LONG-TERM STATION BLACKOUT

Part of the RASCAL Instructor-led Training

LTSBO - BACKGROUND

In a Long-Term Station Blackout, a facility will lose all offsite and onsite AC power. Cooling is initially maintained using diesel generators and batteries. However, after these are exhausted, water in the core will start to heat and eventually boil. RASCAL models this heatup time as 8 hours in a PWR and 6 hours in a BWR. After the core is fully uncovered, fission products begin to release.

The source term model for LTSBO in RASCAL is based on the State-of-the-Art Reactor Consequence Analysis (SOARCA) reports.

LTSBO - Scenario

Arkansas Nuclear One (ANO), Unit 2, was shutdown at the same time as ANO Unit 1, 10:00, due to the earthquake which caused the Unit 1 LOCA.

All offsite and onsite AC power was lost.

LTSBO - Scenario

Diesels initially provided power and cooling was maintained. However, a strong aftershock 5 hours after the original quake incapacitated the diesels. The batteries lasted six hours.

Given the models in RASCAL, at what time does the core heat up to the point of damage/release?

Fission products leak through a slightly damaged containment at 2.0 percent/d with no sprays available.

Finally, power is restored and the core is recovered at 10:00 on the next day. Containment pressure was reduced to atmosphere at noon.

LTSBO - Scenario

Use the following weather data for the ARKA station

Type	Date	Time	Wind Dir (deg)	Wind spd (mph)	Stability Class	Precip	Air Temp (Deg F)
Obs	Today	12:00	210	6	B	None	53
Fcst	Today+1	00:00	210	6	B	None	53
Fcst	Today+1	04:00	340	4	D	None	48
Fcst	Today+1	08:00	350	6	C	None	50
Fcst	Today+1	12:00	0	7	B	None	66

- Why is there a large variation in direction between 8:00 and 12:00?
- Then why did we get a warning message?

LTSBO - Task

Do an assessment of the Unit 2 LTSBO and record the TEDE and Thyroid CDE at 1 and 5 miles from the release.

Dose	Distance from the Site	
	1.0 mi	5.0 mi
TEDE (rem)		
Adult Thyroid CDE (rem)		

LTSBO - RESULTS

Dose	Distance from the Site	
	1.0 mi	5.0 mi
TEDE (rem)	7	.24
Adult Thyroid CDE (rem)	81	2.5

Conclusions?

– Release timing vs LOCA