Energy Supply, Climate Policy, Sustainability

Study shows in figures for the first time: ***New generations of nuclear power plants*** bring massive safety gains

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At a glance

- What has long been technically clear is now quantified in monetary terms for the first time in a new study: New nuclear power plants would be extremely safe.
- The theoretical insurance premiums for new plants are less than one ten-thousandth of a centime per kilowatt hour, even under extreme assumptions.
- The risk of newer generations of NPPs is therefore so low that no relevant difference to renewables can be identified.

A new study commissioned by economiesuisse and conducted by Prof. Dr. Hato Schmeiser, Director of the Institute of Insurance Economics at the University of St. Gallen, examines the theoretical insurance premiums for new nuclear power plants in Switzerland under "very extreme" assumptions regarding the potential level of damage and probability of occurrence. These insurance premiums express the economic risks in monetary terms.

The results are clear: for newer generation nuclear power plants (3+), the premiums are 0.000009-0.00009 centimes per kilowatt hour, which is negligible even under strict assumptions. The main reason for this is the very high technical safety of newer generations of nuclear power plants. The risk of newer generations of nuclear power plants is so low that there is no longer any relevant difference to renewables.

The main reason for these low risk costs is the very high technical safety of modern nuclear power plants. According to expert estimates, Generation 3+ reactors have a 100x lower probability of occurrence of severe accidents (LERF) than the already very safe NPPs built in Switzerland, or 10x lower if the considerable retrofitting of existing plants is taken into account. According to various experts, the probabilities of damage occurring are therefore so low that even different assumptions about damage level distributions hardly affect the results of the study. Technical innovations such as passive safety systems are central to this finding. Replacing the existing plants in Switzerland would therefore not only create security of supply, but also represent a quantum leap in terms of safety technology compared to the already very safe plant fleet.

Insurability is technically given

The study shows that even very large amounts of damage, e.g. CHF 100 billion, are theoretically insurable for new NPPs. This is true even if the technological safety gains of new plants are partially ignored and disproportionately high probabilities of occurrence of major damage events are assumed. The theoretical insurance premiums reflect the present value of the damage risk and show that modern nuclear power plants have a very attractive risk profile. This eliminates a frequently put forward argument against new nuclear power plants, according to which they would no longer be viable if the risk costs were fully internalized.

At the same time, the study notes that the practical feasibility of placing very large amounts of cover on the insurance or capital market cannot be guaranteed for arbitrary fantasy sums - particularly due to their volume. However, such limits exist systematically and independently of technology. There are always liquidity limits on the capital markets for very large sums insured.

In the end, the decisive factors are reasonable insurance cover and equal treatment of all energy sources. The present assumptions go beyond the reasonable level of insurance. Where exactly the desired level of security should lie is a political question. However, overinsurance is a burden on consumers and companies. In any case, it is important that all technologies are treated equally, as otherwise further distortions of competition would arise. This is because extreme events are not insured for other technologies, such as the rupture of a large dam in the case of hydropower.

Comparable with renewable energies

Converted to the Swiss electricity system, the annual risk costs of a new power plant fleet would be in the range of a few thousand to a few tens of thousands of francs (based on around 30 TWh of nuclear energy production per year). This puts them in a similar order of magnitude to renewable energies (namely close to zero).

This result may come as a surprise given the perceived risks. But on the one hand, it demonstrates the value of mathematical analyses: people tend to be bad at adequately assessing serious but extremely rare risks (so-called "dread risk bias") - but the mathematical analysis here shows in a scientifically sound manner that the probability-weighted risk is close to zero, i.e. does not play a role in a rational debate. On the other hand, the results are quite comparable with other studies that see the external costs of nuclear energy at a similar level to renewables (even partly based on older generations[1] of power plants).

Conclusion

The results of the study are clear: the risk and insurance issue does not represent an objective obstacle to new nuclear power plants in Switzerland. On the contrary: modern nuclear power plants are in the same, negligible risk range as renewables.</p

The study is available on request from the author: hato.schmeiser@unisg.ch

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1. older generations: Vgl.https://www.psi.ch/sites/default/files/import/ta/PublicationTab/Hirschberg_-2004.pdf ; https://www.eea.europa.eu/en/analysis/publications/eea_report_2006_8 ; https://www.-psi.ch/sites/default/files/import/ta/NewExtEN/newext_publishable.pdf ; https://unece.org/sites/-default/files/2021-11/LCA_final.pdf