

6th INTERNATIONAL CONFERENCE on

# Smart Energy Systems

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

6-7 October 2020, Aalborg

#SESAAU2020



AALBORG UNIVERSITY  
DENMARK



ONLINE PROGRAMME

LIVE SESSIONS

## Tuesday 6 October at 09:00-11:30

LIVE SESSION

**09:00-11:30** 1st plenary session chaired by Professor Poul Alberg Østergaard

09:00-09:15 Professor Henrik Lund: Opening speech

09:15-10:00 Mogens Lykketoft, former president of the UN General Assembly: On track towards a sustainable future?

10:00-10:15 Short break

10:15-10:45 Catharina Sikow-Magny, Director of the EC Directorate General for Energy: EC Strategy on Energy System Integration

10:45-11:30 Michael Lundgaard Thomsen, Managing Director at Aalborg Portland: Roadmap for sustainable cement production in Denmark

## Wednesday 7 October at 13:15-15:15

LIVE SESSION

**13:15-15:15** 2nd plenary session chaired by Professor Brian Vad Mathiesen

13:15-13:45 Soteris Kalogirou, Professor at Cyprus University of Technology: Renewable Energy Systems - Current status and Prospects In the World

13:45-14:15 Lauren Edelman, Energy Specialist at Facebook: Facebook's commitment to renewable energy and energy efficiency: Innovation and Heat Recovery

14:15-14:45 Panel debate

14:45-15:00 Best Presentation Award ceremony

15:00-15:15 Professor Henrik Lund: Closing speech



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SESSIONS OPEN 2-8 OCTOBER 2020

## Smart energy system analyses, tools and methodologies

**Weena Bergstraesser:** Lessons learned from Excess flow analyses for various district heating systems

**Andra Blumberga:** Achieving Positive Energy Block in historic urban environment: simulation and evaluation of alternative scenarios

**Stef Boesten:** Water to water heat pump for district heating: modeling for MILP optimization and application to a real case study

**Hermann Edtmayer:** Sector Coupling Potentials of a 5th Generation District Heating and Cooling Network

**Thomas Estermann/Elisabeth Springmann:** Method for determining the feasibility of Grid and Ancillary Services by Smart Meters

**Luca Ferrari:** Integrated planning of multi-energy systems (PlaMES): comprehensive modelling framework and decision support tool

**Matteo Giacomo Prina:** Optimization method to obtain marginal abatement cost-curve through EnergyPLAN software

**Hans Christian Gils:** The Contribution of Flexible Sector Coupling to Fully Renewable Electricity Generation in Australia

**Elisa Guelpa:** Maximize the effects of district heating demand response in multi-energy optimization

**Marnoch Hamilton-Jones:** Fault detection and optimization potential on the demand side of district heating systems

**Aleksandar Ivancic:** Evaluation of district energy systems with shared systems for heating and cooling generation

**Joseph Jebamalai:** An Automated Method to Design Multi-Source District Heating Networks with Integrated Thermal Energy Storage – A Case Study

**Hicham Johra:** Using data from smart energy meters to gain knowledge about building clusters connected to district heating networks: A Danish example

**Goran Krajačić:** Modelling the water-energy nexus of the future smart island

**Shravan Kumar:** Comparison of modelling approaches for operational optimization of district cooling networks

**Ari Laitala:** Modelling one hour level heating energy consumption of buildings – can AI algorithms enhance the understanding?

**Thomas Licklederer:** A Thermohydraulic Model of Bidirectional Heat Networks with Prosumers

**Danica Maljkovic:** Evaluation of energy efficiency measures in district heating systems with deep learning

**David Maya-Drysdale:** How scenarios can facilitate local energy planning in cities

**Andrea Menapace:** A flexible methodology to analyse 100 % renewable energy cities

**Steffen Petersen:** Evaluating the temperature performance of Danish building typologies in district heating networks

**Uni Reinert Petersen:** Pathways towards 100% renewable energy on the Faroe Islands

**Stefan Petrović:** An improved modelling of Danish district heating supply and demand in the future energy system

**Marianna Pozzi:** A transparent assessment of retrofit potential in Italy based on open data

**Diego Viesi:** A cost-optimized approach in regional decarbonisation: the integrated and dynamic energy modelling of the Province of Trento

**Fan Zhang:** Night Setback Identification of District Heat Substations using Bidirectional Long Short Term Memory with Attention Mechanism

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

**Theofanis Benakopoulos:** Faults detection and low operating temperatures in radiator system by using data from existing digital heat cost allocators in a multi-family building

**Tom Burton:** Techno-economic assessment of external HIU cupboards on low temperature heat networks

**Michel Gross:** Model based analysis of future district heating networks

**Oddgeir Gudmundsson:** Central heat plant vs decentral temperature boosting in district heating

**Mengting Jiang:** A data-driven approach for fast and accurate dynamic simulation of district heating networks

**Gareth Jones:** Acceptance Testing: Improvement of network performance through standardised dwelling test regime

**Mathias Kersten:** Emission reduction in 4th generation district heat supply networks

**Igor Krupenski:** District cooling system operation in cold climates with existing district heating networks

**Ingo Leusbrock:** DESTOSIMKAFE – Development & rating of technical & organizational system solutions for cold DH to supply heating and cooling

**Graeme Maidment:** Exploring 5th Generation Integrated energy systems

**Sara Månsson:** A taxonomy for labelling deviations in district heating systems

**Thomas Naughton:** Process for optimising heat network performance of existing buildings in the UK

**Ivo Pothof:** Robust thermo-hydraulic design of prosumer district heating networks

**Pavel Rušeljuk:** Economic Dispatch of District Heating Networks via Consumption-Based Management

**Costanza Saletti:** Enabling smart control by optimal management of the State of Charge of district heating networks

**Amos Schledorn:** An advanced optimization-based bidding method for district heating providers considering uncertainty and block bids

**Tim Taylor:** Case study of a 3rd gen CHP district heating system that got updated to a 5th gen system with a shared ground source heat pump system

**Jan Eric Thorsen:** Experience with booster for DHW circulation in multi apartment building

**Riccardo Toffanin:** Impact of Legionella regulation on a 4th generation district heating substation energy use and cost: the case of a Swiss single-family household

**Ulrich Trabert:** Feasibility study and techno-economic evaluation of a DH integration of a river water heat pump at a CHP plant in Germany

**Anna Vannahme:** Comparison of Different District Heating Substation-Systems in a Hardware-in-the-Loop-Test Rig

**Yannick Wack:** Showcasing the potential of adjoint-based topology methods to optimize District Heating Network design on district level

**Sven Werner:** Vocabulary for fourth generation of district heating

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## Components and systems for DH, energy efficiency, electrification and electrofuels

**Louise Christensen:** Thermal comfort and technology acceptance in homes with demand-responsive control of radiator thermostats

**Yuriy Lobunets:** Regenerative Thermoelectric Heat Pump for HVAC Systems

**Dmitry Romanov:** Technical, economic and ecological effects of lowering temperatures in the Moscow district heating system

**Pierre JC Vogler-Finck:** Field experience of data-driven control and monitoring to support energy efficient and flexible building operation

**Benjamin Zühlsdorf:** Model-based fault detection for use in digital twins of large-scale heat pump systems

## Planning and organisational challenges for smart energy systems and district heating

**Dagnija Blumberga:** How to start the waste heat and boiler house competition in Latvia

**Saeid Charani Shandiz:** Towards net-zero emission and energy resilient communities: a multi-dimensional approach to energy master planning

**Hrvoje Dorotić:** Cost and Benefits of Shifting Towards Low Temperature District Heating Networks – Energy Planning Approach

**Leire Gorroño-Albizu:** How could heat consumers' trust in district heating solutions be enhanced? Insights from Denmark and Sweden

**Britta Kleinertz:** District heating supply transformation –Strategies, measures and status quo of network operators transformation phase

**Louise Krog:** 4th generation district heating, consumers, consumer involvement

**Stefano Morgione:** A comprehensive framework for District Energy Systems Upgrade

**Matteo Pozzi:** Supporting Electricity Trading towards XBID implementation through innovative District Energy plant management

**Tars Verschelde:** Case studies on a decision support tool for thermal networks

## Electrification of transport, heating and industry

**Amela Ajanovic:** Impact of coronavirus crisis on electrification of mobility

**Nina Detlefsen:** How electrification of the heating and transportation sector affects the load in low voltage electricity grids

**Christine Gschwendtner:** Uncertain impacts of technology, infrastructure, and vehicle use types on the integration of Vehicle-to-grid (V2G) into distribution networks

**Reinhard Haas:** The correlation between variable renewable energy sources and energy demand for heating&cooling

**Sajjad Haider:** Uncontrolled Electric Vehicle Charging in Low Voltage Grids – Impacts

**Simon Meunier:** Towards mapping grid reinforcement costs from residential low-carbon technologies penetration in Europe

**Adrian Ostermann:** Potential of vehicle to grid charging control of electric vehicles in congestion management

**Niklas Wulff:** Vehicle Energy Consumption in Python (VencoPy): Presenting and demonstrating an open source tool to calculate electric vehicle charging flexibility

**Meng Yuan:** The role of transportation electrification in the energy transformation of urban agglomerations: A case study of Beijing-Tianjin-Hebei region

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## Smart energy infrastructure and storage options

**Diederik Coppitters:** Epistemic and aleatory uncertainty quantification of a grid-connected photovoltaic system with battery storage and hydrogen storage

**Christine Damgaard Asmussen:** Optimizing a grid-connected household photovoltaic installation in Denmark

**Steven Dijkstra-Downie:** Energy Strategy for Expanding Scottish Towns Greenspaces, waterbodies, shared ambient loops, heat pumps and PV to heat and power town growth projects

**Julian Formhals:** Dynamic transition to a renewable and efficient campus solar district heating grid with integrated medium deep borehole thermal energy storage

**Luka Herc:** Economic viability of flexibility options for smart energy systems with high share of renewable energy

**Martin Heine Kristensen:** Heat load demand response experiment in social housing apartments using wireless radiator setpoint control

**Poul E. Kristensen:** Wind + sun for 100% RE heating of buildings

**Kertu Lepiksaar:** Increasing CHP flexibility to improve energy system efficiency

**Rasmus Lund:** Combined heat and power storage: Feasibility in a national renewable energy system context

**Johannes Röder:** Decentral Heat Storages in System-Beneficial District Heating Systems – an Integrated Optimization Approach

**Ligang Wang:** Converting wastes efficiently and flexibly for grid-balancing services and sector coupling

## Institutional and organisational change for smart energy systems and radical technological change

**Gatis Bazbauers:** Linking energy efficiency policies toward 4th generation district heating system

**Andrej Guminski:** Holistic evaluation scheme for industrial greenhouse gas abatement measures – bringing together research and practice

**Andreas Müller:** How much to invest? Balancing investment costs and economic benefits of reducing the temperature levels in existing district heating networks

**Robert Pratter:** HEATflex: Development of a common technical & economic strategy to increase the competitiveness of CHP & district heating plants

**Callum Rae:** Practical learnings from deployed Smart Local Energy Systems: technical barriers to scale-up

**Leon Joachim Schwenk-Nebbe:** CO2 quota attribution effects on the European electricity system

**Daniel Møller Sneum:** Flexibility in the interface between district energy and the electricity system

**Karl Vilén:** The Impact of Climate Policy on the District Heating System in a Nordic city

**Behnam Zakeri:** Aftermath of COVID19 and the Energy Sector: Is a green recovery from economic slowdown possible?

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## Energy savings in the electricity sector, buildings, transport and industry

**Debmalya Biswas:** Reinforcement Learning based HVAC Optimization in Factories

**Henrik Brink:** Identifying optimisation potential in electricity consumption profiles from hourly smart meter data at scale

**Daniel Heidenthaler:** Thermally activated building systems in wooden structures

**Marcus Hummel:**  
Using least cost renovation combinations in buildings for developing future heat demand density maps: case studies in three cities in Europe

**Paolo Leoni:** Lowering the operating temperatures in old-generation district heating systems: first results from the TEMPO demonstration project in Brescia (Italy)

**Antoine Levesque:** Decarbonising buildings energy services through demand and supply

**Chiara Piccardo:** Life cycle cost and primary energy analysis of a multi-storey residential building retrofit to different energy levels with varied materials

**Sverre Stefanussen Foslie:** Integrated heating and cooling in the industry through heat pumps and thermal energy storages – case study of an electrified dairy

**Dimitra Tzani:** Different portfolios of measures to improve efficiency in the residential sector in Greece towards the achievement of the 2030 targets

## The production, technologies for and use of electrofuels in future energy systems

**Christian Bundgaard:** System Effects of Implementing Electrofuels for Decarbonisation of the Transport Sector in a Danish Perspective

**Tobias Hübner:** Simulation-based analysis of synthetic fuels in the industry in relation to climate protection level

**René Kofler:** Comparison of different biorefinery systems integrating the electricity, heating and transport sector

**Xavier Rixhon:** The role of electro-energy carriers under uncertainties for Belgian energy transition

**Hamam Soliman:** Contribution of Power-to-X-to Power in retrofitting of Coal-Fired Power Plants

**Christian Thommessen:** Techno-economic System Analysis of an Offshore Energy Hub and Outlook of Electrofuel Applications

**Kevin Verleysen:** Influence of parametric and operational uncertainties on the dynamic operation of the Haber-Bosch synthesis process for seasonal hydrogen storage

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## Integrated energy systems and smart grids

**Hamza Abid:** Energy storage integration with solar PV for increased electricity access: A case study of Burkina Faso

**Matthias Greiml:** Assessing usage of power-to-gas as an alternative to electricity grid expansion to increase photovoltaic generation in south-east Austria

**Bastian Hase:** Using Short-Time Storage Potentials of Run-of-River Hydroelectric Plants for Frequency Control

**Gauthier Limpens:** Intermittent renewable energy integration: assessing the benefits of the flexibility options

**Pia Manz:** Future synergies of industrial excess heat potentials and buildings energy demand in Germany

**Torben Ommen:** Economic feasibility of fuel-shift appliances supplied by gas, electricity and district heating in Denmark

**Frederik Palshøj Bigum:** Real-scale integrated renewable energy systems

**Dietrich Schmidt:** Digitalisation of district heating systems

**Vittorio Verda:** Challenges in adoption of district cooling in densely populated areas

**Marta Victoria:** Early decarbonisation of the European energy system pays off

## Geographical Information Systems (GIS) for energy systems, heat planning and district heating

**Alice Dénarié:** Assessment of renewable and waste heat recovery in DH through GIS mapping: the national potential in Italy

**Mostafa Fallahnejad:** District Heating Grid Planning

**Fabrizio Fattori:** A Regression Model to Estimate the Dwelling-Network Connection Length Starting from Aggregated Information per Census Area

**Markus Groissböck:** Energy hub optimization framework based on open-source (software & data) – Review of frameworks and concept for districts & industrial complexes

**Morten Karstoft Rasmussen:** Data driven asset management – online distribution grid analysis based on GIS and meter consumption data

**Nina Kicherer:** Design of a District Heating Roadmap for Hamburg

**Hannes Koch:** Rooftop photovoltaic - an algorithmic solution for obtaining total potential power generation by processing solar irradiance data

**Samuel Macchi:** A validated method to simulate district heating network topologies to enable assessing district heating cost

**Johannes Pelda:** FERNWÄRMEATLAS – An Online Tool to Collect Information about District Heating Systems in Germany

**Abdulraheem Salaymeh:** Determination of the district heating supply structure based on geospatial and statistical data

**Martin Santa Maria:** District heating system optimization with RIVUS, Case study Salzburg

**David Schmidinger:** Assessment of future heat demand and supply with the HOTMAPS toolbox: A case study for San Sebastian

**Giulia Spirito:** Potential diffusion of renewable based 3GDH and 4GDH assessment through energy mapping: a case study in Milano

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## Special session on Innovating SMEs

**Hans Jørgen Brodersen:** Turning SME ideas into New Smart Energy Solutions

**Bo Eskerod Madsen:** Clamp-on Monitoring of Energy from the Outside of Existing Multiconductor Cables and Pipes

**Bjarke Henriksen:**  
Total Building Automatic Energy Management

**Mario Javier Rincón:**  
Micro-ORC Technology Development

**Henning Schmidt-Petersen:** Biomass treatment - How to turn a problem into a resource

## Renewable energy sources and waste heat sources for district heating

**Lina Aglén:** Potential of unutilised waste-heat possible to incorporate into UK district heating production

**Lisa Altieri:** Selecting the right heat source in an ultra-low temperature heating network

**Helge Averfalk:** Low-temperature excess heat recovery in district heating systems: The potential of European Union metro stations

**Federico Bava:** Feasibility analysis of renewable DHC concepts in different climatic zones

**Roman Geyer:** Implementation of low-temperature district heating and its benefits

**Stefan Holler:** Feasibility study on solar thermal process heat in the beverage industry

**Anna Kallert:** A Showcase Project: 4th Generation District Heating in Moosburg an der Isar

**Hironao Matsubara:** Heat Roadmap Japan: Smart energy system combining renewable energy and district energy to decarbonize urban area in Japan

**Wiebke Meesenburg:** Flexible heat supply from supermarket refrigeration systems

**Francesco Mezzera:** District heating potential in a hydrogen-based energy system - An exploratory focus on Italy

**Peter North:** A pathway towards the heat autonomous city

**Henrik Pieper:** Ranking of heat sources and sinks based on seasonal performance estimation and demands for heating and cooling areas

**Tobias Reiners:** Waste heat from mine water in an ultra low temperature district heating network

**Akos Revesz:** Waste heat integration into heat networks; a UK wide assessment

**Brage Rugstad Knudsen:** Demand-side management for reducing peak-heating costs in a local low-temperature district heating grid with waste-heat utilization

**Dirk Vanhoudt:** TEMPO - Results of the first temperature reduction measures in the demo sites

**Jelena Ziemele:** A multi-factorial decision support tool for integration of small-scale industrial heat pumps and solar PVs into a district heating system



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