

Consequence Evaluation for Spent Fuel Pool Accidents

Presentation to the Advisory Committee on Reactor Safeguards

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Consequence Assessment

Object of the analysis

**Assess effect of 1 year of decay on offsite consequences
Assess effect of early vs. late evacuation**

Summary of approach

**Use the MACCS code with fission product inventories for 30 days and
1 year after final shutdown**

Conclusion

**Short-term consequences (early fatalities) reduced by a factor of 2
from 30 days to 1 year. Early evacuation reduces early fatalities by up
to a factor of 100.**

**Long-term consequences (cancer fatalities and societal dose) less
affected by additional decay and early evacuation**

Results

Mean Consequences for Surry Population Density				
Decay Time Prior to Accident	Distance (miles)	Early Fatalities	Societal Dose (person-rem)	Cancer Fatalities
30 days	0-100	1.75	4.77x10⁶	2,460
1 year	0-100	1.01	4.54x10⁶	2,320
1 year¹	0-100	.0048	4.18x10⁶	1,990

¹Based on evacuation before release.

Effect of Ruthenium

Small-scale Canadian tests with an air environment show significant ruthenium release following cladding oxidation.

MACCS calculations show that release of all ruthenium increases early fatalities by up to a factor of 100, because the assumed form (oxide) has a large dose per Ci inhaled due to its long clearance time from the lung.

Mitigating factors for ruthenium releases in spent fuel pool accidents

rubbling of the fuel may limit air ingress

1 year half-life of ruthenium

PHEBUS test planned to examine effect of air ingress on a larger scale in an integral facility

Results

Mean Consequences for Surry Population Density				
Decay Time Prior to Accident	Distance (miles)	Early Fatalities	Societal Dose (person-rem)	Cancer Fatalities
1 year	0-100	1.01	4.54x10⁶	2,320
1 year (100% ruthenium release)	0-100	95.3	9.53x10⁶	9,150
1 year (100% ruthenium release)¹	0-100	.13	6.75x10⁶	6,300

¹Based on evacuation before release.

Conclusion: Effect of ruthenium release can be very significant, but can be offset by early evacuation.