Rocfuel

Biomass Opportunities in UK Electricity Market

R J Kennedy

Introduction

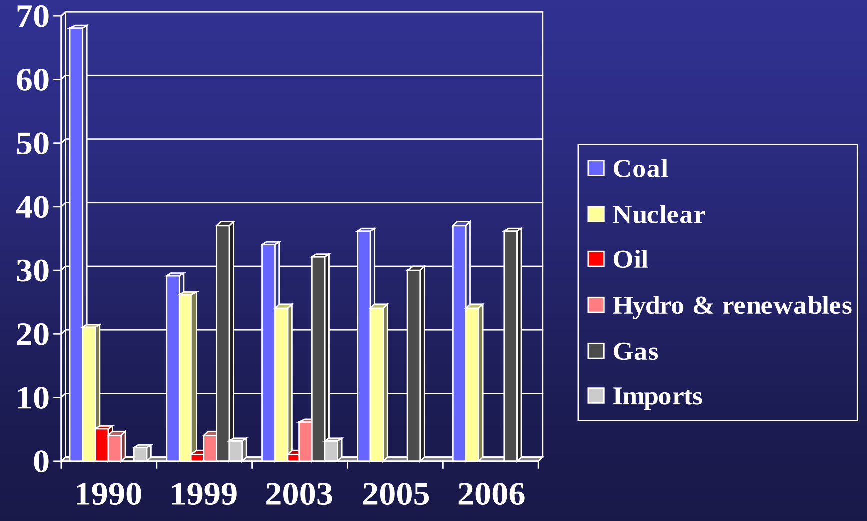
- Issues very complex
- Very political
- Issues very inter-related
- Climate Change
- Renewable Power does not work work without subsidy
- Biomass is now “High Risk”?

Contents

- Review of impact of previous UK policies
- EU Political Dimension
  - EU ETS
- UK Political Position
  - 2000 Energy Paper 68
  - 2003 Energy White Paper
  - 2007 Energy White Paper
  - 2009 Renewable Energy Strategy
  - 2010 ROO 2011 Consultation
- ROC Scheme
- Biomass Market from 2010
- Concluding Comments

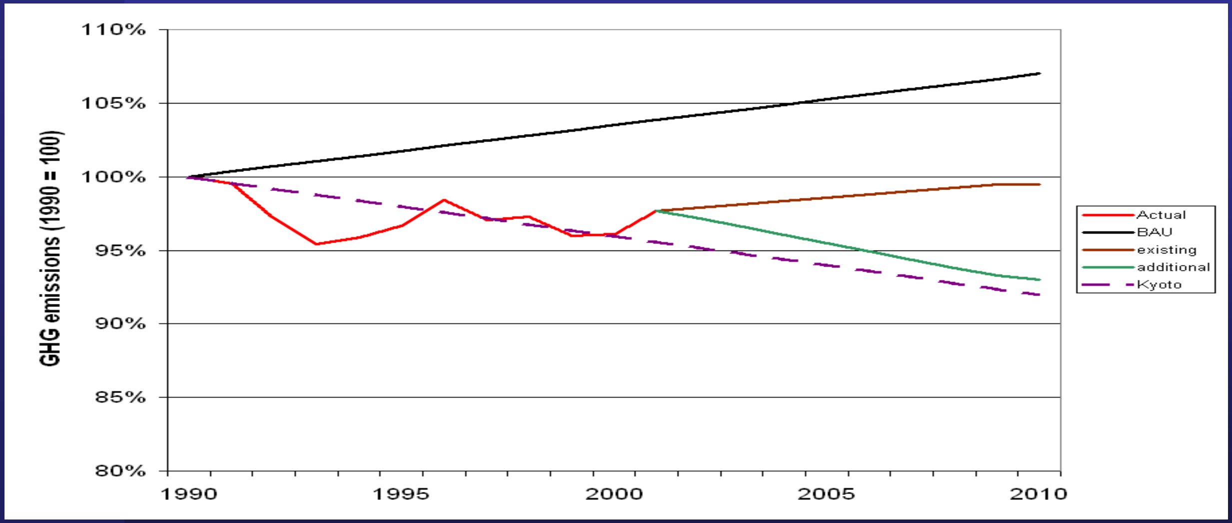
Review of Previous UK Policies

- 1976 Department Trade & Industry Plan – 200 mt/annum of coal
- 1990's Privatisation Programme
  - Dash for Gas – Politics √: Envment ×
  - British Coal
  - Bacton Gas Link
- Electricity Market



EU Political Dimension

- **EU's Kyoto Commitment – Legally binding from 06**
- **Kyoto – What's next post 2012?**
  - **EU GHG Emission 2010 target**



EU Political Dimension

- **EU National Allocation Plans – 1st stage 04 - 07**
  - **EU States submitted plans in 03**
  - **Very complex, many opt outs used**
  - **Most states issued too many allowances, apart from UK! (Explanation later)**
  - **Overall shortage of carbon, until Mar 06**
    - **Emissions published in 06 – price collapse**
  - **Prior Mar 06 Carbon Price Euro 33/mt – then Euro 0.50 cents to 08**

EU Political Dimension

- **EU National Allocation Plans – 2nd stage 08 – 12**
  - **EU States submitted plans in 06/07 most rejected**
  - **EU response - very stringent approach**
  - **A number states plans rejected & made legal challenge – broadly failed (5!)**
  - **Buoyant market from 08 – but nervous!**
  - **Future 08 carbon price Euro 23/mt**
  - **Current price ~ €15 (recession!)**
  - **09 Emission year: UK 60% of shortfall**
    - **Impact €300m (Explanation later)**

EU Political Dimension

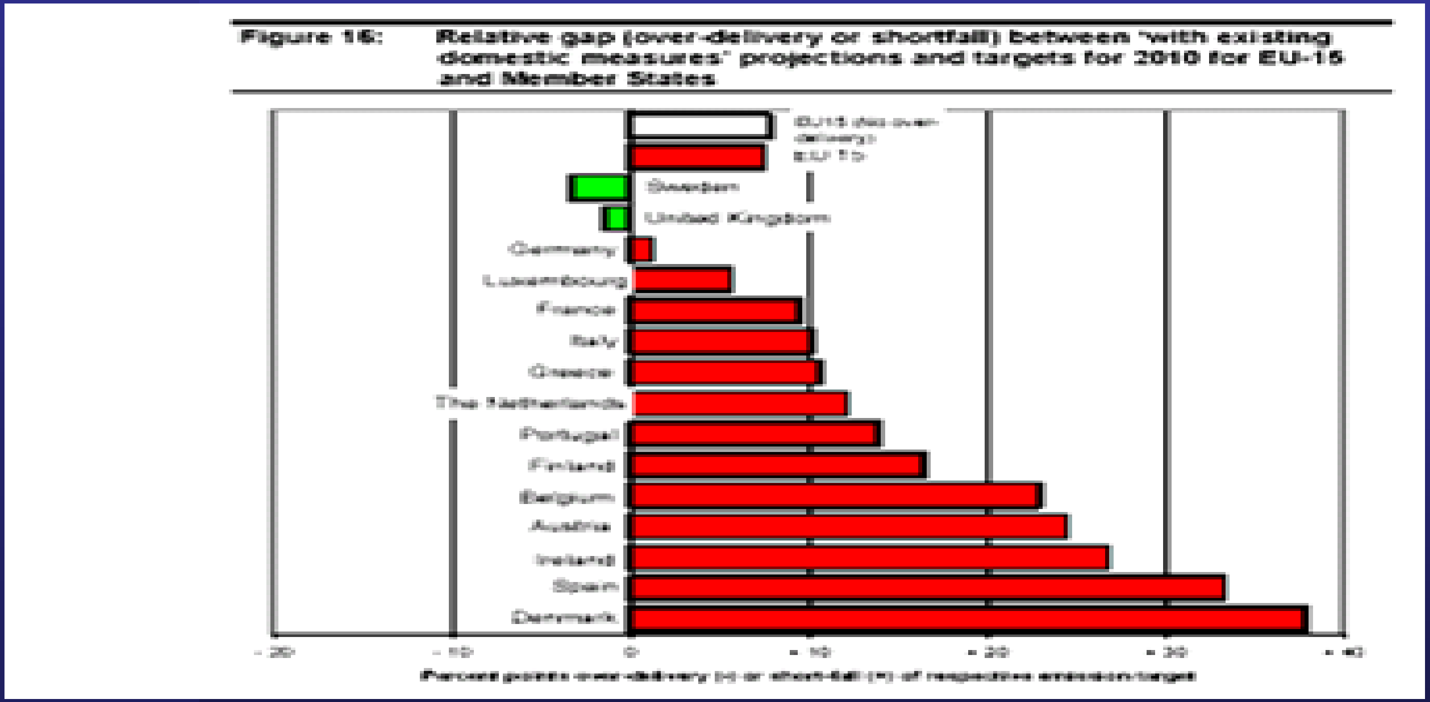
EU ETS phase2 caps (mt/co_2)

Member State	Phase 1 Cap	Verified 2005 Emissions	Proposed Cap 2008-2012	Allowed Cap 2008-2012
Austria	33.0	33.4	32.8	30.7
Belgium	62.1	55.58	63.3	58.5
Bulgaria	42.3	40.6	67.6	42.3
Cyprus	5.7	5.1	7.12	5.48
Czech Rep.	97.6	82.5	101.9	86.8
Denmark	33.5	26.5	24.5	24.5
Estonia	19.0	12.62	24.38	12.72
Finland	45.5	33.1	39.6	37.6
France	156.5	131.3	132.8	132.8
Germany	499	474	482	453.1
Greece	74.4	71.3	75.5	69.1
Hungary	31.3	26.0	30.7	26.9
Ireland	22.3	22.4	2.6	22.3
Italy	223.1	225.5	209	195.8
Latvia	4.6	2.9	7.7	3.43
Lithuania	12.3	6.6	16.6	8.8
Luxembourg	3.4	2.6	3.95	2.5
Malta	2.9	1.98	2.96	2.1
Netherlands	95.3	80.35	90.4	85.8
Poland	239.1	203.1	284.6	208.5
Portugal	38.9	36.4	35.9	34.8
Romania	74.8	70.8	95.7	75.9
Slovakia	30.5	25.2	41.3	30.9
Slovenia	8.8	8.7	8.3	8.3
Spain	174.4	182.9	152.7	152.3
Sweden	22.9	19.3	25.2	22.8
United Kingdom	245.3	242.4	246.2	246.2
Total	**2,298.5**	**2,122.16**	**2,325.34**	**2,080.93**

Source: EU Commission Announcement 26 October 2007

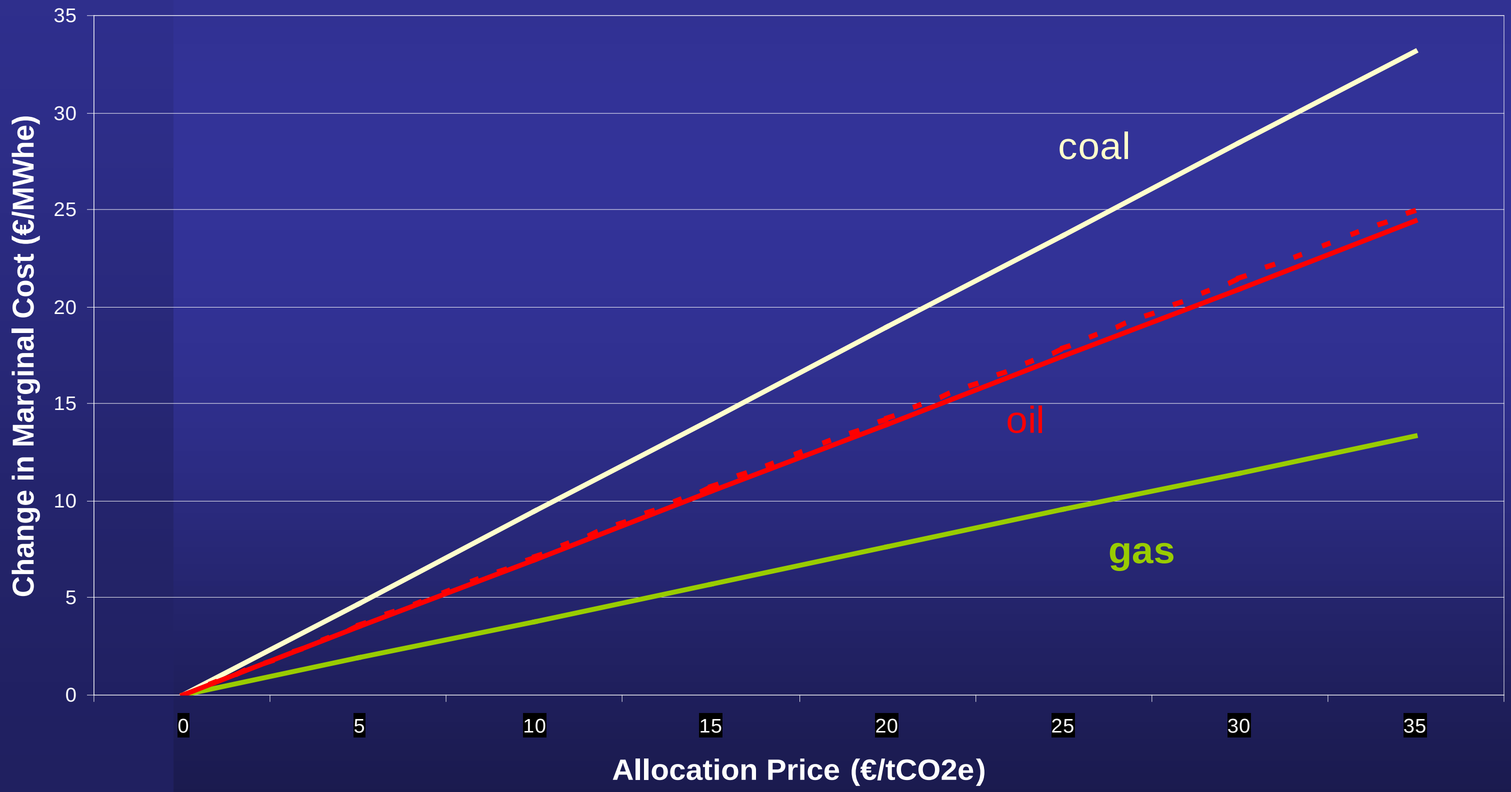
EU Political Dimension

- **EU Performance**
  - **2010 Projected Performance**



EU – ETS Impact on UK Market

– **Impact on marginal cost**



EU – ETS Impact on UK Market

- **Generation Cost Comparison**
  - **Marginal cost of electricity from Gas at 50% efficiency and 20p/therm is £13.50/Mwhr**
  - **Marginal cost of electricity from coal at 37% efficiency and £1.20/Gjoule is £11.00/Mwhr**

UK Political Position

- **Government Planning**
  - Energy Paper 68 (2000)
  - Energy White Paper (2003)
  - Energy White Paper (2007)
  - Renewable Energy Strategy Consultation 2008
  - UK Renewable Energy Strategy 2009
  - 2010 Consultation on Grandfathering of Dedicated Biomass; AD & EfW 2010
  - 2010 Consultation on Grandfathering of Liquid Bio-Fuels – still current
  - 2011 ROO Consultation – still current
  - 2012 Banding Review

UK Political Position - 2000

- **Energy Paper 68 (2000)**
  - **Projection energy demand and CO_2 emissions**
  - **ESI and 12 economic sectors**
  - **Model of UK economy to 2020**
  - **Least cost solution to achieve Kyoto**

UK Political Position -2000

- **Energy Paper 68 (2000)**

Crude Oil Price Assumptions

1999 prices

	Low$US/bbl	High $US/bbl
1999	18.0	18.0
2000	24.0	27.0
2005	10.0	20.0
2010	10.0	20.0
2015	10.0	20.0
2020	10.0	20.0

UK Political Position - 2000

- **Energy Paper 68 (2000)**

Delivered Gas Price Assumptions

1999 prices

	Low p/therm	High p/therm
1999	15.2	17.4
2000	12.3	16.6
2005	12.3	22.1
2010	12.3	24.3
2015	12.3	24.3
2020	12.3	24.3

UK Political Position - 2000

- **Energy Paper 68 (2000)**

UK CO_2 Emission Predictions (MtC)

	High	Low
1990	159.3	159.3
1995	149.6	149.6
2000	147.9	147.6
2005	148.5	143.4
2010	151.2	144.7
2015	157.2	148.7
2020	160.0	149.9

UK Political Position - 2000

- **Energy Paper 68 (2000)**
  - **CHP Targets**
    - **10Gw$_e$ by 2010 – *Bacton interconnector***
  - **Renewable Targets**
    - **10% of Electricity Generation by 2010**
    - **Introduction of ROC Scheme**
  - **Road Fuel duty escalator – *Fuel strikes***
  - Effect of Climate Change Levy - *£4.30*

UK Political Position – 2003

- **Energy White Paper 2003**
  - **Path to 60% reduction by 2050**
  - **Renewable sources 30-40% by 2050**
  - **To 2010 based on EP68 energy projections**
  - **Updated set of Energy Predictions from 2010**
  - **But significantly did not address low gas price assumption in 2000 plan**

UK Political Position – 2003

- **2003 Energy Bill Generation Prediction to 2010/20**

Generation (Gross supplied) by fuel type (Major Power Producers) (TWhe)

	DTI (2003)	EP68		EWP
	2002	2010	2020	2020
Coal	115	83	49	20/25
Oil	2	0	0	0
Gas	136	173	264	170/200
Nuclear	88	66	27	27
Renewables	11	41	41	70/85
Imports	10	8	6	6
Total	364	371	387	290/335
NGC 7 year	364	387		
Difference		16		

UK Political Position - 2003

- **Additional Measures (2003 Energy Bill)**
  - **Transport – *RTFL scheme***
  - Emissions Trading target of 4Mt C/y - *if €40/ton*
  - **Building Regs – *Tighter & aim CO2 neutral***
  - **Afforestation – "*The National Forrest*"**
  - **Public Sector Targets – *NHS reduce 2000 Carbon Footprint by 15% by 2010***
  - **Domestic Energy Efficiency – *Energy Trust***
  - **Business Energy Efficiency – *Carbon Trust***

UK Political Position - 2003

- **EU ETS Phase 1**
- **UK National Allocation Plan - 2003**
  - **UK declared its position with**
    - **Updated energy projections with significant underestimate of "business as usual" emissions**
    - **Electricity demand under-estimated**
    - **Power sector bigger burden than expected**
    - **UK legal challenge in 05 - *Failed***
    - **15m tonne CO_2 shortfall in 2005-7 period**
  - **Carbon bought 04 - 07 from other EU states**

UK Political Position – 2007

- **Energy White Paper 2007**
  - **Renewables Obligation Review**
    - **Banding**
    - **Headroom**
  - **Biomass Strategy**
    - **Major expansion of supply and use in UK**
  - **Commitment to RTFO**
    - **2.5% by 2008**
    - **5% by 2010**
    - **10% by 2020**
  - **Carbon Capture Storage CCS**
    - **Installations to be brought into EUETS in Phase II**
    - **Competition for funding**

UK Political Position – 2007

- **Energy White Paper 2007**
  - **EU ETS**
    - **To achieve ambitious Directive to generate confidence in long term carbon price**
    - **Aviation?**
    - **Surface Transport?**
  - **Distributed Generation**
    - **Simplification of Licence Conditions to remove barriers**
    - **Price transparency – simple tariff**
    - **DTI – Distributed Energy Unit (to assist developers)**

UK Political Position – 2007

- **Energy White Paper 2007**
  - **Carbon Reduction Commitment (CRC)**
    - **Cap and Trade Scheme for large non-intensive, commercial and public sector organisations not caught by either EU ETS or "Climate Change Sector Agreements" –** ***DEFRA aim in force by 2009***
    - **Organisations > 6,000MWh i.e. Elec - £500k/annum**
    - **Planning**
      - **Infrastructure Planning Commission by April 09 (now scrapped!)**
      - **Remit electricity projects**
        - **onshore >50MW**
        - **offshore >100MW**
        - **Network Infrastructure**

UK Political Position – 2010

- **Renewable Energy Strategy 2009**
  - **No Grandfathering for Biomass**
- **Consultation on continued Banding for Biomass**
  - **Result, acceptance of banding with caveats, for biomass & EfW**
- **Consultation on continued Banding for Liquid Bio-fuels**
  - **Ongoing**
- **Consultation on 2011 ROO**
  - **Ongoing**

UK Political Position – ROC Scheme

- **Introduced in 2002**
- **1 MWhr = 1 ROC = ~£45**
- **Sectors – See OFGEM Analysis**
- **Co-firing of biomass – originally to end in 2006**
  - **2004 changes**
    - **Extended to 2009**
    - **Initially with 25% market cap**
    - **From April 06 with 10% cap to 09**
    - **Proportion of Energy Crops after April 09**
  - **Energy White Paper Proposals (2007)**
    - **Banding – Biomass now at higher rate**
    - **Headroom confidence**

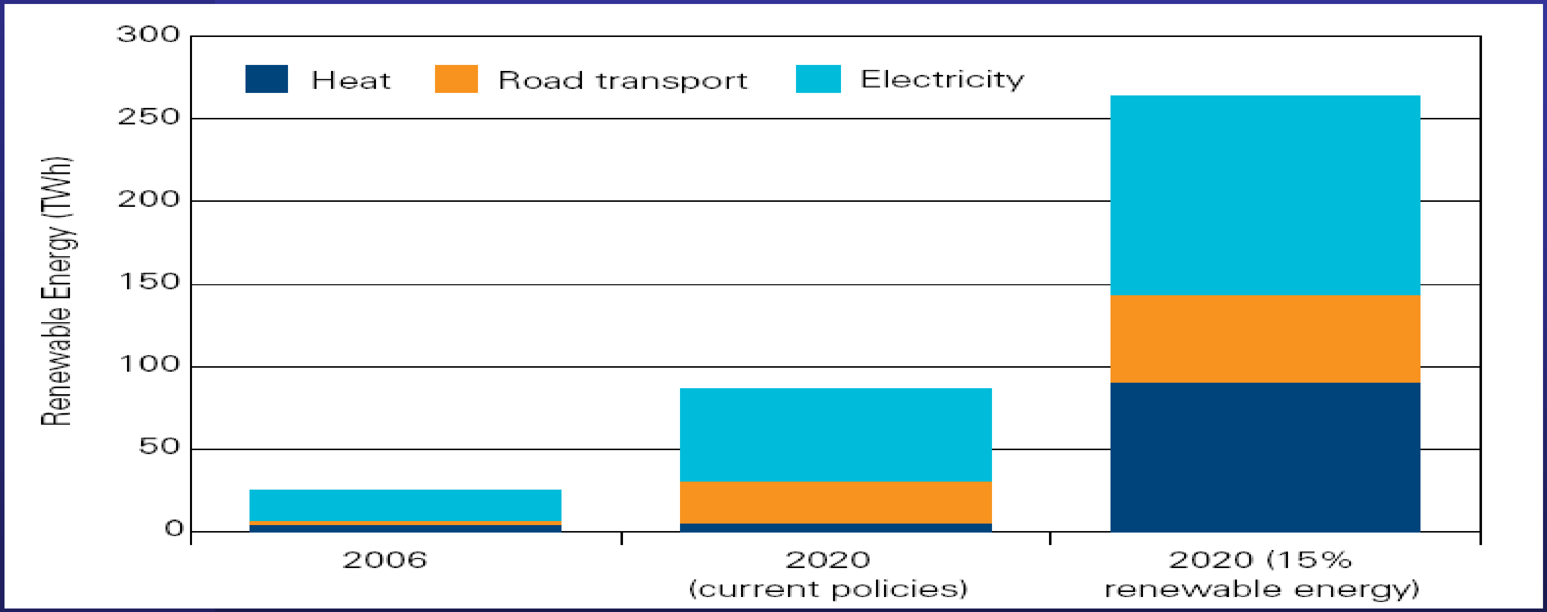
Renewable Electricity Market

- Current Climate
  - ROC Banding from April 09

Band	Technologies	Level of support ROCs/MWh
Established 1	Landfill gas	0.25
Established 2	Sewage gas, co-firing on non-energy crop (regular) biomass	0.5
Reference	Onshore wind; hydro-electric; co-firing of energy crops; EfW with combined heat and power; geopressure; other not specified	1.0
Post-Demonstration	Offshore wind; dedicated regular biomass	1.5
Emerging	Wave; tidal stream; fuels created using an advanced conversion technologies (anaerobic digestion; gasification and pyrolysis); dedicated biomass burning energy crops (with or without CHP); dedicated regular biomass with CHP; solar photovoltaic; geothermal, tidal Impoundment (e.g. tidal lagoons and tidal barrages (<1GW)); Microgeneration	2.0

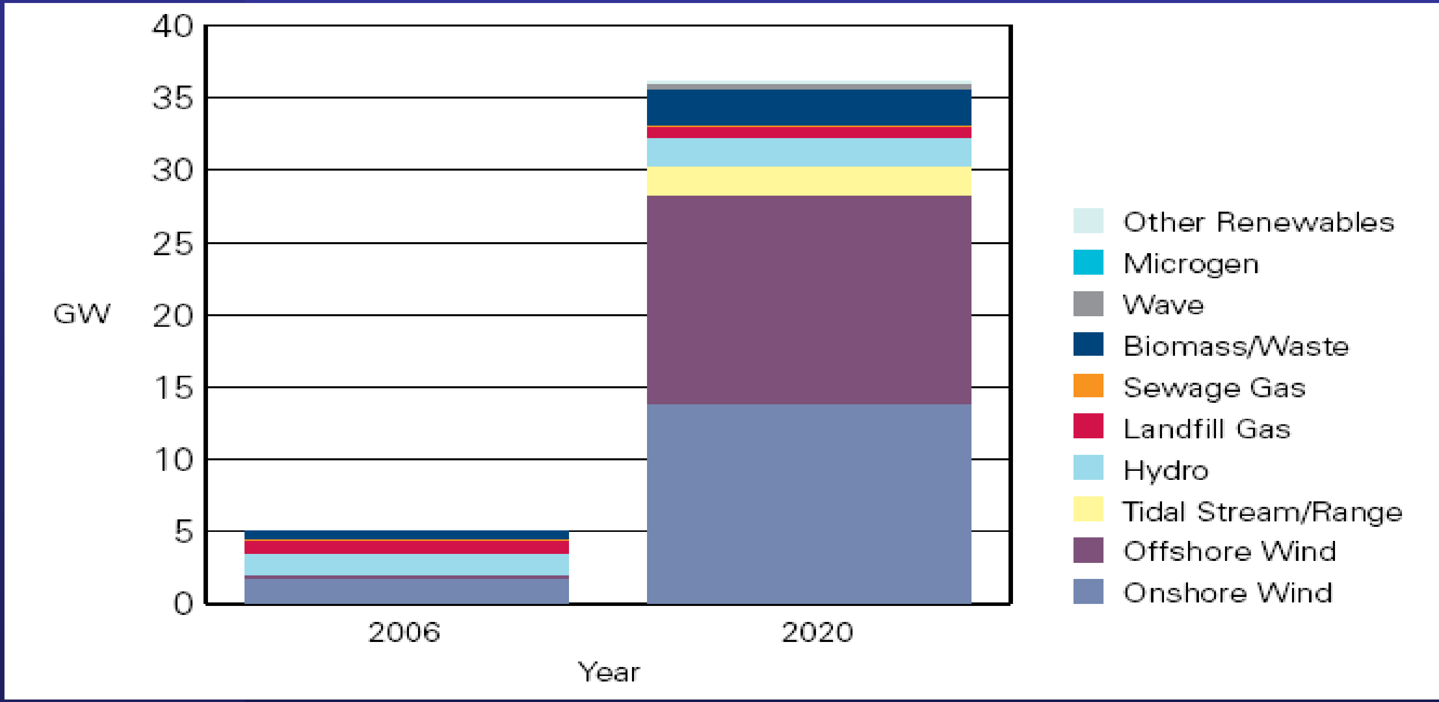
Renewable Electricity Market

- UK Renewable Energy Strategy Consultation BERR - June 08
  - The Size of the Challenge – Potential Scenario to reach 15% Renewable Energy Target by 2020



Renewable Electricity Market

- UK Renewable Energy Strategy Consultation BERR (DECC)- June 08
  - Renewable Electricity Generation Capacity Comparison Between 2006 & Projected 2020



Renewable Electricity Market

Year	Est UK Sales TWh	Suppliers obligation %	Total obligation TWh	Actual TWhr	Co-firing cap %	Max Co-Fired ROCs TWh	Proportion Co-Firing Energy Crop
05/06	320.6	5.5	17.7	13.76	25	4.4	-
06/07	321.4	6.7	21.5	14.96	10	2.2	-
07/08	322.2	7.9	25.5	15.68	10	2.5	-
08/09	323.0	9.1	29.4	18.97	10	2.9	-
09/10	323.8	9.7	31.5		10*	3.2*	25*
10/11	324.3	10.4	33.6		10*	3.4*	50*
11/12	325.2	11.4	37.1		5*	1.9*	75*
12/13	326	12.4	40.4		5*	2.0*	75*

Renewable Electricity Market

- **Current Climate**
  - **Assessment of Market Size**
  - **Technology Type**

Table B3: 2006-07 ROCs, SROCs and NIROCs issued by generation technology type and month

Month	Biomass and waste using ACT	Biomass	Co-firing of biomass with fossil fuel	Hydro <20 MW DNC	Landfill gas	Micro Hydro	Off-shore wind	On-shore wind	PV	Sewage Gas	Wave	Total
Apr-06	786	96,700	123,196	192,426	347,376	5,589	52,288	311,169	7	28,327	0	1,157,864
May-06	963	92,388	106,693	152,801	362,528	4,486	63,618	290,177	17	29,889	0	1,103,560
Jun-06	980	83,661	108,496	101,396	339,708	3,252	33,891	193,650	34	28,397	1	893,466
Jul-06	959	84,227	120,294	92,510	332,064	2,909	38,293	158,750	32	27,646	0	857,684
Aug-06	1,150	80,199	111,365	94,825	351,319	2,771	65,084	208,154	21	27,789	0	942,677
Sep-06	1,451	69,330	126,071	147,893	338,597	4,723	53,534	259,006	22	27,215	3	1,027,845
Oct-06	1,649	70,314	154,711	202,233	358,723	6,017	73,975	326,372	17	27,471	1	1,221,483
Nov-06	1,682	92,596	221,953	250,836	359,464	6,356	75,464	527,198	9	28,839	4	1,564,401
Dec-06	1,628	92,560	208,365	312,288	372,673	6,447	54,005	481,973	3	28,424	0	1,558,366
Jan-07	1,592	96,660	276,969	318,688	371,999	6,739	86,031	619,682	9	27,524	0	1,805,893
Feb-07	1,206	83,839	204,468	229,762	342,899	5,561	54,487	336,438	10	26,568	0	1,285,238
Mar-07	1,519	102,241	166,009	288,350	383,008	7,946	70,154	496,406	229	29,831	0	1,545,693
Total	15,565	1,044,715	1,928,590	2,384,008	4,260,358	62,796	720,824	4,208,975	410	337,920	9	14,964,170

Developments in the UK Waste Market

- **Landfill Legislation**
  - **Disposal Sites Changing from Waste Management Licensing to PPC/IPPC Permits**
    - **Engineering, hydrological & geographical specifications significantly higher.**
    - **Many existing sites can't achieve new standard and are now operating on a closure plan. Expectation is landfill sites will reduce by 40%.**
  - **Landfill Directive – Already banned Co-disposal of Hazardous Wastes with Non-Hazardous Wastes**
  - **Landfill Tax**
    - **Escalating at £8/yr in April 2010 - £46/mt**
    - **Current gate fees to Landfill are approx £20/mt + Landfill Tax**
  - **Councils – Statutory Duty to Divert BMW from Landfill**
  - **LATS structure – Introduced to allow Credits Trading between Disposal Authorities**

Bio-Mass Market: From 2010

- Market Segments
  - Co-Firing Bio-mass
  - Dedicated Bio-mass
  - Combined Heat & Power
- Fuels
  - Imported biomass (mainly wood)
  - Biomass fraction of Waste
- Dedicated Biomass Plants
  - Fuel Contract
  - EPC Contract
  - Project Finance
  - Regulatory Risk
    - Developer
    - Bank

Bio-Mass Market: From 2010

- **Dedicated Biomass Plants Influencing Factors**
  - **Potential is 5GW of capacity**
    - **Base load**
    - **Fully dispatchable**
  - **Fuel Contract**
    - **Fuel Type**
    - **Availability & Longevity at competitive price**
    - **Suitable Counterparty**
  - **EPC Contract**
  - **Project Finance**
    - **Hot to cold!**
    - **Regulatory Risk**
  - **Developer**
    - **Regulatory risk**
    - **More risk averse**
    - **Competition from co-fired sector**
  - **Government**
    - **Jekyll & Hyde?**

Concluding Comments

- Market & drivers complex
- In 09 Banding "kick started various sectors" including Biomass
- Existing generators
  - 0.5ROC doesn't work
  - Conversion option
  - Nervous about banding
- Dedicated Biomass
  - Grandfathering granted
  - Development now appears stalled!
- What's next?