7th International Conference on

Smart Energy Systems

4th Generation District Heating, Electrification, Electrofuels and Energy Efficiency

21-22 September 2021, Copenhagen

#SESAAU2021

PROGRAMME COPENHAGEN

MONDAY 20 SEPTEMBER 2021

energy CLUSTER DENMARK

AALBORG UNIVERSITY

Technical Tour: Middelgrunden Wind farm

Monday 20 September 2021

14:00 – 17:30 (2 pm – 5.30 pm)

The Middelgrunden Offshore Wind Farm is one of the first offshore wind farms in the world. It has a total capacity of 40 MW and consists of 20 Bonus turbines each with a power of 2 MW. Middelgrunden Offshore Wind Farm provides 3 per cent of the electricity consumption in Copenhagen.

The tour includes boat trip to Middelgrunden Offshore Wind Farm with participation from Middelgrunden Wind Turbine Cooperative (duration: 2-3 hours depending on weather); explanation about the project, ownership structure etc., coffee/tea, and, if permitted by the weather, entrance to the turbine foundation.

Departure from Amaliehaven (Amalie Garden), Larsens Plads, 1253 Copenhagen K

More information and registration at conference website.

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Funded by the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement no. 846463

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TUESDAY 21 SEPTEMBER 2021

energy CLUSTER DENMARK

AALBORG UNIVERSITY

08:00-09:00	**Registration and breakfast**

09:00-11:00	**1st plenary session chaired by Professor Poul Alberg Østergaard**	**ROOM: SQUARE 1**
09:00-09:10	**Professor Henrik Lund:** Opening speech	
09:10-09:30	**Keynote (online): Claudia Kemfert, Professor and Head of Department at DIW, Germany:** Corona crisis: Chance for decentralized energy system transformation with full supply from RE	
09:30-09:40	Questions and debate	
09:40-10:10	**Keynote: Anders Nordstrøm, Vice President of Hydrogen at Ørsted, Denmark:** PTX potential for 2050 net zero	
10:10-10:40	**Keynote: Poul Skjærbæk, Chief Innovation Officer at Siemens Gamesa, Denmark:** Unlocking the Green Hydrogen revolution at the sea	
10:40-11:00	Questions and debate	

11:00-11:15	**Short break**

Parallel sessions 1-4

11:15-12:30 ROOM: SQUARE 1

Session 1: Smart energy system analyses, tools and methodologies

Chair: Ulrich Reiter

Session keynote Martin Lindgaard Pedersen: Digital tools for refurbishment planning based on facts and choice of pipe system based on Total Cost of Ownership and CO2 emission

Mostafa Fallahnejad: District heating distribution grid costs: comparison of two approaches

Kirstin Ganz: How can energy system modeling electricity prices be adjusted to reflect real price spreads for flexible assets in the future?

Anna Vannahme: General Optimization Guideline for District Heating Networks and its exemplary Application

11:15-12:30 ROOM: SQUARE 2

Session 2: Integrated energy systems and smart grids

Chair: Jesper Tange

Session keynote Oddgeir Gudmundsson: The role of hydrogen in the future heat supply system

Hammam Soliman: Power-to-X / Electricity-to-Hydrogen – CAPEX & OPEX Vs. Integrated Production

Thomas Natiesta: Testbed to evaluate digital solutions in integrated district heating and electrical grids: First results

11:15-12:30 ROOM: SQUARE 3

Session 3: Planning and organisational challenges for smart energy systems and district heating

Chair: David Maya-Drysdale

Session keynote Matteo Pozzi and **Alessandro Capretti**: Planning large district heating network developments based on Waste Heat Recovery

Claudia Mădălina Dumitru: Optimizing the development process of a hybrid energy supply system based on renewable sources using the LEAN methodology

Ari Laitala: Understanding the profitability of the energy (efficiency) investments – things to consider before putting billions into game

Daniel Møller Sneum: Discounting assumptions in district energy

11:15-12:30 ROOM: STUDIO 3+4

Session 4: 4th Generation District Heating concepts, future district heating production and systems

Chair: Hanne Kauko

Session keynote Anna Volkova: Competitiveness of individual heat pumps in the Baltic states

Felix Agner: Improving robustness to peak load conditions in district heating networks through scalable control coordination subject to network constraints

Marco Cozzini: Performance measurement and detailed modelling of an existing neutral-temperature district heating network based on decentralized heat pumps

Stefan Puschnigg: An analysis of cascaded low-temperature sub-networks in existing district heating networks

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12:30-14:00 Lunch and networking

Parallel sessions 5-8

14:00-15:30 ROOM: SQUARE 1

Session 5: Smart energy system analyses, tools and methodologies

Chair: Nina Detlefsen

Session keynote Matteo Giacomo Prina: Bottom-up method to derive Cost curves for heat savings in buildings for all European countries

Lorenzo Cassetti: Realization and energy assessment algorithm of a Horizontal Packed Bed Regenerator for Thermal Energy Storage

Adrian Ostermann: Forecasting charging station occupancy using supervised learning algorithms

Thanh Huynh: Local Energy Markets for Thermal-Electric Energy Systems considering energy carrier dependency and energy storages

Goran Stunjek: Analysis of hydropower impact in water energy nexus for smart energy systems

14:00-15:30 ROOM: SQUARE 2

Session 6: Integrated energy systems and smart grids

Chair: Hans Jørgen Brodersen

Session keynote Philip Fosbøl: Potential for CCS and CCUS electrification towards reducing impact of climate change

Anders Bavnhøj Hansen: System scenarios towards climate neutrality by use of smart Energy systems solutions

Mads R. Almassalkhi: Characterizing the reactive power capability of wind farm collector networks

Marie-Alix Dupré la Tour: Flexibility enhancement using heat networks within large scale sector coupling studies

Henrik Schwaeppe: Analysing systemic advantages of district heating in an integrated transmission and generation expansion planning model

14:00-15:30 ROOM: STUDIO 3+4

Session 7: Planning and organisational challenges for smart energy systems and district heating

Chair: Peter Jorsal

Session keynote Tore Friis Gad Kjeld: District Heating in Copenhagen – challenges and perspectives

Sara Ben Amer: How successful is municipal energy planning in Denmark - quantifying the impact

David Maya-Drysdale: Achieving carbon neutrality in cities: Lessons from a leader

Britta Kleinertz: Heat Transformation Munich – Analysis and strategy definition for a systemic cost optimal heat supply transformation

Hannah Mareike Marczinkowski: Modelling renewable energy islands and their role in energy transitions

14:00-15:30 ROOM: SQUARE 3

Session 8: 4th Generation District Heating concepts, future district heating production and systems

Chair: Steffen Nielsen

Session keynote Kristina Lygnerud: Implementation of low temperature district heating

Henrik Lund: Transition to 4th Generation District Heating and Motivation Tariffs

Luca Casamassima: A proposed Pathway to future-proof current building stock for upcoming 4th generation district heating in the scope of Positive Energy Districts

Jakob Binder: Interconnection and smart control of district heating networks for increased flexibility

Meng Yuan: District heating in 100% renewable energy systems: Combining industrial excess heat and heat pumps

15:30-16:15 Coffee break

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Parallel sessions 9-12

16:15-17:30 ROOM: SQUARE 1

Session 9: 4th Generation District Heating concepts, future district heating production and systems

Chair: Ralf-Roman Schmidt

Session keynote Christian Engel: Green deal impact of DHC networks: how best preforming piping systems make DHC even more attractive

Hanne Kauko: Investment analysis of a local energy system with seasonal thermal energy storage

Ali Moallemi: COOL DH: A Pioneering Project to Implement Low Temperature District Heating (LTDH) Systems As an Integrated Part of Smart Energy Systems

Dorte Skaarup Østergaard: Combined district heating and cooling – which solutions are available and are they applicable in a Danish context?

16:15-17:30 ROOM: STUDIO 3+4

Session 10: Energy savings in the electricity sector, buildings, transport and industry

Chair: Anne B. Holm

Session keynote Nikola Matak: Selection of mitigation actions in Smart SECAPs through comparison of individual and joint implementation

Philipp Mascherbauer: Investigating the demand side flexibility of the building stock

Gerald Birngruber: Digital Energy Twins - Optimised Operation and Design of Industrial Energy Systems

Tobias Reum: Experimental Investigation of a novel Hybrid Heat Pump

16:15-17:30 ROOM: SQUARE 2

Session 11: Renewable energy sources and waste heat sources for district heating

Chair: Goran Krajačić

Session keynote Aleksandr Ledvanov: Free cooling and district heating supply usage for Tallinn district cooling production

Dario Dall'Ara: Solar energy in low temperature district heating: monitoring and simulation of an innovative district in Milan

Mihai-Rareș Sandu: Analysis and optimisation of a renewable energy hybrid system operation

Vladimir Vidović: Solving barriers for effective utilization of Seawater Heat Pumps for heating and cooling in the Adriatic region

16:15-17:30 ROOM: SQUARE 3

Session 12: Geographical Information Systems (GIS) for energy systems, heat planning and district heating

Chair: Urban Persson

Session keynote Bernd Möller: An empirical high -resolution geospatial model of future population distribution for assessing heat demands

Hermann Edtmayer: Urban Building Thermal Energy Analysis at City District Scale

Ulrich Reiter: Decarbonizing the Swiss energy demand from buildings

Luis Sánchez-García: A Closer Look at the Effective Width for District Heating Systems

17:30-19:30 Break

19:30 Conference dinner, Restaurant GRØFTEN in Tivoli

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WEDNESDAY 22 SEPTEMBER 2021

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Parallel sessions 13-15

09:00-10:30 **ROOM: SQUARE 1**

Session 13: Energy savings in the electricity sector, buildings, transport and industry

Chair: Bernd Möller

Session keynote Marcus Hummel: How cost efficient is energy efficiency in buildings? A comparison of building shell efficiency & heating system change in the European building stock

Andreas Müller: How to decarbonize Munich's district heating production in long-term? Forecasting the space heating demand of Munich

Pierre JC Vogler-Finck: Data-driven operation of building heating to support the energy transition at community level – Learnings from field applications

Daniel Trier: Large-scale heat pumps for district heating – Lessons learned from real applications

Vittoria Battaglia: The role of local energy planning in the achievements of regional and national sustainability targets: an Italian case study

09:00-10:30 **ROOM: SQUARE 2**

Session 14: Smart energy infrastructure and storage options

Chair: Jan Eric Thorsen

Session keynote Charles Hansen: Reducing carbon emissions through low temperature district heating zones

David Barns: Enabling geoexchange in cities: success factors from UK examples

Morten Vang Bobach: Multi-purpose Pit Thermal Energy Storage in Combination with Heat Pumps

Pietro Lubello: Assessment of hydrogen based long-term electrical energy storage in residential energy systems

Jesper Tange: Improving efficiency and scaling up Pit Thermal Energy Storages (PTES) with unique lid design

09:00-10:30 **ROOM: SQUARE 3**

Session 15: Special Session IEA DHC Annex TS3

Chair: Dorte Østergaard

Session keynote Ralf-Roman Schmidt: Integrated District Heating and Cooling Systems: Overview of the results of the international cooperation project IEA DHC Annex TS3

Peter Sorknæs: Energy system synergies of hybrid energy network technologies

Edmund Widl: Categorization of tools and methods for modeling and simulating hybrid energy systems

10:30-11:00 **Coffee break**

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WEDNESDAY 22 SEPTEMBER 2021

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Parallel sessions 16-18

11:00-12:30 **ROOM: SQUARE 1**

Session 16: Smart energy system analyses, tools and methodologies

Chair: Steen Schelle Jensen

Session keynote Morten Karstoft Rasmussen: Connecting the DH value chain with smart meter data

Marko Mimica: A stochastic model for smart energy systems analysis

Tim Pedersen: Modeling all alternative solutions for highly renewable energy systems

Dmitry Romanov/Johannes Pelda: District heating systems modelling: A gamification approach

Costanza Saletti: A hierarchical control algorithm with yearly and daily horizons for optimally managing district energy systems

11:00-12:30 **ROOM: SQUARE 2**

Session 17: 4th Generation District Heating concepts, future district heating production and systems

Chair: Peter Sorknæs

Session keynote Jan Eric Thorsen: Insights on domestic hot water consumption for multi flat buildings

Dietrich Schmidt: Low temperature district heating as a proven and market ready technology – Case studies of IEA DHC ANNEX TS2

Artem Sotnikov: Hydrothermal challenges in low-temperature networks with distributed heat pumps

Kevin Naik: Optimising heat consumption at micro-level using user centric data driven model

Nicola Kleppmann/Benedikt Hartung: ML4Heat - Tools for the optimized operation of existing district heating networks based on machine learning methods

11:00-12:30 **ROOM: SQUARE 3**

Session 18: Electrification of transport, heating and industry

Chair: Anders Bavnhøj Hansen

Session keynote Leif Gustavsson: A lifecycle comparison of primary energy use and climate impact of biofuel and electric cars

Kertu Lepiksaar: Centralised power-to-heat units as flexible consumers in the power grid

Oliver Ruhnau: How flexible electricity demand stabilizes wind and solar market values: The case of hydrogen electrolyzers

Kasper T. Therkildsen: Large scale deployment of modular pressurised alkaline electrolysers

Andrei David Korberg: Supply chain effects of the extreme hydrogen society

12:30-13:45 **Lunch and networking**

13:45-16:00 **2nd plenary session chaired by Professor Brian Vad Mathiesen** **ROOM: SQUARE 1**

13:45-14:15 **Keynote: Liliana Proskuryakova, Deputy Head and leading researcher at HSE, Russia:** The future of renewable energy and renewable energy systems in Russia

14:15-14:30 Questions and debate

14:30-15:00 **Keynote: Rufus Gifford, former U.S. ambassador to Denmark and nominee for Chief of Protocol at the U.S. State Department:** The new climate policies under the Biden Administration and the global challenges for the Paris Agreement

15:00-15:40 Questions and debate

15:40-15:50 Best Presentation Award Ceremony by Professor Poul Alberg Østergaard

15:50-16:00 Closing by Professor Henrik Lund and CEO Glenda Napier

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THURSDAY 23 SEPTEMBER 2021

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Technical Tour: Waste-to-energy Plant: ARC - and the CCS project

Thursday 23 September 2021

09:00 – 14:00 (9 am – 2 pm)

ARC (Amager Ressourcecenter) is a waste treatment company owned by five municipalities in Copenhagen. ARC runs the waste-to-energy plant Amager Bakke, 16 recycling centres, etc., and handles waste from 645,000 citizens and 68,000 companies. In 2020, ARC incinerated almost 600,000 tons of non-recyclable, residual waste and turned it into 244 GWh of electricity and 1,363 GWh of district heating. The vision of ARC is to make waste treatment and incineration net zero/carbon neutral. One step is by implementing an extra cleaning filter that captures CO2 from the flue gas. In collaboration with the Technical University of Denmark, ARC set up a demonstration project in 2021. This is the first CCS project connected to a waste-to-energy plant in Denmark. The technology behind carbon capture is extremely energy intensive. By integrating CO2 capture into the district heating system, ARC's demonstration project aims to show that CO2 capture can be achieved with neutral energy consumption. The tour includes transport from city centre to ARC waste treatment plant + transport from ARC to airport; presentation on Waste treatment in ARC, Waste-to-Energy and Carbon Capture project, guided tour incl. visit at CCS test facilities, lunch as well as an optional visit to the recreational rooftop. Departure by bus from Copenhagen city (bus boarding site to be announced). The tour ends at Copenhagen airport at 14:00.

More information and registration at the conference website.

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