

ELECTRONIC ATTACHMENT 3

**POPULATION DENSITIES AROUND URANIUM MINES
AND NUCLEAR POWER SITES**

UNSCEAR 2016 Report, Annex A,
Methodology for estimating public exposures due to radioactive discharges

Notes

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I. POPULATION DENSITIES AROUND URANIUM MINES

1. Previously in the UNSCEAR 2000 Report [U1] and earlier, the Committee assumed a population density of 3 km^{-2} from 0 to 100 km around a uranium mine/mill tailings site and then a density of 25 km^{-2} from 100 to 2,000 km. Since this time the location of the mines producing most of the world's uranium has changed and therefore further information on population densities was obtained.
2. Table 1 below is derived from information on uranium mines provided by the World Nuclear Association website [W1]. The site states: "Uranium mines operate in some 20 countries, though in 2014 some 54% of the world's production came from just ten mines in six countries, these six countries providing 85% of the world's mined uranium".
3. Information is available on the population distribution and densities around operating mines in Australia and Canada and the densities are summarized in table 2. The other major uranium mining areas are Kazakhstan, Niger, Namibia and the Zabaykalsky Krai region of Russia near the Sino-Russian border. According to the World Bank, the population densities for these geographical regions in 2015 were: Kazakhstan: 6.0 km^{-2} ; Niger: 16 km^{-2} ; Namibia: 3 km^{-2} [W3]. The World Atlas indicates that the corresponding value for Zabaykalsky Krai is: 2.7 km^{-2} [W2].
4. However, the locations of the major mines are all at some distance from the main population centres in these countries and so the population densities around the mines are expected to be lower than the value for the country or region as a whole.
5. From these data the Committee agreed that a population density of 5 km^{-2} should be used for all distances for uranium mines and mill tailings sites.

Table 1. The largest-producing uranium mines in 2014 [W1]

<i>Mine</i>	<i>Country</i>	<i>Main owner</i>	<i>Type</i>	<i>Production (tU)</i>	<i>% of world production</i>
McArthur River	Canada	Cameco	underground	7 356	13
Tortkuduk & Moinkum	Kazakhstan	Katco JV/Areva, Kazatomprom	ISL	4 322	8
Olympic Dam	Australia	BHP Billiton	by-product/ underground	3 351	6
SOMAIR	Niger	Areva	open pit	2 331	5
Budenovskoye 2	Kazakhstan	Karatau JV/Kazatomprom, Uranium One	ISL	2 084	4
South Inkai	Kazakhstan	Betpak Dala JV/Uranium One, Kazatomprom	ISL	2 002	4
Priagunsky	Russia	ARMZ	underground	1 970	4
Langer Heinrich	Namibia	Paladin	open pit	1 947	4
Inkai	Kazakhstan	Inkai JV/Cameco, Kazatomprom	ISL	1 922	3
Central Mynkuduk	Kazakhstan	JSC Ken Dala, Kazatomprom	ISL	1 790	3
Top 10 total				29 075	54%

ISL = In situ leaching.

Table 2. Population densities for uranium mines in Australia and Canada

<i>Site</i>	<i>Population density (km⁻²)</i>	
	<i>0–100 km</i>	<i>100–2 000 km</i>
Key Lake, Canada ^a	0	4.6
McClellan Lake, Canada ^a	0.07	
Ranger, Australia ^b	0.1	0–0.2
Olympic Dam, Australia ^b	0.2	0.3–3.1
Beverley, Australia ^b	0	0.3–3.2
Honeymoon, Australia ^b	0.6	2.1–3.7
Former mines, Australia ^b	0.1–3.9	0–4.1

^a The population estimates for Canadian mines were calculated in ArcGIS using ESRI's World Population Estimate population density map [E1]. Additional details for the population data can be found here: <http://www.arcgis.com/home/item.html?id=ac0401d78fa24a10a9151ffe50f35afe>.

Population data were obtained by 100 km radial intervals (i.e. 0–100 km, 100–200 km, 1 900–2 000 km) and the totals summed. Because all the operating Canadian uranium mine/mill sites are relatively close together, (approx. 160 km between two furthest sites Key Lake and McClellan Lake), and are located in remote regions, the radial intervals were centred around Key Lake Mill, the southernmost uranium mine/mill, which was presumed to result in the most conservative estimate of population because it is closer to the more populous USA. The coordinate system used was a WGS UTM Zone 13N Projection to minimize error in population estimates associated with mapping the earth on a two-dimensional plane.

^b Australian Bureau of Statistics, 2011 Census of Population and Housing [A1].

II. DERIVATION OF POPULATION DENSITIES AROUND NUCLEAR POWER SITES

A. Introduction

6. UNEP/DEWA/GRID-Geneva developed three geoprocessing models able to generate several thousand geodesic buffers of various types and sizes needed to derive population numbers around nuclear power sites within specified buffer zones.

7. Population data were extracted both for sites with any kind of reactor status and for sites with operating reactors only. Tabular results were derived from the population data in three different ways: by nuclear power site, by UNEP GEO region and also for Europe allowing for the effect of double counting.¹

B. Materials and methods

8. In order to deliver the expected outputs, three large geoprocessing models were developed using ESRI ModelBuilder in ArcGIS 10. ModelBuilder can be thought of as a visual programming language for building workflows. A number of advanced techniques were implemented, such as in-line variable substitution, iteration, preconditions and if-then-else logic.

9. Based on user input data and input values, the geoprocessing models automatically generated geodesic buffers, manipulated them in various ways and extracted population from a global population distribution data set. Population data were provided by nuclear power site, by UNEP GEO region and also for Europe with the effect of double counting.

10. The following buffer types and areas were generated around each nuclear power site:

(a) For the output provided by nuclear power site (table 3 and table 4) – one disk buffer with a radius of 10 km and five ring buffers with radius 10 km to 100 km, 100 km to 500 km, 500 km to 1,000 km, 1,000 km to 1,500 km and 1,500 km to 2,000 km;

(b) For the output provided by UNEP GEO region and subregion (table 5 and table 6) – one disk buffer with a radius of 100 km and one ring buffer with radius 100 km to 1,500 km;

(c) For the output provided for Europe with the effect of double counting (table 7 and table 8) – one disk buffer with a radius of 100 km.

11. The required population outputs were produced using the three models mentioned earlier. Each model generated and combined polygons in various ways, iterated over polygons to produce new shapefiles, extracted by mask the cells of a raster population grid, calculated fields and combined multiple tabular files. For each polygon and sometimes group of polygons, the following features were created: a shapefile, a grid and a DBF file. The key applications of the models were as follows:

(a) Using the first model, population by site was determined for each nuclear power site, for a given buffer radius and type, the population located within the buffer area. It contained eight submodels;

¹ Population located within overlapping buffers is counted more than once.

(b) In the second model, population by region was determined for each country, for aggregated buffers of a given radius and type around the nuclear power sites, together with the total population located within the aggregated buffer area (population within overlapping buffers is counted once). It contained seven submodels;

(c) Using the third model, population by region with the effect of double counting, was determined for each country, for each buffer part of a given radius and type around the nuclear power sites, the total population located within the areas of the buffer parts (population within overlapping buffers is counted more than once). It contained eight submodels.

12. The following data sets were used by the models:

(a) UNEP/DEWA/GRID-Geneva Nuclear Power Stations of the World (status 2010);

(b) LandScan (2008) High Resolution Global Population Data Set, UT-Battelle, LLC, ORNL, DoD;

(c) International Boundary Resources, UN Cartographic Section (with expanded coastlines).

1. Effect of overlapping buffers on population (double counting)

13. Table 3 and table 4 (obtained by the first model) show population by nuclear power site for six specified buffer radii (one disk buffer and five ring buffers). For a given site (one site per row), population numbers can be added, because the buffers are non-overlapping (0–10 km, 10–100 km, 100–500 km, ...). For a given buffer radius (one buffer radius per column), population numbers cannot be added, because many buffers are partly overlapping with each other and population within these intersections would be double-counted. These two tables should only be used to obtain, for a given site, the population located around the site within buffers of various sizes.

14. Table 5 and table 6 (obtained by the second model) show population by UNEP GEO region and subregion for two buffer radii (one disk buffer and one ring buffer). For a given region or subregion, population numbers can be added, because the buffers are non-overlapping (0–100 km, 100–1,500 km). For a given buffer radius, population numbers can also be added, because the buffers are aggregated and intersected with the countries. Population located within a buffer intersection (before the aggregation process) is counted once, and thus, there is no effect of overlapping buffers.

15. Table 7 and table 8 (obtained by the third model) show population by the UNEP GEO European region and subregion for one buffer radius (one disk buffer) with the effect of overlapping buffers (double counting). On purpose, the population within a buffer intersection was counted more than once to take into account the exposure from several nuclear power sites. Therefore, the obtained population numbers are much higher than the actual population located within the buffers.

Table 3. Population (2008) by nuclear power site with any kind of reactor status (274 sites)

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
ARGENTINA	Atucha	10,427	7,197,576	19,831,379	30,334,500	38,914,841	67,837,479
	Embalse	13,398	1,914,888	10,718,106	44,026,987	29,413,699	51,816,346
ARMENIA	Metsamor	53,385	3,108,043	43,990,633	108,724,550	143,977,509	245,234,835
BELGIUM	Br-3	103,446	16,436,993	136,035,913	176,381,031	126,955,078	158,243,550
	Doel	50,471	14,020,526	139,574,954	162,349,951	134,677,630	159,892,195
	Tihange	68,385	10,047,701	143,689,438	178,801,869	131,029,885	154,554,706
BRAZIL	Angra	22,033	4,313,566	65,968,204	42,753,831	35,746,939	52,024,619
BULGARIA	Belene	9,627	2,176,273	62,872,929	148,231,072	252,200,746	319,203,157
	Kozloduy	13,926	2,202,690	56,111,578	170,453,860	235,594,691	336,626,959
CANADA	Bruce	5,142	246,998	38,649,910	118,291,463	44,498,295	39,990,267
	Darlington	90,576	6,890,189	42,540,603	99,891,044	46,552,196	39,835,924
	Douglas Point	5,084	247,590	38,838,065	118,330,159	44,342,660	40,388,274
	Gentilly	11,190	1,485,641	19,998,944	75,947,957	54,033,372	45,732,001
	Rolphton Npd	498	83,342	24,912,541	104,799,453	51,452,308	33,418,865
	Pickering	258,647	7,813,376	39,596,118	103,321,448	46,096,138	41,220,452
	Point Lepreau	971	281,986	10,251,819	50,860,971	51,065,666	56,536,044
CHINA	Changjiang	18,468	2,202,962	95,295,118	283,433,051	477,694,583	598,765,048
	Fangchenggang	77,741	3,531,901	121,051,380	346,300,068	498,351,851	616,745,055
	Fangjiashan	140,085	26,494,978	171,836,294	535,376,235	483,892,011	365,788,148
	Fuqing	50,689	10,240,998	125,143,160	411,913,301	555,891,326	427,181,374
	Guangdong	96,436	24,781,591	128,680,356	335,770,813	612,190,971	401,542,105
	Haiyang	57,107	7,970,049	191,402,911	543,368,634	371,582,446	359,642,772
	Hongyanhe	34,259	5,175,997	164,418,454	460,553,841	341,542,348	394,103,039
	Lingao	94,735	24,805,212	128,785,789	335,778,999	612,323,409	401,668,643

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
	Ningde	102,068	6,524,076	161,410,505	425,588,219	580,767,434	362,759,061
	Qinshan	208,073	28,323,363	169,944,947	536,180,560	483,079,505	365,734,746
	Sanmen	47,966	10,208,540	159,243,763	457,774,085	547,997,677	396,325,306
	Taishan	27,583	9,806,359	145,595,317	317,055,033	629,284,858	372,414,314
	Tianwan	138,376	12,697,674	307,482,068	499,732,520	443,545,744	264,743,290
	Yangjiang	3,696	4,800,110	146,504,338	306,621,393	633,778,871	378,758,850
CHINA, Taiwan	Chin Shan	24,077	10,033,161	75,434,929	351,885,004	539,067,152	523,928,754
	Kuosheng	73,674	9,984,430	72,786,693	345,576,949	539,578,989	530,112,410
	Lungmen	10,072	9,647,454	65,264,427	332,838,948	541,347,437	544,253,187
	Maanshan	33,948	3,496,456	58,613,280	249,922,309	444,465,202	643,228,831
CZECH Republic	Dukovany	16,383	4,035,670	100,576,307	245,052,795	202,825,581	163,324,027
	Temelin	20,620	3,013,217	115,305,453	232,163,501	192,222,153	171,965,721
FINLAND	Loviisa	1,430	1,613,119	16,611,968	68,961,815	152,367,057	267,431,448
	Olkiluoto	3,447	548,766	12,408,043	50,050,891	185,486,291	269,157,847
FRANCE	Belleville	18,330	1,786,146	112,872,986	199,542,865	184,383,965	118,674,495
	Blayais	21,812	2,197,415	53,756,322	211,392,778	183,483,948	120,618,022
	Bugey	71,282	5,794,904	88,867,890	225,294,771	203,757,929	121,518,568
	Cattenom	94,060	4,445,462	153,448,194	190,365,893	155,436,987	134,386,008
	Chinon	39,193	2,608,144	75,028,940	213,635,622	168,646,119	125,945,784
	Chooz	19,556	6,443,784	147,075,361	177,993,367	139,760,456	149,088,551
	Civaux	15,946	1,858,514	59,144,932	227,544,990	181,944,677	123,325,666
	Cruas	56,432	2,973,910	68,243,911	244,525,256	202,437,533	112,369,415
	Dampierre	21,080	2,490,008	114,871,185	193,206,740	180,860,307	121,004,761
	Brennilis	10,293	1,671,486	58,371,451	173,227,510	147,833,380	159,822,608
	Fessenheim	63,553	7,345,008	144,067,712	209,813,413	173,861,434	126,495,963
	Flamanville	10,800	689,455	92,703,631	165,503,766	138,244,695	163,230,987

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
FRANCE (continuation)	Marcoule	69,880	3,311,197	59,334,758	244,937,047	206,574,785	115,620,409
	Golfech	26,338	2,155,878	41,648,369	236,005,554	191,009,580	110,456,340
	Gravelines	41,664	5,302,588	140,407,876	149,052,657	138,778,329	160,407,984
	Nogent	19,149	9,365,023	135,178,916	173,316,889	174,639,704	129,237,700
	Paluel	29,370	2,112,948	126,583,414	161,581,437	142,814,300	151,384,477
	Penly	40,217	2,683,068	133,766,677	160,614,354	140,126,183	155,102,960
	Saint-Alban	81,045	4,932,437	83,498,946	230,351,477	198,826,509	112,437,655
	Saint-Laurent	25,936	2,292,774	96,705,261	206,690,038	172,983,605	125,645,101
	Creys-Malville	29,442	5,701,717	90,010,165	225,866,125	203,565,261	123,358,635
	Tricastin	68,702	2,575,489	62,126,726	246,963,454	204,892,096	113,734,998
GERMANY	Juelich	103,831	16,726,403	137,739,799	187,101,894	129,177,874	154,599,327
	Biblis	129,032	10,597,105	151,022,126	199,998,865	150,748,596	149,604,834
	Brokdorf	36,161	6,292,535	92,089,155	229,033,682	140,574,083	148,777,120
	Brunsbuettel	33,952	6,077,612	91,462,047	228,129,085	138,976,620	150,966,970
	Emsland	64,873	7,953,003	114,646,978	215,316,100	120,746,989	164,173,818
	Grafenrheinfeld	113,589	5,475,034	145,272,034	219,859,791	146,978,852	168,302,332
	Greifswald	12,443	1,435,628	70,149,089	225,116,024	199,787,080	140,163,533
	Grohnde	77,370	7,312,877	125,347,848	220,872,322	135,367,075	167,527,965
	Gundremmingen	63,528	8,078,412	134,276,471	222,765,175	179,526,191	136,335,763
	Grosswelzheim	225,861	9,241,533	142,708,219	211,623,421	144,773,202	157,773,393
	Isar	35,706	5,759,382	129,399,427	221,936,830	180,872,958	169,431,897
	Knk Ii	199,581	10,983,600	153,927,226	201,130,707	160,020,692	137,488,333
	Kruemmel	61,605	5,357,535	101,171,618	230,841,208	146,496,153	159,372,667
	Lingen	65,380	7,791,226	114,667,630	215,150,575	120,767,743	163,932,938
	Muelheim-Kaerlich	265,833	10,920,648	140,587,520	199,667,334	135,494,691	156,274,310
	Mzfr	192,834	10,977,146	153,946,886	201,145,109	160,017,283	137,530,045

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
GERMANY (continuation)	Neckarwestheim	155,960	9,927,913	152,155,263	210,344,111	158,917,192	139,413,334
	Niederaichbach	31,399	5,754,643	129,313,034	221,989,521	180,978,390	169,415,102
	Obrigheim	63,001	12,245,602	153,529,981	202,071,110	157,728,587	143,499,579
	Philippsburg	173,306	12,196,805	154,068,391	198,264,334	159,395,787	139,515,695
	Rheinsberg	7,776	5,630,942	92,193,179	228,099,845	176,306,752	157,808,096
	Stade	76,551	6,588,722	96,204,355	229,964,559	141,560,096	147,136,849
	Hamm-Uentrop	120,934	13,824,593	121,558,096	216,619,010	120,750,179	175,028,047
	Unterweser	38,022	4,508,354	103,105,565	223,491,650	128,371,940	160,986,336
	Kahl	233,447	9,221,468	142,498,845	211,831,428	144,745,044	157,893,709
	Wuergassen	37,530	6,987,583	130,497,129	218,384,537	135,737,029	170,273,798
HUNGARY	Paks	26,866	3,117,859	72,138,940	223,987,392	228,644,649	228,864,667
INDIA	Kaiga	4,690	5,309,307	136,859,992	304,555,093	304,930,203	651,303,250
	Kakrapar	103,143	11,129,624	175,198,864	423,683,885	614,449,463	336,813,706
	Kudankulam	55,222	7,860,068	106,694,506	107,563,242	181,519,707	301,754,577
	Madras	79,864	15,220,628	136,599,721	213,997,061	355,743,632	636,673,657
	Narora	285,474	26,793,486	272,891,731	524,979,442	551,742,543	222,678,515
	Kalpakkam	76,951	15,304,943	136,822,957	213,510,968	355,171,611	637,175,529
	Rajasthan	124,681	7,170,134	236,389,886	618,883,267	485,856,893	260,038,307
	Tarapur	132,931	24,261,809	143,030,661	319,421,907	635,099,347	396,898,599
IRAN (Islamic Rep. of)	Bushehr	40,035	641,388	25,908,678	71,346,979	84,462,244	281,933,212
ITALY	Caorso	33,760	10,572,418	81,234,190	240,545,882	211,283,102	138,106,642
	Enrico Fermi	26,674	10,404,957	77,285,601	248,244,030	208,058,317	123,800,854
	Garigliano	49,856	6,474,559	38,833,999	170,543,385	280,487,190	221,772,438
	Latina	90,829	4,848,952	41,486,748	175,870,864	284,842,869	181,668,186

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
JAPAN	Fugen	3,052	8,254,044	93,255,201	92,682,173	167,923,946	455,917,841
	Fukushima-Daiichi	46,887	3,611,402	70,418,574	41,072,776	121,527,521	184,157,753
	Fukushima-Daini	28,020	2,761,391	71,616,864	40,659,684	120,100,128	186,980,804
	Genkai	29,702	6,646,442	50,074,304	252,692,765	536,491,526	353,484,376
	Hamaoka	68,158	4,859,713	92,895,164	44,263,667	97,130,464	401,921,429
	Higashi-Dori	3,309	1,647,258	15,878,583	97,487,822	159,784,441	89,152,156
	Ikata	16,579	3,896,383	67,307,474	118,523,402	424,200,721	450,993,851
	Kashiwazaki-Kariwa	84,216	2,896,862	92,798,876	55,895,904	141,399,442	323,497,296
	Mihama	10,889	8,661,953	92,996,255	92,695,147	172,114,097	455,279,982
	Monju	1,452	8,053,022	93,486,221	92,881,291	170,158,214	455,498,680
	Ohi	13,791	13,850,579	88,437,538	93,646,161	193,676,048	453,711,250
	Ohma	10,458	1,317,309	15,576,001	103,189,816	165,871,405	87,774,747
	Onagawa	14,386	2,974,100	59,530,365	51,010,512	133,514,338	133,929,389
	Sendai	20,195	2,393,199	37,619,317	215,787,690	493,898,343	450,195,600
	Shika	15,675	2,295,815	100,137,411	93,823,025	128,807,283	434,439,214
	Shimane	74,937	1,205,393	77,969,621	127,467,115	382,072,094	418,762,331
	Takahama	19,943	14,547,565	87,579,266	94,230,086	202,954,429	458,544,590
	Tokai	207,101	9,917,728	73,294,384	37,615,070	109,453,439	227,486,169
	Tomari	22,557	2,933,352	7,862,023	94,176,619	188,594,867	87,345,632
Tsuruga	69,791	10,909,421	90,484,032	91,066,043	165,478,716	456,943,813	
KAZAKHSTAN	Aktau	73,621	131,034	10,064,050	75,467,538	154,752,365	225,959,393
LITHUANIA	Ignalina	44,518	683,233	24,744,822	150,199,936	207,801,413	259,252,314
MEXICO	Laguna Verde	17,634	2,801,999	57,816,165	54,092,888	51,044,610	62,317,085
NETHERLANDS	Borssele	71,498	11,779,876	142,616,579	154,846,315	137,003,275	159,099,697
	Dodewaard	151,569	17,061,809	128,776,963	185,784,595	125,071,428	154,229,101

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
PAKISTAN	Chasma	177,768	6,178,718	183,970,077	292,668,310	367,963,318	482,452,819
	Karachi	42,822	13,070,035	38,693,485	241,008,320	496,731,338	494,752,203
REPUBLIC OF KOREA	Kori	41,206	10,750,897	68,963,891	284,235,974	513,946,760	291,354,184
	Shin-Kori	44,772	10,745,311	69,021,235	283,883,404	513,444,320	291,709,092
	Shin-Wolsong	9,704	10,313,104	75,739,969	273,405,902	497,905,165	301,179,861
	Ulchin	28,558	1,026,322	85,600,221	275,020,171	472,652,652	307,414,521
	Wolsong	7,001	10,342,167	75,608,974	273,776,051	498,081,179	300,999,595
	Yonggwang	16,521	4,257,166	72,017,258	451,287,734	490,895,456	302,004,996
ROMANIA	Cernavoda	16,130	1,639,680	56,631,176	156,010,383	249,366,703	307,320,612
RUSSIAN FEDERATION	Akademik Lomonosov	2,405,742	2,996,817	11,825,164	65,569,637	156,789,840	203,488,659
	Obninsk	93,660	7,714,140	35,396,769	88,120,138	128,553,518	221,505,178
	Balakovo	5,114	637,651	20,495,745	80,328,684	87,220,176	197,987,032
	Beloyarsk	33,083	2,693,729	14,687,528	23,729,495	48,158,829	101,781,827
	Bilibino	418	1,254	28,392	93,436	262,212	809,981
	Kalinin	37,521	435,053	36,892,568	64,736,547	138,928,460	199,478,252
	Kola	3,215	357,857	2,065,750	15,414,034	51,513,651	108,719,667
	Kursk	49,623	1,271,878	55,683,396	98,778,624	179,169,652	234,864,029
	Leningrad	53,149	5,474,064	11,550,438	69,710,063	160,447,828	217,044,375
	Novovoronezh	34,194	1,955,949	42,010,750	87,857,384	170,199,931	220,949,436
	Rostov	3,049	523,849	27,985,408	98,944,375	173,728,755	227,527,079
Smolensk	31,128	573,583	45,451,382	112,168,342	161,827,324	259,253,365	
SLOVAKIA	Bohunice	46,475	4,429,488	92,883,222	243,759,714	208,020,372	178,483,748
	Mochovce	33,325	4,902,730	87,779,491	236,768,601	211,399,402	192,591,846
SLOVENIA	Krsko	37,425	3,647,413	80,730,306	241,941,504	229,311,226	170,278,131
SOUTH AFRICA	Koeberg	2,385	3,911,754	1,127,028	8,691,818	34,296,247	18,045,950

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
SPAIN	Almaraz	12,433	630,544	42,134,115	75,623,960	152,274,059	178,133,633
	Asco	9,971	1,387,111	36,648,026	154,493,857	237,646,121	125,106,955
	Cofrentes	5,219	2,950,203	45,615,736	98,629,117	202,466,134	158,368,996
	Jose Cabrera	18,285	5,360,880	36,966,968	99,143,087	226,251,552	130,920,662
	Santa Maria De Garona	2,187	2,633,438	37,725,963	123,557,060	239,060,361	120,861,419
	Trillo	6,234	3,673,257	38,778,036	112,022,452	222,273,552	130,732,255
	Vandellos	37,771	1,395,736	36,879,396	157,059,769	233,924,099	131,083,623
SWEDEN	Agesta	338,397	2,057,234	15,081,279	93,896,588	257,185,564	196,276,187
	Barsebeck	22,763	3,297,979	44,995,816	206,915,296	201,481,991	136,930,560
	Forsmark	1,288	570,169	14,055,737	67,966,201	240,545,780	213,513,764
	Oskarshamn	3,116	289,272	26,716,795	151,479,068	261,929,428	147,891,735
	Ringhals	18,322	1,308,730	25,777,831	183,329,121	211,685,833	152,597,381
SWITZERLAND	Beznau	116,730	7,981,988	134,620,239	218,929,289	177,590,501	129,915,406
	Goesgen	175,373	7,695,826	132,903,928	216,852,262	183,707,281	121,937,319
	Leibstadt	80,582	8,126,708	136,028,496	217,692,513	177,101,997	129,752,747
	Lucens	41,936	4,323,180	118,593,331	218,453,546	190,893,017	126,930,822
	Muehleberg	74,998	5,663,528	124,803,704	216,197,304	190,106,691	124,909,083
UKRAINE	Chernobyl	0	1,208,470	46,300,270	152,323,711	201,726,423	251,177,547
	Khmelnitsky	55,000	1,822,402	59,942,697	164,226,473	269,716,061	201,144,506
	Rovno	52,806	1,707,649	59,683,180	170,613,673	264,600,051	200,646,680
	South Ukraine	13,850	914,548	48,699,288	165,002,047	204,399,752	312,764,841
	Zaporozhe	54,837	2,101,865	43,777,300	137,025,538	212,953,182	299,675,253
UNITED KINGDOM	Berkeley	49,931	7,950,044	92,432,951	123,380,462	144,738,086	162,372,467
	Bradwell	13,227	13,930,124	115,565,073	145,838,403	138,280,062	156,927,325
	Calder Hall	15,217	1,779,644	63,289,598	114,130,052	146,280,947	137,892,150
	Chapelcross	19,542	1,524,719	60,734,615	117,173,540	138,701,646	142,832,616

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
UNITED KINGDOM (continuation)	Dounreay	2,081	79,837	10,143,046	92,122,969	144,531,420	167,093,856
	Dungeness	13,447	8,975,957	126,034,351	149,032,590	135,596,110	160,273,409
	Hartlepool	353,931	3,995,894	66,935,996	139,178,993	146,888,258	132,106,127
	Heysham	103,194	9,048,973	56,568,975	123,572,642	151,162,400	140,024,885
	Hinkley Point	11,040	5,635,808	84,073,394	130,182,049	145,458,209	165,217,867
	Hunterston	26,597	2,874,424	38,223,022	111,254,741	132,610,730	150,091,183
	Oldbury	55,463	7,009,940	92,479,539	123,683,834	144,364,717	162,902,116
	Sizewell	15,825	2,584,534	128,981,045	143,758,195	141,513,601	162,064,086
	Torness	8,282	2,269,363	41,138,621	135,394,557	131,094,799	153,642,079
	Trawsfynydd	8,396	2,790,934	65,223,436	119,750,775	152,589,197	149,329,333
	Windscale	16,429	1,676,280	63,391,966	113,914,980	146,074,223	137,789,554
	Winfrith	18,663	4,624,009	95,145,019	136,452,608	145,090,729	166,202,440
	Wylfa	10,922	1,106,031	64,277,952	111,026,543	154,348,990	140,927,355
UNITED STATES	Arkansas Nuclear One	26,495	580,216	27,072,648	74,618,439	94,309,740	163,814,378
	Beaver Valley	25,769	4,028,307	65,708,431	104,766,033	44,281,729	36,429,632
	Big Rock Point	8,664	290,352	35,641,421	74,471,209	92,120,184	46,608,206
	Bonus	40,147	1,543,137	12,756,927	31,127,893	30,331,186	55,068,966
	Braidwood	28,163	8,381,245	40,874,661	79,904,518	108,330,898	34,213,922
	Browns Ferry	6,536	1,196,033	31,237,179	109,558,958	95,967,984	68,575,710
	Brunswick	17,552	682,824	20,172,150	106,251,783	88,879,837	68,416,799
	Byron	18,715	2,742,730	39,605,411	67,299,314	121,662,865	40,081,796
	Callaway	1,970	908,387	32,106,504	83,916,356	91,582,781	85,484,199
	Calvert Cliffs	27,067	6,167,304	56,343,630	86,181,967	58,715,285	44,464,832
	Catawba	41,732	3,153,656	32,731,784	127,360,021	74,430,346	41,592,091
	Clinton	2,755	1,278,790	43,449,004	84,322,131	111,894,353	38,155,163
	Columbia	1,739	669,429	14,309,119	16,670,441	36,388,653	22,790,816

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
UNITED STATES	Comanche Peak	8,233	2,965,368	23,737,635	40,106,969	139,981,094	128,865,837
(continuation)	Cooper	1,282	653,957	15,271,887	66,171,054	88,782,883	112,052,033
	Crystal River	5,171	1,874,987	20,490,511	47,814,952	104,822,608	197,157,363
	Carolinas Cvtr	2,937	1,896,853	32,030,047	111,376,205	92,739,988	47,881,801
	Davis Besse	4,820	4,745,921	56,343,077	117,904,400	40,457,981	40,180,573
	Diablo Canyon	1,690	461,416	37,446,648	13,659,266	23,293,896	17,491,282
	Donald Cook	22,299	5,069,686	46,415,966	90,806,681	82,780,666	38,819,471
	Dresden	31,181	8,870,484	39,956,630	77,489,367	110,575,437	34,851,210
	Duane Arnold	12,760	858,862	34,973,417	57,116,136	119,852,534	62,057,470
	Elk River	44,076	3,563,370	11,108,863	46,602,854	79,737,756	117,971,127
	Enrico Fermi	19,051	6,157,912	55,005,942	115,254,173	40,768,096	42,349,718
	Farley	3,115	639,638	29,708,040	61,827,397	133,577,096	157,348,065
	Fitzpatrick	9,852	1,468,466	77,259,253	63,696,806	45,783,547	40,842,914
	Fort Calhoun	14,176	1,252,673	14,028,768	58,831,451	90,356,251	114,615,100
	Fort St. Vrain	12,841	3,357,025	2,920,680	26,771,813	104,249,080	93,718,117
	Vallecitos	88,069	8,234,900	11,223,341	33,934,389	22,285,197	15,373,184
	Grand Gulf	4,489	675,531	21,155,642	69,742,115	115,842,773	177,133,786
	H.B. Robinson	24,044	1,725,121	31,639,621	110,507,849	80,150,323	61,498,348
	Haddam Neck	23,231	5,983,699	57,161,452	53,191,064	56,383,032	47,630,969
	Hallam	1,557	874,006	11,068,188	61,995,961	88,017,257	123,219,421
	Hatch	2,228	608,260	34,165,862	63,483,013	132,191,051	81,722,782
	Hope Creek	5,984	8,522,984	60,113,445	72,445,382	56,902,109	40,074,131
	Humboldt Bay	51,568	83,694	14,415,886	35,306,040	20,052,757	15,588,038
	Indian Point	108,185	20,076,442	49,424,796	58,207,686	54,535,134	43,938,050
	Kewaunee	2,041	1,067,118	35,734,913	63,308,640	111,188,918	45,321,015
	Lacrosse	2,246	486,802	30,072,554	62,496,697	114,956,547	57,325,376

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
UNITED STATES (continuation)	Lasalle	6,961	4,564,814	43,043,833	75,972,353	112,644,208	35,834,186
	Limerick	99,164	9,315,242	63,980,176	65,653,594	55,501,932	38,692,813
	Maine Yankee	11,479	861,643	34,810,109	55,479,863	53,809,503	49,174,520
	Mcguire	59,569	3,405,086	33,873,723	127,625,943	71,633,269	40,690,419
	Millstone	85,196	5,222,196	55,186,798	54,104,746	56,953,028	47,580,854
	Monticello	39,038	3,479,959	10,159,822	45,875,868	77,421,563	122,059,188
	Nine Mile Point	11,685	1,480,167	77,286,643	63,706,360	45,765,477	40,846,874
	North Anna	6,698	3,031,901	63,130,954	97,093,469	53,227,963	40,927,272
	Oconee	14,581	2,049,454	36,807,833	107,232,124	100,252,656	36,411,245
	Oyster Creek	56,203	10,671,888	53,835,814	65,950,035	59,297,227	39,008,992
	Palisades	12,915	2,285,849	47,437,150	92,295,266	81,808,695	39,267,242
	Palo Verde	2,912	3,525,202	22,844,506	36,471,855	33,213,099	72,356,063
	Pathfinder	75,960	364,513	11,199,442	47,461,520	77,853,589	126,468,954
	Peach Bottom	11,540	8,538,124	62,711,988	79,304,425	50,582,270	41,180,327
	Perry	26,655	3,647,900	56,149,046	113,459,618	39,453,729	39,145,532
	Pilgrim	34,243	5,805,584	45,146,266	48,694,489	58,679,360	50,881,397
	Piqua	43,903	2,843,950	54,269,578	117,978,481	57,143,761	34,642,082
	Point Beach	3,131	1,062,896	36,078,135	63,487,590	111,434,875	44,630,850
	Prairie Island	11,660	3,519,774	18,921,918	51,244,450	91,644,235	94,827,353
	Quad Cities	7,256	960,378	39,582,636	66,311,502	120,184,711	46,934,763
	Rancho Seco	2,258	4,753,484	13,082,283	38,729,588	20,635,550	14,850,611
	R.E. Ginna	15,239	1,801,805	80,326,939	65,694,043	43,954,760	41,417,259
	River Bend	14,653	1,466,811	17,189,144	63,516,705	150,697,571	156,243,827
	Salem	5,409	8,495,391	60,107,512	72,484,997	56,906,147	40,070,922
	San Onofre	37,810	14,601,460	15,658,804	23,301,755	22,206,136	47,980,243
	Saxton	5,964	1,545,259	83,918,194	81,008,382	44,590,211	41,108,936

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
UNITED STATES (continuation)	Seabrook	63,494	5,510,918	47,336,492	45,852,589	57,551,786	47,690,266
	Sequoyah	29,149	1,388,292	37,449,339	102,759,895	104,881,272	40,319,379
	Shearon Harris	6,912	3,260,698	31,851,012	118,724,055	66,476,472	55,937,428
	Shippingport	25,332	4,026,633	65,752,933	104,723,974	44,301,361	36,426,891
	Shoreham	43,335	14,564,208	46,180,810	60,162,778	55,561,078	46,035,580
	South Texas	3,312	677,240	24,392,660	40,054,273	141,295,147	124,322,896
	St. Lucie	63,155	1,764,657	16,173,594	41,105,850	84,451,910	190,618,604
	Surry	23,446	2,864,325	54,664,090	92,231,583	58,670,481	50,051,718
	Susquehanna	21,090	2,781,996	80,518,961	63,257,636	49,461,367	37,308,703
	Three Mile Island	50,986	5,022,358	72,942,015	79,715,439	46,159,402	39,167,277
	Trojan	20,892	2,466,113	11,553,886	17,053,788	30,425,618	21,661,400
	Turkey Point	2,532	4,156,411	18,024,581	22,412,265	73,184,764	207,548,731
	Vermont Yankee	18,324	3,077,374	56,319,694	53,840,971	56,518,651	47,322,360
	Virgil C. Summer	1,977	1,998,496	32,027,053	112,445,897	91,522,456	47,898,706
	Vogtle	2,357	950,724	33,802,562	79,311,282	120,081,682	59,503,342
	Waterford	43,131	2,221,884	13,708,118	65,266,072	144,044,389	162,929,227
	Watts Bar	7,288	1,903,014	39,928,107	107,643,699	99,572,547	36,145,225
	Wolf Creek	4,198	523,146	17,247,644	76,685,423	81,723,843	120,187,470
	Yankee Rowe	2,113	2,563,601	60,128,918	52,777,516	56,109,755	48,113,094
Zion	88,190	10,110,809	36,660,656	75,871,317	105,788,982	36,246,802	

Table 4. Population (2008) by nuclear power site with operating reactors (193 sites)

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
ARGENTINA	Atucha	10,427	7,197,576	19,831,379	30,334,500	38,914,841	67,837,479
	Embalse	13,398	1,914,888	10,718,106	44,026,987	29,413,699	51,816,346
ARMENIA	Metsamor	53,385	3,108,043	43,990,633	108,724,550	143,977,509	245,234,835
BELGIUM	Doel	50,471	14,020,526	139,574,954	162,349,951	134,677,630	159,892,195
	Tihange	68,385	10,047,701	143,689,438	178,801,869	131,029,885	154,554,706
BRAZIL	Angra	22,033	4,313,566	65,968,204	42,753,831	35,746,939	52,024,619
BULGARIA	Kozloduy	13,926	2,202,690	56,111,578	170,453,860	235,594,691	336,626,959
CANADA	Bruce	5,142	246,998	38,649,910	118,291,463	44,498,295	39,990,267
	Darlington	90,576	6,890,189	42,540,603	99,891,044	46,552,196	39,835,924
	Gentilly	11,190	1,485,641	19,998,944	75,947,957	54,033,372	45,732,001
	Pickering	258,647	7,813,376	39,596,118	103,321,448	46,096,138	41,220,452
	Point Lepreau	971	281,986	10,251,819	50,860,971	51,065,666	56,536,044
CHINA	Guangdong	96,436	24,781,591	128,680,356	335,770,813	612,190,971	401,542,105
	Lingao	94,735	24,805,212	128,785,789	335,778,999	612,323,409	401,668,643
	Qinshan	208,073	28,323,363	169,944,947	536,180,560	483,079,505	365,734,746
	Tianwan	138,376	12,697,674	307,482,068	499,732,520	443,545,744	264,743,290
CHINA, Taiwan	Chin Shan	24,077	10,033,161	75,434,929	351,885,004	539,067,152	523,928,754
	Kuosheng	73,674	9,984,430	72,786,693	345,576,949	539,578,989	530,112,410
	Maanshan	33,948	3,496,456	58,613,280	249,922,309	444,465,202	643,228,831
CZECH REPUBLIC	Dukovany	16,383	4,035,670	100,576,307	245,052,795	202,825,581	163,324,027
	Temelin	20,620	3,013,217	115,305,453	232,163,501	192,222,153	171,965,721
FINLAND	Loviisa	1,430	1,613,119	16,611,968	68,961,815	152,367,057	267,431,448
	Olkiluoto	3,447	548,766	12,408,043	50,050,891	185,486,291	269,157,847

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
FRANCE	Belleville	18,330	1,786,146	112,872,986	199,542,865	184,383,965	118,674,495
	Blayais	21,812	2,197,415	53,756,322	211,392,778	183,483,948	120,618,022
	Bugey	71,282	5,794,904	88,867,890	225,294,771	203,757,929	121,518,568
	Cattenom	94,060	4,445,462	153,448,194	190,365,893	155,436,987	134,386,008
	Chinon	39,193	2,608,144	75,028,940	213,635,622	168,646,119	125,945,784
	Chooz	19,556	6,443,784	147,075,361	177,993,367	139,760,456	149,088,551
	Civaux	15,946	1,858,514	59,144,932	227,544,990	181,944,677	123,325,666
	Cruas	56,432	2,973,910	68,243,911	244,525,256	202,437,533	112,369,415
	Dampierre	21,080	2,490,008	114,871,185	193,206,740	180,860,307	121,004,761
	Fessenheim	63,553	7,345,008	144,067,712	209,813,413	173,861,434	126,495,963
	Flamanville	10,800	689,455	92,703,631	165,503,766	138,244,695	163,230,987
	Golfech	26,338	2,155,878	41,648,369	236,005,554	191,009,580	110,456,340
	Gravelines	41,664	5,302,588	140,407,876	149,052,657	138,778,329	160,407,984
	Nogent	19,149	9,365,023	135,178,916	173,316,889	174,639,704	129,237,700
	Paluel	29,370	2,112,948	126,583,414	161,581,437	142,814,300	151,384,477
	Penly	40,217	2,683,068	133,766,677	160,614,354	140,126,183	155,102,960
	Saint-Alban	81,045	4,932,437	83,498,946	230,351,477	198,826,509	112,437,655
	Saint-Laurent	25,936	2,292,774	96,705,261	206,690,038	172,983,605	125,645,101
	Tricastin	68,702	2,575,489	62,126,726	246,963,454	204,892,096	113,734,998
GERMANY	Biblis	129,032	10,597,105	151,022,126	199,998,865	150,748,596	149,604,834
	Brokdorf	36,161	6,292,535	92,089,155	229,033,682	140,574,083	148,777,120
	Brunsbüttel	33,952	6,077,612	91,462,047	228,129,085	138,976,620	150,966,970
	Emsland	64,873	7,953,003	114,646,978	215,316,100	120,746,989	164,173,818
	Grafenrheinfeld	113,589	5,475,034	145,272,034	219,859,791	146,978,852	168,302,332
	Grohnde	77,370	7,312,877	125,347,848	220,872,322	135,367,075	167,527,965
	Gundremmingen	63,528	8,078,412	134,276,471	222,765,175	179,526,191	136,335,763

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
GERMANY (continuation)	Isar	35,706	5,759,382	129,399,427	221,936,830	180,872,958	169,431,897
	Kruemmel	61,605	5,357,535	101,171,618	230,841,208	146,496,153	159,372,667
	Neckarwestheim	155,960	9,927,913	152,155,263	210,344,111	158,917,192	139,413,334
	Philippsburg	173,306	12,196,805	154,068,391	198,264,334	159,395,787	139,515,695
	Unterweser	38,022	4,508,354	103,105,565	223,491,650	128,371,940	160,986,336
HUNGARY	Paks	26,866	3,117,859	72,138,940	223,987,392	228,644,649	228,864,667
INDIA	Kaiga	4,690	5,309,307	136,859,992	304,555,093	304,930,203	651,303,250
	Kakrapar	103,143	11,129,624	175,198,864	423,683,885	614,449,463	336,813,706
	Madras	79,864	15,220,628	136,599,721	213,997,061	355,743,632	636,673,657
	Narora	285,474	26,793,486	272,891,731	524,979,442	551,742,543	222,678,515
	Rajasthan	124,681	7,170,134	236,389,886	618,883,267	485,856,893	260,038,307
	Tarapur	132,931	24,261,809	143,030,661	319,421,907	635,099,347	396,898,599
JAPAN	Fukushima-Daiichi	46,887	3,611,402	70,418,574	41,072,776	121,527,521	184,157,753
	Fukushima-Daini	28,020	2,761,391	71,616,864	40,659,684	120,100,128	186,980,804
	Genkai	29,702	6,646,442	50,074,304	252,692,765	536,491,526	353,484,376
	Hamaoka	68,158	4,859,713	92,895,164	44,263,667	97,130,464	401,921,429
	Higashi-Dori	3,309	1,647,258	15,878,583	97,487,822	159,784,441	89,152,156
	Ikata	16,579	3,896,383	67,307,474	118,523,402	424,200,721	450,993,851
	Kashiwazaki-Kariwa	84,216	2,896,862	92,798,876	55,895,904	141,399,442	323,497,296
	Mihama	10,889	8,661,953	92,996,255	92,695,147	172,114,097	455,279,982
	Ohi	13,791	13,850,579	88,437,538	93,646,161	193,676,048	453,711,250
	Onagawa	14,386	2,974,100	59,530,365	51,010,512	133,514,338	133,929,389
	Sendai	20,195	2,393,199	37,619,317	215,787,690	493,898,343	450,195,600
	Shika	15,675	2,295,815	100,137,411	93,823,025	128,807,283	434,439,214
	Shimane	74,937	1,205,393	77,969,621	127,467,115	382,072,094	418,762,331
	Takahama	19,943	14,547,565	87,579,266	94,230,086	202,954,429	458,544,590

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
JAPAN (continuation)	Tokai	207,101	9,917,728	73,294,384	37,615,070	109,453,439	227,486,169
	Tomari	22,557	2,933,352	7,862,023	94,176,619	188,594,867	87,345,632
	Tsuruga	69,791	10,909,421	90,484,032	91,066,043	165,478,716	456,943,813
MEXICO	Laguna Verde	17,634	2,801,999	57,816,165	54,092,888	51,044,610	62,317,085
NETHERLANDS	Borssele	71,498	11,779,876	142,616,579	154,846,315	137,003,275	159,099,697
PAKISTAN	Chasma	177,768	6,178,718	183,970,077	292,668,310	367,963,318	482,452,819
	Karachi	42,822	13,070,035	38,693,485	241,008,320	496,731,338	494,752,203
REP. OF KOREA	Kori	41,206	10,750,897	68,963,891	284,235,974	513,946,760	291,354,184
	Shin-Kori	44,772	10,745,311	69,021,235	283,883,404	513,444,320	291,709,092
	Ulchin	28,558	1,026,322	85,600,221	275,020,171	472,652,652	307,414,521
	Wolsong	7,001	10,342,167	75,608,974	273,776,051	498,081,179	300,999,595
	Yonggwang	16,521	4,257,166	72,017,258	451,287,734	490,895,456	302,004,996
ROMANIA	Cernavoda	16,130	1,639,680	56,631,176	156,010,383	249,366,703	307,320,612
RUSSIAN FEDERATION	Balakovo	5,114	637,651	20,495,745	80,328,684	87,220,176	197,987,032
	Beloyarsk	33,083	2,693,729	14,687,528	23,729,495	48,158,829	101,781,827
	Bilibino	418	1,254	28,392	93,436	262,212	809,981
	Kalinin	37,521	435,053	36,892,568	64,736,547	138,928,460	199,478,252
	Kola	3,215	357,857	2,065,750	15,414,034	51,513,651	108,719,667
	Kursk	49,623	1,271,878	55,683,396	98,778,624	179,169,652	234,864,029
	Leningrad	53,149	5,474,064	11,550,438	69,710,063	160,447,828	217,044,375
	Novovoronezh	34,194	1,955,949	42,010,750	87,857,384	170,199,931	220,949,436
	Rostov	3,049	523,849	27,985,408	98,944,375	173,728,755	227,527,079
Smolensk	31,128	573,583	45,451,382	112,168,342	161,827,324	259,253,365	
SLOVAKIA	Bohunice	46,475	4,429,488	92,883,222	243,759,714	208,020,372	178,483,748
	Mochovce	33,325	4,902,730	87,779,491	236,768,601	211,399,402	192,591,846
SLOVENIA	Krsko	37,425	3,647,413	80,730,306	241,941,504	229,311,226	170,278,131

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
SOUTH AFRICA	Koeborg	2,385	3,911,754	1,127,028	8,691,818	34,296,247	18,045,950
SPAIN	Almaraz	12,433	630,544	42,134,115	75,623,960	152,274,059	178,133,633
	Asco	9,971	1,387,111	36,648,026	154,493,857	237,646,121	125,106,955
	Cofrentes	5,219	2,950,203	45,615,736	98,629,117	202,466,134	158,368,996
	Santa Maria De Garona	2,187	2,633,438	37,725,963	123,557,060	239,060,361	120,861,419
	Trillo	6,234	3,673,257	38,778,036	112,022,452	222,273,552	130,732,255
	Vandellos	37,771	1,395,736	36,879,396	157,059,769	233,924,099	131,083,623
SWEDEN	Forsmark	1,288	570,169	14,055,737	67,966,201	240,545,780	213,513,764
	Oskarshamn	3,116	289,272	26,716,795	151,479,068	261,929,428	147,891,735
	Ringhals	18,322	1,308,730	25,777,831	183,329,121	211,685,833	152,597,381
SWITZERLAND	Beznau	116,730	7,981,988	134,620,239	218,929,289	177,590,501	129,915,406
	Goesgen	175,373	7,695,826	132,903,928	216,852,262	183,707,281	121,937,319
	Leibstadt	80,582	8,126,708	136,028,496	217,692,513	177,101,997	129,752,747
	Muehleberg	74,998	5,663,528	124,803,704	216,197,304	190,106,691	124,909,083
UKRAINE	Khmelnitsky	55,000	1,822,402	59,942,697	164,226,473	269,716,061	201,144,506
	Rovno	52,806	1,707,649	59,683,180	170,613,673	264,600,051	200,646,680
	South Ukraine	13,850	914,548	48,699,288	165,002,047	204,399,752	312,764,841
	Zaporozhe	54,837	2,101,865	43,777,300	137,025,538	212,953,182	299,675,253
UNITED KINGDOM	Dungeness	13,447	8,975,957	126,034,351	149,032,590	135,596,110	160,273,409
	Hartlepool	353,931	3,995,894	66,935,996	139,178,993	146,888,258	132,106,127
	Heysham	103,194	9,048,973	56,568,975	123,572,642	151,162,400	140,024,885
	Hinkley Point	11,040	5,635,808	84,073,394	130,182,049	145,458,209	165,217,867
	Hunterston	26,597	2,874,424	38,223,022	111,254,741	132,610,730	150,091,183
	Oldbury	55,463	7,009,940	92,479,539	123,683,834	144,364,717	162,902,116

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
UNITED KINGDOM (continuation)	Sizewell	15,825	2,584,534	128,981,045	143,758,195	141,513,601	162,064,086
	Torness	8,282	2,269,363	41,138,621	135,394,557	131,094,799	153,642,079
	Wylfa	10,922	1,106,031	64,277,952	111,026,543	154,348,990	140,927,355
UNITED STATES	Arkansas Nuclear One	26,495	580,216	27,072,648	74,618,439	94,309,740	163,814,378
	Beaver Valley	25,769	4,028,307	65,708,431	104,766,033	44,281,729	36,429,632
	Braidwood	28,163	8,381,245	40,874,661	79,904,518	108,330,898	34,213,922
	Browns Ferry	6,536	1,196,033	31,237,179	109,558,958	95,967,984	68,575,710
	Brunswick	17,552	682,824	20,172,150	106,251,783	88,879,837	68,416,799
	Byron	18,715	2,742,730	39,605,411	67,299,314	121,662,865	40,081,796
	Callaway	1,970	908,387	32,106,504	83,916,356	91,582,781	85,484,199
	Calvert Cliffs	27,067	6,167,304	56,343,630	86,181,967	58,715,285	44,464,832
	Catawba	41,732	3,153,656	32,731,784	127,360,021	74,430,346	41,592,091
	Clinton	2,755	1,278,790	43,449,004	84,322,131	111,894,353	38,155,163
	Columbia	1,739	669,429	14,309,119	16,670,441	36,388,653	22,790,816
	Comanche Peak	8,233	2,965,368	23,737,635	40,106,969	139,981,094	128,865,837
	Cooper	1,282	653,957	15,271,887	66,171,054	88,782,883	112,052,033
	Crystal River	5,171	1,874,987	20,490,511	47,814,952	104,822,608	197,157,363
	Davis Besse	4,820	4,745,921	56,343,077	117,904,400	40,457,981	40,180,573
	Diablo Canyon	1,690	461,416	37,446,648	13,659,266	23,293,896	17,491,282
	Donald Cook	22,299	5,069,686	46,415,966	90,806,681	82,780,666	38,819,471
	Dresden	31,181	8,870,484	39,956,630	77,489,367	110,575,437	34,851,210
	Duane Arnold	12,760	858,862	34,973,417	57,116,136	119,852,534	62,057,470
	Enrico Fermi	19,051	6,157,912	55,005,942	115,254,173	40,768,096	42,349,718
Farley	3,115	639,638	29,708,040	61,827,397	133,577,096	157,348,065	
Fitzpatrick	9,852	1,468,466	77,259,253	63,696,806	45,783,547	40,842,914	
Fort Calhoun	14,176	1,252,673	14,028,768	58,831,451	90,356,251	114,615,100	

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
UNITED STATES	Grand Gulf	4,489	675,531	21,155,642	69,742,115	115,842,773	177,133,786
(continuation)	H.B. Robinson	24,044	1,725,121	31,639,621	110,507,849	80,150,323	61,498,348
	Hatch	2,228	608,260	34,165,862	63,483,013	132,191,051	81,722,782
	Hope Creek	5,984	8,522,984	60,113,445	72,445,382	56,902,109	40,074,131
	Indian Point	108,185	20,076,442	49,424,796	58,207,686	54,535,134	43,938,050
	Kewaunee	2,041	1,067,118	35,734,913	63,308,640	111,188,918	45,321,015
	Lasalle	6,961	4,564,814	43,043,833	75,972,353	112,644,208	35,834,186
	Limerick	99,164	9,315,242	63,980,176	65,653,594	55,501,932	38,692,813
	Mcguire	59,569	3,405,086	33,873,723	127,625,943	71,633,269	40,690,419
	Millstone	85,196	5,222,196	55,186,798	54,104,746	56,953,028	47,580,854
	Monticello	39,038	3,479,959	10,159,822	45,875,868	77,421,563	122,059,188
	Nine Mile Point	11,685	1,480,167	77,286,643	63,706,360	45,765,477	40,846,874
	North Anna	6,698	3,031,901	63,130,954	97,093,469	53,227,963	40,927,272
	Oconee	14,581	2,049,454	36,807,833	107,232,124	100,252,656	36,411,245
	Oyster Creek	56,203	10,671,888	53,835,814	65,950,035	59,297,227	39,008,992
	Palisades	12,915	2,285,849	47,437,150	92,295,266	81,808,695	39,267,242
	Palo Verde	2,912	3,525,202	22,844,506	36,471,855	33,213,099	72,356,063
	Peach Bottom	11,540	8,538,124	62,711,988	79,304,425	50,582,270	41,180,327
	Perry	26,655	3,647,900	56,149,046	113,459,618	39,453,729	39,145,532
	Pilgrim	34,243	5,805,584	45,146,266	48,694,489	58,679,360	50,881,397
	Point Beach	3,131	1,062,896	36,078,135	63,487,590	111,434,875	44,630,850
	Prairie Island	11,660	3,519,774	18,921,918	51,244,450	91,644,235	94,827,353
	Quad Cities	7,256	960,378	39,582,636	66,311,502	120,184,711	46,934,763
	R.E. Ginna	15,239	1,801,805	80,326,939	65,694,043	43,954,760	41,417,259
	River Bend	14,653	1,466,811	17,189,144	63,516,705	150,697,571	156,243,827
	Salem	5,409	8,495,391	60,107,512	72,484,997	56,906,147	40,070,922

<i>Country</i>	<i>Site name</i>	<i>0-10 km</i>	<i>10-100 km</i>	<i>100-500 km</i>	<i>500-1,000 km</i>	<i>1,000-1,500 km</i>	<i>1,500-2,000 km</i>
UNITED STATES	San Onofre	37,810	14,601,460	15,658,804	23,301,755	22,206,136	47,980,243
(continuation)	Seabrook	63,494	5,510,918	47,336,492	45,852,589	57,551,786	47,690,266
	Sequoyah	29,149	1,388,292	37,449,339	102,759,895	104,881,272	40,319,379
	Shearon Harris	6,912	3,260,698	31,851,012	118,724,055	66,476,472	55,937,428
	South Texas	3,312	677,240	24,392,660	40,054,273	141,295,147	124,322,896
	St. Lucie	63,155	1,764,657	16,173,594	41,105,850	84,451,910	190,618,604
	Surry	23,446	2,864,325	54,664,090	92,231,583	58,670,481	50,051,718
	Susquehanna	21,090	2,781,996	80,518,961	63,257,636	49,461,367	37,308,703
	Three Mile Island	50,986	5,022,358	72,942,015	79,715,439	46,159,402	39,167,277
	Turkey Point	2,532	4,156,411	18,024,581	22,412,265	73,184,764	207,548,731
	Vermont Yankee	18,324	3,077,374	56,319,694	53,840,971	56,518,651	47,322,360
	Virgil C. Summer	1,977	1,998,496	32,027,053	112,445,897	91,522,456	47,898,706
	Vogtle	2,357	950,724	33,802,562	79,311,282	120,081,682	59,503,342
	Waterford	43,131	2,221,884	13,708,118	65,266,072	144,044,389	162,929,227
	Watts Bar	7,288	1,903,014	39,928,107	107,643,699	99,572,547	36,145,225
	Wolf Creek	4,198	523,146	17,247,644	76,685,423	81,723,843	120,187,470

Table 5. Population (2008) by UNEP GEO region and subregion for nuclear power sites with any kind of reactor status (274 sites)

<i>GEO_REG</i>	<i>GEO_SRG</i>	<i>Total</i>	<i>0–100 km</i>	<i>100–1,500 km</i>
Africa	Central Africa	104,480,641	0	0
	Eastern Africa	183,632,995	0	0
	Northern Africa	205,814,027	0	102,431,201
	Southern Africa	179,756,746	3,914,139	44,115,093
	Western Africa	291,265,652	0	290
	Western Indian Ocean	22,141,151	0	0
Asia + Pacific	Australia + New Zealand	25,304,400	0	0
	Central Asia	60,006,150	204,655	58,566,303
	North East Asia	1,539,315,320	214,884,494	1,538,857,760
	South Asia	1,668,744,016	118,344,811	1,608,815,692
	South East Asia	575,626,030	260,834	282,174,842
	South Pacific	9,632,678	0	0
Europe	Central Europe	200,344,228	23,739,643	200,176,716
	Eastern Europe	216,813,250	32,220,022	204,207,868
	Western Europe	412,203,556	242,795,523	404,034,375
Latin America + Caribbean	Caribbean	41,693,996	1,583,284	38,741,537
	Meso America	149,579,727	2,819,633	143,232,691
	South America	384,892,772	13,471,888	243,774,204
North America	North America	344,931,374	181,921,023	335,428,684
Polar	Antarctic	0	0	0
	Arctic	57,307	0	0
West Asia	Arabian Peninsula	60,363,855	0	39,641,181
	Mashriq	65,799,320	0	61,917,885
Total		6,742,399,191	836,159,949	5,306,116,322
Africa		987,091,212	3,914,139	146,546,584
Asia + Pacific		3,878,628,594	333,694,794	3,488,414,597
Europe		829,361,034	298,755,188	808,418,959
Latin America + Caribbean		576,166,495	17,874,805	425,748,432
North America		344,931,374	181,921,023	335,428,684
Polar		57,307	0	0
West Asia		126,163,175	0	101,559,066
Total		6,742,399,191	836,159,949	5,306,116,322

Table 6. Population (2008) by UNEP GEO region and subregion for nuclear power sites with operating reactors (193 sites)

<i>GEO_REG</i>	<i>GEO_SRG</i>	<i>Total</i>	<i>0–100 km</i>	<i>100–1,500 km</i>
Africa	Central Africa	104,480,641	0	0
	Eastern Africa	183,632,995	0	0
	Northern Africa	205,814,027	0	99,320,387
	Southern Africa	179,756,746	3,914,139	44,115,093
	Western Africa	291,265,652	0	290
	Western Indian Ocean	22,141,151	0	0
Asia + Pacific	Australia + New Zealand	25,304,400	0	0
	Central Asia	60,006,150	0	58,566,303
	North East Asia	1,539,315,320	159,739,278	1,525,313,886
	South Asia	1,668,744,016	109,655,080	1,603,251,167
	South East Asia	575,626,030	0	159,218,191
	South Pacific	9,632,678	0	0
Europe	Central Europe	200,344,228	21,165,534	200,176,716
	Eastern Europe	216,813,250	22,782,851	203,242,204
	Western Europe	412,203,556	172,073,865	404,029,452
Latin America + Caribbean	Caribbean	41,693,996	0	33,104,175
	Meso America	149,579,727	2,819,633	143,232,691
	South America	384,892,772	13,471,888	203,842,038
North America	North America	344,931,374	156,255,873	335,418,966
Polar	Antarctic	0	0	0
	Arctic	57,307	0	0
West Asia	Arabian Peninsula	60,363,855	0	13,096,094
	Mashriq	65,799,320	0	61,917,885
Total		6,742,399,191	661,878,141	5,087,845,538
Africa		987,091,212	3,914,139	143,435,770
Asia + Pacific		3,878,628,594	269,394,358	3,346,349,547
Europe		829,361,034	216,022,250	807,448,372
Latin America + Caribbean		576,166,495	16,291,521	380,178,904
North America		344,931,374	156,255,873	335,418,966
Polar		57,307	0	0
West Asia		126,163,175	0	75,013,979
Total		6,742,399,191	661,878,141	5,087,845,538

Table 7. Population (2008) with the effect of double counting provided for the European region and European subregions for nuclear power sites with any kind of reactor status

<i>GEO_REG</i>	<i>GEO_SRG</i>	<i>Total</i>	<i>0–100 km</i>
Europe	Central Europe	200,344,228	28,052,720
Europe	Eastern Europe	216,813,250	38,027,464
Europe	Western Europe	412,203,556	547,953,660
Total		829,361,034	614,033,844

Table 8. Population (2008) with the effect of double counting provided for the European region and European subregions for nuclear power sites with operating reactors

<i>GEO_REG</i>	<i>GEO_SRG</i>	<i>Total</i>	<i>0–100 km</i>
Europe	Central Europe	200,344,228	24,802,147
Europe	Eastern Europe	216,813,250	23,392,573
Europe	Western Europe	412,203,556	291,530,938
Total		829,361,034	339,725,658

16. The following nuclear power sites (with operating reactors) had the largest population within their respective buffer areas.

Table 9. Sites with operating reactors that have the largest populations within set radii

<i>Country</i>	<i>Site name</i>	<i>Radii (km)</i>	<i>Population</i>
India	Kaiga	1,500–2,000	>651,000,000
	Tarapur	1,000–1,500	>635,000,000
	Rajasthan	500–1,000	>618,000,000
China	Tianwan	100–500	>307,000,000
	Qinshan	10–100	>28,000,000
United Kingdom	Hartlepool	0–10	>353,000

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