

Fukushima

For years after the earthquake and tsunami, if you worked at Fukushima, at the beginning of your shift they put you in your protective suit. Two pairs of socks, boots, full body suit, full helmet with respirator, and three pairs of gloves. You got a new suit after lunch, and they're not reusable. If everything goes as planned, in 40 years when they finally get it shut down, they would have had to dispose of millions of contaminated protective suits if everything goes better than expected and more if it doesn't. The actual number will be much less as the worst of it is contained and they design robots to do a lot of the work. They need the robots, because it's getting progressively harder to find qualified workers as they dose out on radiation exposure and need to be replaced. They've already built an incinerator plant for the disposal of protective suits.

So far, very little has been cleaned up, and it's likely that much of it never will be. All that's been done so far is to haul the solid waste out of town and store it in plastic bags and barrels that no one wants in their backyard, and store the contaminated water in hastily constructed tank farms that stretch to the horizon. Dispersing the very mildly radioactive water into the ocean is a perfectly safe solution, but it's been expensive and surrounded by irrational fears. The ice wall will need to remain in operation into the distant future. The immediate "cleanup" costs are easily close to half a trillion dollars, and the costs of disruption to the community is around another half trillion. Total tangible economic impact of the disaster at Fukushima is already upwards of \$10,000 per capita in Japan. No one knows what the eventual costs will be. Since Fukushima only supplied about 1/2% of Japan's total electricity generation, cost per customer so far is already around \$1,500,000. Costs for the cleanup at Chernobyl are similar.

Studying state of the art technology for the disposal of obsolete and derelict nuclear power plants; unless we spend a lot of time and money, it seems likely that a high percentage of them will end up spilling their guts one way or another. You can learn all the basic plans for their cleanup just by watching a cat take a crap. For those that use plutonium, the fuel rods will need to be contained just about forever, We'll still need to babysit the plutonium far beyond the life of this civilization. All of them rely on the grid with diesel backup to avoid catastrophe, both of which are vulnerable to a variety of disasters, both natural and man made. We don't need to hear any more bullshit about how contemporary nuclear energy is cheap, safe, and clean. So far, it's statistically safe and short term clean, but it sure ain't cheap, and when you factor in all the time, energy, resources, and pollution that all that money bought, and will need to be bought into the distant future, it's not a bit clean.

Vitrification and deep burial are safe waste disposal, but it's a bit expensive and it's potentially wasteful, as new technology is about ready to mitigate some of the problems with spent fuel rods and provide us with clean energy for a few generations as we learn to get another round of energy from spent fuel rods. They still contain a lot of usable energy.

Building any more conventional nuclear power plants can be extremely reckless. Only the best of plans for the next generation of nuclear power seem safe and affordable. It's not about abandoning nuclear energy. We need it. It's about learning from our mistakes and proceeding with caution.