

The probability of a Nuclear Meltdown

According to the official “Risk Study of Nuclear Power Plants“, commissioned by the German Government in 1980¹, the total risk of a nuclear melt-down in a German nuclear power reactor is 2.9×10^{-5} (that's 0,000029 or 1 nuclear meltdown in 30.000 years). This does not sound like all too much, if you consider that the usually accepted run-time of a nuclear power plant is 40 years. Such probabilities are calculated using the following formula:

$$\text{Specific Risk} = 1 - (1 - \text{Total Risk})^{\text{Years of Service}}$$

This would mean that the specific risk that a nuclear reactor would experience a meltdown is:

$$1 - (1 - 0,000029)^{40} = 0,001 \text{ or } \mathbf{0,1\%}$$

If this still sounds like an acceptable risk, then one should keep in mind that there's not one, but actually 150 nuclear power reactors in operation in Europe (2004). Of course you can't just multiply the risk of one reactor experiencing a meltdown by 150. Instead, you have to calculate the risk in terms of service-years:

$$\text{Specific Risk} = 1 - (1 - \text{Total Risk})^{\text{Years of Service} \times \text{Number of reactors}}$$

This would mean that the specific risk that a nuclear meltdown in Europe within 40 years is:

$$1 - (1 - 0,000029)^{40 \times 150} = 0,01597 \text{ or } \mathbf{16\%}$$

Now, one might say that not all reactors in Europe are as un-safe as the German ones with their “steel caskets”, the “high amount of zirconium in their core”, the “lacking heat removal by containment spray” and their “higher risk of hydrogen combustion” (all comments from the 1997 OECD report on severe accident management²), which is true. But then again, there's a lot that are still less safe. The calculation above simply assumes that the German power plants represent the average power plant in Europe and while this might not be entirely correct and the actual cumulative risk might deviate by some percent points, the main message stays true: there is a significantly higher risk of a nuclear meltdown in Europe than the nuclear industry wants us to believe.

A risk of 0,1% is like rolling a 6 on a die with 1000 sides. If you have only one die, this might seem like a long shot, but when there are 150 dice, the chance of rolling a 6 on one of them seems a lot more probable – 16%. In fact, it's the same probability as rolling a 6 on a regular, 6-sides die – or playing Russian roulette with a 6-barrel gun!

If you look at the chance of a nuclear meltdown worldwide (again assuming that German nuclear power plants represent the average risk type), just insert the total number of reactors (440 in 2004) into the above equation and you get a risk of **39.9%**. With the nuclear meltdown in Chernobyl, this event has already taken place. The gun has gone off once already – let's not risk finding out how many bullets are still left...

Nuclear power is bad for your health!

Nuclear power plants need to be shut down!



International Physicians for the Prevention of Nuclear War (IPPNW)

Recipient of the Nobel Peace Prize in 1985

www.ippnw-students.org/chernobyl

www.facts-on-nuclear-energy.info/

Thanks to Henrik Paulitz for this calculation and the research on this subject.

Sources :

1 GRS 1980: Deutsche Risikostudie Kernkraftwerke. Fachband 5. Untersuchung von Kernschmelzunfällen. (German Risk Study of Nuclear Power Plants – Volume 5 – Examination of nuclear meltdowns). Study commissioned by the German Federal Ministry for Science and Technology. TÜV Rheinland, 1980.

2 OECD 1997: Level 2 PSA methodology and severe accident management. Prepared by the CNRA Working Group on Inspection Practices (WGIP). Organisation for Economic Co-operation and Development. Paris. Unclassified. OCDE/GD(97)198.