Restricting nuclear power has little effect on the cost of climate policies, study says

October 1 2012

By applying a global energy-economy computer simulation that fully captures the competition between alternative power supply technologies, a team of scientists from the Potsdam Institute for Climate Impact Research and the University of Dayton, Ohio, analyzed trade-offs between nuclear and climate policies. Strong greenhouse-gas emissions reduction to mitigate global warming shows to have much larger impact on economics than nuclear policy, according to the study published this week in the *Proceedings of the National Academy of Sciences*.

"Questions have been raised if restricting nuclear energy – an option considered by some countries after the accident in Fukushima, Japan – combined with climate policies might get extremely expensive. Our study is a first assessment of the consequences of a broad range of combinations of climate and nuclear policies," lead author Nico Bauer says. Restrictions on nuclear power could be political decisions, but also regulations imposed by safety authorities. Power generation capacities would have to be replaced, but fossil fuels would become costly due to a price on CO2 emissions, this in sum is the main concern.

"However, in case of restricted use of nuclear power, the flexibility of allocating a long-term carbon budget over time enables higher near-term emissions due to increased power generation of natural gas," Bauer says. Along with demand reductions and efficiency improvements, these provisions could help fill the gap on electricity. The price of natural gas is projected to decrease due to demand reductions, according to the study. Decommissioning existing plants will also avoid refurbishment

costs for expanding lifetimes of old nuclear power plants.

As a result, early retirement of nuclear power plants would lead to cumulative global gross domestic product losses (GDP) that amount to about 10 percent of climate policy costs. If no new nuclear capacities are allowed, the costs would amount to 20 percent.

For their study, the scientists looked into different nuclear power policies. These cover a range of scenarios from "Renaissance", with a full utilization of existing power plants, a possible refurbishment for a lifetime expansion and investments in new nuclear power capacities, to "Full exit", with a decommissioning of existing power plants and no new investments. They contrasted each scenario with climate policies implemented via an inter-temporal global carbon budget which puts a price on carbon emissions. For the budget, the cumulative CO2 emissions from the global energy sector were limited to 300 gigatons of carbon from 2005 until the end of the century. This represents a climate mitigation policy consistent with the target of limiting global warming to 2 degrees Celsius.

"A surprising result of our study is the rather little difference between a 'Renaissance' or a 'Full exit' of nuclear power in combination with a carbon budget when it comes to GDP losses," Bauer says. While the 'no policy case' with a nuclear phase-out and no carbon budget has only negligible effect on global GDP, the imposition of a carbon budget with no restrictions on nuclear policy implies a reduction of GDP that reaches 2.1 percent in 2050. The additional phase-out of nuclear power increases this loss by about 0.2 percent in 2050 and hence has only little additional impact on the economy, because the contribution of nuclear power to the electricity generation can be substituted relatively easy by alternative technology options, including the earlier deployment of renewables.

More information: Bauer, N., Brecha, R.J., Luderer, G. (2012):

Economics of nuclear power and climate change mitigation policies. *Proceedings of the National Academy of Sciences* (Early Edition) DOI: 10.1073/pnas.1201264109