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ENERGY VULNERABILITY: THE RIGHT INDICATORS

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This article analyses a number of indicators for characterising the energy vulnerability of countries as well as regions such as Europe. The paper is based on the contributions of the three authors to a chapter of a World Energy Council study on the Energy Vulnerability of Europe.

Vulnerability is multiform, so that several indicators are needed. It can be apprehended at the level of Europe, a nation, an energy firm, or a group of consumers. A distinction is generally made between risks of physical disruption, and economic, social and environmental risks. In this summary, only the main indicators proposed in the full paper are mentioned.

The first section discusses vulnerability at the macroeconomic level, mainly addressing economic risk, that of a nation, using aggregate and simple indicators: dependency rate, energy intensity, import concentration, diversification of the energy mix, oil or energy bill. The latter indicator is obviously linked to the others. The scope of these indicators should be analysed with a balanced view. Energy vulnerability is different from energy dependency because it is possible to be dependent without being vulnerable. A country which imports most of its energy at sustainable cost and ensuring the security of supply thanks to well-diversified sources will be dependent but not vulnerable. A country which produces most of its energy at prohibitive cost or using obsolete technologies will be vulnerable albeit independent for its energy supply. A country may be considered vulnerable if its decision centres for energy issues are located abroad because energy companies are controlled by outside capital. It is possible to be vulnerable when the energy leader price increases, making the import energy bill prohibitively expensive from the macroeconomic standpoint. It is possible to be vulnerable when the energy driver price decreases, either as a net exporting country because energy exports account for the major share of fiscal resources, or because of a lower rate of return on its energy technology options stemming from this fall in price. This part includes an analysis of the factors which underlie vulnerability, namely price volatility and exchange rate fluctuations.

We then consider the microeconomic level in a second section, taking the point of view of consumers. We first address the question of fossil energy supply. For the consumer, vulnerability is characterized by the risk of supply disruption and by the attendant increases of price. Prevention naturally implies stockpiling. Thus the level of stocks is a meaningful indicator. Furthermore, the vulnerability of industry to energy supply disruption can be alleviated through the substitutability of its energy sources. This is the case for several electric power companies that operate multi-fuels generating plants. Since electricity cannot be stored, production or import capacity margins are needed in order to meet an unexpected increase in demand or capacity forced outage. Electricity

vulnerability thus depends on three main factors, "margin of capacity surplus", "net import rate", and "interconnection rate" with foreign countries.

Concerning the third indicator, the advantages of interconnections are clear. However, the convergence of electricity spot prices due to interconnections is sometimes perceived as a factor of vulnerability by some consumers who fear losing a comparative advantage in the context of the international competition. For instance, thanks to nuclear power, French industrial firms benefited from low electricity prices, taking investment decisions according to the electricity price structure. In the eventuality of electricity market unification, they risk losing this advantage.

Finally, vulnerability can be analysed from the social standpoint. Low income households can be affected by a surge on their energy bill, as occurred after the energy crises of 1973 and 1979. Governments then took measures to alleviate these consequences. Various indicators can be defined for quantifying these issues.

The final section analyses the vulnerability of energy suppliers. Until recently, most energy utilities were public monopolies; they now face new risks due to the liberalisation of the energy markets. The regulation regarding "unbundling" restricts their ability to integrate their production, transport and distribution activities. However, for electricity and natural gas companies, in the face of market contingencies, a presence at all stages from production to marketing ensures a minimum return on investment, since the economic rent is recoverable either in the downstream or the upstream sector. Another example of new vulnerability factors concerns the risks associated with regulation uncertainties. In the presence of regulation instability and regulatory unpredictability the investors are reluctant to commit to capacity expansion and this situation can provoke insecurity of energy supply. The paper assesses various indicators for some European countries.

References

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