Dose mrem/yr	Source or expected result
450,000	expect that 50% will die (a)
100,000	nausea, fatigue, radiation sickness, expect 100% recovery (a)
50,000	detectable temporary blood changes (b)
10,000	**risks of health effects are to small to be observed or are non-existent (c)**
5,000	**zero health effects is the most likely outcome (c)**
1,500	astronaut 1 month in space (a)
1,300	cigarette smoking (d)
1,100	natural background of Kerala State in India (e)
400	gastric fluoroscope (a)
380	transcontinental jetliner crew (f)
360	**U.S. average annual dose (f)**
200	radon in homes (f)
160	workers at a phosphate fertilizer plant (d)
120	Grand Central Station worker in N. Y. (f)
100	person with a plutonium cardiac pacemaker (d)
40	human bodies own dose to itself (f)
30	terrestrial radiation, soil, rocks (g)
30	cosmic radiation (g)
30	chest X-ray (a)
23	global average from food and water (h)
20	Congress, working on Capitol Hill –granite (f)
10	for every 1,000 ft rise in elevation (f)
10	**INL limiting dose to the MEI***
7.5	spouse of person with plutonium pacemaker (d)
6	heating and cooking with natural gas (f)
5	U.S. round trip by air (g)
3.6	occupants of a brick home (d)
3.5	domestic water (d)
2	eating foods fertilized with phosphate (d)
1.5	children of a person with a plutonium pacemaker (d)
1	sleeping with spouse versus alone (f)
1	watching color TV (d)
1	1 mrem increase for every 100 ft rise in elevation (f)
0.5	airplane travel at 39,000 ft - mrem/hr (i)
0.4	eye glasses (d)
0.3	nuclear powered plant (i)
0.2	camping gas mantle (d)
0.08	highways (d)
0.07	dental prostheses (d)
0.03	coal fired plant (d)
0.008	smoke detectors (d)
0.003	luminous watches and clocks (d)
0.002	natural dose reduction effect from a 1,000 MWe coal burning plant – C-14 (d)
0.0003	airport inspection of luggage (d)
0.00002	fluorescent lamp starters (d)

*** MEI**: an individual whose location tends to maximize their radiation dose from a source resulting in a dose higher than that received by other individuals in the general population. (i)

Dose	Source or expected outcome
450,000	50% will die (a)
100,000	nausea, fatigue, radiation sickness, expect 100% recovery (a)
50,000	detectable temporary blood changes (b)
10,000	risks of health effects are to small to be observed or are non-existent (c)
5,000	zero health effects is the most likely outcome (c)
1,500	astronaut 1 month in space (a)
1,300	cigarette smoking (d)
1,100	natural background of Kerala State in India (e)
400	gastric fluoroscope (a)
380	transcontinental jetliner crew (f)
360	U.S. average annual dose (f)
200	radon in homes (f)
120	Grand Central Station worker in N. Y. (f)
100	person with a pacemaker (d)
40	human bodies own dose to itself (f)
30	terrestrial radiation, soil, rocks (g)
30	cosmic radiation (g)
30	chest X-ray (a)
23	global average from food and water (h)
20	Congress, working on Capitol Hill –granite (f)
10	for every 1,000 ft rise in elevation (f)
10	**INEEL limiting dose to the public**
7.5	spouse of person with pacemaker (d)
6	heating and cooking with natural gas (f)
5	US round trip by air (g)
3.6	building materials (g)
3.5	domestic water (d)
2	fertilizer (d)
1.5	children of pacemaker (d)
1	sleeping with spouse versus alone (f)
1	watching color TV (d)
1	1 mrem increase for every 100 ft rise in elevation (f)
0.5	airplane travel at 39,000 ft mrem/hr (i)
0.4	eye glasses (d)
0.214	**INL 12 year Total Dose to the Public (87-98)**
0.2	camping gas mantle (d)
0.08	highways (d)
0.07	dental prostheses (d)
0.03	modern coal fired plant (d)
0.018	**INL 12 year average dose to public (87-98)**
0.008	smoke detectors (d)
0.003	luminous watches and clocks (d)
0.002	Airport inspection systems (d)
0.00002	fluorescent lamp starters (d)

References

a) "Medical Effects of Ionizing Radiation", Radiation Effects Research Foundation, (RERF), Dale Preston.
b) Foundations Of Nuclear Engineering, Thomas J. Connolly, John Wiley & Sons, Inc., 1978.
c) "Radiation Risk in Perspective", Health Physics Society Position Statement, March 1996.
d) NCRP Report No. 95, "Radiation Exposure of the U. S. Population From Consumer Products and Miscellaneous Sources", National Council on Radiation Protection and Measurements, Dec 1987.
e) "Radiation A Fact Of Life", Internal Atomic Energy Agency (IAEA), IAEA/PI/A9E 85-00740, March 1989.
f) "Perspectives", Tri-Cities Technical Council, 1988.
g) "General Employee Radiological Training", U. S. Department of Energy, DOE/EG-0259T-6, INEL/ESHT-0259-2-1, January 1996.
h) "Radiation Safety", Internal Atomic Energy Agency (IAEA), 96-00725 IAEA/PI/A47E, Apr. 1996.
i) NCRP Report No. 93, "Ionizing Radiation Exposure of the Population of the United States", National Council on Radiation Protection and Measurements, Sep 1987.

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10 year dose to the Maximally Exposed Individual of the Public.

		EDE to the MEI		
1	1987	0.06	mrem	max = 0.06
2	1988	0.03	mrem	
3	1989	0.0012	mrem	
4	1990	0.0019	mrem	
5	1991	0.0043	mrem	median = 0.0063
6	1992	0.0015	mrem	average = 0.0179
7	1993	0.011	mrem	12 yr total = 0.214
8	1994	0.004	mrem	
9	1995	0.018	mrem	
10	1996	0.0465	mrem	minimum = 0.0012
11	1997	0.0277	mrem	
12	1998	0.0081	mrem	

These references are for INL Only

1 NESHAPs 40 CFR 61.93 Monitoring Requirements For Radiological Emissions Emission Sources at INEL. DOE/ID-10310, November 1990

"On December 15, 1989, the EPA published the National Emission Standards for Hazardous Air Pollutants (NESHAP), Radionuclides."
"Annual maximum individual (MI) EDEs due to INEL site operations in 1987 and 1988 calculated using AIRDOS-EPA were 0.06 mrem and 0.03 mrem, respectively."

"The EDE for 1989 was calculated to be 0.0012 mrem using AIRDOS-EPA."

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2 Standard for Hazardous Air Pollutants, Annual Report (1990/1991 Supplemental), DOE/ID-10342(91S), August 1992.

1990 total 1.9E-3 mrem EDE calculated using CAP-88 computer code
1991 total 4.3E-3 mrem EDE calculated using CAP-88 computer code

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3 1993 INEL National Emission Standard for Hazardous Air Pollutants – Radionuclides, DOE/ID-10342(93), June 1994.
1.1E-2 mrem CAP-88 code

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4 1992 INEL National Emission Standard for Hazardous Air Pollutants, DOE/ID-10342(92), June 1993.
1.5E-3 mrem CAP-88 code

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5 1994 INEL National Emission Standard for HAzardous Air Pollunts – Radionclides, DOE/ID-10342(94), June 1995.
4.0E-3 mrem CAP-88 code

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6 1995 INEL National Emission Standard for Hazardous Air Plooutants – Raionuclides, DOE/ID-10342(95), Kune 1996.
1.80E-2 mrem CAP-88

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7 1996 INEEL National Emissions Standard for Hazardous Air Pollutants – Radionuclides, DOE/ID-10342(96), June 1997.
3.14E-2 mrem CAP-88 code
