

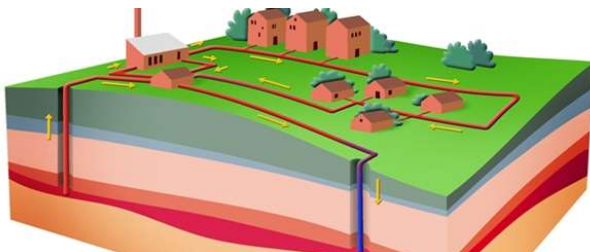
Energy Flexible Buildings

IEA EBC Annex 67

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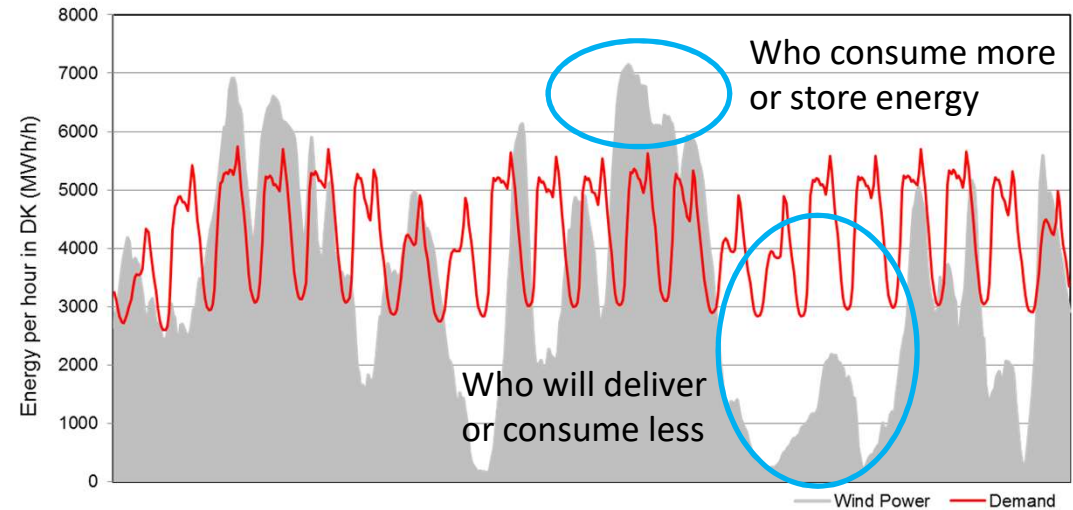
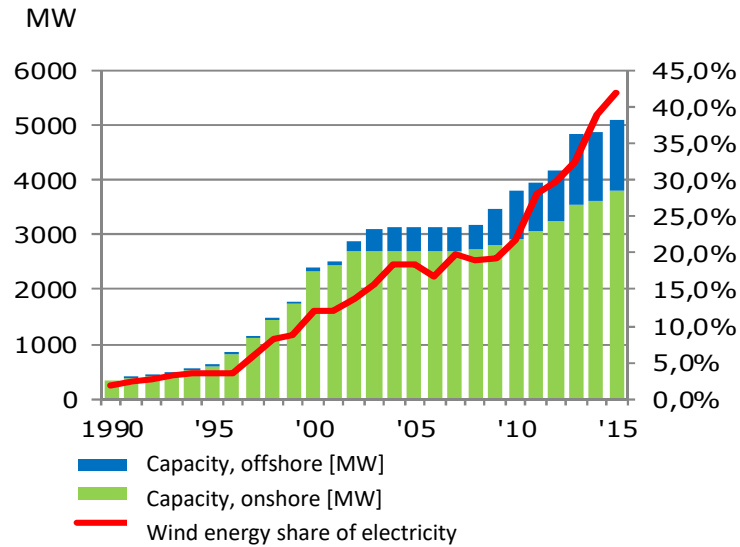
DYNASTEE symposium
Bilbao, April 10-11, Spain

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

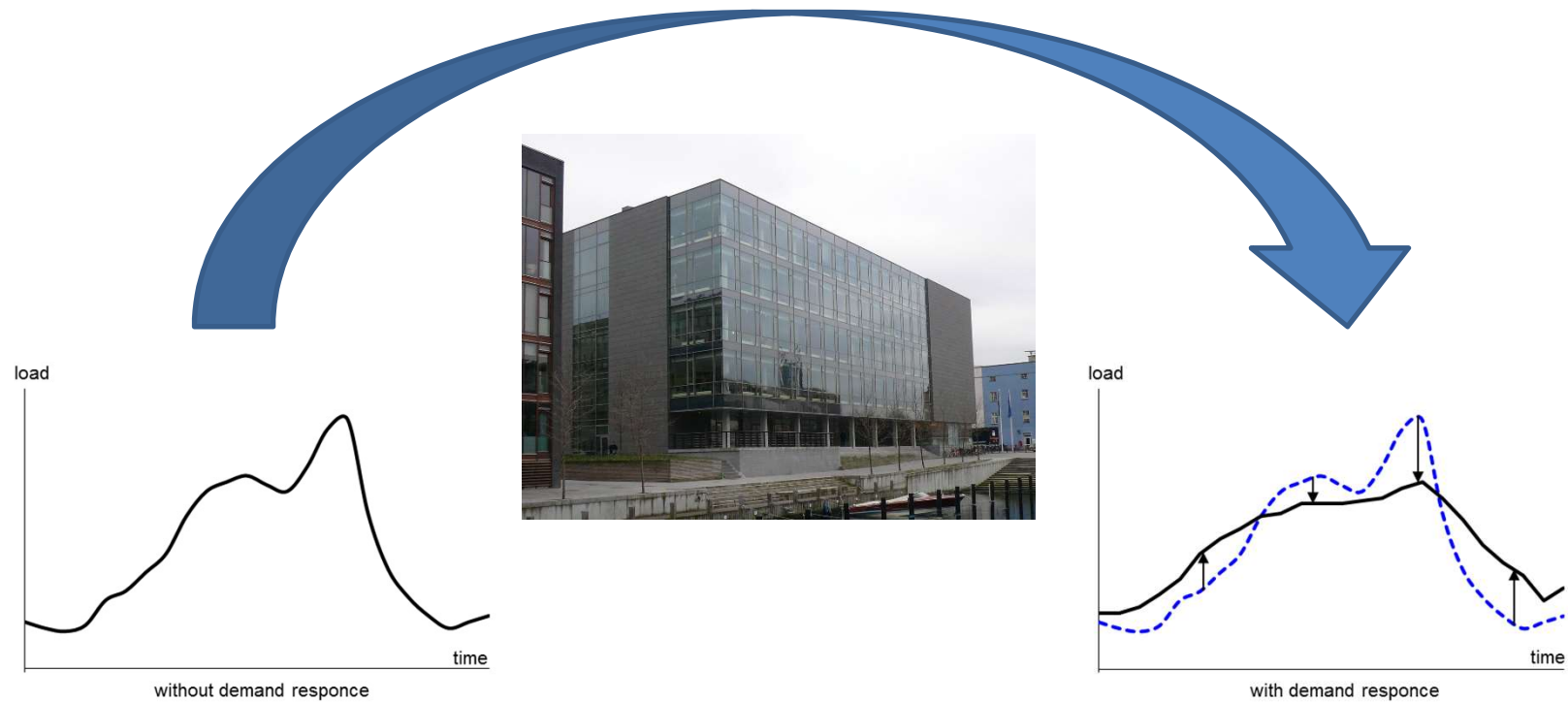


Example: Denmark

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

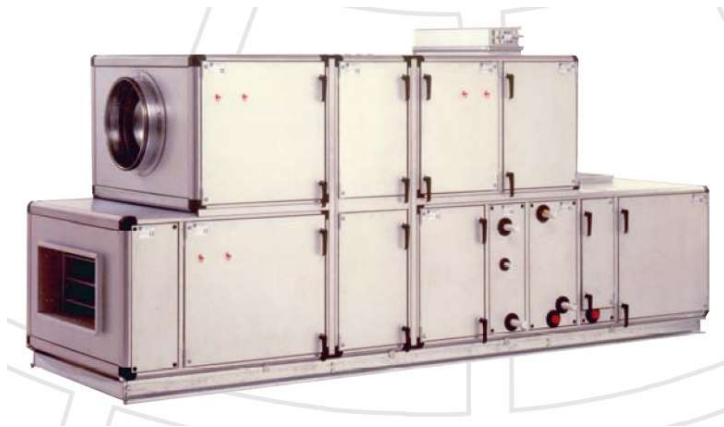


Most buildings have the ability to become energy flexible



Commercial buildings

ventilation systems



cooling systems

supermarkets

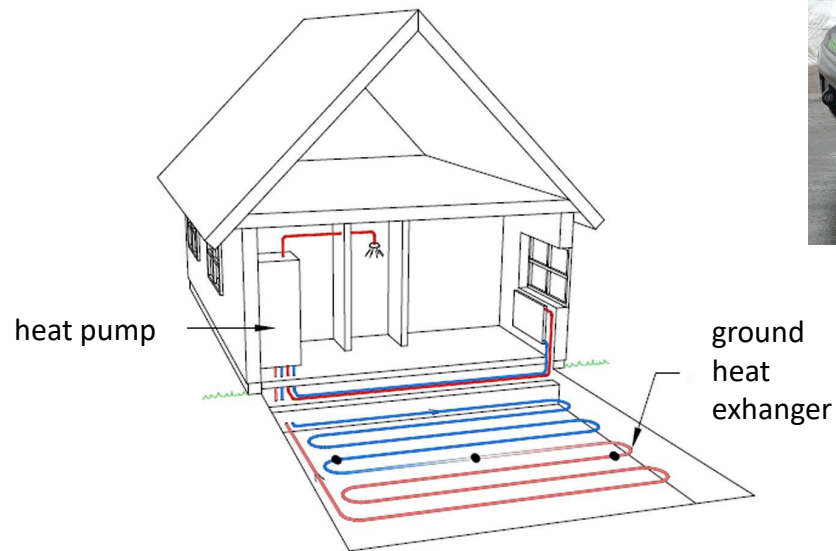


pumps



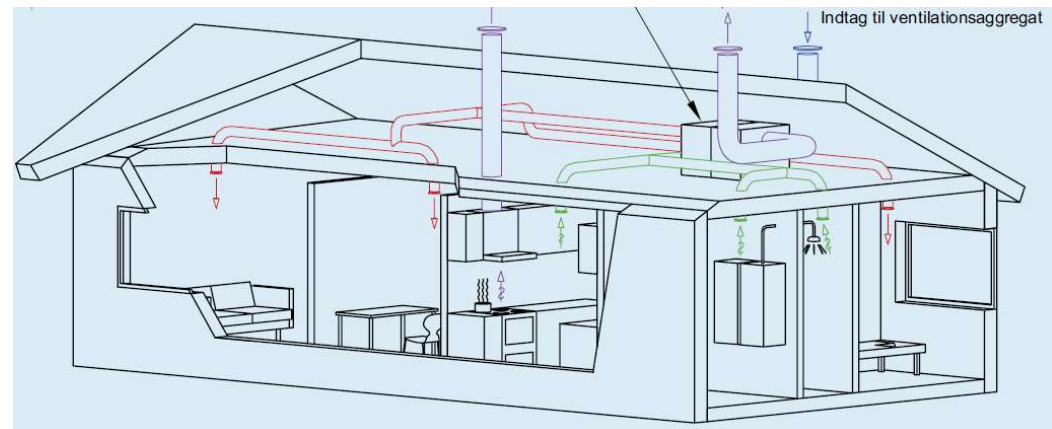
Electricity demand in households

heat pumps (aircondition)



EVs

ventilation systems



white goods

Prosumers



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.

European Union

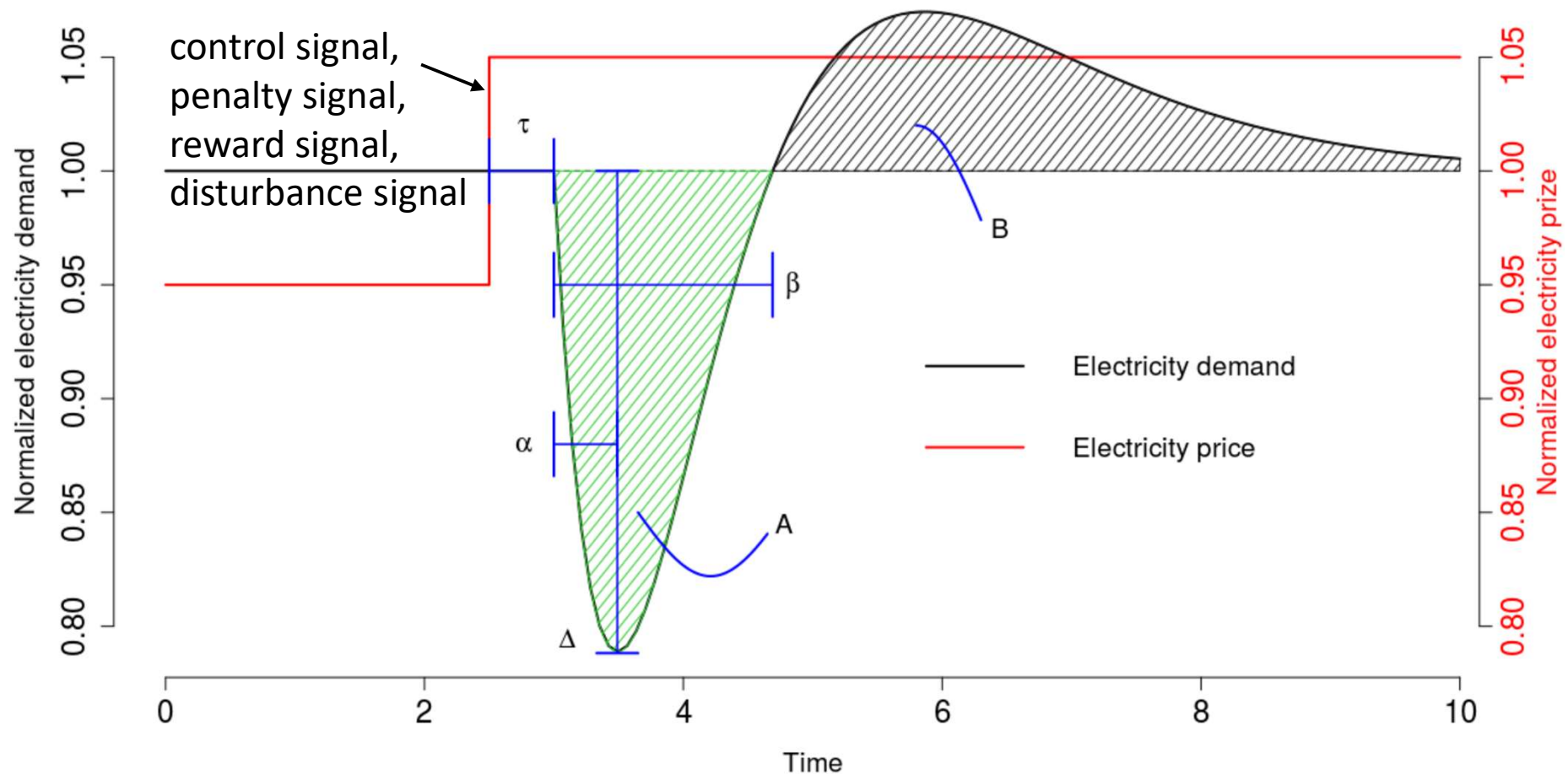
Smartness Indicator in EBPD (Energy Performance in Buildings Directive)

- 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

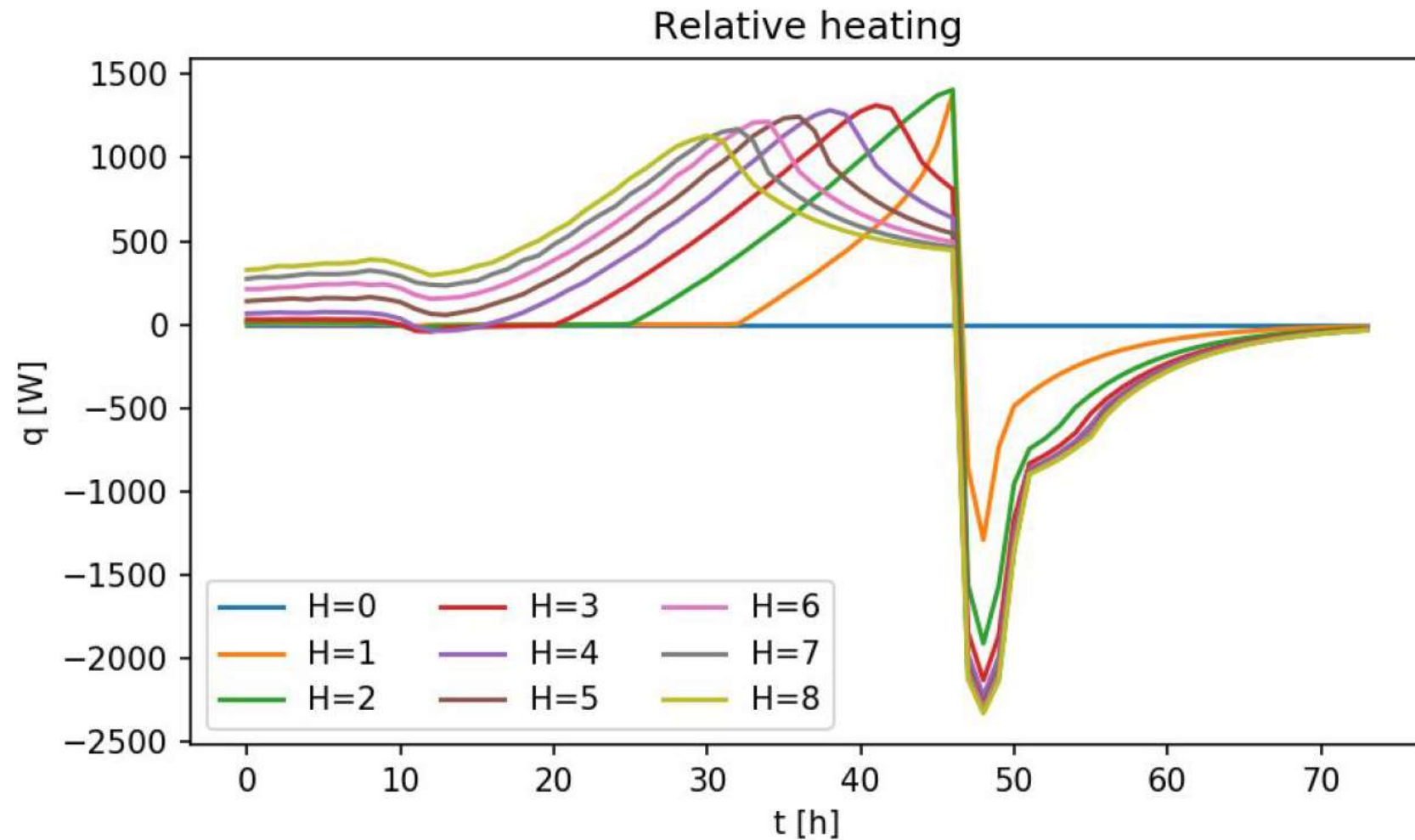
Annex 67 Position Paper:

<http://www.annex67.org/media/1470/position-paper-energy-flexibility-as-a-key-asset-i-a-smart-building-future.pdf>

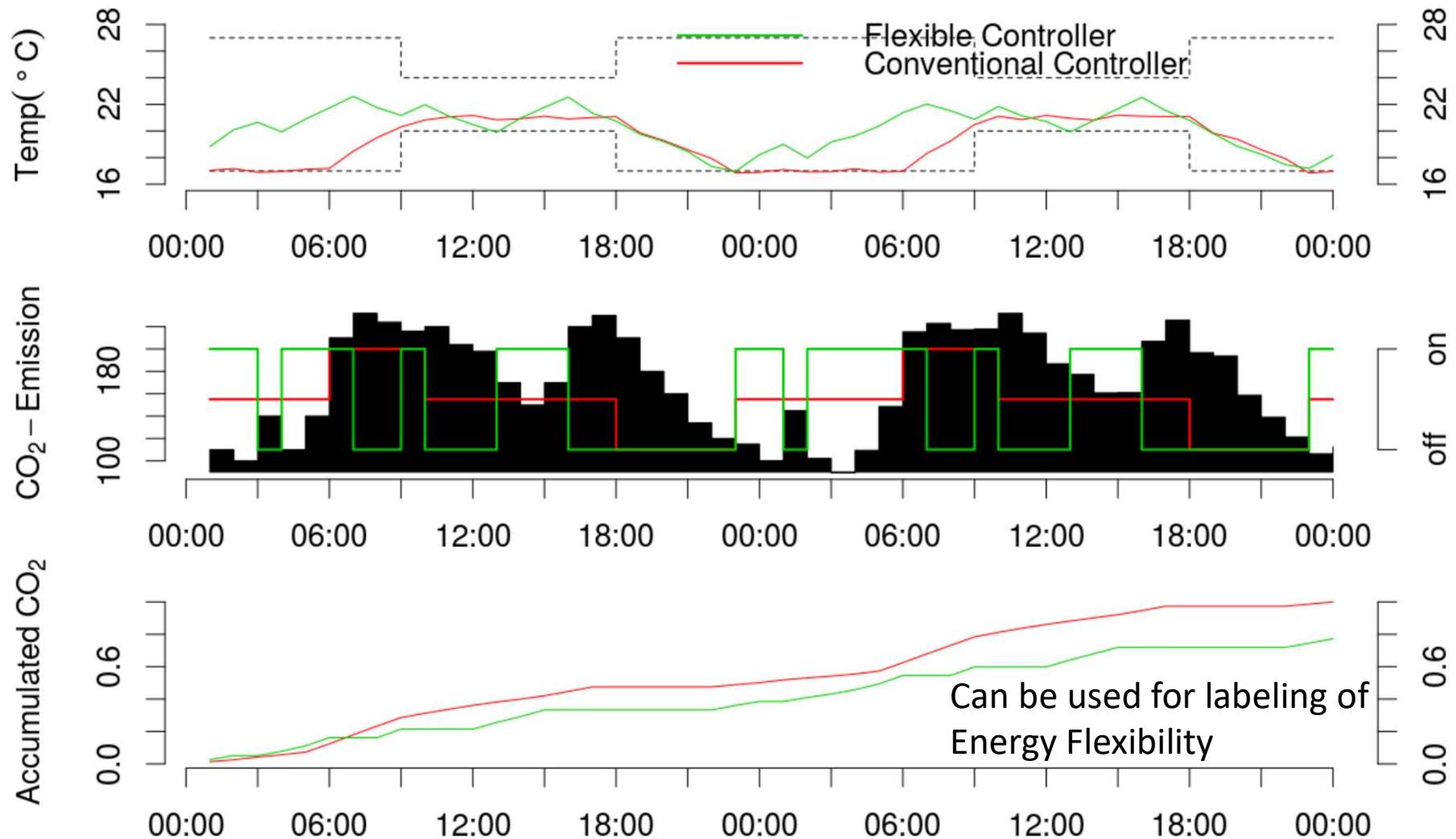
Characterization and labelling of Energy Flexibility in buildings



Pre-use of energy



Energy Flexibility in buildings



Characterizing the Energy Flexibility of Buildings and Districts.

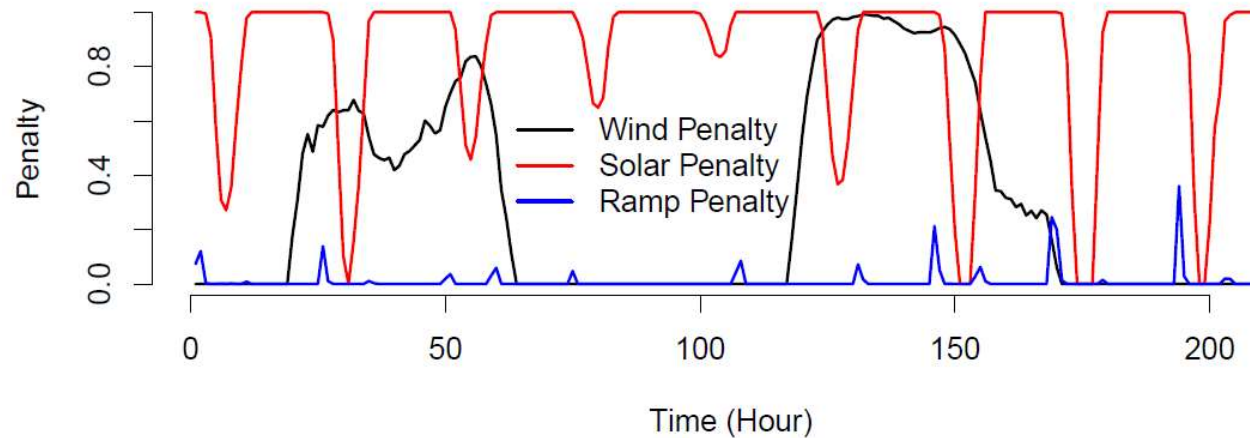
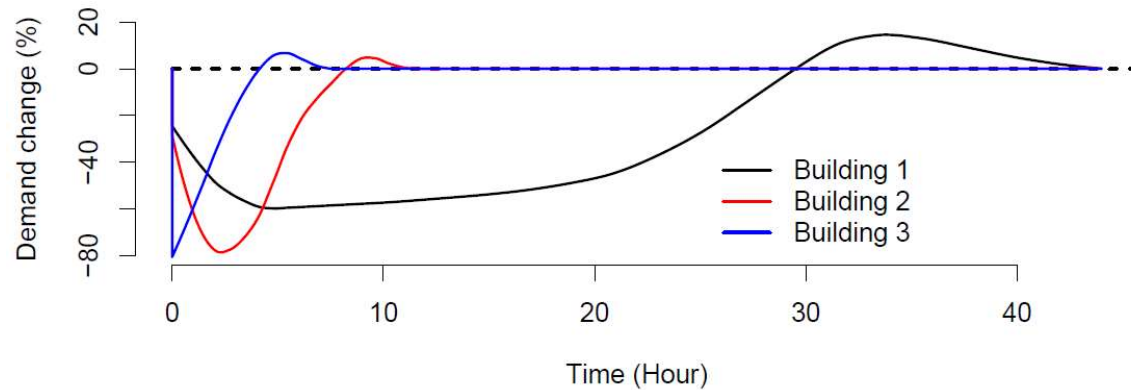
<https://www.sciencedirect.com/science/article/pii/S030626191830730X>

What is the possible Energy Flexibility in buildings?

It depends

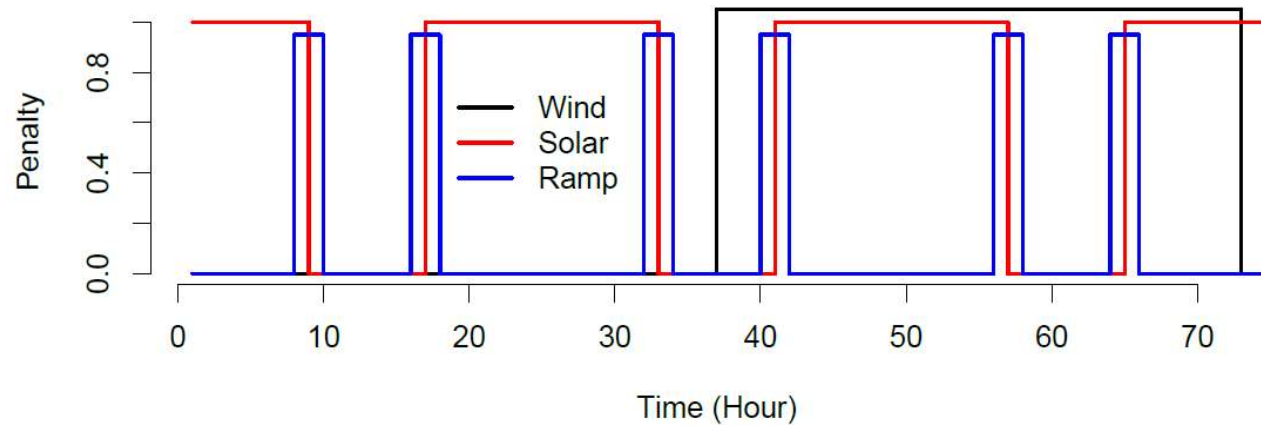
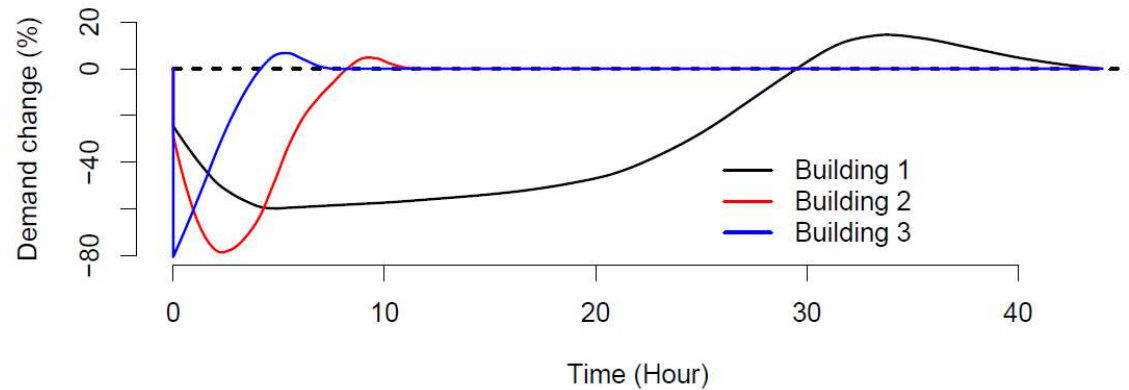
- type of building and energy service systems
- use of the building
- climate
- time of the day and the year
- occupants
- control possibilities
- state of storage (constructions, tank, battery, ...)
- physical max vs. cost optimal energy flexibility
- surrounding grids
- energy tariffs
- ...

Flexibility Saving Index



	Wind (%)	Solar (%)	Ramp (%)
Building 1	11.8	3.6	1.0
Building 2	4.4	14.5	5.0
Building 3	6.0	10.0	18.4

Flexibility Index



	Wind (%)	Solar (%)	Ramp (%)
Building 1	36.9	10.9	5.2
Building 2	14.4	47.9	22.3
Building 3	17.9	35.6	67.5

Expected Flexibility Saving Index vs. Flexibility Index

	Wind (%)	Solar (%)	Ramp (%)
Building 1	11.8	3.6	1.0
Building 2	4.4	14.5	5.0
Building 3	6.0	10.0	18.4

	Wind (%)	Solar (%)	Ramp (%)
Building 1	36.9	10.9	5.2
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Building 3	17.9	35.6	67.5

<https://www.sciencedirect.com/science/article/pii/S030626191830730X>

Output from Annex 67

- **Principles of Energy Flexible Buildings** summarizes the main findings of Annex 67 and targets all interested in what Energy Flexibility in buildings is, how it can be controlled, and which services it may provide.
- **Characterization of Energy Flexibility in Buildings** presents the terminology around Energy Flexibility, the existing indicators used to evaluate the flexibility potential and how to characterize and label Energy Flexibility.
- **Stakeholder perspectives on Energy Flexible buildings** displays the view point of different types of stakeholders towards Energy Flexible Buildings.
- **Control strategies and algorithms for obtaining Energy Flexibility in buildings** reviews and evaluates control strategies for Energy Flexibility in buildings.
- **Experimental facilities and methods for assessing Energy Flexibility in buildings** describes several test facilities including experiments related to Energy Flexibility and draws recommendations for future testing activities.
- **Examples of Energy Flexibility in buildings** summarizes different examples on how to obtain Energy Flexible Buildings.
- **Project Summary Report** brief summary of the outcome of Annex 67.

Website

annex67.org



The screenshot shows a web browser window displaying the annex67.org website. The browser's address bar shows the URL "annex67.org". The website header features the EBC logo and the text "ANNEX 67" with the subtitle "Energy in Buildings and Communities Programme". A navigation menu includes links for Home, About Annex 67, Subtasks, Publications, Newsletters, Next meeting, Participants, Contact, and Member login. A search bar is also present. The main content area contains two paragraphs of text and a diagram. The first paragraph discusses the lack of overview on energy flexibility and the aim of the Annex. The second paragraph highlights the importance of in-depth knowledge for future smart energy systems. The diagram, titled "Smart Grid & other energy infrastructures", shows a hierarchy of energy flexibility levels: Built environment, Building, Floor, Room, Workplace, and User. Below the text, there are two images: one showing people working on laptops and another showing a dog lying down. The footer includes the text "Objectives" and "Project beneficiaries". The Windows taskbar at the bottom shows various application icons and the system clock indicating 10:08 on 13/03/2017.

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annex67.org

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Currently there is no overview or insight into how much Energy Flexibility different building types and their usage may be able to offer to future energy systems. The aim of the Annex is thus to increase knowledge on and demonstrate the Energy Flexibility buildings can provide for the energy grids, and to identify critical aspects and possible solutions to manage this Energy Flexibility.

In-depth knowledge of the Energy Flexibility that buildings may provide is important for the design of future Smart Energy systems and buildings. The knowledge is, however, not only important for the utilities it is also necessary for companies when developing business cases for products and services supporting the roll out of Smart Energy networks. Furthermore, it is important information for policy makers and government entities involved in the shaping of future energy systems.

Read more about Annex 67, [click here](#)

Smart Grid & other energy infrastructures

Built environment
Building
Floor
Room
Workplace
User

Objectives

Project beneficiaries

DA 10:08
13/03/2017

Participating countries

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

Thank you for your attention