The renewable energy contribution from waste across Europe.

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ISWA Dakofa Conference

CEWEP

Confederation of European Waste-to-Energy Plants

CEWEP represents 380 of the 420 Waste-to-Energy plants across Europe.

They thermally treat household and comparable waste, which is not other-wise reused or recycled, and generate energy from it.

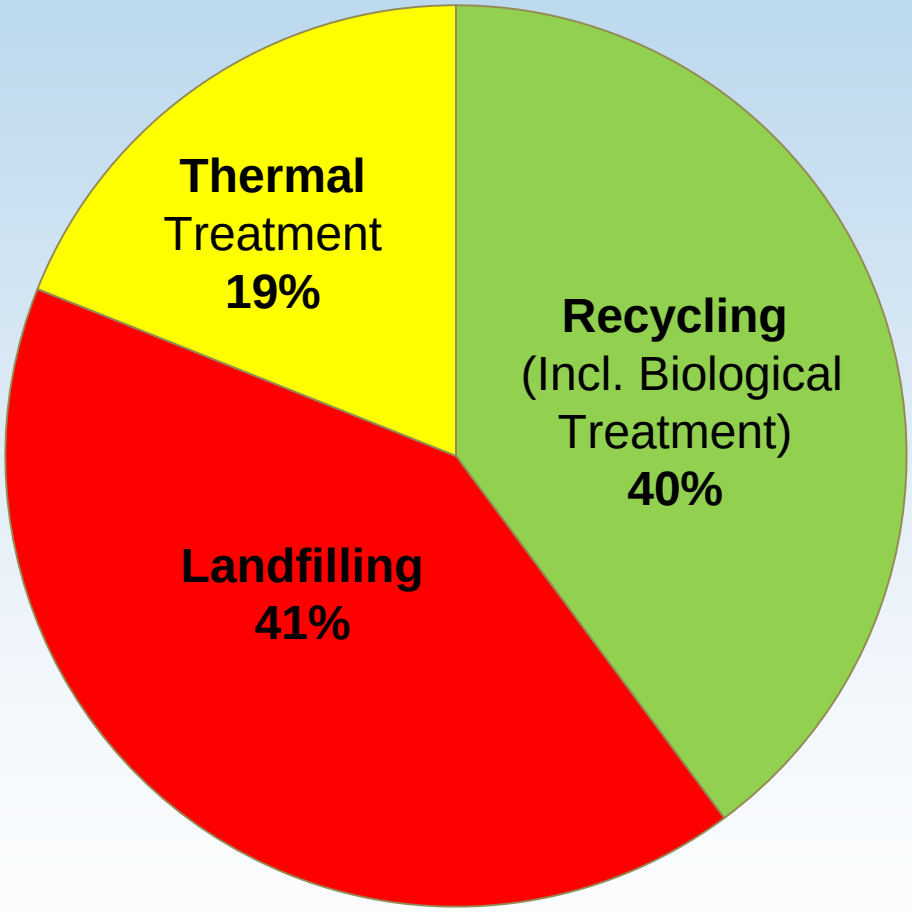
In 2007 across Europe they supply:
electricity for 5 million households
and heat for 4 million households.

Objectives of the Study

Demonstrate **amount of Renewable Energy** generated by **various Waste Processing Routes** across Europe (present and future potential)

Indicate **contribution of Energy from Waste** routes to the achievement of the EU Binding Renewable Energy Targets 2020 in the Renewable Energy Directive

Treatment of MSW in Europe EU27, 250 m tpa



Treatment of Municipal Solid Waste in the EU 27 in 2006
Source: EUROSTAT

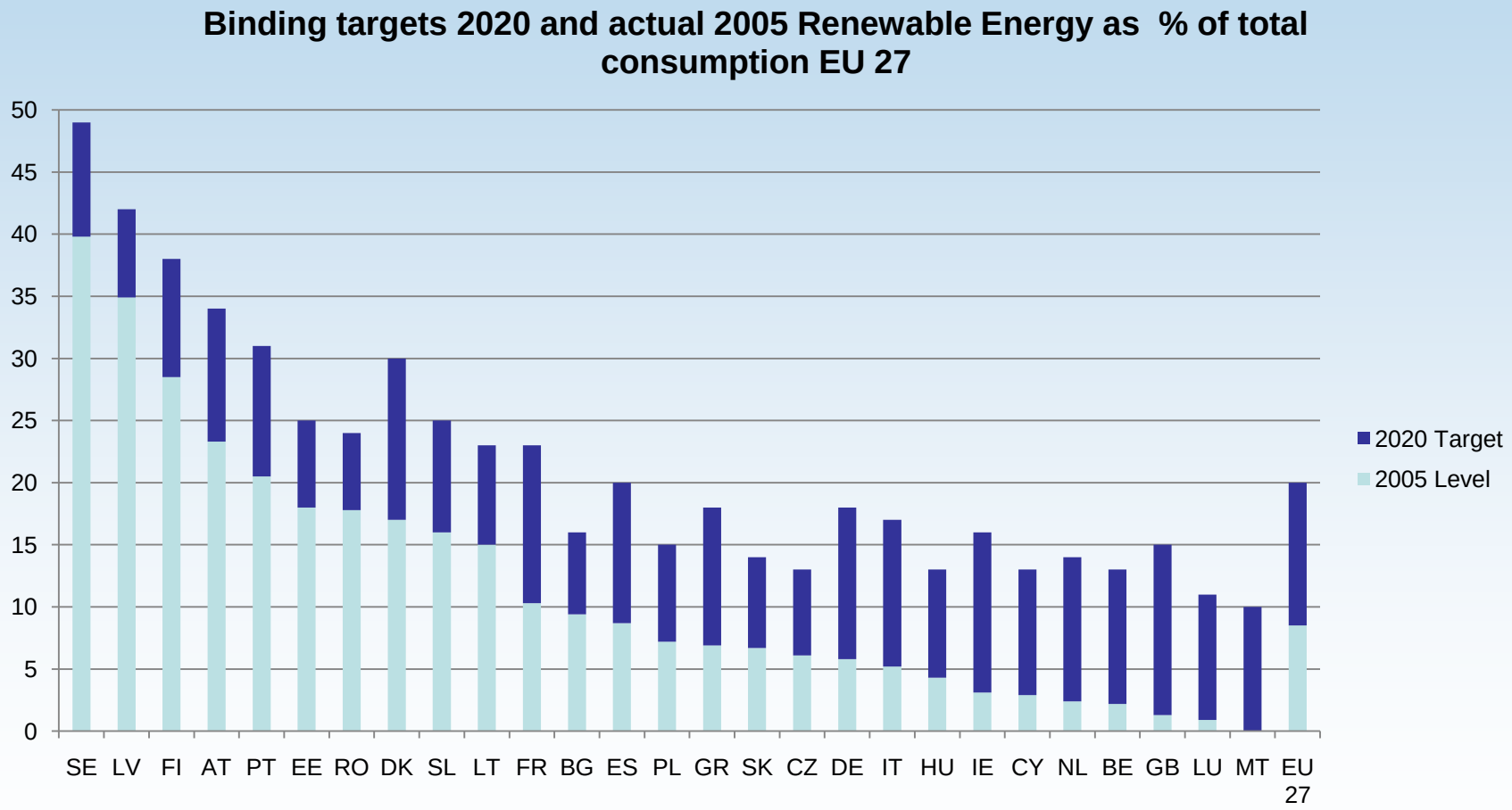
A large part of the EU27 waste is still wasted by putting it on landfills !

But waste is a precious resource which should be utilised for raw materials and ENERGY !

Why Renewable Energy from Waste deserves the attention?

- RE from waste is a much **cheaper source** of RE than from most other RE sources (solar, wind, biomass)
- It is **readily available** from professional waste processing, although in volume it has its limitations
- It already makes a significant contribution to the Renewable Energy performance of various countries
- RE from waste contributes to achieving the 2020 RE binding targets across Europe
- It is a major **factor in avoided CO_2** emissions due to professional waste processing

EU 27 have ambitious targets for Renewable Energy overall 20 % of consumption by 2020



The gap to close is about 1500 TWh of Renewable Energy

(at a flat – zero growth - EU energy consumption level of 13700 TWh)

Approach of study

- Consider years 2006, 2010 and 2020
- Estimate volumes of waste processed for these years
- Assume appropriate Renewable levels
- Calculate production levels of both electricity and heat for supply
- Construct data for 3 scenarios 2020: realistic, optimistic and potential

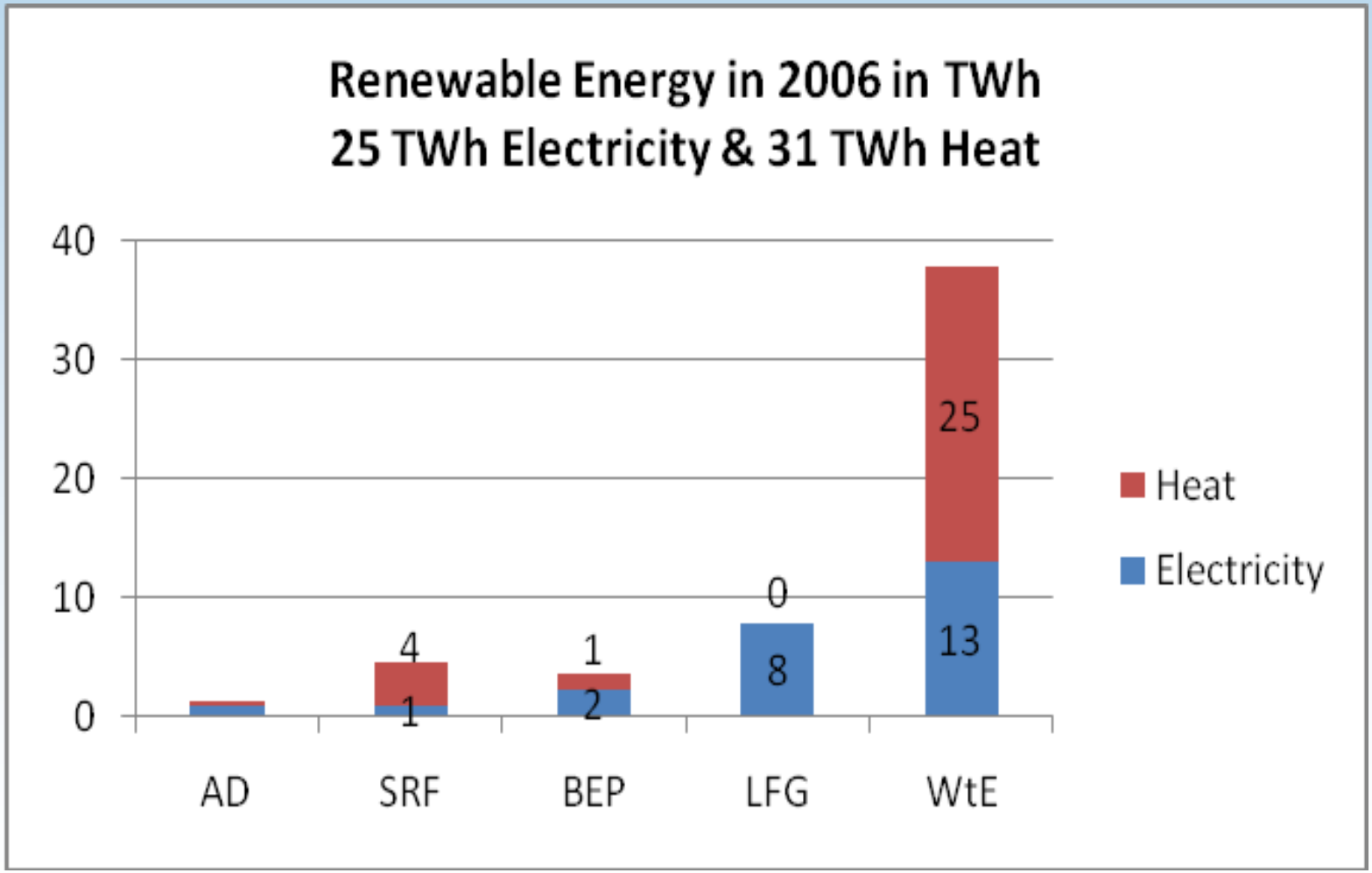
- For AD of separate biowaste and MSW sorted Biowaste
- For SRF and RDF (SRF) as fuel in cement kilns and power plants
- For Landfill Gas (LFG)
- For dedicated Biomass Energy Plants (BEP) (waste wood)
- For WtE thermally treating MSW and comparable waste incl dedicated RDF incineration plants.

- Agricultural waste, industrial food waste , sewage sludge and grown biomass NOT included in this study

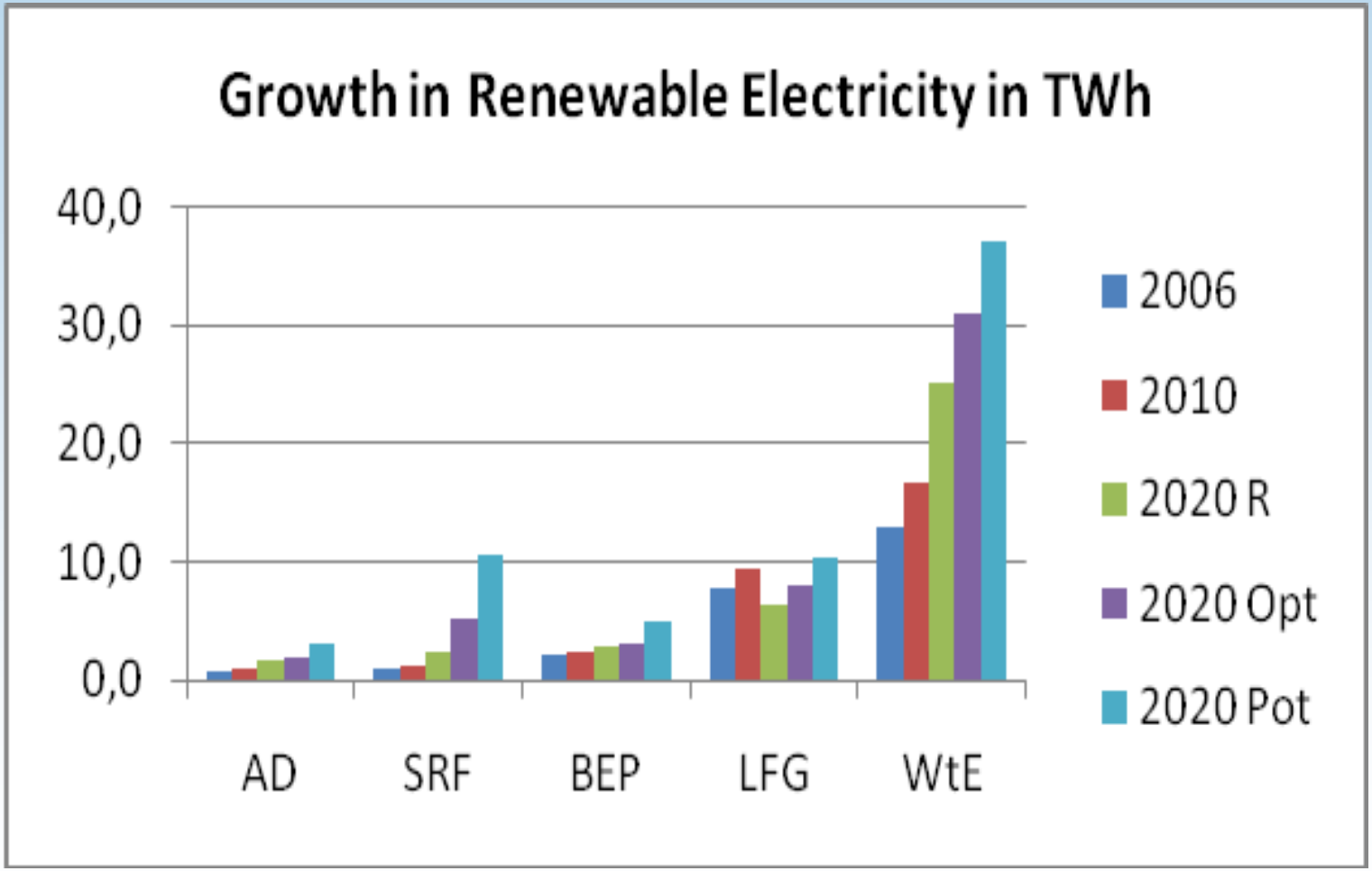
Recognition of energy from MSW and comparable waste as Renewable Energy

Route	Source of waste	Abbr.	Form of energy	% of Energy as Renewable
Incineration with Energy Recovery	Mixed residual waste	WtE	Steam -> Electr. & Heat	**Av 50** Range 47-80
Landfill Gas	MSW or Mixed residual waste	LFG	Biogas -> Electr. (and Heat)	**100**
Solid Recovered Fuel	Sorted fraction from MSW and CDW	SRF	Substituted Fuel in cement kilns, Power pl	**Av 45** Range 30 -55
Anaerobic Digestion	Source separated biomass fraction or Sorted bio-fraction of MSW	AD	Biogas -> Electr. & Heat	**100**
Biomass Energy Plants incineration,gasification	Collected & sorted waste wood	BEP	Steam -> Electr. & Heat	95 - **100**

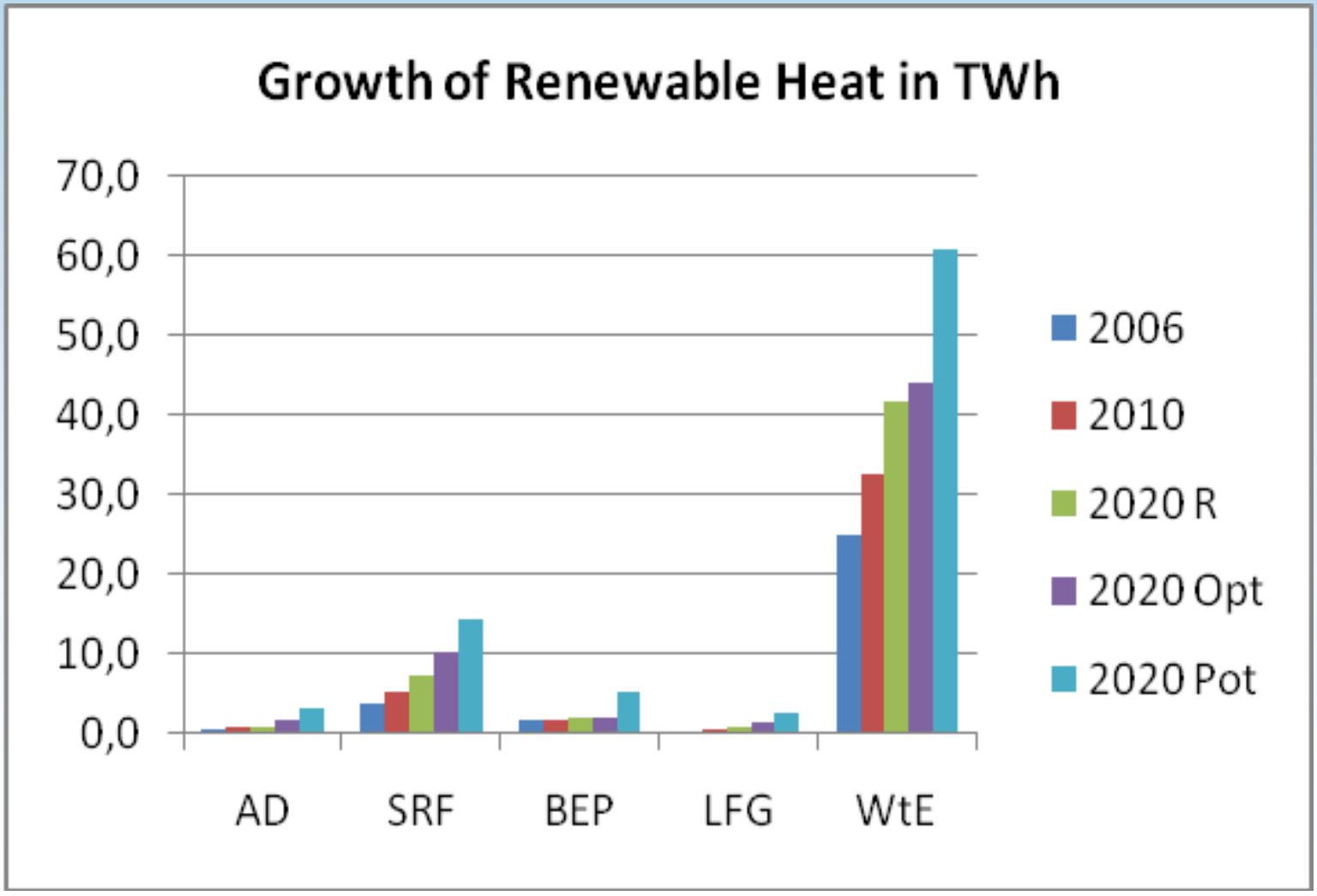
Renewable Energy 2006 from all sources for Europe in total



Growth in Renewable Electricity from all sources for Europe in total



Growth of Renewable Heat from all sources for Europe in total



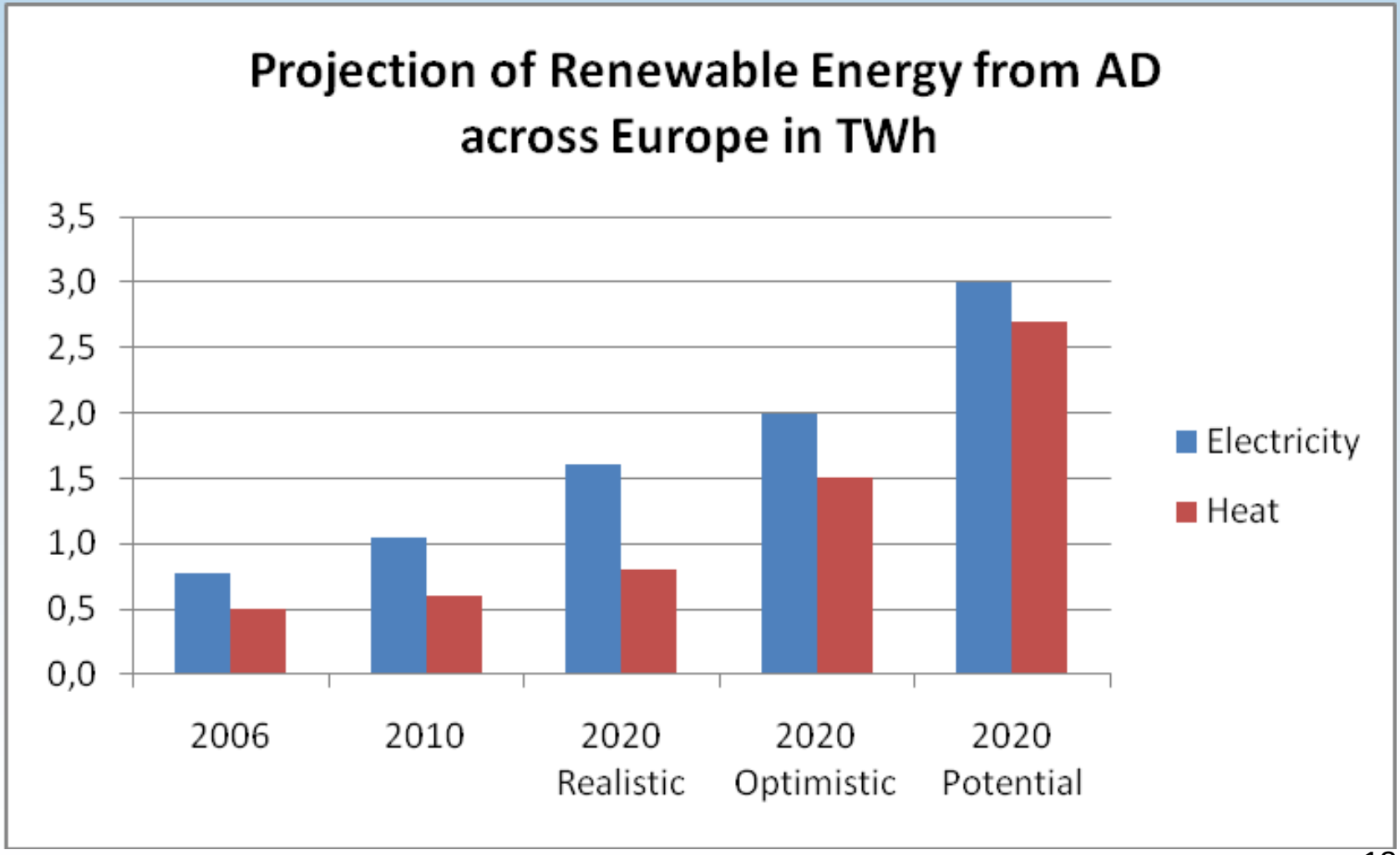
Anaerobic Digestion underlying assumptions

	units	2006	2010	2020Real	2020 Pot
Volume of biowaste	**kt**	**3900**	**5200**	**8000**	**10000**
Renewable Electr Prod	**TWh**	**0,78**	**1,04**	**1,6**	**2**
Renewable Heat applied	**TWh**	**0,5**	**0,6**	**0,8**	**1,2**

Assumptions:
Split in biowaste of 50 % source separated and 50 % from sorted MSW
Generated Electricity is 200 kWh/ tonne biowaste
Additionally heat can be applied as low T heat e.g. in greenhouses; potentially up to 150 kWh/t waste, but outlet is often not available.

Currently applications in ES, DE, AT, BE, DK, IT, NL, CH; sometimes in co-digestion with other biomass from agriculture.
Major interest developing in UK

Renewable Energy projection from AD across Europe



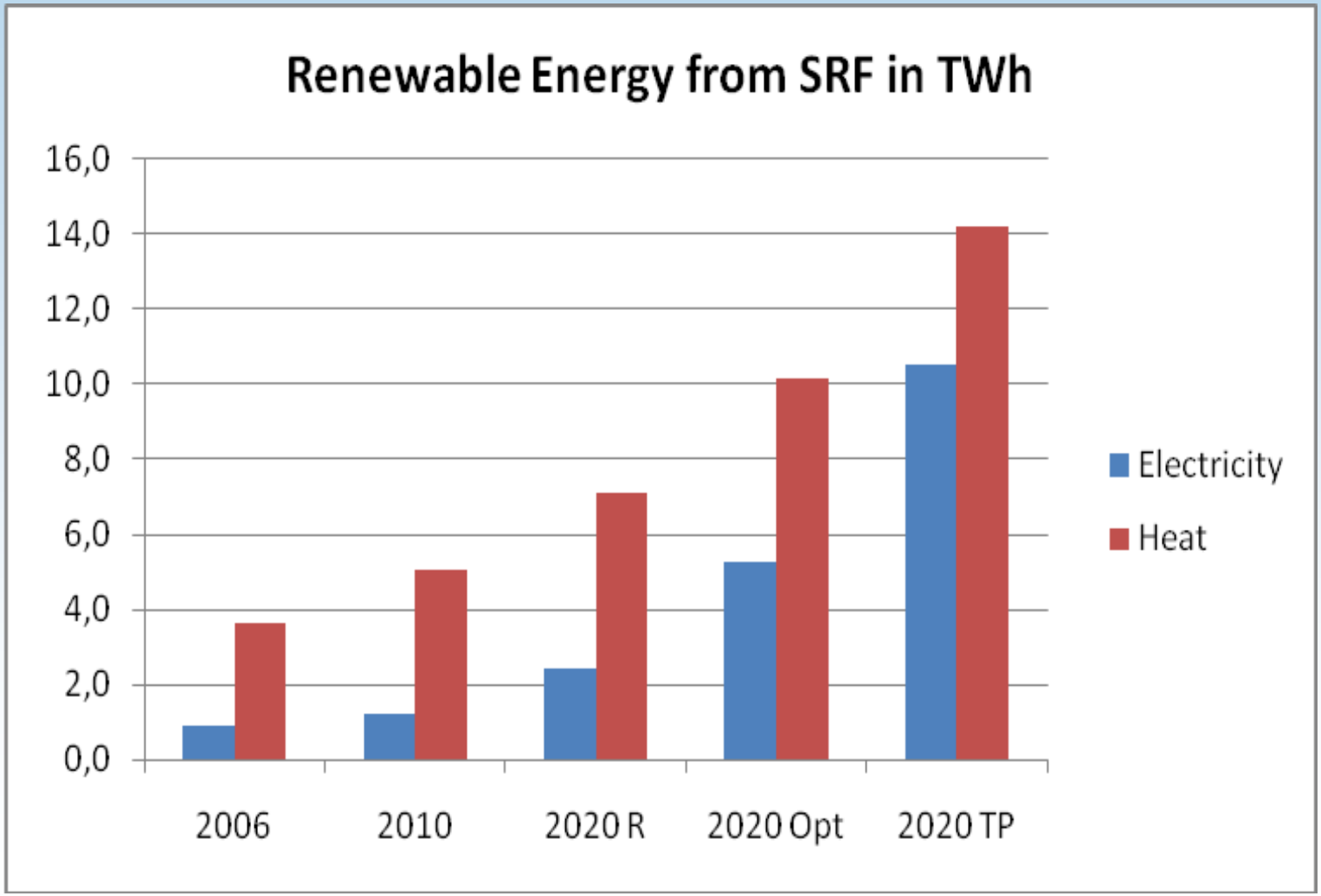
Renewable Energy from SRF/ RDF

- Material originating from sorting of Commercial & MSW
- SRF/RDF supposed to be 45 % biogenic (ERFO)
- Major outlets for SRF/RDF are
  - Cement kilns (heat)
  - Power plants (electricity)
  - Dedicated incineration plants (CHP) = WtE plant (data included in WtE overview)

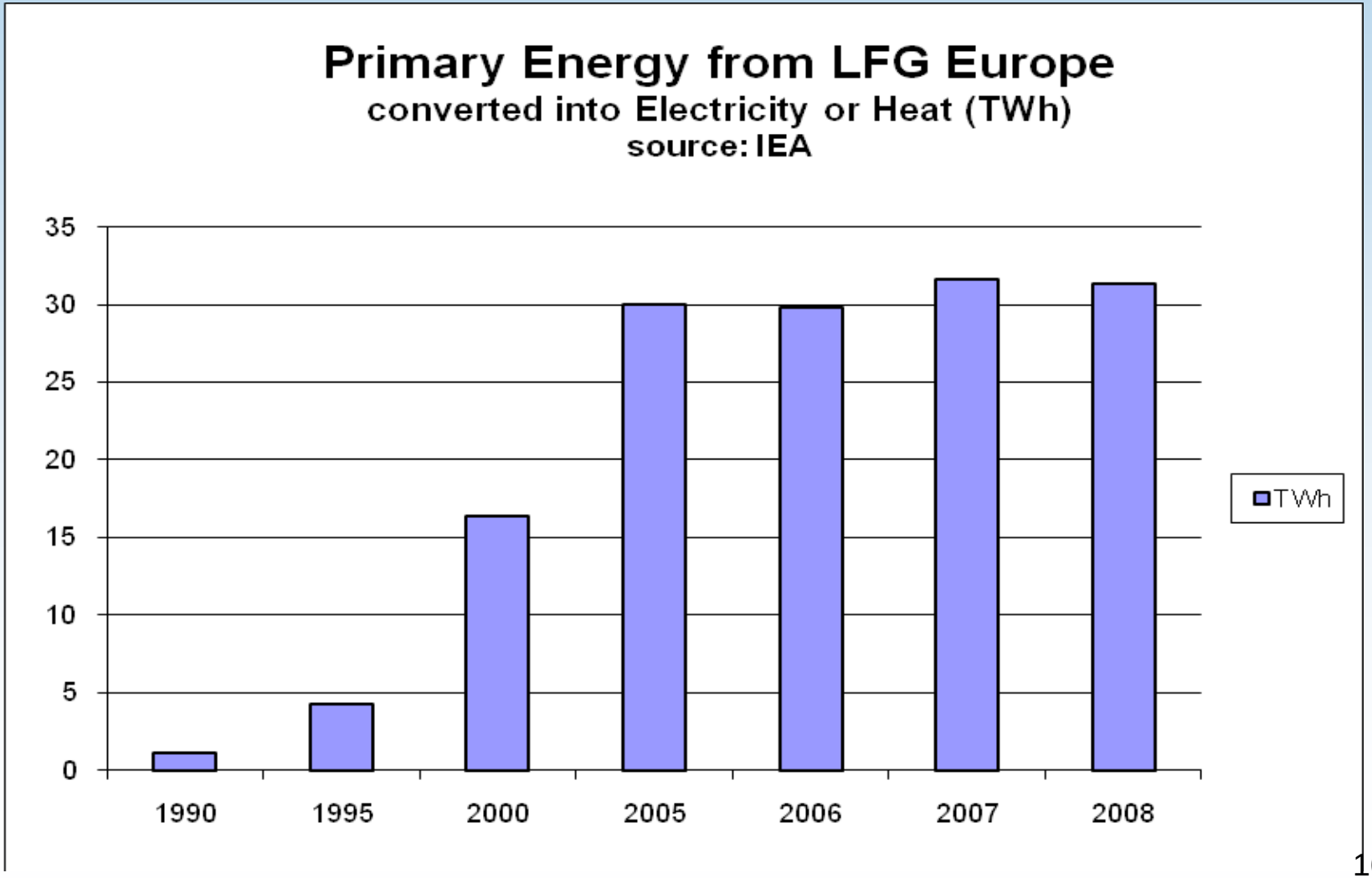
Volume kt	2006	2010	2020 R	2020 Opt	2020 Pot
Cement kilns	**1800**	**2500**	**3500**	**5000**	**7000**
Power Plants	**1150**	**1500**	**3000**	**6500**	**13000**
Dedicated WtE Plants	***1000***	***7000***	***10000***	***12000***	***15000***

This volume is included in WtE section

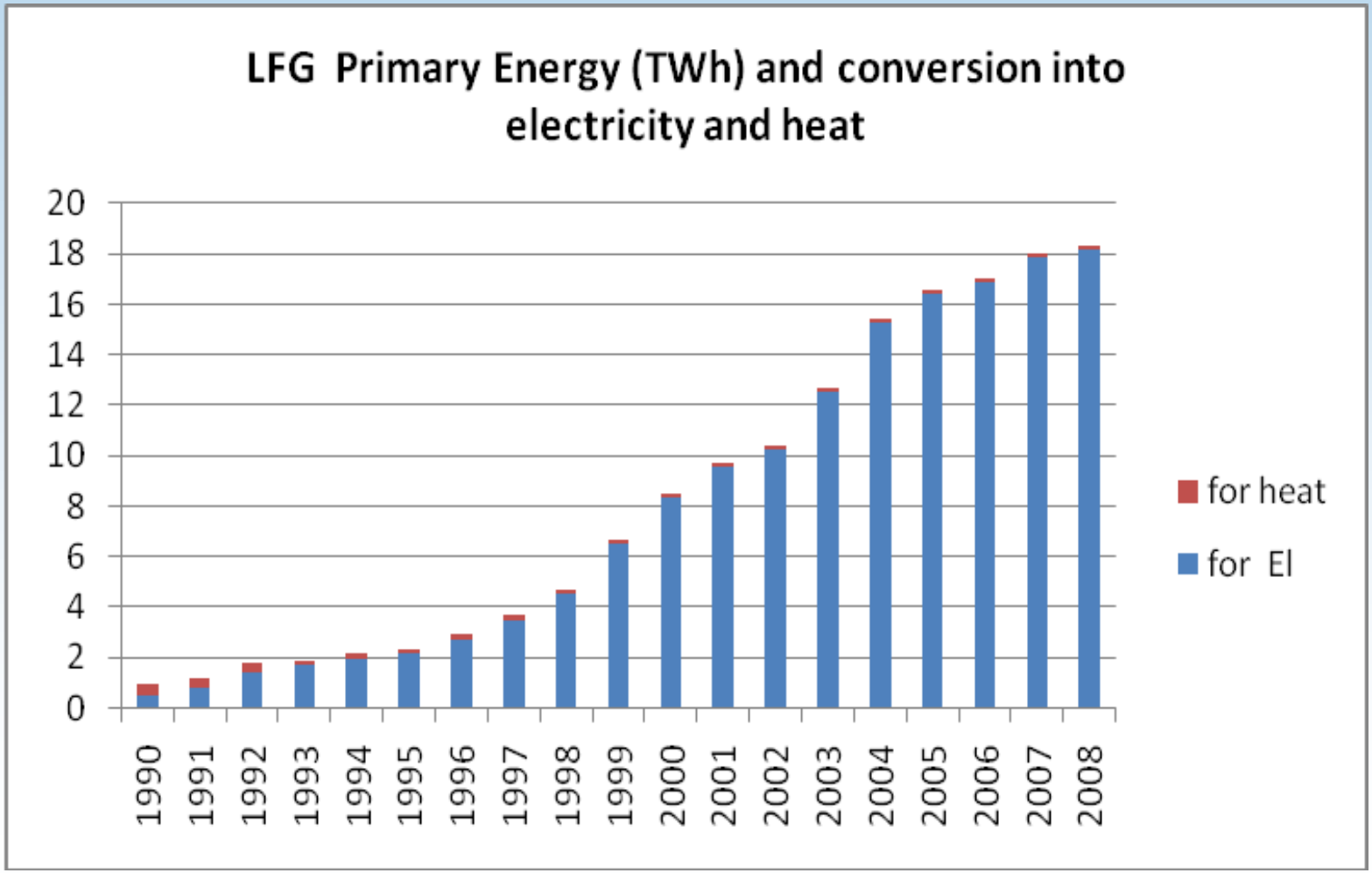
Renewable Energy projection from SFR
(in cement kilns and power plants)



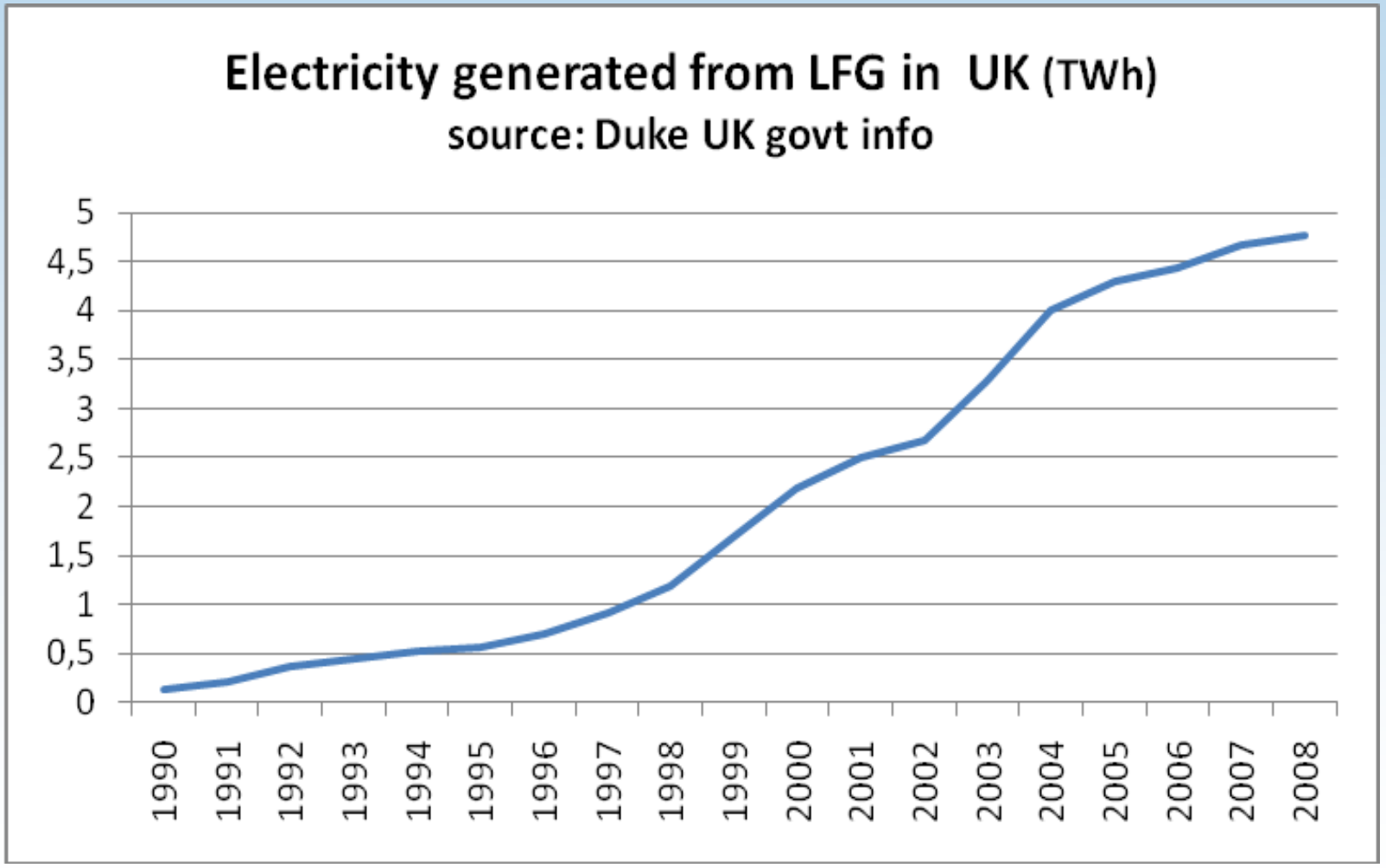
Exploitation of LFG for Energy Recovery has grown fast but is now leveling off. 85 % is coming from the UK, IT, FR and DE



Utilisation of LFG in the UK has been dominated by electricity and has been driven by support schemes



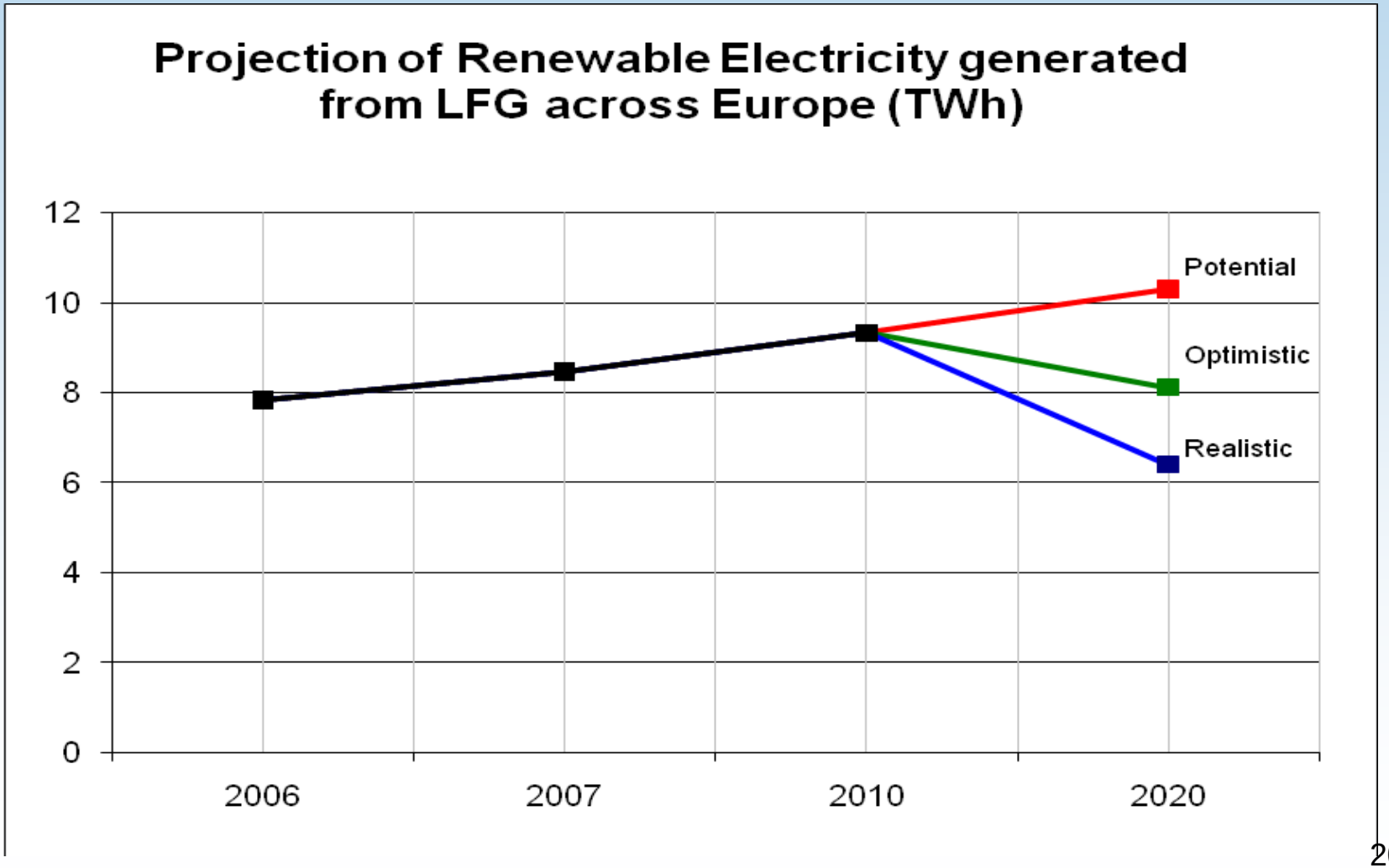
Electricity from LFG in UK is now levelling off at 4.8 TWh



Assumptions on Energy from Landfill Gas Recovery across Europe

- In 2006 Electricity production from LFG was about 7 TWh
- Projections 2020 potential based on country by country analysis
- Energy from LFG in UK,IT, DE, FR, NL and similar countries will **decline** (reduction of waste being landfilled and exhaustion of existing landfill recovery operations)
- New Member States will focus on meeting Landfill Directive but **reluctant to make investment** for LFG conversion to electricity.
- Various obstacles will contribute to modest growth of LFG conversion in current “Landfill countries”:
  - lack of funding for additional conversion investment
  - Lacking grid capacity to transport generated power
  - Remote location does hamper exploitation of heat potential

Electricity from LFG in Europe not likely to grow.



Dedicated Biomass Energy plants (BEP)
(incineration of waste wood)

- Now mainly restricted to DE, NL, SE, CH, BE
- Only viable when heavily subsidised
- Data difficult to verify.
- Limited growth potential

2008 estimate	k tonnes	Electricity TWh	Heat TWh
Germany	1,2	1,2	-
NL	0,5	0,56	-
Sweden		0,38	1,48
Others			

WtE: Waste Incineration with Energy Recovery

Future assumptions WtE:
Waste-to-Energy volumes for scenarios

Million tonnes/ year	2006	2010	2020 Realistic	2020 Optimist	2020 Potential
EU 27	60,0	72,2	97,2	119	130
CH, NO, CR	4,4	4,6	4,6	5	5
TOTAL	64,4	76,9	102	124	135

Volumes do include MSW, commercial waste & dedicated RDF incineration plants
Source: Estimates by CEWEP

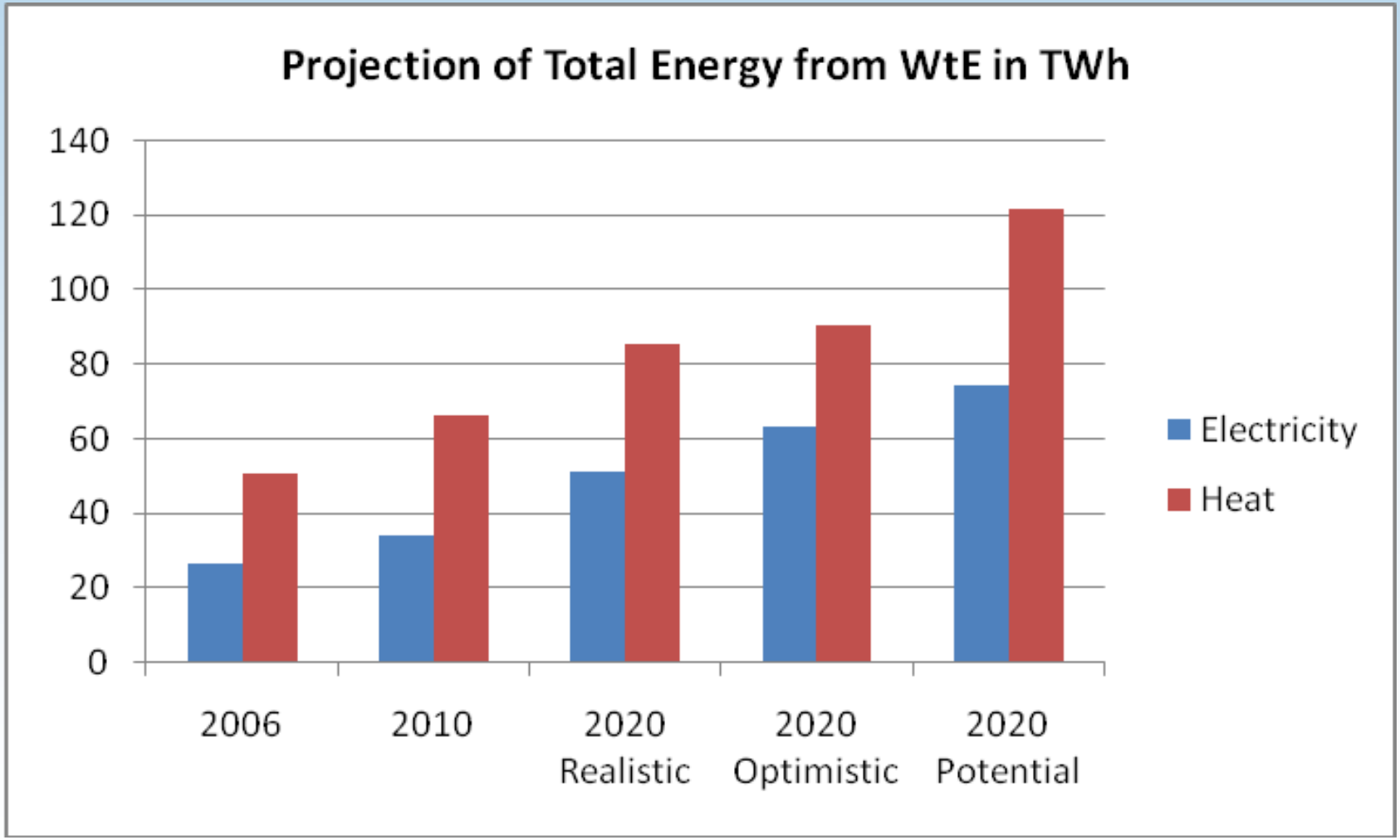
WtE Energy output assumptions

Average energy output data per tonne of waste treated (for portfolio of existing and new plants)

	2006	2010	2020 Realistic	2020 Optimistic	2020 Potential
Electricity production kWh/t waste	**400**	**450**	**500**	**520**	**550**
Heat supply kWh/t waste	**760**	**850**	**820**	**740** Expansion with Electricity only plants	**900** Exploitation of **heat potential**

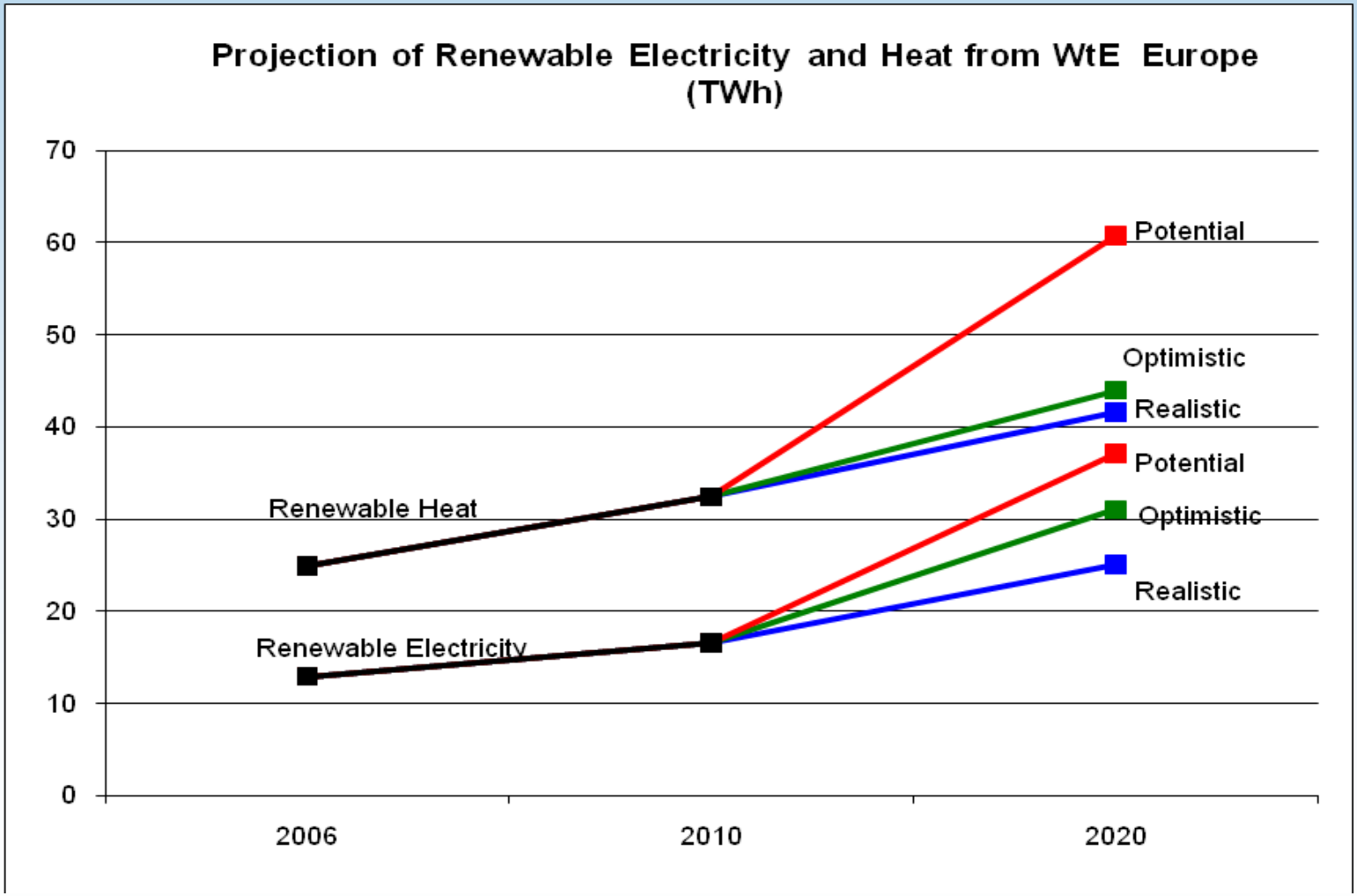
Total energy output (renewable & fossil)

The Total Energy Output projection for WtE



Includes both renewable and fossil components.

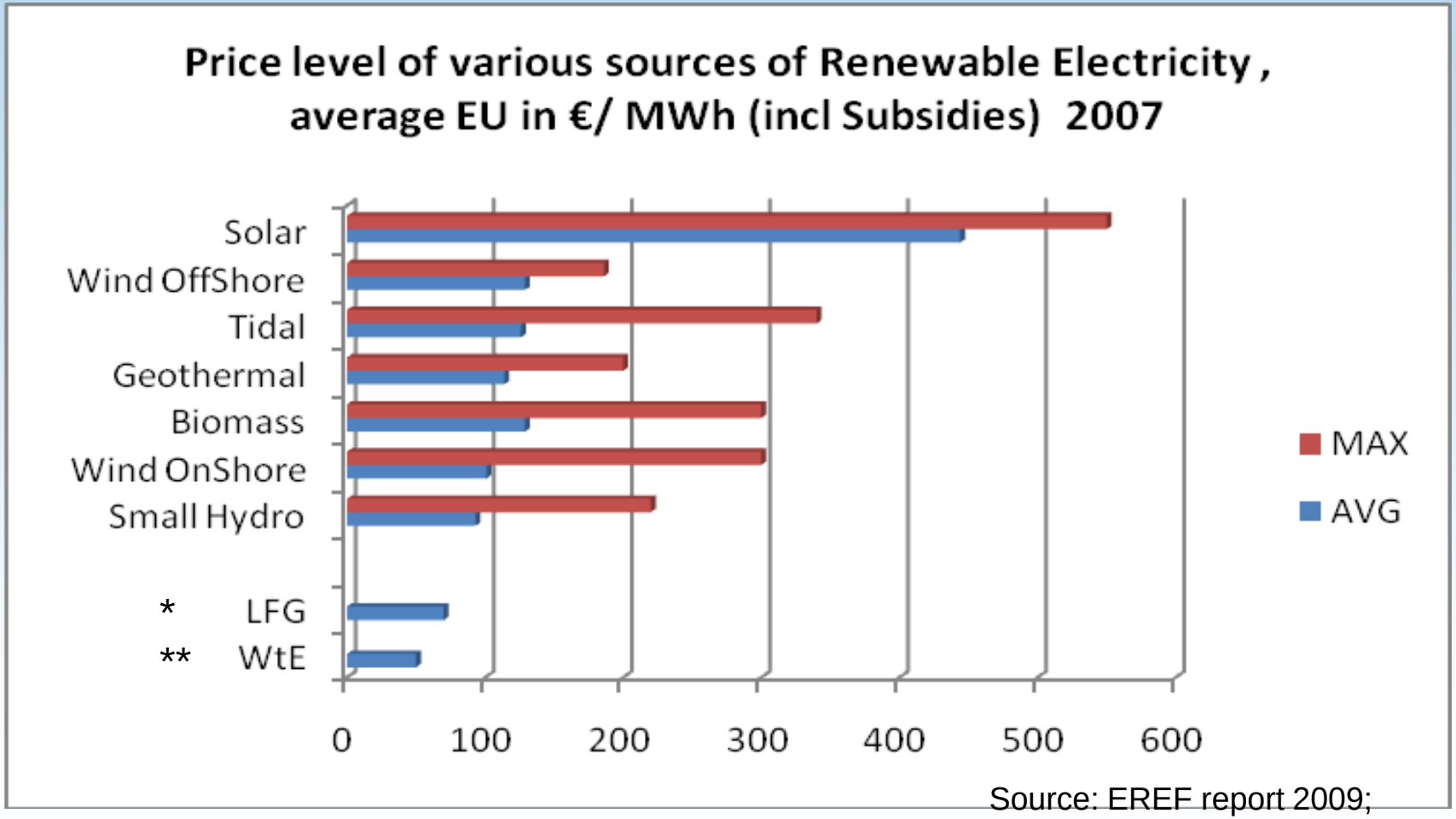
Growth of Renewable Energy from WtE for the total of Europe



Cost of RE from waste: in general lower than all other sources of RE ,except large Hydropower

Route	Cost of Renewable Electricity & Heat	Financial support required for the investment?
WtE	Very competitive,	No,provided realistic gate fees for waste Some, for maximisation of electrical efficiency ,examples NL , IT
LFG	ok	Yes, see example of UK
SRF	ok	No, provided realistic gate fees
AD	Moderately high	Yes, requires some help to make it feasible
BEP	Moderately high	Yes , not feasible without substantial support

RE from waste is by far the cheapest form of Renewable Electricity !

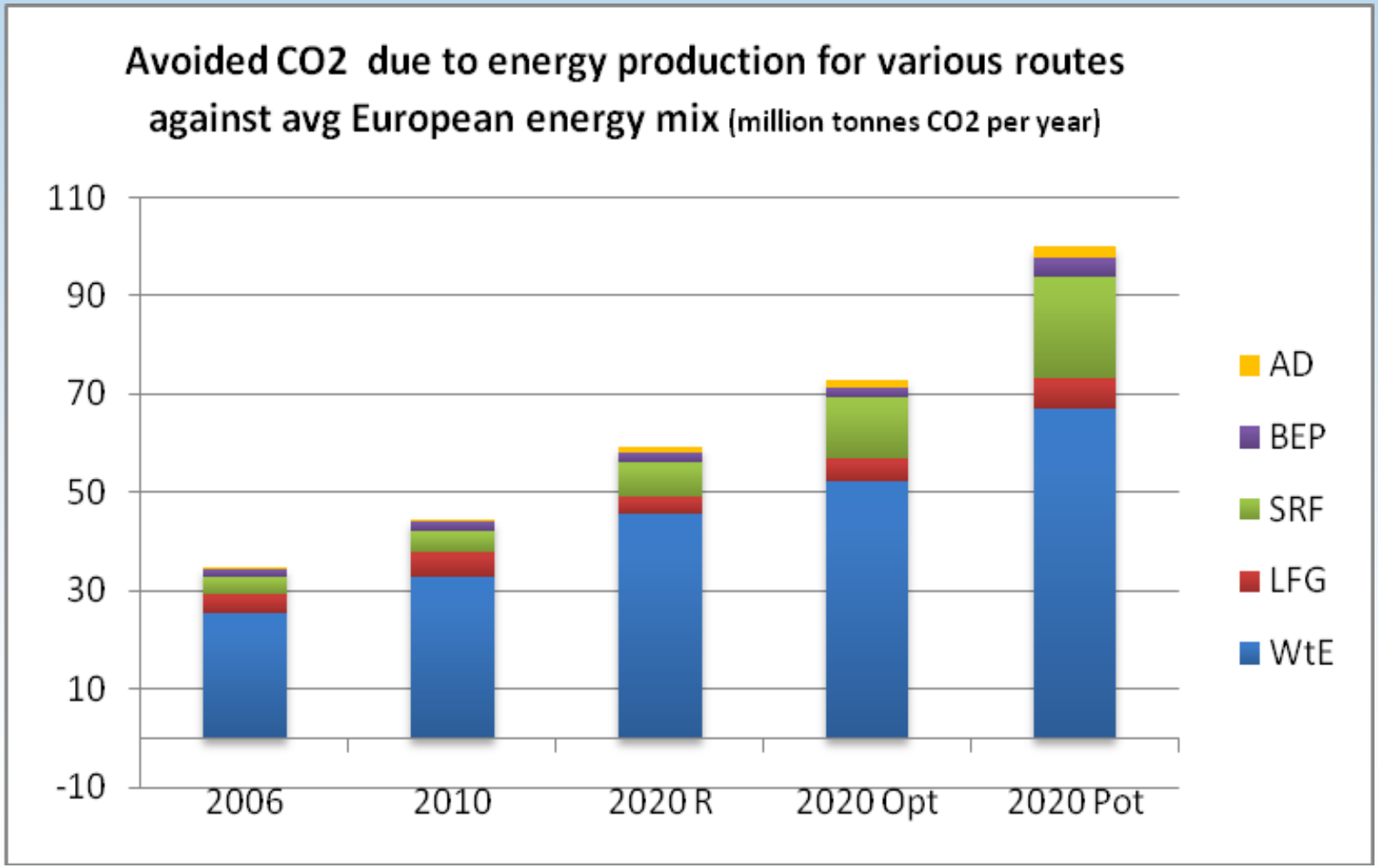


Source: EREF report 2009;

* * Price level for WtE € 45 -65 €/ MWh. Only few % of WtE Electricity gets some Renew Subsidy

* For LFG avg Feed in Tariff in EU: 71 € (incl minor subsidy)

The Avoided CO_2 Emissions due to Energy Production from Waste are huge



Please note that these data exclude fossil emissions and therefore do not represent a full carbon footprint analysis for the various routes !

How much does Energy from Waste contribute to the EU 27 binding targets?

	2006	2020	Comments
Total EU 27 Energy consumption	**13700** TWh	**13700** TWh	If no growth in consumption !
Total EU 27 Renewable Energy	**1258** TWh (8,5 %)	**2735** TWh Target 20 %:	The gap is about **1500** TWh
Renewable contribution from Waste EU 27	**55** TWh	Between **90 – 151** TWh	Waste can potentiallly fill **95** from the gap of 1500 TWh
Share Energy from Waste of Total RE	**4,4 %**	Between **3,3 and 5,5 %**	assuming Binding EU Targets are achieved !

Overall Conclusions Energy from Waste

- In **2006 Renewable Energy from Waste** origin amounts to about 24 TWh of **electricity** and 31 TWh of **heat**. This **represents 4,4 % of all RE** produced in Europe

- This is likely to grow to 38 TWh and 52 TWh respectively by 2020, but has the **potential to grow to 66 and 85 TWh.**

- Energy from Waste has the potential to **fill 95** from the EU 27 RE **gap of 1500 TWh** !

- Energy from Waste also has a significant contribution to make in **avoiding CO_2 emissions**.

- Of the various sources **WtE** is by far the largest and has the **most substantial growth potential**, followed by SRF

Conclusions WtE

- In 2006 Waste to Energy supplies a considerable amount of Renewable Energy: 38 TWh for the whole of Europe
- This will grow towards 2020 to a level of at least 66 TWh, and **potentially to 98 TWh**, through an increase of the amount of waste processed via WtE and by steady efficiency improvements (heat & electrical efficiency)
- Countries which continue to make a significant contribution through WtE to their total Renewable Energy production are: NL, BE, DK, DE, SE

Note that the total Energy output of WtE and SRF is twice the amount regarded as renewable !

Why should generation of RE from MSW and comparable waste get priority across Europe ?

- It is a sustainable biomass source of RE, e.g. not competing with the food chain, although of limited supply.
- With the implementation of smart professional Waste Management Policies it will become available as **“low hanging fruit” at relatively low cost**
- If we want to even get near to achieving the EU 27 binding targets, we **cannot afford “to waste”** this readily available source !
- It is a substantial contributor to **avoiding CO_2 emissions**

Recommendations for maximisation of Renewable Energy from Waste across Europe?

EU Policy Level

- Promote classification as Renewable by all MS
- Promote that MS set up support schemes
- Speed up R1 status of WtE plants across Europe

National Level

- Attitude to learn from successful examples elsewhere e.g. SE, DK, DE , NL, Flanders, UK (LFG)
- Make RE from Waste a key element in National Waste Mgt Plans, in particular for new Member States
- Set up (modest) support schemes for RE from waste to overcome the hurdles

Thank you for your attention !

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Key assumptions for 2020 scenarios EU 27

	2020 Realistic	2020 Optimistic	2020 Potential
MSW market	Flat at 250 mt	Growth to 280 mt esp in new MS	Growth to 312 mt As per ECT EEA
Landfill diversion of MSW in EU 27	30 kt landfill left (12 %) in new MS	**Zero landfill** 60 % Rec/ 40 % WtE & MBT	**Zero landfill** 60 % Rec/ 40 % WtE & MBT
Commercial Waste Market	decrease vs 2006	Flat	Flat
Waste & Energy Management Policies	**Promotion of EfW** as key waste treatment routes in all Member States	**Priority for EfW** implemented in National Policies	**Urgency:** Max. RE generation from waste is made mandatory
Support schemes for Renewable Energy	**Investment support** for Renewable Energy from waste, esp in new M.S. implemented	Generation of **high efficiency** RE from waste is financially supported	**Application of heat** from WtE key priority and **infrastructure supported**