Impact of Population Growth on Cost of United Kingdom Energy Infrastructure and Practicability of Meeting Carbon Reduction Commitments to 2050

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Executive Summary by Population Matters

Introduction

Understanding the contribution of population growth to the cost of energy provision highlights the potential economic benefit of policies to stabilise population size. However, most existing work on energy provision focuses on technology and to some extent consumption behaviour but treats population growth as a 'given'. The UK government's Carbon Plan considers technology trajectories and associated costs needed to meet energy requirements whilst simultaneously reducing UK carbon emissions to twenty per cent of 1990 levels by 2050. Population Matters (PM) commissioned this report to quantify the impact of population growth on the costs likely to be incurred.

Methodology

The impact of population on energy demand was analysed by building on an existing Department of Energy and Climate Change (DECC) model that had been used to forecast emissions for the Carbon Plan. This model was first validated by comparison with two independent studies on renewable technologies and where appropriate modified accordingly. The ability to model the impact of a range of alternative Office of National Statistics (ONS) population growth projections was then added. The DECC model included four specific pathways (comprising alternative combinations of technologies and changes in consumption behaviour) in order to meet the required emissions target. The pathways were adjusted to ensure that the emissions target would still be met in 2050 with the highest population trajectory.

Findings

ONS figures show the existing UK population to have been 62.3 million in 2010, the principal (mid-range) estimate for 2050 being 78.4 million with high and low projections of 87.7 and 68.7 million respectively. For all the scenarios modelled several other variables also have a large influence on the predicted cost of future energy provision. Although the projected range of population size does not have the greatest single effect, its impact is nonetheless very significant in absolute cost terms.

Expressed as net present value, the calculated cost to provide the 2050 energy system is between £380 billion and £1,021 billion greater for the high population projection than that for the low projection. This *additional* cost attributable to the range of population projections is equivalent to that of building up to approximately 260,000 *additional* new 2.5 megawatt (MW) onshore wind turbines. The large range in predicted values depends on which assumptions turn out to be correct with regard to as yet unknown factors such as development of more efficient technology.

Achieving the 2050 emissions targets will require a much higher percentage of intermittent and uncontrollable renewables in the UK's energy mix, with a consequent need for further investment in energy storage. Project time constraints precluded critical examination of the energy storage costs built into the DECC model. If these have been underestimated, the cost implications of the higher population projections may be significantly larger.

Recommendations

Stabilising the UK's population could significantly reduce the cost of providing the UK's energy needs and meeting the 2050 emission reduction targets. The sooner policies are put in place to encourage reduction in population growth, the greater the potential benefits.

Further research is required into the interaction between population size and other variables which affect the cost of energy provision, including development of more efficient technology and energy storage.

Full report