# Neues aus dem IEA Bioenergy Task 32: Verbrennung von Biomasse

## Updates from the IEA Bioenergy Task 32: Biomass Combustion

Photo: HOFOR

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# IEA Bioenergy Task 32 in brief

- IEA Bioenergy is a Technology Collaboration Programme (TCP)
  - Controlled by Executive Committee (ExCo)
  - Several tasks on technology and deployment (currently 11 + ITP)
- Task 32 focuses on combustion of solid biomass
  - Design, operation, efficiency, emissions etc.
  - From logwood stoves to utility scale
- Task 32 members are
  - Austria - Canada - Germany - Japan - Netherlands - Norway Switzerland - USA (observer) - Denmark (lead)
- Activities cover
  - Sharing experiences between member countries
  - Gathering and dissemination of expert knowledge to target groups
  - Collaboration with other groups inside/outside TCP and with industry

Photo: Morten Tony Hansen

# Task 32 work programme 2022-2024

- Based on observed challenges/options for biomass combustion:
  - Need for transformation of industry
  - Emissions (particles + $NO_x$) remain important
  - Sustainability debate is experienced first hand
  - Potential for integration in future energy systems
    - Especially with CCUS to obtain negative emissions

Photos: Morten Tony Hansen

# Task 32 projects:

## **Biomass for high temperature heat in industry**

- Intertask project - now completed
  - Case studies from technical tasks
  - Policy report from Task 40

- More case studies to come
  - Highlighting how biomass combustion can replace fossil fuels

- Assisting decisionmakers
  - Searchable list of cases and examples

Photos: Thomas Nussbaumer

# Task 32 projects:

# **BECCUS and sustainability**

- Biomass combustion with negative $CO_2$-emission
  - Summarising technological options to capture $CO_2$
  - BECCUS case study: Modelling full scale implementation of CC and PtX at existing biomass fuelled CHP plant
  - Study of options for BECCUS at smaller biomass plants
  - Contribution to the sustainability debate regarding GHG balances and use of woody biomass for bioenergy
  - Workshops on experiences with wood chips combustion and on BECCUS


Photo: Morten Tony Hansen

# Task 32 projects:

## **Innovative low emission heating plants**

- State-of-the-art report on biomass fuelled heating plants with low NOx emission (development & cases)
- Study of the nitrogen cycle in biomass combustion plants - Part II
- Report on how heat buffers and cascading boilers result in low emissions (based on Swiss study)

Photos: Morten Tony Hansen

# Task 32 projects:

## **Stoves & residential boilers**

- Report on state-of-the-art residential biomass boiler systems & workshop at biomass conference
- Continued work on inventory of national strategies to reduce emissions from residential wood combustion
- Webinar on sustainable low emission wood stoves - recent developments

Photos: HWAM, RTB, DTI

# Recent Task 32 report:
# **Wood stove design guide** (by DTI, based on European projects)

- Focusing on primary design measures
  - Furnace construction and control systems
- Temperature
  - Refractory lining, insulation of door, window size
- Residence time
  - Gas volume flow, distribution of flue gas over combustion chamber, air distribution, height of combustion chamber
- Turbulence/mixing of flue gasses
- Automated control systems - to reduce user influence

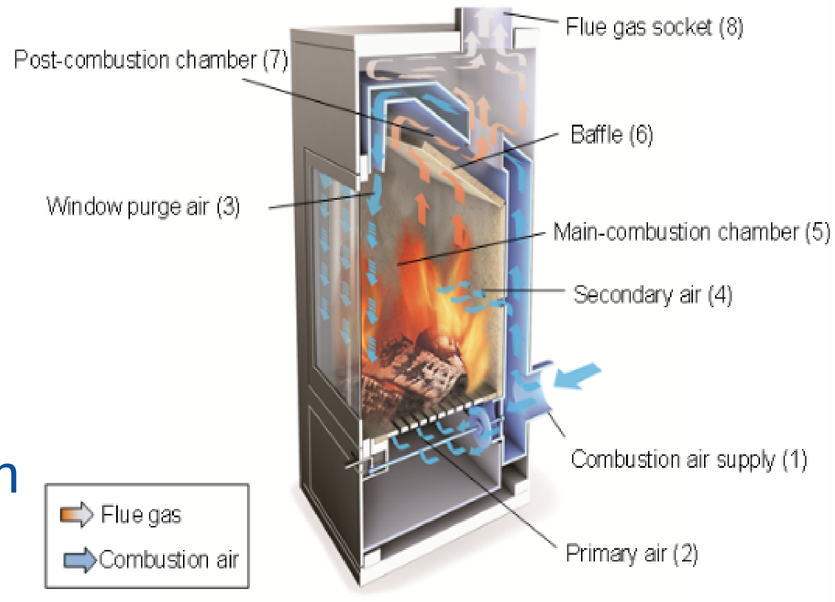


Illustration: Mack et al. (2017)

# Recent Task 32 report:

## **Inventory on emission reduction strategies** (by TFZ)

- Background: Emission of particles and CO still significant from residential wood combustion
- Aim: To learn from approaches (and failures) concerning emission reduction strategies
- Provide an inventory of measures based on national approaches in the Task 32 member countries
- To be used by decision makers and experts involved in emission abatement from wood combustion

Photo: Henrik B. Jensen

# Recent Task 32 report:

# **Test methods and real-life performance of pellet stoves**

- Comparative analysis of existing testing standards for pellet stoves worlwide
- Overview of advanced testing methods from scientific literature
    - Focus on real-life oriented testing procedures
- Real-life performance of pellet stoves compared to test-bench results
- Recommendations for emission regulation policy

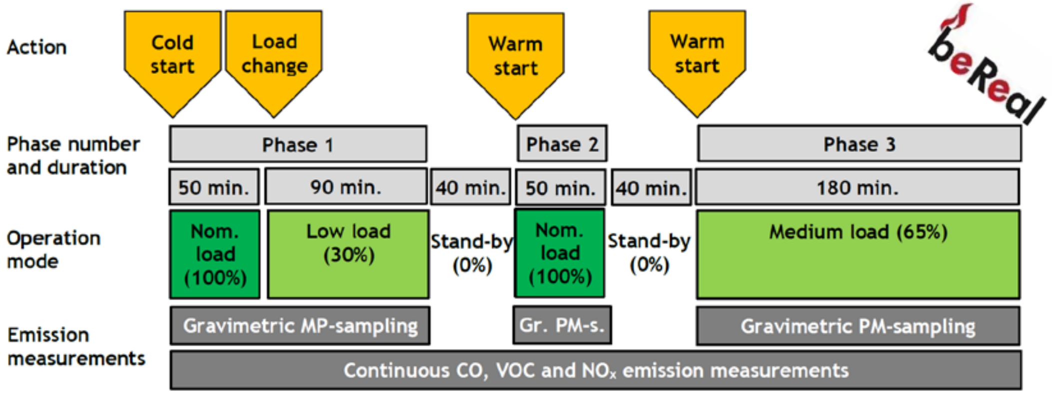


Photo: BEST Research
Illustration: adapted by Gabriel Reichert from Klauser et al., 2018

# Recent Task 32 report:

## **Test methods and real-life performance of pellet stoves**

Conclusions:

- International standardisation (ISO) of testing standards is feasible. This would remove significant barriers for international market implementation.
- New testing methods should focus on real-life-oriented testing conditions. Quality labels could support a later standardisation.
- Emission legislation is able to trigger technological development. Requirements should be challenging, but also realistic.
- Furthermore, legislation should always be complemented with an effective market surveillance (e.g. via the EU Ecodesign Directive)

# Recent Task 32 report:

## **Nitrogen flows in biomass combustion systems**

- Background: The release of reactive nitrogen from various sources has raised strong concerns about direct and indirect effects on environment and public health
- Lots of data available on $NO_x$ emissions from biomass combustion processes, but only very limited information on overall nitrogen flows in bioenergy systems
- Report compiled and analysed relevant literature and defined the scope for a more detailled follow-up study

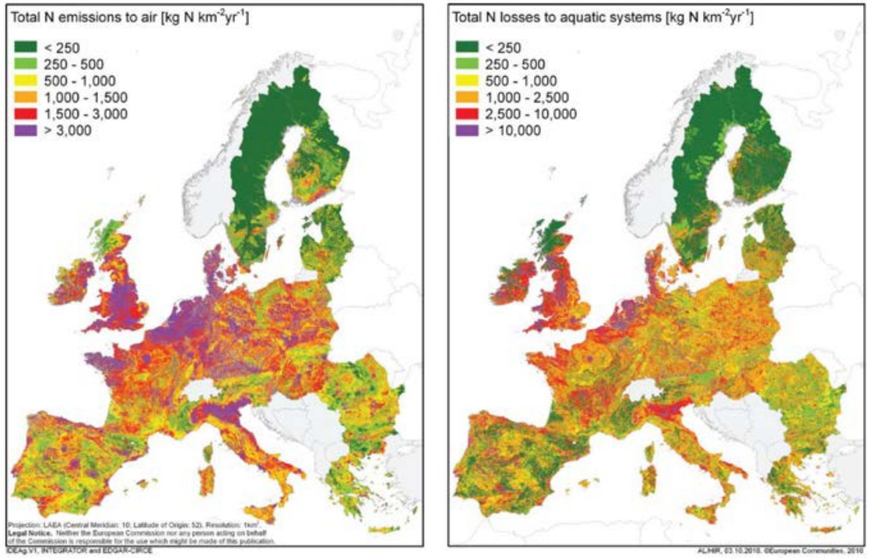


Photo: Jaap Koppejan
Illustration: Sutton et al. (2011)

Recent Task 32 report:

# Nitrogen flows in biomass combustion systems

Conclusions:

- During their growth plants absorb nitrogen from their environment and store it in cell tissue. This nitrogen almost exclusively originates from reactive Nitrogen.
- If burned in a modern boiler, only a small fraction of nitrogen is converted to $NO_x$. Most of the fuel nitrogen is converted to harmless $N_2$.
- Therefore, a net-reduction of reactive nitrogen can be achieved.
- While this effect is very positive for the area where the biomass is harvested, adverse effects on local air quality around the combustion site need to be considered.

# References


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# Thank you!


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