The long-term consequences for Europe's climate ambitions when the EU turns off Russian gas

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Just a few days after Russia commenced aggression against Ukraine, researchers from the Department of Mechanical and Production Engineering at Aarhus University began to calculate the long-term effects of cutting off Russian gas for decarbonization of the European energy system.

The research is based on a high-resolution model of the entire European energy system, including gas-dependent industries, and it has just been published in *Joule*. The research shows that cutting off the gas could actually have a significant effect, depending on the level of ambition in the long-term goals of the Paris Agreement to limit the global temperature increase.

Politically, ever since the Paris Agreement was concluded in 2015, the objective has been to limit the temperature increase to a maximum of 2 degrees Celsius and to work on limiting it to 1.5 degrees.

The strategy has been to replace coal with gas in a transitional phase, and the war in Ukraine has severely challenged this strategy. Associate professor at Aarhus University, Gorm Bruun Andresen, is one of the researchers behind the article, and he says:

"Russia is the biggest supplier of gas to Europe, and in 2019, 34 percent of the Eurozone's gas consumption came from Russia. With the phasing out of Russian gas, we no longer have enough gas for this so-called transition phase. This means that we have to choose between investing in the immediate installation of large amounts of wind and solar energy or falling back on the other options, including coal. The first scenario aligns well with a very ambitious climate strategy, and it will very quickly alleviate Europe's dependence on imported gas. However, the second scenario actually makes it difficult to honor the Paris Agreement at all," he says.

The model developed by the researchers shows the cheapest and most cost-effective path to the 1.5-degree and 2-degree scenarios for the European energy system, respectively. The model shows that high gas prices are forcing European citizens to drop gas-fired installations and install heat pumps instead.

Since the heating sector accounts for approximately one-third of total European gas consumption, this transition will have a major impact on the green transition and this speaks in favor of the 1.5-degree ambition.

"It's interesting that this implies that the price of gas is a driver of what European politicians have been talking about for years. That's not to say that the gas price and restructuring the heating sector are enough for the 1.5-degree scenario. By any means. But it drives the green transition forward to a far greater extent than using gas in a transitional phase," says Gorm Bruun Andresen.

Ebbe Gøtske, who is a Ph.D. student at Aarhus University and is researching renewable energy sources in a European context, notes that now it is important to focus on the climate ambitions of the European countries:

"A reduction in Europe's total gas supply could help accelerate the upscaling of renewable energy sources, provided countries uphold their climate ambitions. If not, we simply risk that other fossil fuels will replace gas in the interim period towards full decarbonization," he says.

The researchers behind the model make no secret that they believe that the quickest path to European energy security is to aim for an ambitious plan and to limit the global temperature increase to 1.5 degrees.

"But this requires a massive roll-out of renewable energy sources in the form of solar and wind," says Ebbe Gøtske and continues:

"We need to install approx. 400 GW per year in the years 2025-2035, and this will be a huge challenge for European politicians."

More information: Tim Tørnes Pedersen et al, Long-term implications of reduced gas imports on the decarbonization of the

European energy system, *Joule* (2022). DOI: 10.1016/j.joule.2022.06.023