Storage of Radiological Waste and the Inherent Risks

Nuclear power is an efficient, reliable choice for power with low greenhouse emissions. The ever-pervasive challenge for nuclear power is the production of hazardous spent (used) nuclear fuel and other radioactive waste materials. These wastes have the potential to cause massive environmental problems if left unmonitored, and the radiological waste does not degrade quickly, meaning the materials stay radioactive for a very long time. As of right now, we have only come up with two seriously implementable solutions to this waste problem: storage at the generating site, or movement to an offsite repository for long-term storage. Both solutions have potential risks that need to be considered in order to fully prepare for nuclear power to grow in future years.

The solution of storing waste on site with the generating station is quite simply the easiest solution, but this solution has some risks associated with it. Some risks include cost, limited lifespan, and safety. Transportation of radioactive materials is over a very small distance within the site, so there are none of the concerns for the safety of the waste while on its way to a comparable off-site repository. However, one problem is that it is expensive to adapt the existing infrastructure to contain even moderate levels of hazardous waste. In the case of Vermont Yankee, the cost of creating fuel storage was approximately $143 million (Faher). According to the Nuclear Regulatory Commission, there are two types of onsite storage, spent fuel pools and dry casks. The spent fuel pools are large and require water to keep the reactor rods cooling for a long enough time for the fuel rods to lose a majority of their heat. The dry casks contain fuel that has been cooled, but these new structures that are being built are not designed to contain radioactive materials for more than forty years (Holtec). Beyond forty years, the casks may be prone to leakage, which would increase costs and decrease safety at the site for workers. Potential issues with the use of the current stainless steel containers include inadequate inspections of the canisters, stress corrosion cracking, and minimal early warning systems if a container were to fail. External inspections of the storage container are currently the only method for verifying adequate storage of spent fuel (Gilmore). These external inspections do not reveal any information regarding the current internal structure and safety of the fuel. Also, certain plants do not keep the casks within the protected area, where security protection is at its highest level, due to space issues. Thus, the radwaste must be stored in places where it could be accessed by outside forces much easier, creating the potential for a national crisis. With so many dry casks in the open unprotected areas, the chances of something disastrous occurring increases dramatically. Thus, the long-term storage of waste on site is not the safest choice for nuclear plants to continue with current production levels. If nuclear energy is to continue expanding, then other options must be considered, such as off-site storage.

Off-site storage is any place that is used to store hazardous waste that is not near a nuclear reactor. This form of storage is designed to be used for long term storage of nuclear waste. Unfortunately, this form of storage has its own problems associated with it, including safety of waste while in transit, public opinion, and problems with interstate coordination. Whenever waste needs to be removed, it is loaded into a transport cask and loaded onto a tractor-trailer or railroad car capable of moving the cask. The casks are designed to, as the American Nuclear Society states, “withstand extreme events, such as a 30 foot drop onto a hard surface, and a 1475°F fire engulfing the cask for 30 minutes... [As well] as being struck broadside by a locomotive traveling at 80 MPH, without failure of containment.” However, while the cask is in in route; the possibility of an unforeseen event breaching the containment is still possible. Even if only one minor breach ever occurs, it would be an unmitigated disaster, contaminating the environment. The potential for a nuclear disaster, such as the one just described, has an immense effect on how the public views nuclear power and their subsequent waste. Whenever people hear about a new storage site, they unreasonably believe that something like Chernobyl will occur at the site. These opinions of the public have a great effect on where and whether long-term storage can be built. The most notable example of public opinion affecting nuclear storage is Yucca Mountain. Located in the middle of Nevada, Yucca Mountain was designed by the U.S. Government to store nuclear waste from all reactors in the country. It was certified to be able to hold waste for one million years without serious contamination to the surrounding environment (Stuckless). Unfortunately, according to the Government Accountability Office, "some members of the public incorrectly equate spent nuclear fuel with nuclear weapons," this leads them to attempt to stop the placement of 'weapons' in their backyards. Due in part to negative publicity, Yucca Mountain was forced to shut down before large amounts of fuel were moved to it. Public opinion also influences the way that states regulate the movement of nuclear waste between sites; some states and areas attempt to either lessen or halt nuclear waste moving through the area (Hopey). Because of the different rules, nuclear waste would need to take roundabout routes to reach the repository. These roundabout paths would increase the probability of an unexpected event due to the radwaste being unprotected for a longer period of time. The risks of transporting nuclear waste to long-term storage are marginal, but real all the same. Thus this choice must be considered with prudence.

Both options have real world consequences associated with them; however both have places in the future policies of nuclear energy. The truth is that on-site storage is only temporary; we know that it is not designed for long-term storage. So we have no choice but to create places where the nuclear waste can be stored indefinitely. The known risks of on-site storage are less than the potential risks of transporting radwaste off-site, but in time, the on-site storage will begin to corrode and leave a mess that will likely be costly. Off-site transportation to a repository becomes the only real option left for nuclear energy in the future to dispose of radwaste. We have the scientific ability to safely store fuel for long periods of time, but we need a dynamic shift to occur in the political sphere so that progress can move forward on these sites.

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