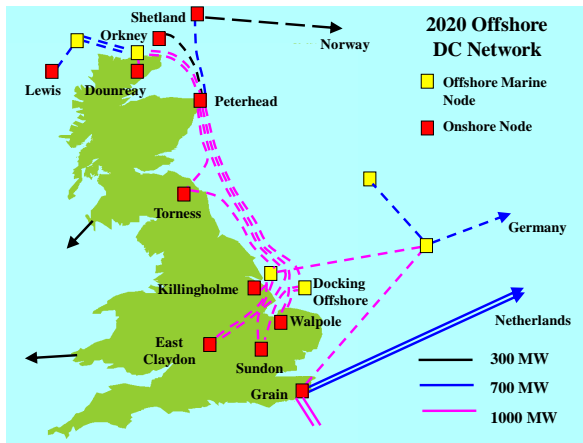
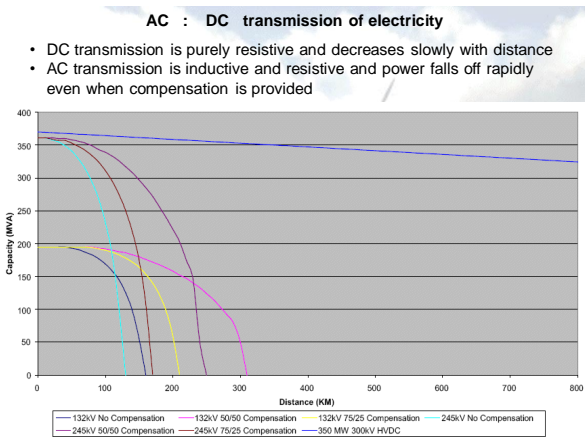
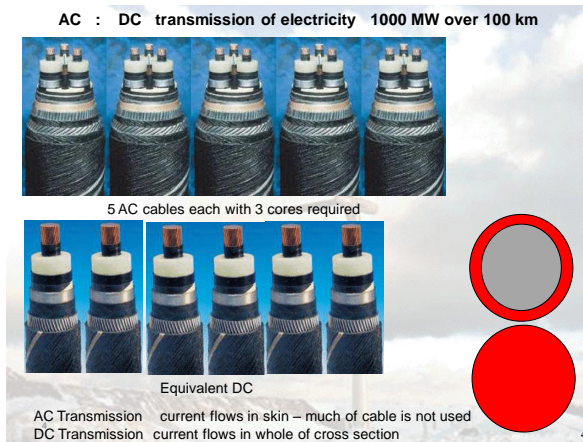
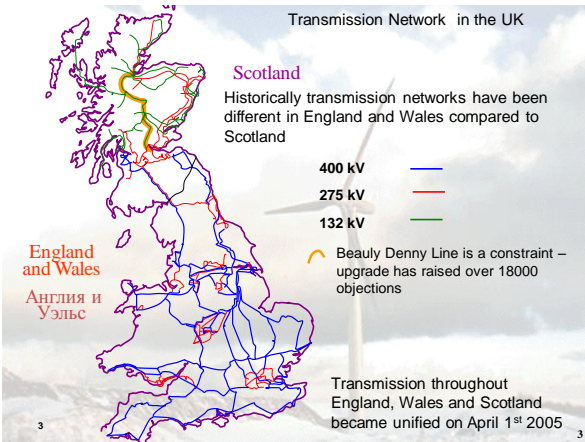
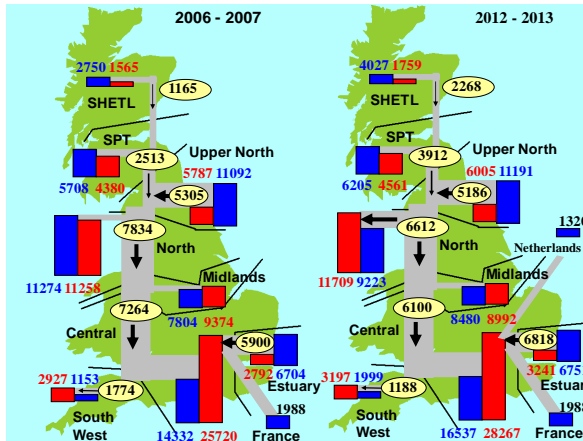


NBS-M017 – 2013
CLIMATE CHANGE: GOVERNANCE AND COMPLIANCE

Transmission issues for the Future

Mechanisms to Promote Renewable Energy

- Non Fossil Fuel Obligation
- Renewable Obligation
- Feed in Tariffs
- Renewable Transport Fuel Obligation
- Renewable Heat Incentive?
- An Integrated Obligation?



Costs of East Coast DC Network

- Stage 1 Core Network: £1.6b
- Stage 2 full Network: £4.8b
- Average cost £750 per MW-km
- Would be built in sectors:
- **Typical Segment costs:**
 - Peterhead to Walpole: £381M (1000 MW cable – 608 km)
 - Peterhead to North Scotland Offshore Marine Hub £412M (2000 MW cable – 245 km)
- For details see WEB Links

West Coast DC Links from North Scotland to Mersey are also being examined

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NBS-M017/NBSLM04D – 2011
CLIMATE CHANGE: GOVERNANCE AND COMPLIANCE

Mechanisms to Promote Renewable Energy

- Non Fossil Fuel Obligation
- The Renewable Obligation
- Feed in Tariffs
- The Renewable Transport Obligation
- Renewable Heat Incentive
- An Integrated Obligation?

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Non Fossil Fuel Obligation: NFFO-1

- Introduced at time of Privatisation in 1990
- Initially seen as a subsidy for nuclear, but later termed NFFO with separate tranche for Renewables
- NFFO became associated only with Renewables and was subdivided into technology bands
- 5 Tranches: NFFO-1, NFFO-2, NFFO-3, NFFO-4, NFFO-5
- NFFO-1 (1990) required a minimum contribution of 102 MW from new "renewables"
- Contracts made 152 MW but by November 2000 the residual capacity was 144.5 MW.
- Fixed Price paid for electricity generated.
- Wind had highest guaranteed price of 11p per kWh compared with typical consumer price at time of 6 – 7p and wholesale prices around 3p. This meant that there was a substantial subsidy for wind.
- Potential generators had to submit applications for the subsidy, but not all ultimately received planning permission, or alternatively the schemes ultimately failed through lack of finance.
- Subsidy was paid until 31st December 1998 – a limit initially placed by the EU

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Non Fossil Fuel Obligation: NFFO-2

- As with NFFO-1 a fixed price was paid to all generating capacity
- NFFO-2 (1991) was further divided the capacity by technology type and the outcome was as indicated in the table below.
- The payments under NFFO-2 also expired on 31st December 1998

Technology Group	NFFO-2 Requirement (MW)	Actual Contracts (MW)	Remaining in November 2000 (MW)	price p/ kWh
WASTE Municipal/ industrial	261.48	271.48	31.5	6.55
Other Waste	28.15	30.15	12.5	5.9
Landfill	48.0	48.45	46.4	5.7
Sewage	26.86	26.86	19.1	5.9
Hydro	10.36	10.86	10.4	6.00
Wind	82.43	84.43	53.8	11.00
Total	457.28	472.23	173.7	

Note: Because payments started 1 year later, there was effectively 12.5% less subsidy than for NFFO-1

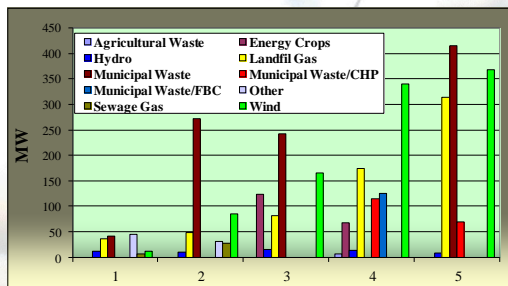
10

NFFO – 3 – January 1995

- As with previous tranches many of the schemes failed through planning permission etc.
- Clearance was given from EU for NFFO-3 to extend beyond 1998, and covers period up to 30th November 2014
- Unlike NFFO -1 and NFFO-2, the price paid for renewables was not a fixed price. Each potential supplier had to bid to supply electricity.
- Within any one technology band, there were a number of different bids.
- Total tranche was 627.8 MW divided between technology bands- successful ones were those which required the least subsidy to provide this amount of installed capacity.
- **NFFO –Orders 4 and 5**
- NFFO orders 4 and 5 were announced in mid 1990s and came into effect in 1996 and 1998 respectively.
- Very similar to NFFO-3 and both have a twenty year timescale finishing in 2016 and 2018 respectively.
- The bid prices were noticeably lower than for NFFO-3.

11

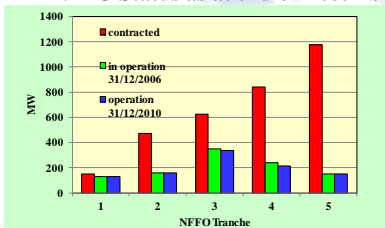
Actual Contracts for different NFFO Tranches



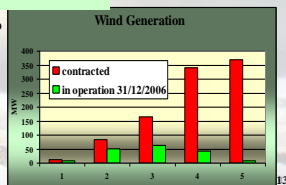
NFFO Tranche

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NFFO Status as at end of December 2006/2010



- Overall actual position as opposed to contracted
- Many NFFO projects did not get off ground because contracts to supply were made before planning and grid issues had been addressed.
- Situation with wind even more dramatic.



Renewables Obligation

1999/2000 UK Government considered different mechanisms to promote renewables following end of NFFO.

- NFFO 1 and NFFO 2 were a form of feed in tariff now used by Germany
- NFFO 3, 4, and 5 were a derivative of this - generators bid to supply and cheapest were given a guaranteed price for whole of life of project up to 20 years.

Other mechanisms considered

- Climatic Change Levy (CCL) goes a small way to encouraging renewables, but only applies to businesses and is at a fixed rate of 0.43p per kWh.

Charge was neutral to businesses overall as there was a rebate for the Employers National Insurance Contribution. Energy Efficient business with large staff numbers benefitted.

- Direct Grants for Renewable Energy Projects
- Energy Taxes/Emissions Trading
- Renewable Obligation – targets set for each year and a mechanism of payments for failure to comply.

Renewables Obligation

On whom should Obligation Fall

- Generators
- System Operator (National Grid)
- Distributed Network Operator
- Supplier
- Consumer

For various reasons the obligation fell on Suppliers

For an enhanced move towards low carbon an obligation on large businesses may be more effective but retaining obligation on suppliers for small businesses and domestic market.

>> An integrated renewable obligation ??????????

Decision taken that only Suppliers should be Obligated

Renewables Obligation

- Requires all suppliers to provide a minimum percentage of electricity from Eligible (New) Renewables.
- Until 31st March 2010 Each 1 MWh generated by renewable qualified for a Renewable Obligation Certificate (ROC)
- From April 1st 2010 technologies were banded so some technologies got more than, and some less than, 1 ROC per MWh
- Obligation increases each year – currently it is ~ 12.4% of electricity supplied to consumers. Accounting Period is 1st April – 31st March
- Compliance can be achieved by:

Either

- Generating sufficient renewable energy to get required number of ROCs
- Purchase ROCs from another generator
- Pay a Buy – Out Fine

- Buy-Out set initially at £30 / MWh but indexed linked each year. This is decided by OFGEM usually in January preceding accounting period and is currently (2012-13) set at £40.71

Renewables Obligation

Year	% Obligation	ROCs per MWh	Buy Out Price (£ /MWh)
2002-2003	3	0.03	30
2003-2004	4.3	0.043	30.51
2004-2005	4.9	0.049	31.39
2005-2006	5.5	0.055	32.33
2006-2007	6.7	0.067	33.24
2007-2008	7.9	0.079	34.30
2008-2009	9.1	0.091	35.76
2009-2010	9.7	0.097	37.19
2010-2011	10.4*	0.111	36.99
2011-2012	11.4*	0.124	38.69
2012-2013	12.4*	0.158	40.71
2013-2014	13.4*	0.206	42.02
2014-2015	14.4*		
2015-2016	15.4*		

The percentage obligation was initially set as far as 2010 – 2011, but later extended to 2015 – 2016.

The scheme has now been extended to 2037, but with a maximum duration of 20 years for any scheme

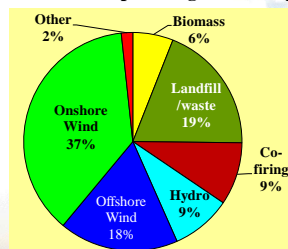
Buy Out Price is increased annually by OFGEM and is approximately equal to CPI.

Total Buy Out market has a value of around £300M+ but fell to ~£120M in 2011-2012

* Original declared figures – situation more complex with banding

Renewables Obligation

Proportion generated by each technology 2011 - 2012



Proportion generated by different technologies. Some were very small amounts – see table

[Link to ROC_Register](#)

Biomass	6.1%
Landfill	16.7%
Sewage	2.2%
Waste	0.6%
Co-firing	9.5%
Hydro <20MW	8.8%
Hydro <50kW	0.0007%
Micro Hydro	0.3%
Photovoltaic	0.0015%
Photovoltaic <50kW	0.000008%
Tidal Flow	0.00168%
Off-shore Wind	18.0%
On-shore Wind	37.9%
Wind <50kW	0.00028%
Wave Power	0.00017%

Note: Since 2009, most small scale hydro, wind and photovoltaic RO generation has been transferred to FITs

Renewables Obligation 2011 - 2012

Load Factors 2009 - 2010		Load Factors 2011 - 2012	
Biomass	15.23%	Biomass	27.61%
Landfill Gas	50.61%	Landfill	60.63%
Sewage Gas	45.81%	Sewage	45.12%
Waste	48.36%	Waste	40.43%
Hydro > 20 MW	10.72%	Co-firing	1.45%
Hydro < 20 MW	38.85%	Hydro <20MW	51.10%
Hydro < 50kW	45.35%	Hydro <50kW	44.38%
Micro Hydro	43.96%	Micro Hydro	46.93%
Photovoltaic	5.61%	Photovoltaic	6.02%
Photovoltaic < 50kW	8.48%	Photovoltaic <50kW	6.24%
Tidal Flow	10.42%	Tidal Flow	4.74%
Off-shore Wind	26.45%	Off-shore Wind	31.32%
On-shore Wind	23.56%	On-shore Wind	28.97%
Wind < 50kW	13.80%	Wind <50kW	16.73%
Wave	1.05%	Wave Power	5.54%

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Renewable Obligation Banding and changes post 2013

	pre April 1st 2009	2009-2013	2013-2014	Future Support
Advanced gasification/ pyrolysis/ anaerobic digestion	1	2	2	2 in 2014/15; 1.9 in 2015/16 and 1.8 in 2016/17
Biomass conversion	1	1.5	1.5	1
Co-firing of Biomass	1	0.5	0.5	0.5
Co-firing of biomass (enhanced)	1	0.5	0.5	1
Co-firing of biomass with CHP	1	1	1	1
Co-firing of energy crops	1	1	1	1
Co-firing of energy crops with CHP	1	1.5	1.5	1.5
Dedicated biomass	1	1.5	1.5	1.5 until 31 March 2016; 1.4 from 1 April 2016
Dedicated energy crops	1	2	2	2 in 2014/15; 1.9 in 2015/16 and 1.8 in 2016/17
Dedicated energy crops / biomass with CHP	1	1	1	2 in 2014/15 closed after 01/04/2015
Energy from waste with CHP	1	1	1	0.5

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Renewable Obligation Banding and changes from 2013

	Prior to April 1st 2009	2009 - 2013	2013-2014	Future Support
Geothermal	1	2	2	2 in 2013/14 and 2014/15; 1.9 in 2015/16 and 1.8 in 2016/17
Geopressure	1	1	1	1
Hydro-electric	1	1	1	0.5
Landfill gas	1	0.25	0.25	0
Microgeneration	1	2	2	2 in 2013/14 and 2014/15; 1.9 in 2015/16 and 1.8 in 2016/17
Onshore wind	1	1	0.9	0.9
Offshore wind	1	2	2	2 in 2013/14 and 2014/15; 1.9 in 2015/16 and 1.8 in 2016/17

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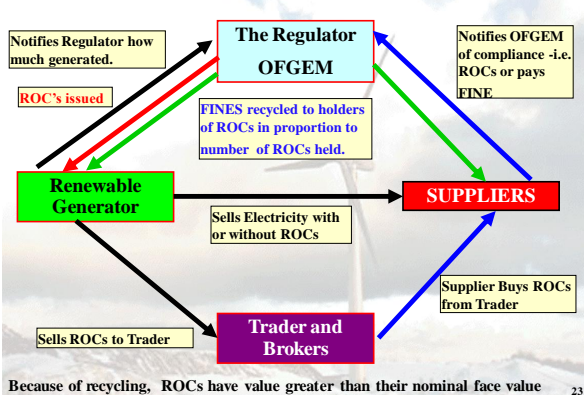
Renewable Obligation Banding and changes from 2013

	Prior to April 1st 2009	2009 - 2013	2013-2014	Future Support
Sewage gas	1	0.5	0.5	0.5
Solar photovoltaic	1	2	2	2 in 2014/15; 1.9 in 2015/16 and 1.8 in 2016/17
Standard gasification and pyrolysis	1	1	1	0.5
Tidal impoundment barrages and lagoons (<1GW)	1	2	2	2 2014/15; 1.9 in 2015/16 and 1.8 in 2016/17
Tidal stream & Wave	1	2	5 up to 30MW thereafter 2	

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- The Renewable Obligation will close for new entrants on 31st March 2017, and subsequently all new entrants will be subject to Electricity Market Reform Regulations.
- Existing Renewable generators can opt into EMR if they wish.
- From 2014 – 2017 – New generators can opt for either RO or EMR.

Renewable Obligation Certificates



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Incentives under the Renewable Obligation

- Several benefits to generator (e.g. wind)
- Whole sale price of Electricity
 - Value of the Renewable obligation Certificate
 - Mark up price arising from Buy- Out Fines
 - Other small benefits
 - BUT if target is met – ROC certificates become worthless
 - Overall value might be up to 10p but could be much less
 - At highest level of incentive – i.e. actual current value of ROC ~ 4.2p cost for reducing 1 tonne of CO₂ ~ £78 per tonne
- Prices per kWh
- | | |
|-----------------|---|
| Recycled Fines | 1.0 – 1.5p |
| But only | 0.338p in 2011-12 (announced 4/10/2012) |
| ROC Certificate | 3.869p |
| [2011-12 value] | 4.071p 2012/13 |
| Wholesale Price | Average 2012 ~4.5p |
| Jan 2011 | 4.950p |
| cf Jan 2010 | 4.521p |

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The Value of the ROC Market

	2003-04	2004-05	2005-06	2006-07
Total Obligation (% of demand)	4.3%	4.9%	5.5%	6.7%
Total obligation (MWh)	12,387,720	14,315,784	16,175,906	19,390,016
Total number of ROCs presented	6,914,524	9,971,851	12,232,153	12,868,408
Shortfall in ROCs presented	5,473,196	4,343,933	3,943,753	6,521,608
Buy Out Price	£30.51	£31.39	£32.33	£33.24
Value of Buy Out Fund	£167M	£136M	£128M	£217M
Markup value	£22.92	£13.66	£10.21	£16.04
Full Value of ROC	£53.43	£45.05	£42.54	£49.28
% compliance	55.80%	69.70%	75.60%	66.40%

The Figures in the "Value of ROC Market" are slightly lower than predicted for data because of non-payment by companies who ceased trading. This figure amounts to around £5M a year.

The Value of the ROC Market

	2007-08	2008 - 09	2009 - 10	2010-11	2012-13
Total Obligation (% of demand)	7.9%	9.10%	10.4%**	11.4%**	12.4%**
Total obligation (ROCs)	25,551,357	28,975,678	30,101,092	34,749,418	37,676,829
Total number of ROCs presented	16,466,751	18,948,878	21,337,205	24,969,364	34,404,733
Shortfall in ROCs presented	9,084,606	10,026,800	8,763,887	9,780,054	3,272,096
Buy Out Price	£34.30	£35.76	£37.19	£36.99	£38.69
Value of Buy Out Fund	£304.7M	£351.4M	£325.6M	£361.1M	£116.3M
Markup value	£18.65	£18.61	£15.17	£14.35	£3.38
Full Value of ROC	£52.95	£54.37	£52.36	£51.34	£42.07
% compliance	64.4%	65.4%	70.9%	71.9%	91.3%

- ** After the introduction of banding, the Obligation is now determined in terms of ROCs, rather than MWh as previously
- The Figures in the "Value of ROC Market" are slightly lower than predicted for data because of non-payment by companies who ceased trading. This figure amounts to around £5M a year.

ROC Market: How total value of ROCs is estimated
Simplified Analysis pre banding

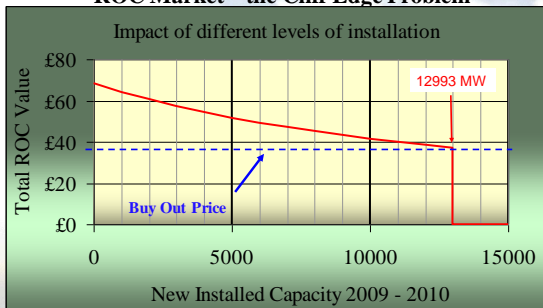
- An Example what is likely value by March 2010
- Buy out price for 2009 – 2010 **£37.19 per MWh** **NOTE: Simplified Version – assuming all technologies have same load factor**
- Estimated demand is 360 TWh Obligation is 10.4%
- Requirement from renewables is 360*0.104 TWH
37440000 MWh
- At April 1st 2008 there were **6250 MW** installed having an average load factor over all technologies of 30%.
In 2009 – 2010 will generate 6250*8760*0.3 = **16425000MWh**
- Assume **1500 MW** installed in 2008 – 2009
At same load factor will generate **3942000 MWh** in 2009 – 2010
- Assume **2500 MW** installed mid way through 2009 - 2010
At same load factor will generate **3285000 MWh** in 2009 – 2010
- Total generated by renewables **23652000 MWh**
- A shortfall of **13788000 MWh** on which Buy Out would be payable

ROC Market: How total value of ROCs is estimated

- shortfall of **13788000 MWh** on which Buy Out would be payable
- Buy Out Price: £37.19
- Total value of Buy Out Fund = **£512781235**
- ROCs presented = **23652000 MWh** Recycled value = **£21.68 per ROC**
- Total value of ROC = £58.87**
- If 5000 MW were commissioned instead of 2500 in 2009 – 2010
- Total Buy Out Fund would be **£390610771**
- Recycled Value per ROC would be £14.50**
- Total Value of ROC = £51.69**

- Note: with banding analysis is a little more complicated.**
- What happens if generation exceeds compliance level?**

ROC Market – the Cliff Edge Problem



Target could be exceeded in particularly favourable weather conditions.
Buy Out Fund would have no money in it and ROCs would become worthless leading to instability in price.

Developments in the Renewables Obligation

- Banding System was introduced from 1st April 2009.
- Reference projects such as on-shore wind will continue to get 1 ROC per MWh,
- Technologies such as offshore wind get 2.0 ROCs per MWh,
- Solar PV, advanced gasification Biomass get 2.0 ROCs per MWh,
- Co-firing generates 0.5 ROCs per MWh
- With no banding: incentive only to exploit established technologies
- Banding will enhance returns for developing technologies.**
- If targets are kept the same, it is easier to achieve targets and "Cliff Edge" Problem could become acute.
- Targets for a given % of renewables in terms of MWh will not be met under current legislation if there is an upward drift in banding.
- Only if reduced ROCs from co-firing balance enhanced ROCs from newer technologies will system remain stable.**

Setting the Level of the Renewable Obligation (1)

- Until 2009, there was exact parity between the number of MWh generated and the ROCs issued.
- With banding, the situation became more complex and to avoid the Cliff Edge Problem a headroom calculation system was introduced as an alternative to a Fixed percentage
- Specific procedures have varied from year to year – see Renewables section of Module Web Page for specific details of a particular year.
- Example – setting level for 2013-14 as recently published – 28th Sept 2012

Target for 2013-14**13.4%** of electricity supplied by LICENSED SUPPLIERS should be from eligible Renewable Sources - (slightly different in Northern Ireland) –

>>>>>>>>Equates to **0.134 ROCs** per MWh,

Some renewables generate more ROCs than others and some less.

Could result in proportionally more or less renewables than target depending on average banding level

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Setting the Level of the Renewable Obligation (2)

Two Calculations needed:

- A)FIXED TARGET – based on a fixed target of **0.134 ROCs per MWh**
- B)HEADROOM TARGET - a ROC Target based amount of renewable electricity expect to be generated uplifted by **10% headroom**

This approach takes into account

1. existing and projected capacity due to come on stream
2. The relevant banding of each Technology
3. The actual load factors as achieved in previous year.

The actual target for a given year is the higher of (A) and (B)

For 2013/14 based on the predicted demand, the number of ROCs under calculation A would be 40 million, whereas under calculation B it would be 61.5 million.

Difference in the two figures is much larger than in previous years because of increasing amounts of offshore wind (which generated 2 ROCs per MWh) coming on line

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Setting the Level of the Renewable Obligation (3)

More Specifics for 2013/14 calculations

A) FIXED TARGET – based on a fixed target of **0.134 ROCs per MWh**

The projection for total RELEVANT UK Electricity supplied in the year from DECC, National Grid and others is **302.7 MWh** – giving a fixed requirement of **40 Million ROCs**

B) HEADROOM TARGET

Potential ROCs taking account of capacity, banding, relevant load factors	ROCs (millions)
From Existing Stations	39.7
From Stations expected to come on line during year	16.2
Total projected generation	55.9
Total ROCs (including 10% uplift)	61.5

(B) is greater than (A) and thus applies - equivalent to a target of **0.206 ROCs per MWh**

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Setting the Level of the Renewable Obligation (4)

Technology	Load Factor
Anaerobic Digestion	48.7%
Energy from Waste CHP	38.1%
Landfill Gas	57.6%
Other biomass	62.3%
Sewage Gas	52.1%
Hydro	
- Small scale (less than 5 MW)	36.3%
- Large scale	35.4%
Offshore Wind	32.0%
Onshore Wind	
- England	25.5%
- Scotland	28.7%
- Northern Ireland	33.3%
Solar PV	9.7%
Tidal stream	14.5%
Wave	1.0%

Load Factors used in 2013/14 to determine ROC Target

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Feed in Tariffs

- Unlike Renewable Obligation, a fixed amount per unit generated is paid and is relevant for small generators
- Introduced from April 1st 2010 as RO system was overly bureaucratic for small generators. Payment rates depend on size of scheme, date of installation and technology.
 - e.g. for small scale retro-fitted solar scheme (<4 kW) fitted before March 3rd 2012, the feed in generation tariff payment is currently 45.4p per kWh (with an additional 50% of the export tariff at 3.2p per kWh).
- These prices are index linked to CPI and TAX FREE
- This amounts to a renewable incentive of ~42p per kWh and **£778 per tonne** of CO₂ saved. (assuming a wholesale price of ~ 5p)
- This is ~9 times the subsidy for onshore wind generation under the ROC scheme

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Feed in Tariffs – Introduced 1st April 2010

Energy Source	Scale	Installation date				Duration (years)	
		To 31/03/11	From 01/04/11	Post Aug 1 st 2011	Original changes		
Payments				From 01/04/12	New installations from 03/03/12		
Solar PV	≤4 kW new	36.1	37.8		34.6	21.0	25
Solar PV	≤4 kW retrofit	41.3	43.3		39.6	21.0	25
Solar PV	>4-10kW	36.1	37.8		34.6	16.8	25
Solar PV	>10 - 50kW	31.4	32.9		30.1	15.2	25
Solar PV	>50-150kW	31.4	32.9	19.0	17.4	12.9	25
Solar PV	>150-250kW	29.3	30.7	15.0	13.7	12.9	25
Solar PV	>250kW - 5MW	29.3	30.7	8.5	8.5	8.5	25
Solar PV	Standalone	29.3	30.7	8.5	8.5	8.5	25
Wind	≤1.5kW	34.5	36.2		34.2	34.2	20
Wind	>1.5 - 15kW	26.7	28.0		26.7	26.7	20
Wind	>15 - 100kW	24.1	25.3		24.2	24.2	20
Wind	>100 - 500kW	18.8	19.7		19.7	19.7	20
Wind	>500kW-1.5MW	9.4	9.9		9.9	9.9	20
Wind	>1.5MW- 5MW	4.5	4.7		4.7	4.7	20
Existing generators transferred from RO		9	9.4		9.4	9.4	to 2027
Export Tariff		3	3.1		3.1	3.1	

- Tariffs are index linked each year for existing generators only new generators were affected by revised prices.
- Tariffs also available for hydro, anaerobic digestion and mini CHP.

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Feed in Tariffs – Example for PV

Payment for tariffs will be from a levy on Utility Companies which MAY see a cumulative rise in bills of around £1 billion or more.

In addition there is a payment of 3.2p per kWh for any electricity exported as opposed to consumed on premises.

BUT an export meter is needed to identify this.

Householder will save on imported electricity at ~ 13 – 14p per kWh, so optimum financial model may not be to generate as much as possible

i.e. for each unit generated and consumed it is worth 45.4** + 13 = 58.4p/kWh
for each unit exported it is worth 45.4** + 3.2 = 48.6 p/kWh

If no export meter is fitted for domestic consumers it is deemed that 50% of generation will be exported.

i.e. On average each unit is 45.4 + 0.5 * 3.2 = 47.0 p/kWh plus 0.5*13 (saved) - i.e. overall approx: 53.5p/kWh

** For installations registered before 03/03/2012

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Installations under Feed In Tariff Scheme (to 17/10/2012)

Technology	Domestic Installations		Industrial & Commercial Installations		Community Installations		Total Installations	
	Number	Installed Capacity MW	Number	Installed Capacity MW	Number	Installed Capacity MW	Number	Installed Capacity MW
NORFOLK								
Hydro	3	0.024	0	0	0	0	3	0.024
Micro CHP	3	0.003	0	0	0	0	3	0.003
Photovoltaic	7215	24.312	129	2.21	15	0.201	7359	26.723
Wind	197	1.076	13	0.109	6	0.031	216	1.216
Total Installed Capacity (MW)		25.415		3.734		0.231		29.381
Total	7418		143		21		7582	
SUFFOLK								
Micro CHP	4	0.004	0	0	0	0	4	0.004
Photovoltaic	5525	18.28	145	2.594	21	0.474	5691	21.348
Wind	98	0.574	3	0.035	2	0.017	103	0.626
Total Installed Capacity (MW)		18.858		2.629		0.491		21.979
Total	5627		148		23		5798	

- The annual output from all PhotoVoltaic installed is ~ 42GWh – the same output as 9 modern 2 MW wind turbines.
- 1 turbine has same output as 2000 – 2500 domestic PV arrays

Growth in Installations under Feed In Tariff Scheme

Technology	Installed 01/04/2010 – 28/09/2011		Installed 29/09/2010 – 17/10/2012		Total Installations	
	Number	Capacity (MW)	Number	Capacity (MW)	Number	Capacity (MW)
NORFOLK – Domestic Installations						
Hydro	2	0.021	1	0.003	3	0.024
Micro CHP	3	0.003	0	0	3	0.003
Photovoltaic	1667	4.691	5548	19.621	7215	24.312
Wind	28	0.197	169	7215	197	1.076
Total Installed Capacity (MW)		4.912		7215		25.415
Total	1700		5718		7418	
SUFFOLK – Domestic Installations						
Micro CHP	2	0.002	2	0.002	4	0.004
Photovoltaic	1519	4.216	4006	14.064	5525	18.28
Wind	28	0.188	70	0.386	98	0.574
Total Installed Capacity (MW)		4.406		14.452		18.858
Total	1549		4078		5627	

Note: considerable increase in rate of installation – this led to emergency reviews and earlier reduction in tariffs than originally planned – driven also by a 50%+ reduction in installation costs

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Feed in Tariffs – Emergency Reviews

The Feed-In Tariff scheme was inherited from proposals from last Government and first indications that changes would take place came in Comprehensive Spending Review in October 2010.

The Government will reform the electricity market, so that it attracts the private sector investment necessary to meet the UK's energy security and climate change objectives, including the investment in nuclear, carbon capture and storage and renewable technology.

In addition to supporting the carbon price, this will also assess the role that revenue support mechanisms (such as Feed-In Tariffs), capacity mechanisms and emission performance standards could play.

For complete information see Section 4 of <http://www.hm-treasury.gov.uk/d/nationalinfrastructureplan251010.pdf>

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From the National Infra-Structure Plan 2010 following Comprehensive Spending Review

The Government will assess proposals against the criteria of **cost-effectiveness**, affordability and security of supply;

- to ensure that regulation of national electricity networks enables the investment needed in transmission infrastructure to connect new low-carbon generation, such as nuclear power stations and offshore and onshore wind turbines;
- maintain the Feed-In-Tariffs to support investment in emerging small-scale generation technologies in electricity, saving £40M by improving their efficiency, and complement this with the Renewable Heat Incentive to reward ground-source heat pumps and other renewable heat sources, **while making efficiency savings of 20% by 2014-15 compared with the previous government's plans.**

For complete information see Section 4 of <http://www.hm-treasury.gov.uk/d/nationalinfrastructureplan251010.pdf>

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From the National Infra-Structure Plan 2010 following Comprehensive Spending Review

The Government will (para 4.18):

- Support investment in low carbon energy supply by:
 - maintaining Feed-In Tariffs for small-scale generation, funded through an obligation on electricity suppliers equating to a levy of almost £900 million over the period to 2014-15.
 - At the same time, the efficiency of Feed-In Tariffs will be improved at the next formal review [2012], rebalancing them in favour of more cost effective carbon abatement technologies.

Equivalent to £36 per household over 5 years

For complete information see Section 4 of <http://www.hm-treasury.gov.uk/d/nationalinfrastructureplan251010.pdf>

- Domestic PV ~ £750 per tonne saved (till 02/03/2012) now ~£210
- Onshore Wind ~ £95 per tonne saved
- Improved insulation < £25 per tonne saved.
- see also issues relating to Feed In Tariffs in Germany

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Feed in Tariffs and recent changes following consultations

	Installation Date					
	01/04/10 31/03/12	01/04/12 31/07/12	01/08/12 31/10/12	01/11/12 31/01/13	01/02/13 30/06/13	01/07/13 01/01/14
Installed Capacity						
Solar Photovoltaic New Build <= 4kW	39.60	Higher 21.00 Middle 16.80 Lower 9.00	16.00 14.40 7.10	15.44 13.90 7.10	15.44 13.90 7.10	14.90 13.41 6.85
Solar Photovoltaic Existing Buildings <=4kW	45.40	Higher 21.00 Middle 16.80 Lower 9.00	16.00 14.40 7.10	15.44 13.90 7.10	15.44 13.90 7.10	14.90 13.41 6.85
CHP <= 1.5 kW	11.00	11.00	11.00	11.34	>13/03/13	12.89
Wind <= 1.5 kW	39.07		36.91		From 01/12/12	21.65
Wind >1.5 kW <= 15 kW	30.21		28.87		From 01/12/12	21.65

- Export Tariff – solar installations before 01/08/2012 and all other installations 3.20 p/kWh otherwise 4.5 p/kWh – **assumed at 50% of generation unless metered**
- Higher Rate for Individual Domestic Properties achieving Energy Standard
- Medium Rate for multiple community schemes
- Lower Rate for domestic properties not achieving Energy Standard

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Renewable Heat Incentive - Domestic

Domestic Installations – as originally proposed - implementation delayed successively – latest proposed date is Spring 2014.

	Original Proposed Tariff (p/kWh)	Declared on 12 th July 2013	lifetime (years)
Solid biomass	9	12.2	7
Ground source heat pumps	7	18.8	7
Air source heat pumps	7.5	7.3	7
Solar thermal	18	19.2	7

Originally Government – proposed deeming of heat, then required metering. Have returned to deeming but with an option that if one installs metering then an additional payment of £200 - £230 per annum will be paid.

Renewable Heat Incentive from 26/11/11 for Non-Domestic Installations

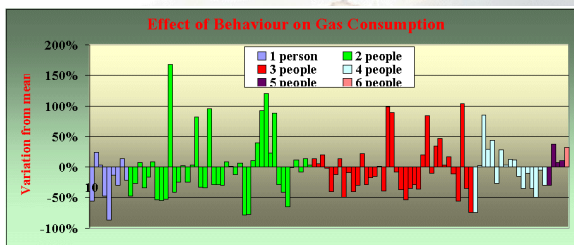
- Original target date for implementation – 1st April 2011 was deferred until November 2011 for large installations and April 2013 for domestic installations.

Tariff name	Eligible technology	Eligible sizes	Tariff rate (pence/ kWh)	Tariff duration (Years)
Small biomass	Solid biomass; Municipal Solid Waste (incl. CHP)	< 200 kWth	Tier 1: 8.3	20
Medium biomass			Tier 2: 2.1	
Large biomass		200 kWth to 1,000 kWth	Tier 1: 5.1	
		>1,000 kWth	Tier 2: 2.1	
Small ground source	Ground & Water - source heat pumps; deep geothermal	<100 kWth	4.7	20
Large ground source			3.4	
Solar thermal	Solar thermal	<200 kWth	8.9	20
Biomethane injection and combustion except from landfill gas – all scales < 200 kWth			7.1	20

Tier 1 applies annually up to the Tier Break, Tier 2 above the Tier Break. The Tier Break is: installed capacity x 1,314 peak load hours, i.e.: kWth x 1,314

Renewable Heat Incentive

- To achieve a 15% Renewable Energy Target by 2020 will require tackling heat (40+% of total energy demand) in addition to transport and electricity.
- RHI aims to tackle this for heat pumps, biomass boilers, solar thermal
- Problem of metering. Government suggests “Deeming” for small installations
 - would be open to abuse as it does not account for behaviour



Renewable Heat Incentive: from April 2013

Renewable Heat Incentive will provide support via an payment for each unit of renewable heat generated.

- Scheme has been delayed, now scheduled to start in April 2013
- All eligible installations installed after 15th July 2009 will qualify
- Consultation launched on 20th Sept 2012 to decide on actual tariffs paid.

	Biomass	Air Source Heat Pumps	Ground Source Heat Pumps	Solar Thermal (Hot Water)
p/kWh	5.2 – 8.7	6.9 – 11.5	12.5 – 17.3	17.3

Because of delay, one off vouchers are available for householders which must be redeemed by 31st March 2013 or expiry of voucher.

All houses	Houses not heated by gas from the grid
£300 – solar thermal – (3 month) voucher	£950 – biomass boiler – (6 month voucher)
	£850 – air source heat pump – (5 month)
	£1250 – ground source or water source heat pump –(6 month voucher)

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Renewable Transport Fuel Obligation (RTFO)

- Came into force 1st April 2008
 - EU Directive 2003
 - Consultation Document April 2007
 - See also UEA's response on WEB
- Ambition to save 1 Mtonnes CO₂ by 2010/2011

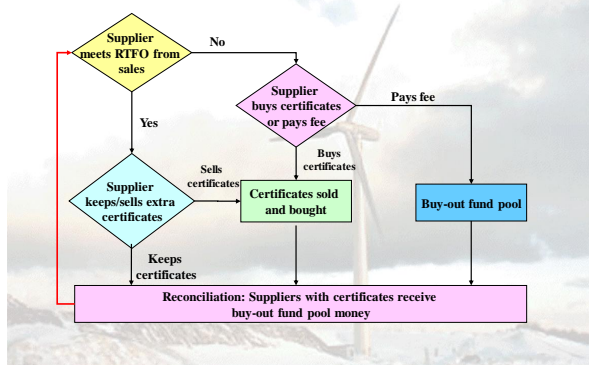
Financial year	UK Target (by volume)
2008 – 09	2.75 %
2009 – 10	3.5 %
2010 – 11	5 %

Obligation on Suppliers as with Renewables Obligation

Note: EU requirement is for 5.75% by Energy Content Represents 8% by volume.

Energy content per litre for bioethanol is very different from energy content of petrol

RTFO mechanism



The level of the obligation?

- Calculated as percentage of volume of fossil fuel sales, rather than of total sales of all fuels
 - 5 % of total fuels represented as 5.2651 % of fossil fuel sales
 - Reduces UK commitment further
 - Reason
 - Duty paid in terms of volume
 - Need to switch to energy based pricing
 - Would make comparison between petrol, diesel and biofuels more rational
 - Maximum 5 % by volume additive is already permitted in EN-standard petrol and diesel fuels -
 - Warranty issues
- Unlike RO, where recycled money is used in UK, recycled RTFO money is likely to go abroad

An Integrated Obligation

- Obligations for RO and RTFO fall on suppliers
- Is this most effective way to promote low carbon strategies?
- Probably realistic for domestic and small businesses.
- If placed on large business and integrated then
 - Effective strategies could be implemented
 - Trade off between the different obligations to promote cheapest solutions to carbon reduction
 - ROCs, RHICs, RTFOCs should be tradeable between each other
- Need to have RTFO buy out based on Energy rather than volume.
 - Bring accounting period for RTFO from April 17th to April 1st,
- Rationalise Buy Out Prices according to primary energy (or carbon emissions to provide one unit of delivered energy (heat).
 - 1 kWh of delivered electricity has carbon factor of 0.54 kg
 - 1 kWh of delivered gas for heat has carbon factor of 0.19 kg
 - Buy out price for Heat should be 36.5% of price for ROC

