ANNEX 8: DECC SCENARIOS

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1. Executive Summary

1.1 Background

In order to complete our expenditure forecast we have considered the regional economic forecast for our operating area and likely changes in customer behaviour driven by the wider context of the UK fourth Carbon Budget Plan that seeks to reduce CO_2 emissions by 35% (from 1990 levels) by 2023 and by 80% by 2050.

The Government, through DECC, has set out four potential scenarios that lead to the delivery of the CO_2 emission reduction targets. These are detailed in 'The Carbon Plan: Delivering our low carbon future' (December 2011) and are summarised below:

DECC Scenario		Heat Pump adoption	Electric Vehicle take up	PV take up	DSR take up
Low - Purchase of international credits	4	Low	Low	Low	None
Medium - High abatement in low carbon heat	1	High	Medium	Medium	None
Medium - High abatement in transport and bio-energy	2	Medium	High	Medium	Medium
High - Focus on high electrification	3	High	High	High	None

These scenarios all envisage greater usage of Low Carbon Technologies (LCTs) such as electric vehicles and heat pumps and also varying levels of energy efficiency and customer participation in commercial options such as Demand Side Response (DSR) (where customers receive a financial incentive to vary the time at which they use electricity).

LCT devices will inevitably increase the demand for electricity, with a doubling of demand by 2050 possible; however there is significant uncertainty as to when and where the increase in demand will materialise.

In formulating our investment plans we have undertaken extensive modelling of these scenarios and included other factors such as energy efficiency, the likely increase in distributed generation particularly at domestic customer level and the benefits of the new smart grid and smart meter technologies now emerging from our innovation programme.

1.2 Forecasting Outcome

The total additional forecast costs of the DECC scenarios are as follows:

£m 2012-13 prices	Increment above Scenario 4 (Low)		
	1	2	3
TOTAL	106.3	129.4	152.8

2. Best View of LCT Uptake

In assessing which of the scenarios is most likely to represent the uptake of LCTs for our region we have engaged widely with our regional stakeholders. This work has indicated that the general outlook for economic activity in the North West is likely to be lower than the national average and history indicates that the region will emerge from the recession more slowly than others such as the South East.

We are also aware that government funded stimulus such as the Domestic Renewable Heat Incentive have been set at a level that favours off-gas grid areas. As the North West has a high degree of gas grid availability and a relatively low level of all electric high multiple occupancy buildings we consider it likely that uptake of such incentives will be comparatively lower than in other regions.

The combination of these economic drivers and stimulus packages indicates that LCT take up will be lower in the North West than the national average. As such we have concluded that the DECC Low scenario is the most probable estimate for RIIO-ED1 for our region.

In order to produce a more accurate asset investment plan we have subdivided the overall regional LCT forecast into sub-regional adoption levels. The Tyndall Centre (part of the University of Manchester) was commissioned to advise how DECC's forecast of heat pump penetration would be likely to map to each local authority (LA) area within our operating area. In addition, they advised how this penetration may be clustered. This latter clustering factor is critical to determining the timing and location of investment needs.

Similarly, the Transport Research Laboratory was commissioned to advise how DECC's forecast of Electric Vehicle (EV) penetration would be most likely to map to each local authority (LA) area within our operating area, again with associated clustering assumptions.

In designing the delivery model for our business plan we have been mindful of the need to be able to flex resources in the event that LCT adoption rates are higher than anticipated. Our delivery plan, detailed in Annex 7, shows how we will be able to increase our contract resources and flex our less time critical investments to accommodate any reasonably foreseeable level of LCT adoption up to and including the highest of the DECC scenarios. The same approach would be applicable for a higher than forecast level of regional economic activity.

3. How We Have Built Up Our Forecast

Our low carbon technology scenarios are based on DECC equivalent scenarios and align with LCT volumes predicted by the Transform model. The table below details the total incremental LCT volumes for our region forecast by technology type over the RIIO-ED1 period.

	DECC scenario			
	1	**2**	**3**	**4**
Heat Pumps	86,475	65,889	86,475	45,303
EV slow charge	38,390	60,133	60,133	12,891
EV fast charge	104,287	159,166	159,166	34,146
PVs (MW)	757	757	941	61

Our approach to calculating the low carbon scenarios is as follows:

- The demand forecast is based on a start point of winter 2011 demand (ie Q3 and Q4 2011-12).
- From the start position we add our base economic forecast which is based on the CEPA economic forecast for our region as at May 2013.
- For each of the four DECC scenarios we then add a supplemental investment forecast to reflect the specific LCT adoption rates for each scenario.

This produces four demand forecasts for all of our network assets (one per scenario), this demand forecast is then compared against existing network capacity and where capacity is exceeded an intervention need is identified. The comparison of forecast demand to capacity at the specific asset level is expressed in the form of a Load Index (LI) with an LI of 5 indicating a need to carry out some form of intervention.

The overall reinforcement costs forecast as resulting from each DECC scenario are as follows;

£m 2012-13 prices	**DECC Scenario**			
	4 (Best View)	**1**	**2**	**3**
EHV & 132kV Reinforcement	39.3	42.9	42.9	53.1
LV & HV Reinforcement	49.5	137.4	159.7	163.7
Sub-total	**88.9**	**180.3**	**202.6**	**216.8**
Fault level	14.5	14.5	14.5	14.5
TOTAL	**103.3**	**194.8**	**217.1**	**231.2**

Annex 21 gives more details of our reinforcement forecasting methodology and the following sections discuss the results in more detail.

3.1 EHV & 132kV reinforcement

Our Grid and Primary (G&P) reinforcement programme addresses reinforcement requirements of the 132kV and 33kV networks, inclusive of High Voltage (11kV and 6.6kV) switchgear at primary substations. This programme is a forecast of specific network issues including identified LIs, and P2/6 compliance for each scenario.

We have forecast demand on the network as a baseline forecast and an incremental forecast. For the baseline forecast we have used CEPA's projection of base economic activity. The incremental forecast recognises the impact on demand of the DECC four scenarios. These forecasts are applied to the network to identify issues requiring reinforcement.

Individual issues at 33kV and 132kV sites have been individually designed and priced for each scenario.

Pricing has been undertaken against the optimum design scope per scheme, each of which is appended to our business plan submission. Pricing of the component elements is based on our latest unit costs.

Our analysis of smart grid and smart meter benefits indicates that a 'smart discount' of 20% is attainable when the latest technologies emerging from indusry innovation work are applied. We have therefore priced our G&P programme on a traditional solution scope of work but discounted across the board by 20%.

3.2 LV & HV reinforcement

Our Secondary Network (SN) reinforcement programme addresses the reinforcement requirements of the High Voltage (HV) and Low Voltage (LV) networks. Although the network is studied to identify issues, the uncertainty surrounding where demand will materialise at these voltage levels means that the programme is specified as an intervention volume count priced with appropriate modular solutions (HV and LV) which in turn are comprised of efficient unit costs.

The Smart Grid Forum Transform model has been used to calculate secondary network reinforcement costs for voltage and thermal issues. Secondary network reinforcement driven by power quality is not covered by Transform and our costs have been calculated using our Future Capacity Head Room (FCHR) model.

Pricing for those elements covered by Transform are from Transform. Pricing of any other elements is based on our latest unit costs.

Our work on the effect of sustained high current loads such as heat pumps shows that they are in general not compatible with looped service configurations. We have calculated the number of such devices that will drive unbundling of such service connections arrangements and included appropriate costs in our forecast.

We have assumed no change in the connection charging boundary for the purposes of this submission.

The circuit type assumptions within the Transform model are, out of necessity, based on average circuit parameters for that circuit type, together with typical loadings for an appropriate mix of property types for the circuit type. As a consequence of this methodology and the apportionment of commercial loads within the model, there is the potential for the model to marginally under or over estimate the current loadings on any one circuit. In the case of our network, the simplified assumptions in the model cause results that suggest that a number of existing high and low voltage feeders may be operating at the margin of the nominal permitted levels for voltage, peak thermal capacity or power quality.

The Transform model estimates that the work required to address these issues would cost around £250m. As no customer feedback or network data exists to suggest that such a problem exists on our network, we have not included this potential capital investment in our forecast.

3.3 Distributed Generation

Reinforcement costs associated with the connection of micro-level Distributed Generation (DG) at domestic properties have been determined using the Transform model calibrated against our internal model. All of the smart grid benefits forecast by Transform have been incorporated into our investment plan.

For commercial scale DG, we have used the central DG forecast for our region provided by DECC. We have assumed no change in the connection charging boundary for the purposes of this submission and hence reinforcement charges for shared assets have been calculated in line with current actual costs.

3.4 Fault Level

Our fault level programme is common across all scenarios and is driven by the background load and DG levels.

Further details of the fault level programme and its derivation can be found in Annex 21.

3.5 Other Costs

Although the majority of the additional costs associated with the DECC scenarios are related to network reinforcement work, there are a number of other impacts on the cost base:

- Additional indirect costs to support delivery of the reinforcement projects (project design, management etc.)
- Additional Remote Terminal Units (RTUs) to control and further automate and control the network together with further LV monitoring installations to increase real-time management capabilities
- Additional IT support costs to manage the increased RTU and LV monitoring equipment

All of the scenarios will require the deployment of additional secondary network RTUs to a greater or lesser extent. These RTUs are mandated by many of the smart solution sets and additionally will be required to confirm load/generation management effectiveness.

They will be deployed at distribution substations dependent on the rate of load growth in particular network areas. They will support all smart grid solutions including closed loop control systems, active voltage control, sensing and demand/generation systems.

We have assumed that the Low scenario will require the installation of an additional 50 units per year above what would have otherwise been required. The further increments relating to the other DECC scenarios are as follows:

	Increment above Scenario 4 (Low)		
	1	**2**	**3**
Count of units p.a.	125	125	250
Total	1,000	1,000	2,000
Unit cost	£5,500	£5,500	£5,500
Total cost	£5,500,000	£5,500,000	£10,900,000
Additional Control hardware	£1,500,000	£1,500,000	£3,500,000
Total cost	**£7,000,000**	**£7,000,000**	**£14,400,000**

The total additional forecast costs of the DECC scenarios are therefore as follows:

£m 2012-13 prices	**Increment above Scenario 4 (Low)**		
	1	**2**	**3**
Reinforcement	91.5	113.8	127.9
Operational IT	7.0	7.0	14.6
IT running costs	0.8	0.8	1.4
Project support*	7.0	7.8	8.9
TOTAL	**106.3**	**129.4**	**152.8**

* This category is reported as 'Closely Associated Indirects' to Ofgem and includes activities such as design and project management

4. Summary

The nature of the new Low Carbon Technologies we anticipate will be connected during the RIIO-ED1 period will create issues not previously seen in any significant volume on the distribution networks.

Our work with industry partners through the Smart Grid Forum and bodies such as the Strategic Technology Programme has enabled us to put in place an innovative and efficient business plan that is able to flexibly respond to any foreseeable LCT and economic activity level.

The final technology deployed on any given intervention need will be determined by CBA analysis as the need arises. However the portfolio of solutions developed to date allows us to meet the forecast challenges at a much lower cost than traditional solutions.