



# StableWood

New solutions and technologies for heating of buildings with low heating demand: Stable heat release and distribution from batch combustion of wood

[www.sintef.no/StableWood](http://www.sintef.no/StableWood)

This newsletter focuses on the latest dissemination efforts related to StableWood results.

## Presentation of results from StableWood on various arenas

Nordic Baltic Bioenergy 2013 Conference summary



<http://bioenergy2013.no/>

The Nordic/Baltic region has abundant natural resources in forests and fields that can produce large quantities of biomass for energy, which in turn can be refined into liquid, gaseous and solid fuels and used for a multitude of end purposes. With large land surface and relatively low population density, and at the same time favourable natural conditions, the Nordic countries have unique potentials to deliver bioenergy that can help remedying pressing climate threats on a regional and European level. The region has a strong bioenergy business community that has developed many globally leading spearhead technologies. The market is well developed with trading companies and logistical solutions. Leading research and development institutions exist and as well as a favourable political climate with politicians who support the growth of renewable energy.

The Nordic/Baltic region is also a world leader in developing modern bioenergy. Still there are threats at the horizon. The use of forests and agricultural land for bioenergy purposes is today often questioned by politicians, media, non-governmental organisations, and even some researchers. They question the sustainability of bioenergy. They question the climate benefits of using biofuels and biomass for energy. They see only problems, where we see opportunities. A number of proposals have been put forward that threaten to hamper the development of bioenergy. Some of these proposals can lead to unnecessary bureaucracy and new administrative burdens. Yet we believe that bioenergy can be used in a sustainable way, and our solutions must be both environmentally

and economically sound. This can be supported by good legislation and basic certification, but overly detailed regulations will create more problems than they solve.

The multifunctional Nordic managed forestry model can deliver both large quantities of forest products and bioenergy, as well as climate benefits through carbon sequestration and storage. Nordic agriculture is at the forefront of sustainable intensification having reduced the use of inputs such as fertilizer and pesticides, while increasing productivity. In the Nordic region, food, feed and bioenergy are products of the same fields and refining processes thereby limiting land use change and mitigating biodiversity losses at home and abroad. The Nordic/Baltic bioenergy conference participants, ask the Nordic and Baltic political leaders to recognise the promises and benefits of bioenergy, and at the same time be aware of the threats to our sector, and continue to give support to the development of sustainable bioenergy as a central part of a renewable energy supply. With good political support we can continue to deliver solutions to pressing climate threats, develop new businesses, create jobs, and earn export incomes to the Nordic and Baltic countries. [http://nobio.no/upload\\_dir/pics/Sustainable-bioenergy-from-Nordic-REV-DIBI.pdf](http://nobio.no/upload_dir/pics/Sustainable-bioenergy-from-Nordic-REV-DIBI.pdf)

### StableWood results presentation:

16:00 Parallell sessions		
2A Bioenergy promotion	2B Biofuel for Transportation	2C Bioheat
<i>Chairperson:</i> Odd Jarle Skjelhaugen, Norwegian Center for Bioenergy Research	<i>Chairperson:</i> Kari Asheim, Zero	<i>Chairperson:</i> Morten Fossum, Statkraft Varme
Bioenergy Promotion – From strategies to activities Aino Martikainen, Fachagentur Nachwachsende Rohstoffe e.V.	Improving the feasibility of 2nd generation biofuels - the HG Biofuel project Christer Larsson, Chalmers	Akershus EnergiPark – a 100% renewable heat solution Frank Sagvik, Akershus Energi
Establishing competence and training centers for bioenergy in Africa and Eastern Europe after the model of The Energy Farm in Norway Erik Eid Høhle, Energigården	The LTL process – a commercially viable process for production of 2. generation biofuels without subsidies. Hans Martin Stora, Trøndelag R&D Institute	Bioenergy opportunities in low-energy buildings - The case of wood stoves Øyvind Skreiberg, SINTEF
Biomass cogeneration as a key point for Lithuanian energy strategy Martynas Nagevicius,	GoBiGas – large-scale thermal gasification to produce bio- methane for transport. Ingemar Gunnarsson,	Energy efficiency and the rebound effects Bente Halvorsen, Norwegian University of Life Sciences

[http://nobio.no/upload\\_dir/pics/Skreiberg.pdf](http://nobio.no/upload_dir/pics/Skreiberg.pdf)

## StableWood

- a Knowledge-building Project with User Involvement (KMB) co-funded by the Norwegian Research Council in the RENERGI-programme.  
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## Bioenergy opportunities in low-energy buildings - The case of wood stoves

### Nordic Baltic Bioenergy 2013

Oslo

21-22 May 2013



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<sup>1</sup>SINTEF Energy Research

<sup>2</sup>Norwegian University of Science and Technology



### The importance of wood firing in Norway



About half of the Norwegian bioenergy use, about 7 TWh per year!  
The double in 2020?

### Thermal comfort simulations



- is the use of a CFD like simulation software, in our case TRNSYS, to simulate the distribution of the transient heat release profile in a building, and evaluating the thermal comfort
- **Question 1:** is it possible to reach an acceptable thermal comfort with a single stove in the entire passive envelope? Not too high temperature in living-room and not too cold in bedrooms?
- **Question 2:** is it possible to implement wood stoves with long production cycles into passive envelopes?



TRNSYS

## The 21<sup>st</sup> European Biomass Conference and Exhibition



<http://www.conference-biomass.com/Home.404.0.html>

For one week Copenhagen hosted the global biomass community at the 21<sup>st</sup> European Biomass Conference and Exhibition. More than 1800 attendees from 66 countries discussed the status and the future of biomass for energy, materials and further

bioeconomy applications in 360 keynote, plenary, oral and 400 visual presentations. These figures, compared to last year, show an increase of 15% in total attendance and a 20% increase in exhibition space making the EU BC&E 2013 once again the most important and stimulating international key platforms in Europe for knowledge exchange on the latest scientific and industrial results, developments in policies and deployment in the biomass and bioenergy sector (*source: EU BC&E 2013 Results*).

"The bioeconomy offers a unique opportunity for growth and job creation through the use of knowledge in many fields such as clean energy and biotechnology", said Anders Eldrup, Conference General Chairman speaking at the closing session of the conference. "Maximizing the efficiency of utilization of our biomass resources is fundamental in order to achieve a sustainable bioeconomy", stated David Baxter, Technical Programme Chairman of the conference while introducing the main highlights of the EU BC&E 2013.

Forest carbon stock in the US and EU have increased over recent decades providing additional biomass resources. Furthermore, developments in traditional markets such as that of pulp and paper create more opportunities for bioenergy. The biomass potential is still largely untapped, however the actual availability of biomass feedstock might be much lower than the theoretical potential and some questions still remain open mainly concerning environmental sustainability.

Many advanced conversion processes are now in the stage of a large industrial demonstration phase or even an early commercial phase, i.e. 2<sup>nd</sup> generation biofuels, bio-oil from pyrolysis and torrefaction. Now that confidence to reach a commercial size has been achieved the main challenge is reducing costs factors. For this reason strong policy support at a European level will be crucial.

### StableWood results presentation:



**Øyvind SKREIBERG**

SINTEF Energy Research, Thermal Energy, NORWAY

**Transient Wood-Log Stove Modelling Integrating Detailed Combustion Physics**

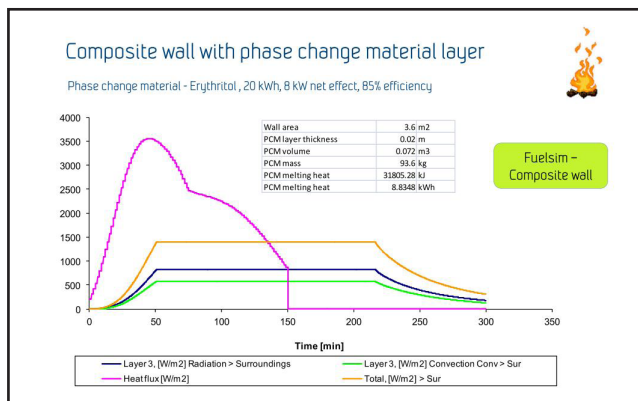
Session reference: 2CO.7.4

<http://programme.conference-biomass.com/abstract.php?idabs=9048&idses=18&idtopic=6>

### Guidelines for the wood stoves of the future



- Nominal effects down to or even below 2 kW
  - Down-sized and/or longer combustion cycle
  - Designed to flatten out the heat release profile to a room, by improved combustion control and/or material use
  - Status quo or reduced particle emission level
  - Increased thermal efficiency
  - Easy operation
  - Still low-cost compared to pellet stoves
- Wood stoves have indeed a place in low-energy buildings!



The authors acknowledge the financial support from the RCN funded StableWood project and Zero Emission Buildings (ZEB) research centre. The StableWood project is also linked to the RCN funded Bioenergy Innovation Centre (CenBio). We also thank the StableWood industry partners.

Thank you for your attention!

#### StableWood PhD candidate presentation:

The StableWood PhD candidate presented preliminary work under the general title "Stable heat release and distribution from batch combustion of wood".

**Abstract:** The purpose of this work is to develop functional heat storage solutions that can increase the utility of wood stoves in low- and zero-emission buildings by dampening the peak heat release and evenly distribute heat over an extended period of time by use of an intermediate heat storage system. Numerical calculations have shown that the use of latent heat storage materials is beneficial. Such heat storage materials generally have a low thermal conductivity and they can decompose if exposed to high temperatures. Numerical simulations were performed on a typical wood stove. The simulations showed that it is possible to store around 3.6 kWh in a compact and light-weight heat storage unit that dampens the heat release. Overheating of the heat storage material was difficult to avoid however, even with heat transfer control attempts using natural air circulation. Heat storage solutions using phase change materials show great promise, as they can increase the use of wood stoves. However, solutions for control of the heat transfer to the heat storage and improvement of heat transfer inside the heat storage have to be developed to ensure that the heat storage has a significant benefit.

## CLIMA 2013 conference



The cooperation with the research centre ZEB (Zero Emission Buildings) continues with a joint presentation at the CLIMA 2013 conference in Prague, 16-19 June 2013. The title of the manuscript to be presented is "On the Integration of Wood Stoves in Norwegian Passive Houses: Investigations Using Dynamic Simulations".

**Abstract:** The space-heating (SH) of passive houses using a wood stove is an attractive solution. Furthermore, stoves are popular in Norway. The way to integrate them properly in passive houses is still in question. Considering thermal dynamics challenges only, current stoves nominal power is generally oversized compared to the passive house needs (overheating risk) and it is not well understood to what extent one stove can contribute to the thermal comfort in the entire building during a heating season. These two questions have already been addressed for the Belgian context in previous communications while the present work investigates the Norwegian context. This is done using detailed dynamic simulations (TRNSYS) on a typical Norwegian detached house typology. Results using a 8kW stove show that the overheating risk is somehow comparable between Belgium and Norway. On the contrary, the ability of one stove to enforce the thermal comfort strongly depends on the local climate. For the mild climates (e.g. Bergen on the west coast), the stove can cover a significant part of the heating load while, for cold climates (e.g. Karasjok far north), the stove should only be considered as a part the total SH emission system in the building.

## Other news

### Kick-off meeting in Trondheim EERA (The European Energy Research Alliance) Stationary bioenergy.

On the 27<sup>th</sup> and 28<sup>th</sup> of May SINTEF Energy hosted the kick-off meeting for the EERA subprogram 5, Stationary bioenergy. Responsible for organizing this meeting was Michaël Becidan who is also the coordinator for the subprogram 5. The meeting was arranged in Trondheim with a large number of participants from many leading institutes and universities performing research and development on stationary bioenergy.

The main goal of this corporation is to establish increased research efforts on a European level, through common projects, publications and increased cooperation regarding the research infrastructure to avoid parallel funding in both national and European projects. Also residential heating with wood stoves is covered by the subprogram through the work package 1:

## Residential/domestic heating and cooling, including micro-CHP (WP 1):

This WP is aimed at increasing the future importance of small-scale biomass-based systems (heat and CHP) by exploiting their unique qualities/properties while ensuring low environmental impact, high energy efficiency and flexibility (fuel, load). More specifically:

- Technological development of systems adapted to tomorrow's buildings energy needs
- Development of novel biomass fuels (ultimately standardized commodities) and adapted systems
- Integration, especially with other renewables

### Representing participants were:

Sweden (SP), Belgium (UCL/BERA), Finland (VTT), the Netherlands (ECN), Norway (SINTEF), Germany (KIT and IFK Stuttgart), UK (Manchester and Newcastle University), Poland (IEn), Italy (ENEA) and Turkey (TUBITAK). The Norwegian research council's ENERGIX program is funding this coordination work provided by SINTEF Energy Research.

## Upcoming events

### "Bygg Reis Deg" 2013

<http://www.byggreisdeg.no/>

Bygg Reis Deg is an open international trade fair, which will be arranged in Norway from 16-20 October 2013 at Norges Væremesse Lillestrøm. The Trade Fair with the best solutions for buildings, homes and constructions!

In 2013, it will be the 25<sup>th</sup> time we have the pleasure of inviting companies from around the world to participate, as exhibitors, in Norway's most prestigious meeting arena for companies in the Norwegian construction industry. In addition to the professional market, exhibitors will meet Norwegian consumers with ample spending power - on the hunt for good ideas, products and solutions for their own buildings and homes. The Norwegian building industry is experiencing considerable activity throughout the entire value chain. In contrast to most European countries, the industry has good prospects for the future, and prognoses indicate continued growth and extensive activity throughout the value chain.

