

A vibrant green leaf with water droplets, symbolizing sustainability and nature. The leaf is the central focus, with its veins and droplets clearly visible. The background is a soft, out-of-focus green, and the leaf's reflection is visible in a light blue surface at the bottom. The overall composition is clean and fresh, emphasizing environmental themes.

# Making sustainable energy feasible

2011.08.11 San Diego, USA

Risto Lehtimäki

# Metso is a global supplier of sustainable technology and services

- Our customers operate in the following industries:
  - Mining
  - Construction
  - Power generation
  - Oil and gas
  - Recycling
  - Pulp and paper
- About 28,500 employees in more than 50 countries.
- 2010 net sales EUR 5.6 billion.
- Our shares are listed on NASDAQ OMX Helsinki Ltd.



# Extensive offering to process industry

## Mining industry

- Mining and minerals processing equipment and systems; wear and spare parts and service solutions

## Construction industry

- Aggregates processing equipment and systems; wear and spare parts and service solutions

## Power generation

- Process solutions, machinery and services for energy production from solid and liquid fuels
- Process automation and flow control solutions

## Oil and gas industry

- Automation and flow control solutions

## Recycling

- Metal recycling solutions
- Solid-waste recycling solutions


## Pulp and paper industry

- Process solutions, machinery and services for production of pulp, paper, tissue and board, including energy, and chemical recovery solutions
- Process automation and flow control solutions



# Our mission

Why do we exist?

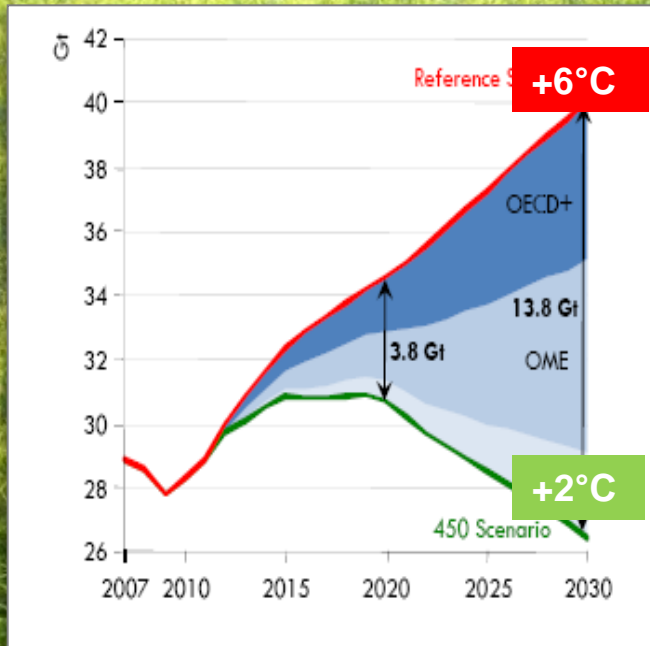


We contribute to a more sustainable world by helping our customers to process natural resources and recycle materials into valuable products.

# Challenge: Sustainable energy generation



# Biggest challenges this century are related to sustainable energy generation



Limiting the global average temperature increase to 2°C above pre-industrial levels would require a 50-85% decline in global emissions by 2050.

Source: International Energy Agency (IEA):  
[http://www.worldenergyoutlook.org/docs/weo2010/weo2010\\_london\\_nov9.pdf](http://www.worldenergyoutlook.org/docs/weo2010/weo2010_london_nov9.pdf)

# Due to its short CO<sub>2</sub> cycle, biomass is a CO<sub>2</sub> neutral fuel



# Sustainable energy markets developing

- 29 states in USA already have renewable energy targets
- By 2020, renewable energy to account for 20% of EU's final energy consumption
- Bio-fuel industry in Brazil improving its efficiency and sustainability image
- Asian countries including China, Philippines and Thailand support bioenergy production development
- Transition from fossil-based power generation requires significant increase in investment in carbon-neutral energy production






# Biomass will present a major share of all renewables

- Flexible biomass capacity requires less backup power and grid investment
- Biomass generates both heat and electricity
- Biomass is locally and/or globally available
  - secure supply
  - reduction in dependence on oil and gas





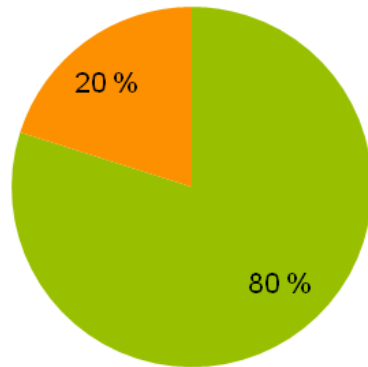
Metso making sustainable  
energy feasible

# CO<sub>2</sub>-neutral energy generation – the world's largest biomass solutions come from us

Since 2000, Metso has sold almost 5 GW<sub>e</sub> of boiler capacity fueled with renewables – equivalent to 6 average nuclear reactors.

Metso's boilers since 2000

■ Renewable fuel ■ Fossil fuel



## Solver effect

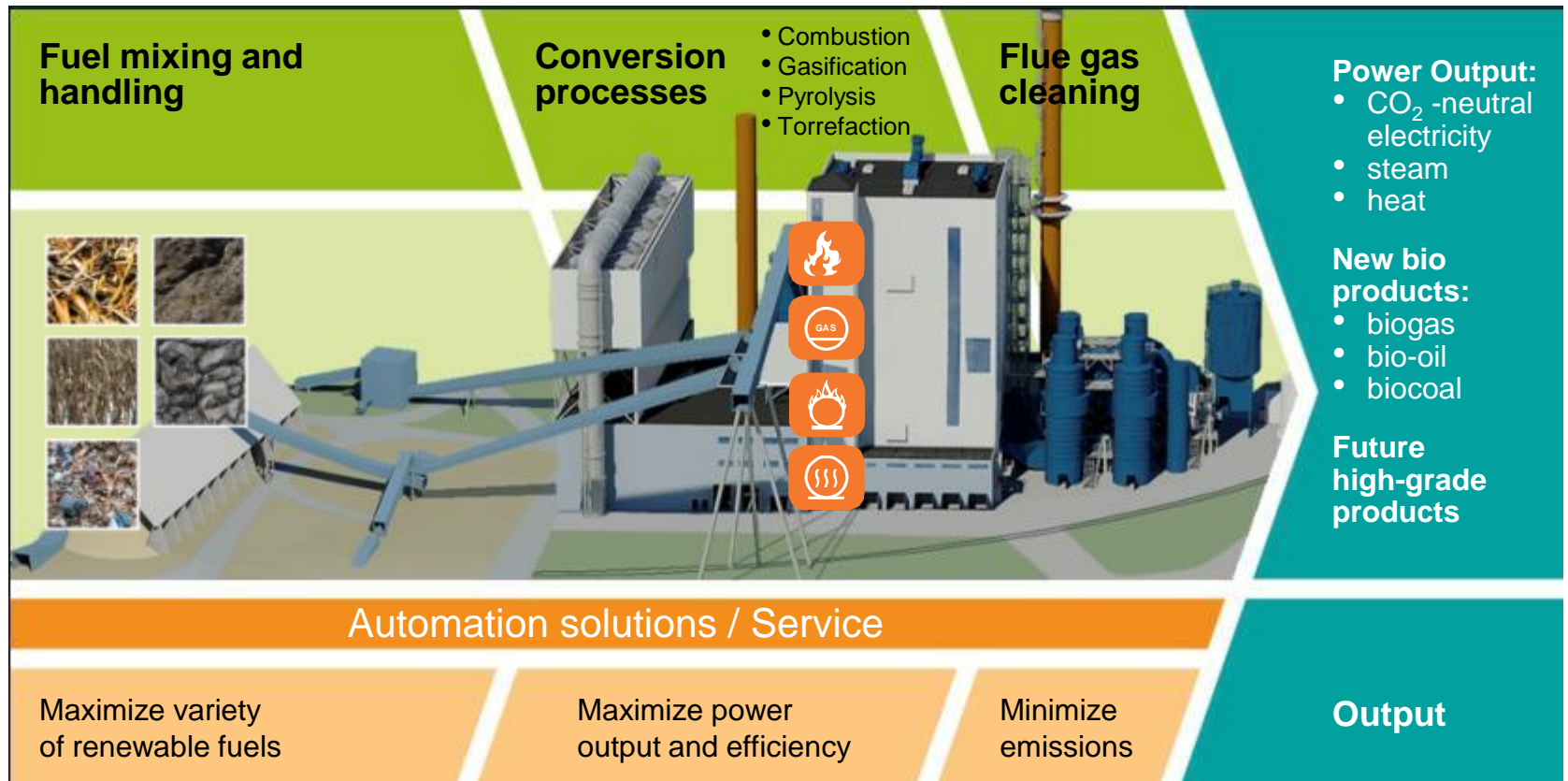
Replaces over 140,000 rail car loads of coal annually.

## Solver effect

CO<sub>2</sub> emissions equivalent to over 24 million cars are avoided annually.

# Metso's bioenergy solutions offering

A unique combination of technologies and services that together enable the conversion of biomass, recycled material and waste into the most valuable form of bioenergy in the customer-specific business.



# Biomass power plants for all needs

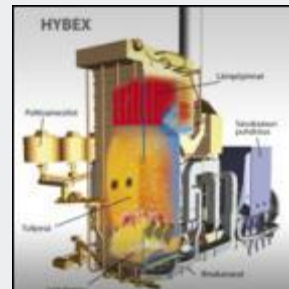
Small-  
modular  
5-10 MW(e)

- For example Bayerfonds BestEnergy
- Fuel sourced near-by
- Typical fuel transportation distance < 50 km



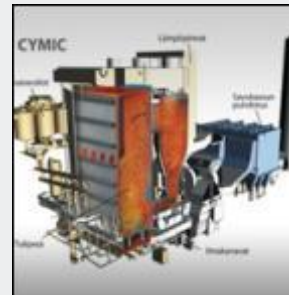
Mid size- BFB  
20-100 MW(e)

- For example PGE Szczecin
- Fuel transportation by road trucks and trains
- Typical fuel transportation distance 50 - 100km



Large - CFB  
100-300 MW(e)

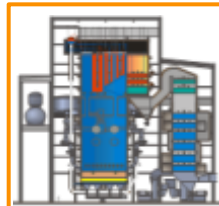
- For example Alholmens Kraft
- Developed fuel logistics
- Long fuel transportation distance, often sea transportation



# Examples of Metso bioenergy solution deliveries



Stora Enso  
Langerbrugge  
Belgium  
• Multi fuel  
solution



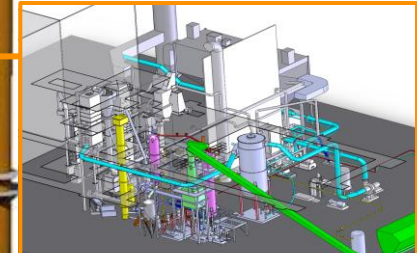
Nacogdoches  
The biggest  
biomass plant  
in US, Texas



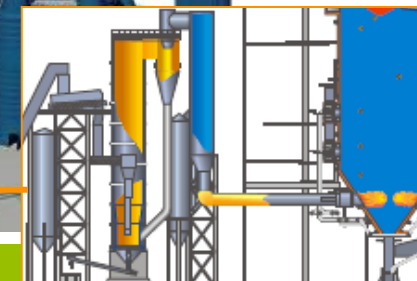
Waste gasification,  
Lahti Energy



Solid  
waste  
shredding  
technology



Bio-oil production



Bio gasification ,  
Vaasa

# Transition from fossils to CO<sub>2</sub>-neutral fuels

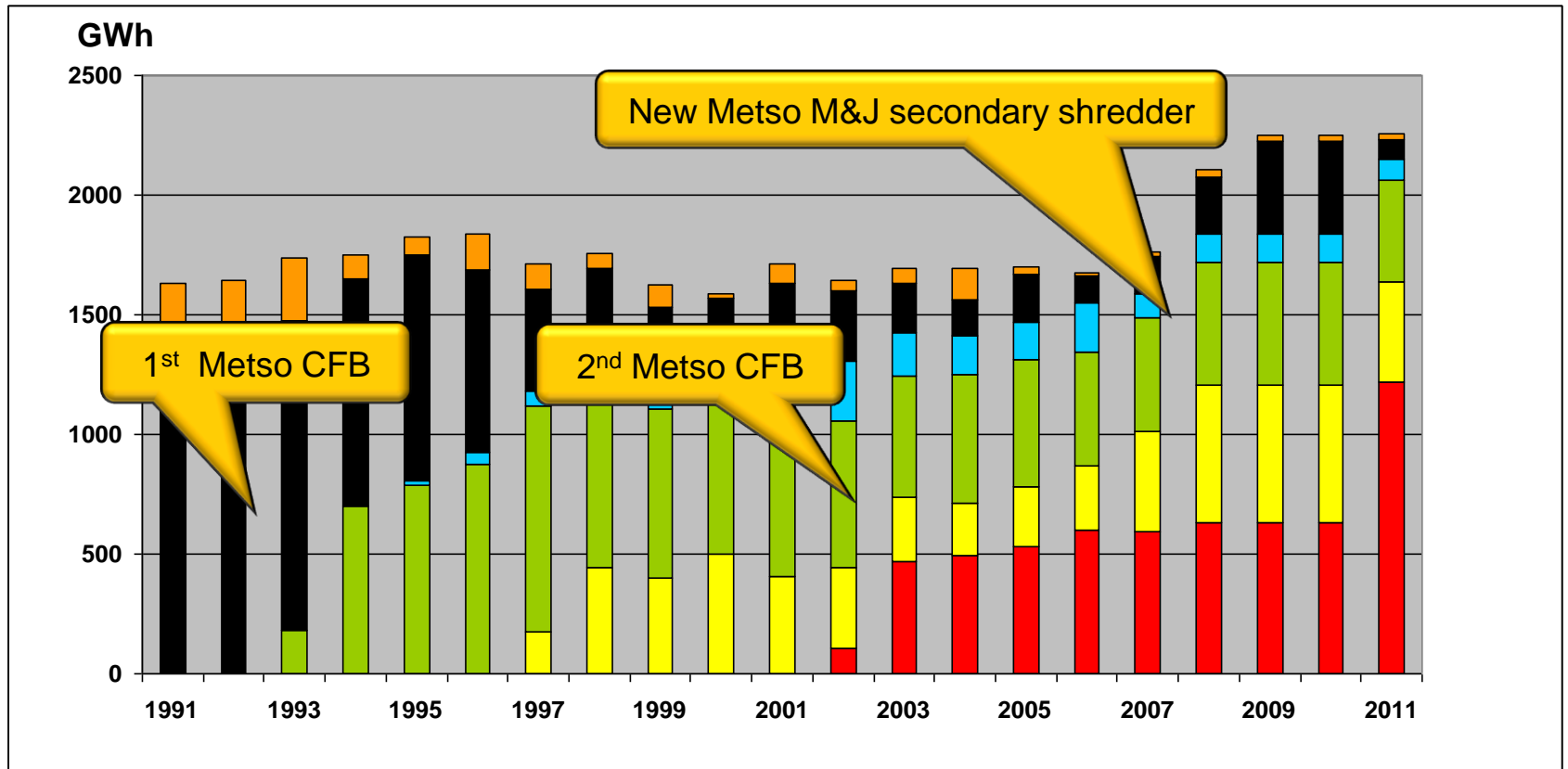
E-on Händelöverket, Norrköping, Sweden



**e-on**

# E-on Norrköping, Sweden

Transformation from coal and oil to essentially carbon-free fuels in 20 years



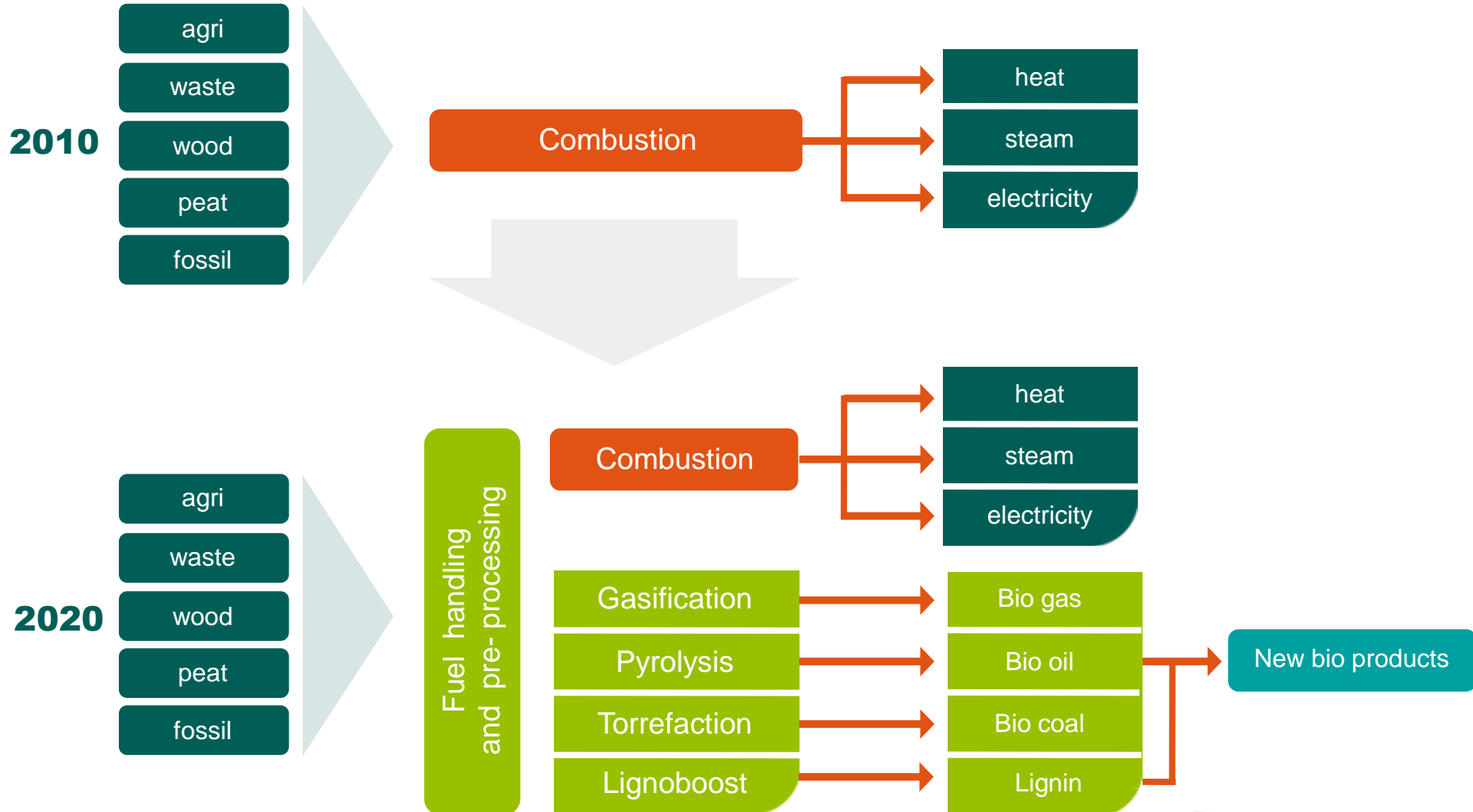
- Oil
- Coal
- Tire derived fuel
- Forest residue
- Demolition wood waste
- Waste





# Development trends and latest news

# From biomass combustion to new conversion technologies



# Frontrunner in new conversion technologies

- Gasification

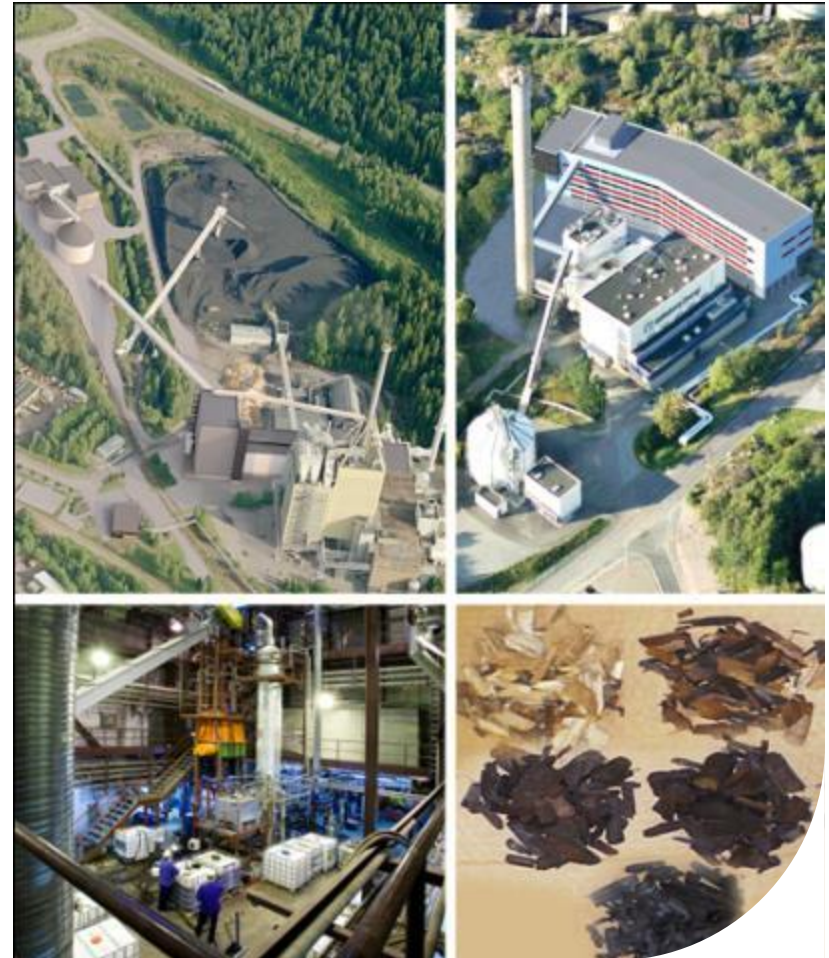
- Lahti Energy: CFB gasifier for waste
- GoBiGas: syngas gasifier for biomass
- Vaskiluodon Voima: CFB gasifier for biomass

- Pyrolysis

- Pilot production 100 tons and successful full-scale combustion tests to replace heavy fuel oil

- Torrefaction

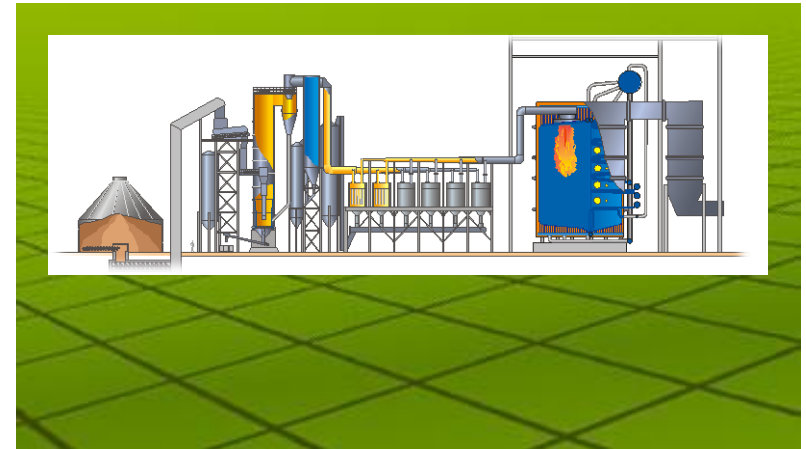
- Readiness for demo plant demonstration



# CO<sub>2</sub> neutral energy generation – waste gasification

## A waste gasification plant at Lahti Energia Oy in Lahti, Finland

- Scope: waste gasification process, gas boiler, flue gas cleaning system with auxiliary and automation systems
- Output of 2 gasification lines: 50 MW of electricity and 90 MW of district heat
- High-efficiency conversion of recycled waste to energy and reduction of fossil fuels
- Waste is turned into combustible gas, which is cooled, cleaned and combusted in a high-efficiency gas boiler to produce steam for a steam turbine



### Solver effect

Replaces over 1,500 railcar loads of coal annually.

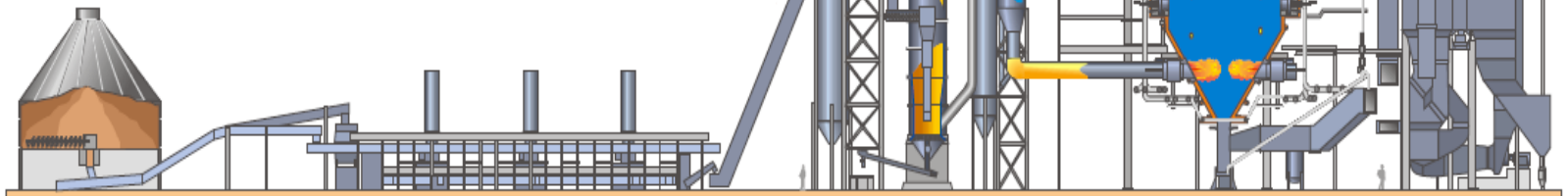
### Solver effect

CO<sub>2</sub> emissions equivalent to over 260,000 cars are avoided annually.

# Vaskiluodon Voima, Finland - world's largest gasification plant



Instrumentation,  
electrification,  
automation



Biomass receiving  
boiler  
and storage

Belt dryer

Gasifier

Existing coal fired

140 MW<sub>fuel</sub>

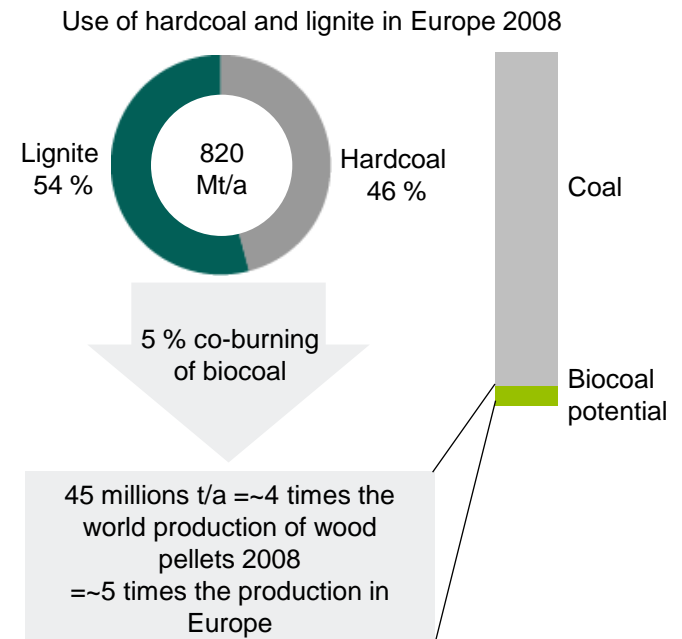
# Bio-oil by pyrolysis entering into a industrial scale test phase

- Increases value of biomass
- When substituting fossil oil, decreases CO<sub>2</sub> emissions
- Applicable technology to both old and new power boilers
- Refining bio-oil further to other products like traffic fuel is under research



# Biocoal by torrefaction process

- Torrefaction produces biocoal which is a promising alternative to replace fossil coal in power plants and decreases CO<sub>2</sub> emissions
- A solution to logistics challenges of bio fuel
  - Light and easy to transport
  - High energy density
  - Hydrofobic - not absorbing moisture from the air



# Metso to supply one of the world's largest biomass boilers to US power producer

*Metso Corporation's press release on July 7, 2011*

*The investment is an important milestone for renewable energy projects for the US, estimating clean electricity production for approximately 70 000 homes.*

Metso will supply a 100 MWe biomass boiler island and plant automation system to the Gainesville Renewable Energy Center (GREC) in Gainesville, Florida, USA. GREC has successfully raised nearly \$500 million in construction financing of which Metso's delivery represents more than 25 percent. The new power plant installation will supply Gainesville Regional Utilities (the city-owned utility) of Gainesville, Florida with a firm source of renewable electric power under the terms of a thirty year power purchase agreement.

The 100 MW biomass boiler will utilize bubbling fluidized bed (BFB) technology and use waste wood from logging and mill activity as well as urban wood waste from clearing, tree trimming and pallets as the main fuel. Metso's complete delivery scope includes the entire boiler island and flue gas cleaning system. Metso will also supply the entire power plant automation system.

Commercial operation of the plant is scheduled for 2013, and once operational, this 100 MW boiler will be one of the largest and most efficient biomass boilers in the world, providing clean electricity for approximately 70 000 homes. The investment in this new power plant, along with the local biomass fuel supply, will bring more than 700 jobs to the community.

The successful development of GREC follows that of Nacogdoches Power, a 100 MW biomass project located in east Texas, for which Metso was chosen 2009 as the boiler island supplier including plant automation system. GREC will be constructed by the same overall construction team, Fagen Inc., as that of Nacogdoches Power. Fagen Inc. is one of the largest green energy design-builders in the US. Gainesville Renewable Energy Center, LLC is an American Renewables project company based in Boston, Massachusetts in the USA.



