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# State of Waste-to-Energy market in Europe


**Dr Ing John Rizzon**

**ESWET**



Dofinansowano ze środków Narodowego Funduszu Ochrony Środowiska i Gospodarki Wodnej


ORGANIZATOR:

EKO CYKL ORGANIZACJA ODZYSKU OPAKOWAŃ S.A.

WSPÓŁORGANIZATOR:

M&M CONSULTING
DORADZTWO W ZAKRESIE OCHRONY ŚRODOWISKA

PATRONI:

Polska Izba Gospodarki Odpadami pigo

Polska Izba Opakowań Polish Chamber of Packaging

COBRO

AKADEMIA LEONA KOŹMIŃSKIEGO

KRAJOWE FORUM DYREKTORÓW ZAKŁADÓW OCZYSZCZANIA MIAST

PATRONI MEDIALNI:

Logistyka Odzysku

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# AGENDA

1. About ESWET
2. Policy developments
3. WI BREF review
4. Waste-to-Energy market development
5. Conclusions

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# 1. ABOUT ESWET

## Introduction

**ESWET** is the association grouping the European Suppliers of Waste-to-Energy Technology

**ESWET**'s Members supplied over 95% of the European Waste-to-Energy plants

# 1. ABOUT ESWET

## Members

# 1. ABOUT ESWET

**Aims**

## ESWET AIMS TO

Constantly improve the technical potential and environmental performance of Waste-to-Energy

Ensure integrated waste management approach that brings benefits to society and economy

Promote Waste-to-Energy as a reliable and local source of energy

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# 2. POLICY DEVELOPMENTS

## Circular Economy Package

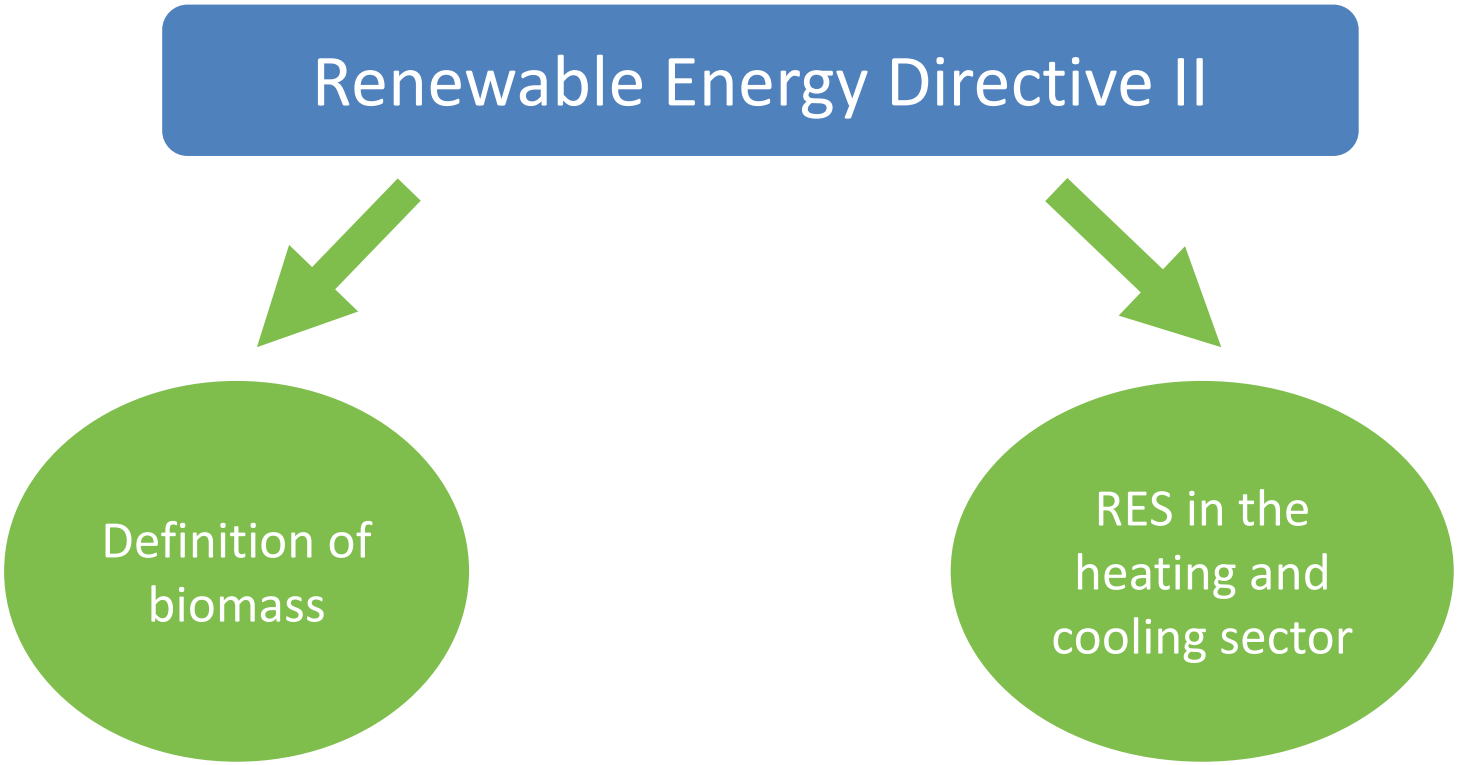
- Waste Framework Directive
- Landfill Directive
- Packaging and Packaging Waste Directive

**Main issues**

- Definition of recycling
- Recycling and landfilling targets
- Commercial and Industrial waste
- Incineration taxes

# 2. POLICY DEVELOPMENTS

## Clean Energy Package



# 2. POLICY DEVELOPMENTS

## Waste-to-Energy Communication

**The Communication on the Role of the Waste-to-Energy in the Circular Economy**

- Published in January 2017
- Changed focus: from the Energy Union to the Circular Economy
- Concentrating on anaerobic digestion (despite its limited applicability)
- Surprising conclusions regarding future available feedstock
- New WtE capacities only in countries with high landfilling rates, and only after ensuring that other measures from higher levels of waste hierarchy are implemented

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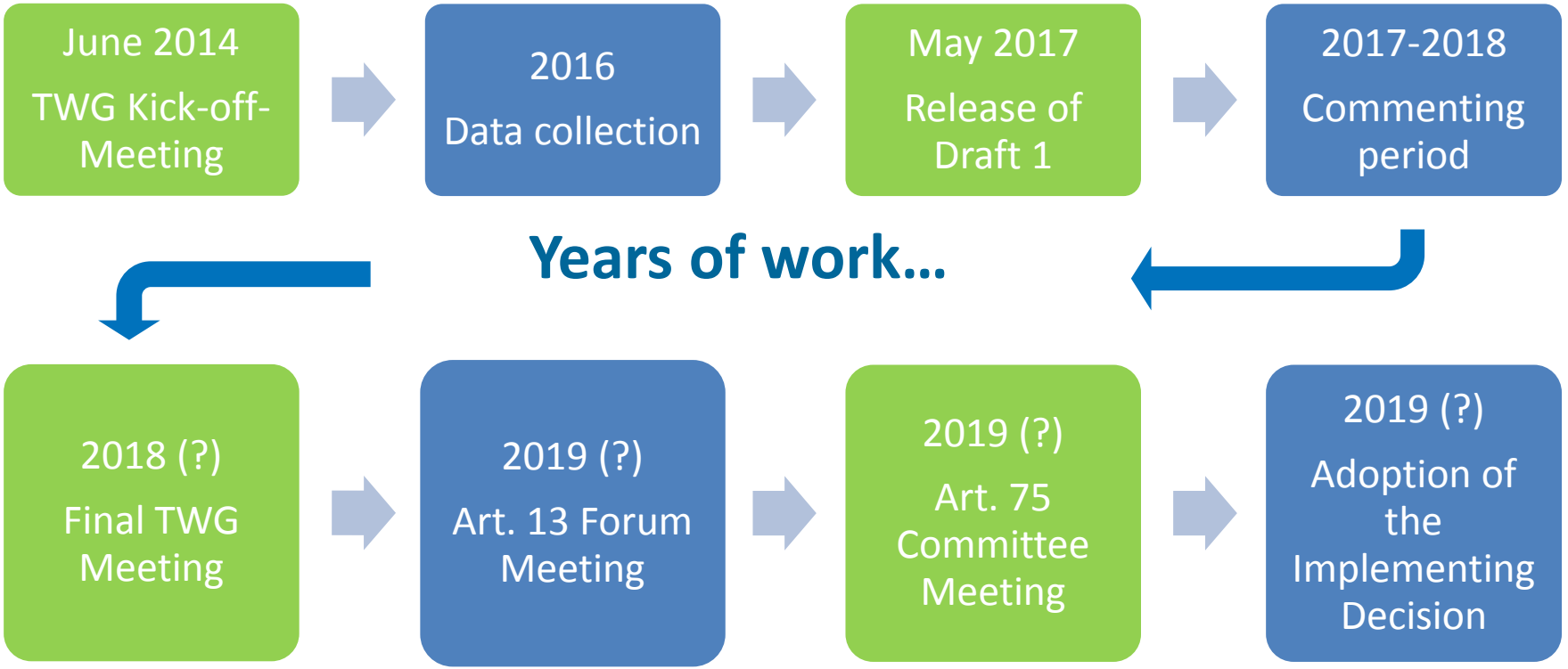
# 3. WI BREF REVIEW

## Review Process



# 3. WI BREF REVIEW

## New legal status of BAT Conclusions

**BAT Conclusions**

- Chapter 5 of BREF document, containing emissions levels associated with BATs (BAT-AELs)
- Basis for permits, together with the IED

**Status under the IPPC Directive (old BREF)**

- Estimates
- Not legally binding, informative

**Status under the IED Directive (new BREF)**

- Legally binding BAT-AELs
- Published in a separate document
- Translated into all official EU languages

# 3. WI BREF REVIEW

## Proposed new BAT-AELs

BAT-AELs for the emissions to air (WI BREF D1):

**Possible issues:**

- Normal Operating Conditions/ Effective Operating Time
- Measurement feasibility
- Cross effects

| Parameter (mg/Nm$^3$ unless stated) | WI BREF 2006 | WI BREF D1 2017 | |
|---|---|---|---|
| | | Existing plant | New plant |
| Dust | 1-5 | 2-5 | |
| Cd+Tl | 0,005-0,05 | 0,01-0,02 | |
| Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V | 0,005-0,05 | 0,01-0,02 | |
| HF | <1 | <1 | |
| HCl | 1-8 | 2-8 | 2-6 |
| $SO_2$ | 1-40 | 10-40 | 10-30 |
| $NO_x$ | 40-100 (SCR)<br>120-180 (SNCR) | 50-150 | 50-120 |
| CO | 5-30 | 10-50 | |
| $NH_3$ | <10 | 3-10 | |
| TVOC | 1-10 | 3-10 | |
| PCCD/F | 0,01-0,1 (ng/m$^3$) | <0,01-0,06 | <0,01-0,04 |
| PCCD/F + dioxin like PCBs | No BAT-AEL for PCBs | <0,01-0.08 | <0,01-0,06 |
| Hg | 0,001-0,02 | 5-25 (µg/Nm$^3$) | 5-20 (µg/Nm$^3$) |

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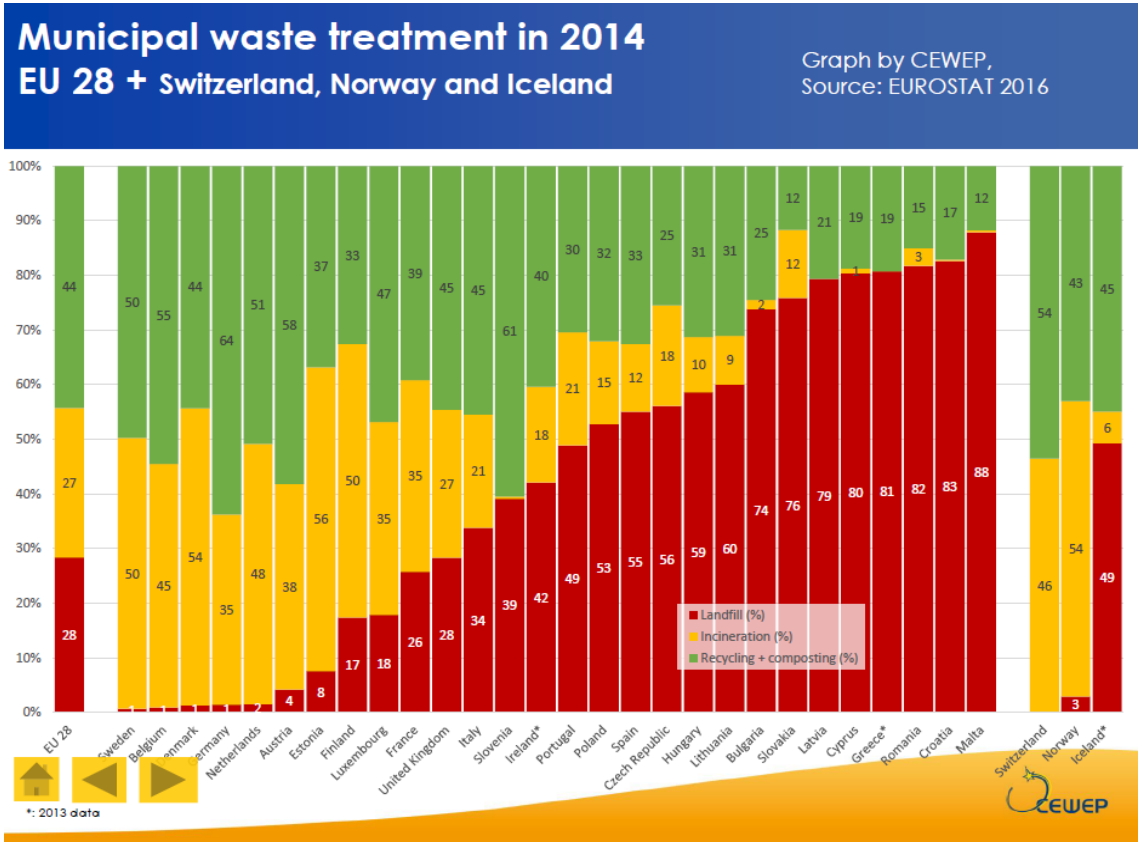
# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## Waste Treatment in European countries

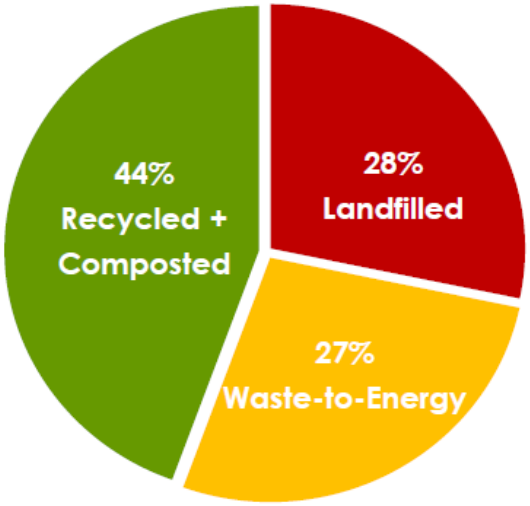


# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## WtE market development

Municipal waste treatment in 2014
EU 28

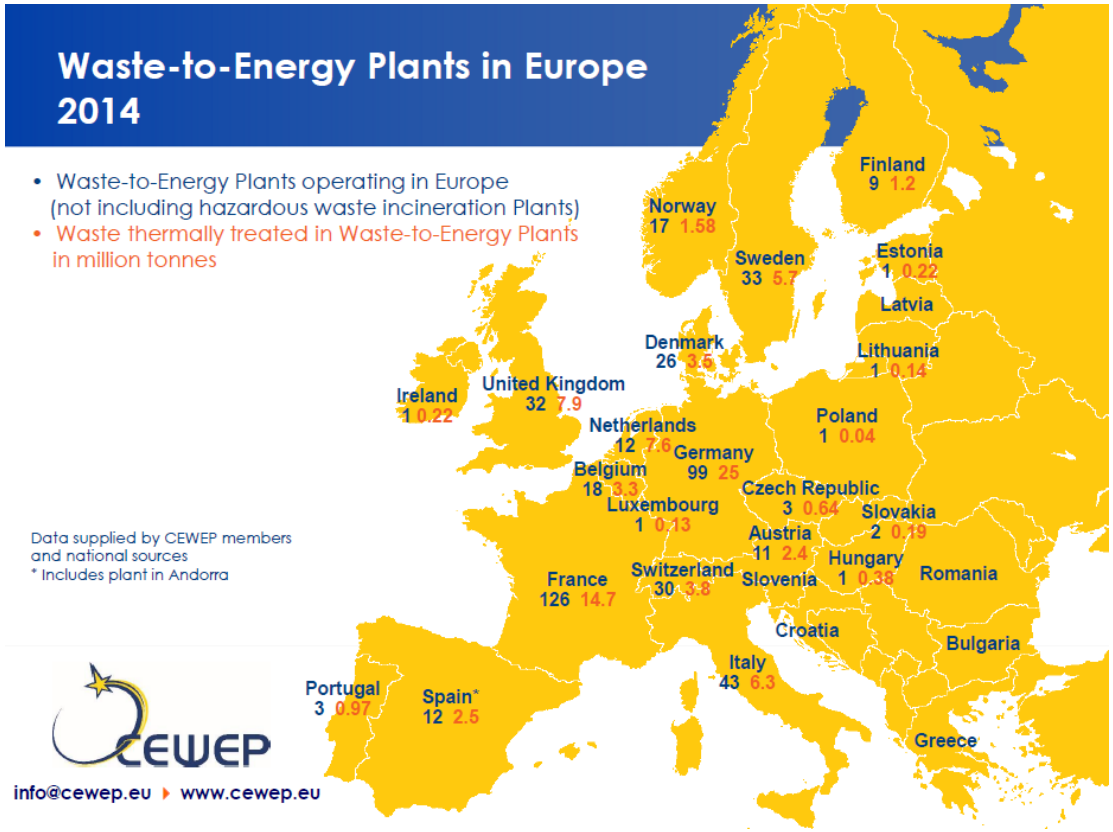
Graph by CEWEP, Source: EUROSTAT 2016




Waste is a Resource.
However 28% of municipal waste across the EU 28 is still landfilled (some 67 million tonnes), although landfill gases (methane) contribute significantly to global warming.

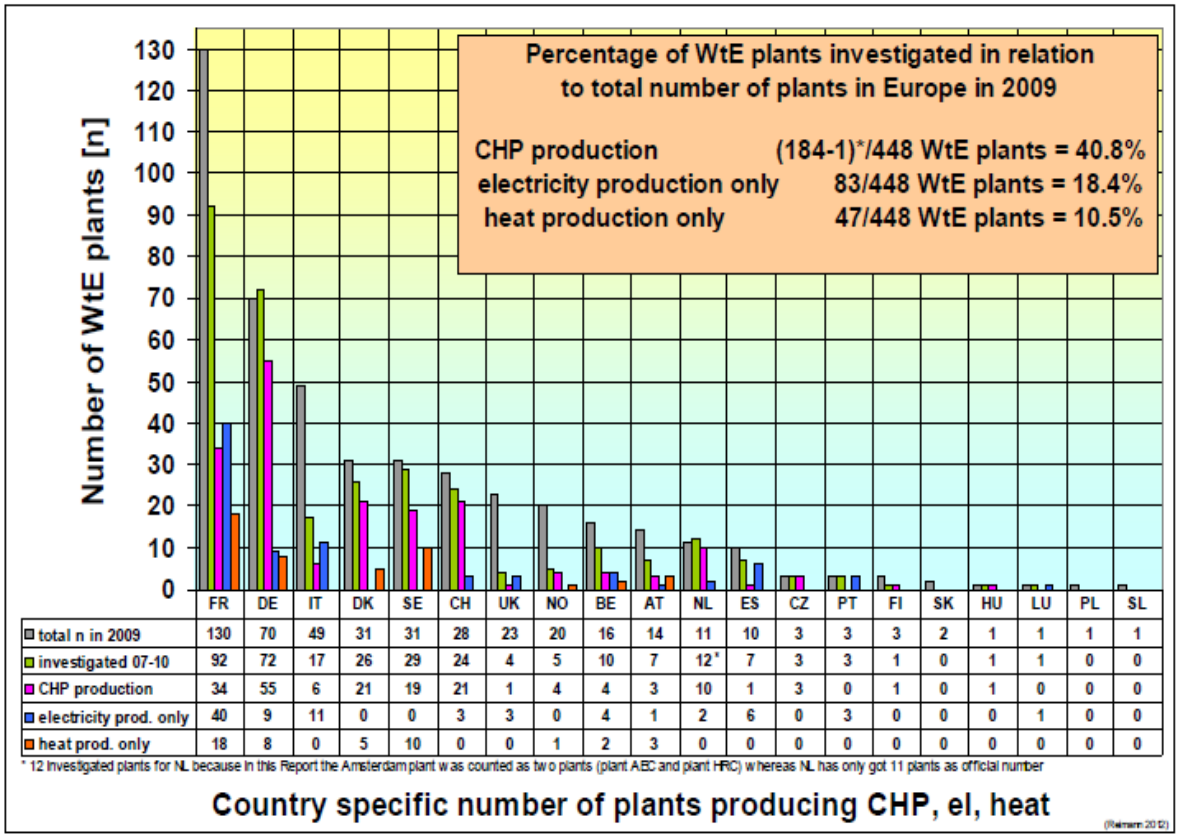
# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## WtE Plants in Europe – Situation 2014



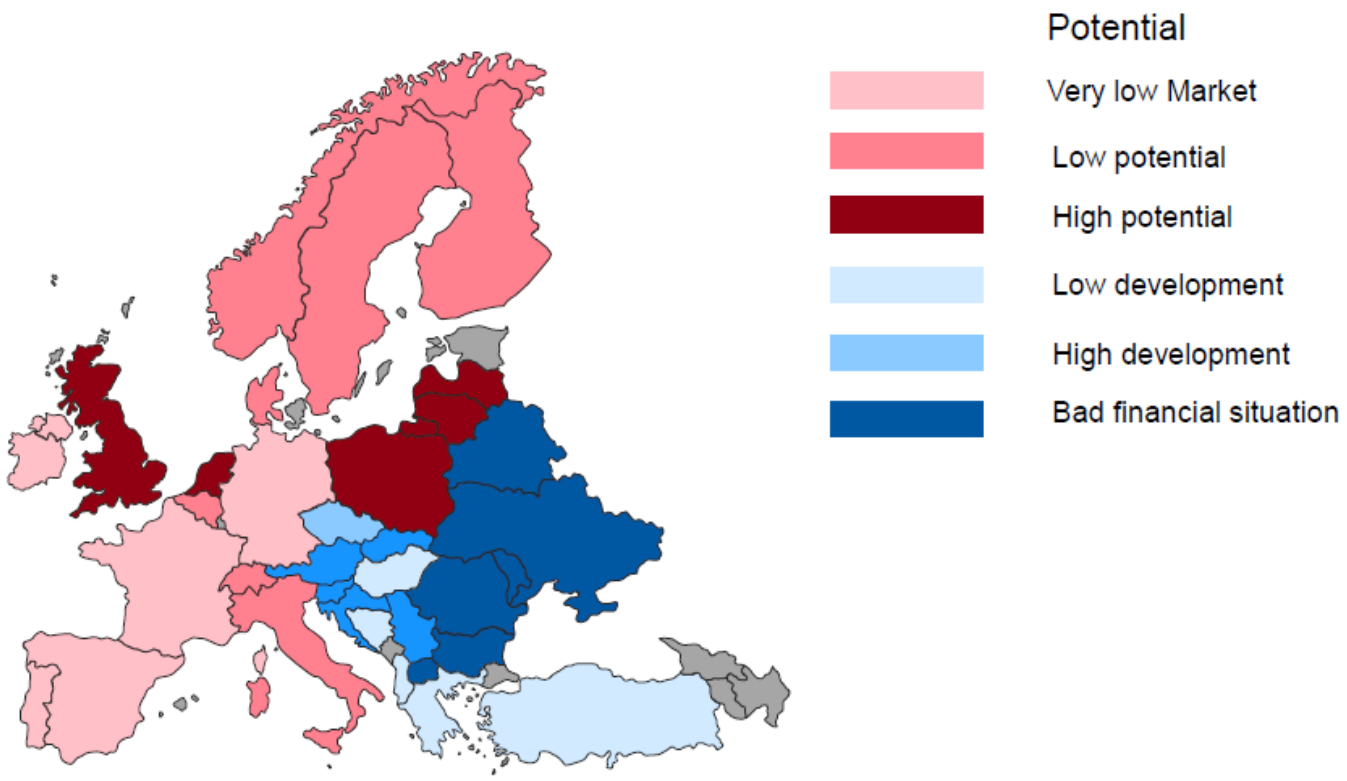
# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## Energy Recovery investigated in 314 WtE Plants (Status 2007-2010)



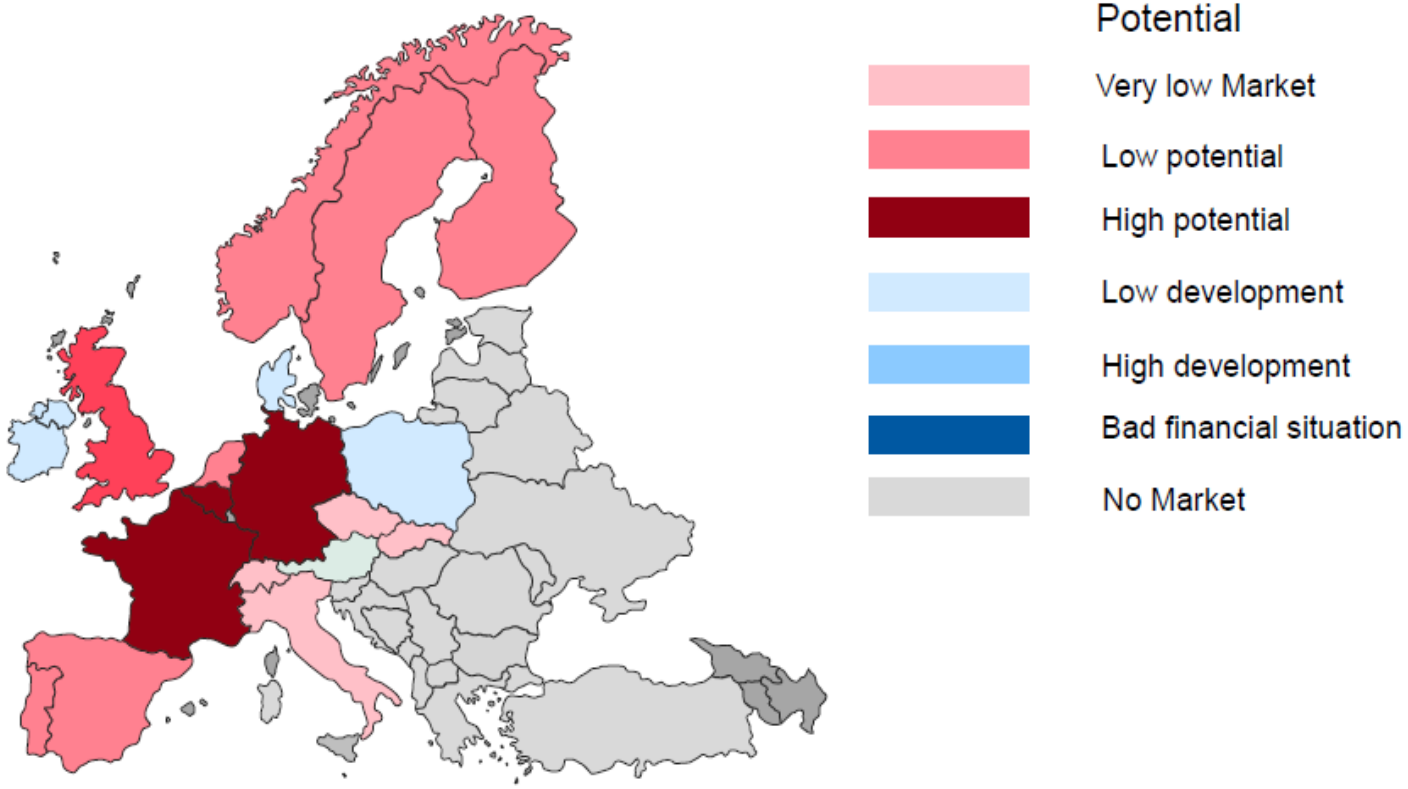
# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## Estimated WtE Potential in Europe (New Plants)



# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## Estimated WtE Potential for Retrofits and “Book to Bill”



# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## WtE Market - Increase of Efficiency (1)

Increasing steam parameters from 40 to 60 bar
->3% output (Corrosion risk, Invest higher)

Realized Examples:

| Unit | p (bar) | T (°C) | Gross Effic. (% ) |
|---|---|---|---|
| | | | |
| Conventional Technology | 40 | 400 | 22,5-25,0 |
| | | | |
| Amsterdam (line 5+6) (NL) | 130 | 440 | 30,0 |
| Brescia (line 1+2) (I) | 61 | 450 | 27,0 |
| Brescia (line 3) (I) | 73 | 480 | 27,0 |
| Heringen (D) (external SH) | 81 | 520 | 29,7 |
| Naples (I) | 90 | 500 | 30,2 |
| Copenhagen (DK) | 80 | 460 | 28,5 |
| Rudersdorf (D) | 90 | 420 | 29,9 |
| Reno Nord (DK) | 50 | 425 | 26,5 |
| Riverside, London (UK) | 50 | 427 | 17,0 |

# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## WtE Market - Increase of Efficiency (2)

| | | | |
|---|---|---|---|
| Increase steam parameters | from 40 to 60 bar | ->3% output | (Corrosion risk, Invest higher) |
| Heat secondary air | | ->0,7-1,2% output | (Invest higher) |
| Increase de-aerator temperature | from 130 to 140°C | ->0,9% output | (Increase size and invest) |
| Add a condensate heater | | ->0,5-1,5% output | (Corrosion risk, Invest higher) |
| Flue gas recycling | reduce $O_2$ by 1% | ->0,75-2,0% output | (Corrosion risk start-up, shut -down) |
| | reduce $NO_x$ level | ->100mg/Nm3 | (Invest higher) |
| Reduce flue gas temp. boiler outlet | for 10°C lower | ->0,4-0,7% output | (depending on FGT system) |
| Use SNCR instead of SCR | | ->3,0-6,0% output | (Invest lower) |
| Reduce O2 content in flue gas | reduce by 1% | ->1,0-2,0% output | (Corrosion risk, CO may increase) |
| Decrease vacuum at ST outlet | for 20 mbar | ->1,0-2,0% output | (Significant increase of invest, |
| | | | Size and noise increase) |
| | | | Source CNIM,2003 |

# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## Trends with new and optimized Processes (1)

### AEB, Amsterdam - The Netherlands

The largest plant in the Netherlands. The recent two lines added to the original four line facility use a reheat Rankine steam cycle and produces electricity with a total efficiency of 30%.

### Lakeside, London - UK

The incinerator was developed by a major UK Waste Management company and is located near to Heathrow Airport. The plant processes residual MSW and C&I waste with gasification/melting technology of a Japanese supplier.

### Spittelau, Vienna - Austria

This was a old conventional moving grate combustion plant. However, it was the first facility that used architectural art by Hundertwasser to gain public acceptance. New technology has been delivered by MHPSE.

### Allington, Kent - UK

One of the largest fluidized bed MSW incineration plant in the world. Same technology has been applied in Madrid, Antwerp, Gien, Mulhouse, Vienna and Sardenia and in several WtE plants in Japan.

### Issy les Moulineaux, Paris - France

One of the newest and largest incineration plant in France. The plant is built on the side of the River Seine in the Centre of Paris and the building only has a vertical profile of 27 meters as 30 meters of the plant is below ground. The roof is flat and covered with grass and shrubs and the exhaust stacks only protrude 5 meter above the building roofline.

### Reno Nord, Aalborg, as well as AMAGER Bakke, Copenhagen - Denmark

Modern incinerator in CHP mode and providing district heating to the local city with high efficiency.

# 4. WASTE-TO-ENERGY MARKET DEVELOPMENT

## Trends with new and optimized Processes (2)

### Bilbao - Spain

High efficiency plant linked to an adjacent combined cycle plant. The steam from the combustion plant is passed to the power plant and converted to electricity at higher efficiency.

### Mainz - Germany

The new third line installed at this existing combustion facility operates with high efficiency due to integration with and adjacent gas turbine plant.

### Riverside, London - UK

One of the newest and largest combustion plant in the UK using state-of-the-art grate combustion technology and high steam pressure and temperature.

### Lahti II - Finland

Metso Power has supplied many fluidized bed combustion plants such as Tampella Power, Gotaverken Miljo and Kvaerner. They developed a CFB gasification plant for RDF fuels that is operating in Finland.

### Brescia - Italy

Plant in Italy operating with high thermal efficiency and complicated mechanical biological pre-treatment.

### Slagging Gasification - Japan

A review of slagging gasification in Japan. There are currently 122 operating slagging gasifiers processing MSW with more under construction. This review describes the processes supplied by the leading Japanese companies.

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# 5. CONCLUSION

## WtE Market Development – Future Trends (1)

- **Increasing recycling rates**
  - ➡ Less waste for WtE
  - ➡ Composition and HCV of waste will change
- **Change of fuel composition**
  - ➡ Co-incineration of waste and sewage sludge no longer accepted
  - ➡ Industrial and commercial waste to be added
- **Lower emission values**
  - ➡ Optimized incineration technologies to reach NOx values with SNCR technologies (<120 mg/m3N)
  - ➡ In case of lower NOx values SCR technology will be applied

# 5. CONCLUSION

## WtE Market Development – Future Trends (2)

- CHP plants will be preferred due to better efficiency
- Waste shipment will be reduced and proximity treatment will be extended
- Less plastic in the waste due to new roadmap for plastic treatment
- Increase of steam parameters leading to higher efficiency
- Reduction of lanfilling of botton ash will lead to supplemetary treatment of the bottom ashes

**WtE technology suppliers are prepared to offer proven technologies to reach the required targets**

# Thank you for your attention!

Niniejszy materiał został opublikowany dzięki dofinansowaniu Narodowego Funduszu Ochrony Środowiska i Gospodarki Wodnej.
Za jego treść odpowiada wyłącznie Eko Cykl Organizacja Odzysku Opakowań S.A.

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