

## Conceptualizing Energy Security

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This paper reviews the multitude of definitions of energy security. We find that the common concept behind all energy security definitions is the notion of risk, or more precisely the absence of, protection from or adaptability to threats that are caused by or have an impact on the energy supply chain. Due to the difficulty of measuring all these threats at the same time, individual authors implicitly or explicitly limit the concept of energy security along one or several of the following dimensions.

The first dimension are the sources of risk: the supply chain is exposed to a variety of different natural, technical and human risk sources. However, many authors only analyse a subset of these risks.

The second dimension is the scope of the impact measure: risks that affect the supply chain can have an impact on the continuity of the supply of commodities - such as gas and electricity -, the continuity of supply of services - such as heating and transportation -, the continuity of the economic output of a country and finally also the environment and society.

The remaining dimensions describe a variety of different severity filters, such as the speed, size, sustention, spread, singularity or sureness of impacts, which are used to specify how large a risk needs to be in order to be of concern for the energy security of a country.

In order to test whether the differences which we observe between authors along these dimensions are important, we conduct a stylised case study of the security of electricity supplies in Austria, Italy and the U.K. We observe that the security level of the electricity supplies in these countries is determined by the security concept that is used. We assume that this result also holds for other commodities and a more refined

measurement process. The conceptual framing is thus an important part of every analysis.

We propose a set of conceptual boundaries, that make sure the concept of energy security remains operational and can be distinguished from the policy goals of sustainability and economic efficiency. In order to reduce the overlap with the concept of sustainability, the concept of energy security should be limited to risks that have an impact on the supply chain, while impacts of the supply chain on the environment and the society are a question of sustainability and safety. In order to reduce the overlap with economic efficiency, the concept of energy security should be limited to changes in the level of supply relative to demand, while concerns about current scarcity levels are a question of economic efficiency, as long as the balance between supply and demand does not change.

The resulting concept could best be described as energy continuity, or the continuity of energy supplies relative to demand, which would also avoid the problem of securitization (Buzan, Wæver, and Wilde 1998). Using the hypothetical perspective of a private company, an end consumer or a public planner, we illustrate that individual studies are likely to focus either on the continuity of commodity supplies, the continuity of service supplies and/or the continuity of the economy and introduce further limitations along the other conceptual dimensions. A reliance on the outcome of partial analyses could lead to inefficient investment decisions and short-sighted regulation. A precise specification of the conceptual limitations should thus be an important part of any analysis of energy security.

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