

NUCLEAR POWER, ENERGY ECONOMICS AND ENERGY SECURITY

Economic development requires reliable, affordable electricity that is provided in sufficient quantities to satisfy the minimum energy requirements at a local, regional or national level. As simple as this recipe for economic development appears, technological, infrastructural, financial and developmental considerations must be analysed and balanced to produce a national energy strategy. Complicating that task is the historic fact that energy at the desired price and in the desired quantities can be neither taken for granted nor guaranteed. Energy economics and energy security determine the options available to nations working to establish a sustainable energy strategy for the future.

Energy Economics

A nuclear power reactor is relatively expensive to build but relatively inexpensive to run. That makes it a good investment in some situations, but not in others. It is more attractive where energy demand is growing rapidly, where alternatives are scarce or expensive, where energy supply security is a priority, where reducing air pollution and greenhouse gas emissions is a priority, where financing is available that can wait for longer term returns (which is more characteristic of governments than private industry), and where financial risks are lower due to more predictable electricity demand and prices, stable market structures and strong non-partisan political support. The 68 power reactors currently under construction around the world reflect these characteristics of favourable investment environments. Thirty-eight are in the Far East (29 in China alone), 15 in Eastern Europe, 10 in the Middle East and South Asia, two in Latin America, two in Western Europe and one in North America.

The uranium to fuel nuclear power reactors is found in abundance around the world. At current prices and consumption rates, currently identified conventional uranium resources would last about 80 years. This compares favourably with reserves of 30–50 years for other commodities such as copper, zinc, oil and natural gas. Reprocessing, recycling and the use of fast breeder technology would increase the longevity of the currently identified resources over 60 times to thousands of years.

Energy Security

Another major consideration, in addition to price and resource base considerations, is energy security. The best way to strengthen a country's energy security is by increasing the diversity and resiliency of energy supply options. For many countries, expanding nuclear power would increase diversity in their electricity supplies. Nuclear power has two features that generally further increase resiliency. Firstly, nuclear electricity generating costs are much less sensitive to changes in fuel prices than are fossil-fired electricity generating costs. Secondly, the basic fuel — uranium — is available from diverse producer countries, and small volumes are required, making it easier to establish strategic inventories. In practice, the trend has been away from strategic stocks toward supply security based on a diverse well-functioning market for uranium and fuel supply services. But the option of relatively low-cost strategic inventories remains available for countries that find it important.

Energy Choices

Countries are different. The right energy mix for a country will depend on how fast its energy demand is growing, on the availability of alternatives like hydropower or shale gas, on its financing options, and on its national preferences and priorities as expressed in national politics. How countries balance the various considerations such as accident risks, inexpensive electricity, mitigating climate change, air pollution, jobs, and energy import dependence is at least partly a matter of national preference, and consequently a decision for the IAEA's Member States themselves.

"Moreover," notes IAEA energy planning expert Alan McDonald, "all countries use a mix of energy sources and generate electricity from a mix of technologies." That diversity, McDonald explains, is partly due to historical development as new technologies overlap with older ones, partly because investors disagree about what will prove most profitable, partly because a portfolio of energy sources reduces risk and vulnerability and, where electricity demand is growing especially fast, as in China, partly just to keep up with demand by using all possible options.