

Valuing Energy Security - Quantifying the Benefits of Operational and Strategic Flexibility

Public policy in virtually every country calls for greater "energy security" – but there is surprisingly little agreement on how to define and value energy security. The concept of energy security is seemingly simple... an electricity system that embodies a high degree of energy security will be resilient to exogenous physical and financial disruptions. But what can we do to increase energy security... and what is the value of doing so? Much of the energy security literature is intertwined with discussions of "diversity" – but diversity itself is not a source of value. Diversity produces value by creating opportunities to switch fuel sources in the event of a fuel disruption. Such operational flexibility is a key source of energy security value... as is strategic flexibility – the ability to make generation investments to access different fuel sources as relative technology and fuel prices shift over time. Investments in specific generation assets can enhance energy security by creating additional dispatch flexibility. Similarly, investments in fuel supply and transmission infrastructure can expand the range of technological options – thereby enhancing future strategic flexibility. Conversely, regulatory policies that limit the range of future technological and fuel options reduce strategic flexibility and destroy value – as do fuel contracts (e.g., take-or-pay contracts) that impose restrictions on the economic utilization of fuels. This paper analyzes and values the system benefits of operational and strategic flexibility, with particular reference to the Singapore electricity system.