



# High Efficiency Energy from Waste



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# Agenda

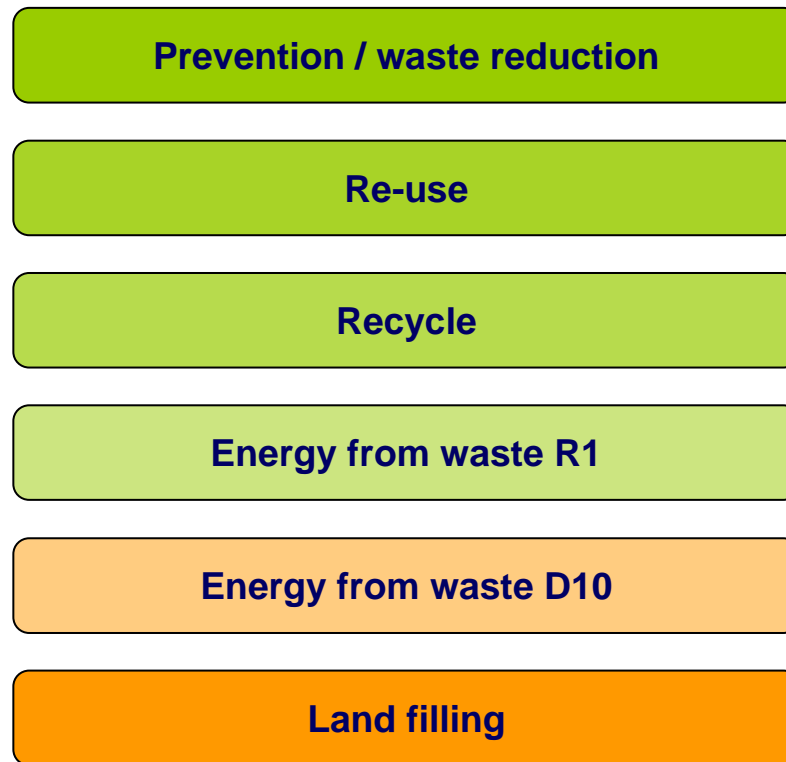
- Dutch waste management
- Afval Energie Bedrijf AEB
- Waste Fired Power Plant



# Dutch waste management



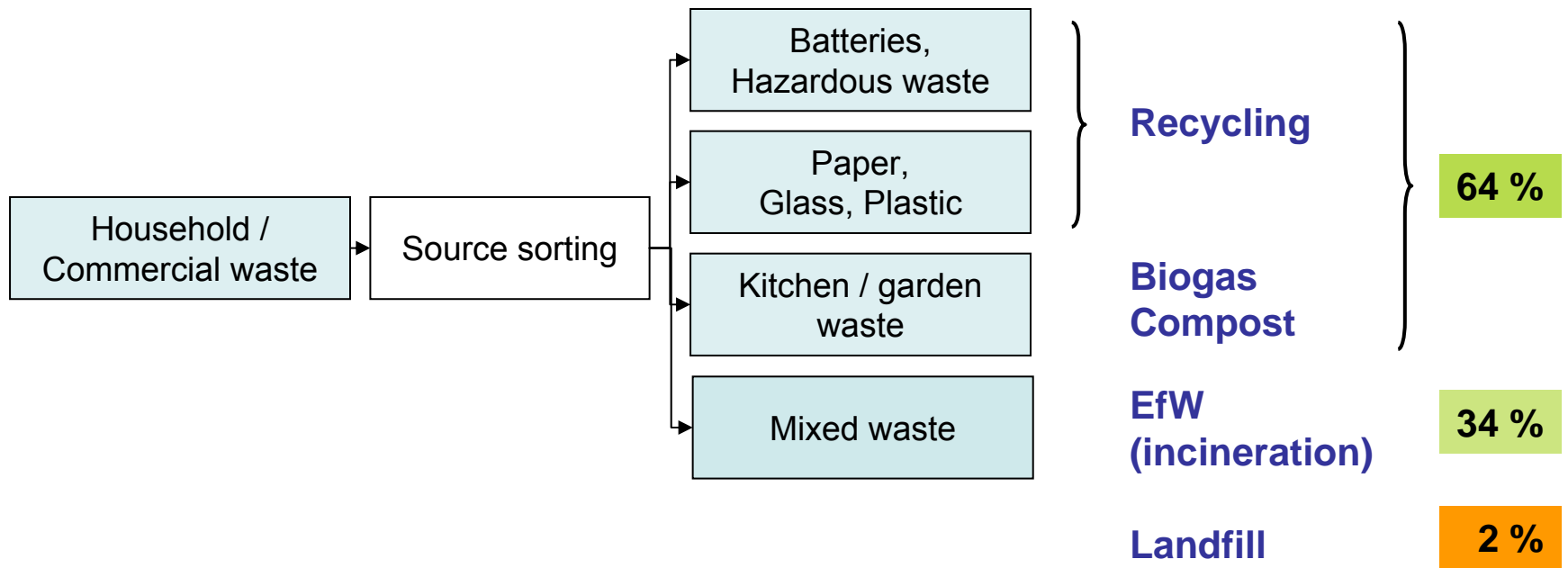
Preferred environmental option



Least preferred environmental option



# 8.5 million tons per year





# Energy from Waste in NL

- 12 installations
- Total capacity 6,4 million tons
- R1: 4.3 million tons

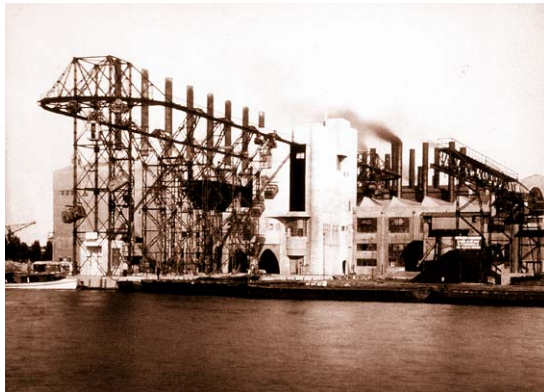


# Gemeente Amsterdam Afval Energie Bedrijf

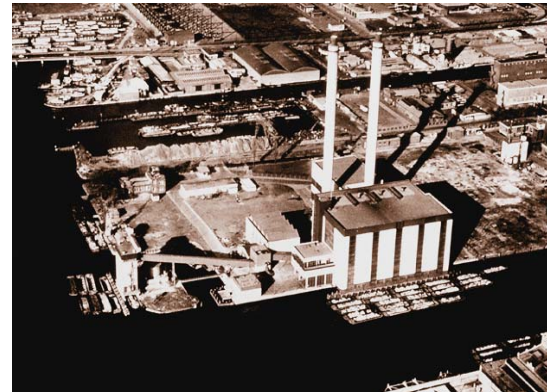




1st Generation 1917-1969



2nd AVI Noord: 1969 - 1993



3rd AVI West 1993 - present

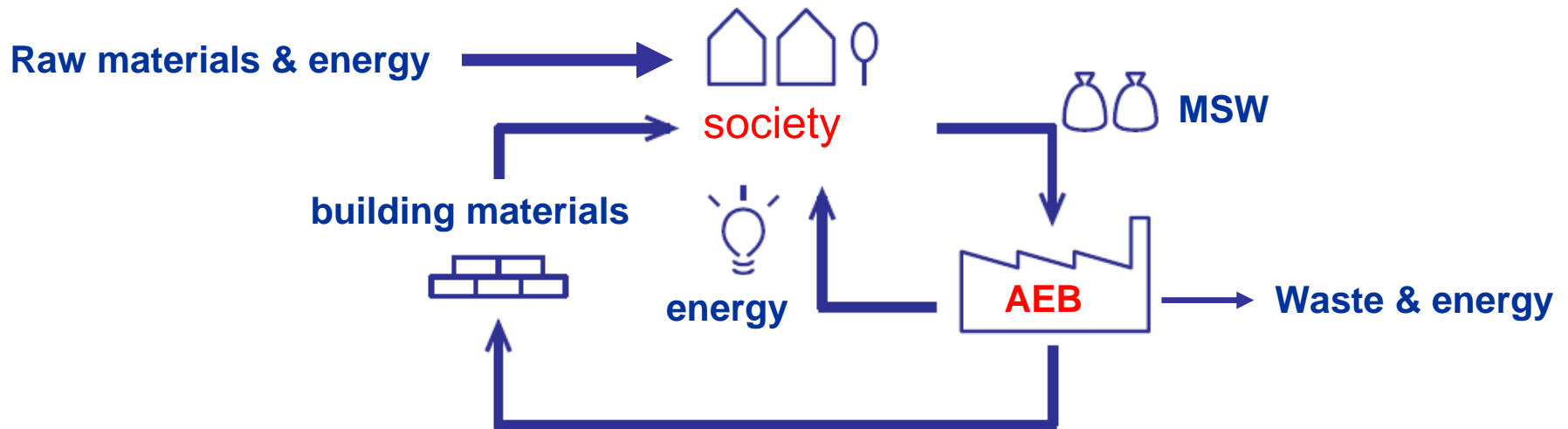


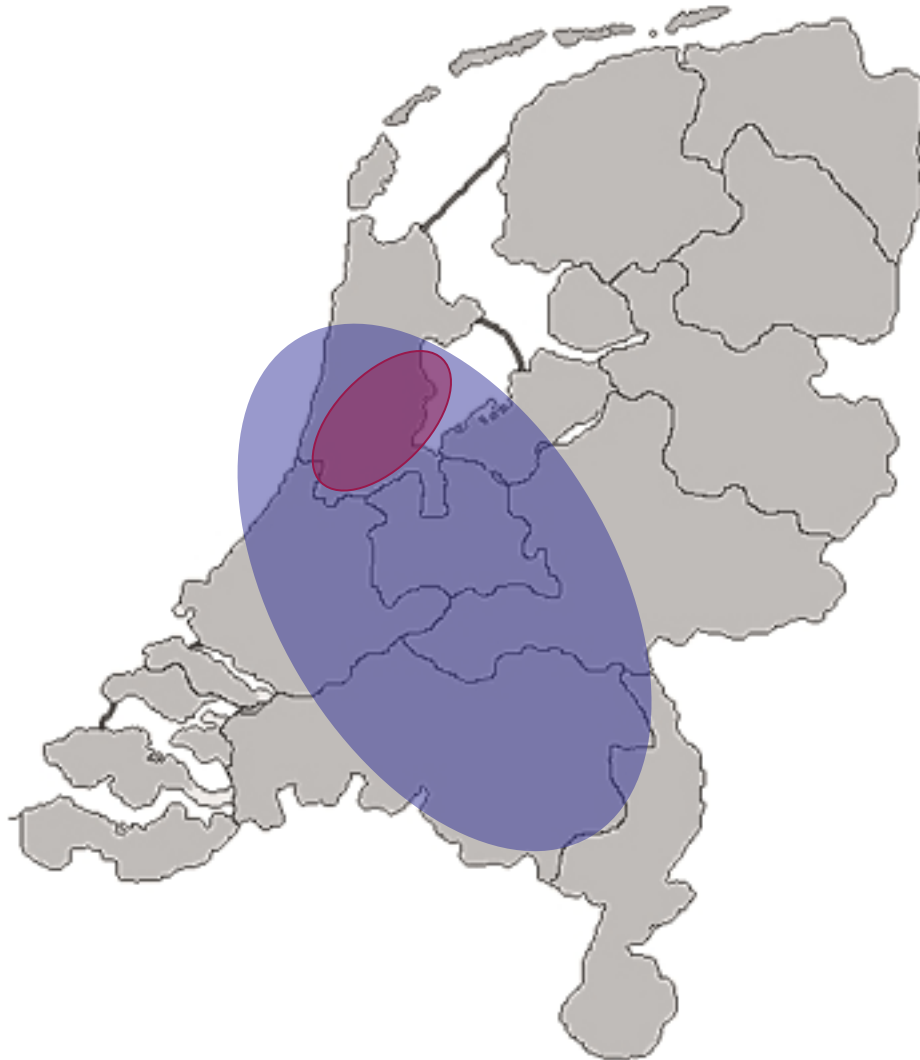
4th WFPP 2007 - present





# AEB Philosophy: closing the loop



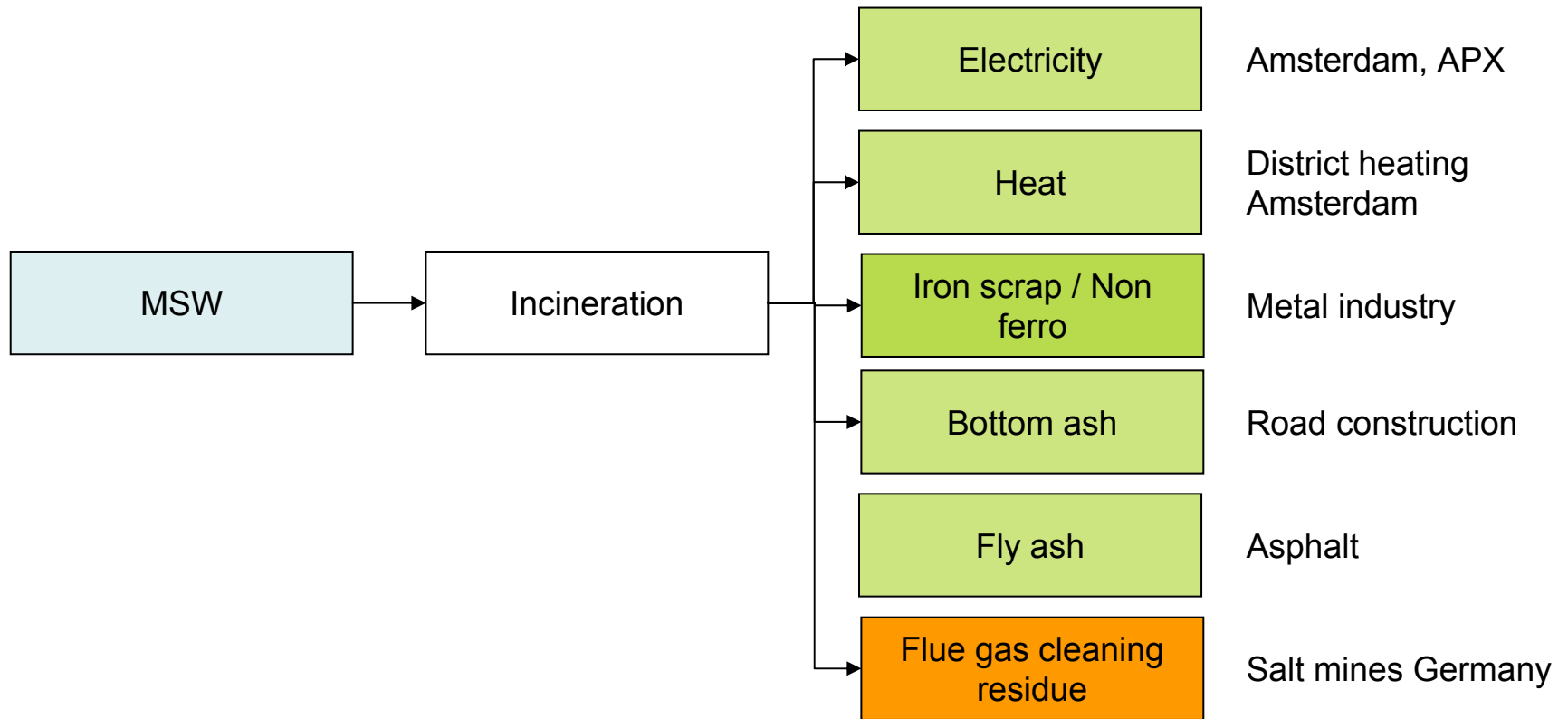


## WTE plant (1993)

- 1.4 million inhabitants
- 850.000 tons of MSW

## WFPP (2007)

- 530.000 tons of commercial waste





## Facts and figures

- 1,4 tons waste
- 600 trucks and 2 trains per day
- 300.000 gigajoule heat for district heating
- 1 million MWh electricity
- 350 employees
- Turnover € 150 Million

**Our aim: 99% recycling**



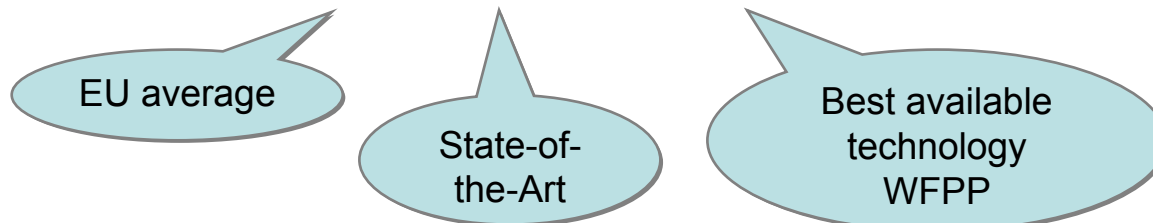
# Waste Fired Power Plant

*designed for recovery*



# Efficiency of electricity production

- Natural gas 55 %
- Oil 50 %
- Coal 45 %
- Lignite 40 %
- Biomass 35 %
- Waste 15...22 %....30%





# Technology

- High steam parameters: 125 bar, 440 °C (130 bar, 480 °C)
- Corrosion reduction:
  - Inconel
  - steam-steam reheating
- Flue gas recirculation
- Bigger boiler
- Water cooled condensor



## Why did Amsterdam invest

- Sustainable electricity production (source, biomass)
  - 30% net electrical efficiency (22% WtE conventional)
- CO<sub>2</sub>-reduction (11% of 2025 target for Amsterdam)
- More revenue, lower waste taxes
- Strengthen AEB position in the waste market



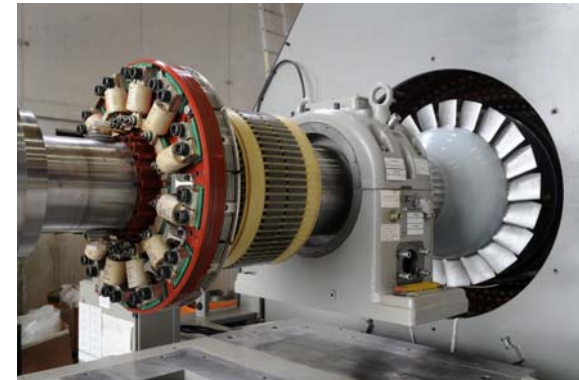
# History



Investment decision 17  
**September 2003**



Hand over  
**1 August 2007**



Fully operational (again)  
**1 March 2009**



First fire  
**19 March 2007**



Turbine shaft  
**3 February 2008**



## Operational results (1)

- Nominal waste throughput realised
- 30,5% Nett-efficiency proved
- Stable firing through big boiler
- Corrosion free superheater
- Low boiler fouling
- Boiler corrosion within specs



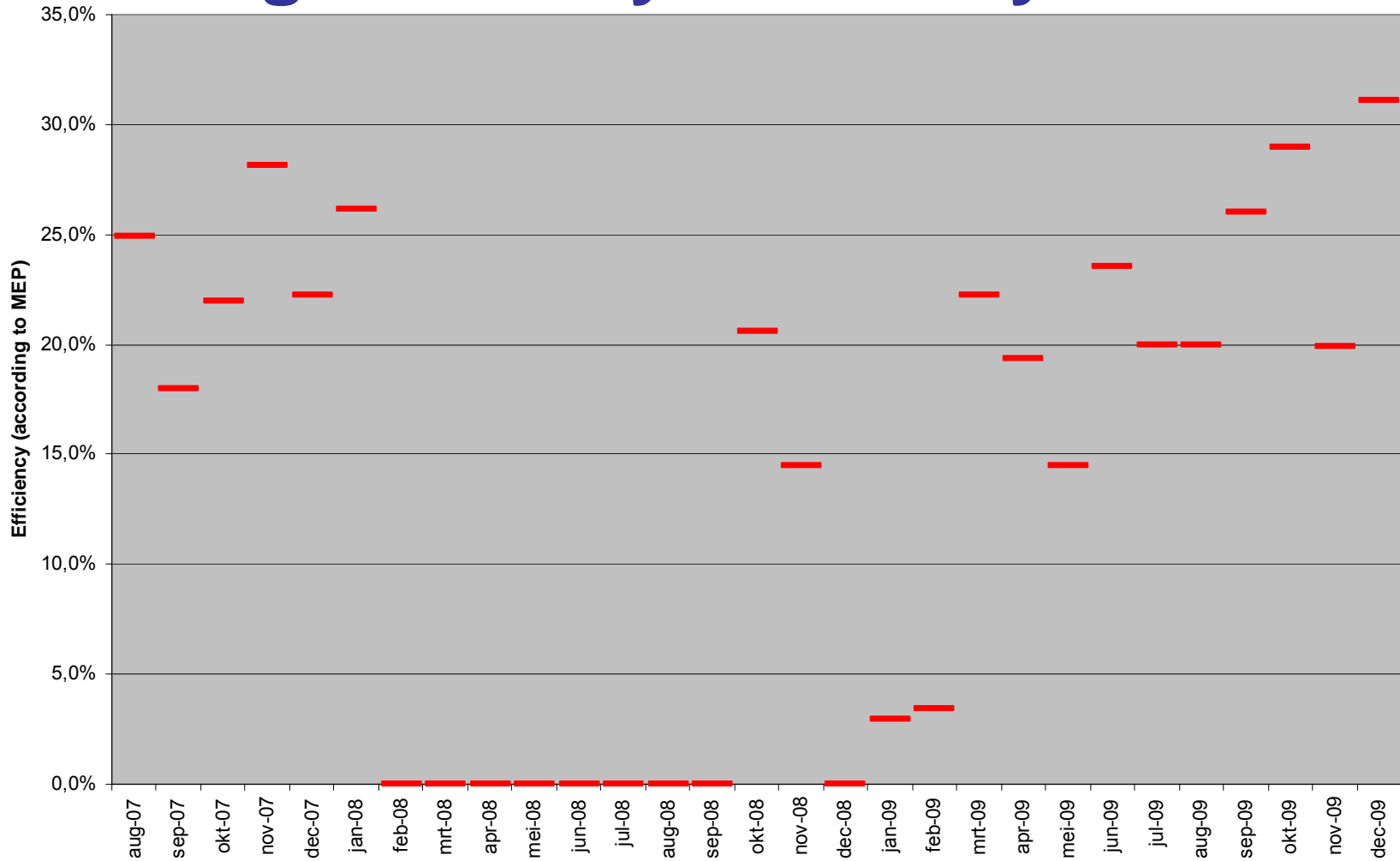
## Operational results (2)

- Turbine shaft
- Water hammer cooling water pipe
- Reheater pumps
- Back fire flue gas recirculation



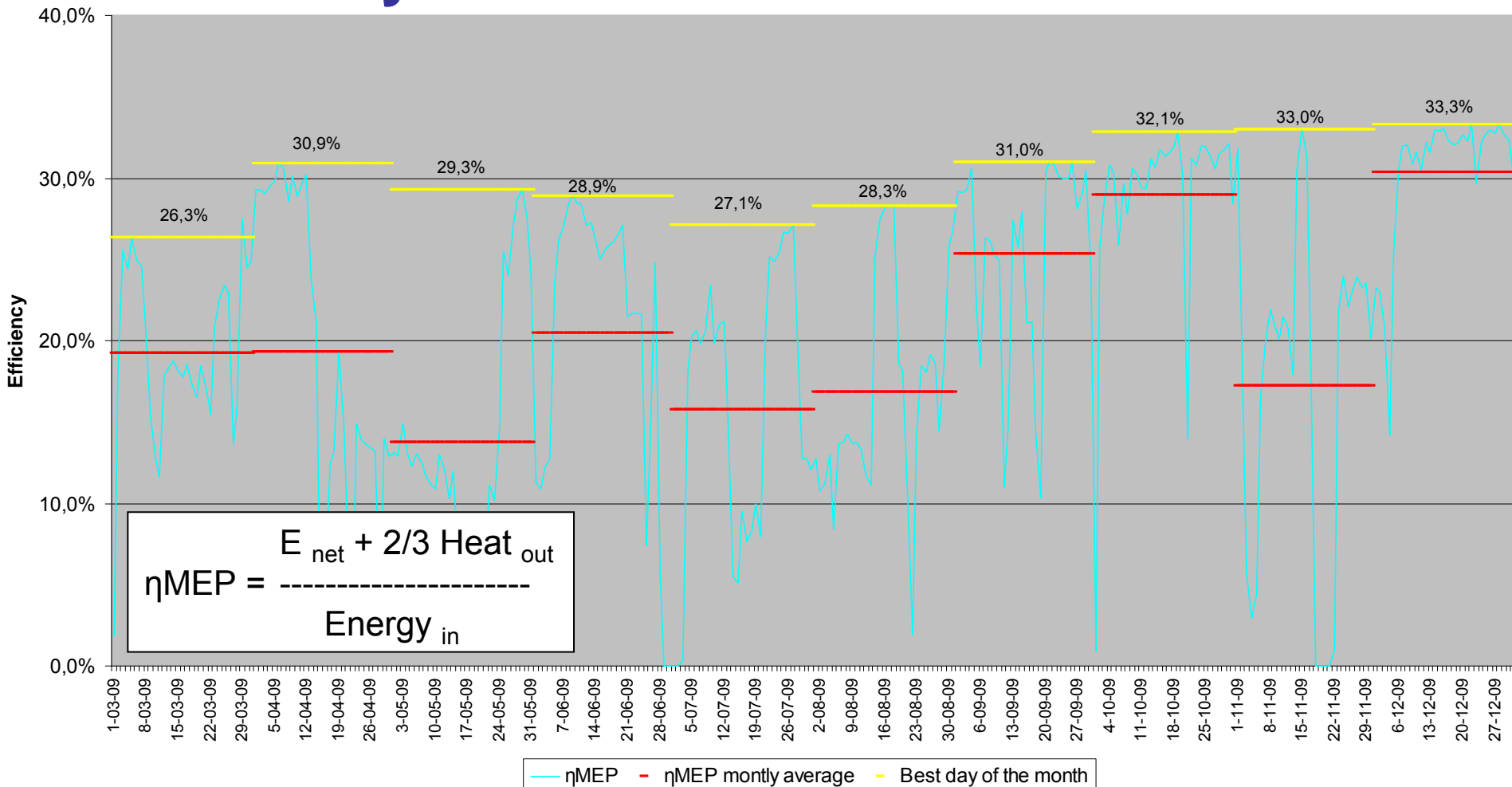


# Average monthly efficiency





# Efficiency Waste Fired Power Plant 2009





## Future

- Optimize firing conditions
- Materials testing
- Training personnel
- 130 bar, 480 °C
  
- Disseminate operational know how
- New co-operations (e.g. CenBio)





# Thank you!



FUNDED BY THE EUROPEAN UNION



SIXTH FRAMEWORK PROGRAMME

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