CHERNOBYL: The end of a nuclear dream
N. Hawkes, G. Lean, D Leigh, R McKie, P Pringle, and A Wilson.
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serious danger. Two caesium isotopes, caesium-134 and -137, with half-lives of just over two years, and 30 years respectively, are a hazard because they tend to concentrate in muscle tissue.

Typically, a 1,000-megawatt reactor which has been operating for several years and has thus reached a stable plateau will contain something of the order of 10,000 million curies of radioactivity. (A megawatt of electricity is sufficient to run a thousand single-bar, one-kilowatt electric fires.) Converting this into becquerels, the units used in this book, involves multiplying by 3.7×10^{10}, so that the total inventory is equal to 3.7×10^{20} – or, to spell it out in full, 370,000,000,000,000,000,000 Bq. This is obviously a very large quantity of radioactivity indeed, and it is worthwhile to compare it with the fission product yield of a small atomic bomb.

The comparison is not altogether straightforward, because one of the major sources of radiation produced by a bomb are the neutrons also generated by the fission process. But, after the first minute, essentially all the remaining material from the explosion has risen so high into the atmosphere that neutrons no longer reach the ground, and what is left are fission products that gradually fall to earth as 'fall-out'. Taking a 1 kiloton fission bomb (a very small bomb, only a twelfth of the yield of the weapon which destroyed Hiroshima), the total radioactivity of the 300 or so isotopes of 36 different elements produced in the explosion one minute after ignition would be about 30,000 million curies, or three times the total inventory of the 1,000-megawatt reactor.

Within a day, the comparison looks slightly different. Radiation from the bomb will have fallen off very rapidly, to about one two-thousandth of its one-minute value, while the radioactivity from the nuclear reactor will have declined by only a factor of about five.