An efficient power supply method is only beneficial if the cost for that power is relatively less expensive when compared to the less efficient alternatives. In the previous section, we examined the difference in efficiency between Nuclear power and other alternative fossil fuels such as coal and natural gas. In this section we will observe the cost difference between fossil fuels and nuclear power in terms of initial cost, and upkeep/maintenance. These two metrics make up the majority of costs of a plant during its entire lifespan and will be used to compare fossil fuel production with nuclear power production.

The initial cost of a power generation method includes purchase of land, labour, and materials to build the physical plant and the price to acquire the materials to start power generation. Due to the highly technical nature of nuclear power plants, they tend to cost more when compared to that of a traditional fossil fuel power plant. Since we can not use the direct cost of the plant itself due to the difference in power produced, we must compare the cost per kWh generated from the plant. Reports from the OCED Nuclear Energy Agency stated that in 2002 the cost of a nuclear power plant was USD $4,000/kWh, a sharp increase from the early 1960's figure of USD $1,500/kWh. The reason for this increase was mainly due to newer building standards, and the increase of demand for regulation and restriction on the nuclear industry. Today the modern cost of a nuclear power plant is approximately USD $5,339/kWh. Compared to coal, which in 2005 peaked at the low value of USD $1,500/kWh to USD$1,800/kWh. Even after an increase in the past 12 years, today the cost of a power power plant is approximately USD $3,100/kWh. Simply comparing the two numbers of the estimated cost for the two styles of power plants today we can clearly see that the initial cost of a nuclear power plant is significantly higher than that of a coal plant.

While nuclear power initially costs a substantial amount more than coal power, it makes up for running and maintenance costs. The running and maintenance costs are the yearly cost can split into three main categories, those are cost of the fuel, cost of physical upkeep and cost of upgrading the plant. A primary difference between the fuel cost of nuclear power versus the costs of fossil fuels such as oil or coal. The fuel costs of nuclear power account for approximately 14% of the operating costs, compared to that of coal which has a fuel cost that is 78% of the operating costs. Nuclear power costs between an estimated $0.02/kWh to $0.05/kWh, which is much lower than coal power which costs between an estimated $0.04/kWh to $0.20/kWh.

Comparing the two we can see that while nuclear power has significantly lower operating costs, it costs more to create the initial plant. However, due to the extreme difference in operating costs, it is sufficient to say that there exists a point in time when the total cost of a nuclear power plant will be less than that of a coal power plant.

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