U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Protective Action Recommendation Study

Randolph L. Sullivan, CHP
Nuclear Regulatory Commission

Health Physics Society Meeting
Portland, Oregon

July 8-12, 2007

Nuclear Plant EP Program Objective

- NP Emergency Preparedness programs are designed to reduce public dose during a severe accident through implementation of protective actions
- NRC protective action recommendation guidance (PAR) is in NUREG-0654 Supplement 3
- Guidance based on 1990 era work

PAR Study Objective

Investigate if the use of alternative protective actions can reduce public dose during severe accidents

Protective Actions

- Evacuation
- Shelter in place
- Stable potassium Iodide

Method of Investigation

- Identify appropriate severe accidents
- Choose source terms (NUREG-1150)
- Identify timing of releases
- Use the MACCS code, developed for NRC dose analyses

Method of Investigation

- Develop generic NPP site
  - Standard US meteorology
  - Emergency planning zone with 80,000 people
- Rank consequences for alternative PARs compared to the current guidance (radial keyhole evacuation)

Method of Investigation

- Only relative consequence results are used since the site is hypothetical
- Allows comparison of alternative PAR for the same set of accidents
- Set evacuation speeds to represent 4,6,8, & 10 hour evacuation times

Alternative PARs

- Shelter in place (SIP) for various times – (within current regimen, but limited use)
- Preferred sheltering for various times (in large public buildings, etc.)
- Lateral evacuation (crosswind)
- Staged evacuation (evacuation nearby, initially shelter others)

Results

Protective Action	Normalized to Total Sum	
	EF	LCF
SIP-2 hrs/Lateral evac	0.00	0.00
PS-2 hrs/Lateral evac	0.00	0.00
SIP-4 hrs/Lateral evac	0.00	0.00
PS-4 hrs/Lateral evac	0.00	0.00
Staged Evacuation	0.00	0.02
Radial Evacuation (constant speed)	0.00	0.03
SIP-2 hrs/Radial evac	0.00	0.05
SIP-8 hrs/Lateral evac	0.00	0.05
PS-2 hrs/Radial evac	0.00	0.07
PS-8 hrs/Lateral evac	0.00	0.08
SIP-4 hrs/Radial evac	0.00	0.11
PS-4 hrs/Radial evac	0.00	0.13
SIP-8 hrs/Radial evac	0.26	0.23
PS-8 hrs/Radial evac	0.74	0.24

Results

- Radial evacuation remains the major element of PAR strategy
- SIP is more protective than evacuation for rapidly developing releases if followed by evacuation after plume passage
- Precautionary preparation efforts are prudent

Results

- Consequences increase as evacuation times increase
- Appropriate PAR is dependent upon the evacuation time
- Staged evacuation always reduces consequences, but not always significantly
- Lateral evacuation reduces dose

Practicalities

- Discussed results with State EP personnel
  - Lateral evacuation is not practical at most sites
  - Preferential sheltering is not practical for many reasons

Next Steps

- The staff will present options for revision of NRC PAR guidance to the Commission for consideration
- Revision process would be public and seek stakeholder input
- Revision would be coordinated with FEMA

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Questions?

Randy Sullivan, USNRC
RXS3@NRC.GOV
301-415-1123