

Zero Emission Buildings

- a national research centre

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FME-ZEB: Zero Emission Buildings

In February 2009, the Research Council of Norway assigned The Faculty of Architecture and Fine Art at NTNU to host one of eight new national Centres for Environment-friendly Energy Research (FME): **Zero Emission Buildings (ZEB)**.

Duration: 2009 – 2016

Budget: approximately 38 mill Euro
(300 mill NOK)



FME-ZEB: Zero Emission Buildings



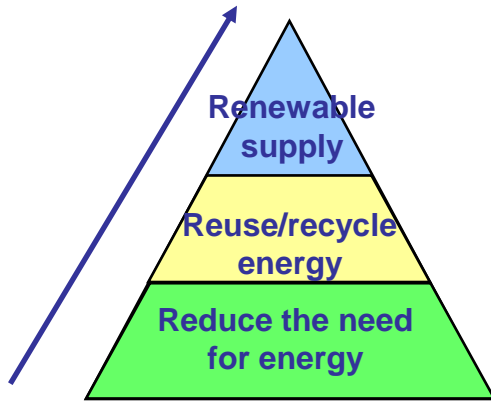
A national research centre that will put Norway in the forefront with respect to research, innovation, and implementation within the field of energy efficient Zero Emission Buildings.

The main objective of ZEB is to develop competitive products and solutions for existing and new buildings that will lead to market penetration of buildings with zero greenhouse gas emissions related to their production, operation, and demolition.

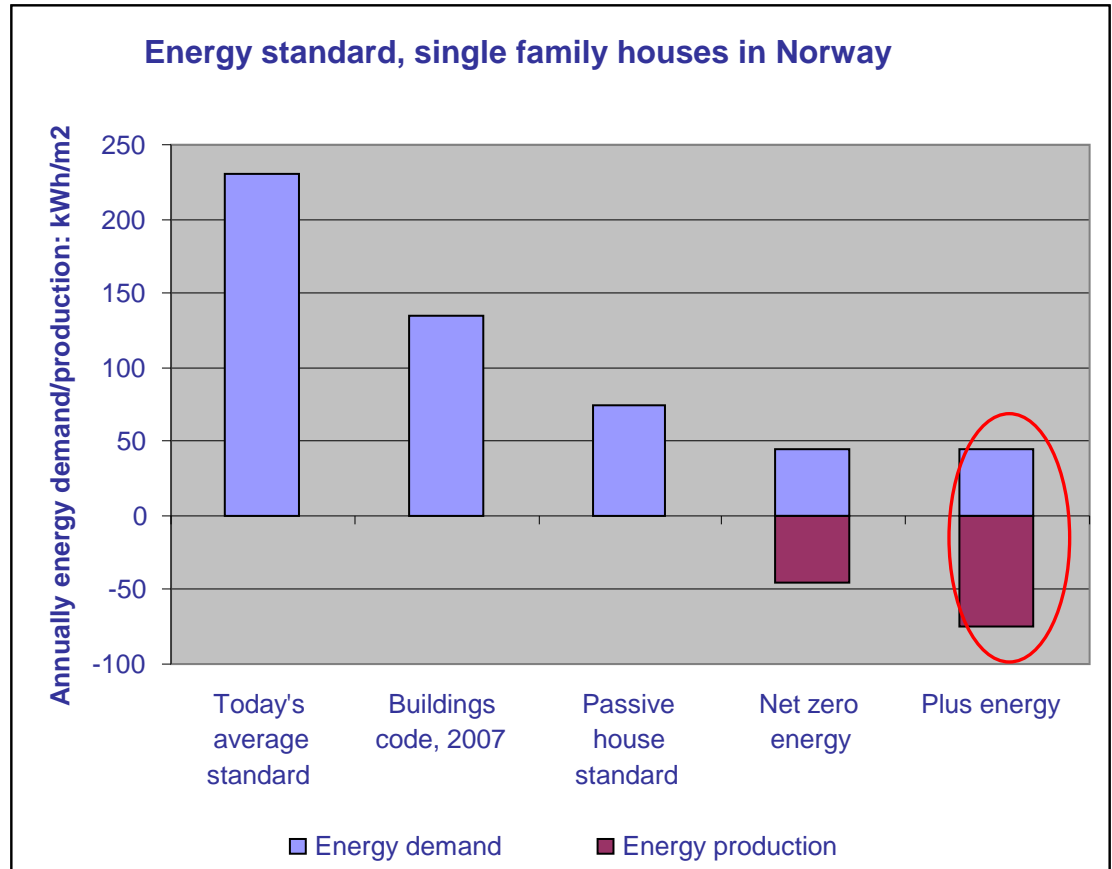
The centre encompasses both residential, commercial, and public buildings.

The challenge:

Compensate for CO₂ emissions from the production of materials and construction by producing more energy than the building uses for operation.



Source: Lechner, Lysen, etc.



Source: SINTEF Byggforsk

ZEB – a national team

ZEB includes experts within *material science, building technology, energy technology, architecture, and social science* and encompasses the whole value chain of market players within the Norwegian construction sector.

International partners:

VTT (Finland)
Chalmers (Sweden)
Fraunhofer (Germany)
TNO (The Netherlands)
LBL (USA)
MIT (USA)
University of Strathclyde (Scotland)
Tsinghua University (China)

National partners:

NTNU
SINTEF
SINTEF Energi
Skanska
Maxit
Isola
Glava
Protan
Hydro Aluminium
YIT
DuPont
Multiconsult
Brødrene Dahl
Snøhetta
ByBo
Forsvarsbygg
Statsbygg
Husbanken
Byggenæringens landsforening
Norsk Teknologi
Statens Byggetekniske Etat

The ZEB research activities

ZEB will focus its work in five areas that all interact and influence each other:

- WP-1: Advanced material technologies
- WP-2: Climate-adapted low-energy envelope technologies
- WP-3: Energy supply systems and services
- WP-4: Use, operation, and implementation
- WP-5: Concepts and strategies

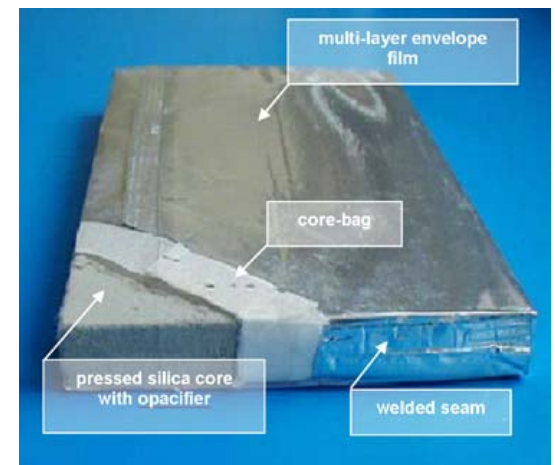
WP1 - Advanced material technologies

Main goal:

Development of new and innovative materials and solutions, as well as improvements of the current state-of-the-art technologies

Subtasks:

- 1.1: New concepts
- 1.2: Opaque and transparent solutions
- 1.3: Controllable materials and solutions
- 1.4: Energy storage solutions
- 1.5: Energy converting materials and solutions



WP2 – Climate adapted, low energy envelope technologies

Main goal:

Develop climate adapted, verified, and cost effective solutions for new and existing building envelopes (roofs, walls and floors) that will give the least possible heat loss and at the same time a reduced need for cooling.

Subtasks:

- 2.1: Optimal thermal performance
- 2.2: Integration of active elements in the building envelope
- 2.3: Daylight and solar shading systems
- 2.4: Development of windows and glazing systems



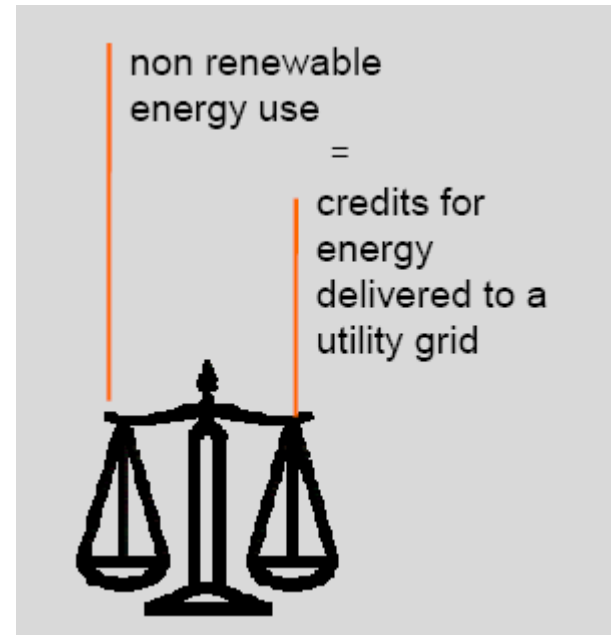
WP3 - Energy Supply Systems and Services

Main goal:

Develop new solutions for energy supply systems and building services systems with reasonable energy and indoor environment performance appropriate for zero emission buildings.

Subtasks:

- 3.1: Available technologies for renewable energy
- 3.2: Interaction between user needs, energy supply, and building services
- 3.3: Integration of technologies and solutions
- 3.4: High performance building services
- 3.5: Test and pilot buildings - Follow up



Source: University Wuppertal, School of Architecture, Building Physics and Technical Building Services.
Prof. Karsten Voss

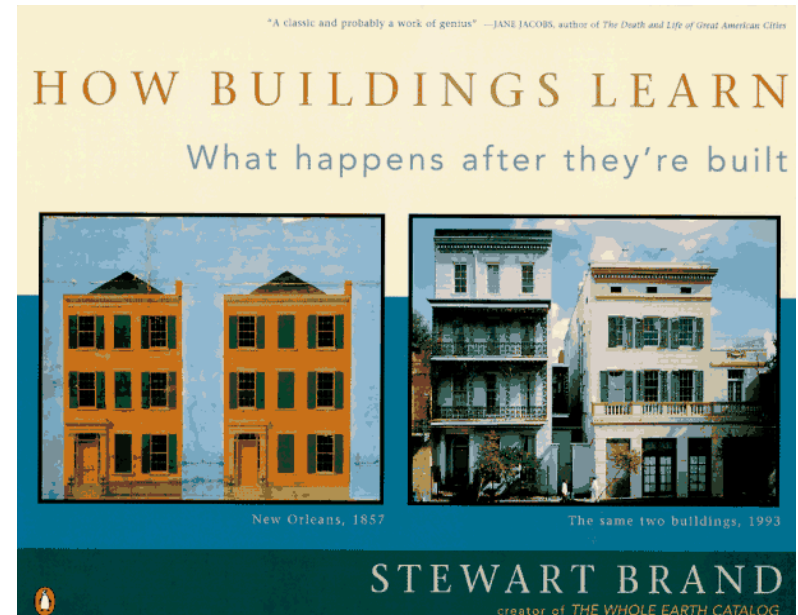
WP4 - Use, operation, and implementation

Main goal:

Provide knowledge and tools which assure usability and acceptance, maintainability and efficiency, and implementation of ZEBs.

Subtasks:

- 4.1: Use
- 4.2: Operation
- 4.3: Implementation



WP5 - Concepts and strategies for ZEBs

Main goal:

Develop concrete concepts for zero emission buildings which can be translated into realized pilot buildings within the time frame of the Centre.

Subtasks:

- 5.1: Definitions of ZEBs
- 5.2: ZEB concepts
- 5.3: Pilot buildings
- 5.4: Strategies and building processes



The ZEB Research Centre

Management:

Director: Professor Anne Grete Hestnes, NTNU

Manager: Research director Terje Jacobsen, SINTEF Byggforsk

Work Package Leaders:

WP1: Professor Arild Gustavsen, NTNU

WP2: Research manager Berit Time, SINTEF

WP3: Professor Vojislav Novakovic, NTNU

WP4: Associate professor Thomas Berker, NTNU

WP5: Senior researchers Tor Helge Dokka/Inger Andresen, SINTEF

EU contact:

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www.zeb.no