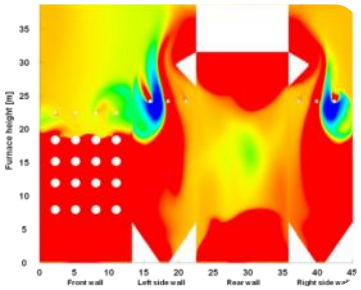











Biomass R&D

BF2RA Forum, 15 October 2013

About E.ON





What we do

At facilities across Europe, Russia, and North America, our more than 72,000 employees generated about **€132 billion in sales in 2012.** In addition, there are businesses in Brazil and Turkey we manage jointly with partners.

With our strategy **cleaner & better energy** we're transforming E.ON into a **global provider of specialized energy solutions** which will benefit our employees, customers, and investors alike.

Our objective is to make energy cleaner and better wherever we operate.

Our focus

We focus on what we do best and where we can add the most value. And that's **making and marketing energy in international markets under competitive conditions.**

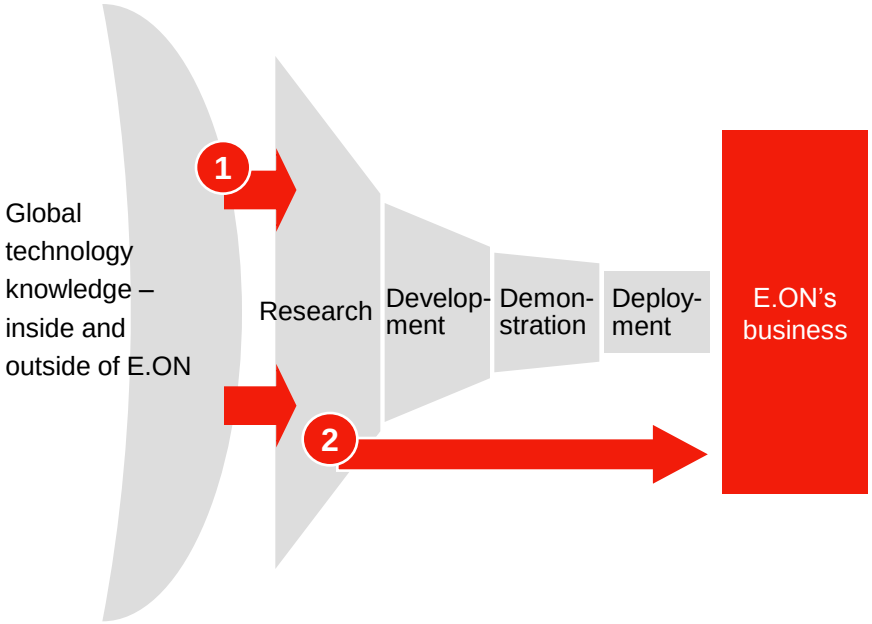
Our **main businesses** are:

- renewable and conventional generation,
- optimization and trading,
- new build and technology,
- exploration and production,
- distributed energy,
- energy distribution and sales.

 Source E.ON General Company Presentation (May 2013)

Mission of Technology & Innovation (T&I) focuses on value generation through technology

Innovation funnel within E.ON



"Turning global technology knowledge into value for E.ON" by ...

1. Transferring global technology knowledge into E.ON know-how
2. Transforming know-how into value-creating business applications

Bioenergy in E.ON

Biomass

Biogas

E.ON Fleet conversion

E.ON Fleet new build

E.ON Heat Sweden

E.ON Germany

E.ON Gas Sweden

Cross-cutting topics

Bioenergy in E.ON

Biomass

E.ON Fleet conversion

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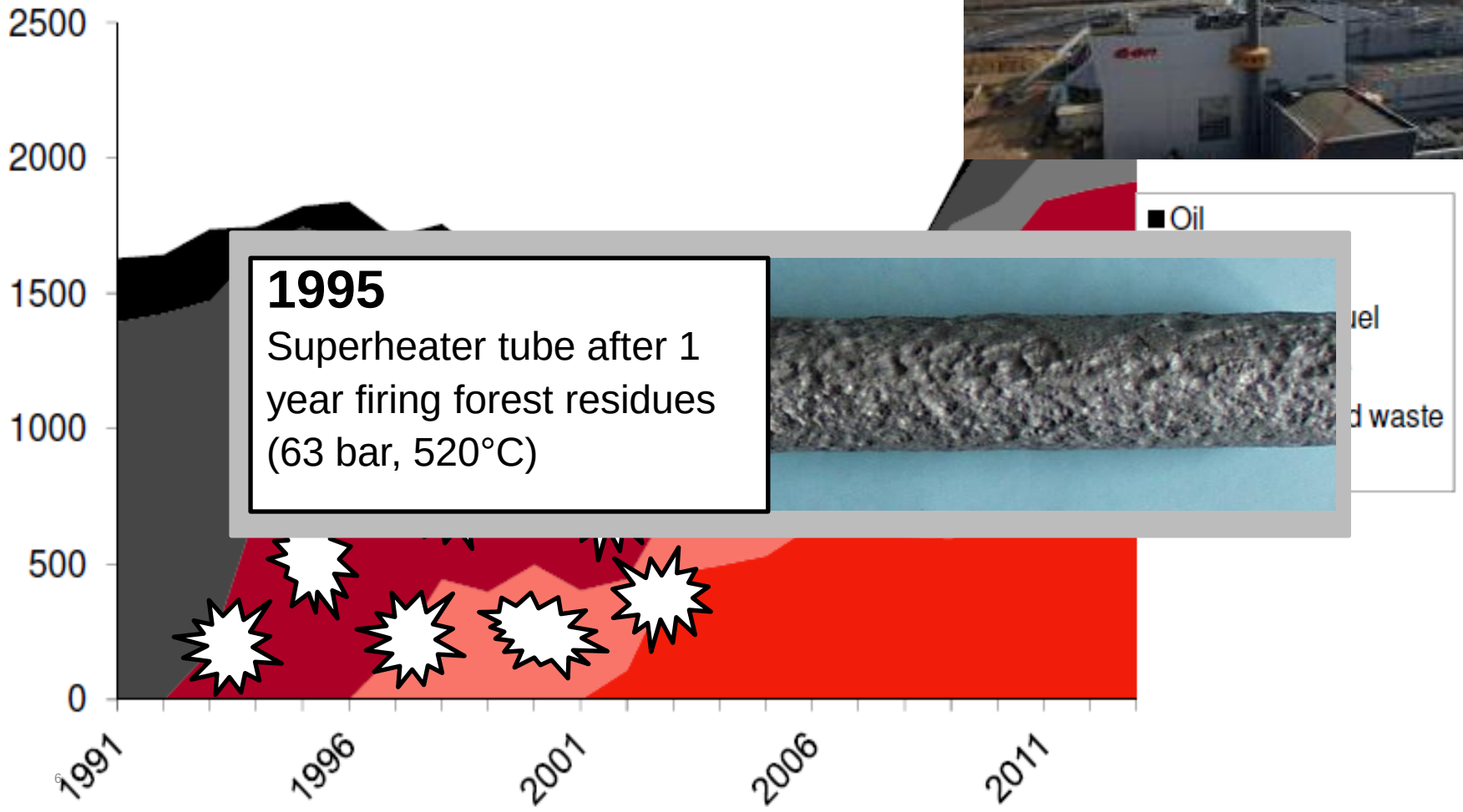
Focus today

E.ON has 20+ years of experience of biomass energy

Fuel 1991-2013, Händelö plant Norrköping



1995
Superheater tube after 1 year firing forest residues (63 bar, 520°C)

In recent years we have run a number of co-firing trials

- **So what is new today???**

Some key challenges

Large conversion

- Scale!

- Handling and storage of large amounts of wood pellets – condition monitoring, standards
- Variability of pellet quality – even within a “standard” spec
- Milling of 100% biomass
- PF transport
- Corrosion and combustion monitoring (elevated temperatures)
- Future emissions limits (BREF)

More challenges

New build / dedicated plant

- Increasing efficiency (new build)
- Fuel flexibility / corrosion
- Emissions (especially small plant)

Common themes

- Sustainability, carbon footprint
  - Evidence vs emotion
  - Meeting changing requirements
- Handling and storage health and safety
  - Standards and best practice
- Ash treatment and reuse

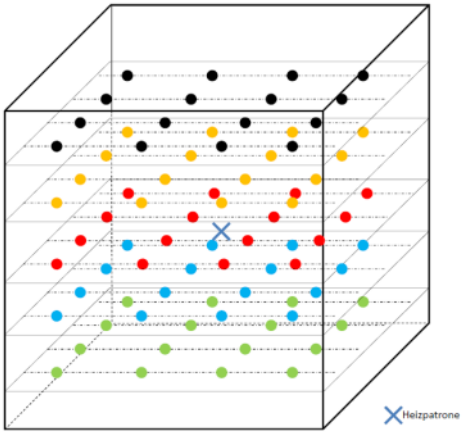
Example 1: Temperature measurement in pellet piles

Challenge

- “Needle in a haystack” – damp / hot spots deep within pellet piles
- Early warning means easier to manage
- Known issues with some current temperature measurement techniques

 Scope for further development?

Example 2: Examination of the fire behaviour of wood pellets and dry wood chips in large scale



Situation

- Dry wood pellets and chips (waste wood) present the biggest fire hazard due to dustiness and low moisture levels
- Bunker fires are of a particular concern due to the difficulty of separating overheating or combusting material.

Complication

- Little large-scale experimental information on how fires spread and the best control measures for fire fighting and detection
- Automatic detection and extinguishing systems exist, but their effectiveness is not fully understood from an independent perspective for this application

Resolution

- Work with third parties to conduct large-scale controlled test fires for pellets and waste wood chips
- Results will be used to update internal guidelines and share with emergency services
- **Testing during October, but please get in touch if you are interested in the test or results**

Example 3: Pellet quality management – benefits from collaboration?

- The industry is in the early stages of understanding pellet quality
- Pellet quality and supply chain performance are critical
  - Improved management of pellet quality benefits all stakeholders
  - Health and safety, operations, logistics, development
- Need to engage with a wide range of parties across the supply chain
  - Work with suppliers and supply chain partners
- Key challenges around data management and definition of processes
- Knowledge gaps better if identified and addressed collaboratively?

Summary

- Current E.ON Technology and Innovation programme builds on over 20 years of bio energy experience in E.ON
- Specific focus on supporting conversion programme
- There is value in continued development of internal and external networks
- E.ON believes some research is best addressed by the whole industry
- Open invitation to participate in and receive results from bunker fire tests
  - other topics include pellet quality management, condition monitoring
- We are always interested in project ideas and opportunities - an open invite internally and externally

Thank you for listening!

Contact details

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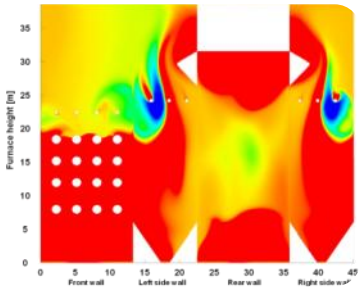








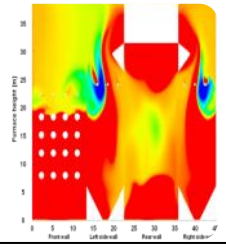

E:ON's Bioenergy T&I Programme


Feedstock and sustainability

- Reduce cost and increase availability of sustainable feedstock
- Improve objective understanding of sustainability issues

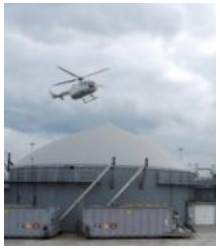

Supply chain and onsite handling and storage

- Contribute to reducing HSSE risk
- Reduce supply chain costs

Combustion plant

- Support conversion programme
- Improve plant fuel and load flexibility




Advanced bio-to power and biogas

- Reduce fermentation plant capex and opex
- Track changing markets and technologies