A typical 1000 MW nuclear reactor produces enough plutonium each year for 40 nuclear bombs. Below is the analysis prepared by Tom Cochran of Natural Resources Defense Council.

A typical 1000 GWe light water reactor produces, on average, 20 metric tonnes (t) of spent fuel (SF) per year, although the refueling interval is now typically 18 months. The spent fuel typically contains 1 percent plutonium. Thus, on average, a 1000 MWe LWR discharges SF containing about 200 kg of Pu/y. The actual value for any reactor may differ and it depends upon the fuel burnup, the percent if U-235 fissioned before the fuel is removed.

Today, LWRs can achieve burnups of 55,000 MWh-years/tonne of heavy metal (HM). If the plant operates such that the MWe/MWh ratio is 0.32 (i.e., 32% of the thermal energy (heat) output is converted into electricity), and it operates 90% of the time, then a 1000 MWe produces:

\[(1,000 \text{ MWe}) \times (\text{MWh}/0.32 \text{ MWe}) \times (365 \text{ days}) \times 0.9) = 1.03 \times 10^6 \text{ MWh-years/year}\]

\[1.03 \times 10^6 \text{ MWh-years/year} / 55,000 \text{ MWh/tonne of HM} = 18.6 \text{ t HM/year as spent fuel}\]

I rounded this number to 20 t SF.

To calculate the plutonium content in 4% enriched fuel after 55,000 MWh-years/tonne of HM is more difficult and requires a reactor code. The simple code I just used gives for 55,000 MWh/tonne of HM:

1.24% plutonium with the isotopic content:
- Pu-238: 9.8%
- Pu-239: 49.4%
- Pu-240: 25.8%
- Pu-241: 8.4%
- Pu-242: 6.6%

Thus,
\[18.6 \text{ t SF/year} = 18,600 \text{ kg SF/year}\]
\[18,600 \text{ kg SF/year} \times 0.0124 = 231 \text{ kg Pu/year}, \text{ which I rounded off above to 200 kg Pu/year}.\]

The Nagasaki bomb contained 6.1 kg of weapon-grade Pu (WGPu, which is Pu with Pu-240 less than 6%). Modern bombs are made with considerably less WGPu. The amount of Pu depends on the design and also the desired yield. Since our Pu from the LWR is reactor-grade (the Pu-240 content is high), it will require more plutonium to achieve the same yield than would be required using WGPu. Just to simplify things, assume a modern fission weapon can achieve the Nagasaki yield with half the amount of WGPu, i.e., 3 kg. Now assume if reactor-grade Pu is used then twice the amount is needed, so we are back to about 6 kg per warhead.

230 kg/6 kg = approximately 40 weapons. Or you could say 200 kg of Pu/year and 5 kg reactor-grade Pu per warhead and get to the same answer, i.e., 40 warheads/year.

Some nuclear boosters, who do not know much about nuclear weapons, say reactor-grade Pu would not work because the neutrons from the high concentration of Pu-240 will initiate the chain reaction prematurely and the yield will be significantly less. In the case of the Nagasaki design the yield would have dropped from 20 kt to about 1 kt. But whether this occurs, i.e., whether the warhead works efficiently or not, depends upon the design. Modern designs are available that get around the pre-ignition problem. A nuclear weapon of any significant yield can be made with any grade of plutonium.