

Appendix E – Manchester Gateway Smart Grid Project

Distributed Renewable Generation

Carbon Benefits of the Project

Within the Gateway, the Co-operative group plan to deploy a 17.4MW Biomass plant to generate onto the open network. The use of a Biomass plant to generate power as an alternative to higher carbon fuels will reduce GHG emissions. However, the export onto the network may present fault-level and network management issues. Thus the Northern Gateway project will deploy extensive network intelligence and a Distribution Energy Management System to resolve these issues and facilitate the operation of the generation.

For the purposes of estimating the carbon benefit, it is assumed that the plant will operate 24x7x365 with a typical load factor of 85%, and will use BioGas or woodchips as a fuel.

To calculate the GHG tCO₂e from a regular electricity generation we use the DECC GHG conversion figure for purchased energy - 0.61707¹ KgCO₂e per kWh.

Regular Electricity Production	
Regular Plant Output (MW) (85% Load Factor)	14.88

¹ DECC GHG conversion factor (Annex 3)
<http://www.defra.gov.uk/environment/business/reporting/conversion-factors.htm>

Annual output assuming 8760 hrs a year (MWh)	129,560
Carbon Generated each year (tCO ₂ e)	79,948

To calculate the GHG tCO₂e from a Biomass plant burning bio gas or woodchips, we use the average of the DECC GHG conversion figures for these two fuels – i.e. 0.3 KgCO₂e per kWh.²

Biomass Plant	
Regular Plant Output (MW) (85% Load Factor)	14.88
Annual output assuming 8760 hrs a year (MWh)	129,560
Carbon Generated each year (tCO ₂ e)	38,868

Annual carbon saving from using a Biomass plant is **41,080 tCO₂e**.

The financial carbon equivalent values are calculated based on the DECC traded carbon values³ in £/tCO₂e.

Year	2011	2012	2013	2014
Total Saving (tCO ₂ e)	41,080	41,080	41,080	41,080
£/tCO ₂ e	14.30	14.50	14.70	14.90
Carbon Value(£)	587,444	595,660	603,876	612,092

² DECC GHG conversion factor (Annex 9)

<http://www.defra.gov.uk/environment/business/reporting/conversion-factors.htm>

³ Financial Carbon Equivalent Values

http://www.decc.gov.uk/assets/decc/what%20we%20do/a%20low%20carbon%20GB/carbon%20valuation/1_20100610131858_e_@@_carbonvalues.pdf

The biomass plant will be owned and operated by the Co-op group, who will bear all costs of installation, operation and fuel. The Northern Gateway project is solely concerned with managing the

GB Rollout Benefit

It is difficult to predict how many commercial Biomass plants using biogas as a fuel could be deployed across the GB. In the absence of any forecast of projected biomass generation rollout in GB, we have assumed another 9 similar sized plants being commissioned between 2011 and 2050. We have assumed the same operating plant size and fuel mix.

The financial carbon equivalent values are calculated based on the DECC traded carbon values³.

Year	Number of generating units	Annual Output GWh	Carbon Reduction (tCO ₂ e)	DECC Equivalent carbon values 2009 £/tCO ₂ e	Equivalent Carbon Value (£)
2011	1	130	41,080	14.3	587,444
2012	1	130	41,080	14.5	595,660
2013	1	130	41,080	14.7	603,876
2014	1	130	41,080	14.9	612,092
2015	2	260	82,160	15.1	1,240,616

201 6	2	260	82,160	15.4	1,265,264
201 7	2	260	82,160	15.6	1,281,696
201 8	2	260	82,160	15.8	1,298,128
201 9	3	390	123,240	16.1	1,984,164
202 0	3	390	123,240	16.3	2,008,812
202 1	3	390	123,240	21.7	2,674,308
202 2	3	390	123,240	27.1	3,339,804
202 3	4	520	164,320	32.4	5,323,968
202 4	4	520	164,320	37.8	6,211,296
202 5	4	520	164,320	43.2	7,098,624
202 6	4	520	164,320	48.5	7,969,520
202 7	5	650	205,400	53.9	11,071,060
202 8	5	650	205,400	59.3	12,180,220
202 9	5	650	205,400	64.6	13,268,840
203 0	5	650	205,400	70.0	14,378,000

203 1	6	780	246,480	76.5	18,855,720
203 2	6	780	246,480	83.0	20,457,840
203 3	6	780	246,480	89.5	22,059,960
203 4	6	780	246,480	96.0	23,662,080
203 5	7	910	287,560	102.5	29,474,900
203 6	7	910	287,560	109.0	31,344,040
203 7	7	910	287,560	115.5	33,213,180
203 8	7	910	287,560	122.0	35,082,320
203 9	8	1,040	328,640	128.5	42,230,240
204 0	8	1,040	328,640	135.0	44,366,400
204 1	8	1,040	328,640	141.5	46,502,560
204 2	8	1,040	328,640	148.0	48,638,720
204 3	9	1,170	369,720	154.5	57,121,740
204 4	9	1,170	369,720	161.0	59,524,920
204 5	9	1,170	369,720	167.5	61,928,100

204 6	9	1,170	369,720	174.0	64,331,280
204 7	10	1,300	410,800	180.5	74,149,400
204 8	10	1,300	410,800	187.0	76,819,600
204 9	10	1,300	410,800	193.5	79,489,800
205 0	10	1,300	410,800	200.0	82,160,000
Lifetime Carbon Saving (tCO₂e)					9,037,600
Lifetime Carbon Value (£)					1,046,406, 192
NPV(£)					403,540,000

Payments to generators for managing their output to meet network requirements

At this early stage in the project development, it is not possible to identify

- a) baseline operating regime of biomass plant and other generators in the Gateway
- b) load profiles of demand in the Gateway
- c) potential scale and cost implications of thermal and fault-level constraints as a consequence. At present, this project has not identified that any reinforcement which could be deferred.

As such, we can not yet put a robust range on potential payments to generators to manage their output to meet network requirements. For the purposes of this bid, we have estimated an upper range of £54,000 in 2012/2013 and £55,000 in 2013/14; if

the bid is awarded but payments to generators are not required, this money would be returned to the fund.

Smart-grid project costs and deferring network reinforcement

Remaining project costs

The total costs of in the funding request are a combination of

- a) 'network costs' or the main expenditure on the network project, as shown in the first line of the table below. This involves the technical work and development of the project, such as the introduction of monitoring, communications, automation and project management, but does not involve any network reinforcement.
- b) 'other costs' including payments to generate and the Co-operative's costs.

Within LCNF bid	2011	2012	2013	2014
Network costs (£)	294,000	5,287,000	3,154,000	966,667
Other costs, including payments to generators and Co-op costs (£)	50,000	200,000	250,000	183,333
Total Second Tier Funding Request (£)	344,000	5,487,000	3,404,000	1,150,000

Remaining project cost - GB projection

Replication of the project across GB would be cheaper than the initial project, because of the learning undertaken in the initial stage. As a rough estimate, the costs of replication are estimated at

80% of their value in the initial project shown in the table above. Rounded to the nearest £100,000 and expressed in 2015/16 prices, this indicates the following *additional* costs for a GB rollout, multiplying the above costs by 9 for replication from 2016 onwards, spread out to 2050 rather than the sum in the table below. The spread of these costs over time is detailed on the net benefits spreadsheet. The subsequent rows of the table multiply payments to generators by 9. Furthermore, project management / dissemination costs of £75,000 per city are included in the initial years of each replicated project.

Replicate to 9 cities	Year 1	Year 2	Year 3	Year 4
Network costs (£m)	2.5	44.2	26.4	8.1
Payments to generators (£m)			0.5	0.5
Project management/ dissemination costs (£m)	0.3	0.3		

Costs excluded from this description

The Northern Gateway project bid does not include the Co-op's costs in owning and operating the biomass generator.