U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

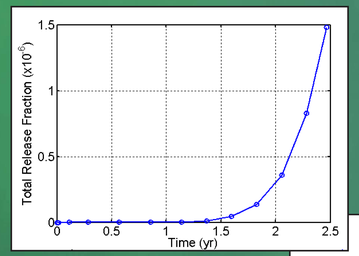
Office of Nuclear Regulatory Research

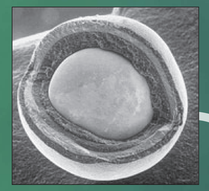
Recent Applications of MELCOR

Protecting People and the Environment through Effective Programs

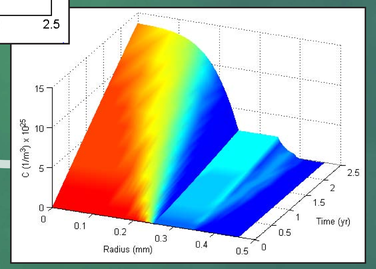
- MELCOR is an integrated system level computer code developed at Sandia National Laboratories for the U.S. Nuclear Regulatory Commission
- State-of-the-art tool for source term analysis
- Design certification for new reactors (design basis and severe accidents)
- Evaluation of system success criteria in probabilistic risk assessment
- MELCOR accident simulation using SNAP
- Model development for gas-cooled reactors

High Temperature Gas Reactor Fission Product Release

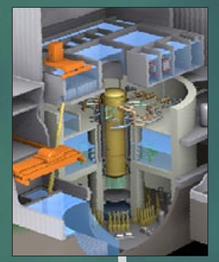


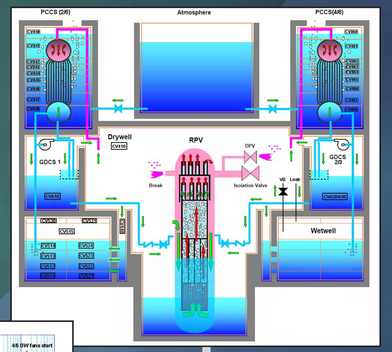


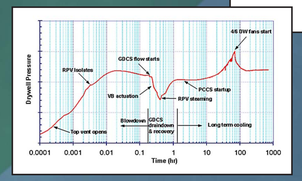
$$\frac{\partial C}{\partial t}=\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2 D\frac{\partial C}{\partial r}\right)-\lambda C+\beta$$



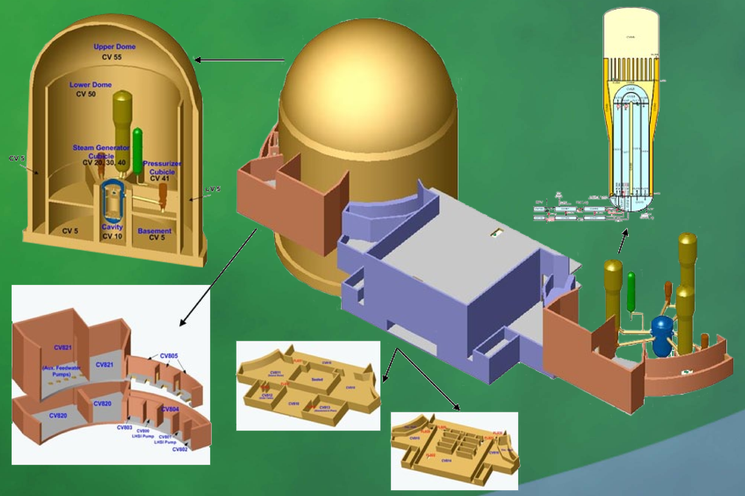
ESBWR Long-Term Containment Cooling



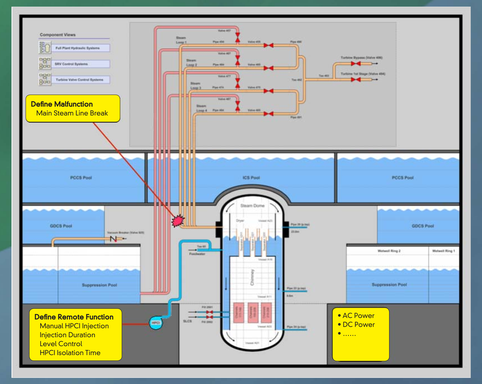




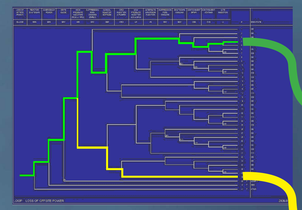
MELCOR Modeling Approach



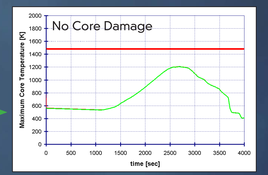
MELCOR Accident Simulation Using SNAP

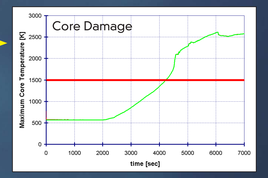


Evaluation of System Success Criteria



Case	RCIC	HPCI	AC/DC	SRV Sticks Open??	HTCL Depress.?	Core Uncover (hr)	Core Damage (hr)
1	No	No	No	No	No	0.5	1.2
1a			Recover at 1.2 hrs	No		0.5	No
2			No	I=0		0.3	0.8
3			Infinite DC	No		17.7	19.4
4		Yes	Infinite DC	No	Yes	5.6	7.2
5			2 hrs DC	No	No	3.3	4.3
6			Infinite DC	Yes		5.6	7.2
7		No	Infinite DC	No		17.5	19.3
8			Infinite DC	No	Yes	9.1	10.8
9			2 hrs DC	No	No	3.8	4.9
10			Infinite DC	Yes		8.9	10.7





Knowledge for Today and Tomorrow