



**Developments on
Waste to Energy
across Europe**

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WTERT, Columbia
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CEWEP

Confederation of European Waste-to-Energy Plants

CEWEP represents 390 of 440 Waste-to-Energy plants across Europe. (60 mt of EU capacity of 73 mt in 2010)
They thermally treat household and comparable waste, which is not otherwise reused or recycled, and generate energy from it.

In 2009 across Europe they supply:
30 TWh electricity and
55 TWh of heat.

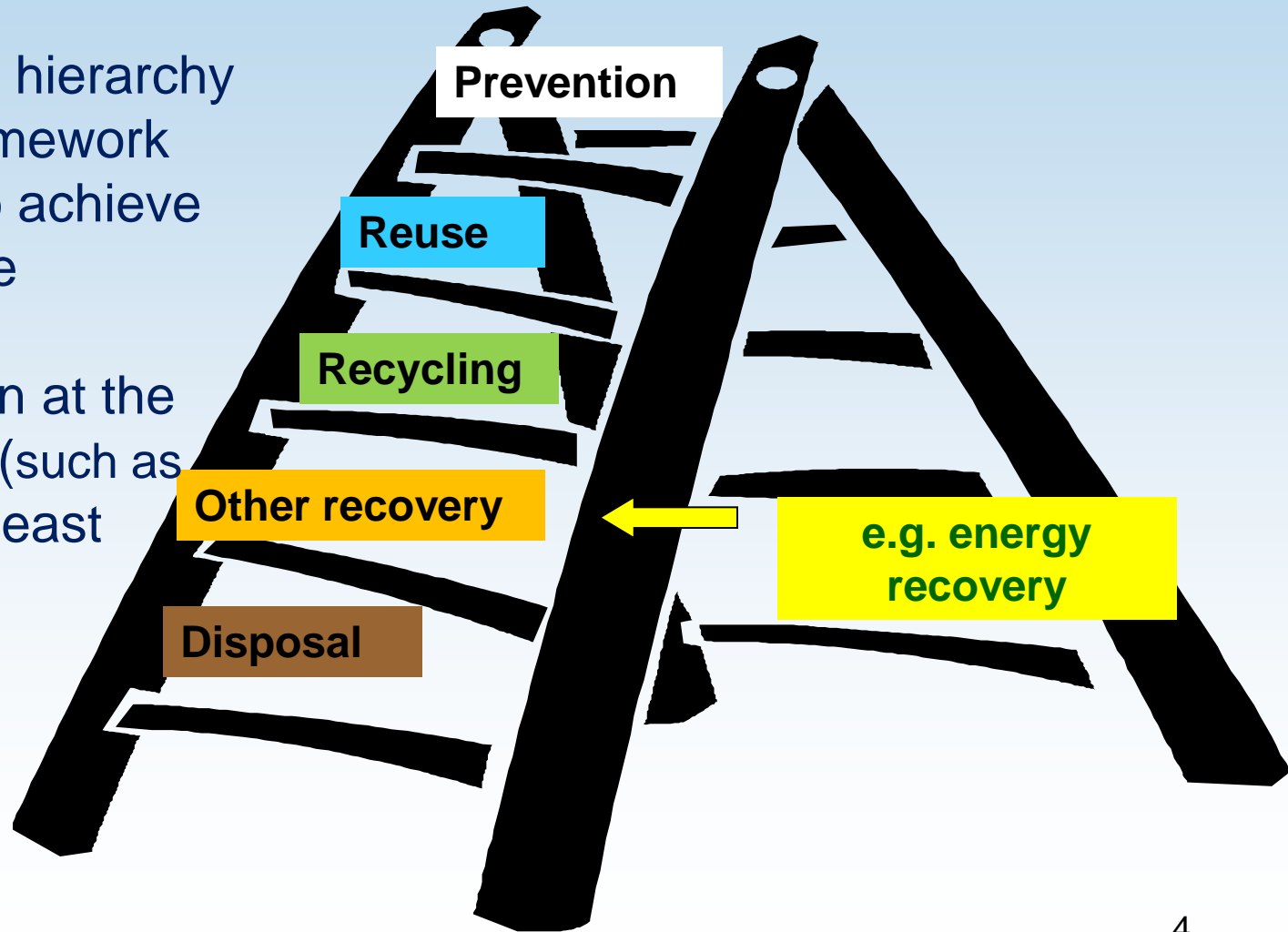


Topics for today

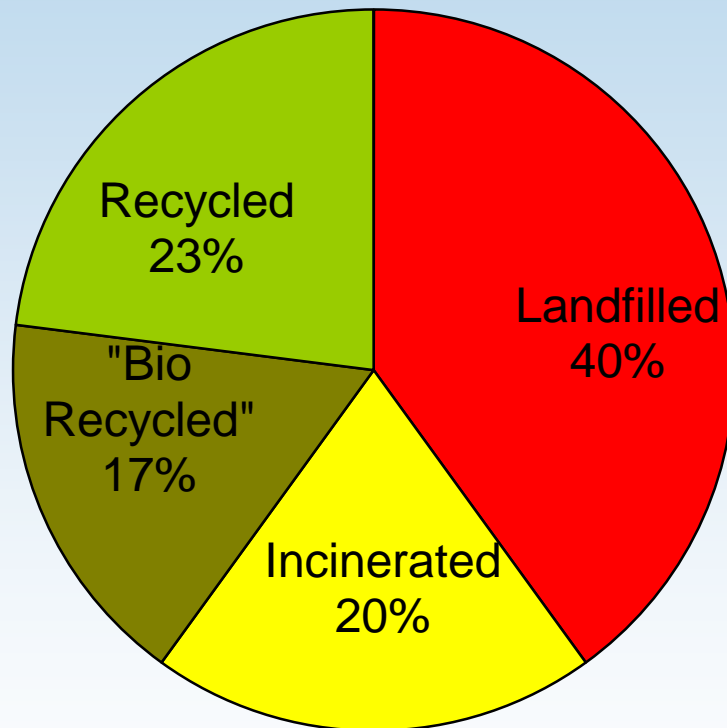
- Major drivers in EU policy on Waste & Energy
- Recovery status for WtE / Energy Efficiency
- Life Cycle Thinking and LCA for WtE
- WtE capacity development in EU
- Renewable Energy from Waste and its potential contribution to the EU binding targets on RE

Waste Hierarchy adopted by EU within the Waste Framework Directive

The 5 step waste hierarchy in the Waste Framework Directive helps to achieve sustainable waste management, placing prevention at the top and disposal (such as landfilling) as the least favoured option.



Treatment of MSW in Europe EU27, 260 m tpa in 2008



Treatment of Municipal Solid Waste in the EU 27 in 2008
Source: EUROSTAT

A large part of the EU27 waste is still wasted by putting it on landfills with negative effects on the environment.

But waste is a precious resource which should be utilised!

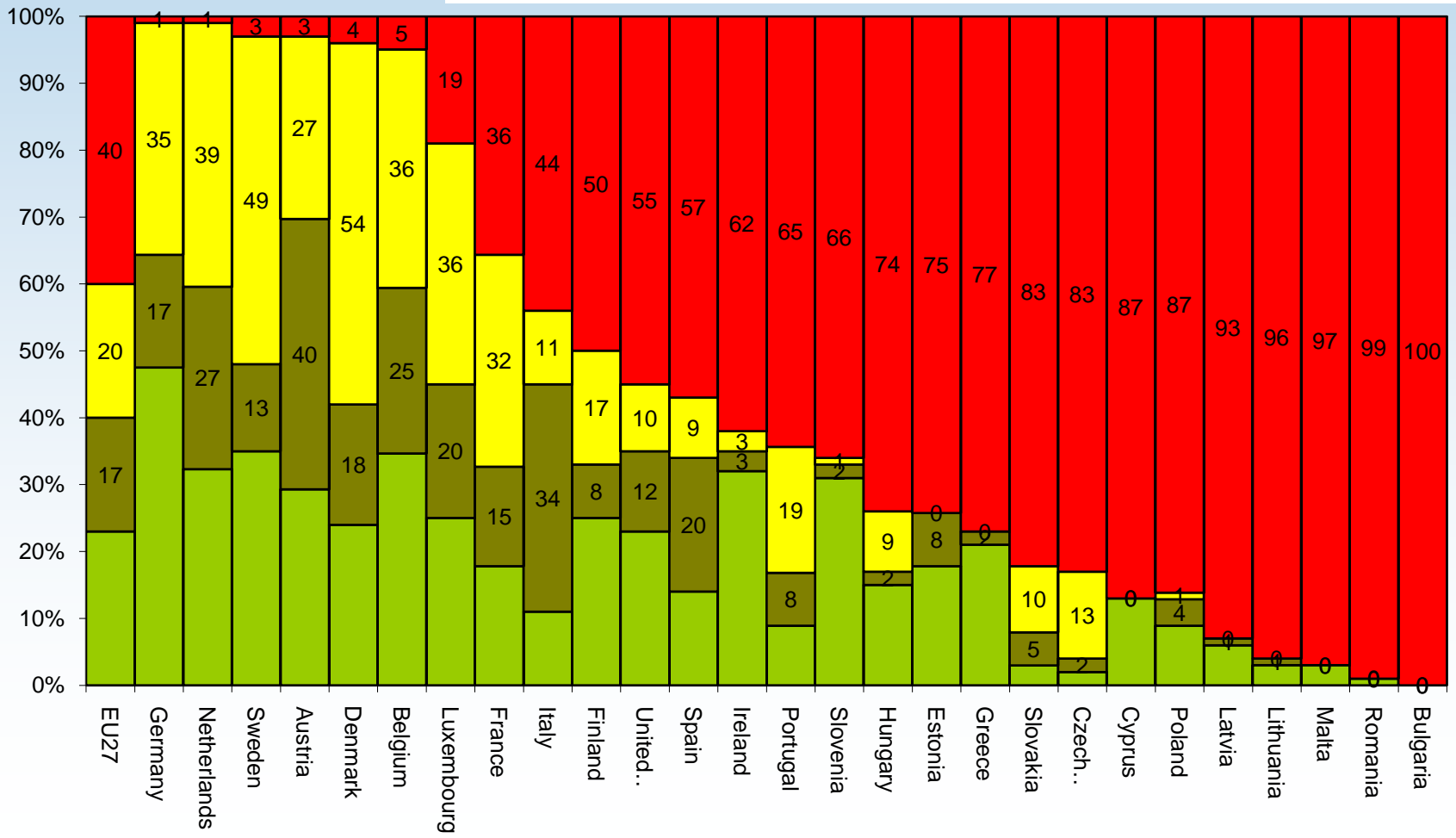
Treatment of MSW in the EU 27 in 2008

Source: EUROSTAT

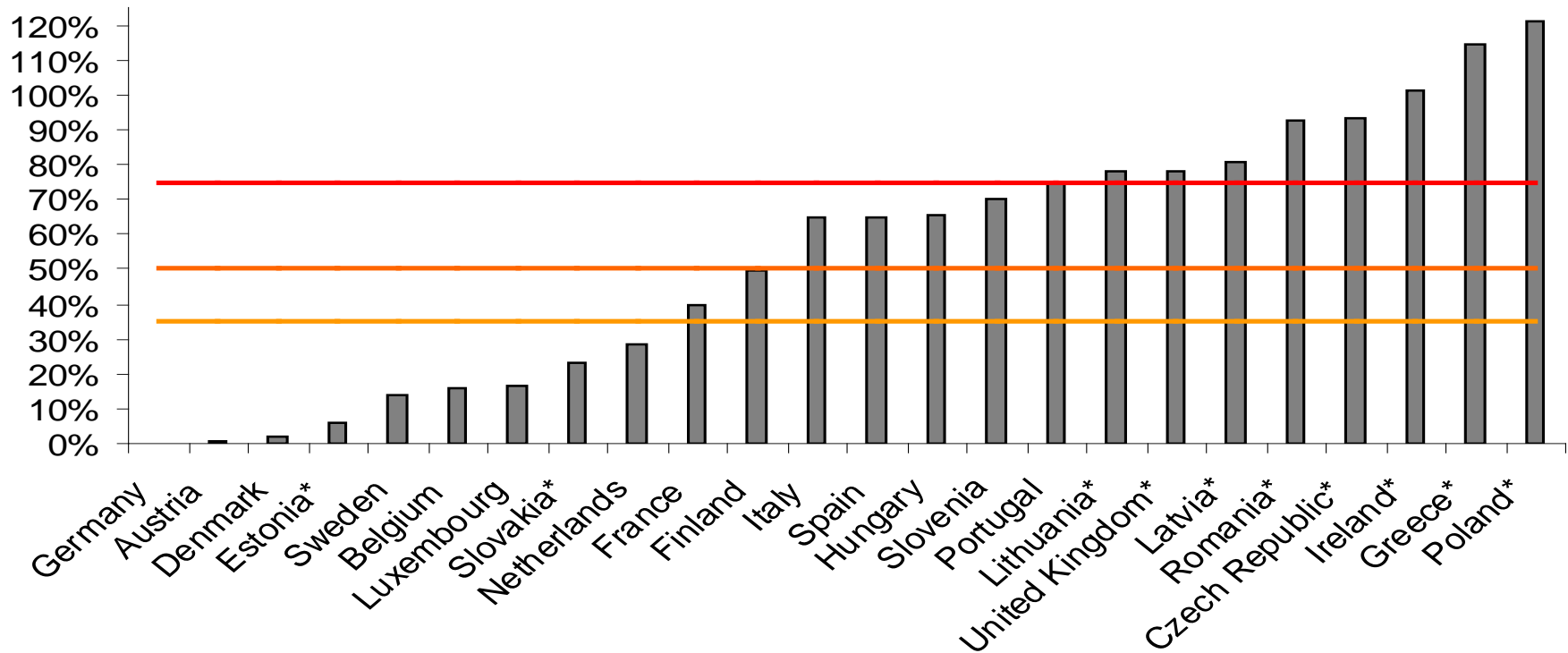


EUROSTAT, Treatment of MSW in EU 27 in 2008

„Bio-Recycling“ refers to biological treatment including composting, MBT and anaerobic digestion.



Diversion of biodegradable waste from landfills - the EU targets and country status in 2006



■ Landfilling of biodegradable municipal waste in 2006, in % of 1995 levels

— Target 2006

— Target 2009

— Target 2016

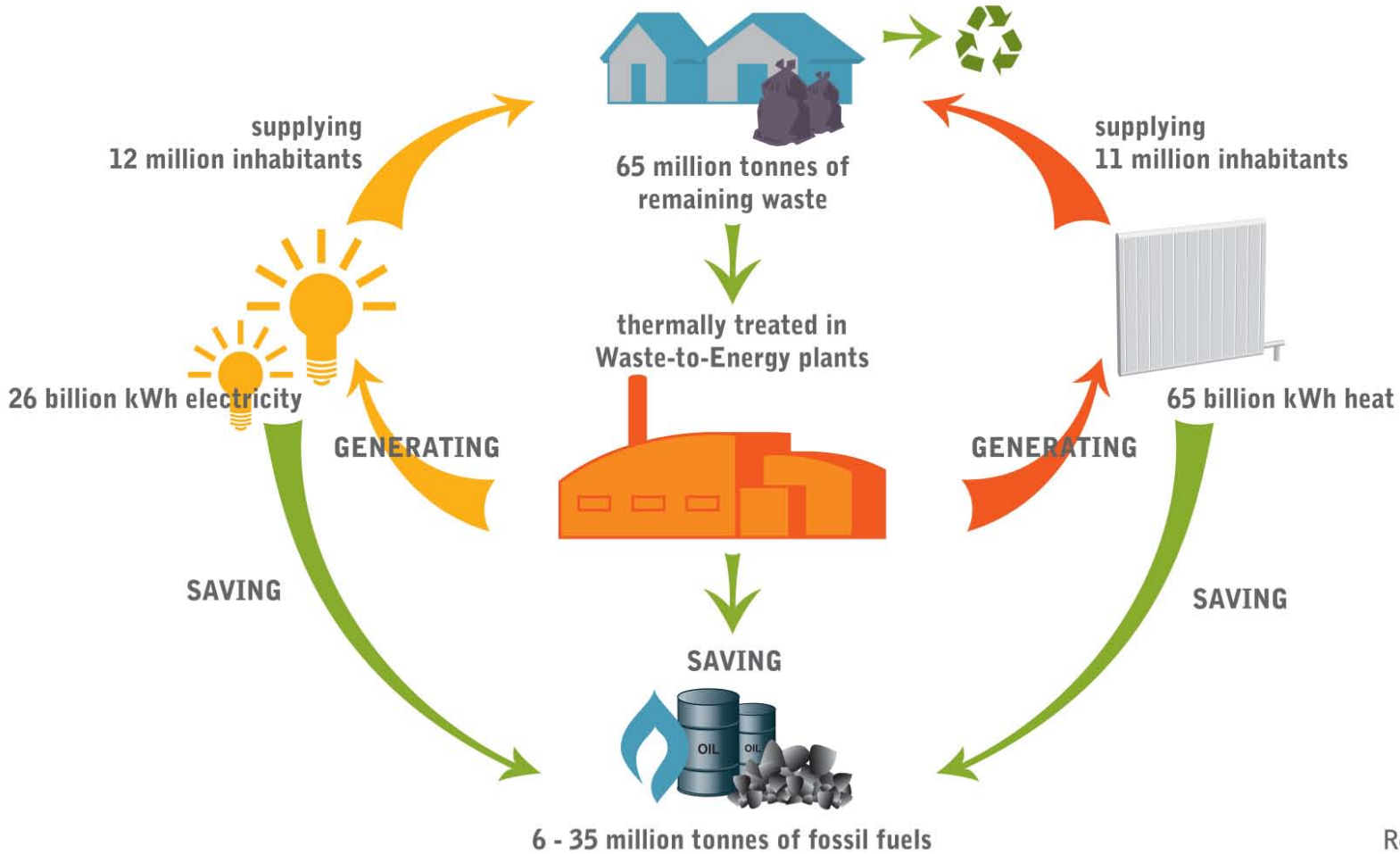
* country with derogation periods of up to 4 years to achieve the target

Waste to Energy in Europe

(Incineration with Energy Recovery of MSW and comparable waste)

- dominant route for the treatment of residual waste
- Fully proven and environmentally safe
- About 71 million tonnes of capacity in operation in 2009 supplying about 30 TWh of electricity (8 million households) and about 55 TWh of heat.
- about 50 % of this energy is classified as renewable
- represents a net CO₂ saving and avoids the use of fossil fuels elsewhere for energy production

Waste to Energy Cycle



Reference year 2007

Agreed formulae within the WFD for the R1 Efficiency criterion

Treatment of waste in a WtE plant is **recovery** if:

An existing plant meets efficiency factor > 0,6

New plant (from 2009) meets efficiency factor > 0,65

Energy efficiency formulae:

Energy produced – (Energy in added fuel + Energy import)

0,97* x (Energy in the waste + Energy in added fuel)

Equivalency factor electricity production x 2,6

Equivalency factor heat exported x 1,1

* factor accounting for energy losses due to bottom ash and radiation

R1 formula and scope

$$\text{R1-factor} = \frac{E_p - (E_f + E_i)}{0.97 * (E_w + E_f)}$$

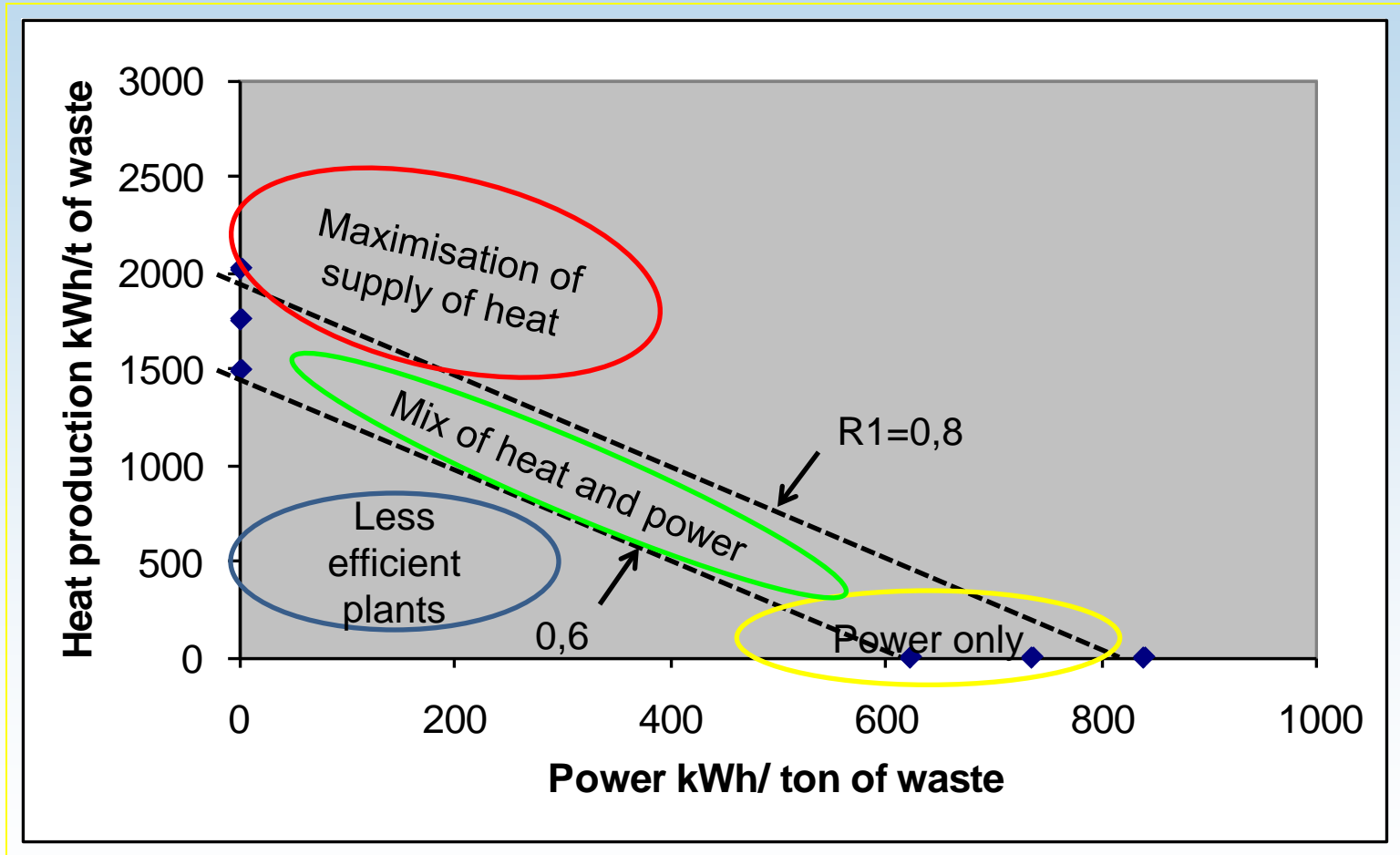
Scope:

- ... incineration facilities dedicated to the processing of **municipal solid waste**
- ➔ Formula does not apply to hazardous waste incinerators, nor to co-incinerators; probably also not to RDF plants

Introduction:

By end of 2010 in all member states

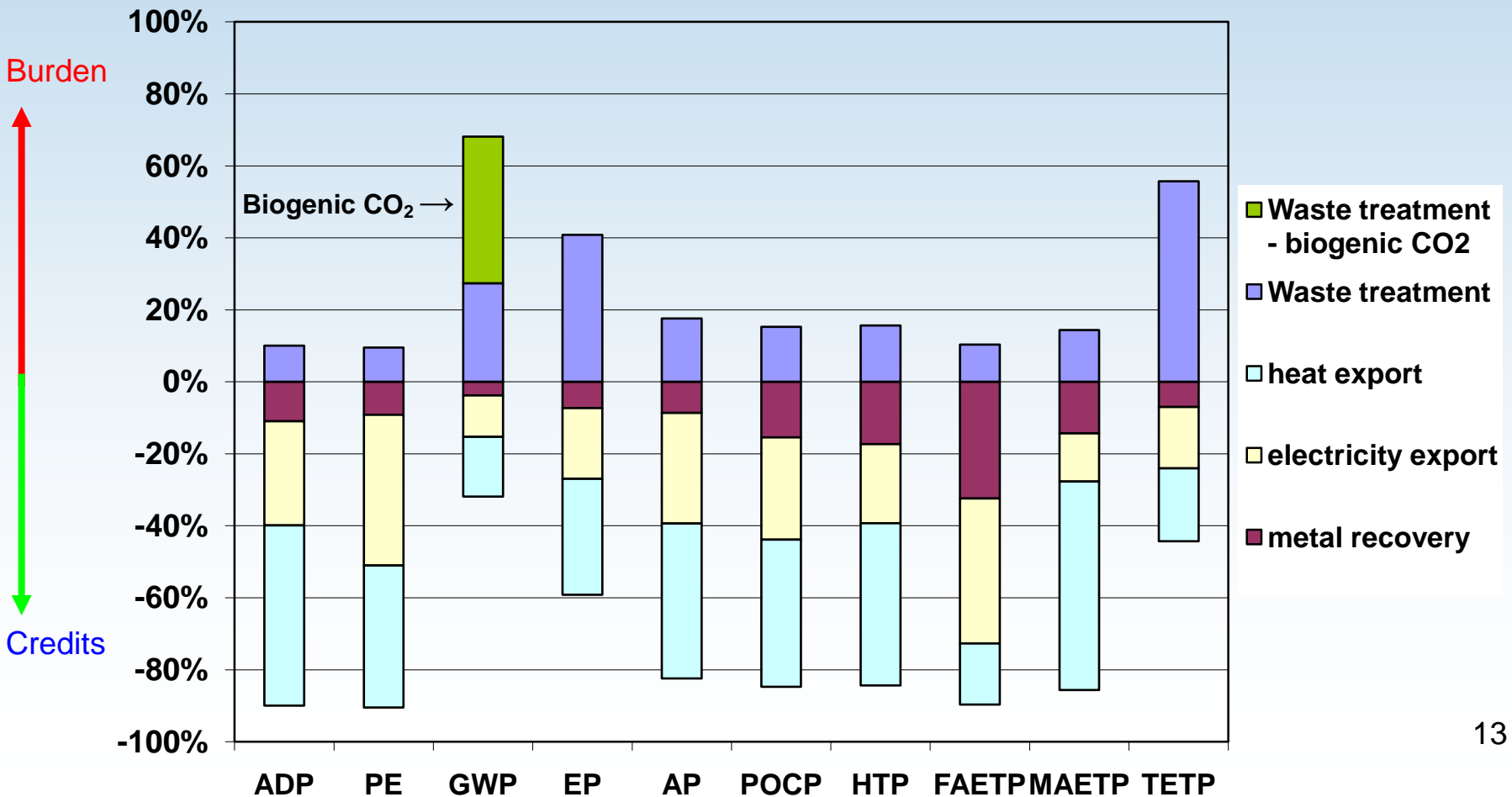
Heat vs Power production by WtE plants across EU relative to EU R1 Criterion



Full 10 parameter LCA for avg WtE plant

Summary of Impact analysis

carried out for CEWEP 2009



Net CO₂ emissions from modern WtE

A state-of-the-art WtE plant **saves CO₂** in the range of 100 to 350 kg CO₂ eq per tonne of waste processed *, depending on:

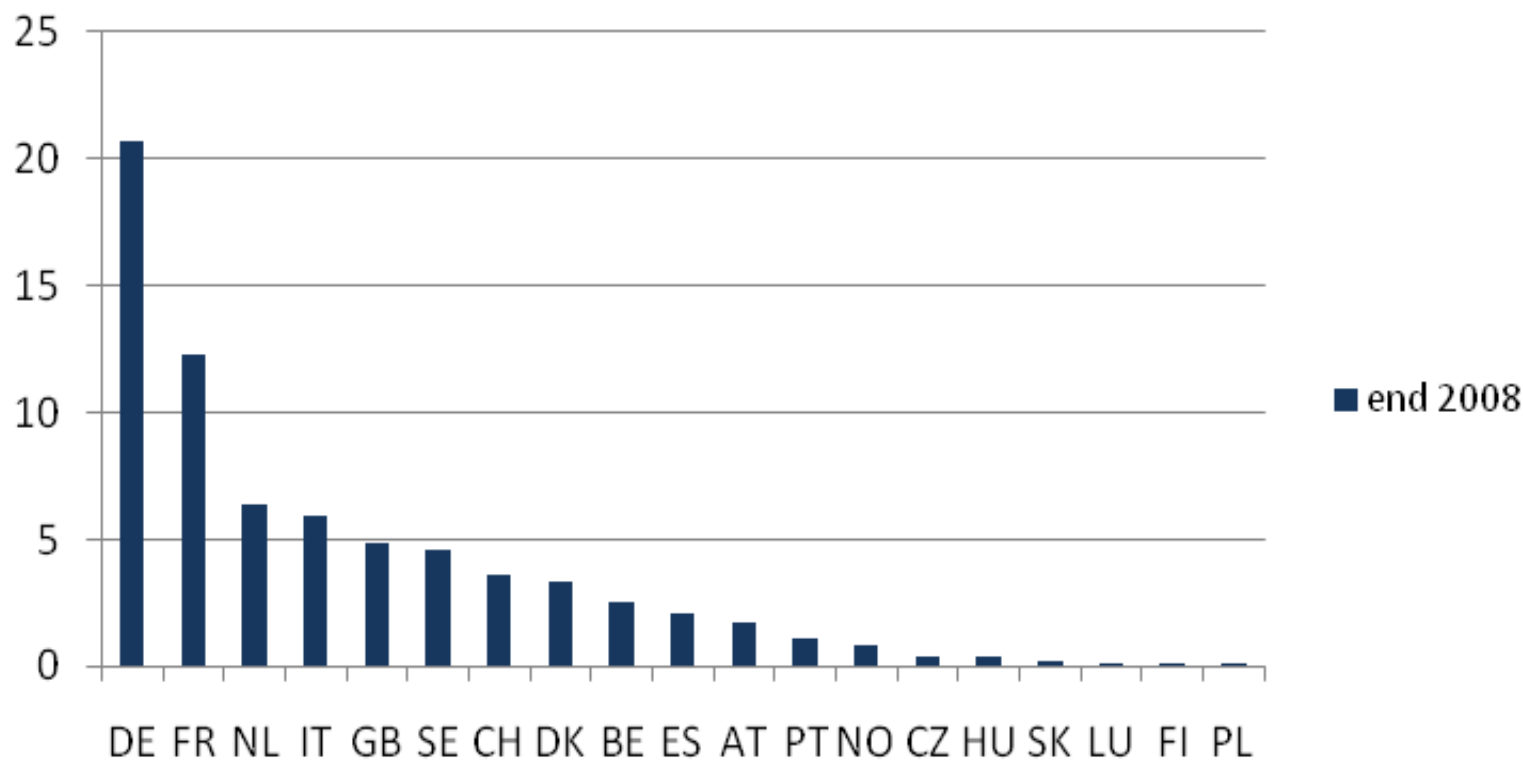
- Waste composition (% biogenic)
- Amount of heat and electricity supplied
- Country Energy substitution mix

If WtE replaces (poor) landfilling, then there would be additional savings of 200 to 800 kg CO₂ /tonne waste

* The more energy can be supplied as heat the higher the CO₂ savings

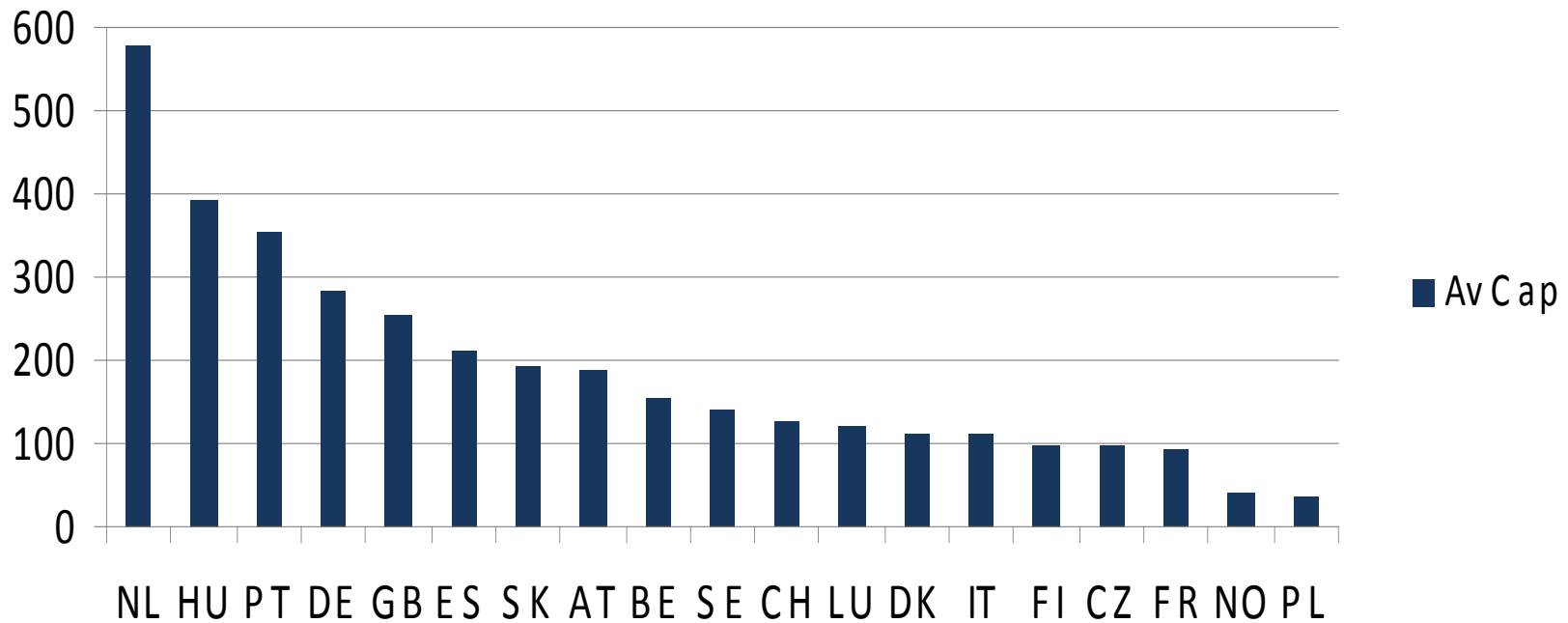
WtE Capacity Europe by end of 2008 is 71 m tonnes.

WtE capacity in Europe by end 2008 in total 71 million tonnes



Average size of WtE plants varies from country to country

Average capacity of WtE plants in 2008 per country (kt per annum)

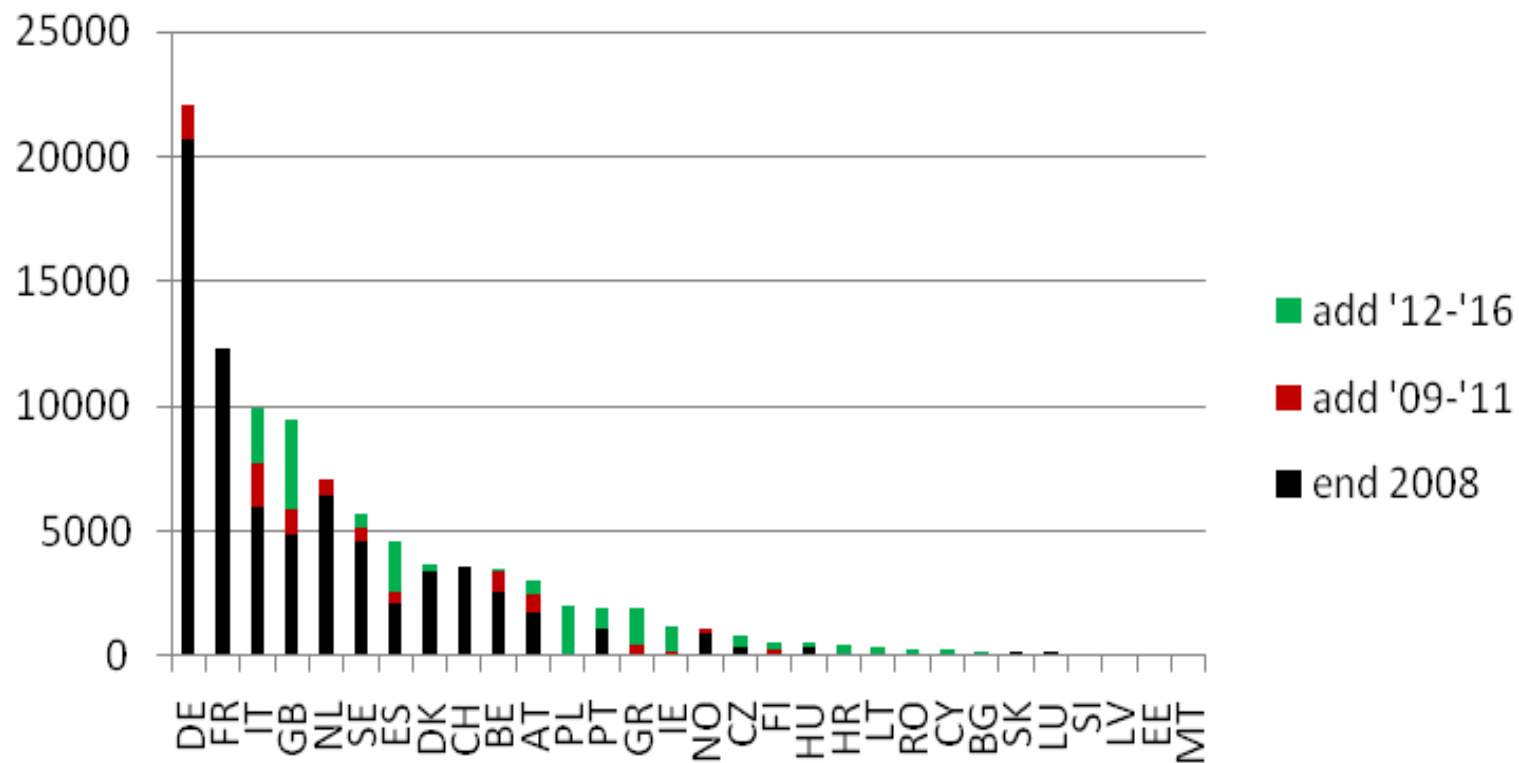


WtE capacity growth in steps

(includes MSW & comparable & dedicated RDF/SRF incin plants)

European WtE Capacity development (mill. tonnes)

71 by end 2008 --> 80 by end 2011 --> 97 by end 2016

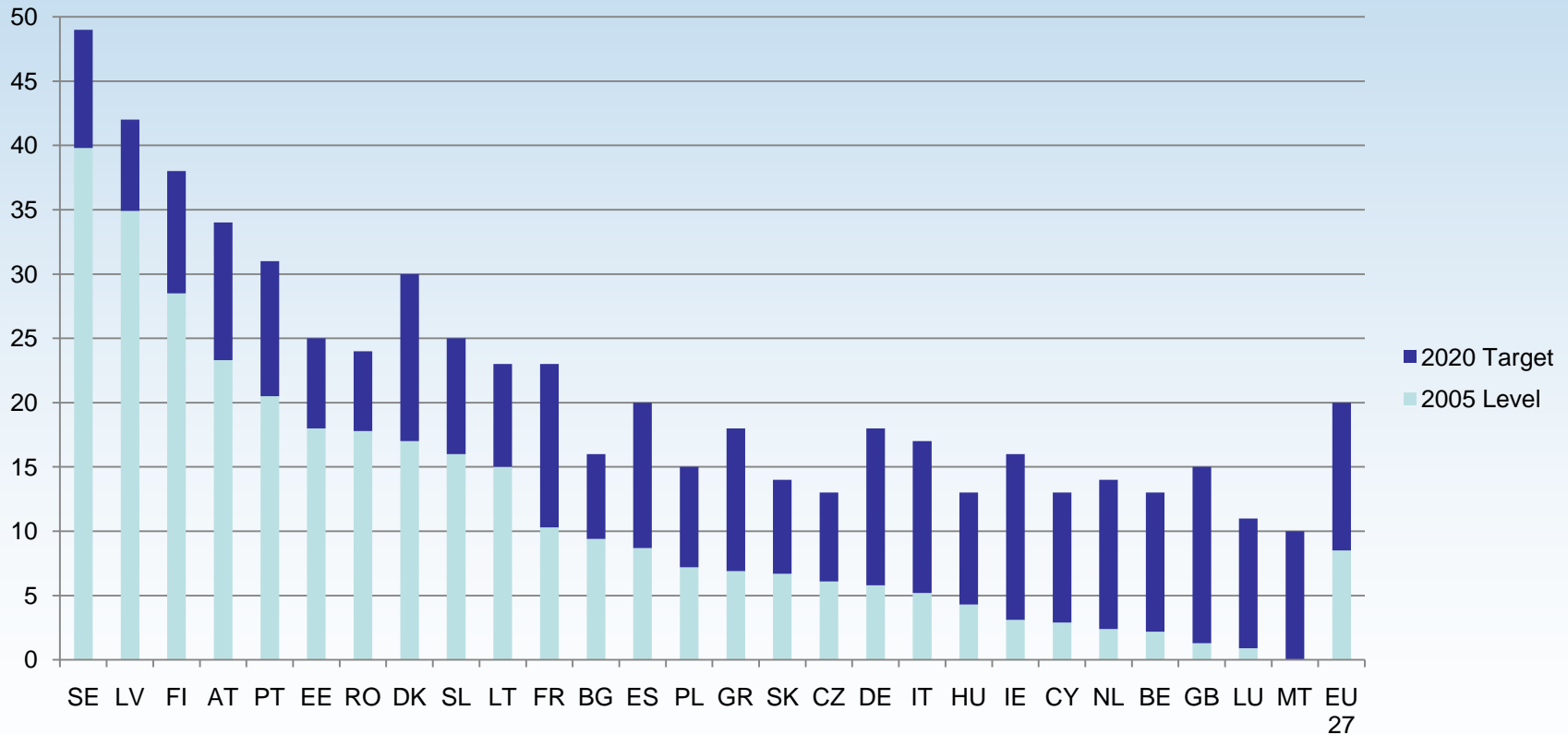


Waste to Energy Capacity Development within Europe

Country Groups	Likely developments Potential for expansion
DE, NL, DK, SE, CH, A, BE	Recent extensions Demand and Capacity in balance or slight overcapacity emerging
FR, IT, ES, PT, IE	Market opportunities, but complications due to local policies & preferences
UK, CZ, PL,	Major extension potential
GR, new entrants	Major potential, provided they can manage internally and with support from EU

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

Binding targets 2020 and actual 2005 Renewable Energy as % of total consumption EU 27



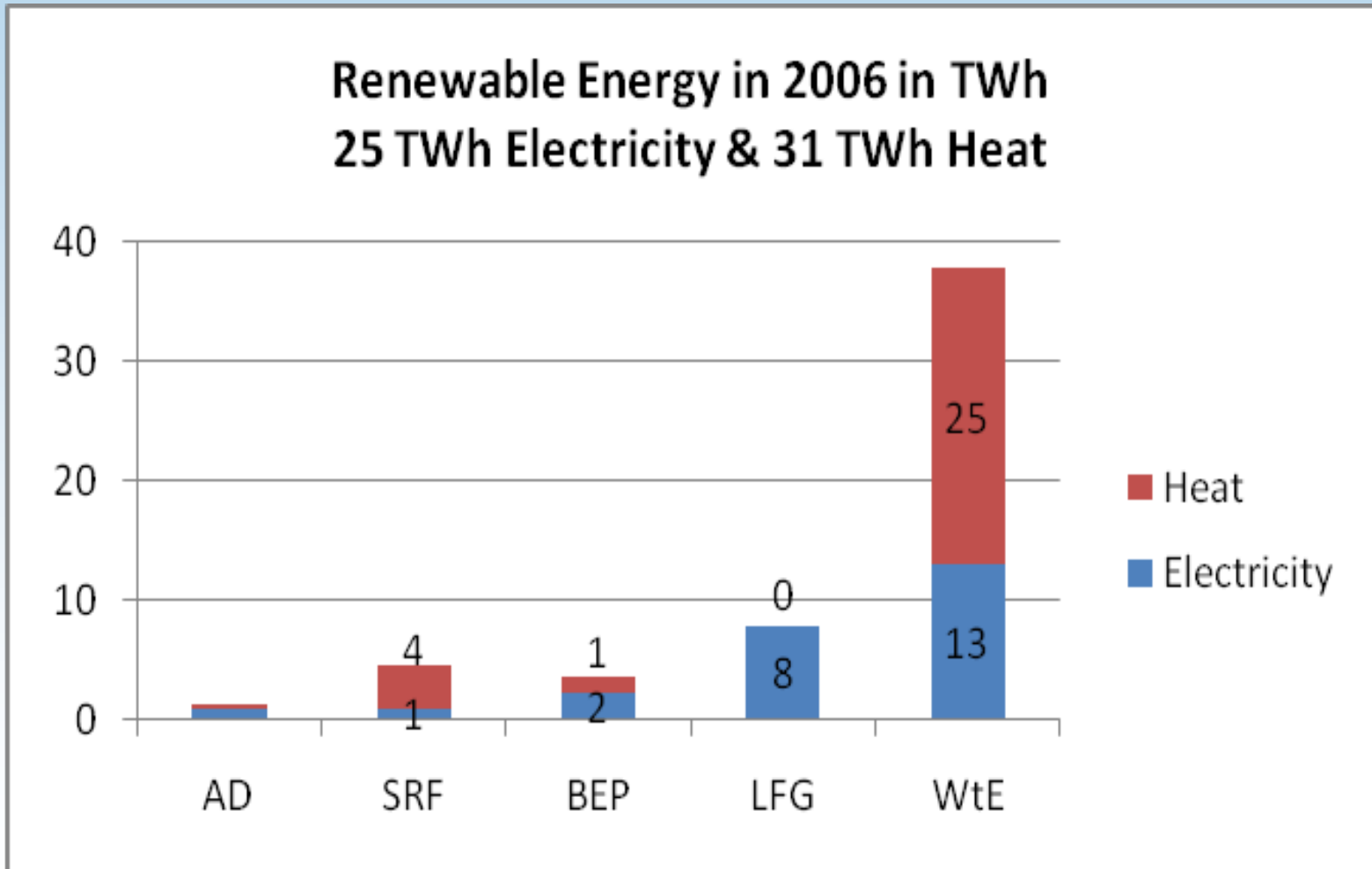
The gap to close is about 1500 TWh of Renewable Energy
 (at a flat – zero growth - EU energy consumption level of 13700 TWh)

Major routes for Energy from Waste- Europe

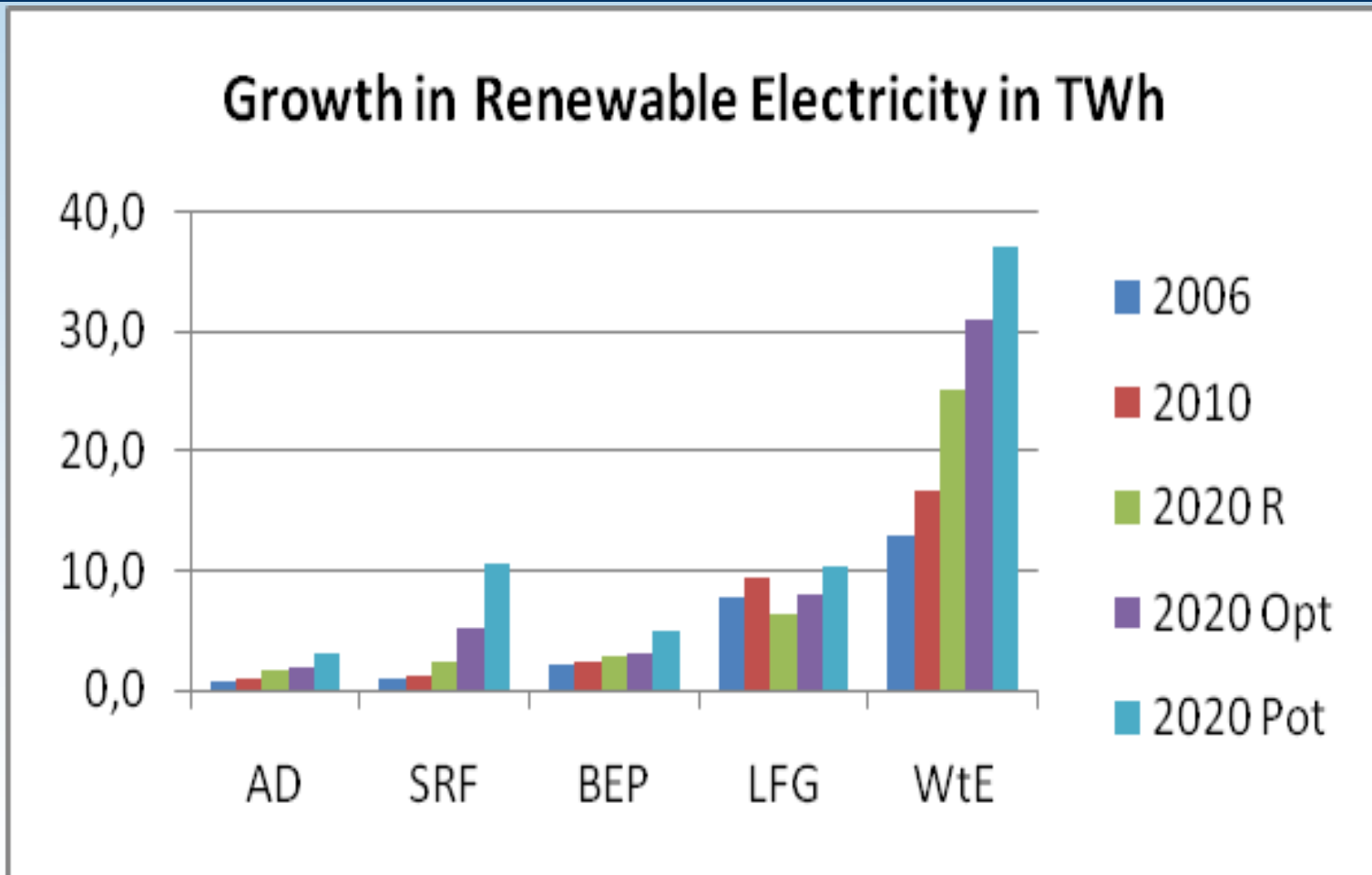
(based on MSW, CDM, but excl. Biomass and Agricultural waste)

Route	Current significance	Where in Europe ?	Form of energy	Status of technology	Growth potent.
WtE from residual MSW (incineration with energy recov)	OOOOO	Throughout	Power, Heat	Mature	Yes, regional
Incineration of RDF, SRF derived from MSW and CDM in Cement kilns, power plants etc	OOO	DE, IT, AT,SE, ES, FI, UK	Power, Fuel replacer	mature / Being proven	regional
Anaerobic Digestion from source-separated organic MSW	O	IT, ES, BE, D,FR, UK	biogas Power	Proven / developing	yes
Anaerobic Digestion from Sorted organic fraction of MSW	O	IT, ES, FR	Biogas, Power	Proven / developing	regional yes
Incineration of Waste derived Biomass (eg wood)	OO	DE, NL, BE	Power subsidised	Proven	Yes, regional
Landfill Gas Extraction	OO	Throughout Western Eur	Power, biogas	Mature	Yes, regional
Gasification & Pyrolysis	o	few	Power, Syngas	Developing	?

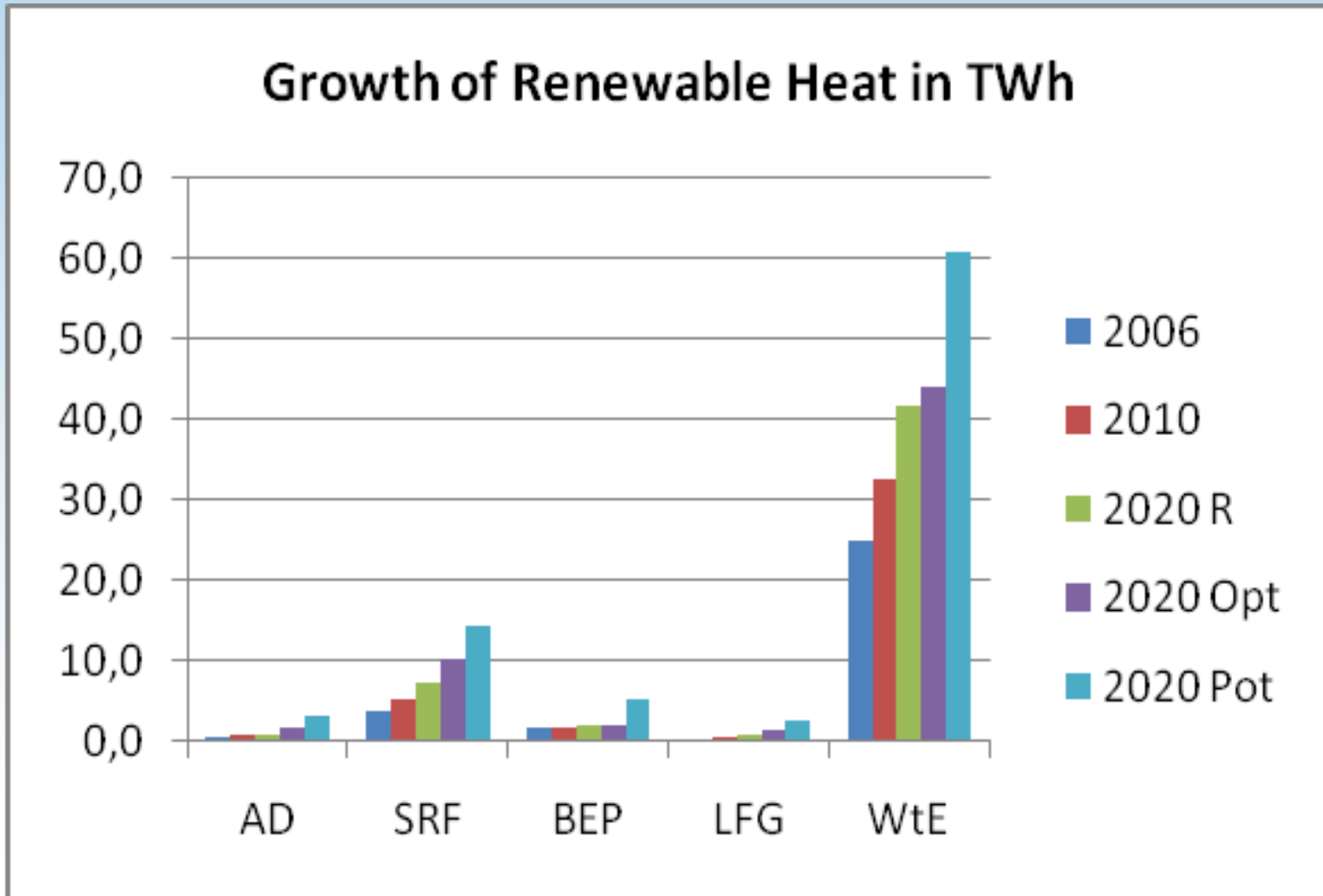
Renewable Energy 2006 from Waste (all routes) for Europe in total



Growth in Renewable Electricity from all routes for Europe in total



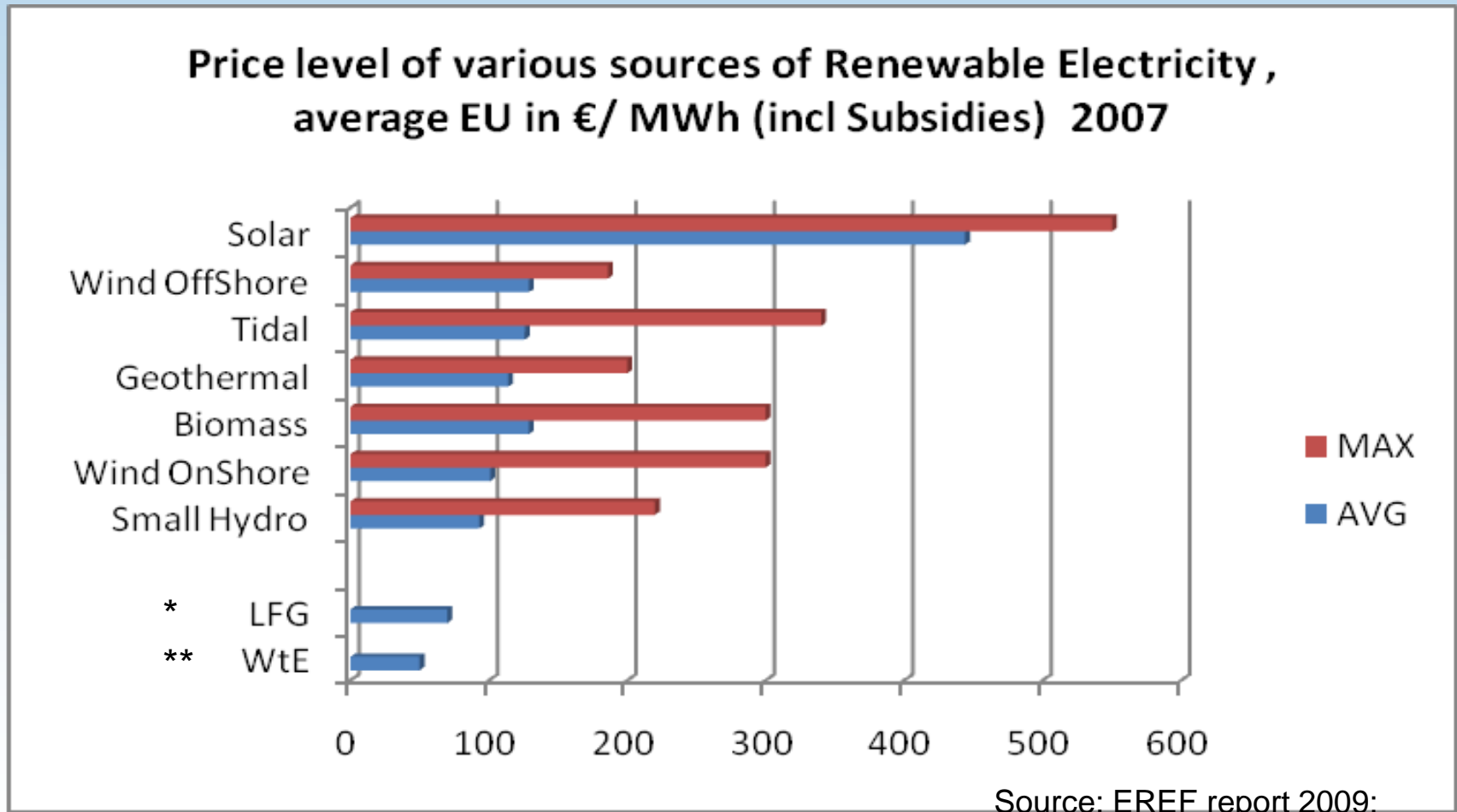
Growth of Renewable Heat from all routes for Europe in total



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 potentially 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 !

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



* * 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)

Thank you for your attention !



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