# Energy Flexible Buildings
## IEA EBC Annex 67

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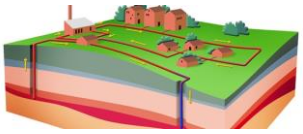
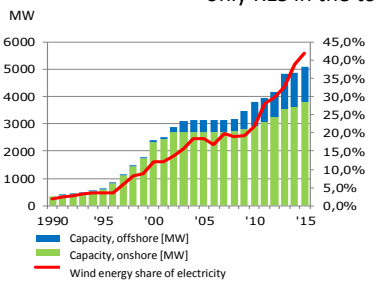
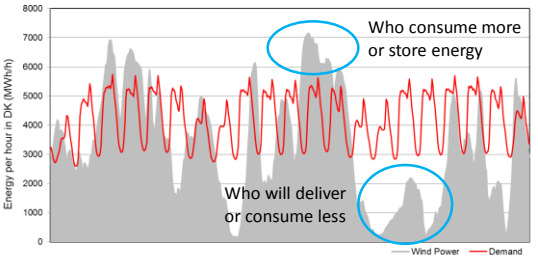
Energy Flexible Buildings - Potential and Performance
Vienna, 26th September, 2017

**Common understanding that we need to replace fossil fuels with renewable energy**



Example: Demnark
Goal: 50 % wind in power grid by 2020 and only RES in the total energy system by 2050



# Austria

## RENEWABLE FINAL ENERGY CONSUMPTION BY TECHNOLOGY

| | in total – GWh | | Change | Share |
|---|---|---|---|---|
| | 2014 | 2015 | 2014→2015 | 2015 |
| Biogas | 1,180 | 1,159 | -1.7 % | 1.1 % |
| Biofuels | 6,722 | 7,760 | +15.4 % | 7.3 % |
| Renewable district heat[1] | 10,116 | 10,494 | +3.7 % | 9.8 % |
| Geothermal energy | 75 | 84 | +12.2 % | 0.1 % |
| Wood fuel[2] | 29,093 | 31,124 | +7.0 % | 29.2 % |
| Black liquors | 7,140 | 6,532 | -8.5 % | 6.1 % |
| Photovoltaics | 785 | 937 | +19.3 % | 0.9 % |
| Solar heat | 2,100 | 2,129 | +1.4 % | 2.0 % |
| Ambient heat | 1,976 | 2,043 | +3.3 % | 1.9 % |
| Hydro power | 40,128 | 39,752 | -0.9 % | 37.3 % |
| Wind power | 3,808 | 4,679 | +22.9 % | 4.4 % |
| **Sums** | **103,124** | **106,694** | **+3.5 %** | **100.0 %** |

[1] renewable share, includes: waste, wood-based fuels, biogas, biogenic liquids, black liquors, other solid biogenics and geothermal energy
[2] firewood, woodchips, wood pellets, wood briquettes, waste wood, charcoal, biogenic waste

Data source: Statistik Austria (2016b)

= 32.8 % of the total energy demand in 2015

## Solutions

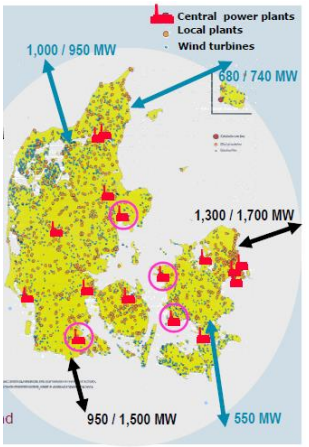
Large interconnectors - export/import

Heat pumps in district heating

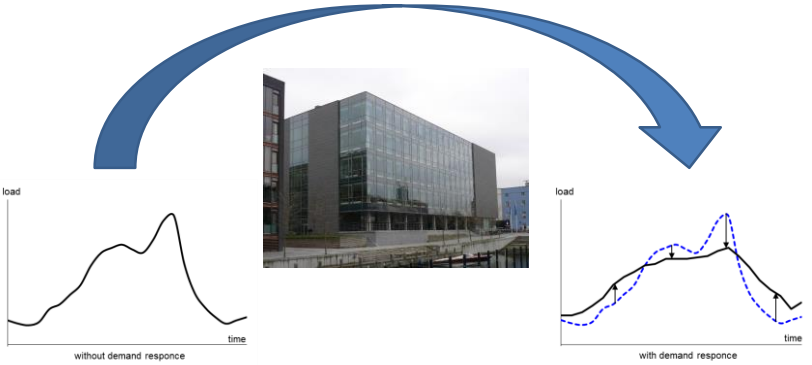
Generation of hydrogen and upgrading of biogas

RES based fuel factories

Demand response – industry and buildings




## Most buildings have the ability to become energy flexible



## Commercial buildings

ventilation systems

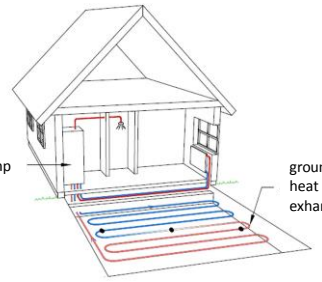
cooling systems

supermarkets

pumps

## Electricity demand in households

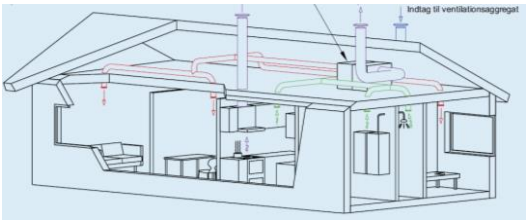
heat pumps



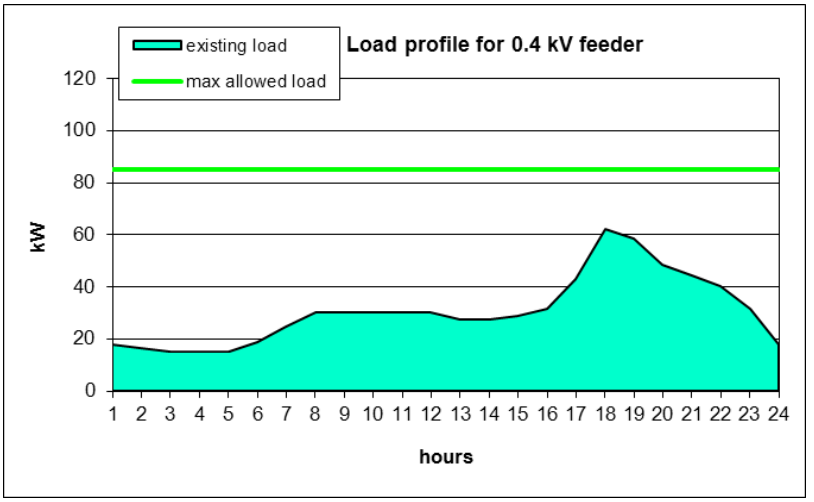
EVs

white goods

ventilation systems



## Example

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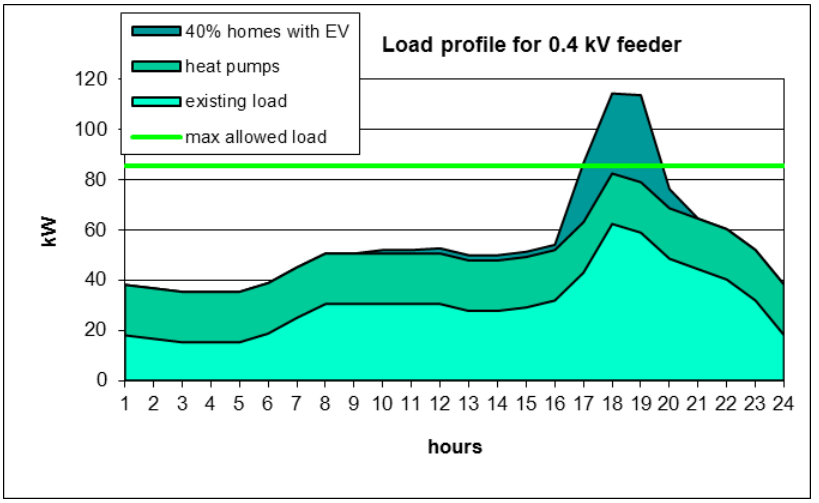

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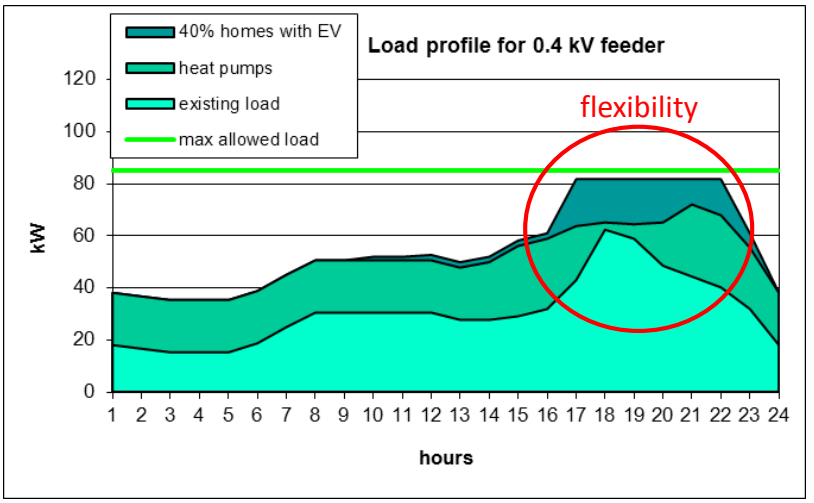
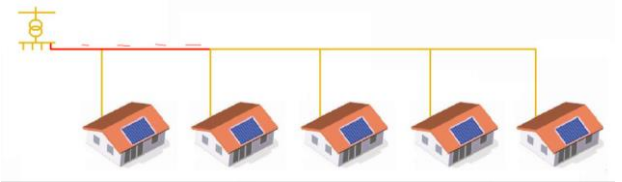
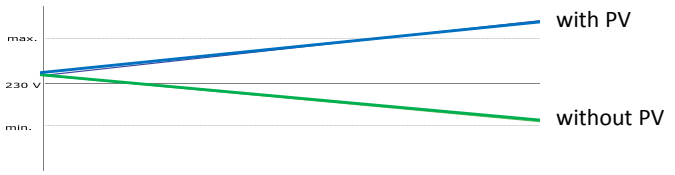



## Prosumers

## Voltage problems






## European Union

Smartness Indicator in EBPD (Energy Performance if Buildings Directive)

- The introduction of a smartness indicator rating the readiness of the building to adapt its operation to the needs of the occupant and the grid, and to improve its performance
- The smartness indicator should be used to measure buildings' capacity to use ICT and electronic systems to optimise operation and interact with the grid

# Challange

Currently there is, however, no overview or insight into how much Energy Flexibility different building types and their usage may be able to offer to future energy systems.

There is thus a need for increasing knowledge on and demonstration of the services Energy Flexible Buildings can provide for the energy grids as well to identify critical aspects and possible solutions to manage this Energy Flexibility.

# IEA EBC Annex 67
# Energy Flexible Buildings

June 2014 – June 2015: Preparation phase: done

June 2015 – June 2018: Working phase: ongoing

June 2018 – June 2019: Reporting phase

Fifth working meeting:

Graz, Austria, September 27-29, 2017

## Definition of Energy Flexibility in buildings

- The Energy Flexibility of a building is the ability to manage its demand and generation according to local climate conditions, user needs and grid requirements.
- Energy Flexibility of buildings will thus allow for demand side management/load control and thereby demand response based on the requirements of the surrounding grids.

## Work plan

### Subtask A: Definitions and Context

- Common terminology and definition of Energy Flexibility in buildings
- Methodology for characterization of Energy Flexibility in buildings
- User needs, motivation and barriers for application of EF in building
- Market analysis

### Subtask B: Analysis, Development and Testing

- Simulation of Energy Flexibility in single buildings and clusters of buildings
- Control strategies and algorithms
- Laboratory tests of components, systems and control strategies
- Example cases and design examples

### Subtask C: Demonstration and User Perspectives

- Measurements in existing buildings
- Demonstration of Energy Flexibility in real buildings and clusters
- User motivation and acceptance

# Participating countries

- Austria
- Belgium
- Canada
- China
- Denmark
- Finland
- France
- Germany
- Ireland
- Italy
- Norway
- Portugal
- Spain
- Switzerland
- The Netherlands
- UK

# Website

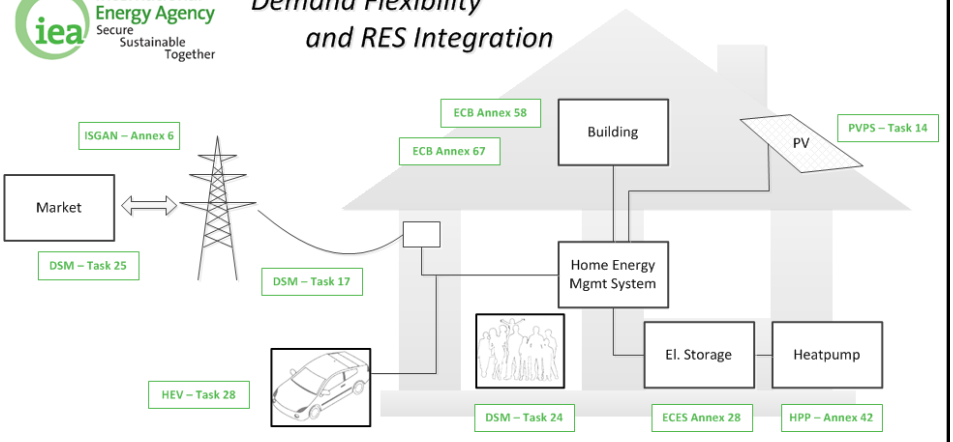
annex67.org

https://authors.elsevier.com/a/1Vmc41M7zGsiYW, until 12/11-2017

# Other related IEA activities

International Energy Agency
Secure Sustainable Together

*Demand Flexibility and RES Integration*




**Thank you for your attention**