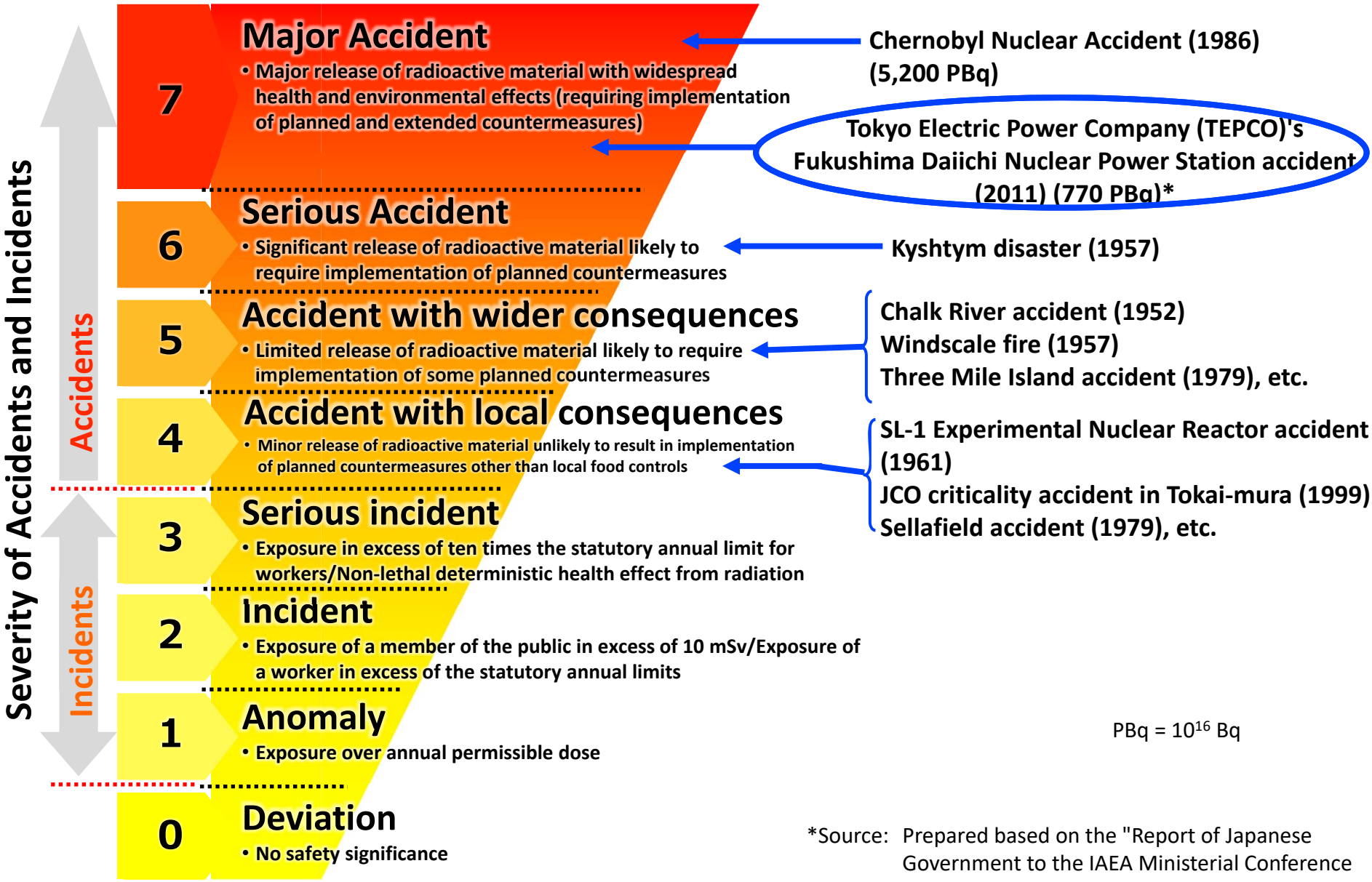
Nuclear Disaster

International Nuclear and Radiological Event Scale

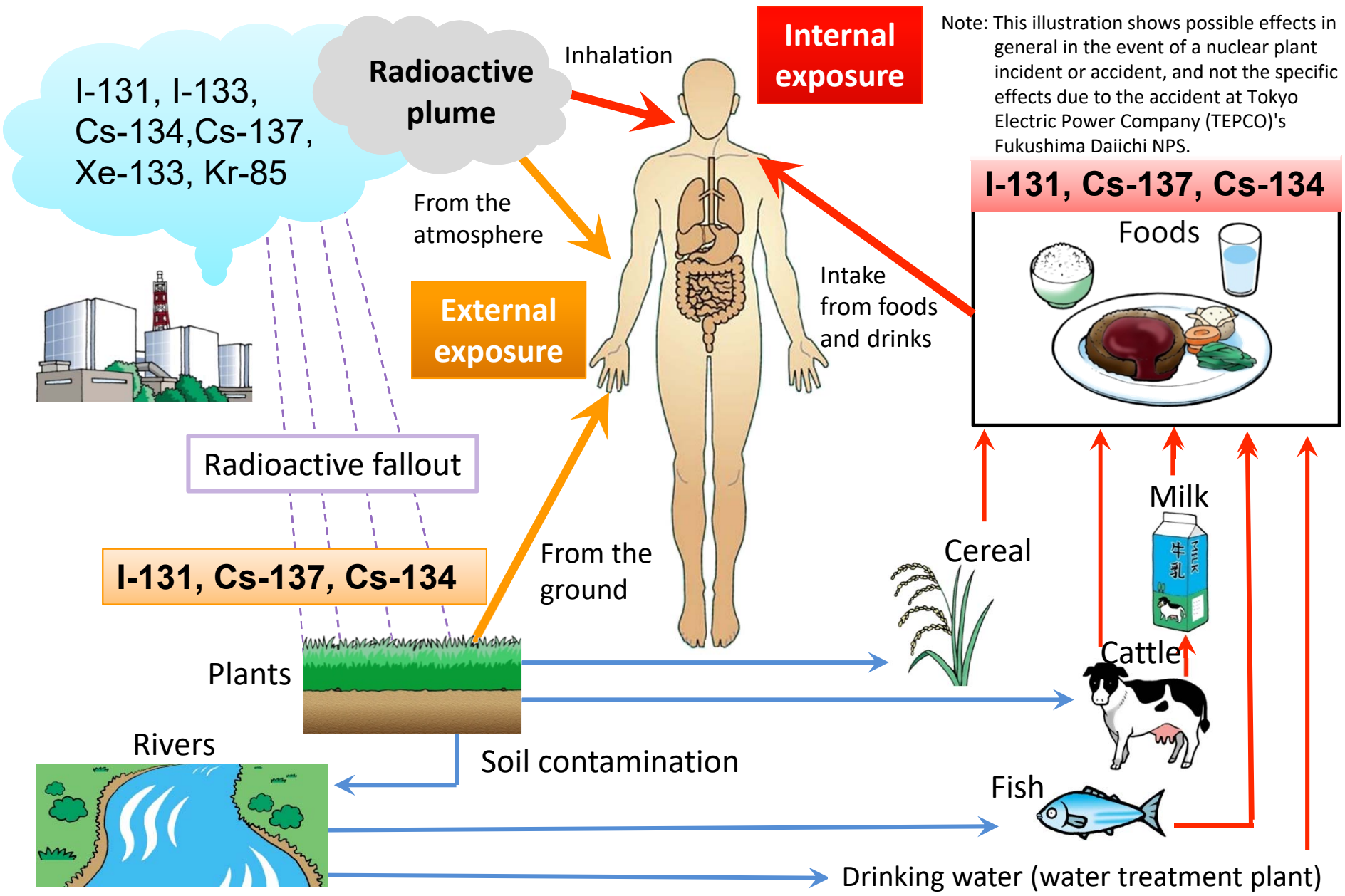


PBq = 10^{16} Bq

*Source: Prepared based on the "Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety" (June 2011)

Nuclear Disaster

Effects of Reactor Accidents

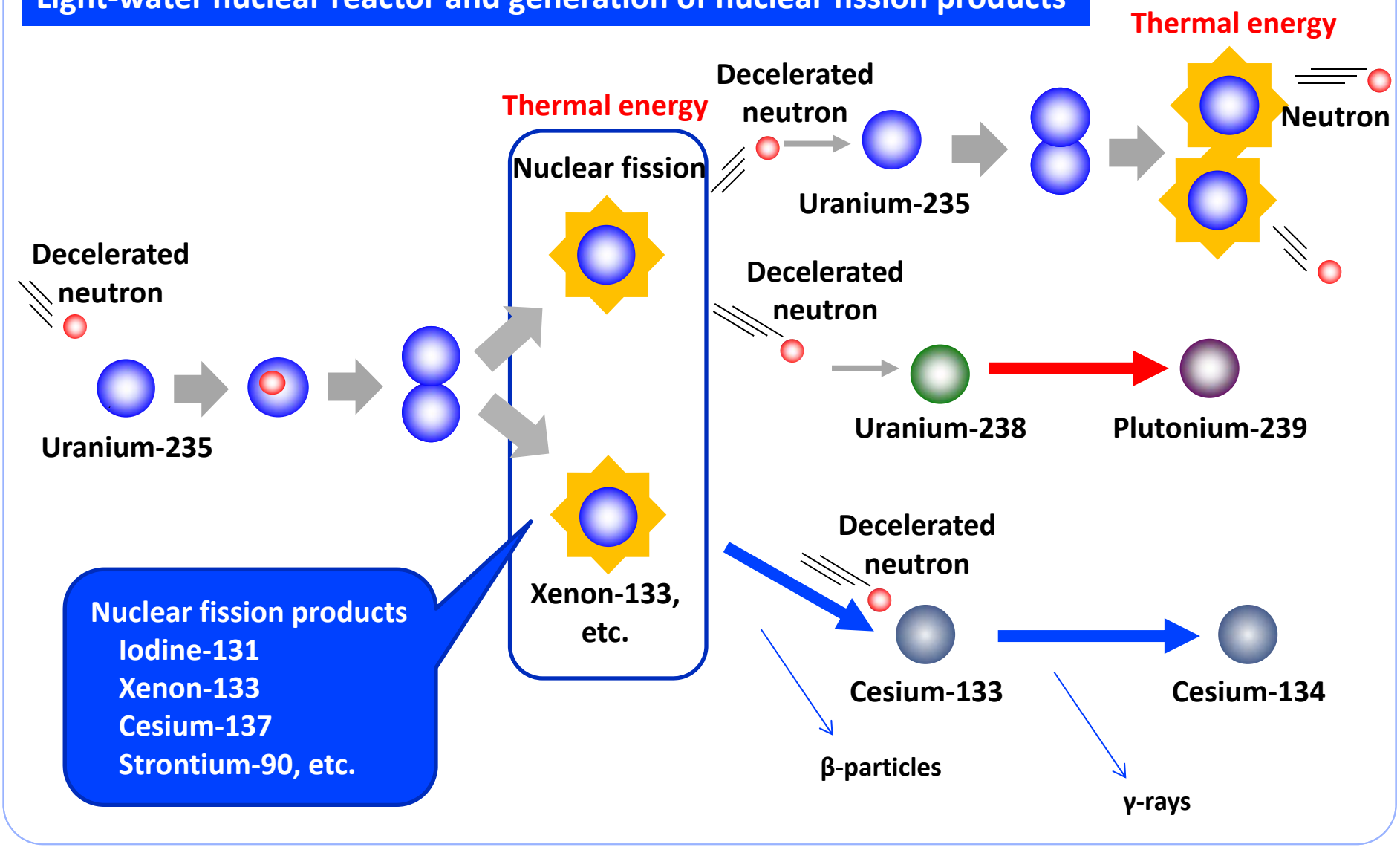


Note: This illustration shows possible effects in general in the event of a nuclear plant incident or accident, and not the specific effects due to the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi NPS.

Nuclear Disaster

Products in Nuclear Reactors

Light-water nuclear reactor and generation of nuclear fission products



Nuclear Disaster

Radioactive Materials Derived from Nuclear Accidents

	H-3 Tritium	Sr-90 Strontium-90	I-131 Iodine-131	Cs-134 Cesium-134	Cs-137 Cesium-137	Pu-239 Plutonium-239
Types of radiation	β	β	β, γ	β, γ	β, γ	α, γ
Biological half-life	10 days *1 *2	50 years *3	80 days *2	70-100 days *4	70-100 days *3	Liver: 20 years *4
Physical half-life	12.3 years	29 years	8 days	2.1 years	30 years	24,000 years
Effective half-life (calculated from biological half-life and physical half-life)	10 days	18 years	7 days	64-88 days	70-99 days	20 years
Organs and tissues where radioactive materials accumulate	Whole body	Bones	Thyroid	Whole body	Whole body	Liver and bones

Effective half-life: The time required for the amount of radioactive materials in the body to reduce to half through biological excretion (biological half-life) and the physical decay (physical half-life) of the radioactive materials; The values are cited from the "Emergency Exposure Medical Text" (Iryo-Kagaku Sha).

Effective half-lives are calculated based on values for organs and tissues where radioactive materials accumulate as indicated in the table of biological half-lives.

*1: Tritium water; *2: ICRP Publication 78; *3: JAEA Technical Manual (November 2011); *4: Assumed to be the same as Cesium-137; *5: ICRP Publication 48

Nuclear Disaster

Comparison of Estimated Amounts of Released Radionuclides between Chernobyl and Fukushima Daiichi NPS Accidents

Nuclides	Half-life[a]	Boiling point[b] ℃	Melting point ℃	Release into the environment: PBq *		Fukushima Daiichi/ Chernobyl
				Chernobyl[d]	Fukushima Daiichi[e]	
Xenon (Xe)-133	5 days	-108	-112	6500	11000	1.69
Iodine (I)-131	**8 days**	**184**	**114**	**～1760**	**160**	**0.09**
Cesium (Cs)-134	**2 years**	**678**	**28**	**～47**	**18**	**0.38**
Cesium (Cs)-137	**30 years**	**678**	**28**	**～85**	**15**	**0.18**
Strontium (Sr)-90	29 years	1380	769	～10	0.14	0.01
Plutonium (Pu)-238	88 years	3235	640	1.5×10^{-2}	1.9×10^{-5}	0.0012
Plutonium (Pu)-239	24100 years	3235	640	1.3×10^{-2}	3.2×10^{-6}	0.00024
Plutonium (Pu)-240	6540 years	3235	640	1.8×10^{-2}	3.2×10^{-6}	0.00018

Ratio of radionuclides accumulated in the reactor core at the time of the accidents that were released into the environment

Nuclides	Chernobyl [f]	Fukushima Daiichi [g]
Xenon (Xe)-133	Nearly 100%	Approx. 60%
Iodine (I)-131	Approx. 50%	Approx. 2-8%
Cesium (Cs)-137	Approx. 30%	Approx. 1-3%

*PBq equals 1015Bq.

Sources: a: ICRP Publication 72 (1996); b and c (except for Np and Cm): Rikagaku Jiten 5th edition (1998); d: UNSCEAR 2008 Report, Scientific Annexes C, D and E; e: Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety (June 2011); f: UNSCEAR 2000 Report, ANNEX J; g: UNSCEAR 2013 Report, ANNEX A