

9th International Conference on

# Smart Energy Systems

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

PROGRAMME COPENHAGEN

TUESDAY 12 SEPTEMBER 2023

08:00-09:00

Registration and breakfast

Plenary room

09:00-10:30

**Smart Energy Systems in the light of the current security crisis** - 1<sup>st</sup> plenary session chaired by Professor Poul Alberg Østergaard

09:00-09:10

**Professor Henrik Lund and CEO Glenda Napier:** Opening speech

## Plenary keynotes

09:15-09:30

**Kristian Jensen, CEO Green Power Denmark:** Energy security <-> secure energy

09:30-09:45

**Christina Grumstrup Sørensen, Senior partner Copenhagen Infrastructure Partners:** Supplier of green capital to large-scale renewable energy projects

09:45-10:00

**Philip Cole, Director WindEurope:** Accelerating Wind Energy Growth in Europe: A Call for Robust Industrial Policy

10:00-10:30

Questions and debate

10:30-10:45

Short break

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## 10:45-12:30 Parallel sessions 1-7

<p><b>10:45-12:30</b>  <b>ROOM:</b> Hovedbanegården</p> <p><b>Session 1: Smart energy systems analyses, tools and methodologies</b></p> <p><b>Chaired by Matteo Giacomo Prina</b></p> <p><b>Session keynote Gorm Bruun Andresen:</b> Exploring 2030 decarbonization scenarios of the European electricity sector using Modeling All Alternatives</p> <p><b>Thibaut Wissocq:</b> Strategies for decarbonisation of a heat district network using an optimization tool: Application to Grenoble city</p> <p><b>Jan Stock:</b> Automated separation of existing district heating networks for the utilisation of available heat sources</p> <p><b>Nicolas Marx:</b> Heat transmission network design optimization and robustness analysis for a case study in Tyrol</p> <p><b>Sina Dibos:</b> Development of the simulation tool HeatNetSim for thermal networks</p> <p><b>Saltanat Kuntuarova:</b> Design and simulation of district heating and cooling networks: A review of modelling approaches and tools</p>	<p><b>10:45-12:30</b>  <b>ROOM:</b> Kødbyen</p> <p><b>Session 2: Smart energy infrastructure and storage options</b></p> <p><b>Chaired by Benedetto Nastasi</b></p> <p><b>Session keynote Kristian Honoré:</b> The age of Digitalization and Flexibility - from consumer to FLEXUMER in the district heating system</p> <p><b>Matteo Pozzi:</b> Digitalisation of the DHC industry: a review by DHC+ and Euroheat &amp; Power</p> <p><b>Maximilian Bernecker:</b> The Value of Information – How Enhanced Load Profiles Save Costs for Local Congestion Management</p> <p><b>Pascal Häbig:</b> Quantifying the Standardization Gap in Smart Energy Systems: Standardizing Information and Communication Interfaces for Small-Scale Flexibility</p> <p><b>Lukas Hofmann:</b> How seasonal heat storage can benefit power system flexibility and power-to-heat integration? An optimisation on the scale of the French territory.</p> <p><b>Anna Vannahme:</b> Study of the optimization of an existing local district heating network with an increasing degree of digitalization</p>	<p><b>10:45-12:30</b>  <b>ROOM:</b> Enghave Plads</p> <p><b>Session 3: Integrated energy systems and smart grids</b></p> <p><b>Chaired by Paula Ferreira</b></p> <p><b>Session keynote Sílvia Ricciuti:</b> Modelling the optimal transition of an urban neighborhood towards an energy community and a Positive Energy District</p> <p><b>Miguel Chang:</b> Energy transition scenarios on Norwegian islands: The case of Utsira</p> <p><b>Kushagra Gupta:</b> Integrated Assessments of City Energy Systems: City Planning Vs National Targets</p> <p><b>Dana Kirchem:</b> Power sector effects of different roll-outs of flexible versus inflexible heat pumps</p> <p><b>Rasul Satymov:</b> From Winter Wind to Summer Sun: Unlocking the Arctic Region's Renewable Energy Potential</p> <p><b>Abdulrahman Azzam:</b> Intelligent Operation Management System for Urban Districts – Conceptualization of a Dynamic Simulation as a Foundation for a Digital Twin</p>	<p><b>10:45-12:30</b>  <b>ROOM:</b> Tivoli</p> <p><b>Session 4: Institutional and organisational change for smart energy systems and radical technological change</b></p> <p><b>Chaired by Iida Tetsunari</b></p> <p><b>Session keynote Bent Ole Gram Mortensen:</b> Consumer empowerment in a time of change in the energy sector</p> <p><b>Hironao Matsubara:</b> Design of smart energy system for decarbonization leading areas in Japan</p> <p><b>Zhe Zhang:</b> Challenges of setting up energy communities involving the Danish public sector: lessons learned</p> <p><b>Daniel Møller Sneum:</b> End-users' up-front payments in district heating: Striking the balance between competitive price and long-term risk</p> <p><b>Nina Kicherer:</b> District heating organizational models for a cost-effective energy transition</p> <p><b>Kristina Lygnerud/Nathalie Fransson:</b> Business models for low temperature district heating - 10 case studies</p>	<p><b>10:45-12:30</b>  <b>ROOM:</b> Vesterbros Torv</p> <p><b>Session 5: Energy savings in the electricity sector, buildings, transport and industry</b></p> <p><b>Chaired by Ulrike Jordan</b></p> <p><b>Session keynote Pernille Seljom:</b> The value and impact of building mass upgrade on the Norwegian energy system transition</p> <p><b>Enrico Ghidoni:</b> Analysis of the impact of energy savings interventions on key performance indicators of a university campus</p> <p><b>Christopher Graf:</b> Domestic Hot Water Preparation in Residential Buildings: Comparison of Current Challenges and Future Solutions</p> <p><b>Peter Lierhammer:</b> Proposal of a Modular Management System to Quantify Suitable Smart Heating Approaches in Existing Buildings</p> <p><b>Valentin Kaisermayer:</b> Intelligent Building Control with User Feedback in the Loop</p> <p><b>Lucas Verleyen:</b> Positive energy districts – Performance assessment of different collective energy systems in a tiny residential cluster of buildings</p>	<p><b>10:45-12:30</b>  <b>ROOM:</b> Kastrup Lufthavn</p> <p><b>Session 6: 4th generation district heating concepts, future district heating production and systems</b></p> <p><b>Chaired by Graeme Maidment</b></p> <p><b>Session keynote Lei Wang:</b> Case study of a local district heating expansion scenario n scenario within the framework of EMB3Rs</p> <p><b>Els van der Roest:</b> Flexibility of a low temperature District Heating system with Power-to-Heat and ATEs</p> <p><b>Henrik Pieper:</b> Heat pump configurations for aquifer thermal energy storage</p> <p><b>Jakub Garbacik:</b> Heat pumps with thermal energy storage for district heating – standalone or integrated with fossil fuel heat plant</p> <p><b>Thomas Schmidt:</b> Emission-free heat supply for a large new residential area with a smart combination of natural heat sources</p>	<p><b>10:45-12:30</b>  <b>ROOM:</b> Spisehuset</p> <p><b>Session 7: Renewable energy sources and waste heat sources including PtX for district heating</b></p> <p><b>Chaired by Iva Ridjan Skov</b></p> <p><b>Session keynote Ieva Pakere:</b> Optimizing Energy Independence for Achieving Climate Neutrality Goals</p> <p><b>Hamza Abid:</b> Existing and future potential hydrogen demands in Europe</p> <p><b>Gabriele Humbert:</b> Optimal sizing and operation of hydrogen generation sites with waste heat recovery for district heating network integration</p> <p><b>Stefan Reuter:</b> Optimizing the Domestic Production and Infrastructure for Green Hydrogen in Austria for 2030</p> <p><b>Doris Beljan:</b> Utilization of the available offshore wind potential - case study for the North Adriatic with the focus on HVDC, hydrogen and ammonia infrastructure</p> <p><b>Maximilian Fey:</b> A combined stochastic wind power forecasting and operational optimisation approach for off-grid offshore green hydrogen</p>
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## 13:45-15:30 Parallel sessions 8-14

<p><b>13:45-15:30</b>  <b>ROOM:</b> Hovedbanegården</p> <p><b>Session 8: Smart energy systems analyses, tools and methodologies</b>  <b>Chaired by Gorm Bruun Andresen</b></p> <p><b>Session keynote John Counsell:</b> Intelligently Controlled Solar Powered Energy Storage &amp; Air-Source Heat Pump Home Heating System</p> <p><b>Ari Laitala:</b> A hybrid city – how the combined production curve of solar and wind electricity looks like in urban locations?</p> <p><b>Kertu Lepiksaar:</b> Integration of solar energy into district heating and cooling systems – Tallinn case study</p> <p><b>Gerd Hofmann:</b> Decarbonizing Municipal Utilities: A Strategy for Achieving CO<sub>2</sub>-Neutrality by 2035</p> <p><b>Mominul Hasan:</b> Techno-economic and geospatial opportunities for meeting Bangladesh's energy demand by solar PV systems</p>	<p><b>13:45-15:30</b>  <b>ROOM:</b> Kødbyen</p> <p><b>Session 9: CCUS and PtX technologies and the production and use of electrofuels in future energy systems</b>  <b>Chaired by Anders Bavnhøj Hansen</b></p> <p><b>Session keynote Carina Jensen:</b> Accelerating Green Transition: Scaling CCUS Technologies and Green Fuels towards Denmark's Climate Goals</p> <p><b>Lazaara Ilieva:</b> Toward holistic sustainability assessments of CCUS pathways</p> <p><b>Nikola Mößner:</b> Modelling the flexibility of process engineering PtX processes to achieve dynamic operation with volatile energy availability</p> <p><b>Dirk Vries:</b> Control strategies for flexible hydrogen production by a 2.5MW electrolyser stack supplying a filling station</p> <p><b>Andreas Krogh:</b> Economic and environmental feasibility of biofuel production facilities based on a Geographical Information System approach</p>	<p><b>13:45-15:30</b>  <b>ROOM:</b> Enghave Plads</p> <p><b>Session 10: Planning and organisational challenges for smart energy systems and district heating</b>  <b>Chaired by Bent Ole Gram Mortensen</b></p> <p><b>Session keynote Steen Schelle Jensen:</b> Consumers role in the transition to low temperature heat networks</p> <p><b>Seán Harty:</b> Starting a district heating network in locations with no experience of district heating</p> <p><b>Alessandro Capretti:</b> City-scale, multi-year and multi-stakeholder optimal district heating network developments planning</p> <p><b>Andreas Möbius:</b> Heat transformation tool to support communities with “municipal heating planning”</p> <p><b>Hinnerk Willenbrink:</b> The new housing area "Warendorf In de Brinke" - 5GDH: from project to principle?</p> <p><b>Thomas Haupt:</b> Cost-optimized decarbonization strategy for an existing residential area in Germany</p>	<p><b>13:45-15:30</b>  <b>ROOM:</b> Tivoli</p> <p><b>Session 11: GIS for energy systems, heat planning and district heating</b>  <b>Chaired by Lei Wang</b></p> <p><b>Session keynote Robbe Salenbien:</b> Using geographically informed non-linear district heating topology design to support higher level assessment methodologies for the potential of DHN</p> <p><b>Hyunkyo Yu:</b> Heat planning in a rural municipality</p> <p><b>Marvin Schnabel:</b> Interactive geodata analyses to support the multi-stakeholder process of thermal energy planning</p> <p><b>Giovanni Dalle Nogare:</b> GIS tool for the individuation of waste heat recovery opportunities</p> <p><b>Shravan Kumar:</b> Integrating excess heat in district energy systems based on a long-term spatiotemporal and dispatch optimisation</p> <p><b>Juan Pedrero:</b> Review of georeferenced energy planning tools and methods for the assessment of decarbonization scenarios</p>	<p><b>13:45-15:30</b>  <b>ROOM:</b> Vesterbros Torv</p> <p><b>Session 12: Components and systems for district heating, energy efficiency, electrification and electrofuels</b>  <b>Chaired by Jacek Kalina</b></p> <p><b>Session keynote Stefan Hay:</b> Sustainable Asset Management District Heating - a Future Perspective</p> <p><b>Jonas Ottosson:</b> Accelerate your growth of DHC with Demand Side Flexibility</p> <p><b>Myeongsik Kong:</b> Risk of pipe fault analysis process for safety diagnosis of district heating network pipe</p> <p><b>Martin Buitink:</b> Effects of smart control of PVT heat pump systems on PV self-consumption</p> <p><b>Gerald Zotter:</b> Using of a special heat pump to lift the district heating supply temperature for an industrial facility</p> <p><b>Ding Mao:</b> Study on the identification of critical pipe segments and reliability design methods for district heating networks based on vulnerability</p>	<p><b>13:45-15:30</b>  <b>ROOM:</b> Kastруп Lufthavn</p> <p><b>Session 13: Renewable energy sources and waste heat sources including PtX for district heating</b>  <b>Chaired by Dagnija Blumberga</b></p> <p><b>Session keynote Anna Volkova:</b> Waste Heat-Based District Heating Network for Industrial Buildings With Low Energy Intensity</p> <p><b>Max Fette:</b> CHG: what are the potentials and barriers of using the waste heat of electrolyzers and how can it be utilised?</p> <p><b>Markus Fritz:</b> What to do with the excess heat? - Assessing the techno-economic potential of different excess heat transport technologies in the European Union</p> <p><b>Bjarne Jürgens:</b> Covering district heating demand by waste heat usage from data centres – a feasibility study in Frankfurt, Germany</p> <p><b>Henrique Lagoeiro:</b> The Potential of Crematoria as Waste Heat Resources in the UK</p> <p><b>Jelena Ziemele:</b> Potential of treated wastewater as an energy source for district heating: a multi-factorial comparative assessment for the cities of London and Riga</p>	<p><b>13:45-15:30</b>  <b>ROOM:</b> Spisehuset</p> <p><b>Session 14: Integrated energy systems and smart grids</b>  <b>Chaired by Ralf-Roman Schmidt</b></p> <p><b>Session keynote Jan Eric Thorsen:</b> Sønderborg (DK) case example of district heating sector coupling and the related control solution</p> <p><b>Sverre Stefanussen Foslie:</b> Leveraging industrial flexibility, sector coupling and wind power production to mitigate power grid capacity limitations</p> <p><b>Sigurd Bjarghov:</b> Coordination mechanisms in local energy communities for connection of industry in congested grids</p> <p><b>Costanza Saletti:</b> Concurrent optimal management of communities of multi-energy prosumers</p> <p><b>Thanh Huynh:</b> Local energy market for thermal-electric energy systems with consideration of temperature flexibility in heating subnetworks</p> <p><b>Christian Schützenhofer:</b> Industrial energy demand and GHG emission scenarios under changing technologies</p>
<p><b>15:30-16:00</b> Coffee break</p>						

## 16:00-17:30 Parallel sessions 15-21

<p><b>16:00-17:30</b>  <b>ROOM:</b> Hovedbanegården</p> <p><b>Session 15: Electrification of transport, heating and industry</b></p> <p><b>Chaired by Peter Jorsal</b></p> <p><b>Session keynote Oliver Ruhnau:</b> Representing electric vehicles in energy system models: an accurate and scalable aggregation approach</p> <p><b>Alaize Dall'Orsoletta:</b> The systemic impacts of electric vehicles' uptake: A conceptual model</p> <p><b>Benjamin Blat-Belmonte:</b> Smart Energy Systems and Electrified Transport: Analyzing the Flexibility Potential of Bus Fleet Operators in Germany</p> <p><b>Noémie Jeannin:</b> From PV to EV: Mapping the Potential for Electric Vehicle Charging with Solar Energy in Europe</p> <p><b>Judith Stute:</b> How do dynamic electricity tariffs and dynamic grid charges interact?</p>	<p><b>16:00-17:30</b>  <b>ROOM:</b> Kødbyen</p> <p><b>Session 16: Smart energy systems analyses, tools and methodologies</b></p> <p><b>Chaired by Erik Ahlgren</b></p> <p><b>Session keynote Sara Månsson:</b> Enhancing Efficiency and Reliability in 4th Generation District Heating: Insights from Automated Fault Detection Implementations</p> <p><b>Maximilian Roth:</b> SlothBrAIIn: a holistic energy operating system</p> <p><b>Pia Manz:</b> Heating density as main factor for district heating: Empirical data analysis and outlook</p> <p><b>Cameron Downing:</b> A Simulink Based Dynamic Home Heating Model Calibrated with BREDEM 12</p> <p><b>Alessandro Sartori:</b> Optimizing the integration of renewable energy sources, energy efficiency, and flexibility solutions in a multi-network pharmaceutical industry</p>	<p><b>16:00-17:30</b>  <b>ROOM:</b> Enghave Plads</p> <p><b>Session 17: Smart energy systems analyses, tools and methodologies</b></p> <p><b>Chaired by Richard van Leeuwen</b></p> <p><b>Session keynote Matteo Giacomo Prina:</b> Machine learning with EPLANopt to speed up the optimization process and explore uncertainty in energy system modelling</p> <p><b>Pascal Friedrich:</b> Effects of network model simplifications in local heat markets on district heating system operation</p> <p><b>Rasmus Magni Johannsen:</b> Developing energy system scenarios for municipalities - introducing MUSEPLAN</p> <p><b>Goran Stunjek:</b> Data-Based Correlation Analysis and Modelling of Water and Energy Systems on an Island Using Renewable Energy Sources for Desalination</p> <p><b>Julia Eicke:</b> Development of simplified models for future district heating networks</p>	<p><b>16:00-17:30</b>  <b>ROOM:</b> Tivoli</p> <p><b>Session 18: Planning and organisational challenges for smart energy systems and district heating</b></p> <p><b>Chaired by Stefan Holler</b></p> <p><b>Session keynote Ralf-Roman Schmidt:</b> Risk minimization for decarbonizing heating networks via network temperature reductions and flexibility utilization – concepts and measures</p> <p><b>Maarten Blommaert:</b> Automated Design Strategies for Low-Temperature District Heating Networks with Multiple Producers</p> <p><b>Mostafa Fallahnejad:</b> Validation of calculated heat demand of the building stock using consumption data under GDPR</p> <p><b>Peter Lorenzen:</b> A new classification for district heating activities and the gap of a comprehensive methodology for the green transition</p> <p><b>Lucy Sherburn:</b> Development of a heat network typology for use within a heat network technical assurance scheme</p>	<p><b>16:00-17:30</b>  <b>ROOM:</b> Vesterbros Torv</p> <p><b>Session 19: Smart energy systems analyses, tools and methodologies</b></p> <p><b>Chaired by Steen Schelle Jensen</b></p> <p><b>Session keynote Paula Ferreira:</b> Citizens' attitudes towards energy policy to foster the energy transition</p> <p><b>Xavier Rixhon:</b> Robust policy optimization for the pathway towards a sustainable energy system using a hierarchical multi-objective reinforcement learning approach</p> <p><b>Arnau Aliana:</b> Policy representation in Energy System Models in context of Sector Coupling: A review</p> <p><b>Nicolas Ghuyts:</b> Integrating Energy System Optimization and Life Cycle Assessment for a Comprehensive Assessment of Sustainable Energy Transitions</p> <p><b>Paolo Thiran:</b> The role of renewable fuels in a fossil-free European whole-energy system</p>	<p><b>16:00-17:30</b>  <b>ROOM:</b> Kastrup Lufthavn</p> <p><b>Session 20: CCUS and PtX technologies and the production and use of electrofuels in future energy systems</b></p> <p><b>Chaired by Urban Persson</b></p> <p><b>Session keynote Diederik Coppitters:</b> Evaluating the Environmental Impacts of Importing Electrofuels Using Planetary Boundaries: A Multi-Objective Optimisation Approach</p> <p><b>Federico Parolin:</b> The role of electrofuels in carbon-neutral scenarios of multi-sector integrated energy systems: An analysis for Italy</p> <p><b>Aurélia Hernandez:</b> Hydrogen in Power System Adequacy Studies</p> <p><b>Eliana Lozano:</b> Integrated e-methanol and drop-in fuels HTL platform –Techno-economic assessment for flexible operation</p> <p><b>Shivaraj Chandrakant Patil:</b> Current and Emerging Technologies for Waste-to-Energy Conversion: A Comparative Study with Multi-criteria Decision analysis approach</p>	<p><b>16:00-17:30</b>  <b>ROOM:</b> Spisehuset</p> <p><b>Special session: IEA DHC Annex TS7</b></p> <p><b>Chaired by Christian Schützenhofer</b></p> <p><b>Peter Sorknæs:</b> Reviewing Methods for Identifying Waste Heat Potentials for District Heating</p> <p><b>Gabriela Jauschnik:</b> How can industrial waste heat be used in district heating networks? Insights on effective project initiation and business models</p> <p><b>Thomas Kohne:</b> Planning District Heating Connections of Multi-Modal Industrial Energy Systems: Optimization Approach from an Industrial Perspective</p> <p><b>Lukas Theisinger:</b> Living Lab DELTA: Development of an Interacting Energy-Optimized Industrial District</p>
<p><b>17:30</b></p> <p><b>19:30</b></p>	<p><b>Break</b></p> <p><b>Conference dinner at Enghavevej 82B, 2450 Copenhagen</b></p>					

## 09:00-10:45 Parallel sessions 22-28

<p><b>09:00-10:45</b>  <b>ROOM:</b> Hovedbanegården</p> <p><b>Session 22: Smart energy systems analyses, tools and methodologies</b></p> <p><b>Chaired by Ieva Pakere</b></p> <p><b>Session keynote Ard de Reus:</b> Real-time non-linear optimization of three district-heating connected heat pumps and a buffer with a Digital Twin</p> <p><b>Jelger Jansen:</b> Model predictive control of a 4th generation district heating network – comparison with rule-based control and impact of prediction uncertainties</p> <p><b>Daniël Bakker:</b> Advancing the use of datacenter waste heat, solar thermal, power-to-heat and heat storage with a digital twin for district heating supply in Groningen</p> <p><b>Hermann Edtmayer:</b> Virtual reality digital twin for immersive energy research and communication</p> <p><b>Benedetto Nastasi:</b> Digitalization and Smartness of Energy Systems from interactive models to Digital Twins</p> <p><b>Kevin Michael Smith:</b> Utilizing Digital Twins to Optimize District Heating Substations and Minimize Return temperatures</p>	<p><b>09:00-10:45</b>  <b>ROOM:</b> Kødbyen</p> <p><b>Session 23: Integrated energy systems and smart grids</b></p> <p><b>Chaired by Costanza Saletti</b></p> <p><b>Session keynote Andra Blumberga:</b> When does Energy Island transfer to Energy Community?</p> <p><b>Christine Nowak:</b> Integrated energy system flexibility options when using heat pumps to save carbon emissions</p> <p><b>Igor Krupenski:</b> Geothermal energy implementation in Estonian District Heating Networks</p> <p><b>Joseph Jebamalai:</b> Optimization of thermal energy storage in district heating systems using Comsof Heat and GBOML</p> <p><b>Jim Rojer:</b> Dynamic GROW Model for Heat District Network feasibility by Techno-economic Planning and Design Optimization with a Mixed Integer Linear strategy</p> <p><b>Lukas Peham:</b> Implementation of a lifetime prediction model for crosslinked, foamed polyolefin insulation of pit thermal energy storages</p>	<p><b>09:00-10:45</b>  <b>ROOM:</b> Enghave Plads</p> <p><b>Session 24: Smart energy infrastructure and storage options</b></p> <p><b>Chaired by Anders N. Andersen</b></p> <p><b>Session keynote Miguel Herrador Moreno:</b> Design of a renewable district heating and cooling plant for a university Campus in Cyprus</p> <p><b>Alaa Farhat:</b> A Novel Aggregator Algorithm for Coordinated Control of Multiple Battery Energy Storage Systems</p> <p><b>Zhiyuan Xie:</b> Interactions between energy storage and electricity prices in a highly renewable energy system for Europe</p> <p><b>Sleiman Farah:</b> Investment-based optimisation of energy storage parameters in a grid-connected hybrid renewable energy system</p> <p><b>Mathieu Peeters:</b> Optimal Extension Planning of District Heating Networks by Phased Investment</p> <p><b>Ebbe Kyhl Gøtske:</b> Cost and efficiency requirements for a successful electricity storage in a highly renewable European energy system</p>	<p><b>09:00-10:45</b>  <b>ROOM:</b> Tivoli</p> <p><b>Session 25: 4th generation district heating concepts, future district heating production and systems</b></p> <p><b>Chaired by Jan Eric Thorsen</b></p> <p><b>Session keynote Marek Brand:</b> Economic comparison of 4GDH&amp;C and 5GDH&amp;C in Rome</p> <p><b>Niklas Kracht:</b> Feasibility study of an innovative drilling method for inclined medium-deep borehole heat exchangers in a 5th generation district heating concept</p> <p><b>Seyed Shahabaldin Tohidi:</b> Optimal price signal generation for local energy management using flexibility function</p> <p><b>Lucien Genge:</b> Evaluating Germany's Ammonia Economy: A Comprehensive Analysis of Application-Specific Demands and Well-to-Tank Supply Costs</p> <p><b>Şirin Alibaş:</b> Hybrid heat pump systems as bridging technology in the natural gas independence of Germany's residential buildings</p> <p><b>Alessandro Maccarini:</b> Techno-economic evaluation of 4th and 5th gen. DH networks and comparing to individual heat pumps: Idea and concept of a simple decision support tool</p>	<p><b>09:00-10:45</b>  <b>ROOM:</b> Vesterbros Torv</p> <p><b>Session 26: 4th generation district heating concepts, future district heating production and systems</b></p> <p><b>Chaired by John Counsell</b></p> <p><b>Session keynote Graeme Maidment:</b> Energy Superhubs - the use of supermarkets as local energy centres</p> <p><b>Orestis Angelidis:</b> Operational Designs for District Heating and Cooling Networks with Decentralized Energy Substations: Development and Validation</p> <p><b>Daniel Zinsmeister:</b> Flow direction in district heating and cooling grids with booster heat pumps: Does it make sense to have unidirectional flow?</p> <p><b>Aleksandr Hlebnikov:</b> Evaluation of a Technical Solution for Seawater District Heating and Cooling Systems</p> <p><b>Rahul Mohandasan Karuvinal:</b> Analyzing Complex Network Hydraulics and Control Strategies in Cold District Heating Networks via Dynamic Thermo-Hydraulic Simulations</p> <p><b>Aadit Malla:</b> Modelling the potential for district cooling</p>	<p><b>09:00-10:45</b>  <b>ROOM:</b> Kastrup Lufthavn</p> <p><b>Session 27: Renewable energy sources and waste heat sources including PtX for district heating</b></p> <p><b>Chaired by Peter Sorknæs</b></p> <p><b>Session keynote Thomas Pauschinger:</b> IEA DHC Annex T55 – Integration of Renewable Energy Sources into existing District Heating and Cooling Systems</p> <p><b>Frederik Feike:</b> Different scenarios for the decarbonization of a campus district heating system</p> <p><b>Giulia Spirito:</b> Has the global energy crisis enhanced the potential of district heating?</p> <p><b>Luis Sánchez-García:</b> Viability of district heating networks in temperate climates: Benefits and barriers of cold and warm temperature networks</p> <p><b>Carina Seidnitzer-Gallien:</b> Transition of district heating and cooling systems to a higher share of renewable energy sources - Outcomes from six European countries</p> <p><b>Frederik Dahl Nielsen:</b> Case study of local sector coupling strategies for e-methanol synthesis</p>	<p><b>09:00-10:45</b>  <b>ROOM:</b> Plenary room</p> <p><b>Session 28: Smart energy infrastructure and storage options</b></p> <p><b>Chaired by Matteo Pozzi</b></p> <p><b>Session keynote Daniel Trier:</b> Simple real time monitoring of large thermal storages</p> <p><b>Toke Kjær Christensen:</b> The Role of Thermal Energy Storages in Smart Energy Systems</p> <p><b>Torstein Balle:</b> Inspection of added thermal storage to increase the match of consumption and renewable generation, analysed for domestic heating on the Faroe Islands</p> <p><b>Karl Vilén:</b> The role of Thermal Energy Storages in Future Heating system – A Long-term Study of an Evolving Heating System</p> <p><b>August Brækken:</b> Energy system modelling of a future zero-emission neighbourhood with seasonal thermal energy storage</p> <p><b>Emanuela Marzi:</b> Coordinating multiple Power-to-Gas plants for optimal management of e-fuel seasonal storage</p>
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# PROGRAMME COPENHAGEN

# WEDNESDAY 12 SEPTEMBER 2023

## 11:15-13:00 Parallel sessions 29-35

11:15-13:00

ROOM: Hovedbanegården

**Session 29: 4th generation district heating concepts, future district heating production and systems**

**Chaired by Dirk Vanhoudt**

**Session keynote Elisa Guelpa:**

Solutions to reduce supply temperature in existing small-to-large scale DH networks

**Alixé Degelin:** Influence of supply temperature and booster technology on the energetic performance of a district heating network

**Isabelle Best:** System temperature reduction for new DH systems in low-energy residential areas: cost-effectiveness and eco-efficiency as a function of plot ratio

**Martin Sollich:** Unlocking the energy efficiency potential of heating networks through low-temperature design and optimal retrofit

**Ali Kök:** Achieving Carbon Neutrality in District Heating: The Impact of Temperature Levels on the Supply Mix of EU -27 in 2050

**Tom Naughton:** Practical experience of converting a 1970s UK social housing block into a 4GDH network with independent quality assurance support

11:15-13:00

ROOM: Kødbyen

**Session 30: Renewable energy sources and waste heat sources including PtX for district heating**

**Chaired by Steffen Nielsen**

**Session keynote Jacek Kalina:**

Sizing large-scale industrial heat pump for heat recovery from treated municipal sewage in coal-fired district heating system

**Michał Raczkiewicz:** The use of heat pumps in a district heating in selected European countries

**Dagnija Blumberga:** How to integrate carbon farming in smart district heating energy systems?

**Ana Catarina Marques:** A Smart Local Energy System with heat recovery from power stations

**Ulrike Jordan:** Potential analysis for phasing out coal, oil and natural gas for heat supply in Kassel, a medium-sized city in Germany

**Martin Colla:** A comparative analysis of the energy return on energy invested (EROI) for different biomass district heating systems

11:15-13:00

ROOM: Enghave Plads

**Session 31: Smart energy systems analyses, tools and methodologies**

**Chaired by Miguel Herrador Moreno**

**Session keynote Moritz Bitterling:** Evaluating different artificial neural network approaches for forecasting heat demand in district heating networks

**Andreas Bott:** Efficient Training Data Generation for Learning-Based State Estimation in 4th Generation District Heating Grids

**Klaas Mielck:** Permutation-based Feature Importance Analysis for Medium-Term Heat Load Forecasting in District Heating Systems

**Manuela Linke:** Grid operation management with Convolutional Neural Networks

**Lea Rehlich:** Mixed-integer nonlinear optimization approach for district heating networks

**Anna Cadenbach:** IEA DHC Annex TS8: Experimental investigations of district heating systems

11:15-13:00

ROOM: Tivoli

**Session 32: Smart energy systems analyses, tools and methodologies**

**Chaired by Kevin Michael Smith**

**Session keynote Dennis Lottis:** Collaborative Laboratory Testing of District Heating Networks Using a Hardware-in-the-Loop Framework: A Proof-of-Concept Study

**Felix Agner:** Numerical Estimation of Improved Heat Transport Capacity using Load Control in a District Heating Grid

**Dominik Stecher:** Creating a labelled district heating data set: From anomaly detection towards fault detection

**Jonne van Dreven:** A Systematic Approach for Data Generation for Intelligent Fault Detection and Diagnosis in District Heating

**Yannick Wack:** The Role of Demand Variability and Intermittent Supply on the Optimal Routing and Design of District Heating Networks

**Parisa Rahdan:** Distributed photovoltaics provides key benefits in a highly renewable European energy system

11:15-13:00

ROOM: Vesterbros Torv

**Session 33: Institutional and organisational change for smart energy systems and radical technological change**

**Chaired by Gareth Jones**

**Session keynote Anders N. Andersen:**

Major economic opportunities and challenges for Danish wind farms and district energy plants of German special regulation and netting

**Anna Billerbeck:** Is Germany on the right way for the market uptake of large-scale heat pumps in district heating? An analysis of the economic framework conditions

**Elisabeth Andreae:** The impact of offshore energy hub and hydrogen integration on the Faroe Island's energy system

**Marianne Petersen:** Vision of Offshore Energy Hub at Faroe Islands: The Market Equilibrium Impact

**Freddie Valletta:** Development of a new standardised testing regime to improve performance levels of residential heat interface units in the UK district heating market

**Julia Barbosa:** Game-theoretic Analysis of Suppliers' Market Power in Local Multi-Energy Markets

11:15-13:00

ROOM: Kastrup Lufthavn

**Session 34: Integrated energy systems and smart grids**

**Chaired by Andra Blumberga**

**Session keynote Lykke Mulvad Jeppesen:** Unleashing renewable energy potential through anticipatory grid investments and risk sharing models

**Vladimir Z. Gjorgievski:** Optimal management of community energy systems considering different energy sharing incentives

**Kristina Haaskjold:** Effect and value of end-use flexibility in the low-carbon transition of the Norwegian energy system

**Kai Hoth:** The Energy Aggregator Problem – A Holistic MILP Approach

**Nicolas Lamaison:** Operational long-term management of a salt cavern for green H2 production for industry

**Jens Schmutge:** Transformation of the heat and gas infrastructure for a cost-optimised climate-neutral European energy system

11:15-13:00

ROOM: Plenary room

**Special session: IEA DHC Annex TS4**

**Chaired by Dietrich Schmidt**

**Session keynote Tijs Van Oevelen:** Testing and evaluation of a smart controller for peak reduction in an Italian thermal network

**Chris Hermans:** Instance-based approach for fault detection in district heating substations

**Mohammed Ali Jallal:** Advancing Smart Heating and Cooling Networks: Deep Learning-Based Fault Detection for Substation Fouling in Heating and Cooling Networks

**Dietrich Schmidt:** Digitalization as the basis for efficient and flexible district heating systems

**Ulrich Trabert:** Flexible Use of Thermal Storage in a Large District Heating Substation using Incremental Deep Learning Heat Load Forecasts

**Qinjiang Yang:** Identifying Common Faults and Misuses in Large Multifamily Building Heating Systems Through Digitalization: A Survey

13:00-14:00 Lunch and networking

Plenary room

14:00-16:00 **REPower EU and the focus on energy efficiency in Europe** - 2<sup>nd</sup> plenary session chaired by Professor Brian Vad Mathiesen

#### Plenary keynotes:

- 14:00-14:15 **Hans van Steen, Principal Adviser EU DG Energy:** Towards a Sustainable and Resilient European Energy System with Energy Efficiency
- 14:15-14:30 **Aur lie Beauvais, Managing Director Euroheat and Power:** Resource efficiency: a new moto for the heating & cooling transition
- 14:30-14:45 **Goran Kraja i , Associate Professor University of Zagreb:** Opportunities for increasing energy efficiency and decarbonisation of heating in the Eastern and Southeastern Europe
- 14:50-15:20 Questions and debate
- 15:20-15:35 DHC+ Student Award Ceremony
- 15:35-15:50 Best Presentation Award Ceremony by Professor Poul Alberg  stergaard
- 15:50-16:00 Closing

# PROGRAMME COPENHAGEN - TECHNICAL TOURS

MONDAY 11 SEPTEMBER AND THURSDAY 14 SEPTEMBER 2023

## Technical Tour: Public and Business Energy Communities Avedøre Holme

Thursday 14 September 2023

The Energy Community Avedøre consists of a wide variety of stakeholders – both citizens, the municipality, a social housing organization, businesses, the local district heating company and the local high school. The aim is to share locally produced energy and to integrate both production and consumption of electricity and heating. The energy community is working with PVs, charging of EVs, batteries and windmills alongside a range of innovative district heating projects. At the site of Hvidovre High School the principal and chairman of the Energy Community Avedøre will bid you welcome and introduce you to the thoughts behind. A representative of a local company – the movie production company Zentropa – will also be sharing his thoughts on being part of the development of the Energy Community Avedøre.

The industrial energy community of Avedøre Holme will also be presented by one of the local stakeholders. He will share his thoughts on the common vision of the companies of the area and their ambitions. They wish to become self-sufficient with locally produced and shared energy.

More information at [conference website](#)

## Technical Tour: Heat pit storage at Høje Taastrup District Heating

Monday 11 September 2023

Høje Taastrup District Heating and the district heating company VEKS have built and now own a heat pit storage together. Since its inauguration in late 2022 it has added value to the Greater Copenhagen district heating system and contributes to the green transition. The purpose of the storage is to store district heating when it is cheap to produce – and supply when it is expensive to produce. The storage contains 70,000 m<sup>3</sup> (equivalent to 3,300 MWh), has a charging and discharging capacity of 30 MW and is expected to add an annual value of DKK 6-7 million to the Greater Copenhagen district heating system. Quoting CEO Astrid Birnbaum: “The project is a unique cooperation between many players in the district heating systems of the Copenhagen metropolitan area. Our common goal is less expensive and greener energy.”

More information at [conference website](#)