


The Growth of Advanced Conversion Technologies for the Treatment of Waste in the UK.

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1.0 Introduction

This report was commissioned by Ricardo-AEA under PO 70102294, and funded by the International Energy Agency's Bioenergy Agreement through Task 36, managed by Ricardo AEA.

Vismundi Limited was requested to investigate the apparent growth of the use of Advanced Conversion Technologies (gasification and pyrolysis) for the treatment of waste in the UK, and identify the number of projects in development and in operation, and state the reason for the growth experienced.

Vismundi has used direct knowledge, internet search engines and the Planning Portal to produce a database of ACT projects, now presented in this report as of March 2015. As a result, 88 projects have been identified in various stages of development. The report then explains how changes in the market for energy from waste in the UK, the Renewables Obligation (RO), and Electricity Market Reform (EMR) has facilitated a growth from a couple to the current number in 5 years.

2.0 Summary

The use of advanced conversion technologies (ACT) – namely pyrolysis and gasification – has increased rapidly in the UK over the last five years. In 2008, when Waste Gas Technology UK Ltd retrofitted an Energos gasification unit into an old incinerator in the Isle of Wight, it became the first successful operational gasification unit in the country using waste as fuel. Today, using Vismundi's direct market knowledge of the waste management market, internet search engines and the UK Government Planning Portal¹ a survey has revealed a total of 87 ACT projects in the UK with the intent of treating MSW or C&I wastes, in various states of realisation. Whilst some of these facilities are delayed in their development – and some are even moribund, - 23 of them are progressing, and a further 28 have a chance of moving into development and operating at some time in the future - a remarkable increase over a relatively short period of time. 37, however are considered to be moribund or have little chance of being developed, indicating that projections based on the number of projects announced or even for which planning permission is granted, overstates the likely growth in waste management infrastructure.

The decline in local authority energy from waste procurements under PFI and the Renewables Obligation (RO) with the incentives offered through Renewable Obligation Certificates (ROCs) has change the market for energy from waste infrastructure development. The competitive advantage provided to ACT by ROCs compared with combustion technologies has facilitated ACT schemes to come forward, but has also encourage a significant amount of speculation by potential developers. The outcome of the 2014 allocation round of Electricity Market Reform (EMR), with its use of auction to award Contracts for Difference (CfDs), indicates, however, that in the future only the more competitive developments will have any chance of receiving an incentive payment and it is expected that the more

1

http://www.planningportal.gov.uk/wps/portal/portalhome/unauthenticatedhome!/ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gjtXBnJydDRwMLbzdLA09nSw_zsKBAIwN3U_1wkA6zeHMXS4gKd29TRwNPI0s3b2e_AGMDAwOlVAE04Gig7-eRn5uqX5CdneboqKglAGUwqho!/dl3/d3/L2dBISvZ0FBIS9nQSEh/

speculative projects will fall away. Consequently, only a fraction of the 88 projects identified are expected to be realised.

3.0 Description of Survey and Results

The survey of ACT projects in the UK intended for the treatment of either MSW or C&I wastes is presented in Appendix 1.

The projects, which include both pyrolysis and gasification technologies, were identified from a combination of sources viz:

- Vismundi's direct knowledge of the waste management marketplace and the company's own involvement in some of those projects;
- Internet searches using key words and Google Alerts reporting pages related to energy from waste ;
- Trade publications such as MRW, Edie Environmental News, ENDS Report etc;
- The UK Government Planning Portal, whose home page is http://www.planningportal.gov.uk/wps/portal/portalhome/unauthenticatedhome/lut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gjtxBnJydDRwMLbzdLA09nSw_zsKBAIwN3U_1wkA6zeHMXS4gKd29TRwNPI0s3b2e_AGMDAwOlvAE04Gig7-eRn5uqX5CdneboqKglAGUwqho!/dl3/d3/L2dBISEvZ0FBIS9nQSEh/

The survey was carried out over March 2014 to March 2015. Initial findings were reported at the IEA Task 36 at Harwell on 29th October 2014 in Vismundi presentation " Drivers for Advanced Thermal Technologies – Why Gasification is booming in the UK". At this time it was reported that over 100 pyrolysis and gasification projects had been identified. Subsequent refinement of the survey reclassified some projects as biomass rather than waste, and eliminated others considered to be "false" announcements and that have not even received real consideration. As a consequence, the number of projects now identified as having some basis and proposed for the treatment of wastes as at March 2015 is 87.

The database presented in Appendix 1 is in the form of a spreadsheet table and provides the following information:

- **Project reference** – this is just an allocated number
- **Developer** – the name of the company responsible for developing the project as far as it is known.
- **Site name** – the name by which the site is known
- **Address** – postal address of the site
- **County** - county, unitary authority or city in which the project lies
- **Country** – England, Scotland, Wales or Northern Ireland to allow a sort by administration
- **Waste throughput (tpa)** – tonnage of waste of thermal treatment process
- **Generation capacity (MW)** – reported capacity of plant in MW electrical
- **Technology** - the type of technology or the proprietary make if known
- **Programme** – any information on programme timescales if known
- **Status** – a short statement of the current position of the project
- **KR Comments** – the personal view of the author.

-
- **References** – internet URLs referring to the project. These are given just as links to provide information. They are not comprehensive and in some cases may not be reliable a number are press extracts.

The database shows the following:

1. Pyrolysis is not yet commonly used for waste treatment, although at times it is difficult to differentiate between a pyrolysis stage (in near zero oxygen) followed immediately by combustion of the syngas and gasification (sub-stoichiometric combustion) followed by full combustion. The reason it is less popular than gasification is probably because it is endothermic and requires energy to be input to maintain stable reaction.
2. There are 88 identified projects as of March 2015. Of these, 61 are in England, 14 in Scotland, 10 in Wales and 3 in Northern Ireland.
3. Using the traffic light system, only 23 of the 87 projects are green with a high probability of proceeding. 27 are amber and may or may not go ahead, but 37 are red with a low probability of proceeding. This indicates how the considering the number of EFW projects alone, without considering the context in which they sit misleads evaluations of capacity versus available waste. It is the writer's view that with the recent implementation of CfD under EMR, most of the amber projects are likely to falter.
4. The survey shows that gasification technology in particular, but also pyrolysis has become an accepted method of thermal treatment of waste and that the ROC system has been successful in encouraging developers to consider ACT.
5. There is a large number of pyrolyser and gasifier designs and more are developed every year. It is apparent from the survey, however, that certain proprietary suppliers are beginning to dominate. Within the UK, the ACT technology suppliers that appear to be establishing themselves (in alphabetical order) are:
 - Advanced Plasma Power
 - Alter NRG (plasma)
 - Biomass Power
 - Chinook Sciences
 - Energos
 - Kobelco
 - New Earth Technologies
 - Nexterra
 - Outotec
 - Valmet

Time will tell whether these will continue to develop or whether some will fall by the wayside.

4.0 Changes in the UK Waste Management Market

The most significant change in the EfW market in the UK over the last three years has been the demise of local authority contracts under PFI. This has had two major impacts:

- The number of local authority procurements has drastically reduced and a number were even cancelled. Whilst there will continue to be local authority tenders, (a) with some notable exceptions, most of the urban conurbations have the benefit of at least one EfW plant within a catchment distance and so the number of future plants required to treat MSW will be considerably less than has been procured in the recent past; and (b) the absence of PFI support disincentivises local authorities to procure EfW plants for themselves and so there is greater propensity to share or even adopt a more commercial approach to disposal of their residual waste;
- The slow down in sales to local authorities implies that future EfW plant sales must rely on C&I treatment of waste. This is a very different market than the MSW one and from a plant supplier's point of view, considerably more competitive, because a C&I collector has more choice of disposal route (including export), and is not driven by ethical policy such as carbon footprint or proximity principle.

The result of the above is that the marketplace for EfW plant sales is dependent on C&I sales with the only driver being a financial one – ie to be competitive with landfill disposal or the cost of export. Despite local authority “best value” methodology, the fact is that PFI has allowed the capital cost of EfW to rise and the typical costs seen in PFI tenders is too high to be competitive in the C&I marketplace. To have a forward order book, it is now necessary for an EfW plant supplier/developer to make use of any financial support available wherever possible to reduce the impact of the capital cost on the gate fee.

5.0 The Renewables Obligation

The Renewables Obligation (RO) has been the main support mechanism for renewable electricity projects in the UK. Smaller scale generation is mainly supported through the Feed-in Tariff Scheme (FITS). The RO came into effect in 2002 in England and Wales, and Scotland, followed by Northern Ireland in 2005. It places an obligation on UK electricity suppliers to source an increasing proportion of the electricity they supply from renewable sources.

Renewables Obligation Certificates (ROCs) are “green” tradable certificates issued to operators of accredited renewable generating stations for the eligible renewable electricity they generate. Ultimately, they are used by electricity suppliers to demonstrate that they have met their obligation, but have no fixed value, but is worth around £46 per ROC in 2013/14 prices.

A full explanation of the RO and ROCs will not be given here, but needless to say, the ROC mechanism effectively subsidised ACT because the number of ROCs issued to each generator is determined according to not only the amount of electricity it generates, but also the type of technology it uses - each type falls under a 'banding level' indicating the number of ROCs issued for each MWh generated by that technology. Until 2014, the banding awarded ACT 2 x ROCs, which is now regressing and in 2016 will be 1.8 x ROCs. However, because it is considered to be an established technology, EfW combustion is awarded no ROCs. Hence, if by way of example, the wholesale price of electricity is say £50/MWh and a ROC is worth £46, even after regression, an ACT would receive £132.30/MWh for the renewable content of its waste fuel, whereas a combustion EfW plant would receive just £50 – whereas the gate-fee received by each could be more or less the same.

Hence, with a shift in the marketplace created by the end of PFI and the strong incentive towards ACT provided by ROCs led to many developers starting to consider pyrolysis and gasification technologies. As successful experience in operating such plants in Northern Europe and Japan became known, projects involving ACT started to come forward.

For energy from waste and ACT, ROCs will no longer be available unless the plant is commissioned and accepted by Ofgem by 31st March 2017 unless it has been awarded a "grace period", in which case the longstop date is 31st March 2018. After this date, all projects with ROCs will be grandfathered and all new projects will need to apply for a CfD (see Section 8 below). Announcement of the end of ROCs was made by DECC in October 2012.

Following the announcement of EMR in July 2011 and the ending of ROCs, with no details available of what EMR would bring, a surge in ACT developments occurred, including a number that were purely speculative. Now that EMR is implemented and we are now in the transition period when operators may choose between the two, it can be expected that the rush for ACT will slow down and the longstop date for ROCs approaches and plants cannot be built and commissioned in time, by Q3 2015, it can be expected that all new ACT developments will fall under EMR.

6.0 Electricity Market Reform and Projected Impacts

The objective of Electricity Market Reform is to deliver the more renewable energy and reliable supply, while minimising costs for consumers in the long term. The intent is to transform the UK electricity sector to one in which low-carbon generation can compete with conventional, fossil-fuel generation.

The mechanism for achieving this is called "Contract for Difference" (CfD). The full scope of EMR and CfD is too extensive to report here, but in essence, new energy from waste developments requiring to avail themselves of:

- (a) a subsidy to boost the value of electricity sales; and
- (b) an off-take contract that protects them from exposure to the wholesale electricity market,

will need to undertake a bidding process in an auction under what is known as an "allocation round". Details of the allocation process can be found on the DECC website at <https://www.gov.uk/government/collections/electricity-market-reform-contracts-for-difference>

To win a CfD, a project has to bid within a “pot”. In 2014, Pot 1 was for more established technologies, Pot 2 for emerging technologies and Pot 3 for dedicated biomass. Energy from Waste with CHP was in Pot 1, and ACT was in Pot 2, in competition with offshore wind and biomass with CHP.

Budgets were set for each pot and starting with the lowest bid price and progressing upwards, projects were accepted and awarded a CfD until the budget was exceeded (ie bid price/MW x capacity). The project “breaking the bank” was then removed, the auction terminated and a strike price awarded to all successful bidders at the highest bid price accepted under the pot for each of the years 2016, 2017 and 2018, depending on when the project is to be commissioned.

The 2014 allocation round has just completed and the CfD Register has been issued. It is of note that :

- (a) Combustion EfW is not supported unless it is accompanied by CHP;
- (b) Two EfW with CHP projects were successful, but both are associated with paper mills to take the heat and can probably be considered as being exceptional;
- (c) Only three ACT projects were successful, at a strike price of £114/MWh at the price basis date (equivalent to approximately £120/MWh at current day prices);

It is unlikely that the structure of the allocation round process will change in the foreseeable future. Therefore, ACT projects that require support above say £120/MWh will not win a CfD and therefore will not be developed. This implies that only the larger, more efficient ACT projects will be developed until such time the support mechanism is changed, if it ever is.

6.0 Conclusions

The database of ACT projects in the UK as at March 2015 has been presented along with the writer’s view of their likely probability of being developed. There are 87 projects identified, but only 23 have a high probability of being developed.

The reason for the surge in ACT projects has been explained. It has been described how the move away from PFI support for local authority procurements, the new importance of the C&I waste marketplace, the RO and support given by ROCs to ACT, the ending of ROCs and the impending introduction of EMR have all conspired to encourage developers to propose ACT projects – a number of them purely speculative.

Lastly the impact of EMR has been discussed and the CfD allocation round mechanism described. It is now expected that the number of ACT projects coming forward will significantly slow down and it is possible that no new combustion EfW plants will be developed unless they are accompanied by a distributed energy system or some form of CHP.

7.0 Acknowledgements

The author wishes to acknowledge and thank the International Energy Agency and Ricardo-AEA, whose support enabled this report to be compiled.

Appendix 1

Database of UK ACT Projects

Reference No.	1.0 Gasification											
Reference No.	Developer	Site Name	Address	County	Country	Waste Throughput (tpa)	Generation Capacity (MW)	Technology	Programme	Status	KR Comments	References
1.1	A E Stuart & Sons	Hill Barton	Hill Barton Business Park, Clyst St Mary	Devon	England	72,000	2.6	Fibre Bricketts	Unknown	Planning permission approved December 2009	Project using 6 gasifiers with 5 engines. Project has been up for sale. Nominated in Devon Waste Management Plan.	https://www.devon.gov.uk/text/plandoc_25_3578.pdf https://www.devon.gov.uk/text/plandoc_22_3578.pdf http://www.propertypil ot.co.uk/pdf/169+14113247.pdf http://www.min eralndwasteplanning.co.uk/foia/20090514.pdf
1.2	Advanced Plasma Power	Tyseley Urban Resource Centre" 2 Hay Hall Road, Tyseley	Birmingham	Birmingham	England	50,000	6.0	APP Plasma	Planning permission gained December 2013	Awaiting outcome of ETI competition	Planning permission granted. No development. Linked to ETI completion for efficient gasification. No announcement yet from ETI. If APP does not win competition, plant may not go ahead	http://www.letsrecycle.com/news/latest-news/app-wins-permission-for-tyseley-gasification-plant/ http://blog.advancedplasmapower.com/news/advanced-plasma-power-receives-planning-permission-waste-to-energy-plant-tyseley/
1.3	Air Products	Tees Valley 1 (TV1)	Stockton-On-Tees	Tyne & Wear	England	350,000	49.9	Alter-NRG plasma gasifier/Foster Wheeler Syngas Clean-up/Air Products APU	Construction commenced August 2012	In construction - late.	Under construction. Reported difficulties. Said to be now in commissioning. FW reconstruction completed. Major Power output likely to be reduced from that stated.	http://www.airproducts.co.uk/microsite/uk/teesvalley/ http://www.airproducts.co.uk/microsite/uk/teesvalley/facilities.htm http://www.waste-management-t-ews/new-energy-deal-to-save-84m-from-government-billworld.com/articles/2013/11/50-mm-plasma-gasification-waste-to-energy-plant-tyseley/
1.4	Air Products	Tees Valley 2 (TV2)	Stockton-On-Tees	Tyne & Wear	England	350,000	49.9	As Item 1.2	Construction started April 2014	Under construction	As Item 1.2	As Item 1.2

1.10	1.9	1.8	1.7	1.6	1.5
BH Energy Gap LLP	BCB Environmental Management	Barry Renewable Energy (BioGen power)	AWM	Amey Cespa	Alternative Use Group/Alchemy Farms
Kirk Sandal Road, Kirk Sandal	Unit 86 Marston Moor Business Park	Barry Dock	Former Solaglas Site	Waste Recovery Park, Dickens Road, Old Wolverton	Riverside Industrial Plant
Doncaster	Tockwith, Wetherby	Barry, Vale of Glamorgan	Ripley Road, Bradford	Milton Keynes	Marsh Lane, Riverside Industrial Estate, Boston, PE21 7PJ
Yorkshire	Yorkshire	Glamorganshire	Yorkshire	Northamptonshire	Lincolnshire
England	England	Wales	England	England	England
120,000	60,000	80,000	160,000	90,000 MSW	90200 wood + 46500 sewage sludge
12.5			20.0	7.0	12.0
Kobelco	Unknown	Formerly Energos with CHP	Probably Kobelco	Energos with CHP	Waste wood & sewage sludge. Thought to be Dragon EFW
Planning permission implemented October 2012	Planning permission refused	Planning permission gained September 2009.	Planning permission renewed July 2013	Operational September 2016	
Under development	No progress	No progress	No progress	Under construction	Planning granted April 2010
Planning permission implemented. In development	Situation unknown	Formerly a FCC project. Situation uncertain	Formerly an Energos Project. Situation uncertain	Local authority MSW contract.	Little is known about this. However, Dragon is a pyrolysing system that has not yet proven to be financially viable.
www.bhenergygap.co.uk		http://www.waste-management-world.com/article-s/2011/02/waste-to-energy-chp-proposals-for-barry-wales.html http://www.biogenerationpower.com/abo	http://www.energogroup.com/energy-recovery-facility/community-liaison/bradford-plant/	http://www.mkwasterecovery.com/ http://www.letsrecycle.com/news/latest-news/ameycespa-confirmed-for-milton-keynes/ http://www.waste-management-world.com/articles/2012/07/26/abroad-for-7	http://www.organic-recycling.org.uk/page.php?article=1133&name=Planning+granted+for+Britain%27s+first+dual+waste+gasification+power+plant+er+plant+ http://www.lincolnshire-echo.co.uk/WASTE-

1.17	1.16	1.15	1.14	1.13	1.12
Biossence	Biossence	Biossence	BioGen Power	BioGen Power	Binn Waste Management Ltd
Cophall Wood	Hooton Park Sustainable Energy Facility	Ford Motor Company Complex	Newport Docks		Binn Farm
Polegate	Hooton Park, North Road, Wirral	Dagenham Dock (ELSEF)	Newport	Irvine, North Ayrshire	Glenfarg, Perthshire, Scotland
East Sussex	Cheshire	London	Monmouthshire	Ayrshire	Perthshire
England	England	England	Wales	Scotland	Scotland
95,000	400,000	130,000	120,000	80,000	60,000
18.0	49.7	19.0	12.0	6.5	4.5
Valmet (formerly Metso)	Valmet (formerly Metso)	Valmet (formerly Metso)	Energos	Energos	TBA
none	Revised planning permission gained September 2014.	None	Planning permission gained April 2009	Planning permission gained August 2007.	Planning permission granted October 2011
Abandoned	Awaits financial close	Abandoned	No progress	No progress	No progress
Planning application withdrawn prior to committee meeting following criticism from ESCC.	Requires commercial arrangements and financial close to be achieved.	Planning permission granted. No development. Biossence Dagenham placed into receivership by LWARB. Site turned over to residential development	Ex-Biogen site. Project thought to be abandoned.	Ex-Biogen site. Project thought to be abandoned.	Originally intended as a BOS gasifier until Dargavel problems emerged. Good
					Good likelihood of proceeding
http://www.biossence.com/node/47	http://www.hootonpark.com/wasteandbioenergy.com/article/1314912/green-light-biossences-hooton-park-wte-plant	http://www.mrw.co.uk/news/london-gasification-firm-enters-administration/8660211 .article	http://www.biogenpower.com/about.htm#plantportfolio	http://www.energogroup.com/energy-from-waste/plants-under-development/	http://www.thecourier.co.uk/news/local/perth-kinross/sta-uk-wins-approval-for-gasification-scheme-at-binn-farm-1.32511 http://www.mine-ralandwasteplanning.co.uk/news/

1.22	1.21	1.20	1.19	1.18
Clean Power Properties Ltd	Chinook Sciences	Bombardier Aerospace	Blakeleys Waste Management Ltd	Birmingham Bio Power
New Lodge Farm	London Sustainable Industries Park	7 Airport Road, Belfast Harbour Estate	Environmental, Energy & Ecology Centre	
Pontardulais Road, Cwmgwili, Llanelli	Dagenham Dock, Newham	Glenfar, Crummlin	Bickershaw Lane, Wigan	
Carmarthenshire	London	Lisburn	Lancashire	Birmingham
Wales	England	Northern Ireland	England	England
128,000	180,000	80,000	70,000	67,000
	20	12.0	12.0	10.0
Unspecified pyrolysis	Chinook	Biomass Power Ltd grate gasification	Unknown	Nexterra
Unknown	Complete 2016/7	9.0	Planning permission granted, January 2013	Commissioning 2016
Planning application validated in February 2014 (ref. S/29559) , Awaits determination	Planning permission granted May 2014	At financial close	No progress	In construction
Local council not in favour of development. Planning application likely to be refused.	Ex Cyclamax project. Reportedly under construction	Originally a Biogen project.	Blakeleys has been acquired by Ainscough Investments. Deliberating over the development.	Waste wood project. Will proceed.
http://cwmgwilienergy.co.uk/	http://www.mrw.co.uk/home/cyclamax-unveils-plans-for-east-london-gasification-facility/3006352.article http://chinookum.com/future-projects/thames-gateway-project/	http://www.planning.gov.uk/index/news/news_releases/common_news_bombardier-energy-from-waste.htm http://www.bbc.co.uk/news/uk-northern-ireland http://www.cwmjournal.co.uk/archives/	http://www.blakeleys.co.uk/enviro_nment_energy_ecology_news.htm http://www.blakeleys.co.uk/enviro_nment_energy_ecology_centre.ht	http://www.power-technology.com/projects/birmingham-bio-power-plant-tyseley/ http://www.nexterra.ca/files/BBPL-project.php

555-0055-10573

1.35	Clean Power Properties Ltd		1.32	1.31	1.30	1.29
		Willesden Junction Freight terminal	Allerton Bywater	Washwood Heath Energy Recovery Centre	London Gateway Logistics Park	Clean Power Properties
Gosport	Forres	Willesden Junction, Ealing	Wheldon Road, Wheldon, Castleford	Washwood Heath	Thames Haven, Thurrock	
Hampshire	Morayshire	London	West Yorkshire	Birmingham	Essex	
England	Scotland	England	England	England	England	
100,000	100,000	128,000	128,000	128,000	180,000	
Unknown	Unknown	15.0	15.0	15.0	20.0	
Unspecified pyrolysis	Unspecified pyrolysis	Unspecified pyrolysis	Unspecified pyrolysis	Unspecified pyrolysis	Unspecified pyrolysis	Unspecified pyrolysis
Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
No information	Planning scoping request submitted May 2012	Planning application deferred in August 2013 due to HS2	Planning application refused June 2014. Permit application	Planning granted November 2012	Planning permission granted May 2014	
Merchant project. No information.	Merchant project. No information following scoping request.	Merchant project.	Merchant project.	Merchant project.	Merchant project.	Merchant project.
	http://news.stv.tv/north/112451-plan-to-build-a-clean-power-station-in-forres-take-another-step/http://forresenergy.info/openlylocal.co.uk/about	http://willesdenenergy.info/news/2013/08/08/deferred-application-2013-08-08/ http://www.kilburntimes.co.uk/news/environment/proposal_to_install_an_incinerator_in_harlesden_is_withdrawn_at_the_11th_hour_1_7022200	http://wheldonenergy.info/downloads/WheldonEnergyClean-power-leaflet.pdf http://www.casutd.co.uk/pdf/Wheldonenergy-board.pdf	http://washwoodenergy.info/local-benefits/	http://www.rilandenergy.co.uk/land/aboutland.htm	

1.41	1.40	1.39	1.38	1.37	1.36
Corus (Tata)	Clean Power Properties Ltd with Hammerson and Standard Life Investments	Clean Power Properties Ltd	Clean Power Properties Ltd	Clean Power Properties	Clean Power Properties Ltd
Tata Steelworks	Brent Cross				New Lodge Farm
Shotton Works	Cricklewood, Barnet	Leith	Swansea	Derby	Pontardulais Road, Cwmgwili, Llanelli
Flintshire	London	Edinburgh City	Swansea City	Derbyshire	Carmarthenshire
Wales	England	Scotland	Wales	England	Wales
110,000	128,000	Unknown	100,000		128,000
12.0	15.0	unknown	12.0		
Refgas	Unspecified pyrolysis	Unspecified pyrolysis	Unspecified pyrolysis	Unspecified pyrolysis	Unspecified pyrolysis
Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Planning permission granted October 2009	Planning permission granted July 2014	Representations made with Network Rail under the Edinburgh LDP in January 2012	No progress	No progress	Planning application submitted February 2014. Not determined
No known progress. Suspect this is awaiting economic justification.	Merchant project .Debate over whether or not Brent Cross should include EFW. No further information	Merchant project still at early stage.	Merchant project.	Merchant project.	Merchant project.
http://www.mineralandwasteplanning.co.uk/news/1090648/CHP-plant-fuelled-refuse-derived-fue/	http://brentcrosscoalition.blogspot.co.uk/2012/10/clean-power-properties-ltd-devil-at-door.html	http://www.rlandenergy.co.uk/riand/aboutriand.htm http://www.edinburghcouncil.info/LDP/MIR_re sponses/Clean%20Power%20Properties%20&%20Network%20Rail%20%28Icen%20projects%20td%29.pdf http://www.edinburghcouncil.info/LDP/MIR_re sponses/Clean%20Power%20Properties%20&%20Network%20Rail%20%28Icen%20projects%20td%29.pdf	http://www.rlandenergy.co.uk/riand/aboutriand.htm	http://www.rlandenergy.co.uk/riand/aboutriand.htm	http://cwmgwilienergy.co.uk/ http://www.cwmgwilienergy.co.uk/wp-content/uploads/2013/09/clean-power-leaflet-english.pdf

1.45	1.44	1.43	1.42
DRENL	DPS/Ethos Energy	Cyclamax Holdings Ltd	Cyclamax Holdings
Stores Road	Avonmouth Industrial Park	Sheepsbridge Resource Park	Raynesway Resource Park
Corby	Avonmouth	Dunston Road, Chesterfield	Raynesway, Spondon, Derby
Northamptonshire	Bristol	Derbyshire	Derbyshire
England	England	England	Wales
80,000	1,000	60,000	70,000
12.0			
Biomass Power Ltd grate gasification	Compact Power Pyrolysis, now owned by DPS	BOS Gasification	BOS Gasification
Commence construction Summer 2015	None	None	None
Seeking financial close	Plant operated between 2002 and 2009. Now closed	Planning permission refused. Permit withdrawn December 2012.	Discontinued
Project delayed due to requirement to vary planning permission. This is now complete and project expected to achieve financial close.	The facility was not financially viable. Ethos Energy acquired it from Compact Power, but it too was unable to sustain the business.	First of the Sita/Cyclamax collaborations. No longer in development	Sita announced 6 plants to be developed with Cyclamax. Cyclamax went into liquidation along with Ascot Environmental
http://www.drenl.co.uk/?q=northamptonshire-county-council-approves-catchment-area-increase-dren%E2%80%99s-energy-waste-facility-corby http://www.drenl.co.uk/?q=corby-recycling-renewable-energy-facility-project-update http://resource.co/energy-waste-use/article/corby-energy-waste-facility-opens-financial-close		http://www.sita.co.uk/news-and-views/press-releases/sita-uk-and-cyclamax-to-partner-on-six-new http://www.letsrecycle.com/news/latest-news/cyclamax-unveils-first-of-seven-resource-parks/ http://www.letsrecycle.com/news/latest	http://www.sita.co.uk/news-and-views/press-releases/sita-uk-and-cyclamax-to-partner-on-six-new

1.50	1.49	1.48	1.47	1.46
Energos Ltd	Eco 2/ William Tracey Group	DRENL	DRENL	DRENL
Knowsley Business Park		TBA	Lostock Works	Ex-ARBRE Renewable Energy Facility
Knowsley	Linwood, Glasgow	TBA	Griffiths Road, Northwich, Cheshire	Eggborough, Selby
Manchester	Glasgow	West Sussex	Cheshire	North Yorkshire
England	Scotland	England	England	England
96,000	120,000	80,000	Unknown	200,000
7.0	12.0	12.0	Unknown	12.0
Energos		Probably Biomass Power Ltd	Probably Biomass Power Ltd grate gasification	Biomass Power Ltd grate gasification
No progress	No information	Unknown	Unknown	Awaiting 2015 CFD Allocation round
Planning permission granted. May 2009. Environmental permit granted	No progress	Planning application awaited	Ex Bedminster MBT site being considered for gasification. Planning permission granted of a	Planning application determination for change in use delayed until April 2015
Held due to inability by Energos to raise funds. Will probably proceed eventually now that it has won two contracts.	Ex-Biogen site. Talked about recently in Chamber of Commerce meeting.	Under consideration. Details not known.	Being considered for change in use to gasification	Planning application successful. Future development unknown.
http://www.mnw.co.uk/news/energogasification-plant-given-go-ahead/8638807 article http://www.energogroup.com/energos/information/news/2012/11/energos-awarded-	http://www.renfrewshirechamber.com/news/LinwoodEnergyRecoveryPlantWilliamTraceyGroup.asp			http://www.drenl.co.uk/sites/default/files/Eggborough%20Leaflet.pdf

1.55	1.54	1.53	1.52	1.51
Foresight	European Metals Recycling	European Metals Recycling	EPI Technology	Enviro-parks ltd
79-85 Beddington Lane	Alexandra Dock			Enviro-parks Materials Recovery Facility
Sutton	Bootle	Oldbury, West Midlands	Willow Lane, Mitcham	Hirwaun Industrial Estate, Hirwaun, Aberdare
London	Merseyside		London	Mid Glamorgan
England	England	England	England	Wales
150,000	130,000	350,000	8,000	240,000
4.5	30.0	40.0		Unknown
TBA	Chinook	Chinook Sciences	EPI Pyrolysis	Unknown
On hold	Planning permission granted February 2010	Operational	Unknown	Likely start 2015
Planning permission granted on appeal and revised September 2014	Unknown	In operation	Partially operational	Planning permission granted December 2010
Project foreclosed by lenders and taken into Foresight direct management in November 2014. Medium probability of proceeding.	For processing car frag and recovering metals. Likely to proceed.	Plant treats car frag and extracts metals.	Small prototype. No electrical export connection. Unlikely to be developed on this site..	Project won a CfD in 2014-Allocation round. Can now proceed to financial close. .
http://sutton.moderngov.co.uk/mgConvert2PDF.aspx?ID=17966	http://www.chinooksciences.com/2010-05-27-emr-granted-permission-for-bootle-gasification-plant/#.VSGqixPF87M	http://www.waste-management-world.com/articles/2012/07/40-mw-gasification-plant-to-recycle-elv-shredder-fluff-in-midlands.html http://www.chinooksciences.com/in-operation		http://www.bbc.co.uk/news/uk-wales-south-east-wales-11895984

1.61	1.60	1.59	1.58	1.57	1.56
Levenseat Lrtd	Kedco (now React Energy)	Island Waste Ltd	Hudol Thermal Ltd	Grundon	Grundon
Levenseat Rail Freight Terminal	Forest Park	Unit 15c, Capital Valley	Circular Technology Park", Airfield Industrial Estate,	Shore Road	
West Lothian	Enfield	Forest Road, Newport	Rhymney, Blaenau Gweru, Tredegar	Ford, Arundel	Bridgend
South Lanarkshire	London	Isle of Wight	Blaenau Gwent	West Sussex	Perthshire
Scotland	England	England	Wales	England	Scotland
60,000	60,000	38,000	5,000	120,000	90,000
10.0	12.0		Heat	14.0	
Outotec gasification	Unknown	Energos	Hudol Gasification	Outotec gasification (anticipated)	Advanced Plasma Power
Anticipated operational 2018	Commissioning early 2016	Operational	Operational	Awaiting commencement of construction. Anticipated completion 2016	Not proceeding
In construction	Under construction	In operation	In operation	Planning permission approved by WSCC, but called in. Approval by	Planning permission refused. Grundon lost appeal August 2013
Project now proceeding to construction following financial close	Wood waste project, so really biomass.		Small operating plant. Technology was used for wood gasification (Pure Power, St Neots), but failed. There has been no further development since.	Development will proceed, but will likely need to bid for a CfD in 2015.	Grundon stated they have withdrawn
http://www.levenseat.co.uk/index_files/Page714.htm	http://www.letsrecycle.com/news/latest-news/enfield-approves-plans-for-waste-wood-biomass-plant/ http://www.reactenergyplc.com/about-us	https://www.islandwaste.co.uk/pdfs/about_island_waste.pdf	http://www.hudol.co.uk/process.htm	http://www.circulartechnologypark.co.uk/ http://www.letsrecycle.com/news/latest-news/west-sussex-approves-ford-etw-plans/ http://beta.dcservices.co.uk/news/1306	http://www.dailyrecord.co.uk/news/local-news/grundon-express-disappointment-shore-road-2749884

1.67	1.66	1.65	1.64	1.63	1.62
Peel Investments	Origin Renewable Energy	Northacre Renewable Energy (Hills)	New Earth Solutions	New Earth Energy	Lisburn Energy Recovery
Bilsthorpe Business Park	Magnetic Park	Northacre Industrial Park	Arena Way		Former Burn House rendering, Lisburn, N. Ireland
Eakrin Road, Bilsthorpe	Harborough Road, Desborough, Kettering	Westbury	Magna Road, Canford	Kings Weston Lane, Avonmouth	Lisburn
Nottinghamshire	Northamptonshire	Wiltshire	Dorset	Bristol	
England	England	England	England	England	Northern Ireland
97,000	96,000	160,000	90,000	90,000	80,000
8.0	12.0	22.0	0.0	13.0	
Alter NRG Plasma	Unknown	Chinook Sciences	NEAT	NEAT	Energos
Unknown - awaiting result of call-in	No progress		Will not be for several years	Opened in September 2011	
Planning permission granted November 2014. Called in by DCLG	Planning permission granted November 2012.	Planning application submitted December 2014	Operational	Operational	Planning permission granted June 2013. Financial close
Awaiting results of call-in. Public hearing in November 2015	No progress since planning permission granted.	Facility likely to proceed if planning permission granted	Currently a prototype experimental unit. Plans to expand it eventually.	Plant in operation. Some teething problems.	Likely to proceed
http://www.bbc.co.uk/news/uk-england-nottinghamshire-30113548	http://www.originrenewableenergy.com/planning_application.html http://www.originrenewableenergy.com/about.html	http://www.hills-group.co.uk/northacre-energy/ http://www.chinooksciences.com/2014-20-10-new-technology-brings-revolution/#:VSi8qBPF87M	http://www.neweartholutions.co.uk/wp-content/uploads/2012/08/Boards-Canford-renewable-energy-booklet-web.pdf	http://www.neweartholutions.co.uk/facilities/avonmouth/ http://www.syngas-products.com/ireland/	http://www.waste-management-world.com/articles/2013/07/green-light-for-80-000-tpa-waste-to-energy-gasification-plant-in-northern-ireland.html

1.73	1.72	1.71	1.70	1.69	1.68
SBS Waste Partnership	Resource Recovery Solutions	Resource Recovery Solutions	PYReco	Peterborough Renewable Energy Ltd	Peterborough Renewable Energy Ltd (PREL)
Enviroparc, Electra Road, Maydown	Sinfin Integrated Waste Treatment Centre	Wincham Lane, Northwich	South Tees EcoPark	Energy Park Sutton Bridge	Storeys Bar Road
Electra Road	Sinfin Lane, Osmaston	Wincham Lane, Northwich	Middlesbrough	Centenary Way, Sutton Bridge	Fengate, Peterborough
Derry	Derby City	Cheshire	Tyne & Wear	Lincolnshire	Cambridgeshire
Northern Ireland	England	England	England	England	England
140,000	140,000	187,000	60,000	420,000	650,000
30.0	11.1	Not specified		60.0	80.0
Unspecified	Energos	Unknown	Metso pyrolysis	Biomass Power Ltd grate gasification	Biomass Power Ltd grate gasification
Unknown		None	Unknown	Unlikely to proceed	Unknown
SBS consortium appointed by NW Region Waste Management Group	Planning permission granted on appeal September 2012. Reached financial	Not likely to proceed	Need to raise finance	Planning permission rejected March 2015	Planning permission granted November 2009
Project has stumbled due to delays in consultation on NI waste strategy. It is not clear what will happen.	Project proceeding	Proposed as part of the Cheshire PFI tender. Shanks was eliminated.	Heralded as a breakthrough in 2011, but has not proved to be financially viable without government support..	Project is too large without benefit of economy of scale	Company acquired by GEP Group & KNM Malaysia. No progress to date, but GEP applied for supply of RDF from Essex CC.
http://www.northwestwaste.org.uk/news/procurement-process-for-new-waste-facilities-reaches-next-stage/ http://www.letsrecycle.com/news/latest-news/shanks-consortium-preferred-for-560m-ni-contract/	http://www.rsrderbyshire.com/news-and-media/shanks-receives-planning-approval-for-derby-waste-management-plant/ http://www.theconstructionindex.co.uk/news/view/interserv-achieves-100m-waste-to-energy-contract/	http://www.northwichguardian.co.uk/news/475872-1.Planning_application_in_for_Wincham_waste_plant/	http://pyreco.com/http://www.waste-management.com/letsrecycle.com/news/latest-news/europes-first-tyre-pyrolysis-plant-planned-in-north-east/world.com/articles/2013/08/80m-tyre-pyrolysis-plant-planned-in-north-east	http://www.greenenergy-parks.co.uk/energy-park-peterborough	http://www.greenenergy-parks.co.uk/energy-park-peterborough

1.78	1.77	1.76	1.75	1.74
Sita (now Suez Environment)	Sita	Shore Energy	Scotgen Dumfries Ltd (now Rank Prospect)	Scotgen
Stoneyhill Resource Recovery Park	Shepperton Eco Park	251 Glasgow & Edinburgh Road	Dargavel Stores, Lockerbie Road	Dovesdale Farm, Carlisle Road
Stoneyhill, Peterhead	Charlton Lane, Shepperton	Coatbridge	Dargavel, Dumfries	Stonehouse, Larkhall
Aberdeenshire	Surrey	North Lanarkshire	Dumfriesshire	South Lanarkshire
Scotland	England	Scotland	Scotland	Scotland
60,000	60,000	160,000	40,000	80,000
4.5	5.0	20.0	2.0	Unknown
BOS Gasification	Outotec	Chinook Sciences	BOS Gasification	BOS Gasification
None		Expected operational in 2017	Expected start-up Autumn 2015	None
Project discontinued	Planning permission granted August 2014. Now under construction.	Planning permission granted May 2011 after an appeal. Under	Temporarily closed	Planning permission refused May 2014
Suez seem to be concentrating on Aberdeen and are merely transferring waste to Newcastle upon Tyne	Part of Surrey CC PFI. Project will proceed.	Plant expected to be operational prior to ROC grace period expires 31 March 2018.	Closed due to a fire, followed by permit withdrawal by SEPA. Operating company went bankrupt and project acquired by Rank Prospect. Plant being revamped, expected to start up again late 2015.	With Dargavel planning refusal and permit withdrawn, Planet Engineering going into receivership, it is unlikely that this project will proceed.
http://www.sita.co.uk/downloads/StoneyhillLeaflet-1105-web.pdf	http://www.sita.co.uk/news-and-views/our-plans/charlton-lane http://new.surreycc.gov.uk/environment-housing-and-planning/waste-and-recycling/charlton-lane-eco-park-and-	http://www.shore-energy.co.uk/	http://www.bbc.co.uk/news/scotland-south-scotland-23850895 http://www.letsrecycle.com/news/latest-news/firm-plans-to-reopen-20m-scotgen-incinerator/	http://www.heraldscotland.com/news/home-news/waste-firm-on-brink-of-closure.21955343 http://www.bbc.co.uk/news/uk-scotland-glasgow-west-19644055

1.87	1.86	1.85	1.84	1.83
W H Malcolm Ltd	Viridor	Teal Energy	Sunrise Renewables	Sunrise Renewables
865 South Street	Polmadie Recycling Centre	Manor Way Business Park	Barry Docks	King George Dock
Glasgow	425 Polmadie Road, Polmadie	Manor Way, Swanscombe, Dartford	Woodham Road, Barry	Port of Sunderland, Sunderland
City of Glasgow	Glasgow	Kent	Glamorganshire	Tyne & wear
Scotland	Scotland	England	Wales	England
120,000	200,000	250,000	72,000	72,000
Unspecified	20 + heat	25.0	9.0	9.0
Unknown	Energos		CHO Power Plasma	CHO Power Plasma
Unknown	Commissioning 2016	Unknown	Unknown	
Planning application submitted March 2015	Planning permission granted January 2013. Under construction	Planning permission granted September 2014, but called	Plans withdrawn	Planning permission granted December 2011
Await outcome of planning application.	Under contract to Glasgow City Council. Project will proceed.	Controversial project. Depends on decision of DCLG.	Waste wood, so really a biomass project.	Waste wood, so really a biomass project situation not known
http://www.malcolmgroupp.co.uk/index.asp	http://www.viridor.co.uk/our-developments/glasgow-rec/management-world.com/articles/2013/12/viridor-s-154m-gasification-and-biogas-and-recovery-facility	http://www.bainconcapital.com/waste-gasification/ http://www.mrw.co.uk/news/teal-energy-fury-at-swanscombe-call-in/8672000.article www.planningresourcereview.co.uk/articles	http://www.barryandistrictnews.co.uk/news/latestnews/8127741.BarrybiomassplantCompanywithdrawalsnewplansthoughappealstiltogoahead/	http://renewables.seenews.com/news/europlasma-to-complete-development-of-four-biomass-plants-in-uk-164238