

Trondheim, Norway

7 - 8 June 2010

Conference program

Renewable Energy Research Conference

- Renewable energy beyond 2020



The Center for Renewable Energy welcomes you to this international research conference on renewable energy technologies. The conference will gather researchers and developers from the renewable energy sector as well as governmental organizations and NGOs.

The conference will consist of plenary sessions, panel discussion and scientific parallel sessions.

The conference will provide an extensive update on ongoing research for various renewable energy technologies, as well as views and visions on the future.

Venue

The conference will take place in the Natural Science Building in Trondheim, at the premises of SINTEF and the Norwegian University of Science and Technology (NTNU). Trondheim lies close to the Polar circle and around Mid-summer (June 23rd) it never gets dark, even at night! More information about the city, SINTEF and NTNU can be found at www.trondheim.com, www.sintef.com and www.ntnu.edu



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Conference website:

www.sffe.no/conference

Monday 7th June

09:00 – 10:00 **Registration**

10:00 – 11:30 **Opening session: Beyond 2020** **(R1)**

Prof. Johan Hustad, Pro-Rector for Innovation and External Relations at NTNU, will open the conference.

Dr. Keith Melton, is president of EUREC (European Renewable Energy Research Centres) Agency and Consultant to the New and Renewable Energy Centre (NaREC), a research and development platform for renewable energy technologies based in Northumberland (UK). Keith Melton has a broad international experience in R&D management and new product development across a range of sectors, with in depth understanding of renewable energy technologies.

Dr. Hans Larsen, Head of Systems Analysis Division at Risø DTU National Laboratory for Sustainable Energy, Denmark. Larsen has participated in the writing of the Risø Energy Report 8: *The intelligent energy system infrastructure for the future*.

Fritjof Unander, Director of Energy and Petroleum Research, The Norwegian Research Council

11:30 – 12:20 **Lunch**

12:20 – 14:00 **Research update** **(R1)**

Presentation of the latest research development from the leaders of the Norwegian Centers for Environment-friendly Energy Research. Stian Nygaard from **The Norwegian Research Council** will host this session and give an introduction about the Renergi-program.

CenBio (Bioenergy Innovation Centre)

Lars Sørum

CEDREN (Centre for Environmental Design of Renewable Energy)

Atle Harby

NOWITECH (Norwegian Research Centre for Offshore Wind Technology) *John*

Olav Tande

NORCOWE (Norwegian Centre for Offshore Wind Energy)

Kristin Guldbrandsen Frøysa

Solar United (The Norwegian Research Centre for Solar Cell Technology)

Erik Stensrud Marstein

ZEB (The research Centre on Zero Emission Buildings)

Anne Grete Hestnes

CenSES (Centre for Sustainable Energy Studies)


Asgeir Thomasgaard

14:00 – 14:30	Coffee break
14:30 – 16:00	Parallel sessions
16:00 – 16:30	Coffee break with fruit
16:30 – 18:00	Parallel sessions
18:00 – 20:00	Poster session and dinner
20:30 -	Social event Concert in the Nidaros Cathedral and social gathering at “Naboen” after the concert.

Tuesday 8th June

08:30 – 10:00	Parallel sessions
10:00 – 10:30	Coffee break
10:30 – 12:00	Parallel sessions
12:00 – 13:00	Lunch
13:00 – 14:30	Parallel sessions
14:30 – 15:00	Coffee break with fruit
15:00 – 16:30	Panel discussion (R1) The conference ends with a panel discussion that will gather industry, politicians and researchers to discuss how to build a robust industry on renewable energy in Europe. Marius Holm from Bellona will lead the discussion, and the participants are: Åslaug Haga , Norsk Industri Sverre Gotaas , Senior Vice President Innovation and Growth, Statkraft Unni Steinsmo , President, SINTEF Richard Taylor , Executive Director, International Hydropower Association <i>(tbc)</i> Pål Julius Skogholt , State Secretary, Ministry of Trade and Industry

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Wind Energy

Monday 7th

14:30 - 16:00 **Wind Resource** (R8)

Chairman: *Jørgen Krokstad, Statkraft AS*

- 14:30 – 14:50 Forecasting scenarios of wind power generation for the next 48 hours to assist decision-making in the operation of the power system. *Nicholas Cutler, University of New South Wales, Australia*
- 14:55 – 15:20 Offshore wind resource assessment and application to offshore wind farm development. *Eirik Berge, Kjeller Vindteknikk*
- 15:25 – 15:50 Small scale wind power harnessing in Colombian oil industry facilities: Wind resource and technology issues. *Mauricio Giraldo, ^aUniversidad Pontificia Bolivariana, Medellín, Colombia*
- 15:50 – 16:00 Open discussion

16:30 - 18:00 **Aerodynamics and Structural Dynamics** (R8)

Chairman: *Trond Kvamsdal, SINTEF/NTNU*

- 16:30 – 17:00 **Invited lecture:** Wind Turbine Wakes modeled with Computational Fluid Dynamics. *Stefan Ivanell, Gotland University, Sweden*
- 17:00 – 17:20 Wake effects on wind turbine performance. *Muywa S. Adaramola, NTNU*
- 17:20 – 17:40 The Design of a Rotor for a Floating Wind Turbine. *Karl O. Merz, NTNU*
- 17:40 – 18:00 Flexible wind turbine rotors modelled with the Corotational Finite Element Method. *Karl J. Maus, UMB*

Tuesday 8th

08:30 - 12:00	New Conceptual Designs and Technologies	(R8)
	Chairman: <i>Asbjørn Strand, Prototech AS</i>	
08:30 – 08:50	Techno-economic potential of wind integrated black liquor electrolysis in a carbon constrained world. <i>Himardi R. Ghatak, Sant Longowal Institute of Engineering and Technology, India</i>	
08:50 – 09:10	Comparison of conventional and hydraulic drive train mass and their influence on support structure design. <i>Niels F. B. Diepeveen, , Delft University of Technology, the Netherlands</i>	
09:10 – 09:30	Performance evaluation of a hydraulic offshore wind turbine (The Delft Offshore Turbine) <i>A. J. Laguna, , Delft University of Technology, the Netherlands</i>	
09:30 – 09:50	Development of small scale standalone Wind Desalination model. <i>R. Rathinavelu, Hamburg University of Applied Sciences, Germany</i>	
09:50 – 10:00	Definition of a 10 MW reference wind turbine - rotor blades. <i>Lars Frøyd, NTNU</i>	
10:00 – 10:30	Coffee break	
	Chairman: <i>Tor Anders Nygaard, IFE</i>	
10:30 – 11:10	Invited lecture: The History and State-of-the-art of Wind Energy Technology. <i>Andrew Garrad, GL Garrad Hassan, UK</i>	
11:10 – 11:30	A comparison of foundation concepts for ultra high capacity offshore wind turbines in intermediate water depth. <i>Eric Van Buren, NTNU</i>	
11:30 – 11:50	A comparison of existing and conceptual designs for floating wind turbines. <i>Anders Myhr, UMB</i>	
11:50 – 12:00	Open discussion	

13:00 – 14:30	Energy System Analysis	(R8)
	Chairman: <i>Tor Anders Nygaard, IFE</i>	
13:00 – 13:20	SusPlan Characterisation and Modelling of the Outer Hebrides Energy Resource. <i>Malcolm Murray, Lews Castle College, Scotland</i>	
13:20 – 13:40	Greenhouse Gas Emissions of Wind Power – State of the Art. <i>Hanne L. Raadal, Østfoldforskning.</i>	
13:40 – 14:00	Hybrid life-cycle assessment of wind power. <i>Anders Arvesen, NTNU</i>	
14:00 – 14:20	Integrating renewable energy into the electricity market: A case study on wind generation and spot prices in the Australian National Electricity Market. <i>Nicholas Cutler, University of New South Wales, Australia</i>	
14:20-14:30	Open discussion	

Solar Cells

Monday 7th

14:30 - 16:15 Silicon solar cells (R7)

- 14:30 – 15:05 **Invited lecture:** Crystalline-Silicon Photovoltaics: Still Necessary and Sufficient. *Dr. Paul Basore, Director, REC Technology US*
- 15:05 – 15:25 Sistruc - a PC-program for directional solidification of Silicon. *A. Dons (SINTEF)*
- 15:25 – 15:45 Distribution of Cu in directly solidified Si. *Zhihong Jia (NTNU) et al*
- 15:45 – 16:05 The influence of Si₃N₄ oxidation on the wetting between silicon and Si₃N₄-coated substrates. *Ingvild Brynjulfsen (NTNU) et al*

16:30 - 18:00 Silicon solar cells (R7)

- 16:30– 16:50 High Temperature Electrochemical Refining of Silicon. *Espen Olsen (UMB) et al*
- 16:50 – 17:10 Constitutive modelling of solar-grade silicon multicrystals at high temperatures. *Julien Cochard (NTNU) et al*
- 17:10 – 17:30 The Effect of Crystal Orientation and Shape of Indenter on Surface Cracking and Chipping on a (100) Silicon Crystal. *Bjørnar Espe (NTNU) et al*
- 17:30 – 18:00 Introduction to poster session (1 minute each)

Tuesday 8th

08:30 - 09:05 **Light harvesting (1)** (R7)

08:30 – 09:05 **Invited lecture** Enhancing the performance of photovoltaic devices via the application of luminescent materials. *Prof. Bryce Richards, Director - Scottish Institute for Solar Energy Research (SISER)*

09:05 - 10:05 **Solar cell systems** (R7)

09:05 – 09:25 The Need for Long Term and Accelerated Climate Exposure and Durability Testing of New Solar Cell Materials and Systems. *Bjørn Petter Jelle (SINTEF) et al*

09:25 – 09:45 Sun Tracking System Directly Controlled By Solar Panels. *Habtamu B. Madessa (NTNU) et al*

09:45 – 10:05 An Investigation of the opportunity to Recover Radiation Waste Heat by the Means of Thermoelectricity. *Marit Takla (NTNU) et al*

10:30 - 11:50 **Solar cells and light harvesting (2)** (R7)

10:30 – 10:50 Atomic layer deposition of copper based oxides for use in PV applications. *Mari Alnes (UiO) et al*

10:50 – 11:10 Light trapping in very thin, crystalline silicon solar cells. *Erik Stensrud Marstein (IFE) et al*

11:10 – 11:30 Solar Cells based on low temperature crystallization of a-Si:H on aluminium foil substrate: Structure & Characterization. *Alexander Ulyashin (SINTEF) et al*

11:30 – 11:50 Laser-based processes for production of high efficiency silicon solar cells. *Sean Erik Foss (IFE) et al*

13:00 - 14:20 **New materials** (R7)

13:00 – 13:20 ZnO nanorod hybrid Organic/Inorganic Solar Cells and the effect of surface modifications. *Christian Weigand (NTNU) et al*

13:20 – 13:40 Metal hydrides for photovoltaics. *Trygve Mongstad (IFE) et al*

13:40 – 14:00 Synthesis of FeS₂ for photovoltaic applications. *Per Martin Rørvik (NTNU) et al*

14:00 – 14:20 Quantum dot density studies for quantum dot intermediate band solar cells. *Sedsel Fretheim Thomassen (NTNU) et al*

Hydropower

Monday 7th

14:30 - 16:00 Scenarios for power system development in Europe (R1)

Chairman: *Atle Harby, SINTEF/CEDREN*

14:30 – 15:00 **Invited lecture** by Richard Taylor, IHA

15:00 – 15:30 Scenarios for hydro power development in Norway to cover peaking and load balancing needs in a European system with increasing use of non-regulated renewable.

Maria D. Catrinu, Eivind Solvang and Atle Harby

15:30 – 15:45 Norwegian Hydropower – a valuable peak power source.

Hermod Brekke

15:45 – 16:00 Hydro investment analysis under new market conditions.

Gerard Doorman

16:30 - 18:00 Equipment and Technology (R1)

Chairman: *Torbjørn Nielsen, NTNU*

16:30 – 16:50 Impact of reservoir sedimentation versus storage of new renewable energy.

Tom Jacobsen

16:50 – 17:10 NORHARD - game changing drilling contractor.

Askjell Tonstad

17:10 – 17:30 Abrasion resistant turbines.

Ole Gunnar Dahlehaug

17:30 – 17:50 Reversible Pumped Hydro – benefits and challenges.

Torbjørn Nielsen and Eve C. Walsetn

17:50 – 18:00 Introduction to poster session (1 minute each)

Tuesday 8th

08:30 - 10:00 **Environmental/Social Effects (I)** (R1)

Chairman: *Leif Lia, NTNU*

- 08:30 – 09:00 Invited lecture by *Stefan Schmutz*
- 09:00 – 09:20 A tool to assess morphological changes in a delta due to hydropower regulation. *Peggy Zinke, Nils Ruether, Nils R. B. Olsen*
- 09:20 – 09:40 Greenhouse Gas Emissions of Hydro Power – state of the art. *Hanne Lerche Raadal and Ingunn Saur Modahl*
- 09:40 – 10:00 Assessing the impact of hydropower and climate change on the fish fauna in Alpine rivers. *Andreas Melcher, Günther Unfer and Stefan Schmutz*

10:30 - 12:00 **Environmental/Social Effects (II)** (R1)

Chairman: *Tore Jørgensen, ICH*

- 10:30 – 10:50 Environmental redesign of hydropower. Potential and examples. *Atle Harby and Torbjørn Forseth*
- 10:50 – 11:10 Assessment of small versus large hydro-power developments – A Norwegian case study. *Tor Haakon Bakken, Atle Harby*
- 11:10 – 11:30 Assessment of the river ice conditions in Lundesokna, a small hydro-peaked river in central Norway. *Håkon Sundt and Tor Haakon Bakken*
- 11:30 – 11:50 Simulation of stranding risk of juvenile fish due to hydropeaking using the habitat model CASiMiR. *Makrus Noack, Matthias Schneider and Silke Wieprecht*

13:00 - 14:30 **Water Management and Climate Change Issues** (R1)

Chairman: *Ånund Killingtveit, NTNU*

- 13:00 – 13:30 Invited lecture by *Luc Gagnon, Hydro Quebec*
- 13:30 – 13:50 A Procedure for Assessing Climate Change Impacts on hydropower. *Byman Hamududu, Emmanuel Jjunju, Ånund Killingtveit and Knut Alfredsen*
- 13:50 – 14:10 Sustainable implementation of village level hydropower in Eastern and Southern Africa. *Wim Jonker Klunne*
- 14:10 – 14:30 The Impacts of climate change on a Norwegian high-head hydropower plant. *Haregewoin Haile Chernet, Knut Alfredsen and Ånund Killingtveit. NTNU*

Bioenergy

Monday 7th

14:30 - 16:00 **Fuel supply and energy planning** (R2)

Chairman: *Øyvind Skreiberg, SINTEF*

14:32 – 14:54 **Invited lecture:** Fuel supply. Odd Jarle Skjelhaugen. *Norwegian University of Life Sciences*

14:54 – 15:16 Variations in Norwegian biomass. *Judit Sandquist. SINTEF Energy Research*

15:16 – 15:38 Effect of whole-tree thinning on long-term forest growth. *Kjersti Holt Hanssen. Norwegian Forest and Landscape Institute*

15:38 – 16:00 BioEnergy Planning – Optimization under Uncertainties. *Harald Uhlemair. Georg-August-Universität Göttingen. Germany.*

16:30 - 18:00 **Conversion mechanisms for heat and power applications** (R2)

Chairman: *Rainer Backman, SINTEF*

16:32 – 16:54 A review on torrefaction of biomass. *Dhruv Tapasvi. NTNU*

16:54 – 17:16 Apparent Pyrolysis Rate of Large Biomass Particle in High Temperature Steam Flow. *Kentaro Umeki. Royal Institute of Technology (KTH). Sweden.*

17:16 – 17:38 Study of the slow batch pyrolysis of mixtures of pine, plastics and tires. Application of Response Surface Methodology. *Filipe Paradela. Laboratório Nacional de Energia e Geologia, Portugal.*

17:38 – 18:00 Molten Salt Pyrolysis of Biomass. *Heidi S. Nygård. Norwegian University of Life Sciences*

Tuesday 8th

08:30 - 10:00 Conversion technologies for heat and power applications (R2)

Chairman: *Morten Grønli, NTNU*

- 08:32 – 08:54 Status for standards on wood- and pellet stoves and needed improvements. *Edvard Karlsvik. SINTEF Energy Research*
- 08:54 – 09:16 Sustainable Generation of Bioenergy in Fluidised Bed Boilers. *Elmar Offenbacher. AE&E Group GmbH. Austria.*
- 09:16 – 09:38 Tubular reactor for gasification of sawdust and powder biomass for Energy applications. *K. C .Mohite. University of Pune. India.*
- 09:38 – 10:00 Using Biomass for Combined Heat and Power as a method for improving Energy Efficiency in Serbian Industry. *Marta Trninic. Engineering University of Belgrade. Serbia.*

10:30 - 12:00 Biofuels and biopower (R2)

Chairman: *Khanh-Quang Tran, NTNU*

- 10:32 – 10:54 **Invited lecture:** Production of Fuels and Chemicals from Biomass. *Narendra Kumar. Åbo Akademi University. Finland.*
- 10:54 – 11:16 Syngas based biopower. *Chris Chapman. Fiborgtangen Vekst AS*
- 11:16 – 11:38 Research results from a prototype for power generation from low temperature heat sources in small and medium sized sawmills. *Tor-Martin Tveit. Single-Phase Power AS*
- 11:38 – 12.00 Ash related behavior in staged and non-staged combustion of biomass fuels and fuel mixtures. *Øyvind Skreiberg. SINTEF Energy Research*

13:00 - 14:30 Environmental aspects and ash (R2)

Chairman: *Mette Bugge, SINTEF*

- 13:02 – 13:24 Emission Control through Primary Measures in Biomass Combustion. *Ehsan Houshfar. Norwegian University of Science and Technology*
- 13:24 – 13:46 Life Cycle Assessment of bio-fuelled Combined Heat and Power Plants - Centralized versus Decentralized deployment strategies. *Geoffrey Guest. NTNU*
- 13:46 – 14:08 Review of Additives Used for Abating Ash Related Problems in Biomass Combustion. *Liang Wang. NTNU*
- 14:08 – 14:30 The effect of kaolin and peat ash on the combustion of demolition wood under well controlled conditions. *Roger A. Khalil. SINTEF Energy Research*

Renewable Fuels for Transportation

Monday 7th

14:30 - 16:00 Sustainable transportation (R3)

Chairman: *Ann Mari Svensson, SINTEF*

14:30 – 15:00 **Invited lecture:** E-Mobility - Identifying key vehicle segments for fuel cell, battery-electric and plug-in-hybrid vehicles. *Ulrich Bunger, LBST, Germany*

15:00 – 15:20 The standarization of major WtW databases: measuring uncertainty on a macro level. *H. El-Houjeiri University of Oxford, Great Britain*

15:20 – 15:40 "Sustainable mobility necessitates the co-existence of alternative transport fuels. *G. Gilpin, Vestforsk*

15:40 – 16:00 Zero emission solutions for transportation. *S. Møller-Holst, Sintef*

16:30 - 18:00 Biofuels - Overview (R3)

Chairman: *Bernd Wittgens, SINTEF*

16:30 – 17:00 Second Generation Biofuels – a discussion on oportunites and challenges related to processes and feedstocks. *B. T. Børresen Statoil*

17:00 – 17:20 Short-term Global Warming Mitigation Costs of Fischer-Tropsch Diesel Production and Policy Scenarios in Norway. *R.M. Bright, NTNU*

17:20 – 17:40 How do we manage Our Limited Bio Carbon Resources best? *P.Heyerdahl, UMB*

17:40 – 18:00 Environmental and economic feasibility of sugar cane ethanol in the Mexican Transportation sector" *C.A. Garcia UNA, Mexico*

Tuesday 8th Hydrogen session

08:30 – 10:30 **Materials aspects of hydrogen technologies** (R4)

Chairman: *Svein Sunde, NTNU*

08:30 – 09:00 **Invited lecture:** Non-precious electrocatalysts for PEM fuel cells. *Frederic Jaouen, INRS-EMT, Canada*

09:00 – 09:20 As Cast and Rapidly Solidified Ti-V Alloys for Hydrogen Storage. *S. Suwarno, NTNU*

09:20 – 09:40 Characterization of core-shell catalyst for electrooxidation of small organic molecules. *P. Ochal, NTNU*

09:40 – 10:00 Hydrogenation behaviour and crystal structure of the LaMg₁₁ with a giant unit cell synthesized by hydrogen metallurgy" *A. Poletaev, NTNU*

10:30 – 12:00 **Production and application of hydrogen for transportation (R4)**

Chairman: *Ulrich Bunger, LBST, Germany*

10:30 – 10:55 **Invited lecture:** Hydrogen as the fuel for the future. *J. Wind, Daimler, Germany*

10:55 – 11:15 On-site Hydrogen production – an IEA_HIA task. *I. Schjøllberg, Sintef*

11:15 – 11:30 Hydrogen fuel quality control: Standardization and instrumentation. *T.A. Aarhaug, Sintef*

11:30 – 11:45 A useful tool in energy efficient reactor design evaluated for the Gas Heated Reformer: The specified entropy production. *Ø. Wilhelmsen, NTNU*

11:45 – 12:00 Hydrogen in Marine Diesel Engines. *A. Vogler Univ. of Aberdeen, Great Britain*

Tuesday 8th Biofuels session

08:30 – 10:30 1. Generation biofuels (R3)

Chairman: *Gudbrand Rødsrud, Borregård*

- 08:30 – 08:55 From wood to biofuels and chemicals – challenges and solutions in pretreatment of lignocellulosics. *Karin Øyaas, PFI*
- 08:55 – 09:15 Kinetic study of the esterification of free fatty acid and ethanol. *J.M. Marchetti NTNU*
- 09:15 – 09:40 Development of Jatropha Oil Purification Process Reactor. *Chanakan Asasutjarit Thailand Institute of Sci. and Techn. Res., Thailand*
- 09:40 – 10:00 Hydrocracking of Rapeseed oil. *S. Palanisamy Chalmers, Sweden*

10:30 – 12:00 Biofuels - Gas Conversion (R3)

Chairman: *Hilde Venvik, NTNU*

- 10:30 – 11:55 Modeling of Single Tube Fischer-Tropsch Reactor for Model Biosyngas. *M. Rafiq NTNU*
- 10:55 – 11:15 Catalytic steam reforming for the production of biomass derived synthesis gas. *E.S. Wangen NTNU*
- 11:15 – 11:35 Economic Modeling of Bio-SNG concepts. *L.P Lauven Univ. Gottingen, Germany*
- 11:35 – 12:00 Compact Conversion of Natural Gas and Biomass to DME in Microstructured Reactors. *R. Myrstad, Sintef*

13:00 - 14:30 Biorefinery (R3)

Chairman: NN

- 13:00 – 13:25 From oil refinery to biorefinery: LCA of a wood-based concept coproducing transportation biofuels, bioenergy and chemicals. *F. Cherubini, NTNU*
- 13:25 – 13:45 Renewable Motor Fuels: Thermochemical Conversion in the Context of a Lignocellulosic Biorefinery. *T. Barth UiB*
- 13:45 – 14:10 The chemistry of the lignin to liquid (LtL) conversion process. *B. Holmelid UiB*
- 14:10 – 14:30 A new pre-treatment process for lignocellulosics. *G. Rødsrud Borregaard*

Zero Emission Buildings

Monday 7th

14:30 – 16:00 Concepts and strategies for zero emission buildings (R5)

Chairman: *Inger Andresen, SINTEF Building and Infrastructure*

14:30 – 15:00 **Invited lecture:** Zero Emission Buildings – A solution for sustainable development in the building sector?

Per Heiselberg, Aalborg, Denmark

15:00 – 15:20 Proposal of a Norwegian ZEB definition: Storylines and Criteria

Igor Sartori, Ingeborg Graabak and Tor Helge Dokka, SINTEF Building and Infrastructure

15:20 – 15:40 North European Understanding of Zero Buildings

Anna Joanna Marszal, Julien S. Bourrelle, Björn Karlsson, Jyri Nieminen, Arild Gustavse and Per Heiselberg, Aalborg, Denmark

15:40 – 16:00 ZEB Definition: Assessing the Implications for Design

Igor Sartori, Inger Andresen and Tor Helge Dokka, SINTEF Building and Infrastructure

16:30 - 18:00 Energy supply systems and services (R5)

Chairman: *Hans-Martin Mathiesen, NTNU*

16:30 – 16:50 Renewable energy applications in zero emission buildings – a case study.

Matthias Haase and Vojislav Novakovic, NTNU

16:50 – 17:10 A life cycle cost analysis of large scale thermal energy storage technologies for buildings using combined heat and power.

K. Gaine and A. Duffy, Dublin Institute of Technology, Ireland

17:10 – 17:30 The impact of domestic load profiles on the grid-interaction of building integrated photovoltaic systems in extremely low-energy dwellings.

Ruben Baetens, Roel De Coninck, Lieve Helsen, Dirk Saelens and K.U.Leuven (Be)

17:30 – 18:00 Introduction to poster session

Tuesday 8th

08:30 - 10:00 **Climate-adapted low-energy envelope technologies** (R5)

Chairman: *Berit Time, SINTEF Building and Infrastructure*

- 08:30 – 09:00 **Invited lecture:** The building enclosure - from the envelope to the skin
Marco Perino, Turin, Italy
- 09:00 – 09:20 Towards an active, responsive and solar building envelope
Francesco Goia, Marco Perino, Valentina Serra, Fabio Zanghirella, Politecnico di Torino, Italy
- 09:20 – 09:40 Accelerated Ageing of Vacuum Insulation Panels
Erlend Wegger, Bjørn Petter Jelle, Erland Sveipe, Steinar Grynning, Arild Gustavsen and Jan Vincent Thue, NTNU
- 09:40 – 10:00 Application of Vacuum Insulation Panels in Retrofitting of Timber Frame Walls - An Experimental and Theoretical Study of Moisture, Thermal Performance and Robustness – An experimental Investigation. *Erland Sveipe, Bjørn Petter Jelle, Erlend Wegger, Sivert Uvsløkk, Jan Vincent Thue, Steinar Grynning, Ole Aunrønning, Egil Rognvik, and Arild Gustavsen, NTNU*

10:30 - 12:00 **Energy efficient use and operation** (R5)

Chairman: *Thomas Berker, NTNU*

- 10:30 – 10:55 User evaluations of passive houses and low energy buildings – Literature Review and Further Research
Åshild L. Hauge, Judith Thomsen and Thomas Berker, SINTEF Building and Infrastructure
- 10:55 – 11:20 Potential of passive cooling, natural ventilation and solar control in cold climates office buildings
Luca Finocchiaro, Tore Wigenstad, Anne Grete Hestnes, NTNU
- 11:20 – 11:45 Efficient Building Operation as a Tool to Achieve Zero Emission Buildings
Natasa Djuric and Vojislav Novakovic, NTNU
- 11:50 – 12:00 Discussion

13:00 – 14:30

Advanced materials technologies

(R5)

Chairman: *Arild Gustavsen, NTNU*

13:00 – 13:20

Nano Technology and Possibilities for the Thermal Building Insulation Materials of Tomorrow

Bjørn Petter Jelle, Arild Gustavsen, Steinar Grynning, Erlend Wegger, Erland Sveipe and Ruben Baetens, NTNU

13:20 – 13:40

Nanoelectrochromics with Applied Materials and Methodologies

Tao Gao, Arild Gustavsen and Bjørn Petter Jelle, NTNU

13:40 – 14:00

Dynamic Solar Radiation Control in Buildings by Applying Electrochromic Materials

Bjørn Petter Jelle and Arild Gustavsen, NTNU

14:00 – 14:20

The Effect of Wall-Integrated Phase Change Material Panels on the Indoor Air and Wall Temperature – Hot-box Experiments

Sunliang Cao, Arild Gustavsen, Sivert Uvsløkk, Bjørn Petter Jelle, Jacques Gilbert and Jussi Maunuksela, University of Jyväskylä, Finland

14:20 – 14:30

Discussion

Ocean Energy

Monday 7th

14:30 – 18:00 **Sea and river water mixing as a power source (I)** **(R10)**

Chairman: *Odne Burheim, NTNU*

14:30 – 15:00 **Invited lecture:** Blue Energy: from smart concept to promising technology

Cees J.N. Buisman, Wetsus, The Netherlands

15:00 – 15:20 The Physics of Low and Mass Transport in Salt Power: Towards Improved Module Designs Membranes for Pressure Retarded osmosis power plants.

Jon Pharoah. Queen's University. Canada.

15:20 – 15:40 Membranes for Pressure Retarded osmosis power plants.

Torleif Holt. SINTEF Petroleum Research, Seismic and Reservoir Technology.

15:40 – 16:00 Thin film composite polyamide membranes on a hydrophilic cellulose support for PRO.

Inger Lise Alsvik, NTNU

14:30 – 18:00 **Sea and river water mixing as a power source (II)** **(R10)**

Chairman: *Jon G. Pharoah, Queen's University, Canada*

16:30 – 16:50 CaCO₃ scaling in pressure retarded osmosis.

Willy Thelin. SINTEF Building and Infrastructure.

16:50 – 17:10 Design of an osmotic power plant.

Edvard Sivertsen, SINTEF Building and Infrastructure

17:10 – 17:30 Reverse Electrodialysis – a renewable DC Power Source.

Odne S. Burheim, NTNU

17:30 – 18:00 Open discussions

Tuesday 8th

08:30 – 12:00 **Tidal and wave energy (I)** (R10)

Chairman: *Ole Gunnar Dahlhaug, NTNU.*

08:30 – 09:00 Invited Lecture: Tidal Power Plants Design and Operation Optimization *Antoine Libaux, EDF Generation & Engineering - Hydro Engineering Centre, France.*

09:00 – 09:20 **Invited lecture:** Status and Future Challenges for Wave Energy Devices. *Jørgen R. Krokstad, Statkraft*

09:20 – 09:40 Design of a tidal turbine. *Céline Faudot, NTNU*

09:40 – 10:00 Open discussions

10:00 – 10:30 Coffee break

10:30 – 10:50 Dynamic Analysis of a Grid-Connected Marine Current Power Generation System Using an Induction Generator. *Li Wang, National Cheng Kung University, Taiwan. R.O.C.*

10:50 – 11:10 On Design and Performance Prediction of Horizontal Water Turbine *Ming-huei Yu*

11:10 – 11:30 A Novel Approach for Extracting Ocean Wave Energy Utilizing the Wave Shoaling Phenomenon. *Shafiq-Ur-Rehman Qureshi, National University of Sciences and Technology (NUST), Pakistan.*

11:30 – 12:00 Open discussions

12:00 – 14:00 **Tidal and wave energy (II)** (R10)

Chairman: *Jørgen R. Krokstad, Statkraft.*

13:00 – 13:20 Dynamic Analysis of a Wave-Energy Power Generation System Connected to a Distribution System through Power- Electronics Converters. *Li Wang, National Cheng Kung University, Taiwan. R.O.C.*

13:20 – 13:40 Control Strategies of a Wave Energy Converter for Power Quality Improvement. *Elisabetta Tedeschi, NTNU*

13:40 – 14:00 Tuned liquid tank used to suppress motion of a floating wave energy capture system. *Bang-Fuh Chen, National Sun Yat-Sen University, Taiwan. R.O.C.*

14:00 – 14:30 Open discussions

Social Studies of Renewable Energy

Monday 7th

14:30 - 16:00 **Joint parallel session with key-note speakers (R9)**

- 14:30-15:00 Public engagement: Scientific governance and science-public relation. *Alan Irwin, Copenhagen Business School, Denmark*
- 15:00-15:30 Experiments in sustainable living: The role of domestic material practices and the co-articulation of participation. *Noortje Marres, Saïd Business School, United Kingdom*
- 15:30-16:00 Natural Gas and Renewable Energy: A Good Match or a Mismatch? *Steven A. Gabriel, University of Maryland*

16:30 – 18:50

E1: Public acceptance, understanding of renewable energy technologies (R9)

Chair: *Alan Irwin, Dean of Research, Copenhagen Business School*

- 16:30-16:50 Public engagement in wind energy: Lessons from a Dutch case study. *Suzanne Brunsting, Sylvia Breukers, Ruth Mourik and Thomas Mikunda, Energy Research Centre of the Netherlands,*
- 16:50-17:10 Image is everything? On Norwegian and Swedish representations of bioenergy. *Tomas Moe Skjølvold, STS, NTNU*
- 17:10-17:30 Approaching public acceptance of new technologies by studying the subjectivity: the hydrogen case. *Olga Di Ruggiero, Alexandra R. C. de Haan, Delft University of Technology, The Netherlands*
- 17:30-17:50 Brøset - carbon neutral settlements in the making. *Helen Jøsok Gansmo, STS, NTNU*
- 17:50-18:10 Knowledge and attitudes on CCS in Norway, Robert Næss, STS, NTNU, Hans Torvatn, SINTEF, Sturle Danielsen Tvedt, Department of psychology, NTNU
- 18:10-18:30 User participation in future carbon-neutral settlements. *Erica Löfström, STS, NTNU*
- 18:30-18:50 Mass Media and Renewable Energy representation by societies: A wind farm project in Puerto-Rico. *Judith Priam, Université des Antilles et de la Guyane andv , Servicios Científicos y Tecnicos, Neftalí García-Martínez, Servicios Científicos y Tecnicos, Puerto Rico*

16:30 – 18:30

E3: Energy policy: Governance, commercialization and industrial development (R54)

Chair: *Knut Holtan Sørensen, NTNU*

- 16:30-16:50 Fostering Renewable Energy in Small Developing Island States Through Knowledge and Technology Transfer: the – DIREKT Project. *Walter Leal, Veronika Schulte, Julia Gottwald, Hamburg University of Applied Sciences.*
- 16:50-17:10 The impact of energy market and actors on the competitiveness of renewables technologies diffusion in developing countries. *Djiby-Racine Thiam, University of Bordeaux*
- 17:10-17:30 Renewable Energy (RE) Market in Rural Electrification: Country Case Nepal. *Brijesh Mainali, Semida Silveira, Royal Institute of Technology, Sweden.*
- 17:30-17:50 Implications of the Diffusion of Biomass Based Energy Technologies: The Case of Pellets from Agricultural Subproducts in Brazil. *Bruna Missaglia, Cinthya Guerrero, Hans Joachim Krautz, Wolfgang Schluchter, Brandenburg Technical University of Cottbus, Germany*
- 17:50-18:10 An Assessment of Exploiting Renewable Energy Sources with Concerns of Policy and Technology. *Yung-Chi Shen, Grace T.R. Lin, Kuang-Pin Li, Benjamin J.C. Yuan, Chiyang James Chou, National Chiao Tung University*
- 18:10-18:30 Production of renewable energy from wind power in local communities. *Bente Johnsen Rygg, Sogn og Fjordane University College*

Tuesday 8th

08:30 - 10:10

E3: Energy policy: Governance, commercialization and industrial development (R9)

Chair: *Marianne Ryghaug, NTNU*

- 08:30-08:50 A Norwegian case study of the formation of a research program for utilizing natural gas feedstock from the North Sea. *Sjur Kasa, University of Oslo. Anders Undertun, NTNU*
- 08:50-09:10 Big is beautiful? The gasification of new renewable. *Margrethe Aune, Eirik Swensen, NTNU*
- 09:10-09:30 Supply networks for bioenergy: state support and local actors. *Magnar Forbord, Jostein Vik, Centre for Rural Research. Bengt Gunnar Hillring, Hedmark University College.*
- 09:30-09:50 The governance of hydropower in Norway and Sweden: How to manage the European current? *Audun Ruud, Gerd Jacobsen, Jørgen Knudsen, SINTEF Energy Research, Måns Nilsson & Peter Rudberg, Stockholm Environment Institute, Sweden.*
- 09:50-10:10 Offshore wind power. Market opportunities for the Norwegian supply industry, and regulatory framework needed to realize these opportunities. *Gro Holst Volden, SINTEF Technology and Society*

08:30 - 10:10

E5: The cultural dynamics of new renewable energy technologies (R54)

Chair: *Noortje Marres, University of Oxford*

- 08:30-08:50 Comfort, mobility, growth, efficiency – conceptual frames or blinders for disciplinary engagements in transition processes? *Ulrik Jørgensen, DTU Management, Innovation and Sustainability.*
- 08:50-09:10 Changing fields of rationality – a policy for change? *Einar Strumse, Høgskolen i Lillehammer. Hege Westskog, CICERO. Tanja Winther, Universitetet i Oslo*
- 09:10-09:30 How to live CO2 neutral in bathrooms, offices, living rooms and kitchens? *Thomas Berker, Helen Jøsok Gansmo, NTNU*
- 09:30-09:50 Discourses of community-based renewable energy project in the case of Korea. *Jeong Y., Walker G., Lancaster University*
- 09:50-10:10 Psychological Factors in the Diffusion of Sustainable Technology: A Study of Norwegian Households' Adoption of Wood Pellet Heating. *Bertha Maya Sopha, Christian A. Klöckner, NTNU*

10:30 - 12:10

E4: Energy markets and energy actors

(R9)

Chair: *Asgeir Tomasgard, NTNU*

- 10:30-10:50 Agent-based Modelling of Heating System Adoption in Norway. *Edgar G. Hertwich , Bertha Maya Sopha, Christian A. Klöckner, NTNU*
- 10:50-11:10 The effects of environmental and renewable energy policies on the existence conditions for distributed generators in electricity markets. *Zaida Contreras, The University of New South Wales, Australia.*
- 11:10-11:30 Renewable energy and the ir-effect on electricity prices: the case of the German nuclear phase-out. *Daniel Comtesse, University of Amsterdam. Sebastian Schröer, Hamburg Institute of International Economics, Germany*
- 11:30-11:50 An Optimization Model for Biogas Production at District of Columbia Water and Sewer Authority. *Steven A. Gabriel, Chalida u-Tapao, University of Maryland, USA*
- 11:50-12:10 Green certificates as climate policy instrument. *Frode Skjeret, Institute for Research in Economics and Business Administration*

10:30 - 12:00

E2: The renewable energy innovation system: innovation and learning

(R54)

Chair: *Olav Wicken, University of Oslo*

- 10:30-10:50 User innovation, social learning and renewable energy technology: Lessons from Austria. *Michael Ornetzeder, Austrian Academy of Sciences*
- 10:50-11:10 Developing Norwegian wind power – a case of “meeting ones former self”? *Ole I. Gjerald, Vestlandsforskning / STS, NTNU*
- 11:10-11:30 Commercialisation of environmentally oriented consulting engineering services. *Jøran Solli, NTNU*
- 11:30-11:50 Markets as learning arenas for “new” renewable energy technologies? Feed-in tariffs, learning and the technological innovation system for Solar cells. *Jens Hanson, University of Oslo*

13:00 - 14:30

E2: The renewable energy innovation system: innovation and learning (R9)

Chair: *Olav Wicken, University of Oslo*

- 13.00-13.30 Operable Urban Landscapes: Investigations on Utilization of Renewable Energy Sources in Urban Contexts. *A. Senem Deviren, Istanbul Technical University, Turkey.*
- 13.30-14.00 Biogas in Burkina Faso- Influential factors of biogas projects in rural areas of Burkina Faso. *Andreas Aschaber, University of Innsbruck, Austria*
- 14.00-14.30 New Renewable Electricity – A future Norwegian export industry? *Olav Wicken, University of Oslo*

13:00 - 14:30

E4: Energy markets and energy actors (R54)

Chair: *Steven A. Gabriel, University of Maryland*

- 13:00-13:20 Impacts of climate change on the Norwegian Energy System. Audun Fidje, Pernille Seljom, Eva Rosenberg, Institute for Energy Technology. *Jan Erik Haugen, The Norwegian Meteorological Institute. Michaela Meir, University of Oslo*
- 13:20-13:40 Optimal investments in hydrogen infrastructure for the transport sector. *Jogeir Myklebust, Asgeir Tomasgard, NTNU*
- 13:40-14:00 Bills to pay – Consumers and policymakers' reactions to problems with the liberalised market for electricity. *Henrik Karlstrøm, NTNU*
- 14:00-14:20 Investing in a CO2 value chain with Enhanced Oil Recovery. *Adela Pages, Asgeir Tomasgard, NTNU*

Poster presentations

Wind Energy

Indian Ocean Phenomenon effecting wind business *Altaf Tamboli*

Fabrication Challenges in Mass Production of Support Structures for Offshore Wind Energy Turbines
Daniel Zwick, Geir Moe, NTNU

Solar Cells

Distribution of Boron during Removal from Molten Silicon when Using CaO-SiO₂ Slags, *L.K. Jakobsson et al. NTNU*

Effect of crystal and crucible rotations on global heat transfer and melt convection during Czochralski silicon crystal growth, *O.A. Noghab et al. NTNU/SINTEF*

High temperature heat treatment of multicrystalline PV-silicon, *A.R. Gallala et al. NTNU/SINTEF*

Structural Properties Of Germanium-Doped Multicrystalline Silicon, *G. Minozzi et al, Univ Padova/NTNU*

Simulation of phosphorus removal from silicon by induction vacuum refining, *S. Zheng XMU/NTNU*

Reflection Reduction through Porous Textures on mc-Si Wafers by Anodic Polarization in Aqueous KOH,
M. Abburi et al. Norut/NTNU

Inorganic photoluminescent films for the UV to Vis energy conversion, *E. Garskaite et al. UMB*

XPS, TEM and DFT studies of TCO (ITO, ZnO) thin films and TCO/Si interfaces, *S. Diplas et al. SINTEF/UIO/STFC*

Energy conversion materials for PV applications, *P.A. Hansen et al UiO*

Pulsed laser ablation and deposition of silicon, *S. S. Yap et al NTNU/SINTEF*

Photovoltaic research in Southern Norway, *A.G. Imenes et al UiA/Teknova*

How to Maximize Solar Efficiency during Snow Downfall on Solar Cell Roofs?, *B.P. Jelle NTNU/SINTEF*

Wet Chemical Synthesis of Silicon Quantum Dots for Photovoltaic Applications, *M.H. Balci et al. NTNU*

Bioenergy

Thermocalorimetric analysis of forest waste. *Severiano Pérez. University of Cantabria, Spain.*

Hydropower

Minimum discharge and landscape. *Priska Helene Hiller, Sweco Norge AS*

The flushing process as a possibility to advance the sediment removal in hydropower reservoirs. *Stefan Hauna, NTNU*

Reservoir bathymetric mapping for optimum operation of hydropower plants. *Kiflom Belete, NTNU*

Baseline Mapping of hydropower Resources for Climate Change and other studies in a sparsely investigated catchment. *Jjunju E, Killingtveit Å. NTNU*

European Hydropower Production Capacity – Study of the Correlation between the Scandinavian system and Hydropower in the Alps, Balkan and Iberia Regions. *Ånund Killingtveit, NTNU*

Assessing the Water Temperature Variations and Ice Conditions in Lundesokna: A Norwegian case study *Christophe Degouy/Tor Haakon Bakken*

A link between biological embeddedness factors and grain size distribution for the evaluation of habitat quality of juvenile salmon. *Stefan Jocham/Tor Haakon Bakken*

Comparison of Evapotranspiration derived from GCM Latent heat flux with that from land-use characteristics and meteorological records. *Emmanuel Jjunju, Ånund Killingtveit, Knut Alfredsen, NTNU*

Renewable Energy in Transportation

Nanocrystalline Mg-SiC for Hydrogen Storage Material Obtained by Mechanical Alloying, *Zulkarnain Jalil, Adi Rahwanto and Mustanir, Syiah Kuala Univ., Banda Aceh, Indonesia*

An Optimization Model for Biogas Production at District of Columbia Water and Sewer Authority, *S.A. Gabriel, C. u-Tapao, Univ. of Maryland, USA*

A novel monolithic catalyst for the transesterification of vegetable oils to produce Biodiesel, *D.M. Reinoso, J.M. Marchetti, G.M. Tonetto, PLAPIQUI (UNS-CONICET), Argentina*

A Reasonable Alternative Fuel for Diesel Engines; Pistacia Terebinthus Biodiesel (PTB) and Its Blends with Diesel Fuel, *M. Ozcanli, A. Keskin, H. Serin, K. Aydin, Cukurova University, Turkey*

Comparison of biodiesels based on different vegetable oil with diesel in a experimental boiler, *B. Bazooyar, A. Ghorbani, A. Shariati, Petroleum University of Ahvaz*

Biofuels Sustainable Production: Challenges and opportunities for developing nations. Insight of the Colombian Case, *C.A.R. Triana, MGSM, Australia*

Optimal operational conditions for hydrogen production using Palm Oil Mill Effluent (POME), *M. Badiei, J. Md. Jahim, N. Anuar, Siti rozaimah sheikh abdulah, UKM, Malaysia*

Isolation and characterization of ligninolytic microbes from termite's gut, *C-Y Ho, J-J Chang, T-Y Chin, C-C Huang, National Chung Hsing University, Taichung, Taiwan*

Use of renewable energies in irrigated canola production in Iran, *A. Mohammadi, S. Rafiee, University of Tehran, Iran*

Characterization of Bio-oils from Lignocellulose Using Advanced Analytical Techniques and Data Analysis, *J.R. Gasson, M. Kleinert, T. Barth, I. Eide, UiB, Norway*

Field trials of Biodiesel (B20) and diesel fuelled direct injection tier-III compliant off road vehicles in Indian conditions, *A. Parthiban, S. Balamurugan, R. Krishnamoorthy, Mahindra & Mahindra Ltd., India*

Composite of Conducting Polymers and Aligned CNT for Energy Storage, *Fan Huang, Estelle Vanhaecke, De Chen. Dept. of Chem. Eng., NTNU, Norway*

Plant cell wall degrading enzymes of the parasitic plant *Cuscuta* spp. as new tools in biofuels production. *Hanne Risan Johnsen, Kirsten Krause. University of Tromsø*

Zero Emission Buildings

A simplified numerical method for use in analysis of horizontal ground heat exchangers with parallel shallow pipes operating in heat sources, heat sinks or thermal storage volumes. *Michael Greene, Laurentiu Dimache, Niall Bruke, John Lohan and Ray Clarke*

Rock core samples cannot replace thermal response tests - A statistical comparison based on thermal conductivity data from the Oslo region. *Heiko Liebel, Kilian Huber, Bjørn Frengstad, Randi Kalskin Ramstad and Bjørge Brattli, NTNU*

Utilisation of Geothermal Heat Pumps within Permeable Pavements for Sustainable Energy and Water Practices. *Kiran Tota-Maharaj, Miklas Scholz and Stephen J. Coupe, University of Edinburgh (Gb)*

Design and Optimisation of a Thermal Energy Storage System Charge-Cycle using an Intermittent Electrical Energy Supply. *John Macbeth, John Currie, Dr. Mohamed Imbaby and Dr. Neil Finlayson, Greenspace Research (Gb)*

Towards a zero emission built environment - Master program in Sustainable Architecture. *Annemie Wyckmans, NTNU*

The Center for Renewable Energy (SFFE) is a virtual center for coordination of research and education in the area of renewable energy at NTNU, SINTEF and IFE. The SFFE-network at NTNU, SINTEF and IFE involves around 250 scientific staff and 150 PhD students within the field of renewable energy.

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