



Gasification of biomass
EUBIA Industry Day in Valencia

E:ON Sverige Göran Tillberg



My name is Göran Tillberg from E.ON Sverige AB

Co ordinator within the E.ON Group of R&D activities in Bioenergy

We focus on the following areas

- Fermentation
- Combustion
- **Gasification**
- Biomass (Raw material)



E.ON Group

- Focused on our core power and gas business and our target markets: Central Europe, the United Kingdom, Northern Europe and the Midwestern US

Sales of just under € 69 billion

Around 88,000 employees

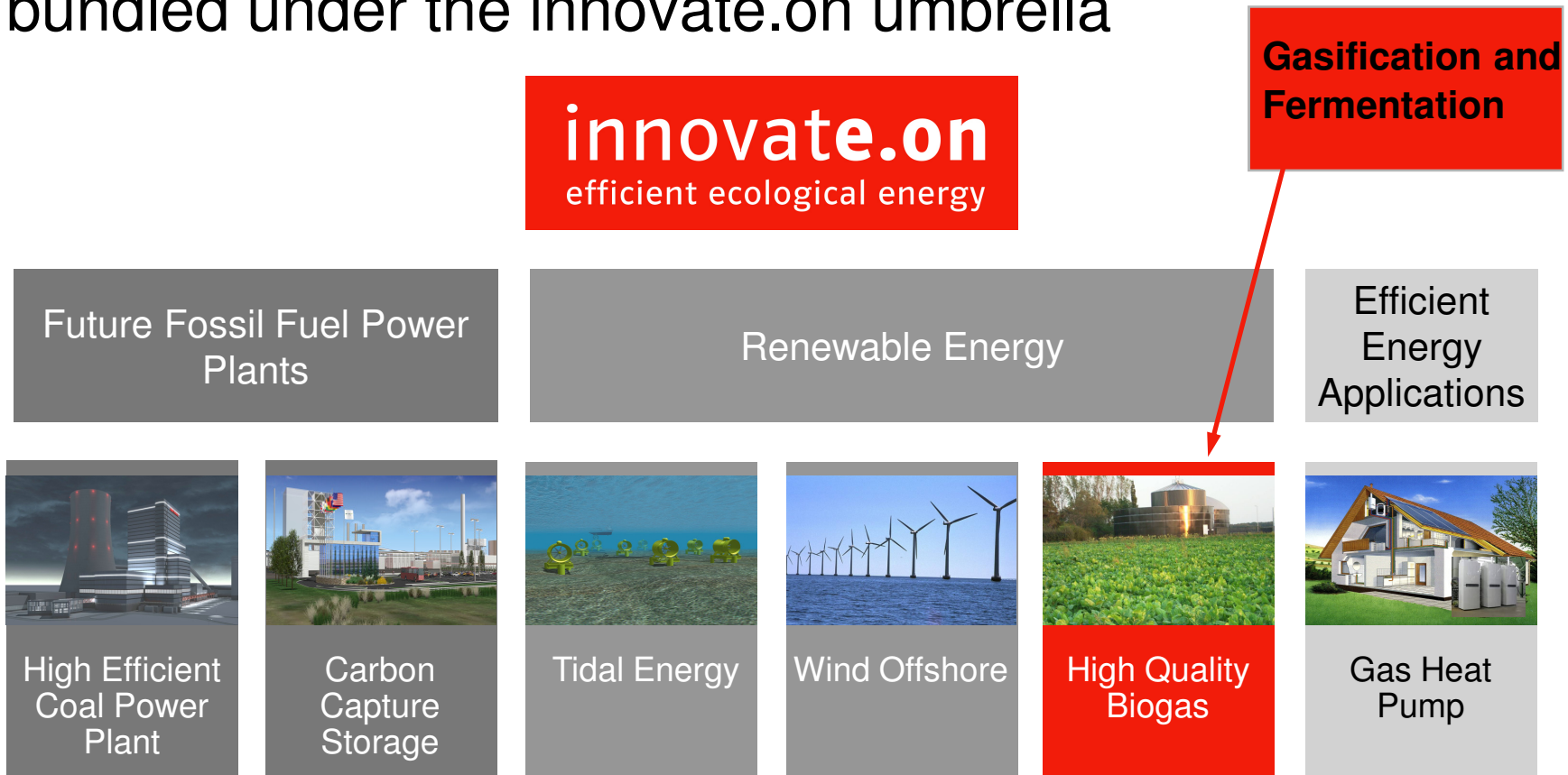
30 million customers

Headquarters in Düsseldorf,
Germany

In 2007 we started up a new
Market Unit
E.ON Climate&Renewable



E.ON's RD&D strategy focusing on key technologies bundled under the innovate.on umbrella



We are confronted with a couple of challenges that requires investment in new technologies

Increased energy need

Increased prices on today's feedstock fuels

Increased need of using renewable sources of feedstock fuels

Keep competitive consumer prices

Continuous protection the environment

↳ **Gasification on Biomass is one of these technologies**

Gasification of biomass is a promising technology but to be successful costs has to be lowered

Large-scale investments requires

- That we have access to raw material for large-scale energy production at an acceptable price level
- That production costs, the technology, for gasification of biomass becomes lower

E.ON Sverige therefore decided to perform a feasibility study to investigate under which conditions E.ON might invest in commercial plants for thermal gasification. The study was performed during 2007

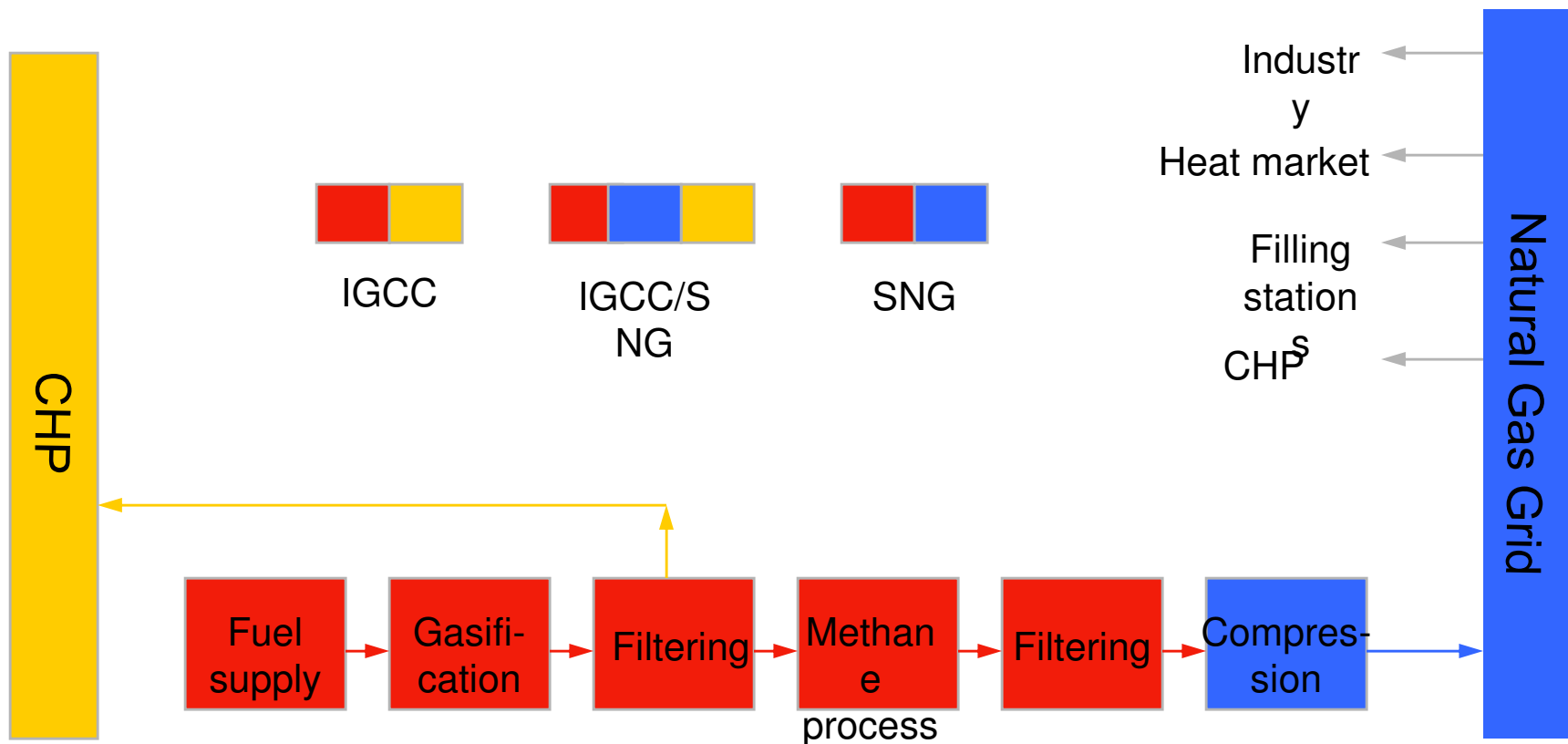
E.ON Sverige has already experience from gasification of biomass from the establishment in Värnamo (6 MW_{el}, 9 MW_{heat})

- The test program was finished in October 1999
- More than 3600 hours continuous running
- About 8500 hours of tests
- No negative effects on gasification, filter or gas turbine



➤ The results from Värnamo shows that gasification works

The feasibility study included –BIGCC, SNG and polygeneration BIGCC/SNG



BIGCC - Biomass Intergrated Gasification Combined Cycle
 SNG – Substitute Natural Gas

The study covered economical analysis and technology as well as siting and fuel supply

Analysis

- Profitability assessments
- Risk evaluation with regard to economics, the environment and technology.

Technology

- Involved identifying and evaluating various technologies and specifying development requirements and opportunities.

Siting

- Involved strategies and supporting documentation for the application processes for both the demonstration facility and future commercial facilities.

Fuel supply

- Involved logistics and costs for supply of the demonstration facility as well as future commercial facilities.

The result of the feasibility study showed on a potential for gasification plants in Sweden of some twenty plants

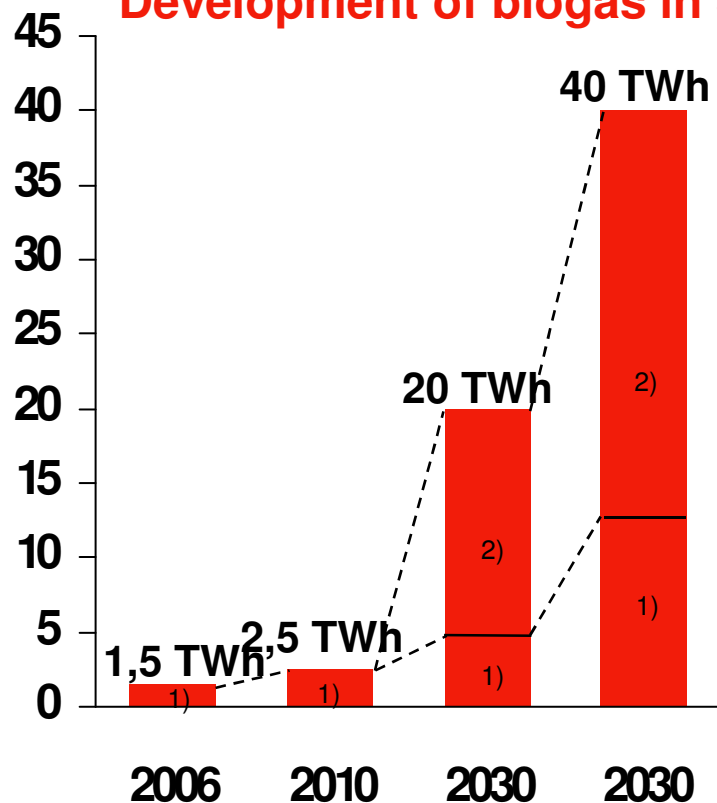
E.ON Sverige has therefore decided to go on

BIGCC technology already works. Demonstrated in Värnamo

But the technology for biogas (SNG) production has to be demonstrated in a semi industrial scale before commercialization

Biogas is a reality in Sweden today with a large technical potential in the future

Development of biogas in Sweden



- 1,5 TWh biogas produced today
- Biogas has the potential to diversify the fuel base further
- Increased activities in the renewable segment creates positive image for natural gas as well as for E.ON (CSR – Environment)
- Can be a profitable energy business
- The Swedish government ambition to become non-dependent on oil in 2020 - RES for transportation is an important part of the ambition

1) Fermentation/Digestion
2) Gasification

Realistic potential Maximum potential

E.ON Sverige Target 2020 for biogas is ambitious

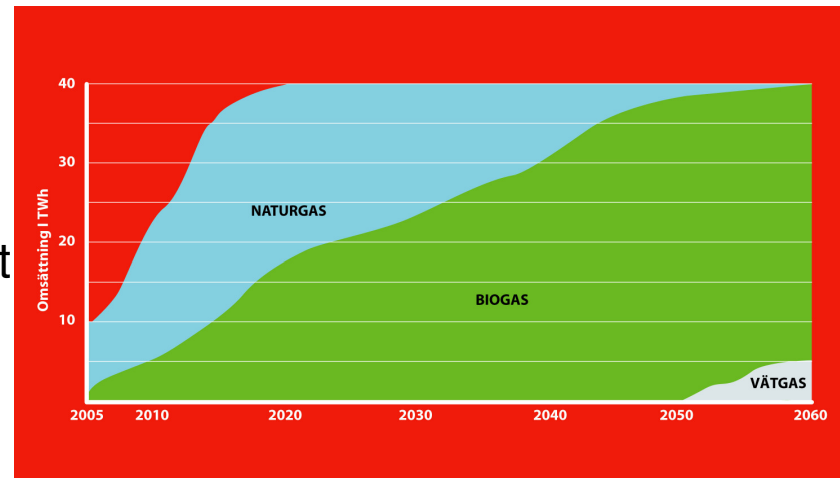
Vision 2020 is 20 TWh of Biogas

Out of these 20 TWh it is assumed that

10 TWh to be gasification

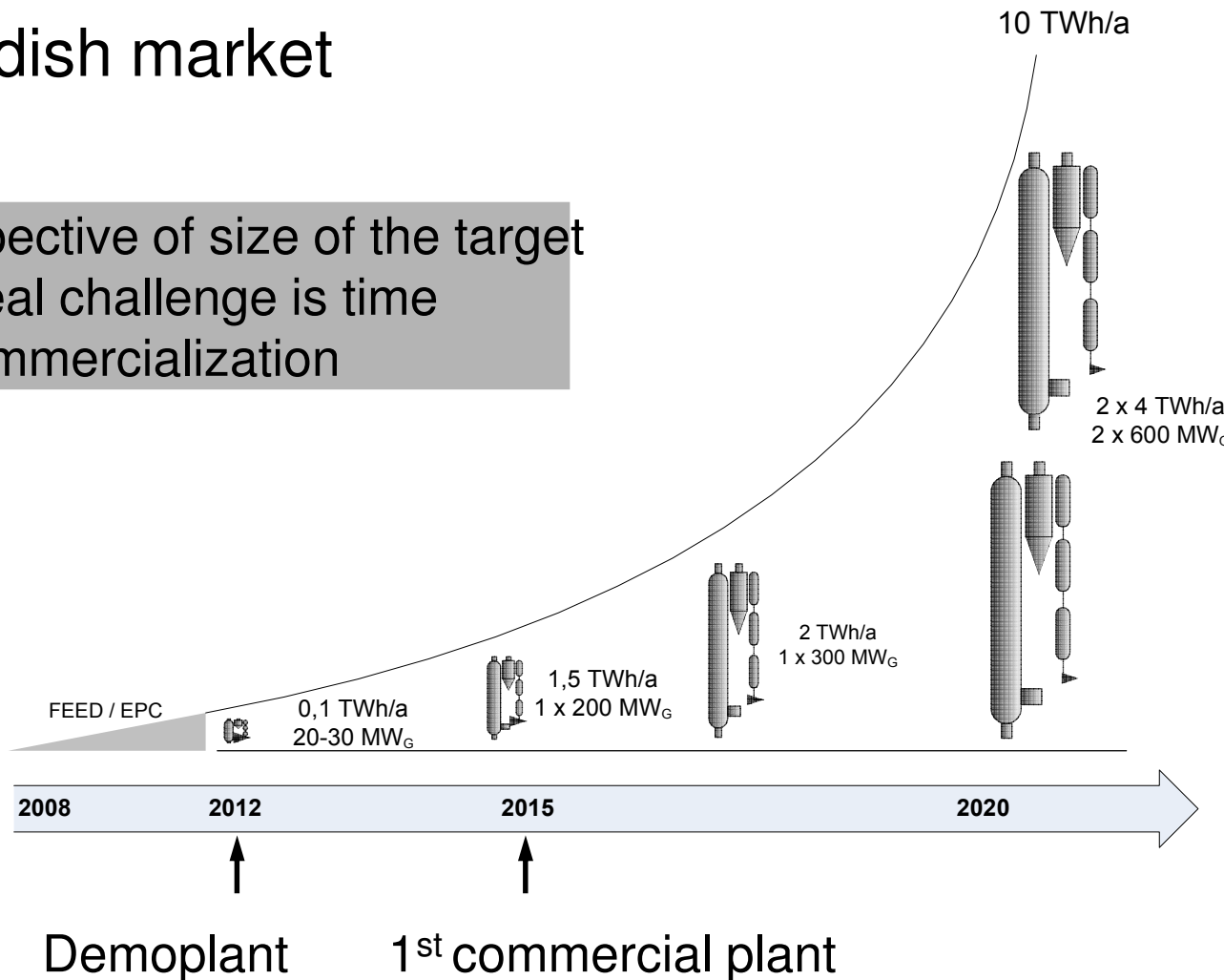
The rest will be

- 6 TWh to be fermentation
- 4 TWh to be Combi-nate

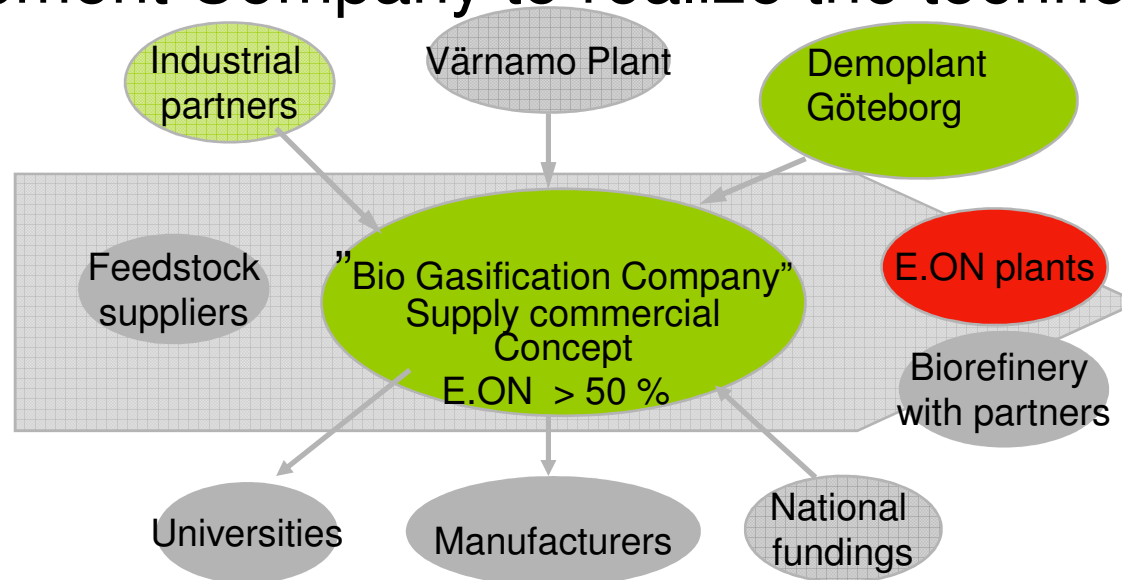


Commercialization route for Gasification Swedish market

Irrespective of size of the target
the real challenge is time
to commercialization



We have established a E.ON Bio Gasification Development Company to realize the technology



Purpose Bio Gasification Development Company

- Owned by E.ON > 50 %
- Partner in Plant Company Göteborg (under discussion)
- Know how build up
- Industrial partners will be invited as shareholders
- Design and engineering of the first commercial plant



Discussions ongoing with Göteborg Energi

Construction of a demoplant for SNG production

Capacity $20 \text{ MW}_{\text{gas}}$ ($35 \text{ MW}_{\text{th}}$)

Located in Gothenburg

In operation 2011