



## Security of energy supply – Indicators for measuring vulnerability and risk

A study on behalf of the  
World Energy Council's German Member Committee

The study is available for download: [www.weltenergierat.de](http://www.weltenergierat.de)

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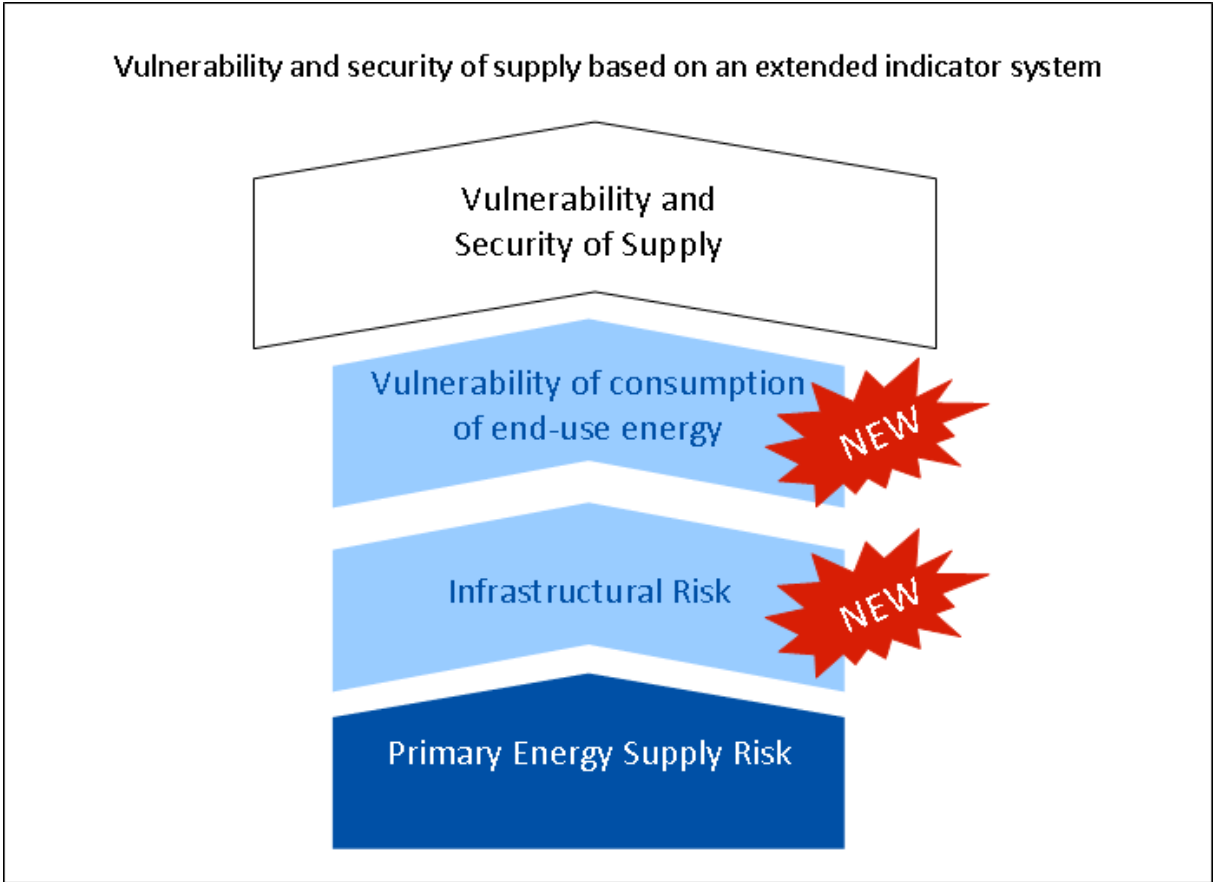
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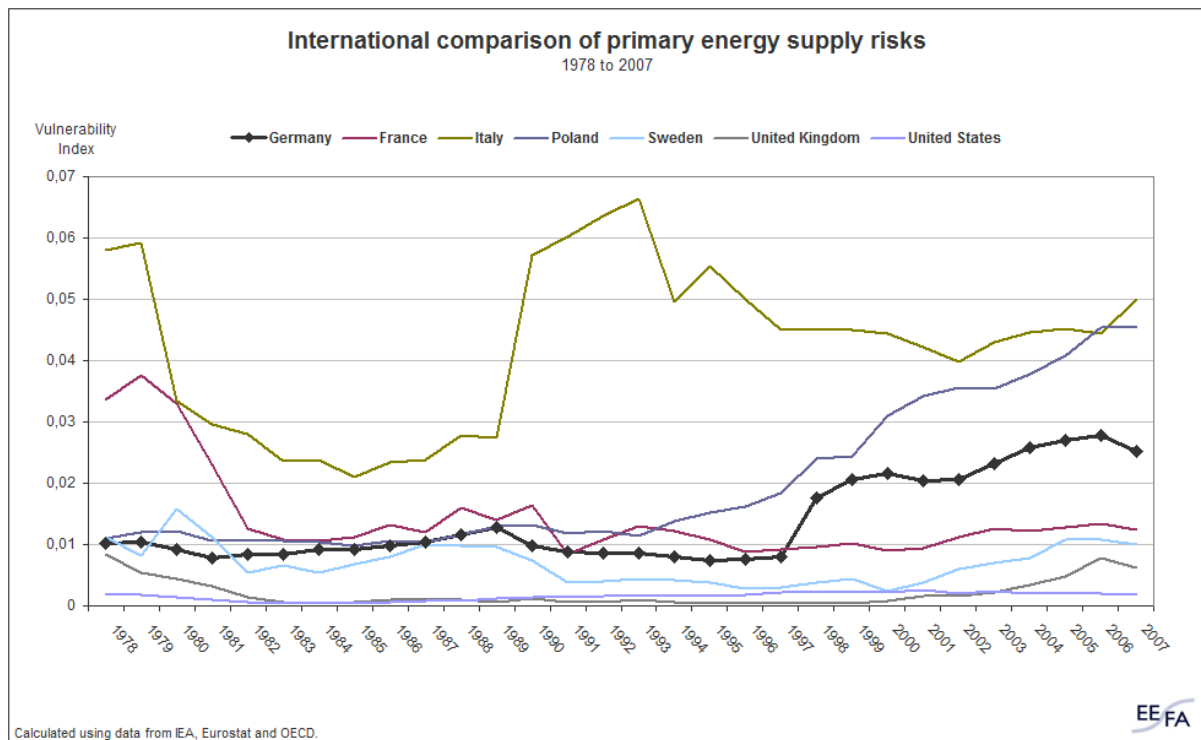
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# Executive Summary

In an era of increasing globalization, secure and affordable energy supplies are an essential requirement for economies to work, much less develop and grow in the long term. The present study, *Energy security of supply – indicators for measuring vulnerability and risk*, develops a **broad methodical assessment concept** to raise awareness among policymakers and the public regarding the vulnerability of energy supplies to potential energy crises. It explores the different aspects of vulnerability, from the primary energy level to energy infrastructure (storage, networks, power plant parks) to the efficiency and cost of energy consumption for end users (see diagram).

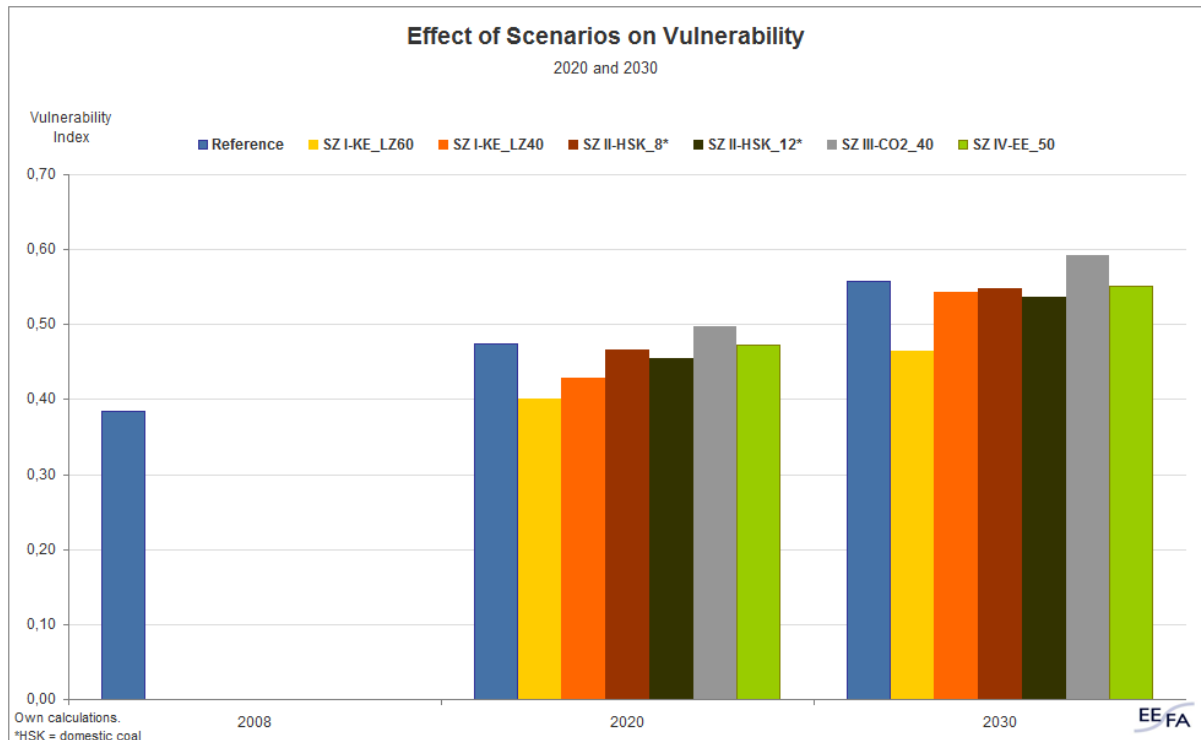


The individual characteristics of the formal concept were quantitatively evaluated for several OECD regions (Germany, UK, Sweden, Poland, Italy, France and the US) using a comprehensive empirical database and reduced to a single indicator for assessing energy supply vulnerability. Part of the database comprises historical observations for the period between 1978 and 2007.



An empirical evaluation of the vulnerability indicator system in the ex-post period yielded the following key results:

- In Germany, **risk to primary energy supplies** has increased notably since the late 1970s and has more than doubled between 1990 and 2007 alone. In the international comparison, only Italy and Poland currently post a higher vulnerability index at the primary energy level. The situation is considerably better in the UK, France, Sweden and the US. The main reason for Germany's elevated supply risk is its growing dependence on imported energy and the associated rise in demand for imports from supply regions with high or growing geopolitical risks.
- Germany's impressive energy efficiency record and excellent energy infrastructure have done much to reduce its vulnerability at the end-user level. Still, supply risk at the end-user level did increase by around 18 percent between 1990 and 2007. To avoid further increases in the future, it is essential that investments be directed at ensuring the ongoing maintenance and expansion of these energy systems.



Moreover, supply security forecasts show that Germany can expect its vulnerability to significantly increase in the future. The most important outcomes of the forecast and simulation calculations for Germany are summarised in the following bullet points.

- **If the energy policy of recent years continues to 2030 (reference scenario), Germany can expect its supply risk to increase significantly in that period.** In this reference scenario the vulnerability index in 2030 would be 47 % higher than in 1990. This dramatic rise would be driven by an increasing reliance on energy imported from high-risk regions as a result of the drying up of domestic and European energy reserves, as well as of Germany continuing to phase out the use of nuclear energy.
- However, an unchecked increase in the risk to Germany's energy supply is by no means unavoidable. Rather, the study confirms that the considered alternative scenarios could increase the security of the country's energy supply by making appropriate changes to fundamental national energy and climate policies.
- Extending the **life of nuclear power stations** to 60 years would have by far the greatest impact on improving Germany's energy security. Such a step would reduce the vulnerability index drastically, more than halving the risk level predicted in the reference scenario. The reason for this decrease would be reduced reliance on imported energy, particularly coal and gas, as well as the positive effect that extending the life of nuclear power stations would have on the economy by keeping energy prices down.
- The **continued use of domestic coal** past 2018 combined with a 15 % investment subsidy for high-efficiency power stations would reduce vulnerability by 6 %. The main reasons for this would be the avoidance of coal imports and the positive effect it would have on the economy compared with the reference scenario.

- **Actively promoting the development of renewable energy sources** would also significantly reduce energy supply risk. The increased use of domestic renewable energy would reduce Germany's reliance on imports from foreign suppliers. The vulnerability increase in this scenario would be 2 % lower than in the reference scenario.
- **Raising the target for reducing greenhouse gases from 40 % to 50 % by 2030** would not reduce energy vulnerability. This is mainly because gas power stations would have to take over most of the responsibility for electricity production to achieve this ambitious goal. Meeting the target would necessitate a rise in gas imports from increasingly unstable supply sources and would produce a negative effect on the overall economy by pushing up electricity prices. Raising climate protection targets would ultimately increase vulnerability by 9 %.
- It is worth noting that none of these options are capable of reversing the trend of growing risks to the security of Germany's energy supply in the future. To tackle this issue effectively, it is vital to implement **a variety of measures as broad as possible** so as to achieve the greatest possible improvement.
- The study also shows that the implementation of the instruments described would not only serve to improve the security of Germany's energy supply, it would also help to meet **climate protection and economic** targets. For example, extending the life of nuclear power plants to 60 years would reduce carbon-dioxide emissions and create up to 60,000 additional jobs by 2030 versus the reference scenario.