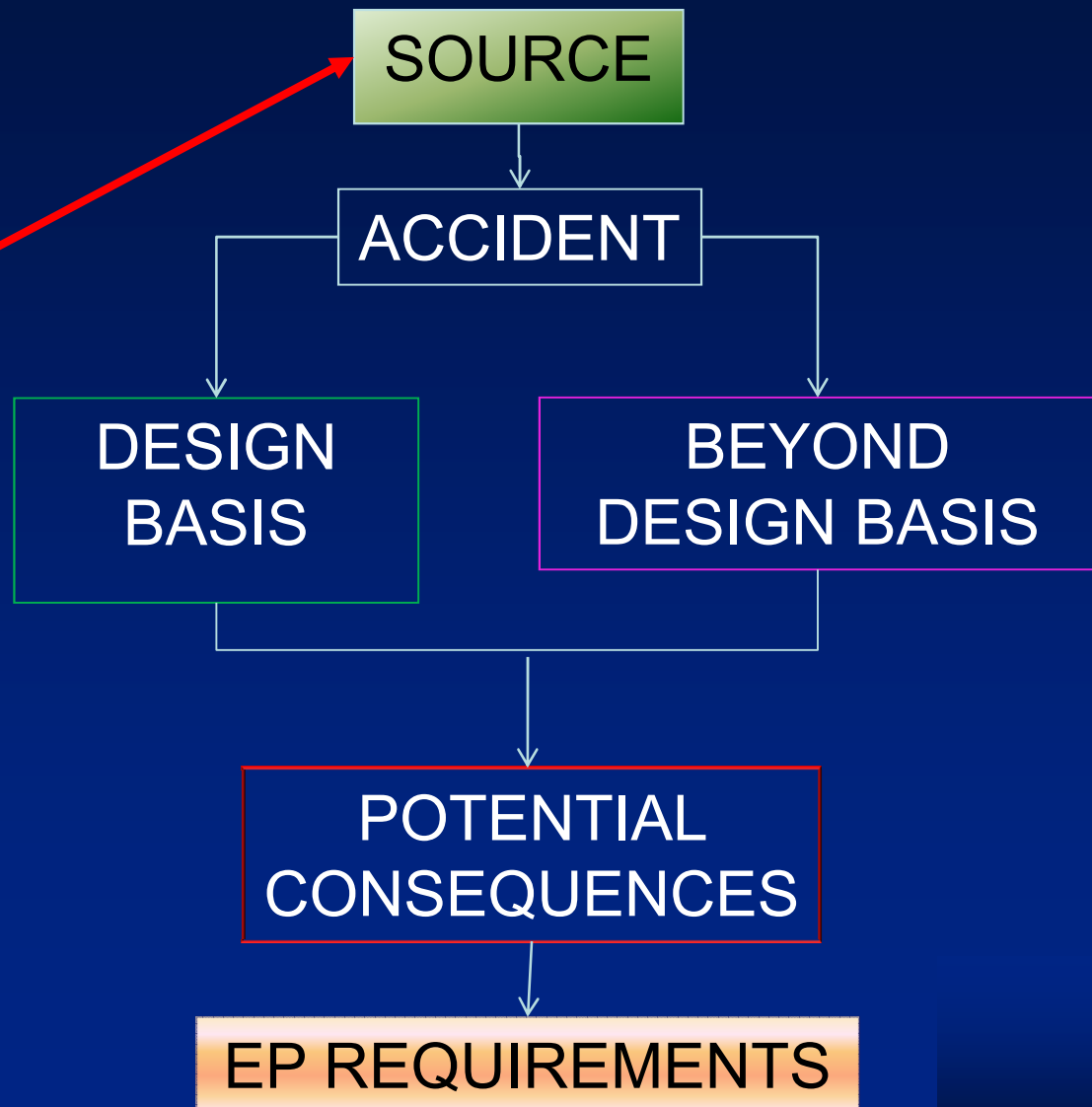
**How
do
you
get
there?**



SMR Emergency Preparedness

How do you get there?

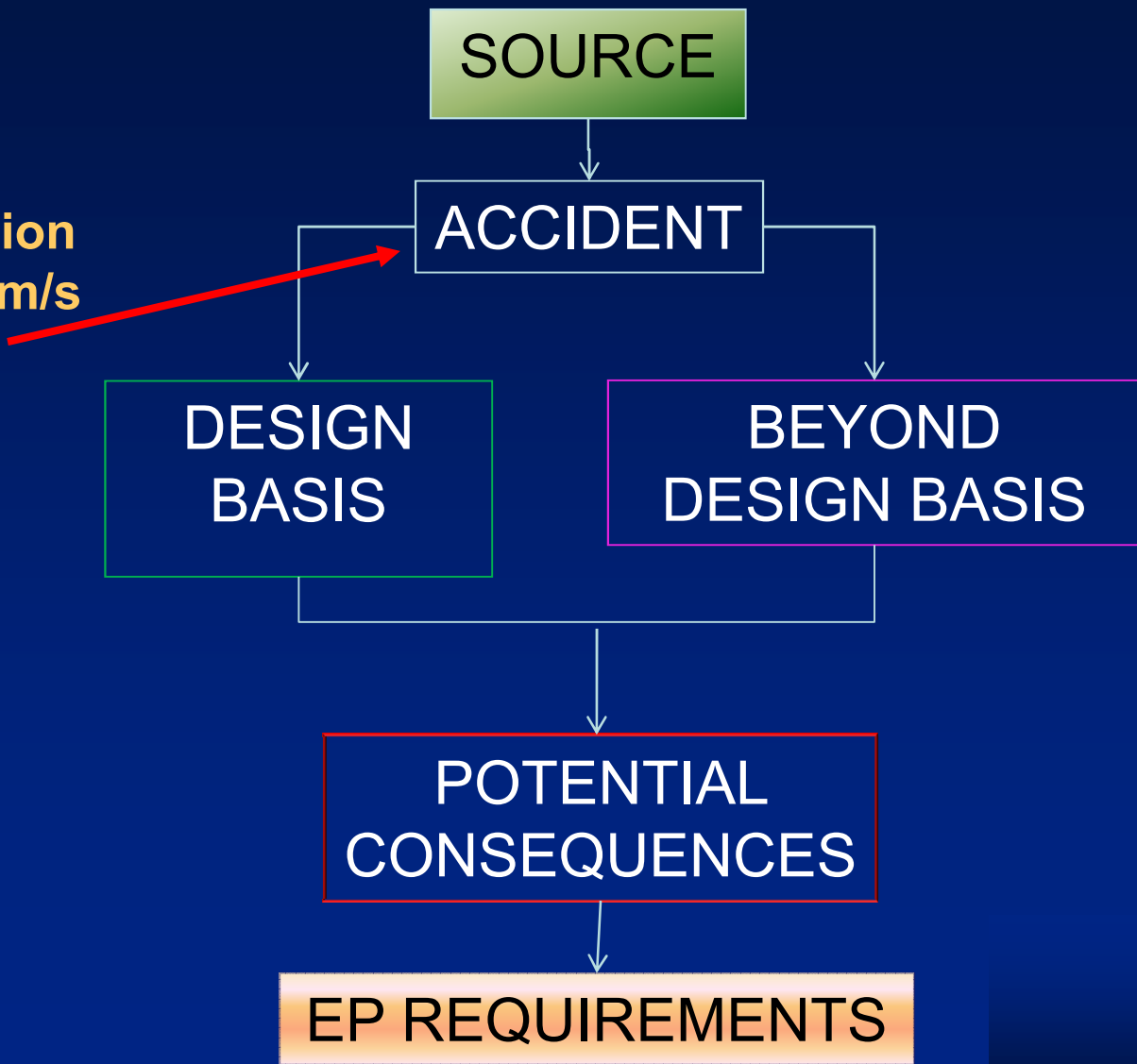
- Fuel Type
- Core Load
- Operational History



SMR Emergency Preparedness

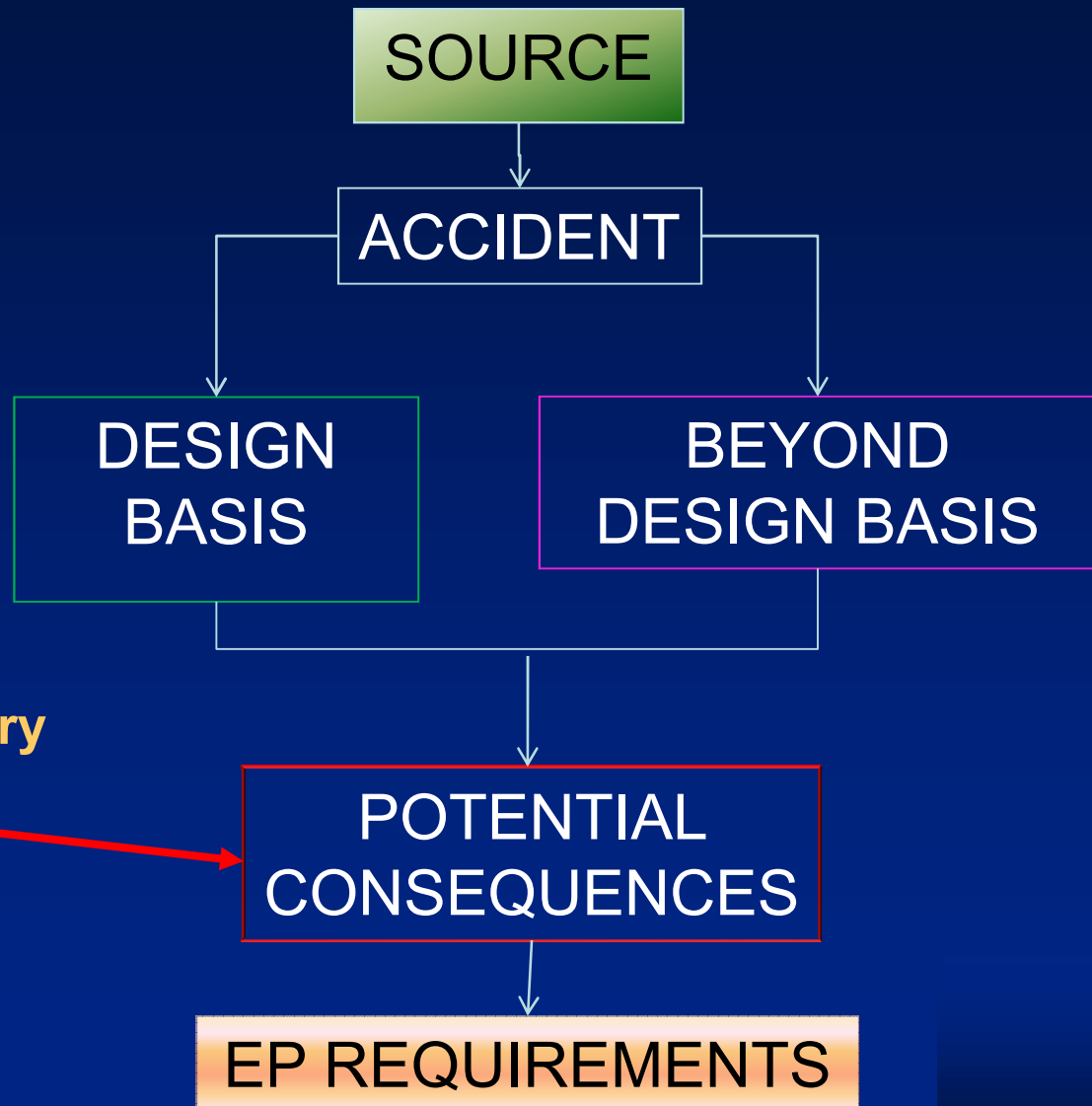
How do you get there?

- Accident progression
- Release mechanism/s
- Fission barrier
- EALs



SMR Emergency Preparedness

How do you get there?

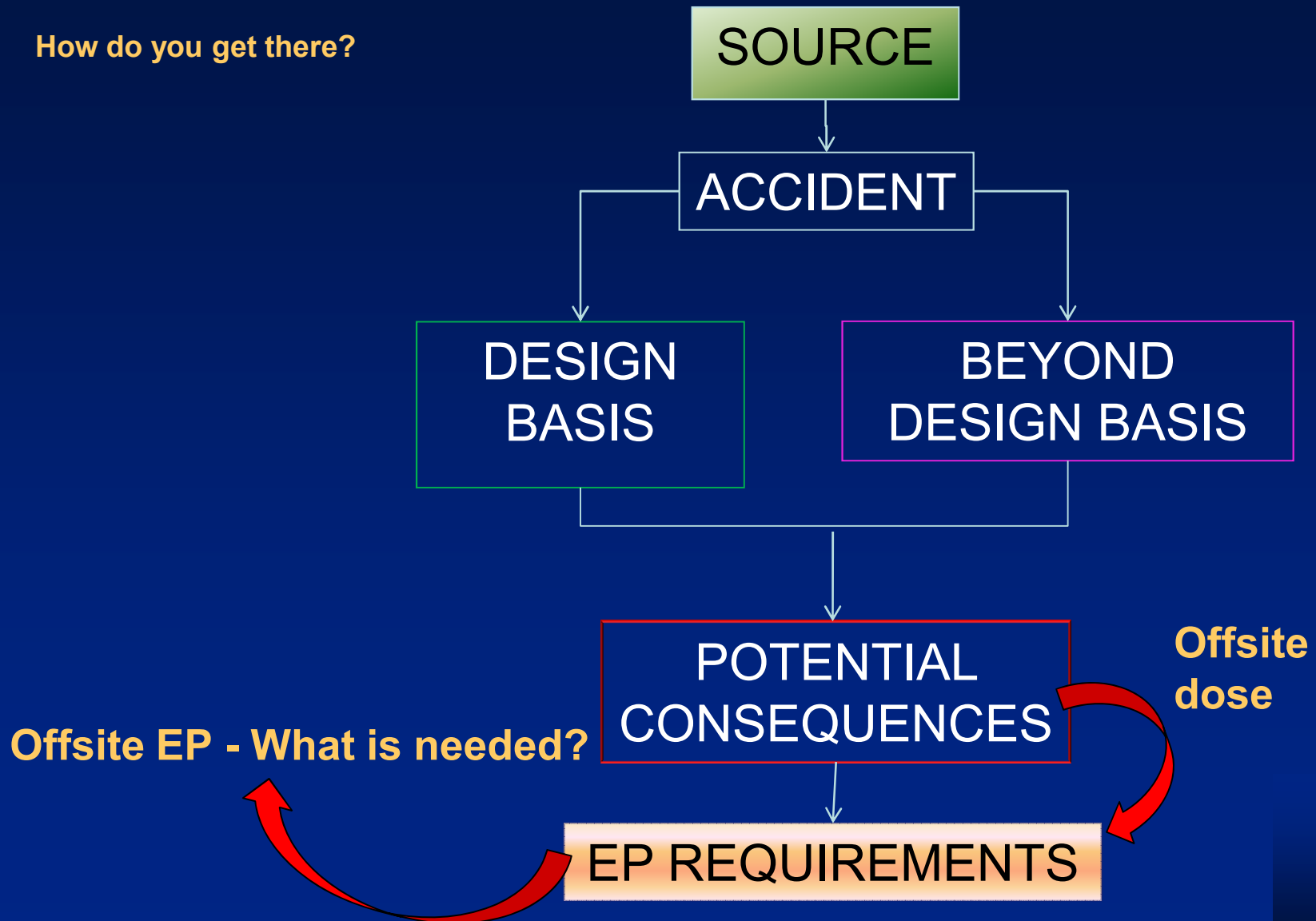


- Protected area boundary
- Offsite dose



SMR Emergency Preparedness

How do you get there?



Questions that must be answered:

WHAT IS THE SOURCE TERM FOR THE SMR DESIGN?

WHAT ARE THE BASES FOR MODIFIED EP PLANNING REQUIREMENTS FOR THE SRM SITE?

Questions that must be answered (Cont'd)

- What are the results of a comprehensive analysis which consider the implications of the CFR and Regulatory Guides on the SMR design?
- What are the historical perspectives of the Commission policy issues regarding EP planning for reactors other than LWRs?

Questions that must be answered (Cont'd)

- What is the technical basis for revisions to EP planning requirements for the proposed SMR design?
- How would the public and affected offsite organizations be impacted by a proposed modification of EP planning requirements when compared to those of current LWRs?

Partial Listing of NRC Documents

Regulations

- 10 CFR
 - 30
 - 40
 - 50/52
 - 70
 - 100
 - 110

Guidance

- RG 1.206
- RG 2.6
- RG 1.101
- NUREGs
 - 0654
 - 0396
 - 0800

SECY Papers

- 97-020
- 10-0034

Example of things the NRC will consider

- Public health and safety and the environment
- CFR regulations
- Regulatory Guides
- Commission policy documents
- Technical basis for requirements

Examples of Other Things to Consider

- Emergency Classifications
- Emergency Action Levels
- Emergency Procedures
- Emergency Planning Zones
- Protective Actions
- Federal, State, and Local Responsibilities
- Emergency Exercises/Drills
- Response to Terrorism

Examples of Other Things to Consider (cont'd)

- Impact of modularity
- Passive systems
- Siting on mixed-use facilities
- SMR definition for EP purposes
- RTR Emergency Preparedness
- Use of Potassium Iodide
- Shift staffing

Discussion on EPZ

ISSUE	FUEL FACILITY	RESEARCH AND TEST REACTOR	SMALL MODULAR REACTOR	LIGHT WATER REACTOR
PLANNING STANDARDS	RG 3.67	10		16
SOURCE TERM	Well Defined	Well Defined		Well Defined
EP PLAN	Current Regulations	Current Regulations		Current Regulations
EPZ – Plume	N/A	CR to 800 meters		10 Miles
EPZ – Ingestion	N/A	N/A		50 Miles
OFFSITE - Response	Coordinated	Coordinated		Coordinated
Highest ECL	SAE	SAE		GE

Discussion on EPZ (cont'd)

HTGR Case-by-case

- 10 CFR 50.33 (g)
 - “...The size of the EPZs also may be determined on a case-by-case basis for gas-cooled reactors and for reactors with an authorized power level less than 250 MW thermal...”

Exemption

- 10 CFR 50.12
 - Thermal power levels greater or equal to 250 MW and less than the current licensed thermal power of current LWR fleet
 - Process exists for such exemptions

Discussion on EPZ (cont'd)

A few examples of topics that should be considered when modifying EPZs:

- the technical basis for zone modifications
- consequence assessments such as siting evaluation
- evacuation time estimation
- capabilities and resources for EP and response

REGULATORY ISSUE SUMMARY 2010-03 EP QUESTION:

For ESP applicants, will the applicant be seeking approval of either “proposed major features of the emergency plans” per 10 CFR 52.17(b)(2)(i), or “proposed complete and integrated emergency plans” per 10 CFR 52.17(b)(2)(ii)?

Questions?

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The Sixteen Planning Standards



10 CFR 50.47(b)(1)

Primary responsibilities for emergency response by the nuclear facility licensee and by State and local organizations within the EPZs have been assigned, emergency responsibilities of the various supporting organizations have been specifically established, and each principal response organization has staff to respond and to augment its initial response on a continuous basis.

■ **Translated:**

- Responsibilities for onsite/offsite personnel/organizations are established to support 24/7 coverage

■ **Examples:**

- Emergency response organizational chart
- Position descriptions

10 CFR 50.47(b)(2)

On-shift facility licensee responsibilities for emergency response are unambiguously defined, adequate staffing to provide initial facility accident response in key functional areas is maintained at all times, timely augmentation of response capabilities is available and the interfaces among various onsite response activities and offsite support are specified.

■ **Translated:**

- Transition from normal duties to emergency responsibilities; ensuring sufficient onshift emergency staff at all times; timely augmentation of onshift staff; and identifying offsite emergency resources

■ **Examples:**

- Shift Manager to Emergency Director
- Shift Staffing Schedule to Support Onshift Emergency Response
- Identify local ambulance agency(s), fire department(s), police, hospital(s), etc. and obtain MOU's



10 CFR 50.47(b)(3)

Arrangements for requesting and effectively using assistance resources have been made, arrangements to accommodate State and local staff at the licensee's near-site EOF have been made, and other organizations capable of augmenting the planned response have been identified.

■ **Translated:**

- Federal, State, and local governmental assistance is arranged with space available in EOF for their response and other technical organizations as needed by the plan

■ **Examples:**

- INPO
- Utility Owner's Groups
- Coast Guard



10 CFR 50.47(b)(4)

A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures.

- **Translated:**

- Ability to classify an emergency via a standard scheme

- **Examples:**

- Emergency Action Levels
- ORO Standard Operating Plans (SOPs) entry conditions



10 CFR 50.47(b)(5)

Procedures have been established for notification, by the licensee, of State and local response organizations and for notification of emergency personnel by all organizations; the content of initial and follow-up messages to response organizations and the public have been established; and the means to provide early notification and clear instruction to the populace within the plume exposure pathway EPZ have been established.

- **Translated:**

- Capability to provide notification and response instructions to onsite/offsite emergency response personnel and the public.

- **Examples:**

- Call out list
- Notification Forms
- EAS Messages
- Alert and Notification Systems (ANS)
- Tone Alert Radios



10 CFR 50.47(b)(6)

Provisions exist for prompt communications among principal response organizations to emergency personnel and to the public.

■ **Translated:**

- Have plans for contacting all necessary OROs and emergency personnel

■ **Examples:**

- Pagers, Cell Phones, Blackberries
- Emergency Notification System
- Direct ringdown phones from licensee to counties/States



10 CFR 50.47(b)(7)

Information is made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency, the principal points of contact with the news media for dissemination of information during an emergency are established in advance, and procedures for coordinated dissemination of information to the public are established.

■ **Translated:**

- Information on nuclear power plant emergencies shall be provided annually to the general public and the media

■ **Examples:**

- JICs
- Phone Books
- Annual Mailers, Calendars
- Annual Media Training



10 CFR 50.47(b)(8)

Adequate emergency facilities and equipment to support the emergency response are provided and maintained.

■ **Translated:**

- Provide and maintain all facilities and equipment necessary to support emergency response at all times.

■ **Examples:**

- TSC, EOF, OSC, EOC
- Air Samplers, computers, FAX machines, backup power
- Met towers



10 CFR 50.47(b)(9)

*Adequate methods, systems, and equipment for **assessing and monitoring actual or potential offsite consequences** of a radiological emergency condition are in use.*

- **Translated:**

- Ability to monitor and assess radiological release

- **Examples:**

- Dose modeling software
- Radiation monitors
- Field monitoring teams

10 CFR 50.47(b)(10)

A range of protective actions has been developed for the plume exposure pathway EPZ for emergency workers and the public. In developing this range of actions, consideration has been given to evacuation, sheltering and as a supplement to these, the prophylactic use of potassium iodide as appropriate. Guidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in place and protective actions for the ingestion exposure pathway EPZ appropriate to the locale have been developed.

■ **Translation:**

- Have a set of preplanned protective actions (that must consider evacuation and sheltering – potassium iodide is a possible supplement, but not a replacement) that can be implemented based on radiological conditions for both EPZs

■ **Examples:**

- Evacuation sector maps
- Assembly Areas
- List of Dairy Farms within 50 miles



10 CFR 50.47(b)(11)

Means for controlling radiological exposures, in an emergency, are established for emergency workers. The means for controlling radiological exposures shall include exposure guidelines consistent with EPA Emergency Worker and lifesaving Activity Protective Action Guides.

■ **Translated:**

- Have a plan for protecting and directing plant personnel that must respond to radiological hazards during an emergency

■ **Examples:**

- Life-saving dose levels identified and those who can authorize entry
- Emergency worker dosimetry both onsite and offsite



10 CFR 50.47(b)(12)

Arrangements are made for *medical services for contaminated injured individuals.*

- ***Translated:***

- Arrangements made with ambulance and hospitals prepared to treat contaminated personnel

- ***Examples:***

- Evaluated drills with ambulance and hospital personnel
- Onsite emergency medical squads



10 CFR 50.47(b)(13)

General plans for recovery and reentry are developed.

- **Translated:**

- Create a framework for recovering from an emergency

- **Examples:**

- Event Termination and/or de-escalation criterion pre-established in the emergency plan



10 CFR 50.47(b)(14)

Periodic exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of exercises or drills are (will be) corrected.

■ **Translated:**

- Evaluated and training exercises/drills are conducted to identify and correct weaknesses and maintain proficiency

■ **Examples:**

- Biennial Evaluated Exercise (FEMA)
- Licensed Operator Requal (LOR) Drills
- Fire Drills
- Critiques



10 CFR 50.47(b)(15)

Radiological emergency response training is provided to those who may be called on to assist in an emergency.

- **Translated:**

- Training to onsite and offsite emergency response personnel

- **Examples:**

- Fire Department training on decontamination efforts
- Classroom training on classifying emergencies



10 CFR 50.47(b)(16)

Responsibilities for *plan development and review* and for distribution of emergency plans are established and *planners are properly trained*.

- ***Translation:***

- Emergency preparedness responsibilities are assigned to qualified personnel

- ***Examples:***

- Initial and continuous training of EP department staff
- Annual review of emergency plan



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