Countries transitioning to zero carbon should look at more than technology cost

August 12 2020

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A 'one-size-fits-all' approach to producing cleaner energy based on cost alone could create social inequalities, finds a new study.

The Paris Agreement aims to keep global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit it to 1.5°C. One major route to achieving this is for countries to reach 'net zero' carbon emissions by 2050—either producing no emissions or removing the same amount that they produce.

Reaching this goal will require a mixture of replacing fossil fuels in energy production with sustainable alternatives like solar and wind power, and deploying technologies that remove carbon dioxide either from power plant emissions or directly from the atmosphere.

Many current models for determining the best mix of strategies for a country to adopt focus on the projected cost of the technologies. However, this 'one-size-fits-all' approach ignores the current state of a country's energy economy and industrial strengths, which could lead to social inequalities, argue Imperial College London researchers in a new analysis published today in *Joule*.

The team took the example of three countries—Spain, Poland and the UK—and ran an analysis that included the economic and social implications of different energy mixes, as well as the technology costs.

Poland, for example relies on coal for 80 percent of its energy generation and has no in-country expertise in solar power. So, even if deploying solar is the cheapest option technologically, the impact on the workforce would be large as it would be difficult to reskill such a large portion of the workforce. This could cause economic upheaval and social inequality.

For Poland, therefore, the researchers argue that a better option may be to continue using coal in the majority, but to deploy carbon capture and storage (CCS) technologies that remove the carbon dioxide from the power plant emissions.

Spain, in contrast, already has a solid solar and wind power industry, meaning the analysis based on cost alone is similar to the analysis that includes socio-economic impacts, as it would be far less disruptive to deploy more solar and wind power.

The UK has a growing offshore wind industry but would face problems with intermittent power from a completely renewables-based energy mix, so the deployment of CCS power stations remains a priority.

First author of the study Dr. Piera Patrizio, from the Centre for Environmental Policy at Imperial, said: "The transition to net zero needs to be technically feasible and financially viable, but should also be socially equitable, avoiding any potentially regressive outcomes, perceived or otherwise, that might be caused by changes in the labor market."

Lead author Professor Niall Mac Dowell, from the Centre for Environmental Policy at Imperial, said: "If countries fail to account for the national situation; what resources are available both technically and in the labor market, they risk energy transitions that results in deeper social divisions, which, in the long term, will affect growth, productivity, wellbeing, and social cohesion."

The team are currently extending their analysis across the European Union, and to the United States of America, considering policies such as a recent push to adopt hydrogen fuel technologies and how that might affect different countries. They will also consider the impact of the COVID-19 pandemic and how decisions about the transition to net zero could affect recovering economies.

More information: *Joule* (2020). DOI: 10.1016/j.joule.2020.07.010

Provided by Imperial College London