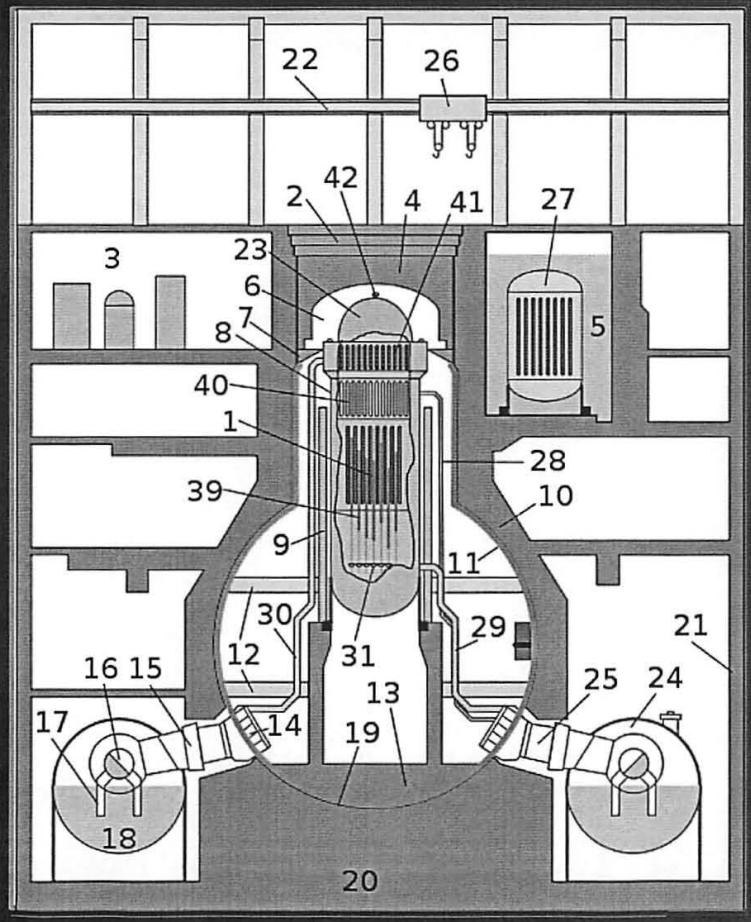
Briefing to Texas A&M University nuclear engineering students in the wake of Fukushima-Daiichi NPP accidents



1 Core with fuel rods
2 Concrete shield plug
3 Equipment pool
4 Drywell head
5 Fuel storage pool; spent fuel area
6 Refuelling cavity
7 Drywell flange
8 Reactor pressure vessel
9 Biological shield
10 Secondary concrete shield wall
11 Free standing steel drywell
12 Radial beam
13 Concrete embedment
14 Jet deflector
15 Expansion bellows
16 Vent header
17 Downcomer pipe
18 Water (wetwell)
19 Embedded shell region
20 Basement
21 Reactor building
22 Refueling platform
23 Refueling Bulkhead
24 Pressure suppression chamber (runs in a torus around the reactor)
25 Vent (81 inch diameter)
26 Crane
27 Used Fuel
28 Coolant pipe
29 Cold water pipe (from generator)
30 Steam pipe (to generator)
31 Control rod drives
39 Control rods
40 Steam separators (water normally goes to this level)
41 Steam dryer
42 Vent and head spray

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Core Damage Frequency (CDF)

Typical Nuclear Power Plant	CDF per reactor year
Boiling Water Reactor Design Type 3 (BWR/3)	4.5×10^{-6} *
BWR/4	1×10^{-5}
BWR/6	1×10^{-6}
Advanced BWR (ABWR)	2×10^{-7} (operating in Japan)
Economic Simplified BWR (ESBWR)	1×10^{-8} (NRC approval stage)
AP1000 (Westinghouse Advanced PWR)	5.09×10^{-7}
European Pressurized Reactor (EPR)	4×10^{-7}

A 2003 European Commission study remarked that "CDF of 5×10^{-5} /ry are a common result" or in other words, one core damage incident in 20,000 reactor years. A 2008 EPRI study estimated core damage frequency for the United States nuclear industry is estimated at once in 50,000 reactor years, or 2×10^{-5}. Assuming there are 500 reactors in use in the world, the above numbers mean that, statistically, one core damage incident would be expected to occur somewhere in the world every 40 or 100 years, respectively.