M+W GROUP

Global Business Unit Energy

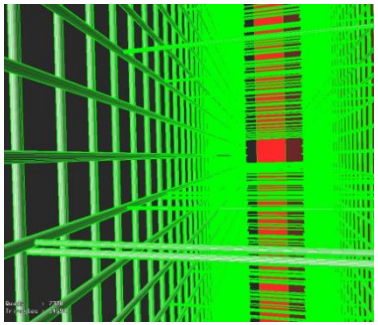
Waste to Energy -
The United Kingdom‘s Experience

Mar 2015

M+W Group at a Glance

100+ years experience

in high tech engineering and construction projects



7000+ employees

including 6000 engineers, technical experts and project execution resources.

World-Class safety

and security solutions for high risk environments with an outstanding EHS performance record

Experts in process

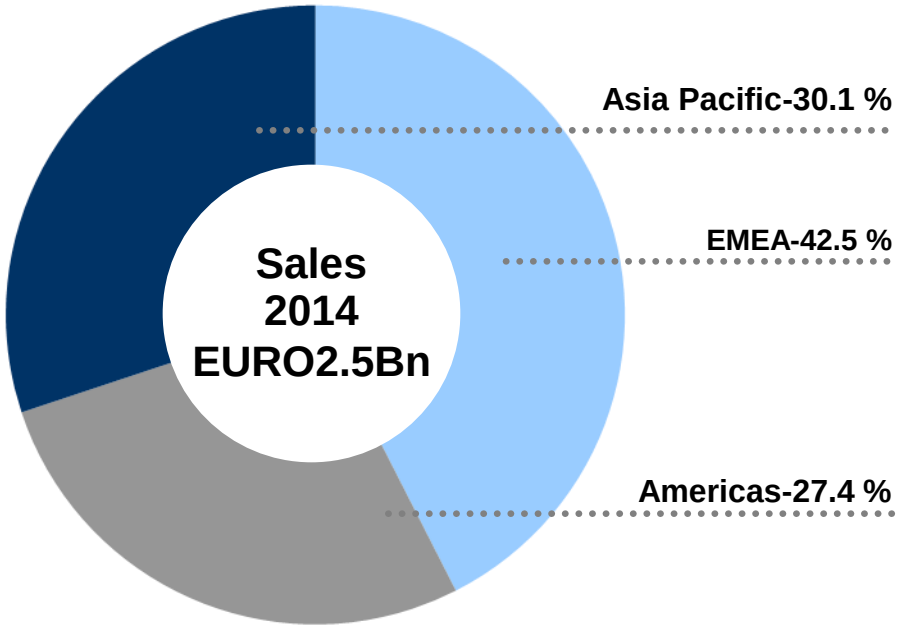
and utilities engineering with extensive in-house design, engineering and architecture capability

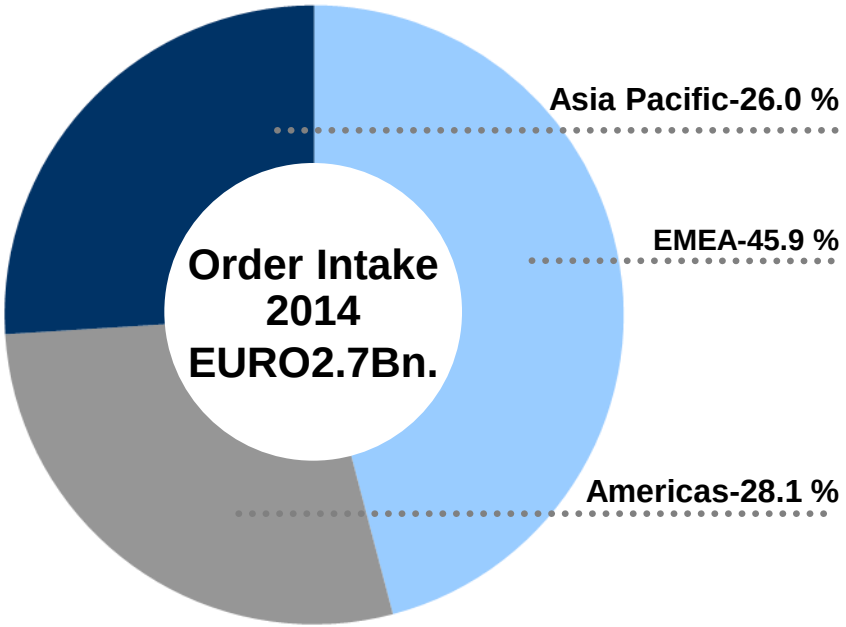
Simple, turnkey

integrated solutions. Design, fabrication and installation of industry leading systems

Financial Strength & Mission

"Create value for our customers through a unique combination of lean and sustainable, high-technology engineering and project management solutions"

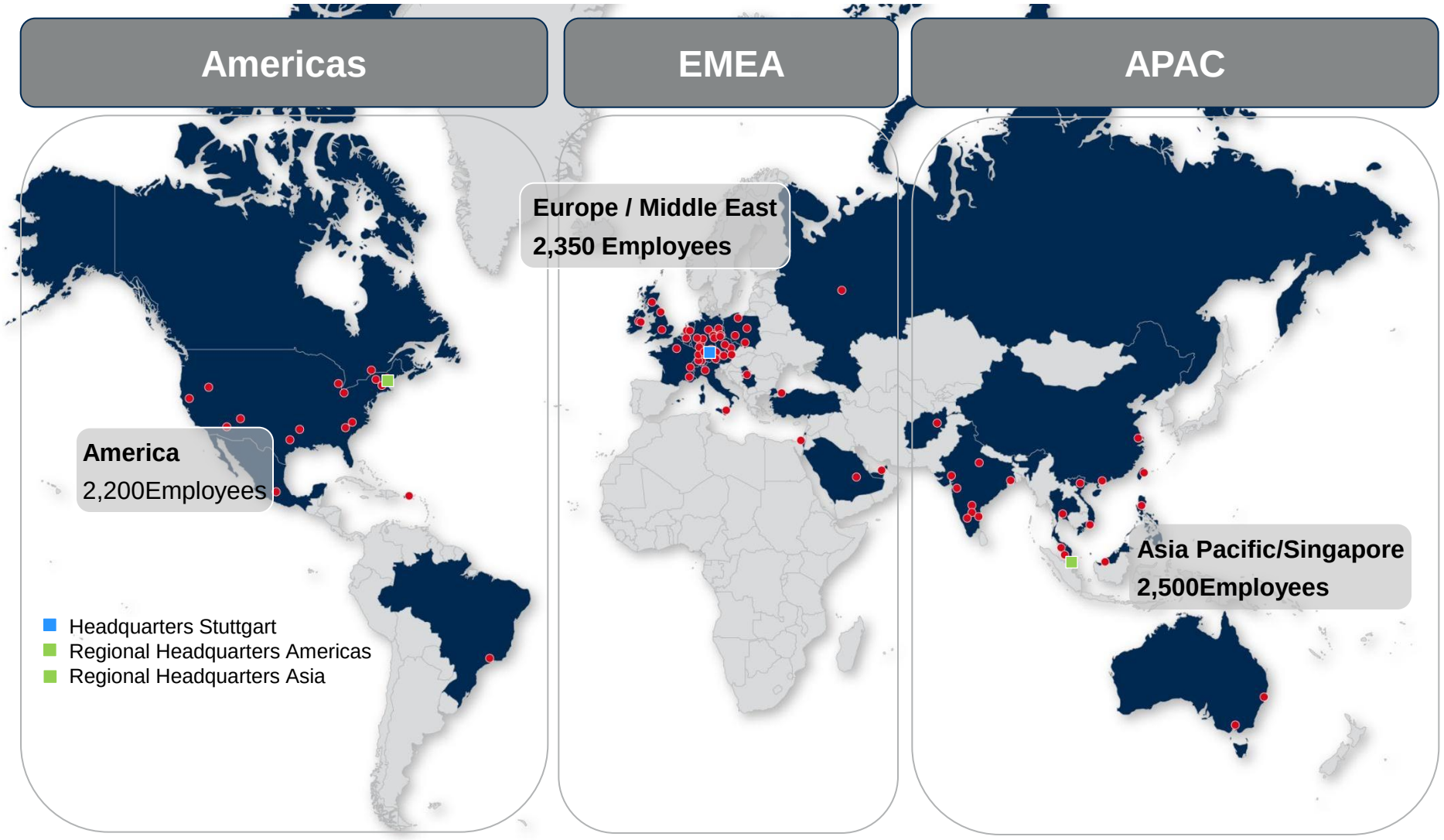




Founded	1912
Employees	7000+
Countries	32

Ownership	Private
Bonding Capacity	>600M
Debt	Zero

Global Reach



Energy Business Unit

M+W GROUP

Americas | EMEA | APAC

Energy

Thermal, Solar and Nuclear

GAS	WASTE/ BIOMASS	SOLAR	NUCLEAR
			
Combined Cycle Power Plants	Biomass Thermal & Digestion	Photovoltaic Power	Fusion Research
			
Embedded Co/Tri Generation	Waste Recycling & Thermal	Concentrated Solar Power	Decommissioning

Waste
Waste Sorting & Thermal Treatment

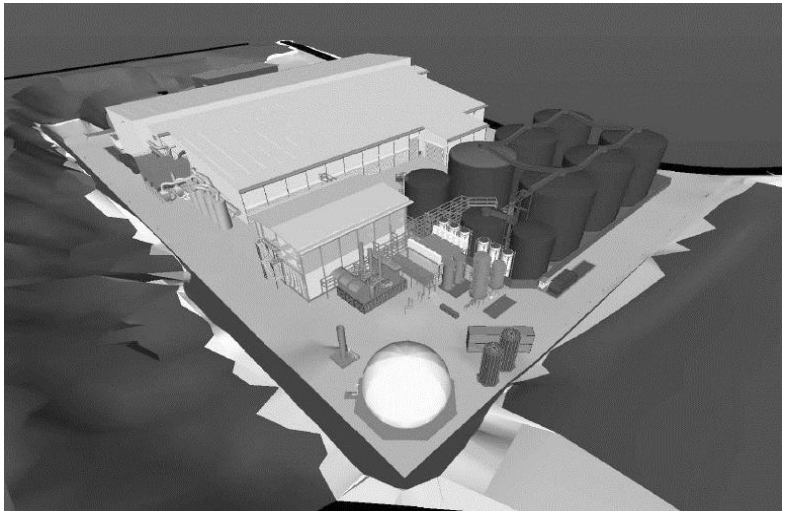
M+W scope of works as general contractor for waste sorting, gasification and incineration plant projects. Typical size:- 100,000 - 400,000Tpa of waste.

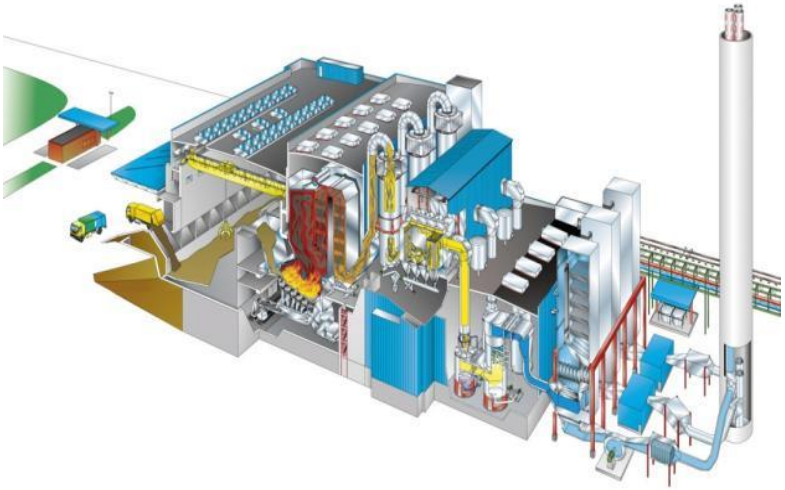
Conceptual phase

- Technical and economical evaluation of different types, configurations and concepts

Engineering, procurement, installation, commissioning and testing of

- Waste recycling, fuel preparation and handling
- Gasification and incineration technologies
- Boiler
- Turbines (steam or gas as appropriate)
- Condensers
- Flue gas treatment
- Balance of plant
- Instrumentation, control and electrical equipment
- Buildings, connection and infrastructure





References - Waste

Project

Industry leading MBT/AD waste treatment facility (PFI project)

Client

Biffa

Location

Horsham, UK

Period

2010 - 2014

TIC

£112m

Scope

M+W Group was responsible for the full EPC delivery of a 312kt per annum municipal waste Mechanical Biological Treatment (MBT) facility at Horsham for Biffa and West Sussex CC. The facility produces 4.2 MWe. Key features of the project included the provision of: reception hall, wet and dry pre-treatment areas, gas compound , dryer building, AD tank farm, visitors' center (BREEAM Excellent) as well as offices

UK: SITA – Charlton Lane Eco Park, Surrey

- Re-development of operational facility maintaining usage throughout construction (facility receives over 1.1 million visits/ year from residents)
- PFI contract corporate financed by Suez Environmental. Full contract release and mobilised June ’15
- 60ktpa municipal waste > fluidised bed gasification >3.65 MWe
- 40ktpa segregated food waste > anaerobic digestion > 1.8 MWe

UK: Levenseat Renewable Power, Scotland

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- Facility to replace adjacent landfill. ~2 million m3 rock blasted and removed to create development platform and screening mound
- Project Financed, Foresight, Zouk and Investec Bank. Closed March ‘15.
- 220ktpa mixed commercial/industrial waste > materials recycling facility (MRF) > 96ktpa gasifier fuel (RDF)
- Fluidised bed gasification > 12.66MWe + heat offtake for drying in MRF

UK: Energy Works Hull, South Yorkshire

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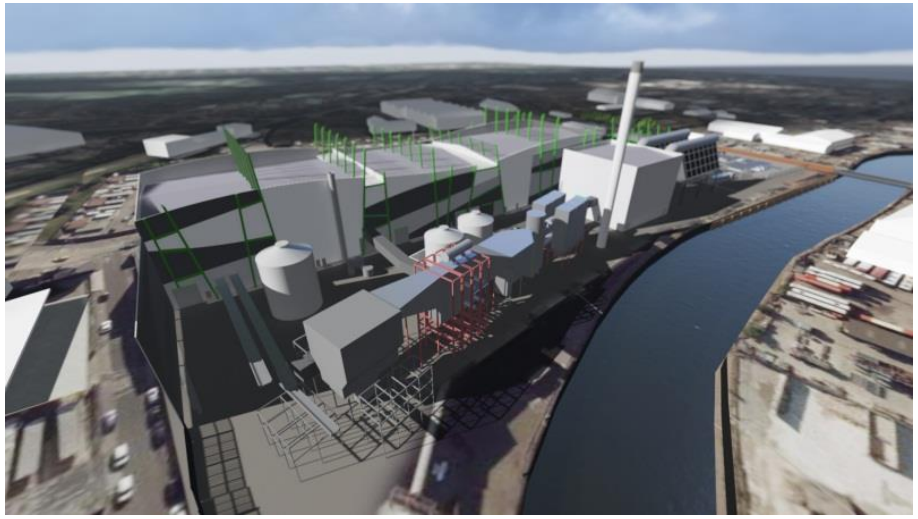
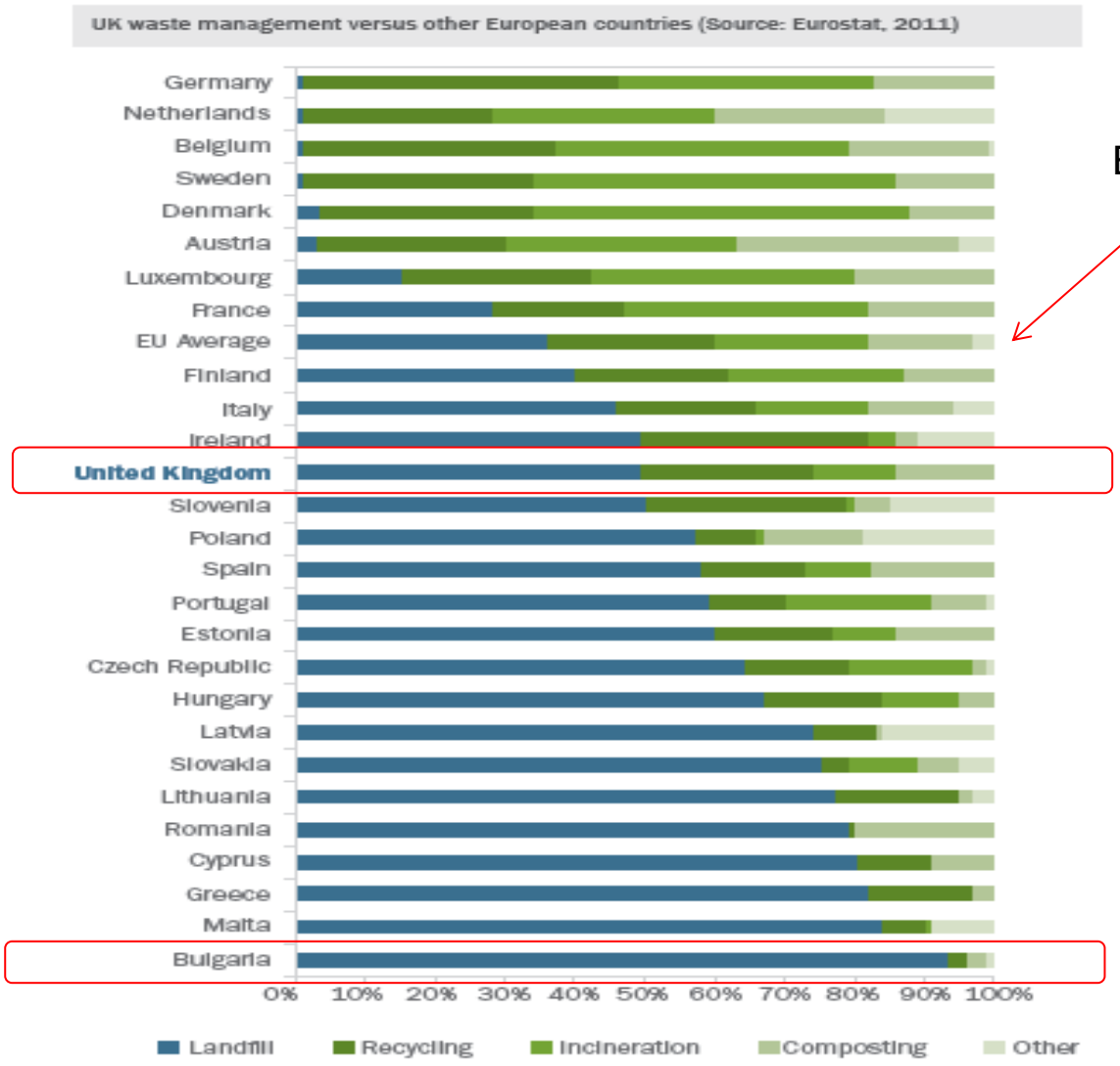
- Re-development of industrial site in former docks on River Humber, improving area by building Waste to Energy facility, using fluidised bed gasification.
- All equity Project finance including Foresight as lead arranger and Bioenergy Infrastructure Group as principal funder. Closed November ‘15
- Includes an Energy Academy to become part of Hull University. Benefits from EU regeneration grant of €28m.
- 300ktpa Refuse Derived Fuel > Material Pre-treatment plant > 269ktpa gasifier fuel > 29.4MWe.
- First close in UK of a Waste to Energy plant under new Contract for Difference subsidy regime.



THE UNITED KINGDOM'S EXPERIENCE

Lessons from the United Kingdom

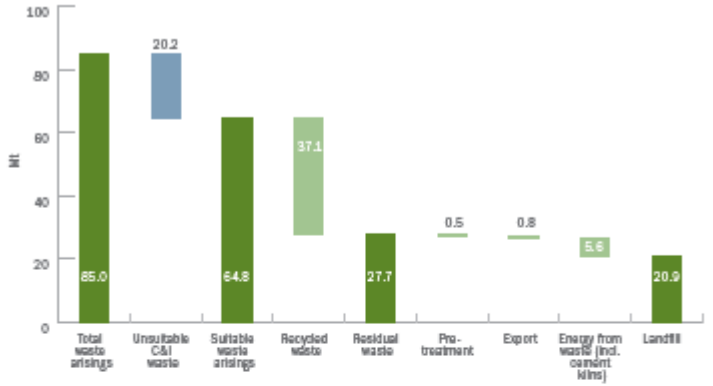


EU Average

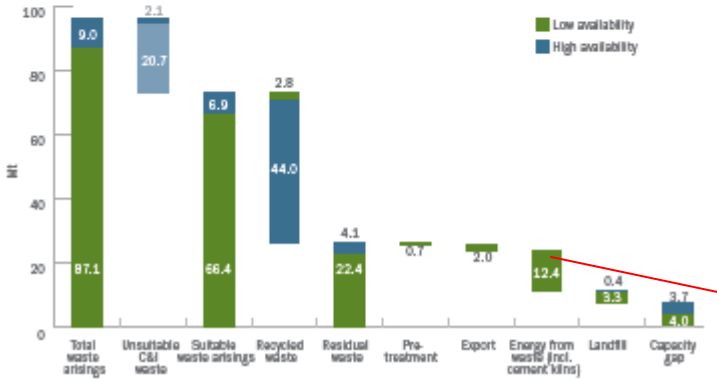
- In 2011, UK and Bulgaria both below EU average
- Bulgaria was the lowest ranking Country
- Bulgaria had highest landfill contribution

Lessons from the United Kingdom

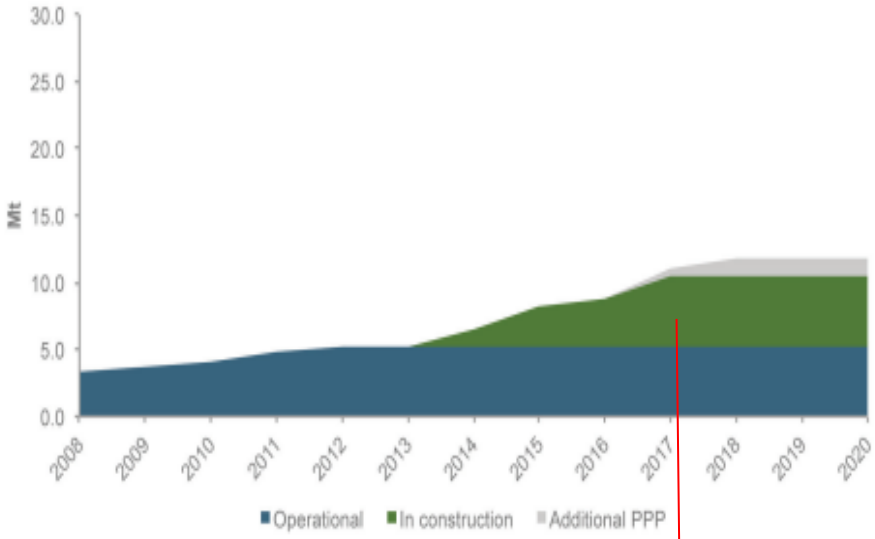
UK waste landscape in 2012



UK waste landscape in 2020[2] (Low and high availability cases)



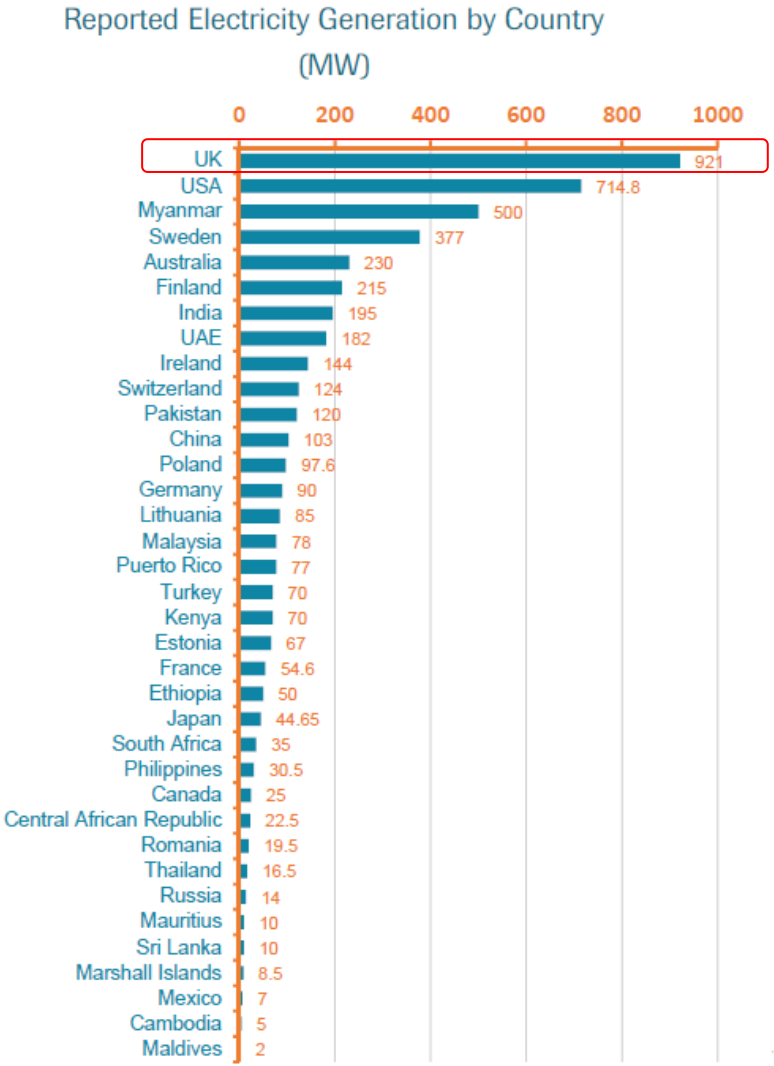
PPP backed energy from waste capacity (as at December 2013)

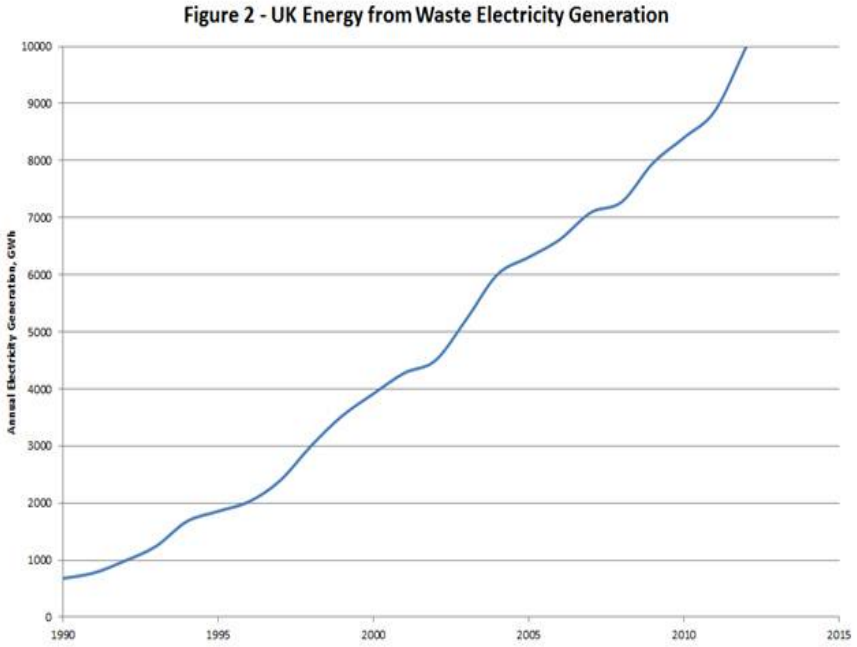


+6Mt of capacity in construction

Increase= 6.8Mt

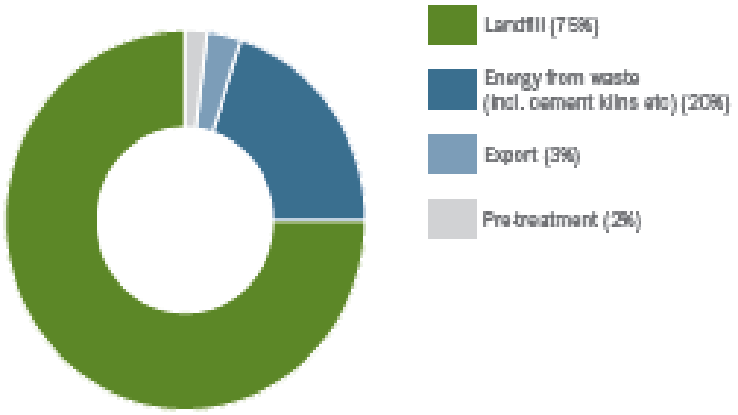
Lessons from the United Kingdom



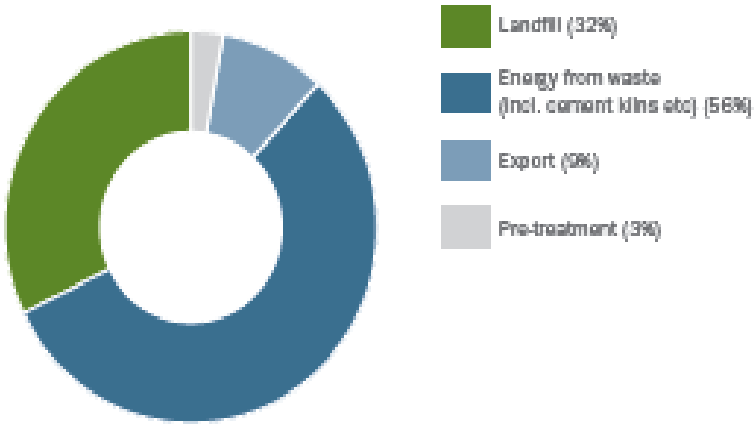


Lessons from the United Kingdom

Residual waste in 2012

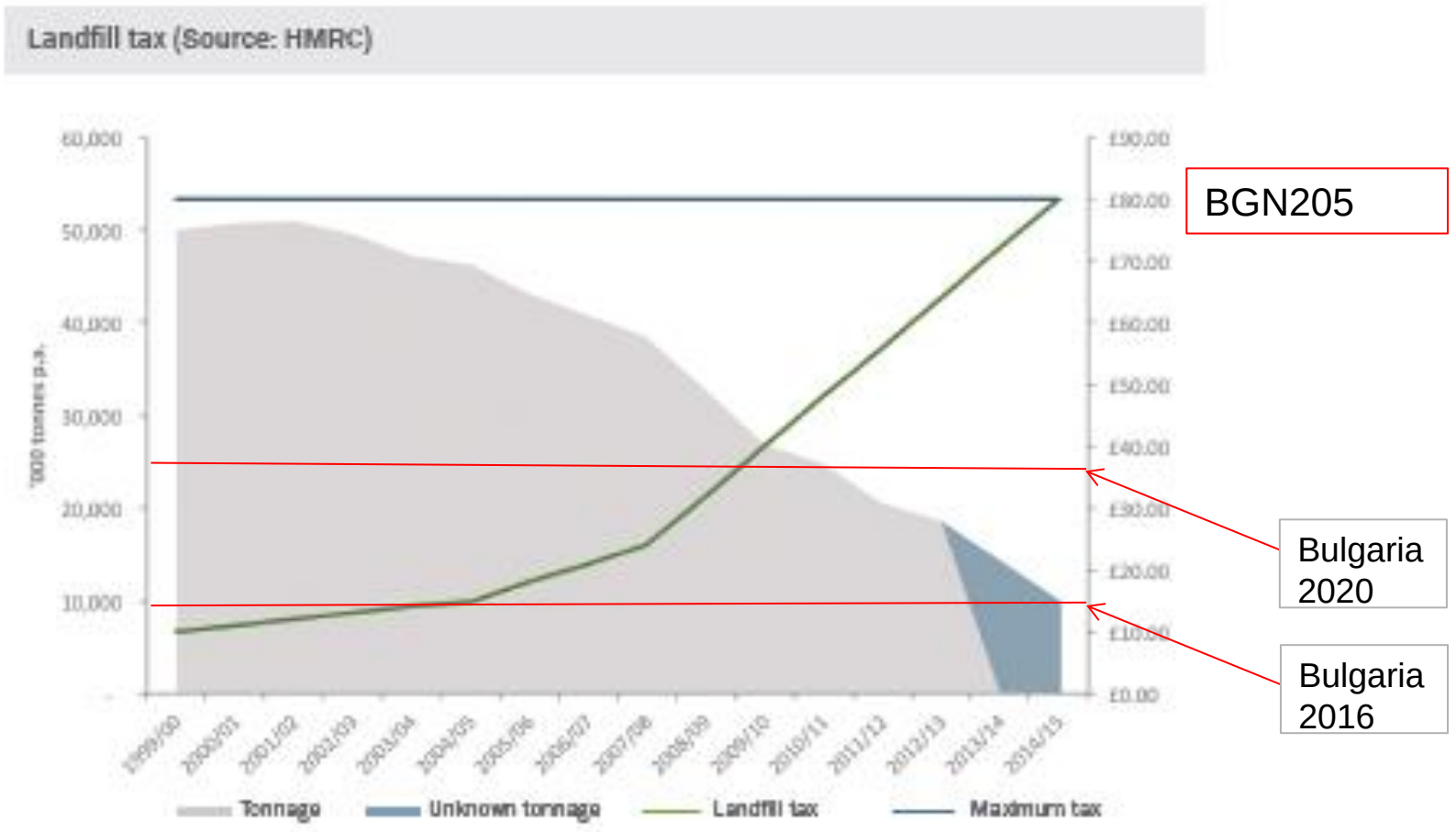


Residual waste in 2020 (estimated)



In 8 Years EfW will Jump from a 20% Contribution to 56%

Lessons from the United Kingdom



Lessons from the United Kingdom

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Table 8: Determination of ROC recycle value since 2008-09

	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Buy-out and late payments redistributed	£352,651,576	£323,668,318	£358,308,373	£123,116,772	£164,420,029	£42,372,844
ROCs presented	18,948,878	21,337,205	24,969,364	34,404,733	44,773,499	60,757,250
Recycle value per ROC	£18.61	£15.17	£14.35	£3.58	£3.67	£0.70
Worth of a ROC	£54.37	£52.36	£51.34	£42.27	£44.38	£42.72
Average ROCs issued/MWh	1.00	1.04	1.07	1.12	1.27	1.27
Support per MWh supplied	£54.37	£54.45	£54.93	£47.34	£56.36	£54.25

Average= £53.62 (BGN136)
BUT – EFW with CHP only received 0.5ROC AND 50% biogenic reduction so £13.41 (BGN34) per MWh

Lessons from the United Kingdom

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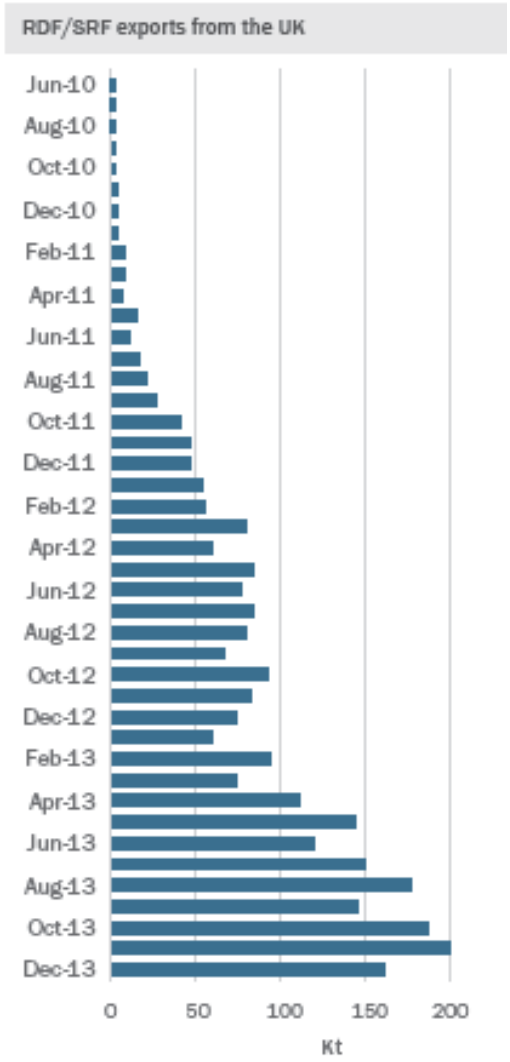
Pot 1 (established technologies)	Administrative Strike Price (2015/16)	Pot 2 (less established technologies)	Administrative Strike Price (2016/17)	Pot 3
Onshore wind*	95	Offshore wind	150	Biomass conversion
Solar Photovoltaic*	120	Wave‡	305	
Energy from Waste with CHP	80	Tidal Stream‡	305	
Hydro†	100	Advanced Conversion Technologies	150	
Landfill Gas	55	Anaerobic Digestion*	150	
Sewage Gas	75	Dedicated biomass with CHP	125	
		Geothermal	145	

£80=BGN205
(50% biogenic to apply)

£150=BGN380
(50% biogenic to apply)

Lessons from the United Kingdom



- BUT!
  - UK exported over 2.5Mt in 2015
  - Over 15Mt was landfilled in 2015
  - Resource recovery growth has compromised
  - £10M's have been wasted on failed EfW projects
  - CfD process has caused a slow down in investment in terms of uncertainty, prices achieved (80%) and lack of available 'pot'
  - Biogenic measurement still very unclear

Lessons from the UK - Summary

- Landfill taxation combined with EfW subsidy have increased the rate of deployed EfW infrastructure in the UK dramatically
- Energy subsidies in the UK have assisted EfW, but not anywhere near as materially as increases in gate fees caused by avoiding high landfill taxation
- Increasing landfill taxation in Bulgaria is encouraging but investment is required to provide the alternatives
- In the first instance MRFs are required to reduce landfill percentage and increase recycling for Bulgaria to meet 2020 targets
- The current absence of effective support for the renewable energy element of EfWs will prevent deployment using external or non-grant capital. However, co-firing RDF with coal may support an investment case
- As the average duration of collect and dispose contracts has increased, so has the rate of infrastructure deployment. Longer public contracts provide more investment
- Any future EfW subsidy should be ring-fenced from other renewables in its own ‘pot’ to avoid competition for subsidy from wind and other ‘easier’ projects
- Projects aligned with industrial energy consumers are successful, particularly as carbon levy derogation falls away
- Gasification is now bankable and projects have been much quicker to deploy
- Planning and permitting delays are the biggest problem for new infrastructure. Central Government control is recommended

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We stand for reliability and long-term commitment