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IS FUEL DIVERSITY THE ANSWER TO SECURITY OF SUPPLY?

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Overview

One possible response of policy makers to concerns about security of gas supply is to impose a fuel diversity requirement. Such types of policy seem to have become more popular in the last year: Government spokespersons in both the Republic of Ireland and Italy have stated that 'too much' gas is being used for power generation, and that some form of fuel diversity policy should be imposed. The belief is that using a mix of fuels – and specifically using less gas – will mitigate the risk of a gas-price shock and reduce the effects of a supply disruption. In this paper we investigate whether a fuel diversity policy – which we interpret as a cap on the proportion of electricity generated by gas-fired plant – is a cost-effective security of supply policy for electricity generation. We use our proprietary electricity market model to calculate the effect of a fuel diversity policy on the price and cost of electricity on the Island of Ireland. We examine the benefits of a fuel diversity policy in the event of major physical gas supply disruption, and discuss, in qualitative terms, the need for and effect of the policy on investment.

Methods

We have used our proprietary model to compare prices in two alternative scenarios. First, an 'unconstrained' base case where developers faced no constraints on their fuel choices; and a second scenario where the authorities limit the fraction of electricity generated by gas-fired plant to approximately 50% (a 'constrained gas' scenario). We assume that coal-fired plant replaces gas-fired capacity in the constrained gas scenario. We chose to model the scenario on the Island of Ireland, because this is a market that appears to be considering a fuel diversity policy and for which heavy gas import dependence means that security of supply is an important issue.

We investigate the effectiveness of the fuel-diversity policy in mitigating gas price rises. We calculate electricity prices and the cost of generating electricity for both the unconstrained and constrained gas scenarios in the event of high gas prices. For our gas price shock, we assumed that gas prices remained roughly constant in real terms at the historically high levels forecast for 2007 in early-2006. While gas prices have subsequently fallen, the prices used are a good approximation of the prices one could expect in a gas price shock scenario.

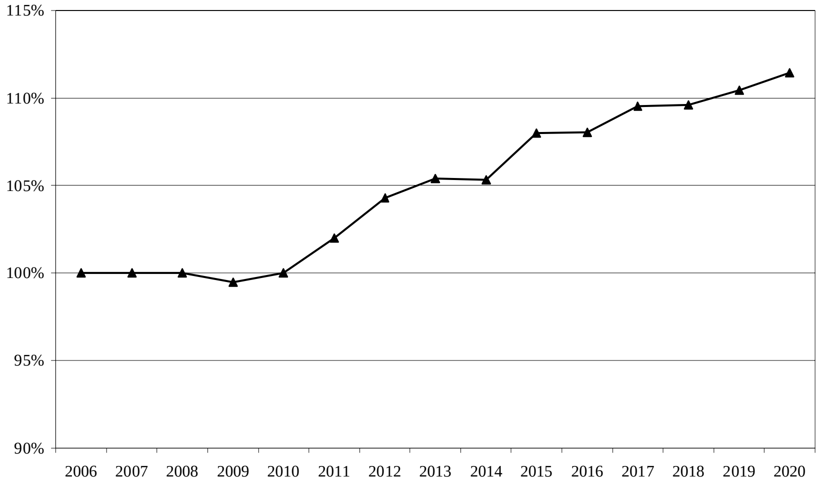
Results

We find that the two scenarios only start to diverge around 2012, when new plants need to be added to the Irish system and the 50% limit on electricity produced by gas-fired plant starts to bind. As Figure 1 illustrates, between 2011 and 2020 limiting the fraction of gas-fired plant increases the average electricity price by over 7%, or €160 million a year, in 2005 money. We also find that a fuel diversity policy would increase carbon emissions in Ireland by 6% and SO_2 emissions by around 35%, even assuming that new coal plants would have Flue Gas De-sulfurisation fitted.

In the event of a gas price shock, electricity prices in both the constrained gas and unconstrained cases are virtually identical, differing by only 2% on average over the period. A fuel diversity policy not only appears unable to protect consumers from high electricity prices in the event of a gas price shock but actually results in slightly higher prices on average. This counter-intuitive result arises because of the need for new coal plant to

recover their capital costs as well as their fuel costs. Since we estimate that the capital, fixed and operating costs of coal plants are higher than those of gas plants, even under the gas shock scenario, prices in the longer term are also higher.
We also calculate that in Ireland – and we suspect many Member States – a fuel diversity policy does little to protect against a failure of the largest source of imports. In Ireland, even with a fuel diversity policy, if the main gas-import pipeline failed there would be a need to curtail electricity supplies drastically. We also note that a policy whereby gas-fired plant are required to keep reserve stocks of distillate fuel, and be able to switch to these supplies in the event of gas supply failure, would be an effective means of ensuring security of the electricity supply.

Fig. 1: Electricity prices in the 'constrained gas' scenario as a percentage of base case prices.



Conclusions
For many European electricity markets, gas-fired electricity plants set the price of electricity for the majority of the time. Increasing the proportion of non-gas fired, infra-marginal plant would not reduce the cost of producing electricity in the event of a gas-price shock because gas-fired plant would continue to set the electricity price. A gas price shock would however increase profits for (non gas-fired) infra-marginal plant, and this may provide some incentive for the market to diversify fuel sources without the need for Government intervention. Moreover, ad hoc attempts by policy makers to limit gas demand would undermine the incentive for the market to invest in gas supply measures such as storage and LNG, which in itself could lead to a supply shortfall.
The stated aim of fuel diversity policies is to protect consumers against the economic harm of a gas-price shock by providing an "insurance policy". The idea is that a country should accept a sub-optimal fuel mix now, to insure against a future price shock. However, the probability and size of such a shock is very hard to estimate. Accordingly, it is very difficult to guess how much economic efficiency to sacrifice today for potential benefits in the future. Given the risks attendant on making an error in this trade-off, it is likely to be better for policy makers to leave such insurance decisions to the market.

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