

Level	Definition	People and environment	Radiological barriers & control	Defence in depth	Example
7	Major accident	Major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures			Chernobyl, Ukraine, 1986
6	Serious accident	Significant release of radioactive material likely to require implementation of planned countermeasures.			Kyshtym, Russia, 1957
5	Accident with wider consequences	Limited release of radioactive material likely to require implementation of some planned countermeasures • Several deaths from radiation	<ul style="list-style-type: none"> Severe damage to reactor core. Release of large quantities of radioactive material within an installation with a high probability of significant public exposure. This could arise from a major criticality accident or fire 		Windscale, UK, 1957; Three Mile Island, 1979
4	Accident with local consequences	<ul style="list-style-type: none"> Minor release of radioactive material unlikely to result in implementation of planned countermeasures other than local food controls. At least one death from radiation. 	<ul style="list-style-type: none"> Fuel melt or damage to fuel resulting in more than 0.1% release of core inventory. Release of significant quantities of radioactive material within an installation with a high probability of significant public exposure. 		FUKUSHIMA 1, 2011
3	Serious incident	<ul style="list-style-type: none"> Exposure in excess of ten times the statutory annual limit for workers. Non-lethal deterministic health effect (e.g., burns) from radiation. 	<ul style="list-style-type: none"> Exposure rates of more than 1 Sv/h in an operating area. Severe contamination in an area not expected by design, with a low probability of significant public exposure. 	<ul style="list-style-type: none"> Near accident at a nuclear power plant with no safety provisions remaining. Lost or stolen highly radioactive sealed source. Misdelivered highly radioactive sealed source without adequate procedures in place to handle it. 	Sellafield, UK, 2005
2	Incident	<ul style="list-style-type: none"> Exposure of a member of the public in excess of 10 mSv. Exposure of a worker in excess of the statutory annual limits 	<ul style="list-style-type: none"> Radiation levels in an operating area of more than 50 mSv/h. Significant contamination within the facility into an area not expected by design 	<ul style="list-style-type: none"> Significant failures in safety provisions but with no actual consequences. Found highly radioactive sealed orphan source, device or transport package with safety provisions intact. Inadequate packaging of a highly radioactive sealed source. 	Atucha, Argentina, 2005
1	Anomaly			<ul style="list-style-type: none"> Overexposure of a member of the public in excess of statutory annual limits. Minor problems with safety components with significant defence-in-depth remaining. Low activity lost or stolen radioactive source, device or transport package 	

Year	Incident	INES level	Country	Location	IAEA description
2011	Fukushima		5 Japan	37.319444, 141.021111	Reactor shutdown after the 2011 Sendai earthquake and tsunami; failure of emergency cooling caused an explosion
2011	Onagawa		Japan	38.401111, 141.499722	Reactor shutdown after the 2011 Sendai earthquake and tsunami caused a fire
2006	Fleurus		4 Belgium	Fleurus, Belgium	Severe health effects for a worker at a commercial irradiation facility as a result of high doses of radiation
2006	Forsmark		2 Sweden	60.403333, 18.166667	Degraded safety functions for common cause failure in the emergency power supply system at nuclear power plant
2006	Erwin		US	36.145, -82.410833	Thirty-five litres of a highly enriched uranium solution leaked during transfer
2005	Sellafield		3 UK	54.4205, -3.4975	Release of large quantity of radioactive material, contained within the installation
2005	Atucha		2 Argentina	-33.967519, -59.205119	Overexposure of a worker at a power reactor exceeding the annual limit
2005	Braidwood		US	41.243611, -88.229167	Nuclear material leak
2003	Paks		3 Hungary	46.5725, 18.854167	Partially spent fuel rods undergoing cleaning in a tank of heavy water ruptured and spilled fuel pellets
1999	Tokaimura		4 Japan	36.4667, 140.5667	Fatal overexposures of workers following a criticality event at a nuclear facility
1999	Yanangio		3 Peru	Latitude -11.2156 Longitude	Incident with radiography source resulting in severe radiation burns
1999	Ikitelli		3 Turkey	41.0792, 28.7825	Loss of a highly radioactive Co-60 source
1999	Ishikawa		2 Japan	37.061111, 136.726389	Control rod malfunction
1993	Tomsk		4 Russia	56.5, 84.966667	Pressure buildup led to an explosive mechanical failure
1993	Cadarache		2 France	Cadarache, France	Spread of contamination to an area not expected by design
1989	Vandellos		3 Spain	40.951389, 0.866667	Near accident caused by fire resulting in loss of safety systems at the nuclear power station
1989	Greifswald		Germany	54.140586, 13.664422	Excessive heating which damaged ten fuel rods
1986	Chernobyl		7 Ukraine (USSR)	51.389553, 30.099147	Widespread health and environmental effects. External release of a significant fraction of reactor core inventory
1986	Hamm-Uentrop		Germany	51.679167, 7.971667	Spherical fuel pebble became lodged in the pipe used to deliver fuel elements to the reactor
1981	Tsuruga		2 Japan	35.672778, 136.0775	More than 100 workers were exposed to doses of up to 155 millirem per day radiation
1980	Saint Laurent des Eaux		4 France	Saint Laurent des Eaux, France	Melting of one channel of fuel in the reactor with no release outside the site
1979	Three Mile Island		5 US	40.153889, -76.724722	Severe damage to the reactor core
1977	Jaslovské Bohunice		4 Czechoslovakia	48.476111, 17.65	Damaged fuel integrity, extensive corrosion damage of fuel cladding and release of radioactivity
1969	Lucens		Switzerland		Total loss of coolant led to a power excursion and explosion of experimental reactor
1967	Chapelcross		UK	55.01566, -3.22605	Graphite debris partially blocked a fuel channel causing a fuel element to melt and catch fire
1966	Monroe		US	41.889167, -83.345556	Sodium cooling system malfunction
1964	Charlestown		US	Lat: 41.44N, Lon: 71.69W	Error by a worker at a United Nuclear Corporation fuel facility led to an accidental criticality
1959	Santa Susana Field Laboratory		US	Santa Susana Field Laboratory	Partial core meltdown
1958	Chalk River		Canada	Chalk River Nuclear Labs	Due to inadequate cooling a damaged uranium fuel rod caught fire and was torn in two
1958	Vinča		Yugoslavia	Vinča belgrade serbia	During a subcritical counting experiment a power buildup went undetected - six scientists received high doses
1957	Kyshtym		6 Russia	Mayak, Russia	Significant release of radioactive material to the environment from explosion of a high activity waste tank.
1957	Windscale Pile		5 UK	Sellafield, Cumbria UK	Release of radioactive material to the environment following a fire in a reactor core
1952	Chalk River		5 Canada	Chalk River Nuclear Labs	A reactor shutdown rod failure, combined with several operator errors, led to a major power excursion of more than double the reactor's rated output at AECL's NRX reactor