



RenewableUK policy paper

**Initial proposals for RIIO and specifically RIIO-T1:
The Low Carbon Economy Incentive (LCEI)**

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2. **Disclaimer**

- 2.1 This document is work in progress and has not been through a full consultation process within RenewableUK membership. The document is intended to support our proposals for the Low Carbon Economy Incentive (LCEI) by providing more details for discussion. However, it is RenewableUK policy to support and implement some form of LCEI as a primary output measure for RIIO T1 specifically, and for RIIO in general.

3. Background to discussions

- 3.1 On 4 October 2010, the Gas and Electricity Markets Authority (GEMA) published its 'Decision' document to implement a new regulatory framework, known as the RIIO model (revenue = incentives + innovation + outputs). The RIIO model has been designed to promote smarter gas and electricity networks for a low carbon future.
- 3.2 The overriding objective of the RIIO model is to encourage energy network companies to:
- 3.2.1 Play a full role in the delivery of a sustainable energy sector;
 - 3.2.2 Deliver long-term value for money network services for existing and future consumers.
- 3.3 As stated within Ofgem's RIIO decision document¹, the energy sector is in a period of significant change. The changes are primarily driven by the need to deliver a low carbon economy – with a target of 80 per cent reduction in green house gas emissions by 2050 and the decarbonisation of electricity generation by 2030 – while maintaining security of supply. The drivers of change will continue to evolve. Network companies and the regulatory framework will need to adapt accordingly.
- 3.4 As part of the roll out and implementation of the new RIIO framework within subsequent price controls Ofgem has facilitated a number of stakeholder engagement activities. This has included the convening of numerous working groups, each considering identified price control categories and how the new objectives can best be instilled.
- 3.5 RenewableUK has been an active participant within the working group with responsibility for consideration of environmental outputs, customer satisfaction, and connections. RenewableUK has also contributed to the Price Control Review Forum, the Environmental Stakeholder forum, and a workshop on the Innovation Stimulus.
- 3.6 Through participation within such working groups, RenewableUK has argued that monopoly network companies have a vital role to play in the delivery of the low carbon economy, as well as in the address of renewable and low carbon energy targets.

¹ RIIO decision document: <http://www.ofgem.gov.uk/NETWORKS/RPIX20/Pages/RPIX20.aspx>

3.7 RenewableUK recognises that monopoly network companies are responsible for connecting the two markets of generation and demand. Historically, the old regulatory framework of RPI-X was responsible for driving improved efficiency within network activities. However, the scope and structure of RPI-X did not encourage network companies to take sufficient account of the wider energy sector and related available benefits. See Figure 1.

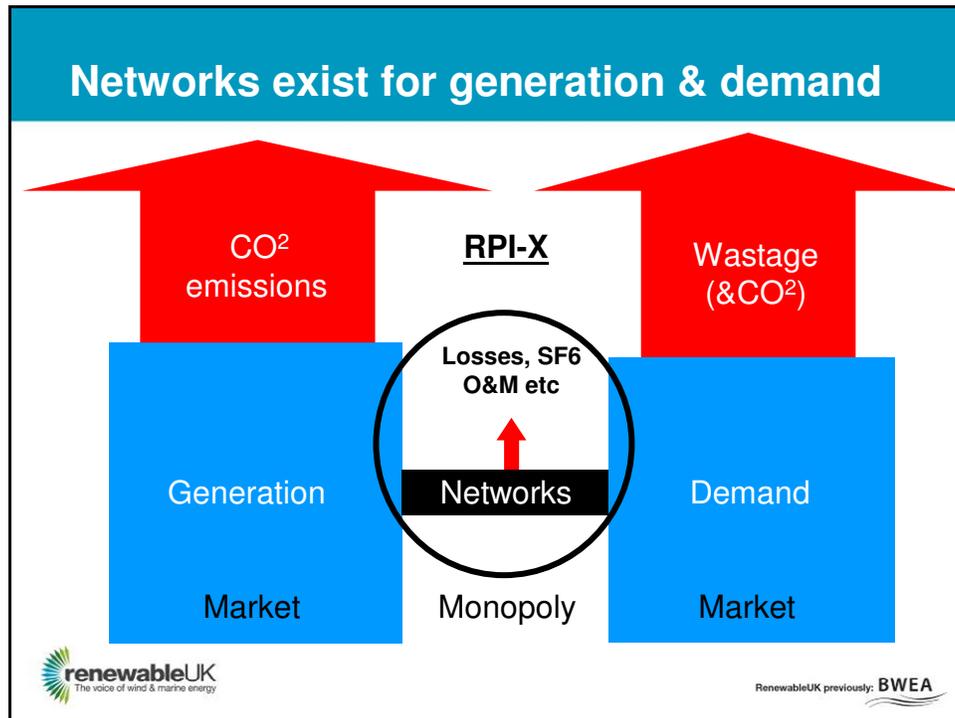


Figure 1: RPI-X focused on network activities without encouraging sufficient account to be taken of wider system benefits.

3.8 In transforming the regulatory framework, and moving from RPI-X to RIIO, monopoly network companies must now play a full role in the wider energy sector through supporting the delivering of the low carbon economy. This will require network company activities to take account of the benefits available within the generation and demand markets, and to provide services that enhance the ability of the wider system to provide long term benefits to consumers.

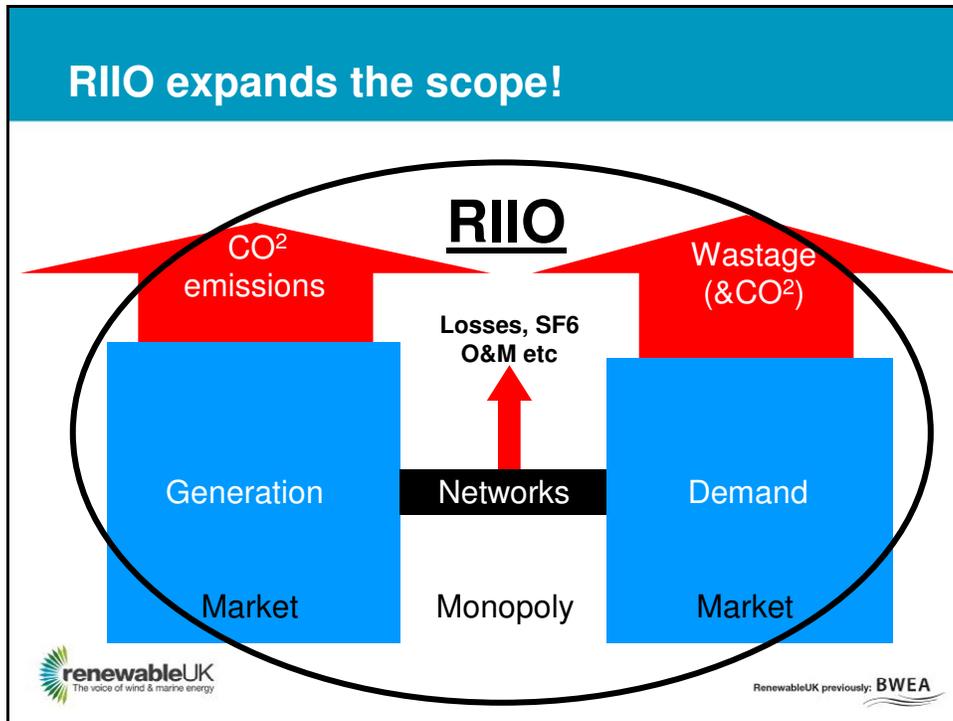


Figure 2: RIIO encourages the activities of monopoly network companies to take account of the wider system benefits.

3.9 Example: Under RIIO, the network company may allow losses to increase in volume on the basis that larger carbon prizes are captured within the wider energy system through the reduction the carbon intensity within the generation market.

3.10 With regard to the deliver of the low carbon economy, and the provision of long term value for money, RenewableUK recognises the RIIO framework will support the delivery of the following milestones:

3.10.1 EU 2020 Renewable Energy Targets – 15% of energy;

3.10.2 UK 2030 Decarbonisation of Electricity – Reduce carbon intensity to 50gCO₂/KWh;

3.10.3 UK 2050 GHG Emission Target – 80% reduction.

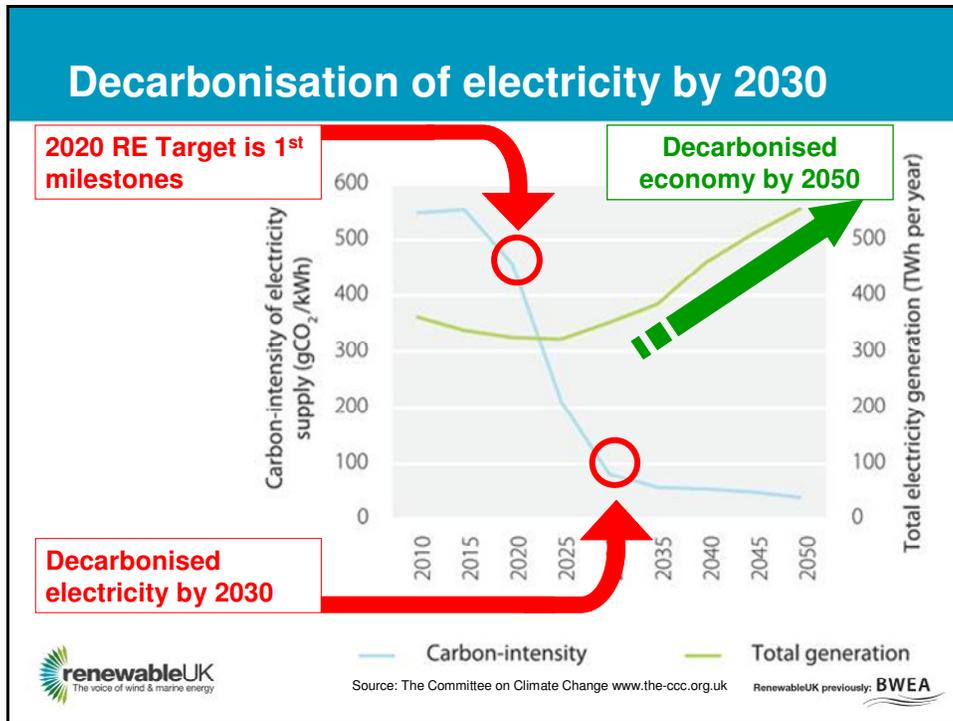


Figure 3: The Committee on Climate Change recommends least cost address of 2050 emissions targets will require decarbonisation of electricity by 2030.

- 3.11 Whilst we recognise that monopoly network companies neither build the generation plants, nor deploy insulation, their activities (or lack of pro-activity) can materially affect the ability of wider system to decarbonise, as well as the speed and also the cost at which such a transition can take place. Network companies have the simultaneous capacity to support and obstruct the rate at which the low carbon economy can be delivered.
- 3.12 In recognition of RIIO objectives, and the vital role networks will play in delivering those objectives, RenewableUK has proposed RIIO-T1 to include a dedicated output measure to encourage the low carbon economy – the LCEI.

4. What can the network companies do to play a “full role” in the delivery of sustainable energy sector?

4.1 The first reaction to the idea of a Low Carbon Economy Incentive is to ask what can the network companies do to help achieve the targets and the deliver of a sustainable energy sector. What type of activities should such an incentive encourage?

4.2 We have listed of a number of activities and issues below which could be delivered and improved on. We believe that with an appropriate incentive in place the companies themselves will add to this list, with innovation delivering new ideas. Our proposal for a team bonus will help encourage the dissemination and adoption of best practice and innovations. Some may be more applicable to DNOs, some to TOs, and some to the SO:

4.2.1 Connect generation more quickly;

4.2.2 Share reinforcements between new generators;

4.2.3 Encourage local use of renewable sources which would otherwise be constrained;

4.2.4 Minimise network investment requirements for renewables delivery;

4.2.5 Make anticipatory investments in networks so that generation connections can be delivered when generation is ready;

4.2.6 Smart grid and active network management scheme to facilitate connection;

4.2.7 Provide faster connection offers and more certain timescales and costs;

4.2.8 Provide more information on connection costs and opportunities for DG;

4.2.9 Encourage DSM to reduce network reinforcements and to use available DG locally and reduce constrained DG;

4.2.10 Change voltage control schemes to allow more generation onto 11kV networks without voltage rise issues;

4.2.11 Deploy dynamic line ratings to allow more wind on the system when lines are wind cooled;

4.2.12 Develop on-line phasor measurements and stability analyses to operate networks more efficiently and securely;

4.2.13 Encourage new demand connections to reduce their supply capacity by passing on lower costs / faster connections when DSM and DG measures are incorporated in new customer developments;

4.2.14 Identify “worst customers” in terms of carbon footprints and provide guidance / support and encouragement – including with third party providers – to reduce energy usage;

- 4.2.15 Find ways of providing more electric vehicle charging points without network reinforcements;
- 4.2.16 Identify means of connecting heat pumps whilst minimising network reinforcements;
- 4.2.17 Optimise the SQSS to speed connections, reduce constraints, minimise investments whilst maintaining security of supply;
- 4.2.18 Reducing grid barriers to entry by providing fast and free connection budgets;
- 4.2.19 Monitor and develop connect and manage;
- 4.2.20 Develop overhead line designs that will be more planning friendly;
- 4.2.21 Consider innovative line routes, voltages and designs e.g. to use motorway or rail corridors;
- 4.2.22 Develop ancillary services for low load factor conventional plant (e.g. reactive power, inertia, fault/short circuit infeed) to enable these generators to continue in the market and avoid closure;
- 4.2.23 Improve SO-TO coordination for outage planning;
- 4.2.24 Developing Demand Side Participation so that a load can offer services to the DNO, TSO and SO at different times;
- 4.2.25 Monitor and influence European 3rd Package codes and requirements to ensure they support renewables and low carbon generation;
- 4.2.26 Reduce barriers to connection by updating codes and regulations to properly account for new technologies;
- 4.2.27 Encourage new ancillary services that can be provided by new technologies (e.g. rapid controllable high frequency response from wind farms);
- 4.2.28 Be proactive in adapting the Grid Code to allow the connection of new technology – such as larger long shafted wind turbines which have different performance capabilities to current large wind turbines some of which are better than current code requirements and some of which are worse;
- 4.2.29 Co-operate and identify best national and international practice to allow wind turbines to be operated close to overhead lines without risking system security;
- 4.2.30 Re-examine every consultation and code change draft and ask – will this help or hinder renewables and decarbonisation?
- 4.2.31 Work with the Green Deal to identify users and areas most in need of investment to save energy;
- 4.2.32 Consider how they can work with gas networks, district heating networks and their own asset replacements and developments to deliver lowest cost low carbon heat and electricity to users;

- 4.2.33 Develop ideas with other industry players to unlock energy efficiency to deliver surplus capacity (as per consideration explore within the recent consultation on Electricity Market Reform);
- 4.2.34 Deploying innovation – deploying the unknown.

5. Materiality – Assessing the carbon saving opportunities

- 5.1 In considering how the electricity sector can be decarbonised in a cost effective and timely manner, it is important to first establish where carbon emission are located across the UK energy system.
- 5.2 At a RIIO-T1 working group on the 8th September 2010, Ofgem provided a quantified comparison of contribution to UK carbon emissions from networks and the generation market or electricity. Figures coming from Ofgem analysis clarified that in 2009 carbon emissions from electricity transmission losses equated to 2.64MtCO₂, compared with 149MtCO₂ from power stations (Losses data is from DEFRA, Generation data is from DECC).
- 5.3 Further analysis carried out by RenewableUK supported the notion that carbon emissions from the generation market far exceed equivalent contributions from networks regarding business carbon footprints (BCF), sulphur hexafluoride (SF₆), and losses. See Figure 4 and 5.
- 5.4 RenewableUK notes that TPCR4 and original TPCR5 proposals from Ofgem contained output measures for BCF, SF₆ and losses. Original proposals did not however contain output measures dedicated to the deliver of carbon reduction within the wider electricity market, where the vast majority of emissions are delivered.

Sector	Annual emissions (MtCO ₂ Equivalent)	Percentage (%)
Business carbon footprint (BCF) of network companies	0.01 ²	0.006
Sulphur Hexafluoride (SF ₆)	0.14 ³	0.09
Losses	2.64	1.7
Generation	154.0	98.2
Total	156.8	100

Figure 4: Generation market emissions overwhelmingly exceed those attributed to environmental activities traditionally incentivised under previous price controls.

- 5.5 Furthermore, it was noted in the Ofgem working group discussion that historic incentives could encourage perverse network activity if left unrevised in light of regulatory transition

² Estimated by RenewableUK

³ Estimated from Scottish Power: 700kg / year

from RPI-X to RIIO, from TPCR5 to RIIO-T1. For example, maintaining strong incentives to reduce losses, could discourage the connection of low carbon generation in remote areas of the network as these would increase losses, even though their deployment would deliver significant net carbon saving benefits to wider society. The workshop noted that such incentives on the network company would be in contradiction to the objectives of the new RIIO regulatory framework.

5.6 Industry stakeholders also considered the merits of applying financial weight to activities which offered immaterial contributions, or less cost effective contributions to emissions reduction, the deliver of the low carbon economy, and the objectives of RIIO.

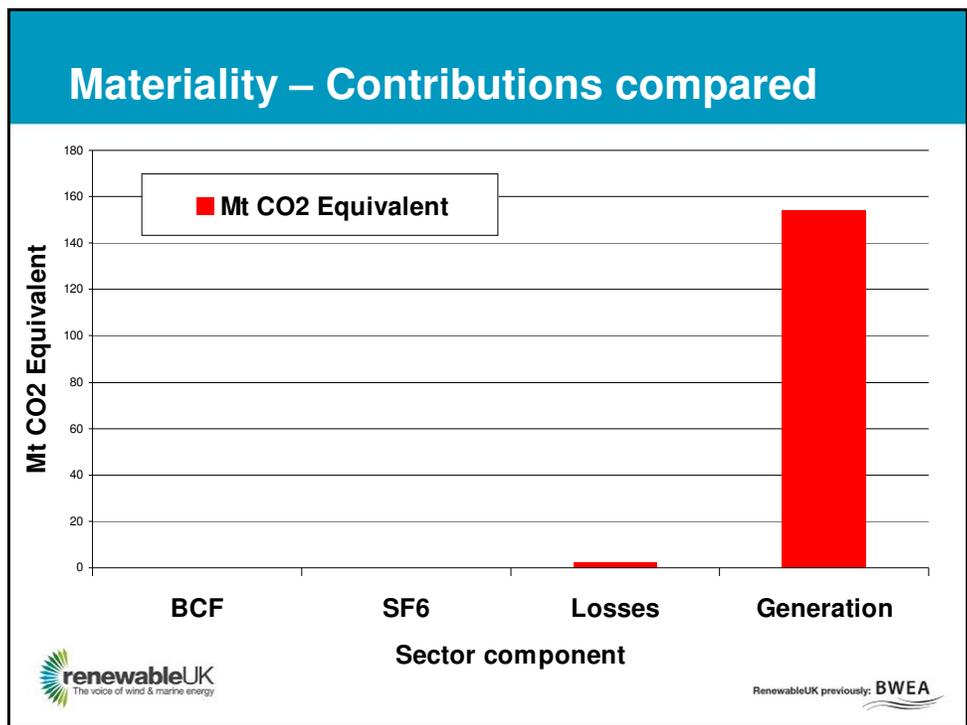


Figure 5: Original TPCR5 proposals incentivised network company activity on BCF, SF6, and losses but did not include a dedicated output measure for supporting the reduction of emissions within the generation market.

5.7 In order to inform the consideration of the materiality of network company activity with regard to RIIO objectives, RenewableUK undertook further analysis. We modelled potential network company activities with regard to BCF, SF6, losses and in supporting the accelerated delivery of low carbon generation. To compare the opportunities for carbon saving, we quantified the societal value provided in each area of activity through use of a shadow carbon pricing.

5.8 In our modelling for each activity of the network companies we took a view about what might potentially be achieved across the price control review period. Details can be found in Appendix A, with high level description as follows:

5.8.1 BCF – 25% reduction in emission over price control period;

5.8.2 SF6 – Annual reduction of 600 kg through asset replacement;

5.8.3 Losses – 30% of transformers replaced with low loss versions over price control period;

5.8.4 Low carbon generation – 1000MW of low carbon generation brought forward by 1 year, every year of price control;

5.9 RenewableUK modelling illustrates that pro-active support of low carbon generation, and the acceleration of related energy generation, by the network companies can yield a significant contribution to society in the form of long term carbon benefits. Detailed examination of potential network activities show the carbon saving potential of generation related activity could deliver benefits twenty five times greater than potential achievements in reducing SF6 emissions, and far in excess of that offered by action on losses and BCF. See Figure 6.

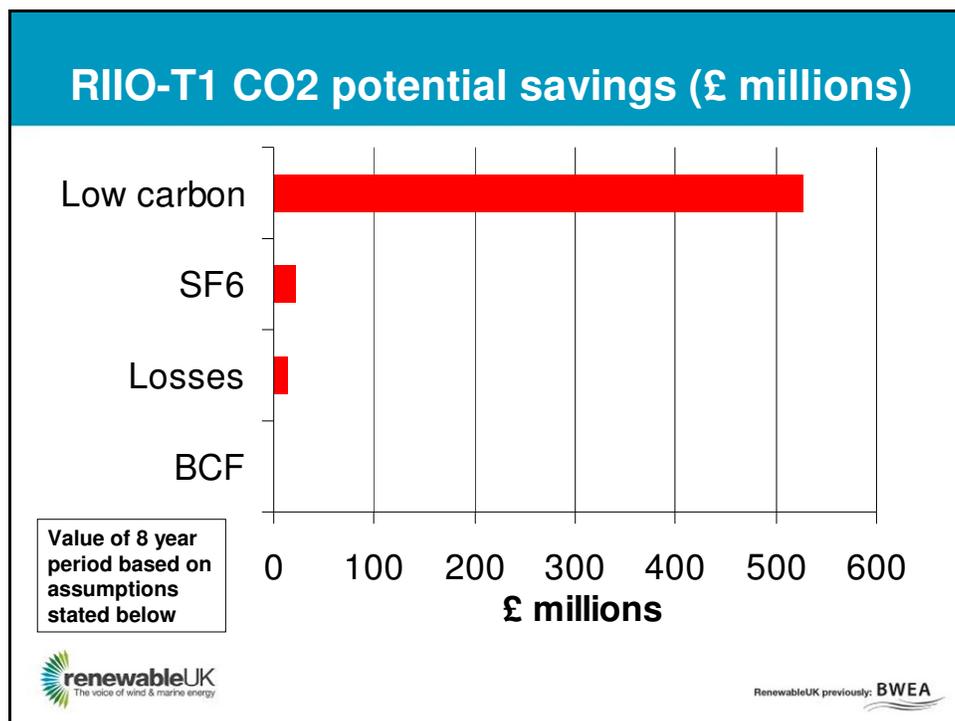


Figure 6: Materiality of network company activity compared- RenewableUK modelling assumption

5.10 RenewableUK recommends that network companies have a vital role to play in delivering the low carbon economy. Our analysis establishes that facilitating the decarbonisation of

electricity supplies is by far the most material means by which network companies can actively contribute to emission reduction, the delivery of a sustainable energy sector, and in so doing successfully contribute to the address the RIIO objectives.

- 5.11 On this basis RenewableUK welcomes the inclusion of a “broad environmental” output within Ofgem’s RIIO-T1 consultation. We believe that without a dedicated incentive based on delivering the low carbon economy, industry and Ofgem will have collectively failed to appropriately instil the principle of the new regulatory framework within RIIO-T1.
- 5.12 In considering whether RIIO-T1 will successfully deliver on the principles and objectives of RIIO, it is important to question to what extent the various output measures will aid the delivery of low carbon economy. RenewableUK undertook analysis of the various environmental outputs initially proposed by Ofgem for inclusion within RIIO-T1.
- 5.13 Using Ofgem’s stated principles against which any output measure should be considered, we assessed the comparative strength of five separate output measures in the context of delivering the low carbon economy. These output measures included an incentive on SF6, BCF, Customer Satisfaction, Losses, and the RenewableUK proposed LCEI output which centred on the deliver of the low carbon economy via the satisfaction of renewable and low carbon targets.
- 5.14 The principles, against which each output was judged, included Materiality, Comparability, Measurability, Comparability, Applicability, Compatibility with promotion of competition, and the extent to which the output was legally compliant.

Principles	Details
Material	significant contribution toward the objectives of Sustainable Network Regulation
Controllable	have full or a sufficient degree of control over performance against the primary outputs, with the strength of any incentive taking account of the degree of controllability
Measurable	possible to meaningfully measure the primary outputs using quantitative or qualitative methods
Comparable	be possible to measure the primary outputs meaningfully over time and across network companies in a sector by normalising the levels of performance that they are incentivised to achieve

Applicable	possible to use the primary outputs to set penalties and rewards as part of the process of determining revenue allowances
Compatible with promoting competition	facilitate competition in upstream and downstream markets
Legally compliant	compatible with existing legal obligations

Figure 7: Ofgem principles against which any output measure should be considered

5.15 RenewableUK’s assessment of the proposed environmental output measures found that historic output measures that have looked to address the carbon impact of network companies (e.g. SF6, BCF, Losses) gained low scoring regarding materiality. Overall, we considered that the Low Carbon Economy Incentive (LCEI) scored highest when considered across all seven principles.

Low Carbon Economy Incentive – Score		
Principles	Score	Details
Material	3	High level measure is most material
Controllable	1	Depends on generation being connected and demand changes
Measurable	2	Energy flows and related fuel types are already measured by others, needs breaking down by network company.
Comparable	1+1	Normalisation will be difficult because of geographic differences and changing technologies – however team bonus is proposed.
Applicable	2	Yes
Compatible with promoting competition	3	Compatible with competition
Legally compliant	1*	Yes - Supports UK international obligations and UK law
SCORE	14	


RenewableUK previously: 

Figure 8: The Low Carbon Economy Incentive scores

5.16 The Customer Satisfaction output measure scored higher than most on materiality, but only on the basis that we assumed the vast majority of customers were the large and significant low carbon / renewables stakeholders. It is not at all certain that the views of these customers will be weighted against the views of others. We also noted that customers may not fully understand the roles of TO, SO, or DNO and the planning system. We also highlighted the difficulties in ensuring potential customers (who are

unable to connect for network reasons) are properly captured, and in weighting existing customers in terms of their materiality and contribution to RIIO and low carbon objectives.

Customer satisfaction - Score		
Principles	Score	Details
Material	2	Assuming vast majority customers are low carbon / renewables
Controllable	2	Do customers understand roles of TO, SO or DNO and planning system (e.g. w.r.t. statements of works, charging, time delays)
Measurable	1	Hard to ensure potential customers are captured
Comparable	1	Hard to weigh importance / potential of each customer. Low numbers for TOs could be statistical errors.
Applicable	2	Assuming problems can be surmounted.
Compatible with promoting competition	3	Compatible with competition
Legally compliant	1*	Yes- Networks must respond to customers
SCORE	12	


RenewableUK previously: BWEA

Figure 9: Customer satisfaction output scores and additional explanation.

5.17 Any output on losses was considered to score low on materiality. The controllability of losses is more dependent on user behaviour (e.g. connection of generation and location of demand) than on network company activities⁴. Other challenges potentially preventing a losses output measure from being effective are posed by comparability and the normalisation of performance across differing circuit types, and annual generation variance.

⁴ A paper by National Grid demonstrated this point: TBA

Losses– Score

Principles	Score	Details
Material	1	Losses are only 1.8% of emissions – and carbon cost of losses will be negligible post decarbonisation.
Controllable	1	Depends on generation being connected and demand changes. TO changes higher voltage and low loss trafos are decades to roll out.
Measurable	2	Already measured but mixed up with accuracy and data issues + (at DNO level) theft.
Comparable	1	Normalisation will be difficult because of voltages, flows and annual differences. Outages exacerbate..
Applicable	1	Difficult - see above
Compatible with promoting competition	0	Irrelevant or anti-competition (discourages remote connections)
Legally compliant	1	Yes – done before
SCORE	7	



RenewableUK previously: BWEA

Figure 10: Losses output scores and additional explanation.

5.18 Un-weighted grading of each output measure can be found in Figure 11. More detail assessment of each output measure will be added to this document in due course.

Principles	SF6	BCF	Customer Satisfaction	Losses	LCEI
Material	1	0	2	1	3
Controllable	2	2	2	1	1
Measurable	3	2	1	2	2
Comparable	1	1	1	1	1+1
Applicable	2	2	2	1	2
Promoting competition	1	1	3	0	3
Legally compliant	1*	1*	1*	1*	1*
SCORE	11	9	12	7	14

Figure 11: Un-weighted comparison of various environmental output measures.

6. High level introduction to the Low Carbon Economy Incentive

- 6.1 The LCEI has been proposed by RenewableUK for inclusion with RIIO-T1 as a primary output measure. However we view the principle of incentive could also be applied to price controls for the system operator (SO), distribution network owners (DNOs) in the electricity sector, and even across the gas sector. This document is restricted to the electricity sector and focuses on transmission.
- 6.2 The incentive aims to encourage the monopoly network companies to play a full roll in the delivery of a sustainable energy sector, and to support RIIO-T1 in meeting the primary objectives of the RIIO regulatory framework. The incentive will reward transmission owners for pro-activity in cost effectively delivering the low carbon economy in conjunction with other energy sector stakeholders such as project developers, manufacturers, innovators, DNOs, SOs, planners, and neighbouring transmission owners.
- 6.3 We anticipate the Low Carbon Economy Incentive will support the encouragement of some of the activities highlighted in Section 4 of this document.
- 6.4 The incentive is structured on the basis of two parameters: (a) national progress towards renewable and low carbon policy milestones, and (b) individual network company contribution towards renewable and low carbon policy milestone
- 6.5 We note is the policy of UK Government to:
- 6.5.1 Renewables: Source 15% of energy supplies from renewables by 2020;
- 6.5.2 Low carbon: Reduce GHG emissions by 80% by 2050;
- 6.6 The UK Government has published the Renewable Energy National Action Plan⁵, which details the rate of change that will need to be delivered across the heat, electricity, and transport sector over the next decade. It details that by 2020, 31% of UK electricity supplies will need to come from renewables in order for the overall energy target to be met:

⁵ DECC RE NAP:

http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/ored/uk_action_plan/uk_action_plan.aspx

Table 1: DECC RE NAP: Percentage of UK electricity supplies provided by renewables 2010-2021 (BLUE shading reflects RIIO-T1) (*2010 figure = NAP2010 – DUKES2009)

Year	NAP RE %	Annual percentile change
2010	8.6%	1.6*%
2011	10.1%	1.5%
2012	11.4%	1.3%
2013	12.7%	1.4%
2014	14.3%	1.6%
2015	16.2%	1.8%
2016	18.9%	2.8%
2017	22.0%	3.0%
2018	25.0%	3.0%
2019	27.9%	2.9%
2020	31.0%	3.2%
2021	-	-

6.7 Assuming renewables are deployed in keeping with the NAP throughout 2011 and 2012, this will mean that over the first 7 years of an 8 year RIIO-T1 price control, the percentage contribution from renewable will have to treble. Depending of the mix of technologies and their performance, operational renewable capacity will need to increase from 12.7GW to an estimated 38.2GW by the end of 2020. The pro-activity of network companies is essential to enabling such level of deployment to take place.

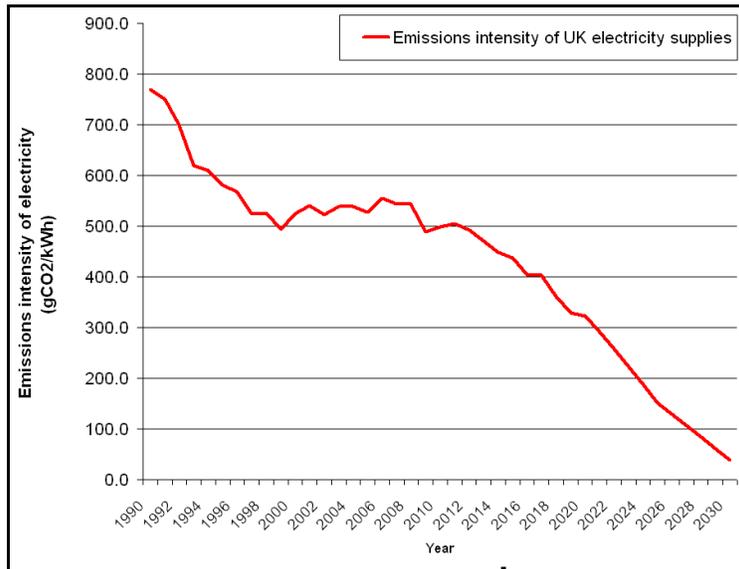


Figure 12: The Committee on Climate Change recommends reducing the emissions intensity of electricity to below 50gCO2/kWh by 2030

- 6.8 Whilst the UK government is legally bound to reduce emissions by 80% by 2050, the decarbonisation of UK electricity will be required at an early stage to enable the electrification and decarbonisation of the heat and transport sectors. In their 4th Carbon Budget Report, the Committee on Climate reiterated that for least cost satisfaction of 2050 emission targets, the early decarbonisation of electricity is essential. The CCC has recommended that the emission intensity of electricity will require reducing to below 50gCO₂/kWh by 2030.
- 6.9 Decarbonisation of electricity by 2030, in just two decades time, will be a challenging milestone and will require the rate of emissions reduction to match those delivered by the “dash for gas” during the 90s.

Table 2: CCC 4th Carbon Budget recommendations: electricity emissions intensity reduction over RIIO-T1 control period

Year	Emissions intensity of electricity (g/kWh)	Annual change (g/kWh)
2010	498.0	9.0
2011	504.7	6.7
2012	492.3	-12.3
2013	471.2	-21.2
2014	448.9	-22.3
2015	437.3	-11.6
2016	402.7	-34.6
2017	403.2	0.5
2018	361.3	-42.0
2019	329.5	-31.7
2020	322.7	-6.8
2021	292.3	-30.4

- 6.10 Table 2 shows the average annual reduction of emission intensity of electricity over the RIIO-T1 price control period equates to more than 25gCO₂/kWh.
- 6.11 In order to meet renewable and low carbon milestones in 2020 and 2030, we have only two transmission price controls with which to deliver successful results. RenewableUK proposes that RIIO-T1 (2013-2021) should possess an incentive dedicated to meet the 2020 renewables target and could have an incentive for the decarbonisation milestone, and that RIIO-T2 (2021-2029) should have an incentive on decarbonisation.
- 6.12 In terms of measuring the UK's progress toward these milestone it is possible to take account of, and actively track, the following parameters on an annual basis:
- 6.12.1 Volumes of generation (TWh) [G];

- 6.12.2 Losses (TWh) [L];
- 6.12.3 Demand (TWh) [D];
- 6.12.4 Generation from renewables (TWh) [RG];
- 6.12.5 Generation from non-renewables (TWh) [CG];
- 6.12.6 Generation type (Wind, Gas CCGT, Coal, etc);
- 6.12.7 Carbon intensity of each generation type (gCO2/kWh);

6.13 The above letters in square brackets [] relate to Figure 13 below.

6.14 It is similarly possible to take account of, and actively track each of these parameters for each network system component, i.e. for a transmission network [T], or a distribution network [D], or an offshore transmission network [OFTO], or for an interconnector network [IC].

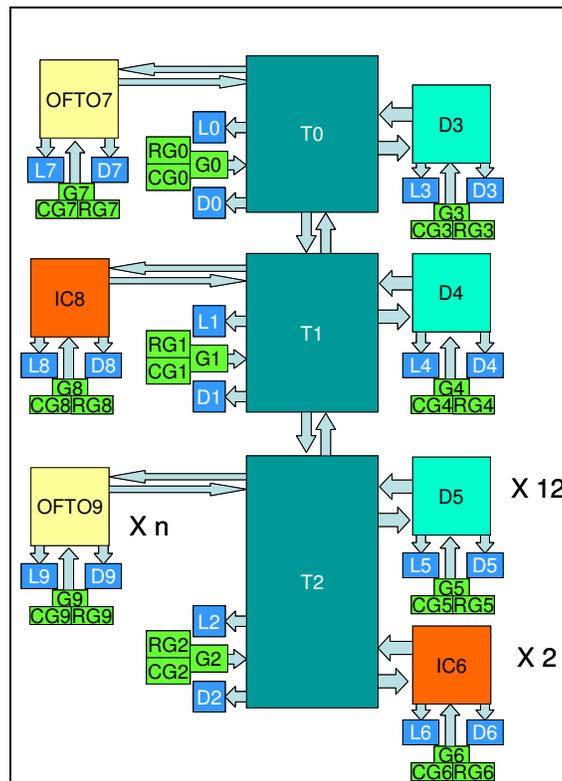


Figure 13: Schematic diagram showing different network components (Transmission, Distribution, OFTO, Interconnector)

6.15 Figure 13 shows a schematic of the different network components and related parameters.

6.16 In modelling numerous network components, it is possible to track energy flows with regard to directly connect customers, but also between different network components. In

so doing, it is possible to understand either the proportion of energy flows in that network component that is renewably sourced, or indeed the carbon intensity of the energy flow in that network component.

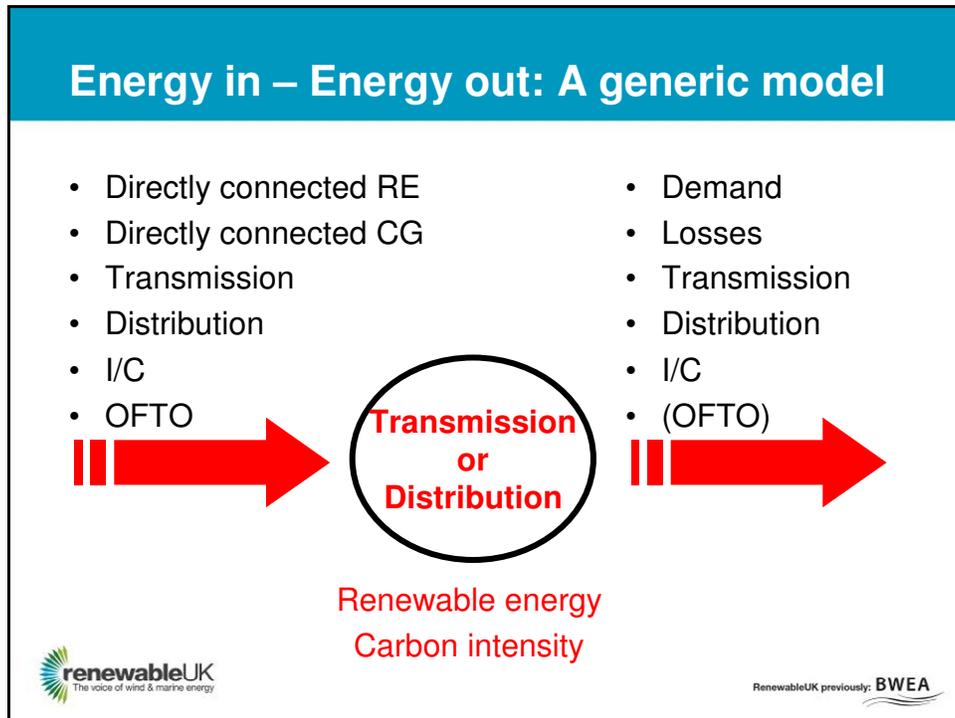


Figure 14: For each network component it is possible to calculate the carbon intensity of its energy flows as well as the proportion of its energy flow that is renewably sourced.

6.17 Such an approach can be taken beyond modelling so to consider actual energy content of existing GB networks, be that for the purpose of understanding renewable content or the carbon intensity of energy flows. RenewableUK recommends that it is on this basis that network companies should be incentivised as part of RIIO-T1.

7. Detailed introduction to the Low Carbon Economy Incentive

7.1 RenewableUK has established that, for each network component, it is possible to understand and track either (a) the proportion of energy flow in that network that is sourced from renewables, or (b) the carbon intensity of energy flow in that network.

7.2 RenewableUK has also established annualised metrics charting the level of progress that is required to meet both (a) the renewable energy target for 2020, and (b) the decarbonisation of electricity by 2030;

7.3 We will now explore how the LCEI will structure in rewarding monopoly network companies for national and individual progress towards each of these milestones. At this point it is worth stating that our proposal aims to provide a “straw man”, so to concentrate minds, stimulate further discussion, and benefit from the contributions of other industry stakeholders in further refining its design. Going forward we anticipate there will be further opportunities for Ofgem and industry to collectively consider the detailed architecture of such a proposal, and how it can be best customised to meet overall ambitions.

7.4 For simplicity and in the interests of clarity we have chosen to separate the design of a Low Carbon Economy Incentive into the following stages:

7.4.1 Size of ambition

7.4.2 Size of reward

7.4.3 Shape of reward

7.4.4 Distribution of reward

7.5 Before considering each of these stages it is worth clarifying that subsequent examples are based on incentivising renewable generation, and the successful address of 2020 targets. The LCEI could equally be based on carbon intensity, rather than, or in parallel with renewable generation.

7.6 Size of ambition

7.7 In our view the LCEI should support the delivery of renewables targets i.e. an increase in renewable electricity from 11.4% to 31% (see Table 1 above) a change of 19.4 percentage points.

7.8 Size of reward

7.9 Once the LCEI ambition is agreed, it is then necessary to place a financial value on achieving this ambition in the context of price control revenues. RenewableUK plans to carry out further analysis on what size of incentive would be necessary for RIIO-T1. However for the purposes of explaining LCEI, we propose that 2.5% of total transmission revenues should be incentivised through LCEI. Based on overall annual RIIO-T1 revenue of approximately £1.6 billion, the LCEI value is worth £40m annually, and £320m over the duration of the price control period.

7.10 We recommend the value of the LCEI incentive should be strong enough to overcome any competition posed by diametrically opposed or competitive incentives. So for example, the LCEI incentive should be stronger than any focused on minimising losses such that the wider carbon prizes of the generation market can be captured.

7.11 The next step is to consider the value of unit change. Using the above numbers for total incentivised revenue over the price control period in conjunction with the size of ambition, it can be said that each percentile change point is worth £16.5m (LCEI value divided by LCEI ambition, 320/19.4). So if the UK increased the contribution of renewables by 1 percentage point, the LCEI reward would equate to £16.5m.

7.12 We note SO, and DNO incentives have previously been of the order of £40-80m per annum, and we would recommend a £40m annual incentive would not be an unreasonable level of incentive.

7.13 Shape of reward

7.14 In considering how the LCEI should be designed, there are a number of different options which could potentially promote different behavioural reaction from those incentivised.

7.15 Initially we considered the LCEI reward could be flatly applied to annual progress against predefined renewable and low carbon metrics. However we note that other payment shapes could be applied by adopting a stepped, or even a ramped payment methodology, see Figure 15.

- 7.16 So for example, a step payment could only activate the provision of a LCEI reward per percentage point of change if a pre-defined national (or individual) annual target was met.
- 7.17 For both step and ramp approaches, it would be possible to define lower and up caps, as well as the timing and/or rate at which the step/ramp would be activated. See Figure 15 for an illustration of this.
- 7.18 RenewableUK would recommend the LCEI reward is made payable annually. However we would welcome the views of others on this point.
- 7.19 We note that the setting of national targets could be informed by the DECC RE NAP for a renewable based incentive, and by CCC recommendations for a low carbon based incentive. There would be a question over how such targets would be annualised, but such breakdown could either be made in line with given figures, or annualised on an average basis across the price control period. We note the setting of individual, or indeed national targets could also be informed by the well justified business plans of the network companies.

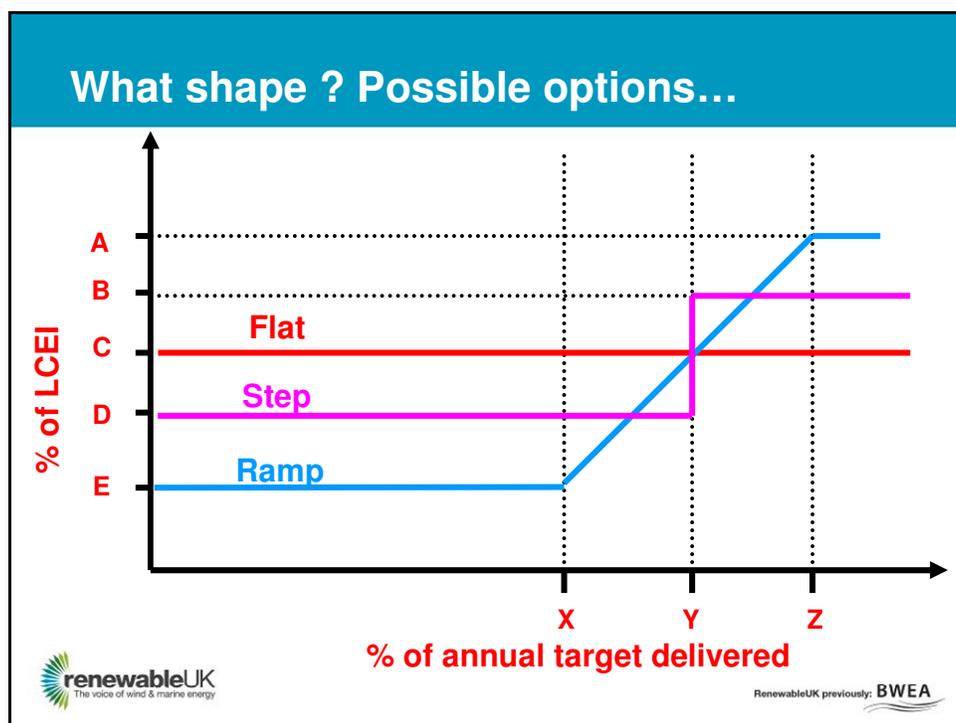


Figure 15: Different payment designs

- 7.20 Distribution of reward

- 7.21 There is also flexibility with regard to the method of allocating and distributing reward.
- 7.22 One option is to distribute the reward for national progress towards target milestones on “team bonus” basis. This is where the reward for national progress is distributed evenly to network companies, regardless of individual contribution. We recognise that structure of reward can overcome any perverse incentives where network companies could deny societal benefit through excessive competition between one another. However we also recognise that the incentive should not look to reward “free loading” where network companies are rewarded mainly on the performance of fellow team members rather than their own pro-activity.
- 7.23 Ultimately all system components will need to improve the level of cross company collaboration in order to deliver the low carbon economy. And so we recommend that maintaining a team bonus element to the LCEI will positively encourage greater collaboration and support the building of improved working relationship in the interest of societal as a whole.
- 7.24 Ofgem have highlighted that the discretionary element of the distributing the reward could dynamically alter over the price control period. So for example, in the 1st year of the price control all LCEI reward payment could be paid of a 100% team bonus basis, with each subsequent annual distribution of LCEI reward payments increasingly distributed on an individual, rather than national, performance.

7.25 So in summary, there are four primary decision categories that will define the function and impact of the LCEI, see Figure 17. These include:

(1) Size of ambition:

- Decide of whether to use a Renewable based LCEI or a Low Carbon based LCEI, or both;
- Define the units (e.g. percentage points for a renewable LCEI, or gCO₂/kWh for a low carbon LCEI);
- Define the level of change for the 8 year price control period;
- Define how this change will be allocated on an annual basis;

(2) Size of reward:

- Decide the size of the reward, (e.g. the reward could equate to 2.5% of the network company's revenue).
- Calculate the corresponding value of unit change (e.g. £ / percentage point change in Renewable contribution to UK electricity supplies);

(3) Shape of reward:

- Apply a flat, stepped or ramped reward shape;
- Annual target will require defining;
- If stepped or ramp, the dimension of the reward will require deciding upon (e.g. 0% of the value of unit change will be released unless an annual target is met, in which case 100% of the value of unit change is released);
- Upper or lower caps may or may not be required;
- The shape of the reward may or may not change over the price control period (e.g. the height of the step, or gradient of ramp may increase or decrease in relation to whether the overall system is on track to meet target milestones);

(4) Distribution of reward.

- Decide on the proportion of reward that is allocated on the basis of team or individual performance;
- The discretionary element may change over the price control (e.g. in year 1 of the price control, all fund could be allocated in a team bonus basis. But in following years the proportion of the total reward will become increasingly allocated on individual performance.

7.26 For a detailed example of how a flat rate LCEI could look, please see Appendix B.

8. **The LCEI and energy efficiency**

- 8.1 In the recent Government consultation on Electricity Market Reform, DECC referenced project analysis carried out by the European Climate Foundation Roadmap 2050 which found that in order for energy efficiency to meet its full potential, it needs to be “recognise, financed and delivered on the basis that it is a power system resource.” The LCEI proposed would incentivise the companies to encourage energy efficiency where possible as it would reduce demand and therefore non renewable generation increasing the proportion of renewable generation and lowering the carbon intensity.

9. Will the incentive provide perverse outcomes?

9.1 We are concerned that the LCEI does not result in:

9.1.1 Rewarding companies for business as usual;

9.1.2 Windfall gains;

9.1.3 Double counting with other incentives.

9.2 Avoiding rewards for business as usual can be achieved through appropriate design of the incentive scheme and mechanisms. This should ensure that companies can be incentivised on the basis that targets are on track to be met or exceeded, and not simply on the basis that progress is made regardless of original ambition. Benchmarking of businesses can be used to ensure that each company is pulling its weight. Customer satisfaction surveys can provide additional checks that the business has indeed played a role in meeting the targets. However as has been highlighted in section 5, customer surveys could pose challenges with regard to measurability. Companies can be asked to show what they have changed to help achieve targets.

9.3 Some other incentives proposed in RIIO-T1, as well as in other price controls, are also expected to contribute to the deliver if the low carbon economy. As such resulting company behaviours may hit two or more incentives. E.g. a connections incentive may mean that a company which connects lots of renewable and/or low carbon generation receives an incentive payment for connection and also an incentive for meeting renewables/ low carbon targets. In this case we should ask: which is the most appropriate incentive? And what might be the perverse outcomes? A connections incentive may reward connection of high carbon generation or low load factor renewables (e.g. solar PV) and despite this a renewables/low carbon target may be missed. We would therefore argue that preferred or dominant incentive in this case should be the LCEI.

10. Why not a reputational incentive?

- 10.1 In our view the broad environmental incentive should be financial and not reputational. A reputational incentive is of benefit where customers of a company can move their business to a competitor. In the case of licensed network businesses this is not generally the case. There is not an option for the vast majority of customers to change their network provider. Hence a reputational incentive will have a very limited financial impact - positive or negative – on the companies.

11. **Business plans**

- 11.1 We have to consider how the companies will consider renewables and decarbonisation in their business plans. We would expect each company to have a well researched and considered view as to its role in the process and the relevant activities and opportunities that could be exploited in its licence area. In particular we would expect each company to identify a matrix of the numbers, sizes and types/ fuel sources of renewables that will connect to their networks over the course of the price control (on an annual basis) and over the next price control period (to ensure the companies are investing in their networks in the current price control review period to deliver targets in the next period).
- 11.2 We would expect Ofgem to assess all the business plans of the TOs and DNOs and to assess whether these show that the targets will be met. If they are not forecast to be met we might expect Ofgem to benchmark the companies and reject business plans which are clearly inadequate in their assessment or accommodation of renewables and low carbon generation.

12. **Discrimination**

- 12.1 We want to emphasise that we are not seeking discrimination in favour of renewable or low carbon technologies and against conventional fossil fuel plant. We believe that the drivers towards these technologies will be delivered in the electricity and emissions markets and not in the network arrangements. The companies have licence conditions that prevent discrimination. We expect that the companies will follow these obligations in future and that they have followed them in their dealings with renewables to date; in spite of the challenges that new technologies and scales of generation have brought to the companies.
- 12.2 However, in every aspect there are often several options available to the companies which all meet their licence and statutory obligations. Therefore, we are looking beyond the obligations to influence the discretionary behaviours. We can imagine the scrutiny of current procedures, innovation and revised approaches that would result in the companies if security of supply was threatened and the lights were going out. For the integration of renewables and the transition to the low carbon economy a paradigm shift is required. We believe the necessary culture change throughout the companies is not something that can be legislated, but that can be delivered by the right incentives and management drive.

13. Benefit to consumers

- 13.1 The aim of the LCEI is to provide an overall benefit to consumers. In our view this will be achieved by delivering more renewable and low carbon generation faster and cheaper than would be the case without the LCEI. So although the incentive will be extra money collected from customers to fund the network companies, there will be lower costs elsewhere in the market which will reduce costs.
- 13.2 We aim to develop the evidence to show that the additional costs in the regulated income of the companies will be offset by savings elsewhere in the market, low carbon and renewables support schemes.

14. **Controllability**

- 14.1 We recognise that companies don't build low carbon and renewables generation nor do they insulate home, and these have been given as reasons why the companies cannot control the renewables or decarbonisation targets. We agree that they do not control these matters, any more than they control whether energy is generated or used, however they can speed up, slow down, decrease or increase costs of achieving the targets.

Appendix A: Detailed working supporting RenewableUK modelling of potential network activities to reduce emissions

BCF	Unit	Detailed comment / Activity
25	%	Assume 25% reduction over price control period.
0.01	MtCO2	Existing carbon footprint
0.0025	MtCO2	Annual reduction at end of RIIO-T1
0.01	MtCO2	Saving over 8 years
0.5	£m	Carbon value over price control period
SF6		
20	Kg	20kg per annum per changed GIS CB/CT
30	Units	Circuit breaker / Circuit transformer
600	Kg	Annual reduction
4800	Kg	Annual reduction at end of price control
0.11	MtCO2	Annual reduction at end of price control
0.42	MtCO2	Saving over 8 years
21	£m	Carbon value over price control period
Losses		
20	%	Assume 20% of losses are transformer losses
30	%	Assume 30% of transformers are replaced
40	%	Losses in each transformers are reduced by 40% by low loss versions
2.4	%	Annual reduction
0.06	MtCO2	Annual reduction at the end of price control period
0.86	£m	Carbon value over price control period
Low carbon Generation		
1000	MW	Low carbon generation brought forward one year, each year
35	%	Load factor
3.07	TWh	Annual generation brought forward a year early
0.43	Kg/kWh	Carbon intensity
1.32	MtCO2	Carbon saving each year
10.55	MtCO2	Carbon saving over 8 years
527.50	£m	Carbon value over price control period
50	£/tCO2	Carbon price, as applied for all modelling

Appendix B: Flat rate LCEI example

B.1 Size of ambition:

- Use a Renewable based LCEI;
- Unit = percentage point – percentage of UK electricity supplied by renewables;
- No annual target, as will apply a flat, uncapped reward;
- RE status at start of price control = 10.4% (See Year 1, Figure 16);
- RE target = 40% of UK supply from renewables by the end of price control.
- Level of change required for the 8 year price control period = 40 – 10.4 = 29.6%;

Example: Renewable Energy					
Transmission Owner	Year 1		Year n		Change
	RE (TWh)	% UK Gen	RE (TWh)	% UK Gen	Up to Year n
T0	5	1.3%	25	6.7%	5.4%
T1	10	2.6%	40	10.7%	8.1%
T2	5	1.3%	50	13.3%	12%
Distribution	20	5.2%	40	10.7%	5.5%
Total	40	10.4%	155	41.4%	31%

Note: RE = Directly connected RE generation + OFTO
Total generation (Year 1 / Year n) = 385 / 375 TWh




Figure 18: Example scenario for LCEI based on renewable progress

B.2 Size of reward:

- Size of reward = 2.5% of TO revenue = 0.025 * £1600m = £40m per annum
- Size of reward over 8 year price control = 40 * 8 = £320m
- Percentage point change over 8 year price control = 29.6 percentage points
- Value of unit change, over price control = 320 / 29.6 = £10.8m per percentage point of change;

Example: Renewable Energy

- Assume bonus = 2.5% of total revenues (£1.6Bn p.a.)
- **2.5% = £320m over 8 year price = £40m p.a.**
- Assume RE Target at end of 8 year price control = 40%
- Therefore RE30% (40 – 10.4) = £320m
- And Change Percentile, **RE1% = £10.8m**
- **Payment provided annually**



RenewableUK previously: BWEA

Figure 19: Summary of workings – Setting the ambition and value for the LCEI

B.3 Shape of reward:

- Flat rate of £10.8 per unit change;
- No annual target as the payment is flat, and uncapped;
- Shape of this payment will not change over the price control period;
- A flat payment shape would mean the LCEI reward is paid on the basis of progress toward overall targets regardless of the rate at which such progress is made, be that in a single payment cycle (e.g. 1 year), or across the control period as a whole.

B.4 Distribution of reward:

- For this example we have calculate the reward of the basis of a number of different distribution scenarios. Each scenario contains differing level of discretion in payment after year n. See figure 17 for details of this.
- In further consideration of this example in Figure 17, it is highlighted that total system change between year 1 and year n is 31%, in excess of LCEI ambition (29.4%). TOs have collectively contributed 25.5 percentage points of change, while DNOs have collectively contributed 5.5 percentage points of change.
- If an uncapped LCEI reward of £10.8m, per percentage point of change, is shared evenly between the three TOs in proportion to UK trends - Each TO would be rewarded with a third share of £336m, equating to £112m each.

Example: Team bonus Vs Individual bonus

	Change	Incentive reward (Year 1 to Year n)				
		Team bonus : Individual bonus				
		100:0	75:25	50:50	25:75	0:100
T0	5.4%	112	98	85	72	58
T1	8.1%	112	106	100	94	88
T2	12%	112	116	121	125	130
Total	25.5%	£336m	£320m	£305m	£291m	£276m

Distribution change = 5.2%, Total GB change = 31%
 Target change = 30% = £320m



RenewableUK previously: BWEA

Figure 20: Increasing the discretionary element within payment distribution