Article 5: Siting Flexibility

Choosing a suitable site for a nuclear power plant is a complex process that involves carefully balancing a multitude of variables and issues. The factors that need to be taken into account when reviewing the suitability of a site to host a nuclear power plant can be divided into three categories: physical, economic, and societal. First, with regard to physical siting requirements, the location of a nuclear power plant should have low seismic activity and low susceptibility to floods; the site should also be close to water sources for cooling during normal operation and during accidents. Second, the key economic determinants are the local cost of land and labor (for construction and operation); the geographical accessibility of the chosen site, which determines transportation costs (especially for heavy equipment); and the proximity to markets for the electrical energy generated, given that locating a power plant far from consumption centers induces economic penalties due to longer transmission lines and power losses on these lines. Third, there are societal issues such as the population density at the site: more people living near the reactor could result in greater impacts from accidents and greater difficulty evacuating the local population in the event of a plant emergency. Another societal factor is the local attitude toward nuclear power, which may strongly vary regionally, even within a country. Most siting challenges arise because of the tradeoffs among the various variables listed above. Clearly, building a nuclear reactor closer to densely populated areas reduces transmission costs and losses but increases the health impacts of a radiation release in an accident.

Small modular reactors raise different siting issues where there already is a power plant at the site versus where the site is undeveloped. In the first instance, packages of small modular reactors might replace today's large nuclear plants as they are retired in the United States, Japan, France, or elsewhere. There would be a four-way competition at each site: several small modular reactors, one large new nuclear plant, non-nuclear power production, or a site no longer producing power. If use of the site for nuclear power were discontinued (either of the last two options), the site would need to be "decommissioned," which is expensive. The construction of either small or large reactors at the site would postpone the need for decommissioning, although it might result eventually in greater cleanup costs because of its extended use.

Of course, small modular reactors could have other roles beyond replacing old nuclear plants as they are retired: they could also be constructed at sites that currently host coal-fired power plants if these were to be shut down. Such deployment would reduce the total cost of small modular reactors because they could use some of the infrastructure (transmission lines, cooling water, railroad access) already in place at these sites. In the United States, there are about 560 coal sites with almost 1,400 generators and an installed capacity of more than 300,000 megawatts. Many of these plants are small and old—and they will have to be closed down soon.

In the United States, 250 of these sites host coal plants that were built before 1980 and that have less than 500 megawatts of capacity. As seen in Figure 5.1 below, about 150 of these sites are potential candidates for replacement of aging coal plants by small modular reactors, because they have a population of less than 100,000 within 10 miles of the plant; the total capacity of the coal plants at these sites is 70,000 megawatts. About 60 of these sites have a population of less than 20,000 within 10 miles of the plant.

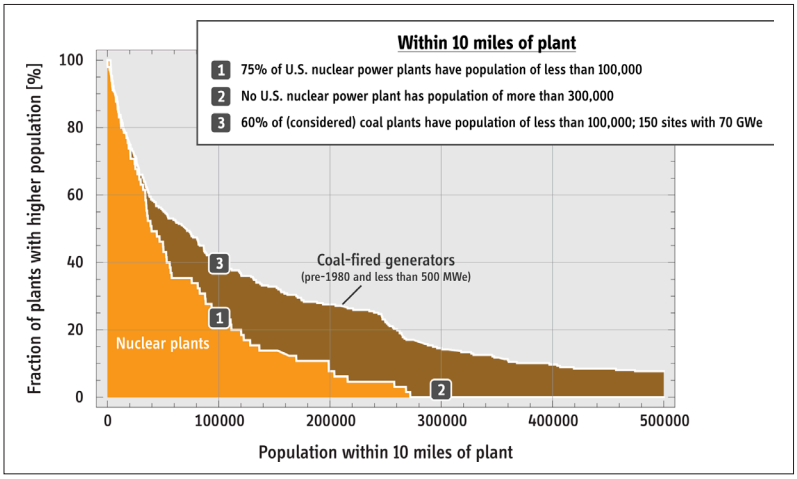

Figure 5.1: Populations within 10 miles of coal-fired and nuclear power plants in the United States. Note: MWe and GWe refer to megawatts and thousands of megawatts of electric capacity, respectively.