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How public acceptance affects power system development in Ireland and Germany[1, 2]

Leonie Sara Plaga, Muireann Á. Lynch*, John Curtis and Valentin Bertsch

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INTRODUCTION

Many EU member states rely on rapid deployment of renewable electricity generation to meet ambitious climate targets. Both Ireland and Germany have a target of up to 80% of electricity demand to be met by renewable power by 2030. However, public opposition to renewable power infrastructure, particularly onshore wind, can lead to delays and increased costs in renewable investment. This phenomenon has been observed worldwide, including Ireland and Germany.

In this research, we utilise two datasets, from Ireland and Germany to quantify the level of opposition to wind power investment in each region in Ireland and Germany. We then calculate the best investment profile in the power sector for each country, with and without opposition to wind investment, and compare the outcomes. In this way, we determine the extent to which opposition to wind power investment increases total costs in each country, as well as the change in the final power generation investment portfolio. We also consider the impact of transmission line investments[3] on the results.

DATA AND METHODS

Our measurement of opposition to wind power investment was based on the responses to two surveys which were conducted amongst two representative samples of the population in Germany and in Ireland. The response of participants when asked what the minimum distance they would want between their place of residence and a wind plant was used to compute a metric for acceptance of wind

[1] This Bulletin summaries the findings from: Plaga, L., Lynch, M.Á., Curtis, J. and Bertsch, V.(2024). "How public acceptance affects power system development—A cross-country analysis for wind power", *Applied Energy*.
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* Correspondence: muireann.lynch@esri.ie

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[3] This is the cost of investment in transmission infrastructure, eg, overhead cables and grid reinforcements technologies.

power in each region. Acceptance levels varied across Ireland and Germany, but acceptance in general was lower in Ireland compared to Germany. The optimal power generation mix was then determined using the BACKBONE power systems model for Europe, with and without acceptance constraints, and with and without transmission investments.

RESULTS

The costs of acceptance constraints are higher in Ireland compared to Germany: in Germany, constraining wind power investment by public opposition increases total costs by 0.2% without transmission investment and 0.25% with transmission investment, while the comparable figures for Ireland are 1.55% and 2.12% respectively. The higher increase in costs in the scenarios with transmission investment are explained by the fact that transmission makes wind more valuable: a wind farm that is connected via a stronger grid is more valuable to the system than a wind farm that is connected via a weak grid. Therefore, public opposition to wind farms which results in them being built in less favourable locations, or not at all, is relatively more costly under a stronger grid compared to a weaker grid.

While the increase in total costs is relatively small, there is a large shift in the type of investment: from onshore wind in the north to solar power in the south in Germany, while Ireland instead shifts from onshore wind power to offshore.

We also compute a metric to approximate the cost of public opposition to energy investments, by dividing the increase in costs in each jurisdiction by the change in wind power investment in each jurisdiction. This determines the increase in electricity costs per unit of wind power investment avoided (due to public opposition). We find that this metric is 1.4 to 1.9 times higher in Ireland compared to Germany, which reflects differences in the costs of available alternatives and other system-specific considerations.

CONCLUSIONS

The results of this paper indicate that public opposition can have a material impact on the location of energy power projects in Ireland and Germany alike. Furthermore, higher levels of opposition lead to higher costs and higher inefficiencies. However, there is no common pattern to the changes in investment for Ireland compared to Germany: one jurisdiction sees an increase in transmission while the other sees a decrease. Similarly, Germany shifts from onshore wind to solar, while Ireland shifts to offshore wind. In general, public opposition impacts on the costs and investment in the power system, although the final investment is system-specific. Policy-makers may choose to include this trade-off of small increases in total costs against decreases in public opposition when determining renewable energy policy, which may result in a net societal benefit. However, this trade-off includes acknowledging a shift in investment between regions within a given jurisdiction, and may also lead to increased costs not modelled here, particularly in the short-run, such as increased planning and legal costs.