Review of technical potential for electricity demand reduction by Nick Eyre (Environmental Change Institute, University of Oxford)

Summary

1. This analysis[1] of the scope for electricity demand reduction (EDR) in the UK represents a major improvement on earlier analysis undertaken by McKinsey, primarily because of the use of UK specific data and more careful technical analysis.

2. The technical potential identified (32 TWh/year) is a reasonable estimate based on the sectoral scope analysed, the technical potential identified in those sectors and an allowance for the potential expected to be delivered via existing policies.

3. The assessment is conservative. Different assumptions about sectoral scope, definition and potential would be likely to lead to much larger numbers, and this should be made clear in the presentation of analysis.

Review Findings

General Technical Approach

4. The basic analytical approach is sound. UK specific data is used throughout, which is the key advance over the McKinsey review. The data used are documented, using other peer reviewed reports. Where these are unavailable, estimates by DECC professional staff are used. These appear to be reasonable to me, and therefore this is an appropriate approach.

Models

5. The models underlying the energy saving potential estimates for the non-domestic building sector (N-DEEM) and industrial processes (ENUSIM) are both based on rather old data. The report authors, and the consultants on whose reports they rely, are clearly aware of this issue and recognise the problem. However, there is no easy solution: the models remain the best available for the UK, and therefore the best choice. In principle, this could result in an error in either direction (energy efficiency potential may have risen or fallen subsequently) and there is no reason to believe that it will be a very large effect. Nevertheless, the problem should be clearly stated in the final report.

Definitions and Assumptions

6. The report concerns the "technical potential" for energy efficiency. In common use (amongst analysts) this term is generally used to mean the potential for improving energy efficiency (and therefore, ceteris paribus, reducing energy demand) using all

[1] See revised estimate of technical potential in the EDR Impact Assessment: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/201018/Impact_Assessment_for_Electricity_Demand_Reduction_Policy_Options_FINAL.pdf

technically available options at the relevant point in time. In this report there are two issues that need to be noted. Firstly, at least in the industrial sector, a slightly modified definition is being used with an "adjustment to the numbers [that] reflects experience in the industrial sector of the practicalities surrounding the installation and operation of components and systems". This may well be a sensible adjustment, but it should be clear in the report and ensure that further reductions to a 'realistic potential' are not made which double count the adjustments.

7. Any assessment of realistic potential also needs to take account of the impracticality of very early retirement of capital stock. This is normally achieved by assessing potentials at some future date. In this case 2030 is used. The use of a future date, however, raises two new questions for the definition of potentials.

8. Firstly, what assumptions are being made about the availability of technology at that date? In this case the analysis uses the most conservative assumption. "The analysis has focused on technology that is available today. We recognise that innovation will increase the potential for energy saving above this, but given the level of uncertainty in modelling technology innovation we have taken the conservative approach of using fixed technology." This is perfectly acceptable, if clearly stated, and provided that resulting policy design does not exclude innovative technologies. It should be noted that efficiency technologies, in many cases, change somewhat faster than supply side technologies. So within a whole system approach, the numbers in this analysis are strictly not comparable with supply side analyses that include technologies that have yet to be demonstrated (e.g. CCS).

9. Secondly, the potential depends upon the baseline projection for demand (in this case for electricity) to the date at which the potential is estimated (2030). This is always a difficult issue. There is no "correct" answer – the only tests are reasonableness and transparency. In this case the choice made has been to use the 'central scenario' of the latest Updated Energy Projections (UEP). This should be made clear in the final documentation. On the face of it the choice is reasonable as this scenario represents DECC's "best guess" of a future that includes "all agreed policies where decisions on policy design are sufficiently advanced to allow robust estimates of impact". However, it needs to be noted that the scenario is inconsistent, in important ways, with the envisioned outcome of EMR, i.e. substantial investment in, and growth of production from, low carbon electricity generation technologies. Under 'central scenario' electricity generation rises from 338 TWh in 2011 to 370 TWh in 2030. In contrast, in the DECC 2050 pathways scenarios (i.e. scenarios consistent with ambitious 2050 carbon targets), generation in 2030 ranges from 480 TWh to 720 TWh, with much more substantial electrification of heat and transport than in the UEP. The choice of the UEP as a baseline is entirely reasonable to assess the potential for EDR in the world consistent with the UEP, but it does not allow examination of the increased scope for EDR in low carbon, high electricity scenarios that define DECC's "preferred future". This is discussed further below.

Scope

10. The scope of the analysis is consistent with what is examined for targeted policy intervention in the EDR consultation, i.e. process industry, non-domestic buildings and household appliances. In other words household heating and lighting and (electric) transport are out of the scope of the assessment. There is no attempt to justify this here, other than by reference to the EDR consultation. I personally don't find the justification in the EDR consultation is robust. As pointed out above, the decision will be much more important in 2050 Pathways type futures than UEP baselines. The implications of exclusions are discussed in the next two paragraphs.

11. Transport is not mentioned in the documentation. Given the very limited use of electricity in transport at present and in the chosen baseline to 2030, this is understandable. But it should be made transparent, with a caveat about the likely increased importance of electricity in this sector in low carbon scenarios. I am not aware of any policy options to promote efficiency within the electric vehicle market, so this warrants analysis (even if not in this report).

12. Housing refurbishment is a different case. The EDR consultation includes the option of market wide incentives that include the domestic sector. It therefore seems premature to exclude household heating and lighting from the analysis. It is potentially an important omission. The consultation states that "There is extensive support available through Green Deal and Energy Company Obligation for efficiency measures in domestic homes and the overlap with these existing policies would need to be considered carefully before the introduction of additional financial support." But the existence of "extensive support" in this context is difficult to justify. ECO (by comparison with its predecessors) focuses support away from electricity using technologies, except where insulation is applied in electrically heated homes. And Green Deal is not an incentive scheme in the usual sense of the word. Increases in electric heating will increase the potential of both fabric improvement and heating technology efficiency to levels that exceed the ambition of ECO and Green Deal. This increase will be primarily driven by the take up of heat-pumps, which reach 30% market penetration by 2030 in some 2050 Pathways scenarios. They are currently supported under the Renewable Heat Incentive, which requires a minimum performance, but has no firm plans for incentives for high efficiency (pending the outcome to the 2012 consultation). DECC analysts are fully aware of these issues, and that, if and when there is electrification of heating, the potential for building fabric and heating efficiency measures to reduce electricity demand will increase. I understand modelling the interactions between these effects is beyond the scope of the current evidence base, so it should be noted as an important sensitivity.

Presentational issues

13. There are a number of presentational issues around explaining the number presented 'before' and 'after' the impact of existing policies, e.g. the relationship between Figures 1 and 2 in the main document and Tables 1 and 2 in Annex X. I am content that the impact of existing policies has been addressed reasonably, but this is not currently well explained.