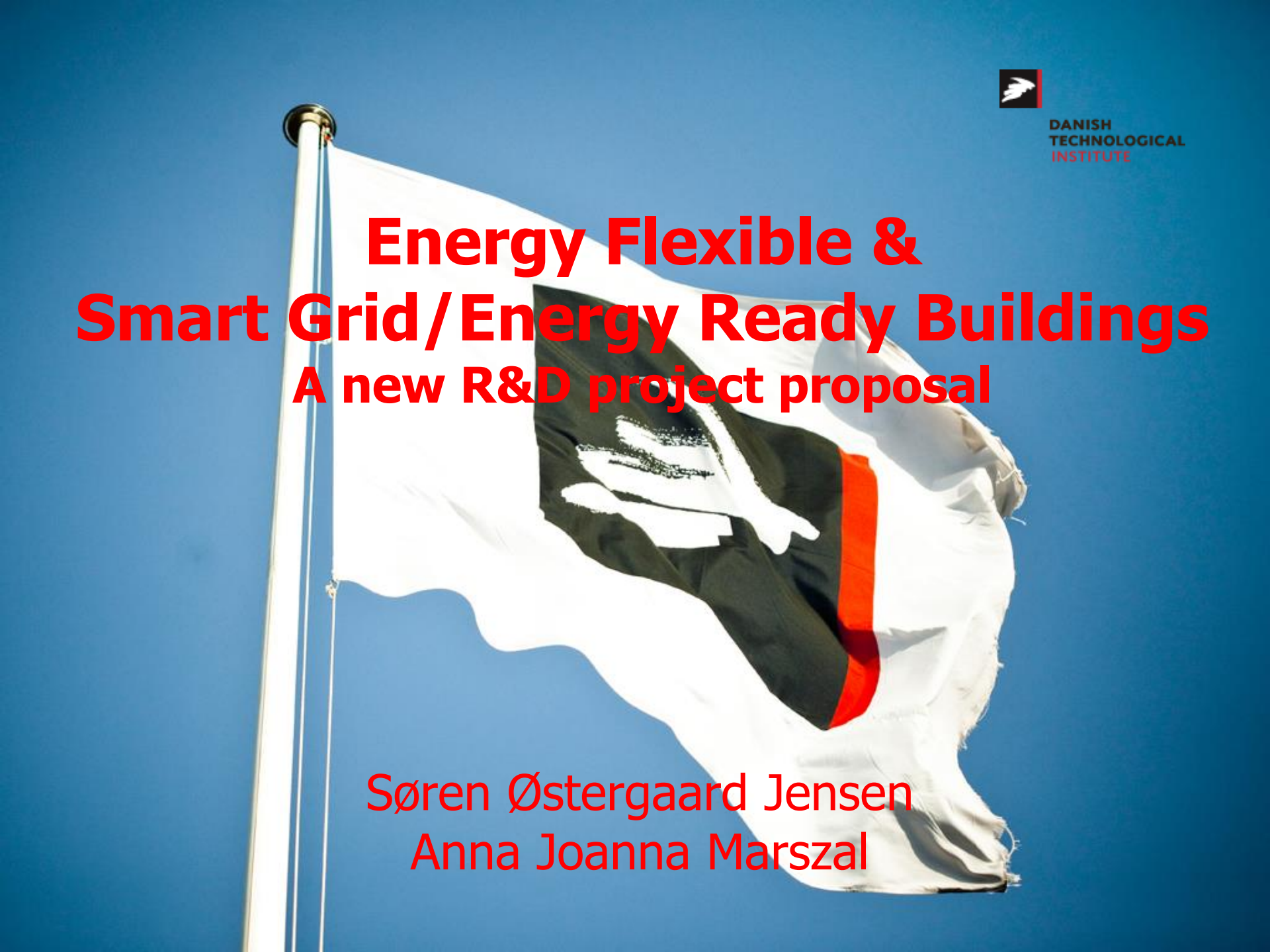

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Energy Flexible & Smart Grid/Energy Ready Buildings

A new R&D project proposal

Søren Østergaard Jensen
Anna Joanna Marszal

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Content

- general procedure for creating a new EBC project (an ‘Annex’)
- proposed new EBC Annex: ‘Energy Flexible & Smart Grid/Energy Ready Buildings’

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From idea to Annex

- you would like to work together with colleagues in other countries on a subject that is within the scope of EBC
- check it fits within the focus areas identified within EBC's Strategic Plan www.iea-ebc.org/strategy
- the lead person should contact their national EBC representative: www.iea-ebc.org/contacts

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From idea to Annex

- if agreed by their national representative, the lead person presents the concept proposal (4 pages fixed format) at the next EBC Executive Committee ('ExCo') meeting
- if agreed by the ExCo, the lead person then holds an international workshop to develop a full Annex Proposal ('Annex Text' – about 10 pages fixed format)

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From idea to Annex

- if approved by the EBC ExCo, the proposal becomes an Annex
- one of you will need to agree to become the responsible project manager (the ‘Operating Agent’)
- Annexes typically last between 3 to 5 years, including a one year ‘preparation phase’ (to allow participants to obtain funding), a ‘working phase’ and a final ‘reporting phase’

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The EBC ExCo has agreed to a definition workshop for a proposed Annex with the working title:

Energy Flexible &

Smart Grid/Energy Ready Buildings

The definition workshop will be held in Copenhagen on March 5-6, 2013.

If interested contact:

sdj@teknologisk.dk

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Background for the Annex Example

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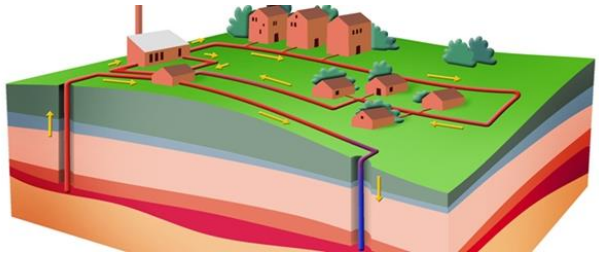
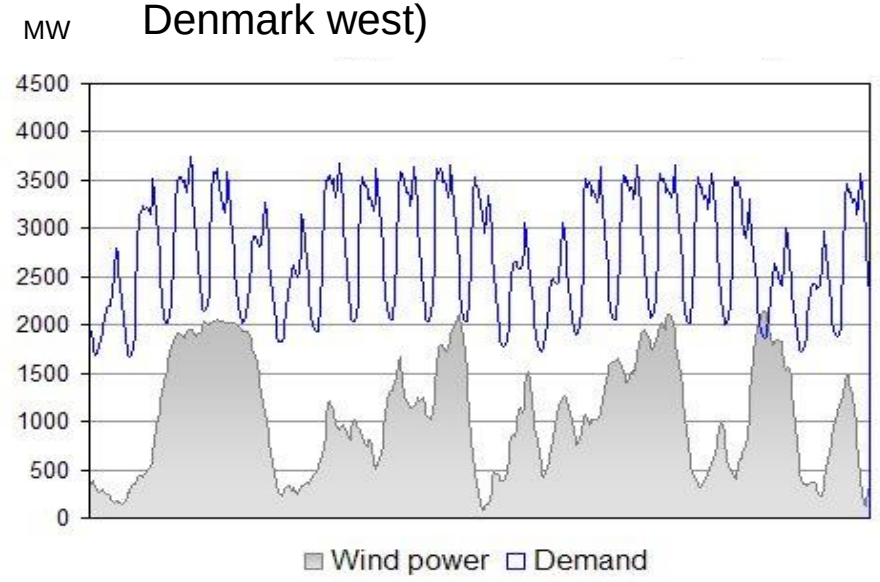
The goal for the Danish energy system:

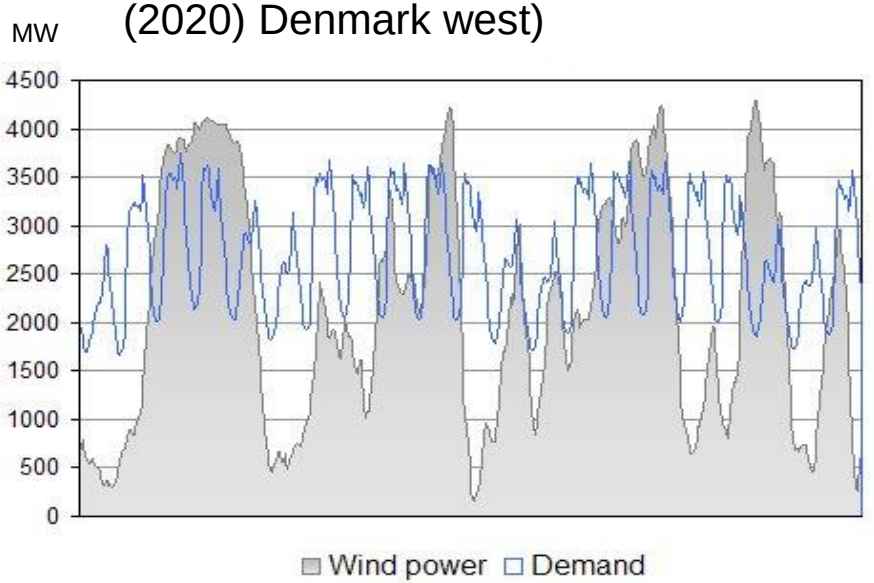
electricity and heating shall by 2035 solemnly be based on renewable energy. By 2050 this will be the case for the entire energy system



25% wind power (January 2008 Denmark west)



50% wind power (January 2008 (2020) Denmark west)



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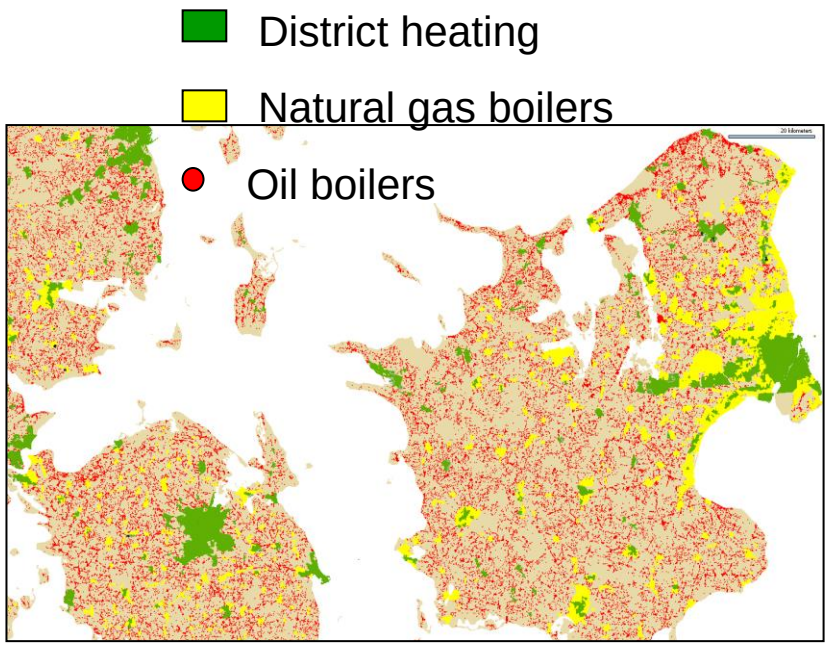
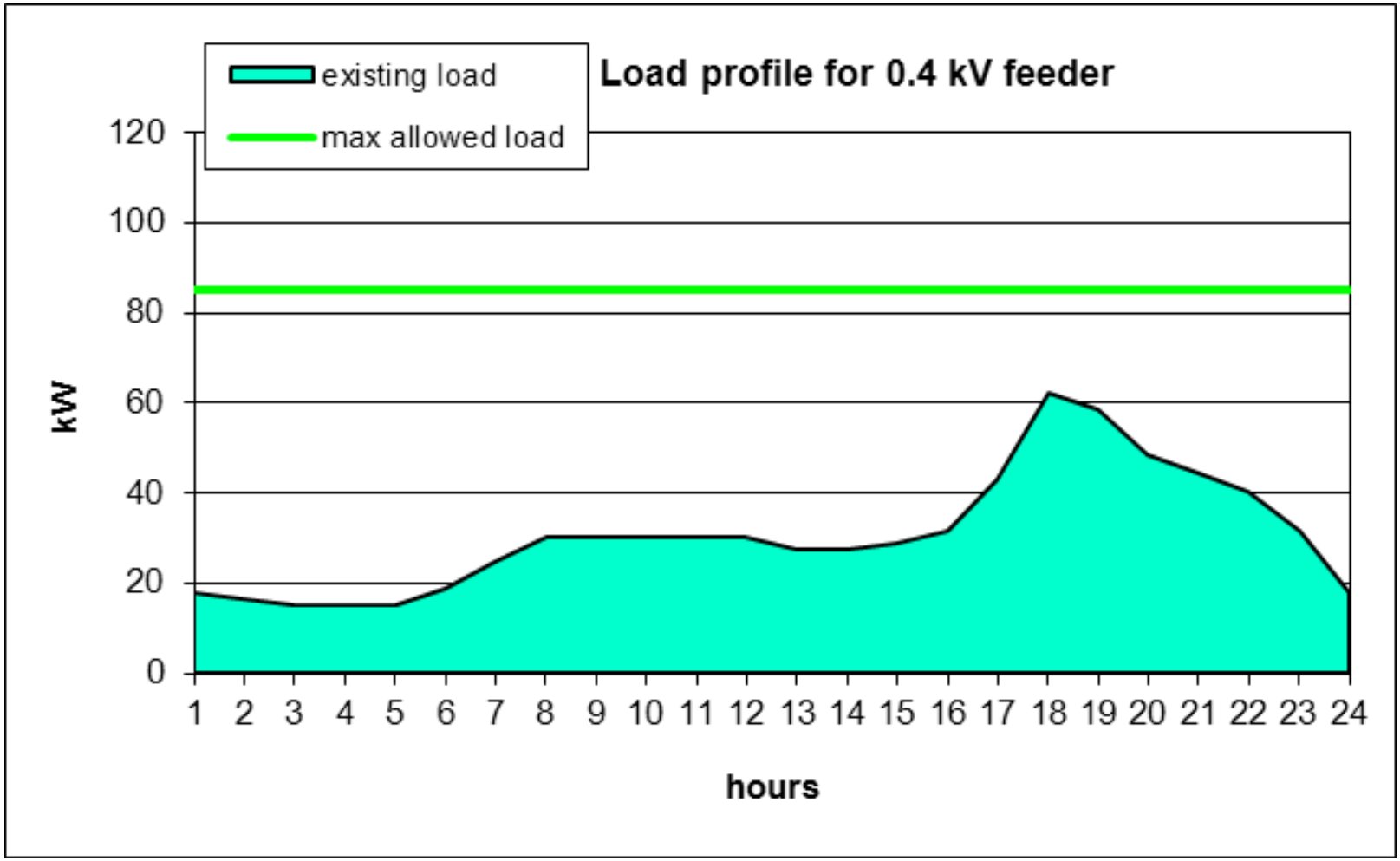
Part of the Danish energy Policy

- 70 % of heating of buildings via district heating
- 30 % of heating of buildings via heat pumps
- electrical vehicles

=> transition from other energy carriers to electricity




Load profile for 0.4 kV feeder
existing load
max allowed load
kW
120
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40
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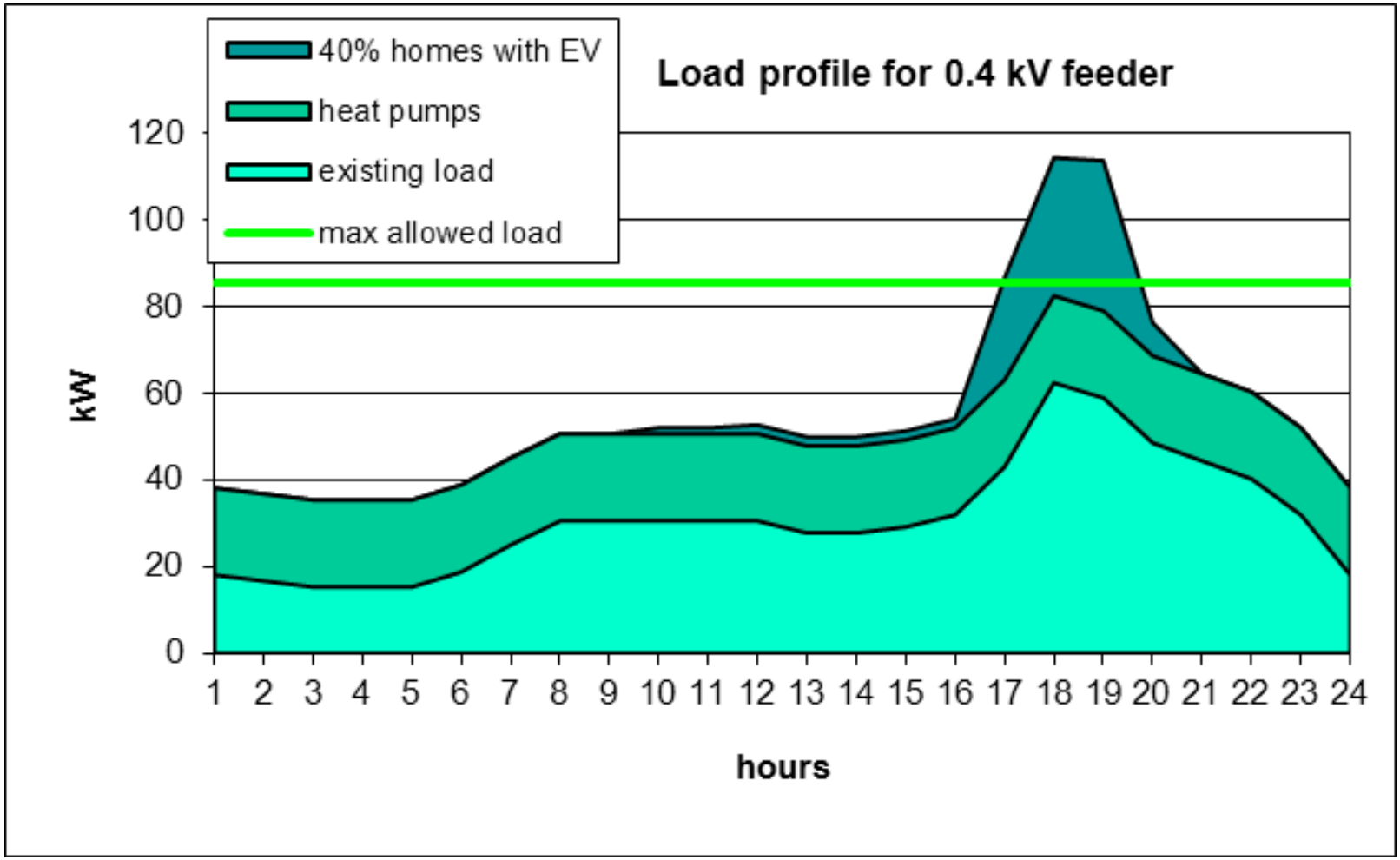
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
hours


Load profile for 0.4 kV feeder
40% homes with EV
heat pumps
existing load
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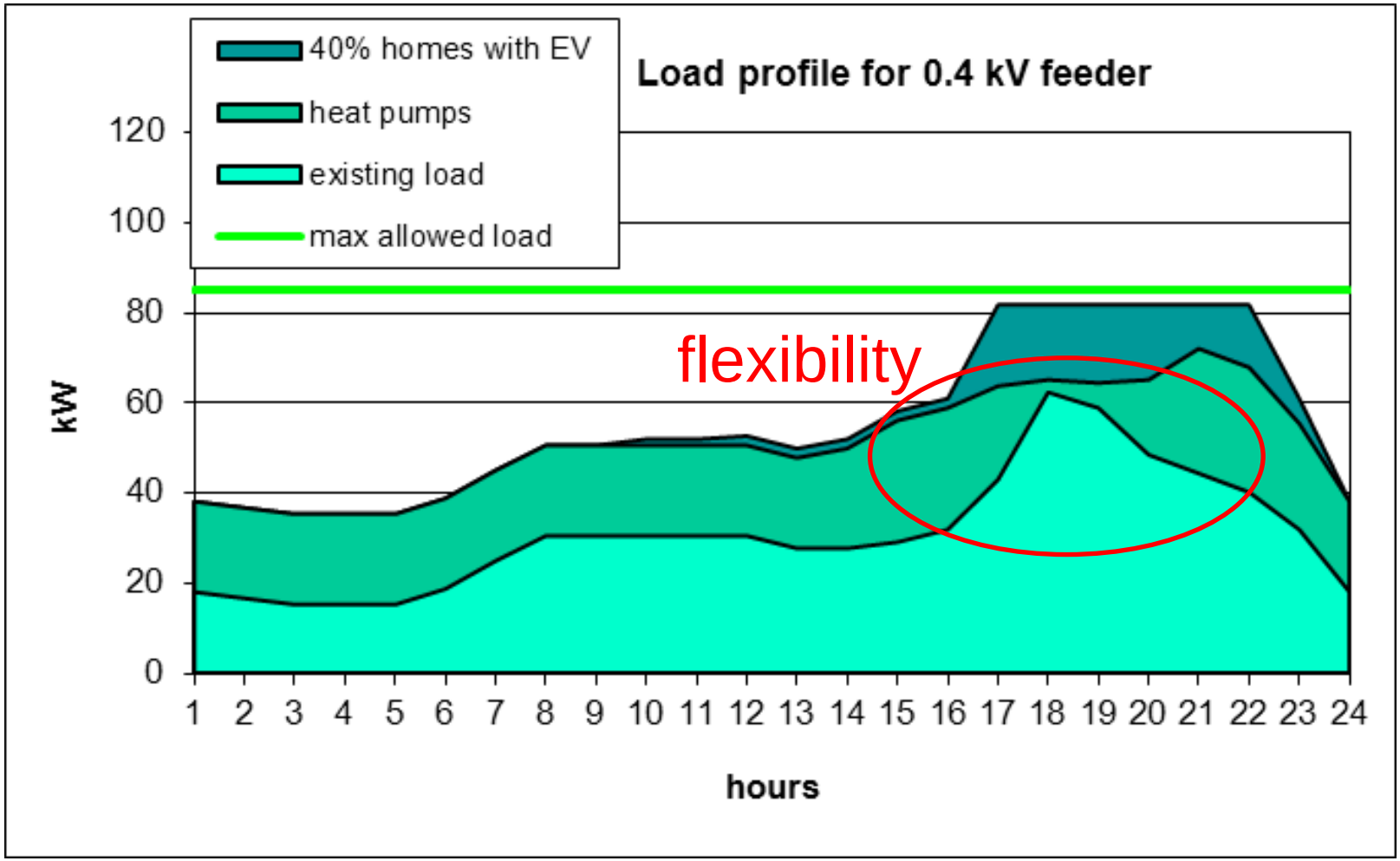
40% homes with EV
heat pumps
existing load
max allowed load
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hours

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Possible solution

a transition from generation on demand to consumption on demand

the energy flexibility of buildings will be an important part of this transition

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New EBC Annex:

Energy Flexible &
Smart Grid/Energy Ready Buildings

The aim of the proposed Annex is to increase knowledge, identify critical aspects and possible solutions concerning of the flexibility that buildings can provide and the means to control this flexibility

The objectives of the proposed Annex will be to investigate/develop:

- definition of “flexibility of buildings”
- the possible flexibility of buildings
- enhancement of the flexibility of buildings
- control of the flexibility of buildings
- cost and benefits of flexibility of buildings
- comfort and user acceptance when utilizing the flexibility of buildings
- characterisation of the flexibility of buildings
- labelling of the flexibility of buildings

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Available storage capacity

All buildings have a certain amount of thermal mass (and thereby storage capacity) due to their constructions. Depending on the amount, distribution, speed of charging/discharging, etc. of the thermal mass it is possible to postpone heating or cooling for at certain period without jeopardizing the thermal comfort in the building. And if a building is excess pre-heated/cooled within the comfort band of the room temperature prior to a shutdown of heating/cooling it is possible to prolong the shutdown period. The time constant of buildings is - depending on the amount and exploitability of thermal mass together with the heat loss, internal gains, user patterns and the actual climate conditions - typically between 1 hour and several days. Without too much effort buildings may typically be able to deliver peak shaving but also ancillary power (e.g. frequency and voltage control) to the grid.

Most buildings further have some kind of water storage e.g. a DWH tank which may add to the possible flexibility of the building

Control possibilities

increase in flexibility

- **simple on/off control**: - devices are simply not allowed to run during prefixed peak hours
  - a signal from the utility shuts the devices down
- **on/off control incl. comfort**: a signal from the utility shuts the devices down if this doesn't jeopardize comfort – e.g. the room temperature may not fall below the lower boundary of the comfort band
- **control based on comfort**: includes the above control and adds excess energy use (for pre-heating/cooling) prior to a period with high energy prices (energy prices need to be known in advance). This control requires access to e.g. thermostats in order to be able to change the set point of these
- **optimization using forecast**: the efficiency of a heating/cooling system depends on the actual heating/cooling need and the temperature level on each side of the system. Shift in time of the heating/cooling supply will, therefore, change the COP/EER of the system. Based on forecast of the energy prices, the weather and the energy use of the building algorithms may be developed that optimize the energy cost for the building while maintaining the comfort and increases the flexibility

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Energy Flexible & Smart Grid/Energy Ready Buildings

Proposed structure of the new Annex:

- Subtask 1 – Possible and accessible storage capacity in buildings
- Subtask 2 – Control of flexibility of buildings
- Subtask 3 – Test of Smart Grid readiness/flexibility

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Process:

- November 14, 2013: EBC ExCO approved a definition workshop
- Definition workshop in Copenhagen: March 5-6, 2014
- Full Annex Proposal to EBC ExCo: June 2014
- Preparation phase: June 2014 – June 2015
- Start of working phase approved by EBC ExCo: June 2015
- Annex duration: June 2014 – June 2019

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Thank you for your attention