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Coal vs. Nuclear in an Uncertain Future

Up until recently, when we focused on a future date, more often than not it was the year 2000. Now that the year 2000 has come, our time horizon has been shifted into the first decade of the twenty-first century and beyond. In many respects, this will prove to be a crucial time for our industry given the challenges and opportunities it faces. This will be the first of an occasional series examining some of the key changes that can affect the future of nuclear power and the nuclear fuel market.

In many ways, nuclear power is now at a crossroads. On the one hand, deregulation and political opposition threaten its future. On the other hand, continued growth in electricity demand means that there is the potential for increases in nuclear capacity, especially if nuclear's environmental benefits are recognized by the public. So far, nuclear power is holding its own in a deregulated market, but this does not appear to be the case on the political front. The impact of any environmental benefits of nuclear power on new capacity are yet to be seen.

The situation in which nuclear power now finds itself is captured in a recent paper by Marian Radetski entitled "Coal or Nuclear in New Power Stations: The Political Economy of an Undesirable but Necessary Choice," published in *The Energy Journal*. The paper presents a three-step analysis that compares the internal and external costs of coal and nuclear power, and examines expert versus layman views on the magnitude of the external costs. In the paper, internal costs are identified as those associated with the direct production of electricity--the type most people think of

It is in the area of external (environmental) costs that nuclear loses out, according to Radetski. On the surface, this observation appears ludicrous, given that nuclear does not emit the pollutants and greenhouse gases that coal does. While nuclear does have the problem of waste disposal, weapons proliferation, and the potential for a catastrophic accident, the associated environmental damage is deemed to be rather small, at least in the opinion of experts (as well as most people in this industry).

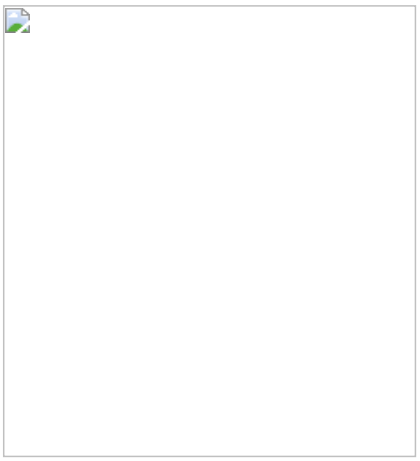
While not disagreeing with the foregoing, Radetski differentiates between the expert and layman views of the environmental harm from coal vs. nuclear power. This is the third and most crucial step of his paper. He asserts that the layman view of nuclear in an environmental context is much more dismal than the expert view. Radetski then goes on to argue that the layman's view has a much greater influence on politicians than the expert one. Because of this influence on energy policies, he concludes that "the public's views about the level of external costs will be the ultimate determinant for choosing one or the other technologies (coal or nuclear)." Further, he notes that "the public perceptions are formed in an unsystematic manner and are unstable over time," making it difficult to predict what their energy choice will be.

Radetski thus attributes the decision of some countries to abandon or prematurely shutter their nuclear power programs (Italy, Sweden, and Germany) to the discrepancy between the expert and lay views of external costs being much more extreme for nuclear than for coal, with nuclear suffering as a consequence.

If Radetski's analysis is correct, it has

when making cost comparisons, while external costs are ancillary to the production process and typically relate to environmental impacts associated with the energy choice.

Radetski starts out by noting that natural gas is the overwhelming choice for the expansion of electricity generating capacity, with hydro power also favored. However, these energy sources are not universally available, meaning that other sources must also expand to meet future electricity demand. He points out that this expansion must come from either coal or nuclear power, which together currently account for over half of all electricity generation. To put this into perspective, Radetski notes that in 1995 13,204 TWh of power was generated worldwide, and the International Energy Agency (IEA) projects that 20,852 TWh will be produced in 2010, and increase of 7,648 TWh. Of this increase, the IEA projects that 3,131 TWh will come from natural gas generation and 947 TWh from hydro power, leaving a balance of 3,570 TWh to come from coal, nuclear, oil, and renewable sources. Of this balance, the IEA projects that 2,846 TWh will come from coal and only 236 TWh from nuclear power. Nuclear's contribution is less than 348 TWh that is projected to come from oil, which by any measure is environmentally undesirable.



The low growth of nuclear power is not surprising to most people in this industry, and many would attribute it to nuclear being at an economic disadvantage compared to coal. However, Radetski points out that this is not the case. On

profound implications for the future of nuclear power. Changing the public and hence political view about nuclear power could tip the scales toward nuclear in its competition with coal and could potentially result in a considerable expansion of nuclear capacity. Of course, this is precisely the activity with which organizations like the Nuclear Energy Institute and the Uranium Institute are involved. On the surface, Radetski's thesis should be embraced by these organizations, as it helps justify their existence. However, it also magnifies any failure to produce opinion changes that effectively help nuclear power (or, more precisely, changes that can be demonstrated to help nuclear's prospects). Taking polls that shows that the public's opinion of nuclear power is improving doesn't cut it unless it can be shown that this change is having an appreciable impact on energy policy.

The challenge appears to be quite difficult. Not only is the battle being lost in certain European countries, but the fact that nuclear is holding its own in some countries while losing ground in others indicates that the issue must be tackled on a country-by-country basis. One explanation for this difference recounted by Radetski in his paper is that nuclear has been successful in countries where political decisions reside with a small, powerful group--France, Japan, and Korea (the same can be said for the former Soviet Union), suggesting that the "acceptance" of nuclear in these countries is more a function of the political system than public opinion at large.

The foregoing suggests that any trend away from more centralized decisionmaking may be bad for nuclear power. One argument against this line of thinking relates to nuclear power in the United States. On an absolute basis, the U.S. still has by far the largest nuclear program of any country. While the program has not been growing (in terms of new reactors) in recent years, there is no concerted political effort to dismantle it. By and

the basis of internal costs, he notes that coal and nuclear are roughly equivalent, although nuclear suffers when a higher discount rate is used due to its higher capital costs.

large, political decisionmaking in the U.S. is decentralized and quite open to public opinion. More importantly, the economy is market driven, more so than any other country in the world. If the U.S. represents the new political/economic paradigm and nuclear power can survive and even flourish here, then perhaps there is hope for other countries. Clearly, more work needs to be done in the area of understanding the forces that shape nuclear power's destiny.