第8回スマートエネルギー・第4世代地域熱供給国際会議
8th International Conference on Smart Energy Systems
(2022年9月13日～14日　ハイブリッド開催)
概要報告

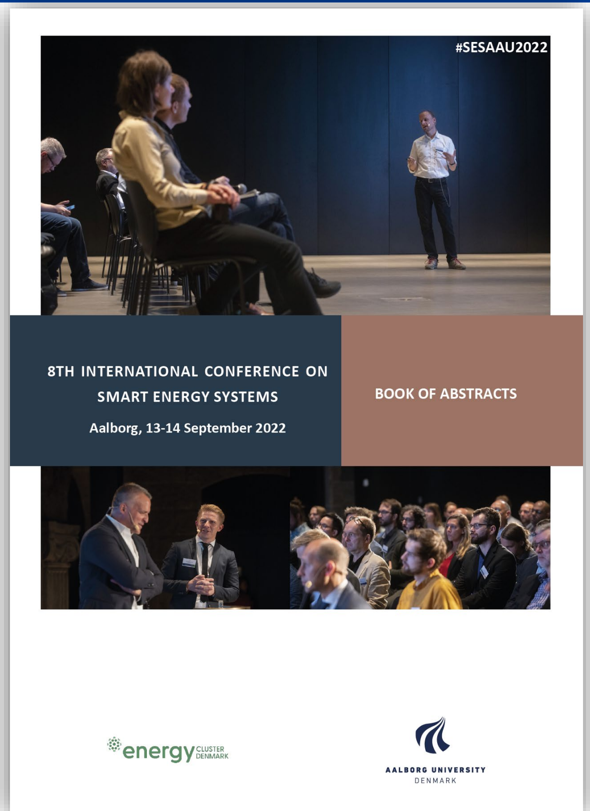
特定非営利活動法人　環境エネルギー政策研究所

松原弘直

2023年3月27日

環境エネルギー政策研究所
東京都新宿区四谷三栄町16-16
Tel 03-3355-2200 Fax 03-3355-2205
http://www.isep.or.jp/

第8回スマートエネルギー・第4世代地域熱供給国際会議 2022年9月13日～14日(ハイブリッド開催)全体概要



8th International Conference on Smart Energy Systems

- スマートエネルギーシステム
- 第4世代地域熱供給
- 蓄エネルギー
- 再生可能エネルギー
- エネルギー効率化
- 電化

参加者：203名(リアル)+26名(オンライン)
参加国：23カ国
発表数：133

https://smartenergysystems.eu/2022-2/

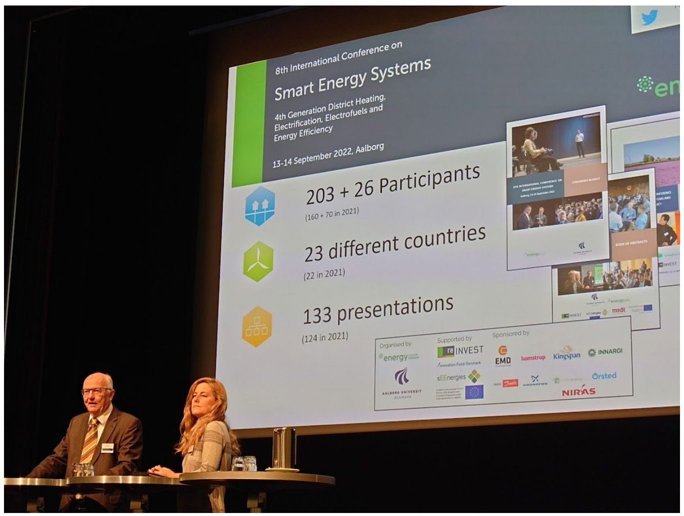
Organised by: AALBORG UNIVERSITY DENMARK, energy CLUSTER DENMARK

Supported by: reINVEST, Innovation Fund Denmark, sEEnergies

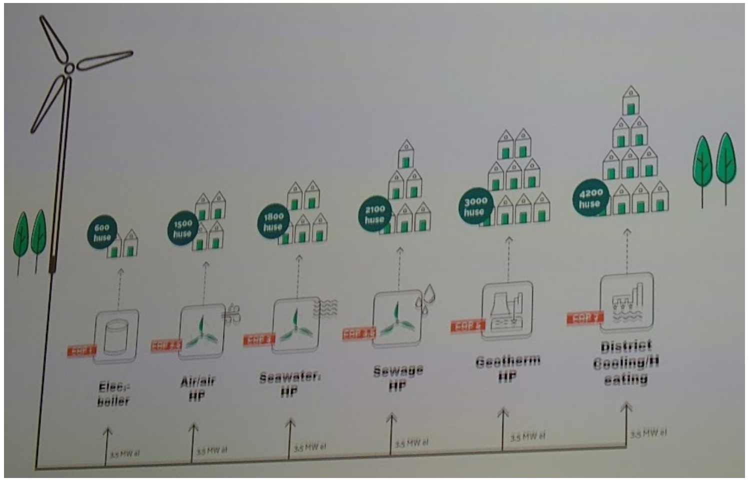
Sponsored by: GRUNDFOS, kamstrup, EMD International, Kingspan, ENGINEERING TOMORROW Danfoss, GRØN ENERGI, INNARGI, Ørsted, NIRAS

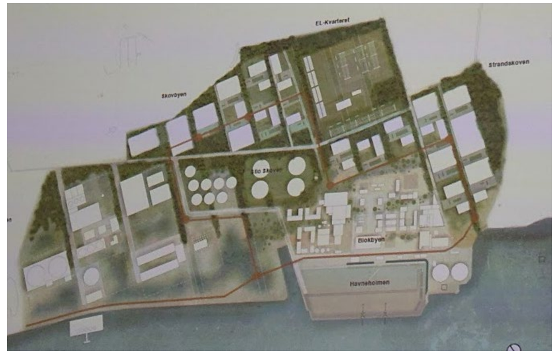
第8回スマートエネルギー・第4世代地域熱供給国際会議
全体セッション1(2022年9月12日)

“8th International Conference on Smart Energy Systems”
開会スピーチ：Henrik Lund(オールボー大学)&Glenda Napier(ECD)
基調講演1:Jesper Møller Larsen「オールボー地域熱供給のグリーン化」
基調講演2:David Dupont-Mouritzen「Power-to-Xによるグリーン転換」
基調講演3:Samir Abboud「地域熱供給における地熱利用」
基調講演4:Sven Werner「地域冷房の4世代と将来展望」

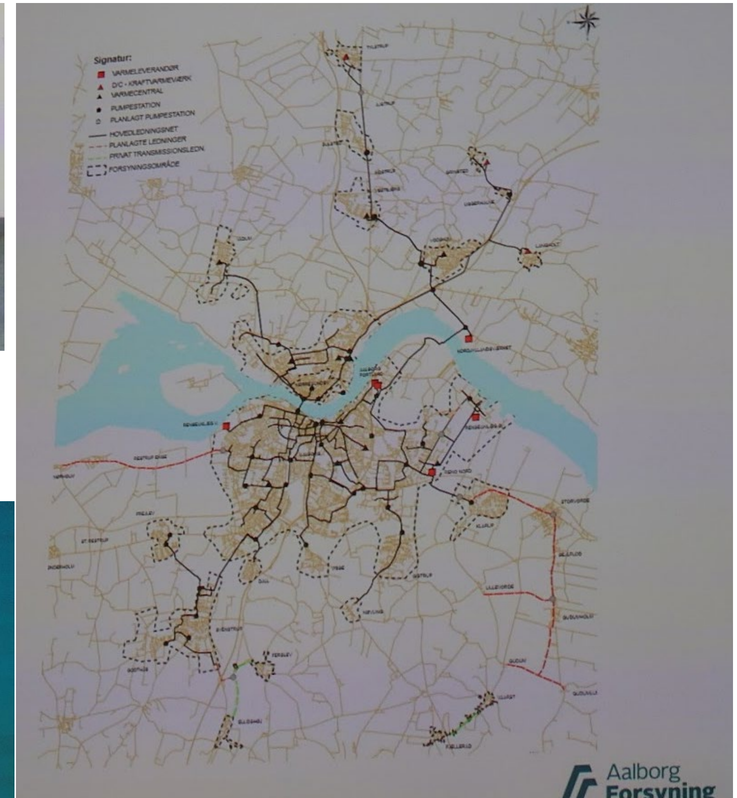


全体セッション1: 基調講演1
Jesper Møller Larsen「オールボー地域熱供給のグリーン化」

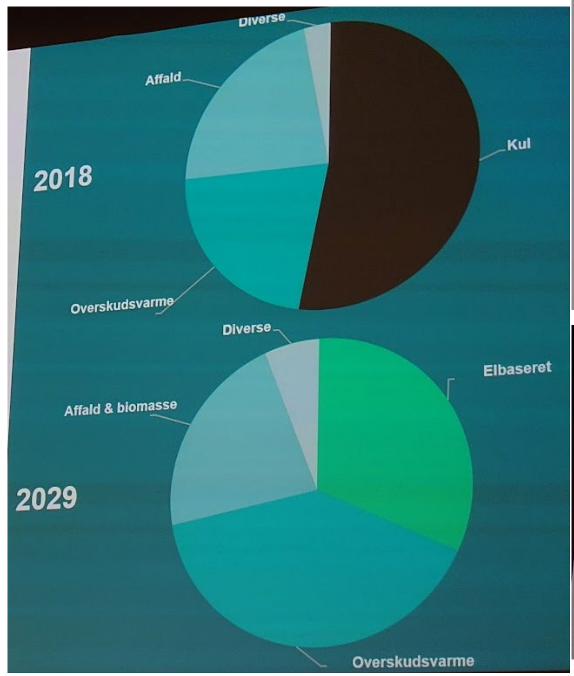


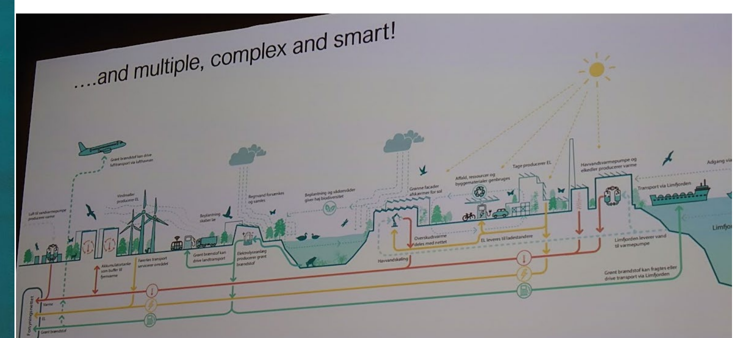


Norbis Park



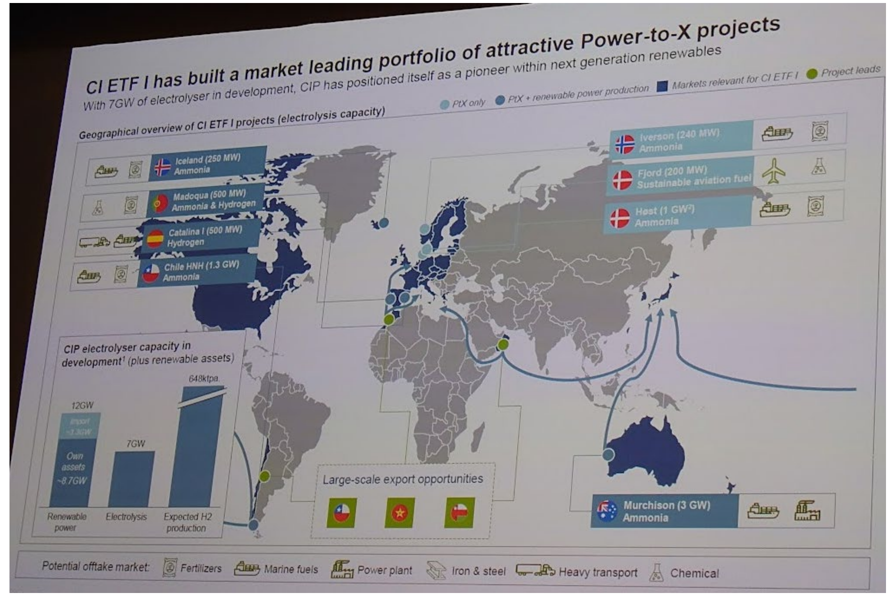
- オールボー市の自然エネルギー戦略2017
  - 石炭CHPを2028年までに廃止
  - 2050年までの脱化石燃料
- 達成方法：
  - 排熱利用の増加
  - 大規模な蓄熱槽の導入(柔軟性)
  - 新技術の実証と利用
  - 多様な技術の統合
  - スマートエネルギーシステム



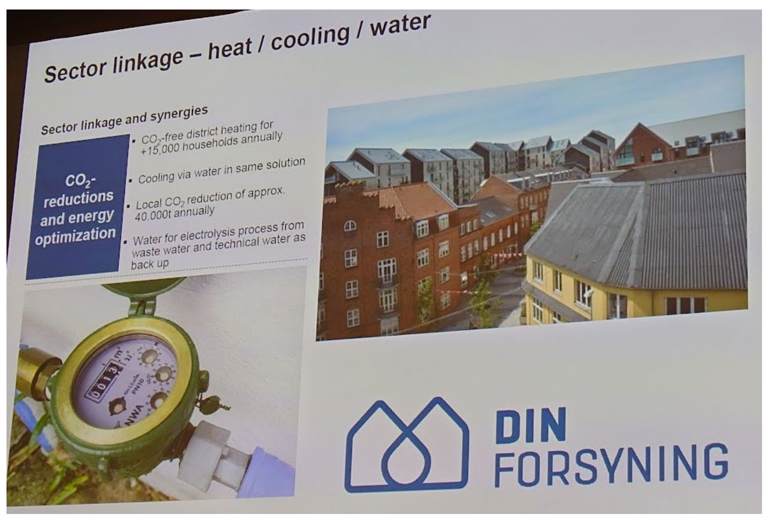


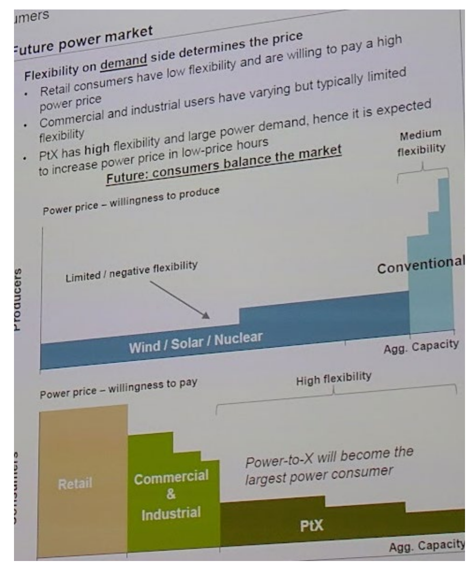
出所：オールボー地域熱供給

全体セッション1: 基調講演2
David Dupont-Mouritzen「Power-to-Xによるグリーン転換」



CI ETF I プロジェクトの全体像





出所: CIP資料

第8回スマートエネルギー・第4世代地域熱供給国際会議 特別セッション

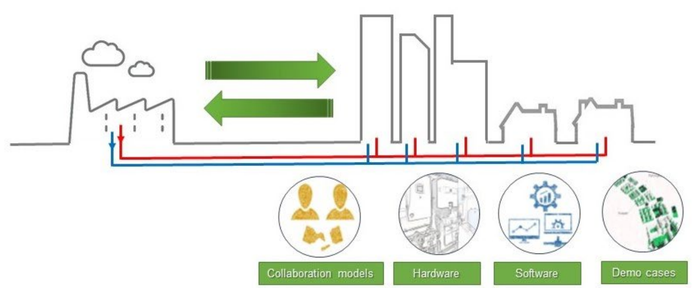
1. **Heat 4.0**
2. **RewardHeat**
   Technologies and management strategies of low- and neutral-temperature district heating and cooling grids
3. **IEA DHC Annex TS4**
   Digitalisation of District Heating and Cooling
4. **IEA EBC Annex 84**
   Demand Management of Buildings in Thermal Networks

HEAT 4.0

IEA DHC|CHP

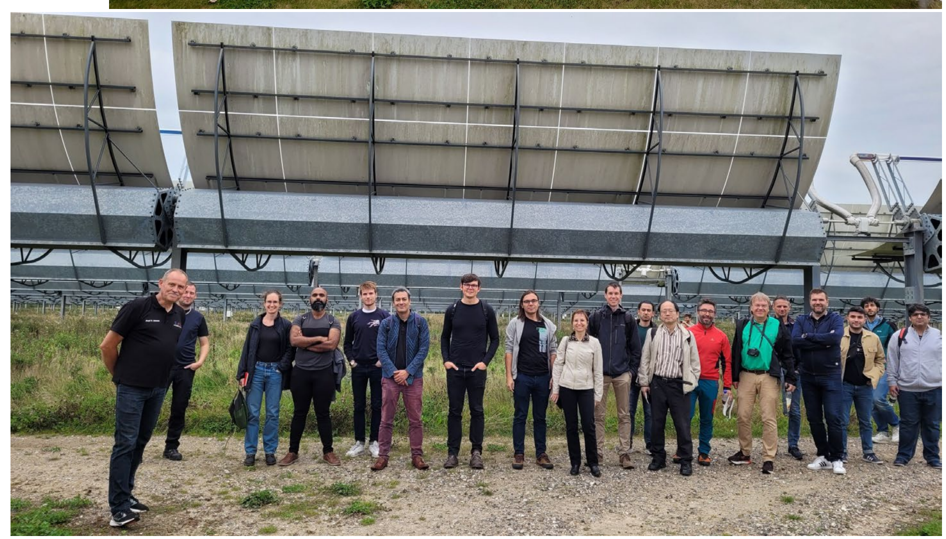
REWARDHeat

EBC
Energy in Buildings and Communities Programme



第8回スマートエネルギー・第4世代地域熱供給国際会議
テクニカルツアー(1):Broenderslev 地域熱供給(Solar+Biomas)

太陽熱+バイオマスCHPによる自然エネルギー100%地域熱供給

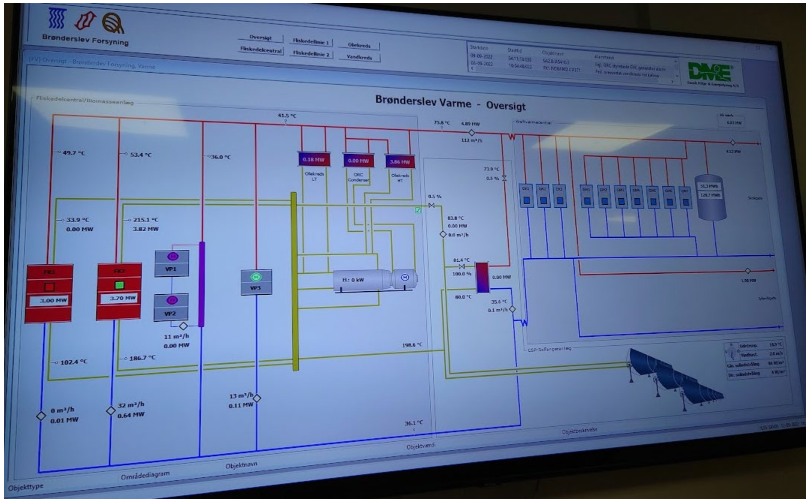


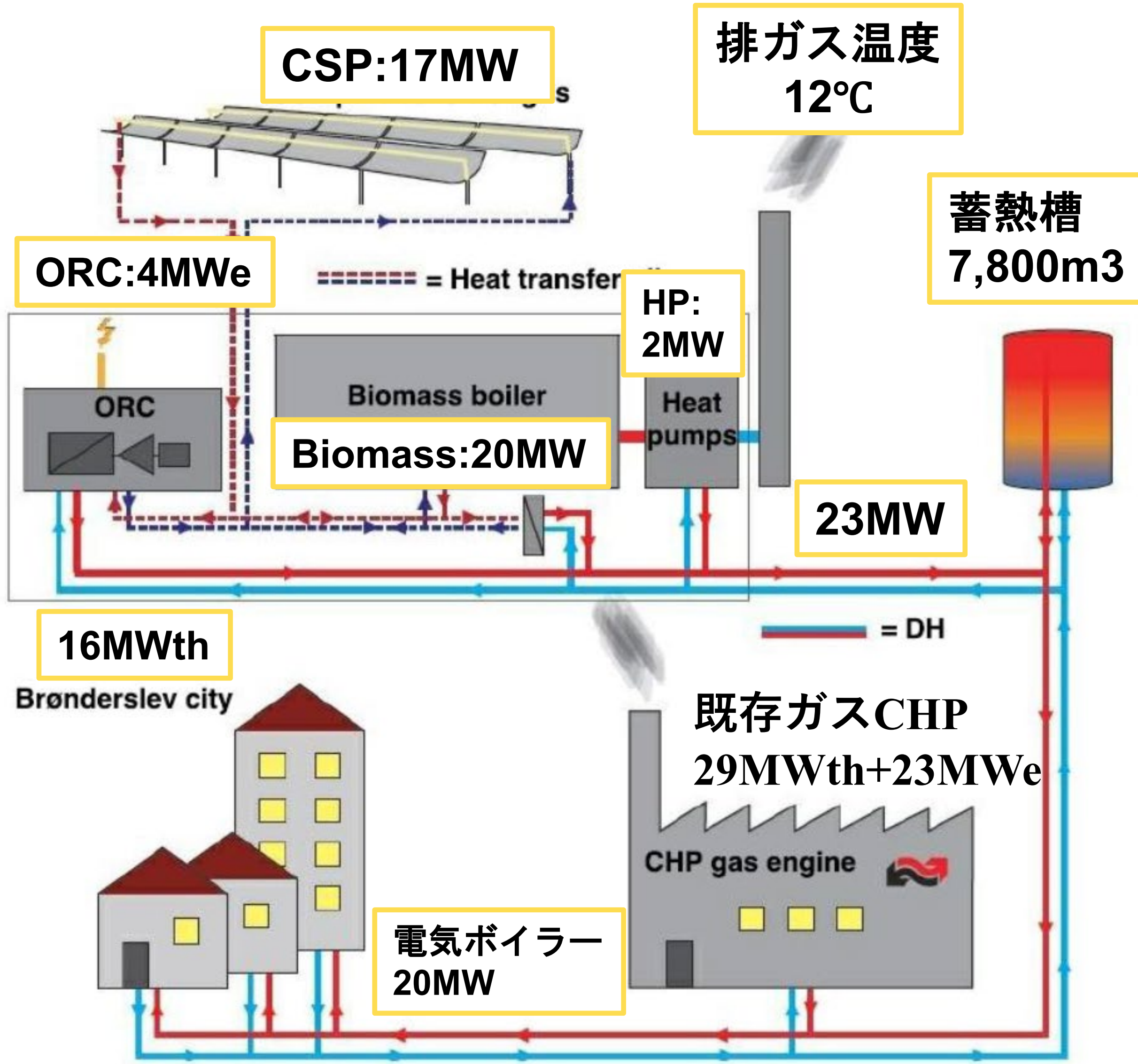
テクニカルツアー(1):Broenderslev 地域熱供給
太陽熱+バイオマスCHPによる自然エネルギー100%地域熱供給

バイオマスプラント
- **ボイラー出力: 20MW(200t/d)**
- **ORC: 4MWe + 16MWth**
- **潜熱回収HP: 2.2MWth**
- **合計出力23MWth(熱効率114%)**

太陽熱(CSP)プラント
- **集熱器 延長5km**
- **27,000m2**
- **出力:17MW**
- **熱媒: Therminol 66**

テクニカルツアー(1)：ORCによるCHPの最新事例
デンマーク北部Bronderslev町でのスマート地域熱供給





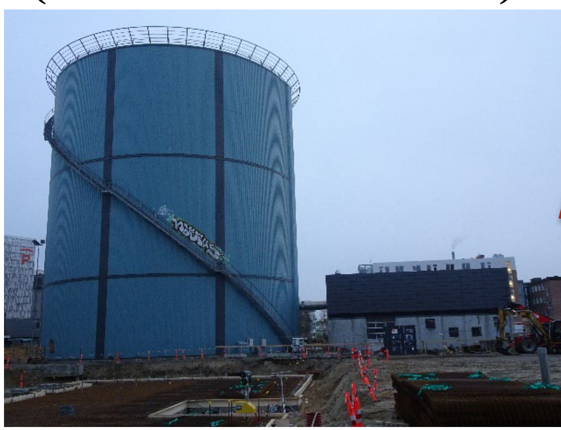
最大熱需要40MW(4600ユーザー)

テクニカルツアー(2):
オールボー地域の地域熱供給システム

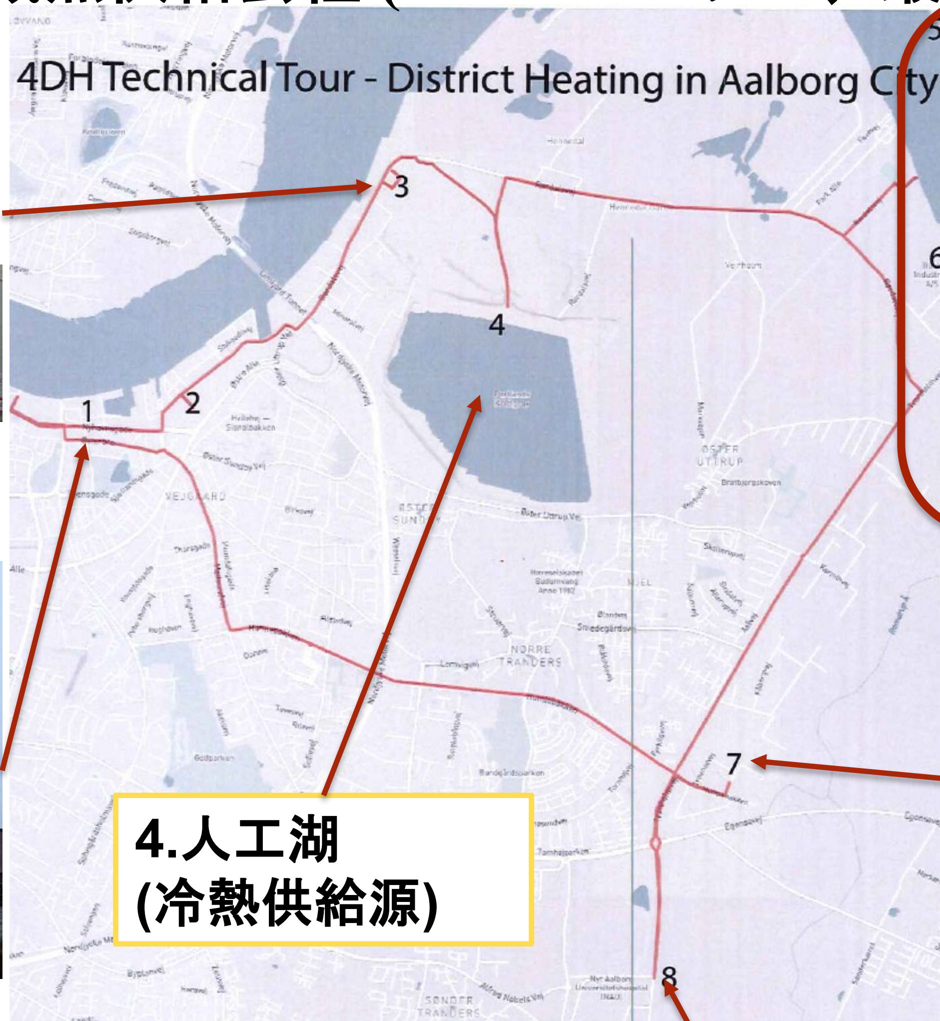
Aalborg Forsyning

オールボー地域熱供給会社 (34000ユーザー、最大需要800MW)

3.セメント工場の排熱 (DHの約20%を供給)



1. 蓄熱槽(1.2万m3)とポンプ室



4.人工湖 (冷熱供給源)

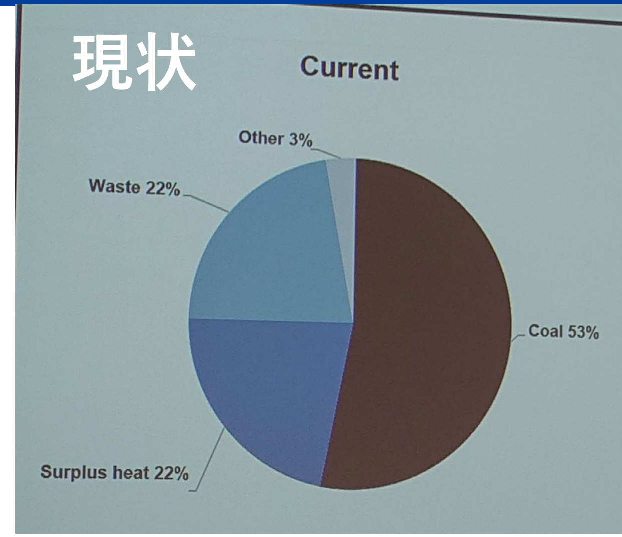
8.大学病院 (新規需要先)

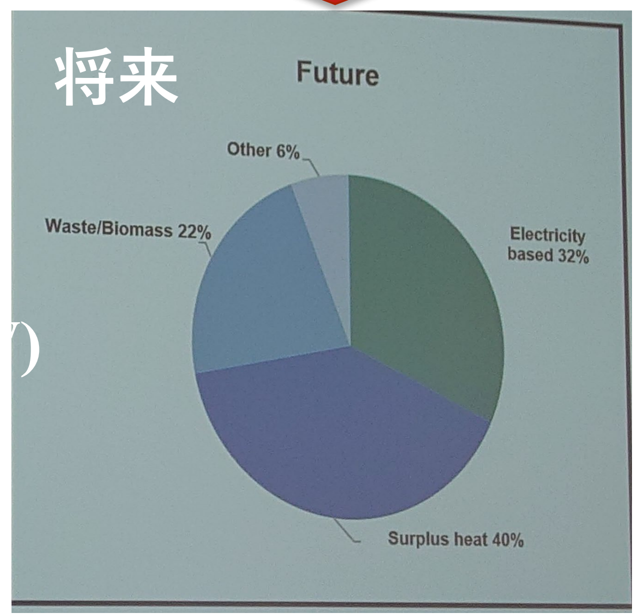
5.石炭火力CHP(500MW) DHの約50%を供給

7.廃棄物CHP(60MW) DHの約25%を供給

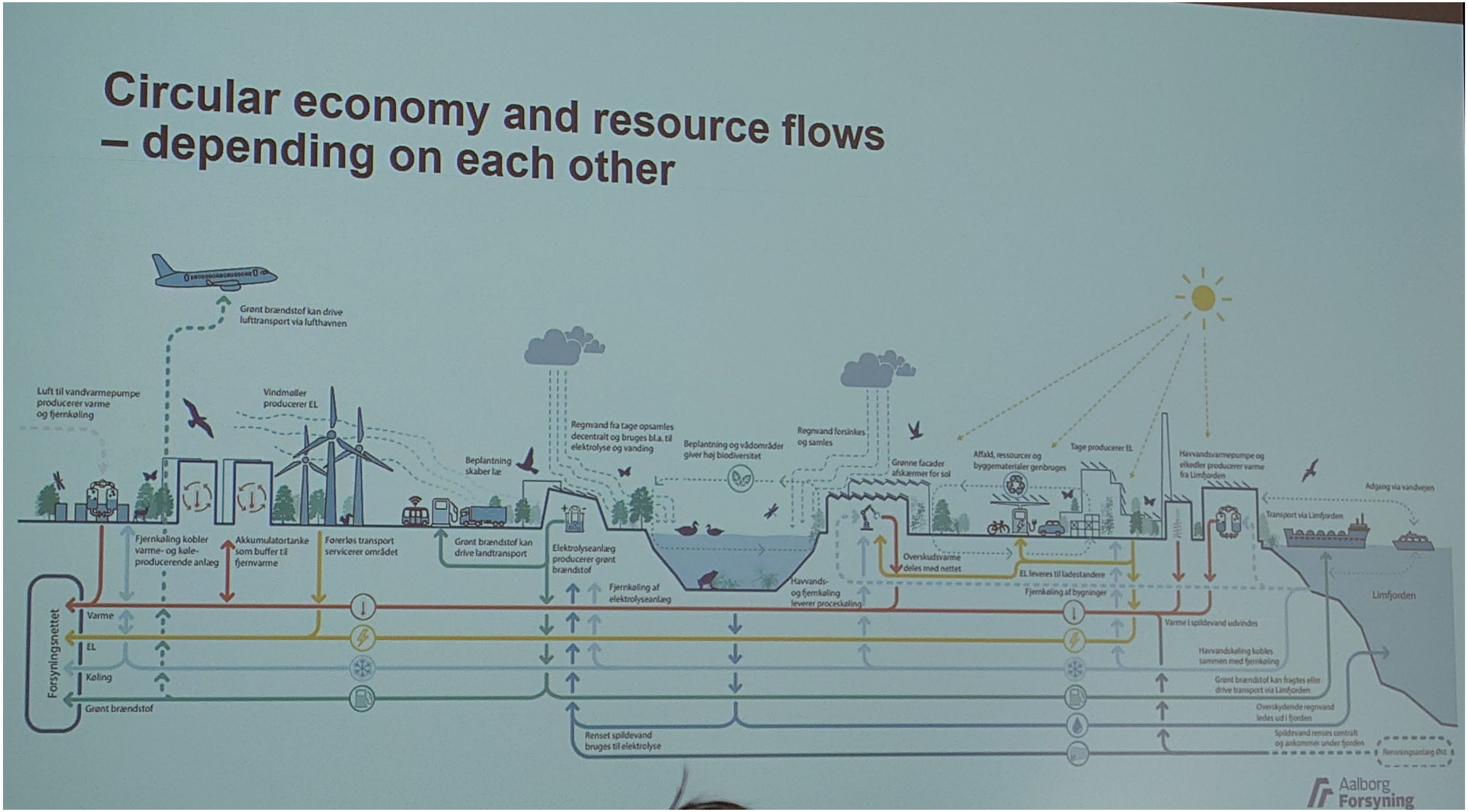
テクニカルツアー(2):
オールボー地域熱供給の脱炭素化ロードマップ

- **2028年までの石炭CHPの廃止**
- **2050年までの脱化石燃料(脱炭素化)**





テクニカルツアー(2):
オールボー地域熱供給：脱炭素化のフロー・イメージ



テクニカルツアー(2):
オールボー地域の地域熱供給システム

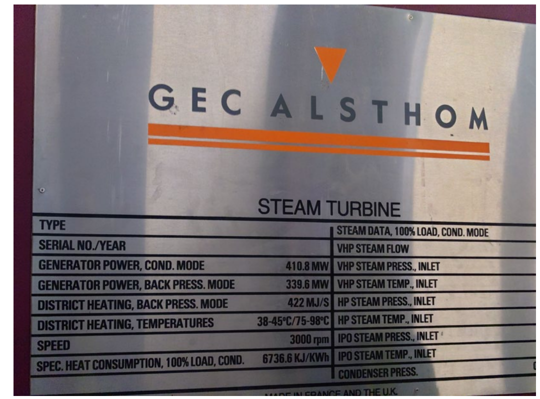
Norbis Park: Facilitating development and testing, Business development, Partnership, Cmmunicating knowledge and results, Symbiosis

- Aalborg Utilities
- Vattenfall
- Kyoto Group
- Fjord PtX

テクニカルツアー(2):
オールボー地域の地域熱供給システム：石炭CHP

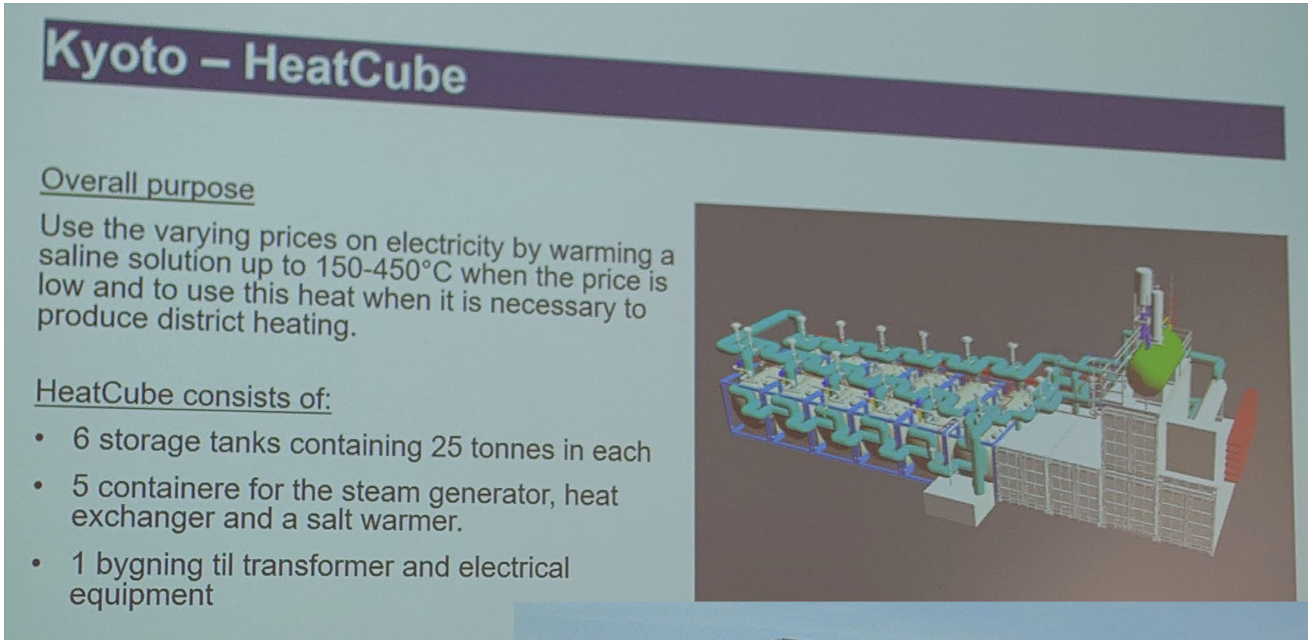
- **DHの約50%の熱を供給する石炭火力CHP(400MWe+400MWth)**
- **2028年までに廃止予定**

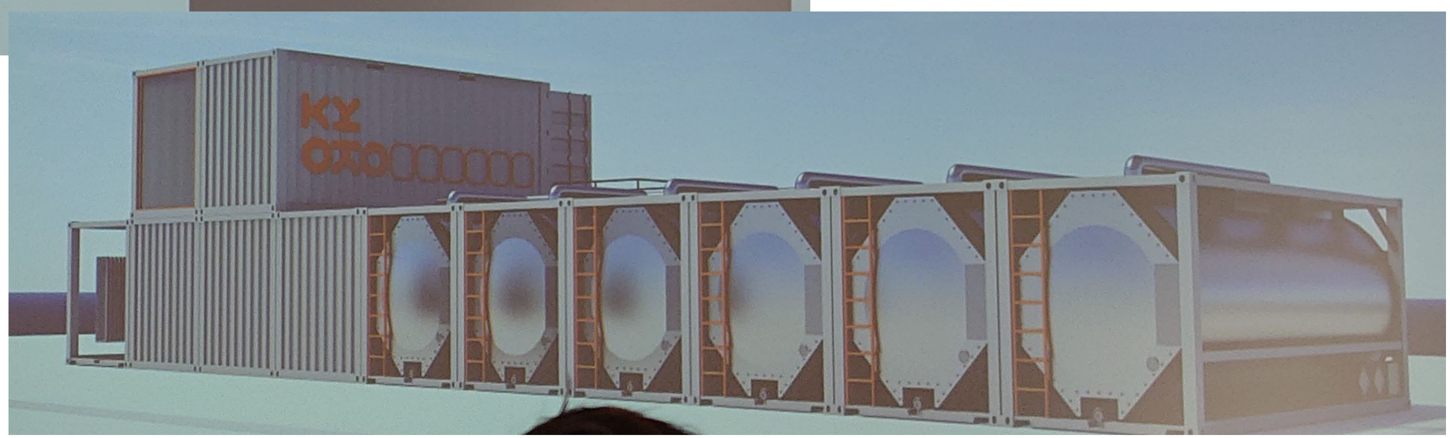
3号機のみ稼働中



テクニカルツアー(2):
オールボー地域の地域熱供給システム：蓄熱システム(実証中)

- **Heatcube: 導入中の蓄熱システム(5,000MWh/年)**
- **設備容量18MWh　(出力5MW)**





テクニカルツアー(2):
オールボー地域の地域熱供給システム：PtXシステム(計画中)

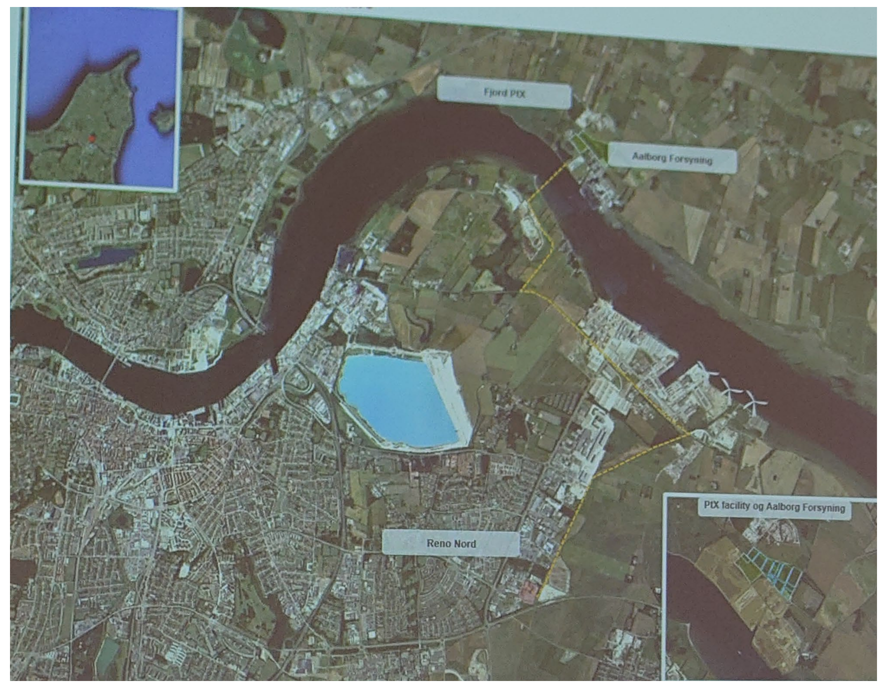
Fjord PtXプロジェクト

年間生産量

- **グリーン・e-メタノール：13万トン/年**
- **年間130GWhの排熱(オールボーDH熱需要の7%)**
- **CO2(18万トン/年)を再利用**

メリット

- **廃棄物焼却時のCO2を再利用**
- **20〜50MWの排熱利用**
- **化石燃料をグリーンな合成燃料に転換**
- **“Green Test Centre”への誘致**
- **50名の新たな雇用**
- **柔軟な発電への対応**
- **プロセスでO2が発生(利用可能)**



第9回スマートエネルギー国際会議(2023年9月)
9th International Conference on Smart Energy Systems

2023年9月12日～13日(コペンハーゲン・デンマーク)

https://smartenergysystems.eu/

9th International Conference on

Smart Energy Systems

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

12-13 September 2023
Copenhagen

AALBORG UNIVERSITY DENMARK

#SESAAU2023

energy CLUSTER DENMARK

CALL FOR ABSTRACTS

We invite researchers and experts from industry and business to contribute to further enhancing the knowledge of smart energy systems, 4th generation district heating, electricfication, electrofuels, and energy efficiency.

The Smart Energy System concept is essential for cost-effective 100% renewable energy systems. The concept includes a focus on energy efficiency, end use savings and sector integration to establish energy system flexibility, harvest synergies by using all infrastructures, lower energy storage cost as well as to exploit low-value heat sources.

As opposed to, for instance, the smart grid concept, which takes a sole focus on the electricity sector, the smart energy systems approach includes the entire energy system in its identification of suitable energy infrastructure designs and operation strategies. Focusing solely on the smart electricity grid often leads to the definition of transmission lines, flexible electricity demands, and electricity storage as the primary means of dealing with the integration of fluctuating renewable sources. However, these measures are neither very effective nor cost-efficient considering the nature of wind power and similar sources. The most effective and least costly solutions are to be found when the electricity sector is combined with the heating and cooling sectors and/or the transport sector. Moreover, the combination of electricity and gas infrastructures may play an important role in the design of future renewable energy systems, and the electrification of heating and transport – possibly through electrofuels – can play a pivotal role in providing flexibility and ensuring renewable energy integration in all sectors.

In future energy systems, energy savings and 4th generation district heating can be combined, creating significant benefits. Low-temperature district heat sources, renewable energy heat sources combined with heat savings represent a promising pathway as opposed to individual heating solutions and passive or energy+ buildings in urban areas. Electrification in combination with district heat is a very important driver to eliminate fossil fuels. Power heat, power to gas and power to liquid together with energy efficiency and 4th generation district heating create a flexible smart energy system. These changes towards integrated smart energy systems and 4th generation district heating also require institutional and organisational changes that address the implementation of new technologies and enable new markets to provide feasible solutions to society.

Important dates 2023

14 April	**Deadline for submission of abstracts** (Additional upgrade to paper after the conference is optional)
24 April	**Reply on acceptance of abstracts**
24 April - 31 May	**Early registration**
1 June - 10 August	**Normal registration**
12 - 13 September	**Conference**

Topics

Smart energy system analyses, tools and methodologies

Smart energy infrastructure and storage options

Integrated energy systems and smart grids

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

Energy savings, in the electricity sector, in buildings and transport as well as within industry

4th generation district heating concepts, future district heating production and systems

Electrification of transport, heating and industry

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

Planning and organisational challenges for smart energy systems and district heating

Geographical information systems (GIS) for energy systems, heat planning and district heating

Components and systems for district heating, energy efficiency, electrification and electrofuels

Renewable energy sources and waste heat sources for district heating

Conference fees

Early registration (for presenters with accepted abstracts):

- **375 EUR** (attendance in Copenhagen)
- **275 EUR** (virtual attendance)

Normal fee:

- **475 EUR** (attendance in Copenhagen)
- **375 EUR** (virtual attendance)

Additional fee for conference dinner (CPH): **100 EUR**