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Memo

To: Joe Quill, ORR
Date: 19 October 2012
From: NERA Team
Subject: Update to our May 2012 assessment

1. Summary

This short note provides an update to our report of May 2012 for the ORR, which examined the likely impact of increased track access charges on electricity supply industry (ESI) demand for coal.

For this update, we have been asked to re-run the base case ESI coal demand forecast using input assumptions that align on the main assumptions used by DECC in some of its recent published projections. We have therefore calculated a revised base case that uses fuel price forecasts and renewable generation assumptions published in the DECC publication "Updated Energy & Emissions Projections – October 2011". As requested by ORR, we have then run three freight charging scenarios, with £5, £10 and £15 (GBP per thousand net tonne km) TAC increases respectively, as variants on this revised base case.

In the revised base case, the overall pattern of projected ESI coal demand is more similar to DECC's forecast than in the May base case, in particular the overall decline in coal demand over the period to 2020. There are, however, still some differences in the *levels* of coal generation between DECC's projections and the revised base case projections. Most significantly, even with DECC's fuel price forecasts and renewables assumptions, our model projects more generation from coal plant in the short to medium term than DECC. These differences may be due to differences in modelling frameworks or to other assumptions that vary between the two models, but we cannot be sure given the very limited information published by DECC.

The main conclusion of our May report was that the increases in track access charges we examined would have only limited effects on ESI coal demand. For example, we found an increase in track access charges of £10 per thousand net tonne kms would reduce ESI demand for coal by around 5 per cent over the period 2014-18, assuming no change in the proportions of coal that each power station obtains from different sources. With the revised base case, we arrive at very similar conclusions, although the timing of the impact is slightly different. For example, we now find that an increase in track access charges of £10 per thousand net tonne kms would

reduce ESI demand for coal by around 2 per cent over the period 2014-18, assuming no change in the proportions of coal that each power station obtains from different sources.

2. Key DECC Assumptions

For this report we have calculated a revised base case, adopting assumptions on commodity prices and renewable generation that reflect those set out in the DECC publication "Updated Energy & Emissions Projections – October 2011".

2.1. Fuel Prices

Figure 2.1 shows the implied dispatch cost for representative coal and gas plants based on DECC assumptions, and Figure 2.2 shows our assumptions from the May 2012 report, which were based on market forward curves and long run projections by IEA. We have illustrated the range of CCGT gas generation costs based on typical efficiencies[1], ranging from an inefficient plant of (42%) to a new plant (52%). We also illustrate the magnitude of the TAC increase in the figure. A £10 TAC increase corresponds to about €0.3-0.6/MWh for a typical coal plant, typically corresponding to less than 1% of dispatch costs.[2] The comparison of our May assumptions and the DECC assumptions shows that the DECC assumptions imply that coal plants are significantly more competitive relative to gas plants in the mid-twentyteens than we assumed in May. All else equal, adopting DECC's assumptions implies that we would see more coal generation over this period than we saw previously, and that is indeed the case, as we will describe below.

[1] HHV net efficiency calculated as electrical output in MWh divided by thermal calorific energy input in MWh(th)

[2] With a distance of 100km, £10 per thousand net tonne km is £1/t of coal lifted. In cost per unit of energy, this corresponds to (£1/t) / (26GJ/t / (3.6GJ/MWh(th))=7.2MWh(th)/t) = £0.13/MWh(th). With an efficiency of a coal fired power plant of 35% that would convert into 0.13/0.35= €0.37/MWh (e).

Figure 2.1
Gas and Coal Dispatch Costs, DECC Assumptions

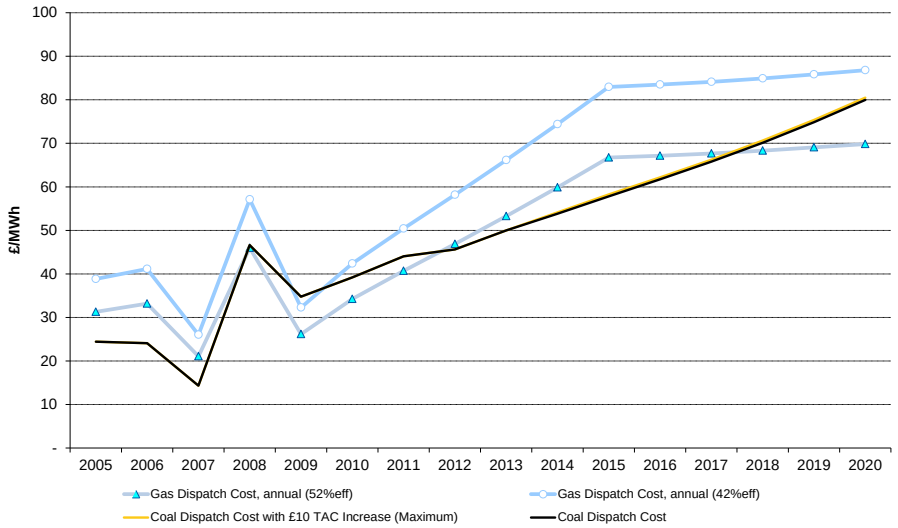
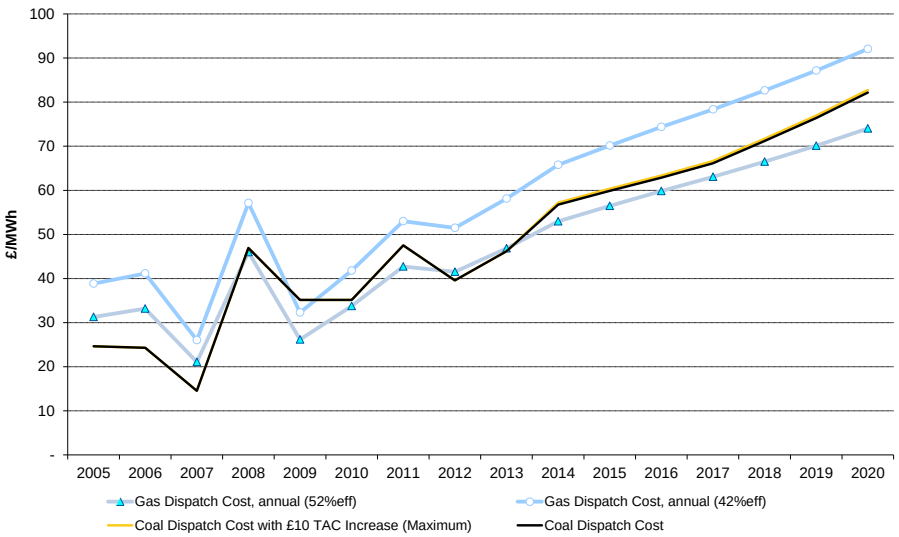


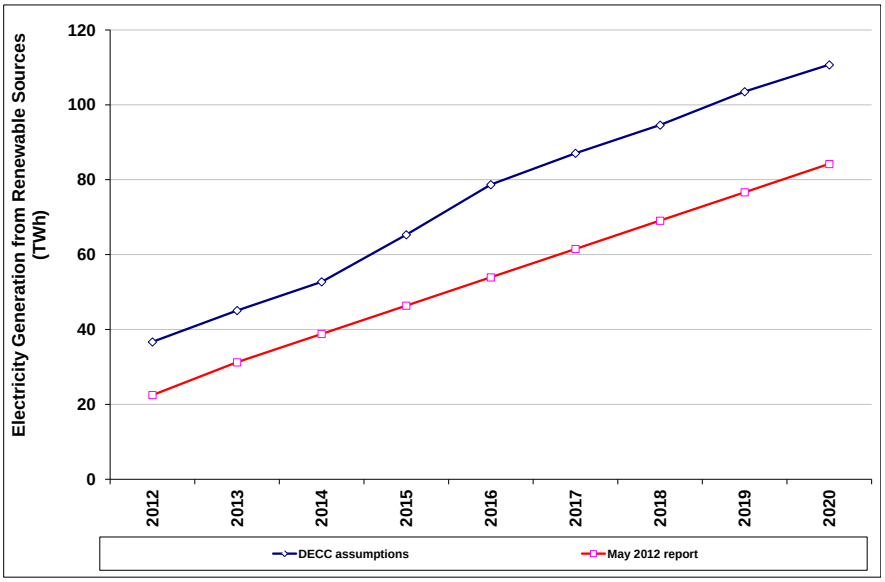
Figure 2.2: Gas and Coal Projected Dispatch Costs, May Report 2012



2.2. Renewables

As illustrated in Figure 2.3, DECC assumes a lot more renewable generation than we assumed in May, with the difference growing over time.

Figure 2.3: Comparison of Renewables Assumptions

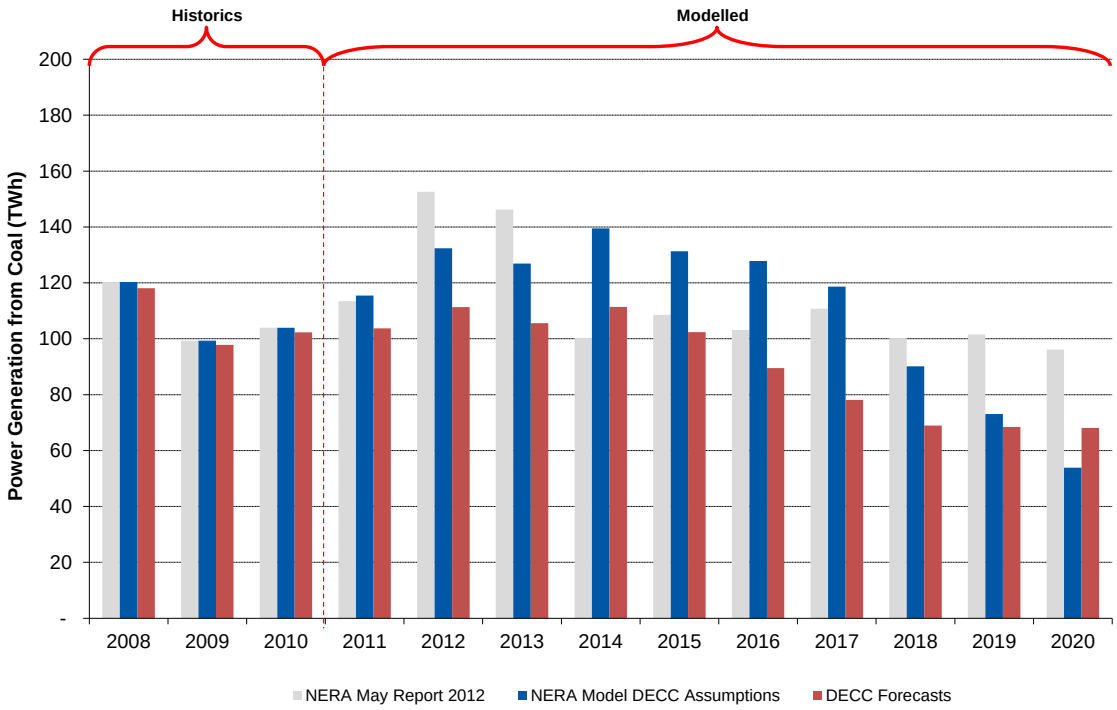


All else equal, we would expect this difference to result in less coal generation in our revised base case than in our May report. In practice, it seems the fuel price effect outlined above predominates in the mid-twentyteens, but in the long-term we do indeed see less coal generation, as we describe below.

3. Base Case Generation from Coal Plants

Figure 3.1 and Table 3.1 show the projected generation from coal plants in (i) our report from May 2012, (ii) the revised base case projection using DECC assumptions and (iii) DECC's own projections.

Figure 3.1
Projected Power Generation from Coal Plants



Source: NERA analysis

Table 3.1
Projected Power Generation from Coal Plants

Coal Generation (TWh)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NERA Model - DECC Assumptions	120.3	99.3	103.9	115.4	132.4	126.9	139.5	131.3	127.8	118.6	90.2	73.1	53.9
NERA May Report Generation	120.3	99.3	103.9	113.5	152.6	146.3	100.3	108.6	103.1	110.8	100.2	101.5	96.1
DECC Forecasts	118.1	97.8	102.3	103.7	111.3	105.6	111.4	102.3	89.5	78.1	68.9	68.4	68.1

Source: NERA analysis

As we have seen, DECC's assumptions imply that coal is relatively more competitive in the period 2014-2017 than we projected in our May report. Correspondingly, over this period the revised base case projects that coal plants will generate more than they did under the assumptions in the May report. After 2017, coal demand in the revised base case is significantly below the level we projected in our May report, probably due to the fact that DECC assumes a lot more renewables towards the end of the period than we did in the May report.

Compared to DECC's own generation projections, the revised base case show a similar overall pattern of decline in coal generation over the period to 2020, but starting from a higher level. These differences may be due to differences in modelling frameworks or to other assumptions that vary between the two models, but we cannot be sure given the very limited information published by DECC. In practice, the revised base case projection for 2012 is much closer to the high levels of coal fired generation seen already this year than DECC's projection.[3]

4. Impact on Coal Demand of TAC increases

The estimated impact on coal generation of the TAC increases (as measured in GBP per thousand net tonne kms) measured against our revised base case (i.e., with the DECC assumptions) is shown in Figure 4.1. The impact on coal demand is shown in Table 4.1 and Table 4.2.

The impact on coal demand of TAC increases is affected by changes to price assumptions:

- **When generation from coal plant is inframarginal**, any small increase in the track access charges does not change the nature of the merit order and we expect only a very limited effect of increasing the track access charges. As seen in Figure 2.1, the DECC fuel price assumptions imply that coal plants are generally inframarginal up to about 2017. In this period, TAC changes have indeed only a limited effect on coal demand. The estimated effect is also somewhat smaller than when using the commodity price assumptions from our May report, where coal and gas are in much closer competition (see Figure 2.2).

- **When generation from coal plant is on the margin, i.e.** in close competition with gas plants**,** we would expect the effect of TAC changes to be much larger. After 2018, the DECC assumptions imply that coal does indeed become more marginal (see Figure 2.1) and for this period, our model suggests that the impact on coal demand is indeed much more material than in the period 2014-2017. At the end of the modelling horizon, the effect of a £15 increase is up to a 15% reduction in demand. The effect in absolute terms is slightly larger than the effect suggested by our model in our May report. (Coal generation is lower in the DECC baseline due to more renewables)

There are a number of dynamic effects to the TAC changes which predominantly stem from the modelled constraints on maximum operating hours of the LCPD and the IED. The TAC changes affect these constraints as follows:

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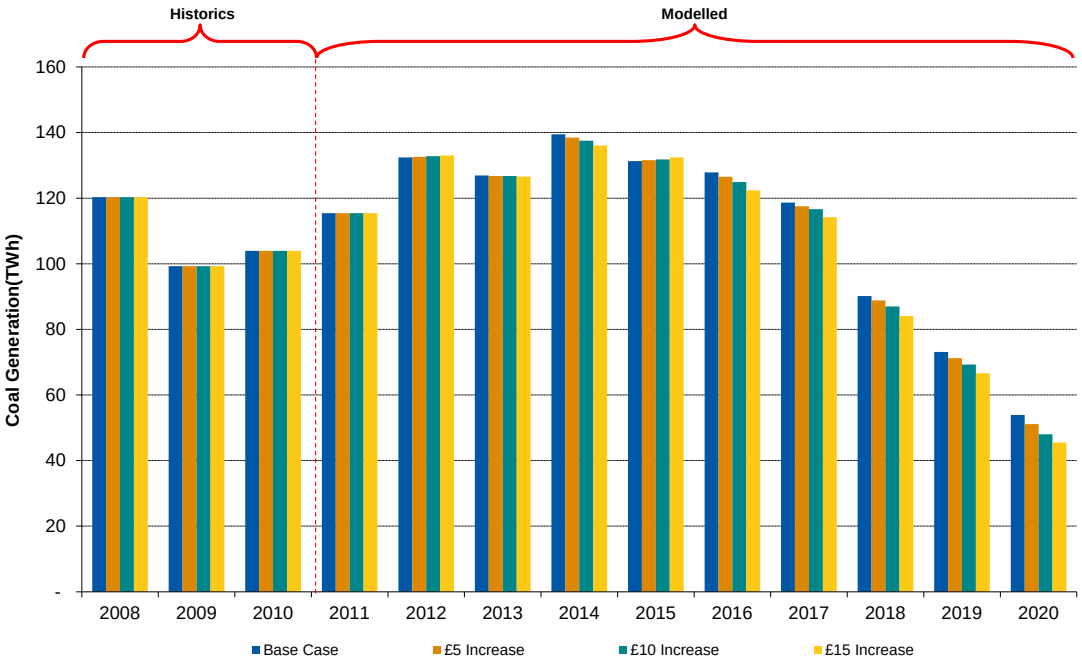
[3] According to data from DUKES, coal generation for the period January-July 2012 was about 38% higher than for the same period last year. Also see http://www.decc.gov.uk/assets/decc/11/stats/publications/energy-trends/3945-energy-trends-section-4-electricity.pdf

- **The opt-in/opt-out IED:** With higher TAC charges, it becomes slightly less profitable to fit SCR equipment in order to comply with the IED. Higher TAC charges therefore tend to lead to slightly less capacity opting in. From 2016 onwards, the IED restricts operating hours of opted-out IED plants such that in the long run, aggregate coal generation tends to be lower for scenarios where they opt-out. However, in the short run (2014-2015), we assume that coal plants which choose to opt-in by fitting SCR need to schedule planned outages in order to install the equipment. According to our modelling, slightly more capacity does indeed opt-out for the high TAC scenarios (not shown). Our modelling suggests for scenarios where more plants opt-out, slightly higher overall coal plant availability in 2015, and slightly higher generation.

- **The *timing* of production given opt-out:** Plants which decide to opt out are constrained by multi-year maximum operating hour constraints. If coal plants are *expecting* increases to track access charges in the future, it becomes relatively more lucrative to use up operating hours before the introduction of track access charges. In our modelling, some coal plants restricted under LCPD increase output in 2012 and 2013 in the wake of expected increases to future track access charges, and close earlier. This is the main reason why aggregate coal demand is slightly higher in 2012 in the high TAC scenarios.

Figure 4.1: Impact on Coal Demand (DECC Assumptions)



Source: NERA analysis

Table 4.1
Impact of TAC Increase on Coal Demand in Tonnes (DECC Assumptions)

Deltas (tonnes)	2012	2013	2014	2015	2016	2017	2018	2019	2020
£5 Increase	58,664	-69,480	-423,365	96,862	-527,011	-419,328	-527,329	-725,623	-1,093,736
£10 Increase	158,192	-69,511	-798,410	175,562	-1,175,375	-777,033	-1,254,730	-1,499,104	-2,290,269
£15 Increase	241,134	-144,993	-1,400,247	397,946	-2,185,880	-1,765,284	-2,403,801	-2,506,933	-3,253,458

Source: NERA analysis

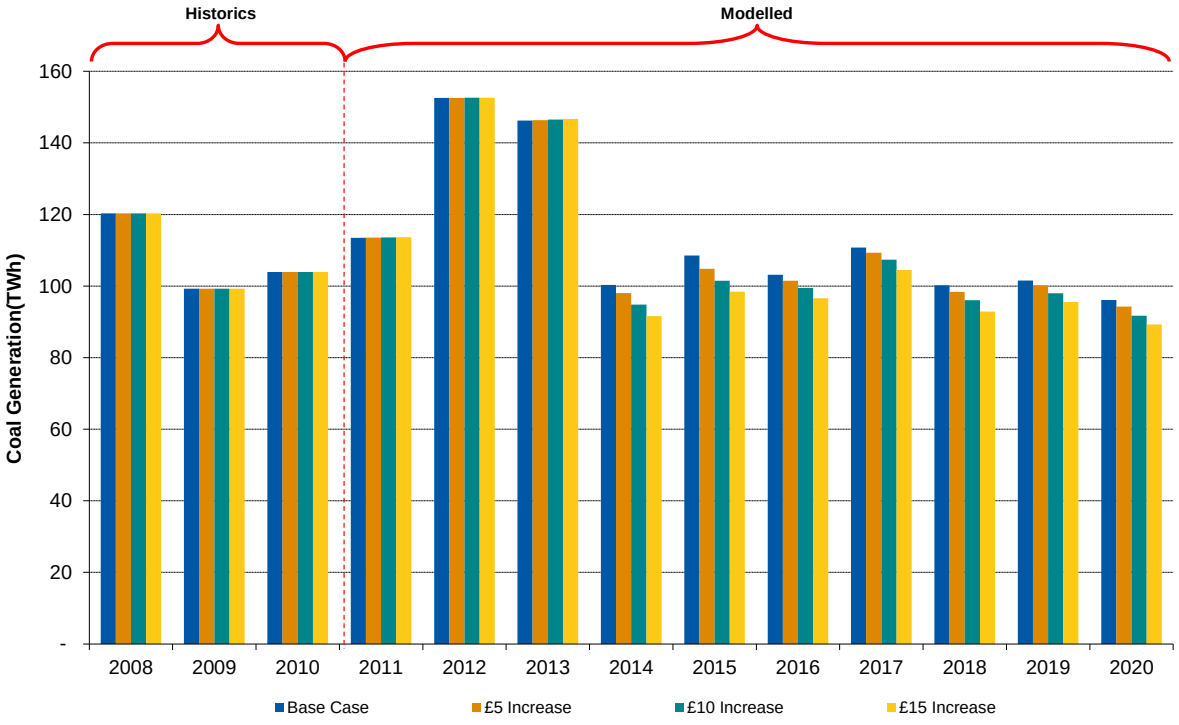
Table 4.2
Percentage Impact of TAC Increase on Coal Demand (DECC Assumptions)

% Change	2012	2013	2014	2015	2016	2017	2018	2019	2020
£5 Increase	0.1%	-0.1%	-0.8%	0.2%	-1.0%	-0.9%	-1.5%	-2.6%	-5.3%
£10 Increase	0.3%	-0.1%	**-1.4%**	0.3%	-2.3%	-1.7%	-3.6%	-5.3%	-11.0%
£15 Increase	0.5%	-0.3%	-2.5%	0.8%	-4.3%	-3.8%	-6.8%	-8.8%	-15.6%

Source: NERA analysis

By comparison, Figure 4.2 shows the impact on power generation from coal from our May 2012 report. The corresponding change in coal demand is shown in tables Table 4.3 and Table 4.4.

Figure 4.2: Impact on Coal Demand (May Report)



Source: NERA analysis

Table 4.3
Impact of TAC Increase on Coal Demand in Tonnes (May Report)

Deltas (tonnes)	2012	2013	2014	2015	2016	2017	2018	2019	2020
£5 Increase	-538	41,381	-928,003	-1,528,535	-654,151	-572,450	-732,913	-562,833	-741,655
£10 Increase	17,046	95,249	-2,228,075	-2,897,725	-1,472,293	-1,362,695	-1,686,787	-1,416,020	-1,771,222
£15 Increase	17,046	156,092	-3,514,920	-4,141,399	-2,618,210	-2,518,205	-2,939,925	-2,398,018	-2,742,834

Source: NERA analysis

Table 4.4
Percentage Impact of TAC Increase on Coal Demand (May Report)

% Change	2012	2013	2014	2015	2016	2017	2018	2019	2020
£5 Increase	0.0%	0.1%	-2.3%	-3.5%	-1.6%	-1.3%	-1.9%	-1.4%	-2.0%
£10 Increase	0.0%	0.2%	**-5.6%**	-6.7%	-3.6%	-3.1%	-4.3%	-3.6%	-4.7%
£15 Increase	0.0%	0.3%	-8.9%	-9.6%	-6.5%	-5.8%	-7.5%	-6.0%	-7.3%

Source: NERA analysis

Table 4.5 and Table 4.6 show the total impact on coal demand (coal lifted and coal moved) over the whole period 2014-2018.

Table 4.5
Total Impact on Coal Demand 2014-2018 (DECC Assumptions)

	Coal Lifted		Coal Moved	
	million tonnes	*% Change*	*million tonne kms*	*% Change*
Base Case	211	0.0%	31,901	0.0%
£5 Increase	209	-0.8%	31,594	-1.0%
£10 Increase	208	-1.6%	31,289	-1.9%
£15 Increase	204	-3.1%	30,668	-3.9%

Source: NERA analysis

Table 4.6
Total Impact on Coal Demand 2014-2018 (May Report)

	Coal Lifted		Coal Moved	
	million tonnes	*% Change*	*million tonne kms*	*% Change*
Base Case	178	0.0%	27,889	0.0%
£5 Increase	174	-2.1%	27,221	-2.4%
£10 Increase	170	-4.6%	26,501	-5.0%
£15 Increase	165	-7.4%	25,466	-8.7%

Source: NERA analysis

Comparison of the above tables and charts shows that the overall levels of impacts are similar whether the starting point is the revised base case (using DECC assumptions) or the base case

used in our May report. Indeed, the reductions in demand during 2014-18 are slightly lower when starting from the revised base case.