



Energy Flexible Buildings

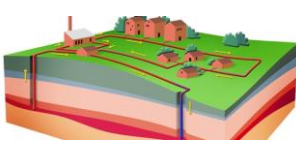
IEA EBC Annex 67

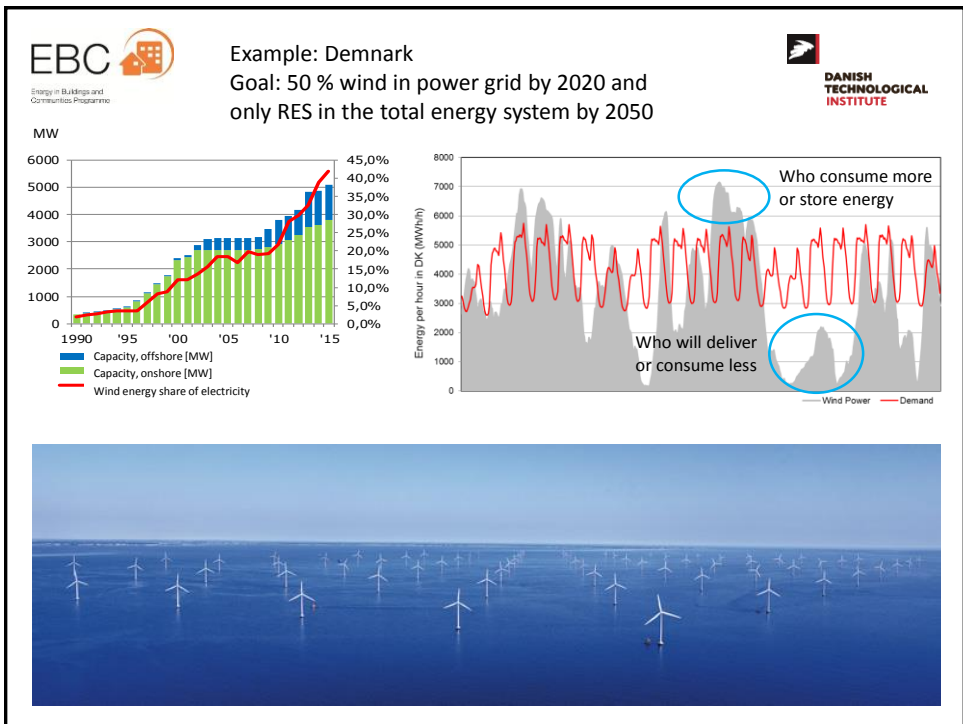
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Energy Flexible Buildings - Potential and Performance
 Vienna, 26th September, 2017



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








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Austria



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**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%

**= 32.8 % of the total
energy demand in 2015**

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

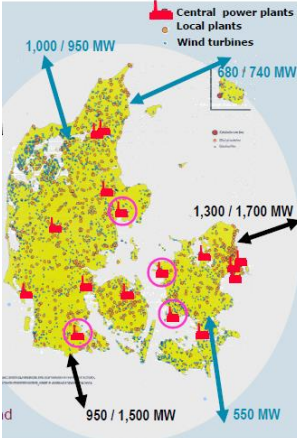
Data source: Statistik Austria (2016b)

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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**



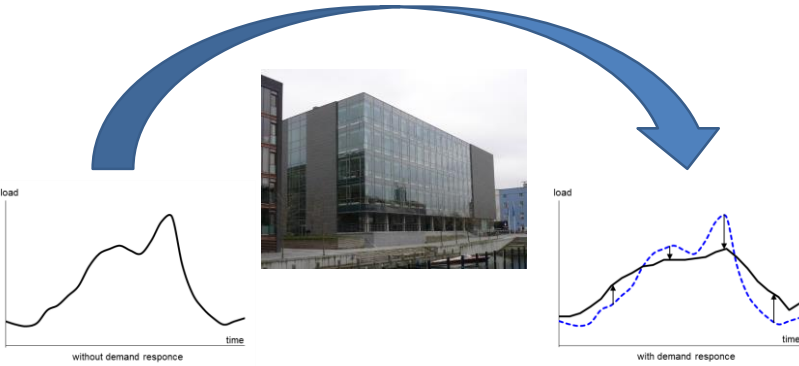
The map illustrates power plant capacities and interconnector flows across Europe. Key data points include:

- Central power plants (red squares)
- Local plants (orange circles)
- Wind turbines (yellow dots)
- Interconnector flows:
 - 1,000 / 950 MW (Northwest Europe)
 - 880 / 740 MW (Central Europe)
 - 1,300 / 1,700 MW (East Europe)
 - 950 / 1,500 MW (Southwest Europe)
 - 550 MW (South Europe)

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Most buildings have the ability to become energy flexible



The diagram illustrates the concept of energy flexibility in buildings. It shows a building's load profile over time, comparing the situation 'without demand response' (left) and 'with demand response' (right). A large blue arrow points from the 'without demand response' graph to the 'with demand response' graph, indicating the transition to energy flexibility. The building image in the center represents the physical structure being analyzed.

without demand response


with demand response

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Commercial buildings

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ventilation systems




cooling systems



supermarkets



pumps

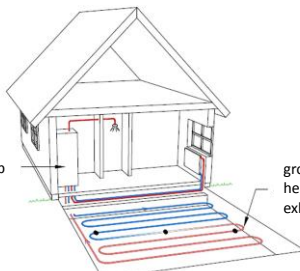


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Electricity demand in households

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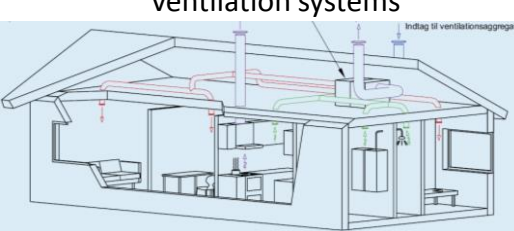
heat pumps




EVs

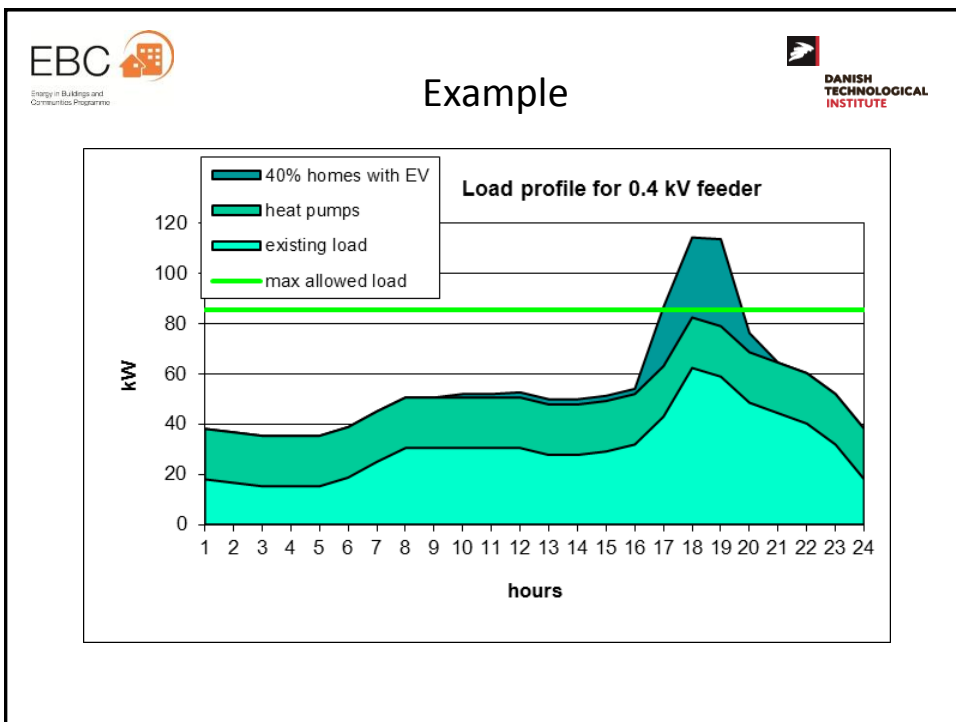
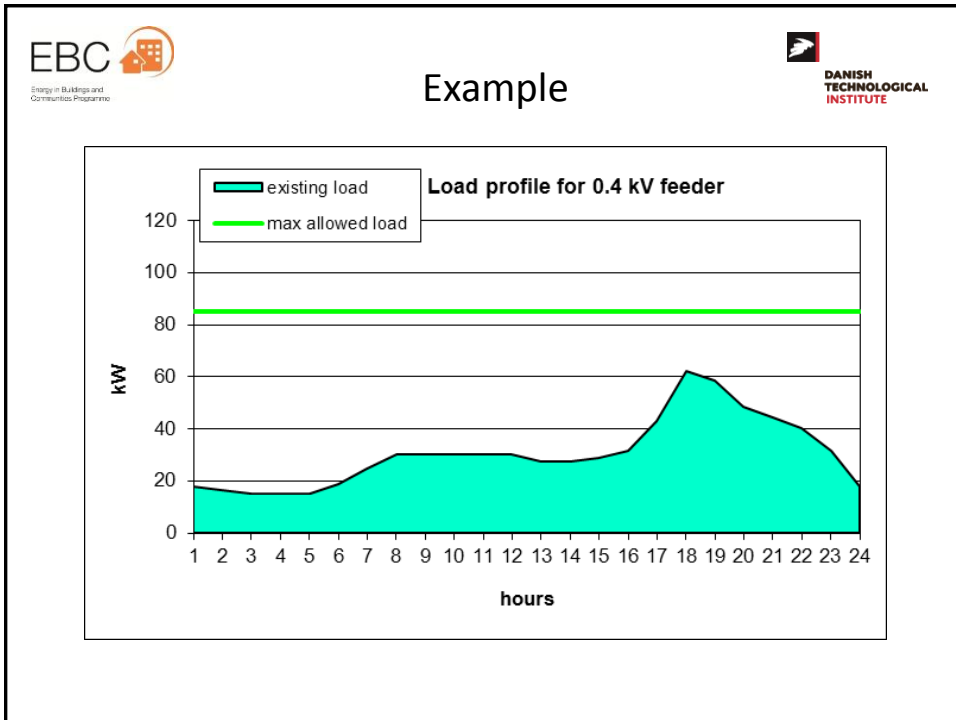


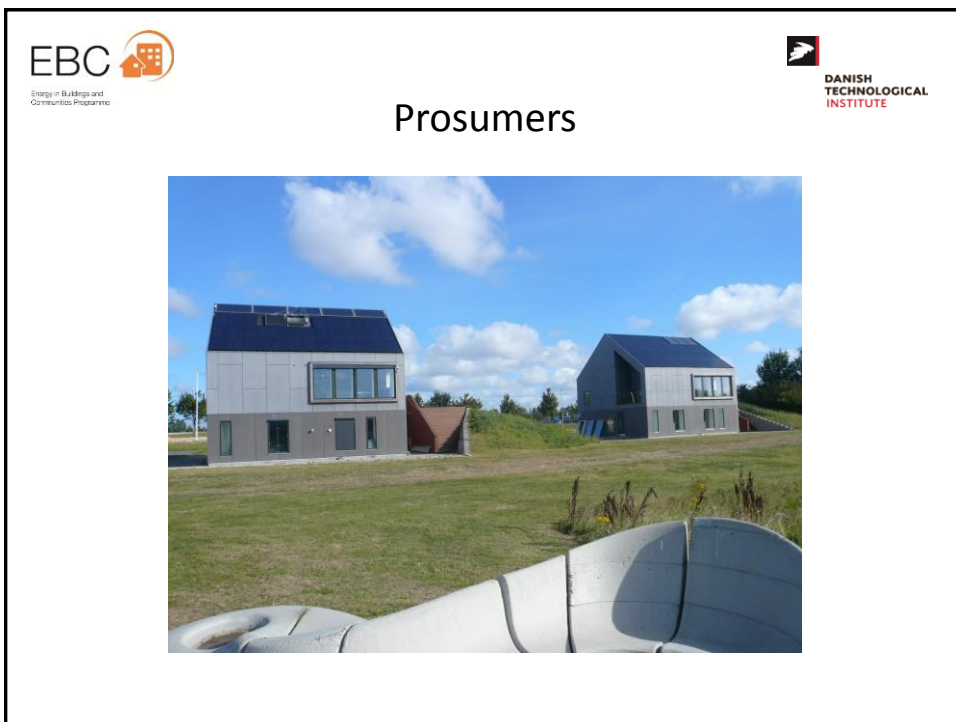
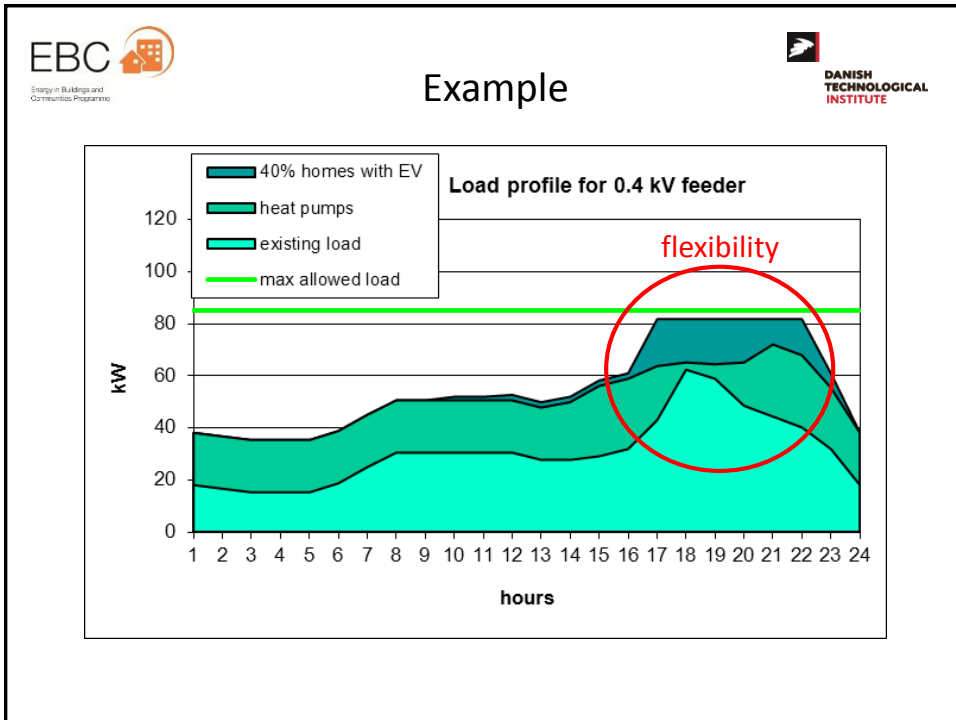
ventilation systems

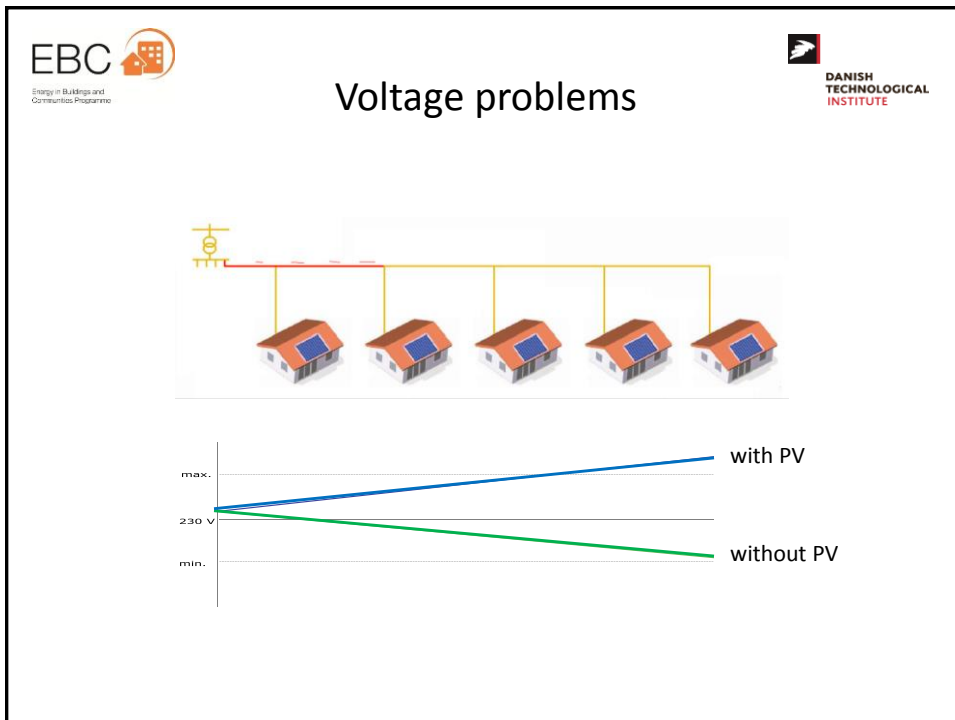


white goods









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European Union

Smartness Indicator in EBPD (Energy Performance of 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

Challenge

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



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Participating countries



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- Italy
- Norway
- Portugal
- Spain
- Switzerland
- The Netherlands
- UK



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Website

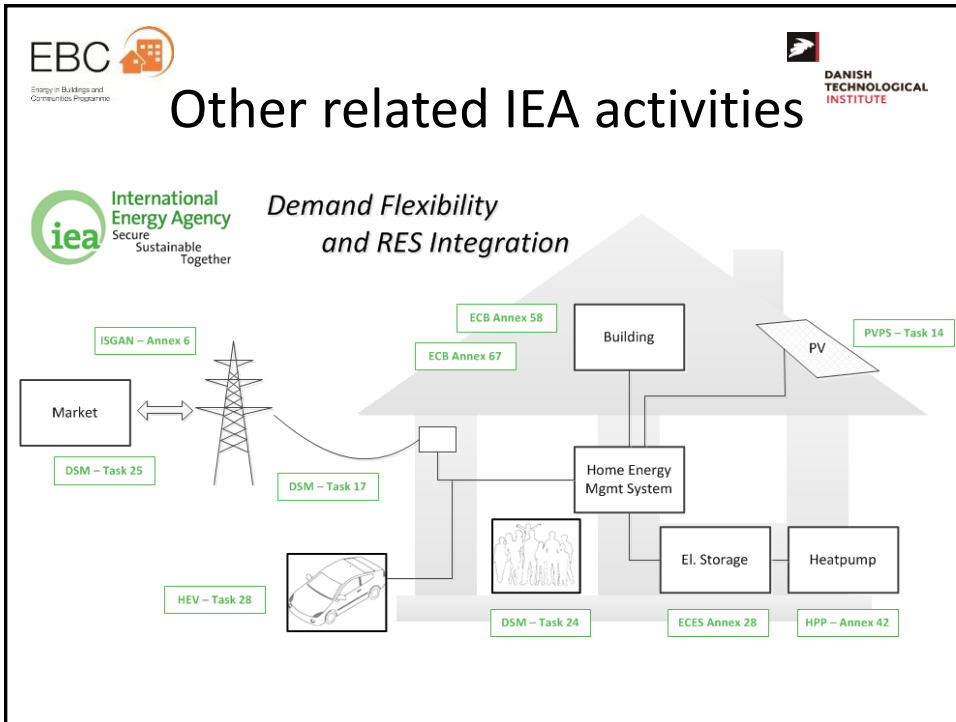
annex67.org



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The screenshot shows the homepage of the ANNEX 67 website. The header includes the EBC logo, the text 'ANNEX 67', and a search bar. A navigation menu contains links for Home, About Annex 67, Subtasks, Publications, Newsletters, Next meeting, Participants, Contact, and Member login. The main content area features a paragraph about Energy Flexibility, a diagram titled 'Smart Grid & other energy infrastructures' showing a flow from Smart environment to Smart, then to Smart Grid, Smart Buildings, Smart Grids, Smart Cities, and Smart. Below the text is a link to a publication on Elsevier: <https://authors.elsevier.com/a/1Vmc41M7zGsiYW>, until 12/11-2017. At the bottom, there are two images: one showing a person working on a computer and another showing a person working on a desk.



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Thank you for your attention