LCNF Full Submission

Supplementary Answer Form

DNO Name:	Electricity North West Limited	**Question Number:**	ENWL014
Question Date:	15 Sept 2010	**Answer Date:**	12pm 20 Sept 2010
Question Topic:		Appendix E	

Original Question No:		**Original Answer Date:**	
Original Question:			
Original Answer:			

Question:	Can you provide further detail on the underlying assumptions on DSM carbon savings (rationale for customer behaviour; source of energy/carbon saving)?

Answer:	One of the aims of the Corridor Manchester Smart City Project is to develop a technically and commercially viable DSM approach. In advance of the Project, the detailed savings cannot be precisely estimated, but Appendix E gives information on their potential scale. Appendix E states that 'We have assumed that the DSM scheme can call on customers to reduce demand at peak times. We have assumed 300 customers in the scheme and 8 demand reduction events per year where the demand is reduced by 5kW for 3 hours.' There are a large number of non-residential customers in the Corridor with load levels significantly above 5kW; the six Corridor partners each cover multiple sites / buildings with significant load i.e. many more than 6 customers; there are also a further 1,441 businesses in the Corridor area. This means the Project is likely to be able to identify of the order of 300 customers which have sufficient suitable load to offer a 5kW peak load reduction. The Project will work with EnerNOC on an urban Demand Response Management System, visiting

	customers to identify interruptible load and installing monitoring and control equipment on customers' premises. Based on 300 customers at 5kW each, the total peak load reduction would be of the order of 1.5 MW (300x5kW = 1,500 kW). This is around 5% of the envisaged 26MW of additional load for the Corridor area (see Box 1). Our previous experience of DSM and discussions with Aggregators indicates that typically 5% (maximum 10%) of the total load in a demand group could be involved in DSM. Thus this scale seems appropriate. This scale of DSM would involve shifting 36,000 kWh/yr, based on a 3-hour demand reduction, eight times per year on average. This time period reflects the breadth and frequency of the highest typical winter evening peaks in this area of Manchester. There are a variety of different economic sectors and load types within the Corridor area, offering a variety of opportunities for reducing or deferring load at peak. Examples of these different load types include building services plant (for heating, cooling and ventilation), lighting and various sector-specific loads related to the business, education, retail, health and leisure sectors within the Corridor. The primary objective of DSM for DNOs is to reduce peak load for network management and avoidance of reinforcement, rather than specifically for the carbon savings. However carbon savings may be derive from: a) Avoiding new network assets, both embedded carbon in assets and operational carbon including losses. The end of Appendix E describes the scale of avoided emissions from the carbon associated with reinforcement assets in the Corridor, identifying that these were small relative to the carbon impacts of other activities by Corridor partners; b) Shifting load from peak to off-peak periods, since higher carbon emissions are associated with generation and supply of electricity at peak; and c) Shifting load from peak, when the load is not replaced at an alternative time ie an overall demand reduction. We are aware that depending on the type of load-shifting, there can be situations where a proportion of

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the load shifted from peak does not re-appear later on the network i.e. a net energy demand reduction, with the remaining energy demand shifted in time. The balance of load-shifting against demand reduction will be specific to the context of the types of loads and methods of load-shifting in a specific DSM project.

1. Electricity North West's experience to date of a DSM project with an industrial customer (the Omnia quarry at Ashwood Dale) has involved rescheduling shift patterns to regularly shift 500kW of load from peak to off-peak, with 100% of demand replaced later i.e. 0% demand reduction.
2. A study of DSM in the commercial and government sectors in Norway found only 10-40% of shifted demand was replaced later i.e. 90-60% demand reduction.
    - K. Roland and T. Haugland, Joint implementation: difficult to implement. In: C.J. Jepma, Editor, The feasibility of joint implementation, Kluwer Academic Publishers, Dordrecht (1994), pp. 359–366., quoted by A. Malik, Impact on power planning due to demand-side management (DSM) in commercial and government sectors with rebound effect—A case study of central grid of Oman (2007) Energy, Volume 32, Issue 11, Pages 2157-2166.

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3. DSM studies for New York found that some time-discretionary loads would be reduced, rather than just simply delayed.
    - McDonough, C. and R. Kraus (2007). "Does Dynamic Pricing Make Sense for Mass Market Customers? Aug./Sept. 2007, Vol. 20, Issue 7." The Electricity Journal 20(7) 26-37.

For our Project in the Corridor, we do not yet know the balance between simple load-shifting and load-reduction, and make an initial assumption of 50%. This split is not relevant to the carbon benefits associated with avoided reinforcement, but can be relevant to how the other GHG reduction benefits of DSM are assessed.

Ofgem advised DNOs to use DECC's GHG emissions factors to estimate carbon reductions. As set out in Appendix E, for demand reductions we have used DECC's rolling grid average of 0.61707kgCO2e/kWh. However DECC does not provide a standard conversion factor for the GHG emissions benefit of switching from peak to off-peak. As Appendix E describes, the difference between the emissions factors for (peak) coal and (off-peak) gas generation is roughly equivalent to the grid rolling average. Thus we have used the same GHG emissions factor to estimate the impact of both shifting from peak to off-peak and demand reductions.

As we have used the same GHG emissions reduction factor for shifting from peak to off-peak and for demand-reduction, the choice of 50% is academic to the overall impact on GHG emissions.

Energy saving	36,000 kWh/yr	(300x8x3x5)
DECC GHG conversion factor (Annex3)[1][2]	0.61707 kgCO2e/kWh	
GHG emissions per year	22,215kgCO2e	(36,000x0.61707)

However the emissions reductions associated with shifting from peak to off-peak are potentially difficult to quantify – the benefit could be much larger if the comparison is between (peak) coal and a low-carbon off-peak or baseload generation source such as wind or nuclear.

In either case, these are not carbon benefits which accrue to the DNO, but which occur in the wider energy system.

[1] DECC GHG conversion factor (Annex 1) http://www.defra.gov.GB/environment/business/reporting/conversion-factors.htm

[2] This GHG conversion factor reflects the 2008 grid rolling average; as the carbon emissions of the electricity mix reduce over time as suggested by the Low Carbon Transition Plan, this is likely to overestimate the GHG emissions associated with electricity demand.

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Attachments:	None