Powerhouse –
Making future buildings sustainable

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INTERDISCIPLINARY ARCHITECTURE AND CONSULTING COMPANY

Approx. 900 employees with expertise in:

- Architecture
- City and Area Planning
- Building and Construction
- Energy and Environment
- Geographic Information Systems and IT Visualization
- Landscape Architecture
- Communication and Transport Engineering
- Social Analysis and Evaluation
- Community Planning
- Technical Infrastructure
- Water Supply and Environmental Engineering

Background

40%

Buildings account for approximately 40 % of global energy consumption

1.3 Why cities and buildings?

> *"Cities are where the Climate Change battle will be won or lost over the next decades"*
> *Marco Scuriatti, Senior Operations Officer at the World Bank, 2011[1]*

Cities have a crucial role to play in the fight against climate change, both because they generate around 75% of global GHG emissions and because of their great potential to reduce these emissions through local policy and action. Local governments have a greater understanding of – and influence on – local realities and constraints. Even if by nature each local government can only act locally, the accumulated impact can be significant when they act collectively on the same issue – contributing to global efforts to address climate change and complementing the efforts of national governments. (2)

Decisions made in cities now can have long-standing impacts on future GHG emissions trends; for example new infrastructure and buildings, depending on their design, could either "lock in" unsustainable energy consumption over their lifetime, or deliver net climate benefits (3).

Buildings – in cities and elsewhere – represent a key area for focusing climate change mitigation. They account for approximately 40% of global energy consumption, which in turn generates around 30% of all energy-related GHG emissions. Current trends in population growth and urbanisation will lead to a significant need for new buildings in a very short period, with an additional two billion urban inhabitants expected by 2030. Such growth will bring with it a rise in energy consumption and associated GHG emissions – and not just from residential buildings but also the commercial and industrial developments that accompany them.

Considerable opportunities exist to realize significant gains in energy efficiency and implement low carbon strategies in our cities. The building sector in particular has some of the greatest untapped potential for reducing GHG emissions and at least cost. In order to make the most of these opportunities, governments and industry must be mobilized to put meaningful and effective projects and policies in place.

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Office building before refurbishment

Project details:

- Originally built: 1980
- Area: 5,180 m^2
- Project start: January 2012
- Completed: April 2014

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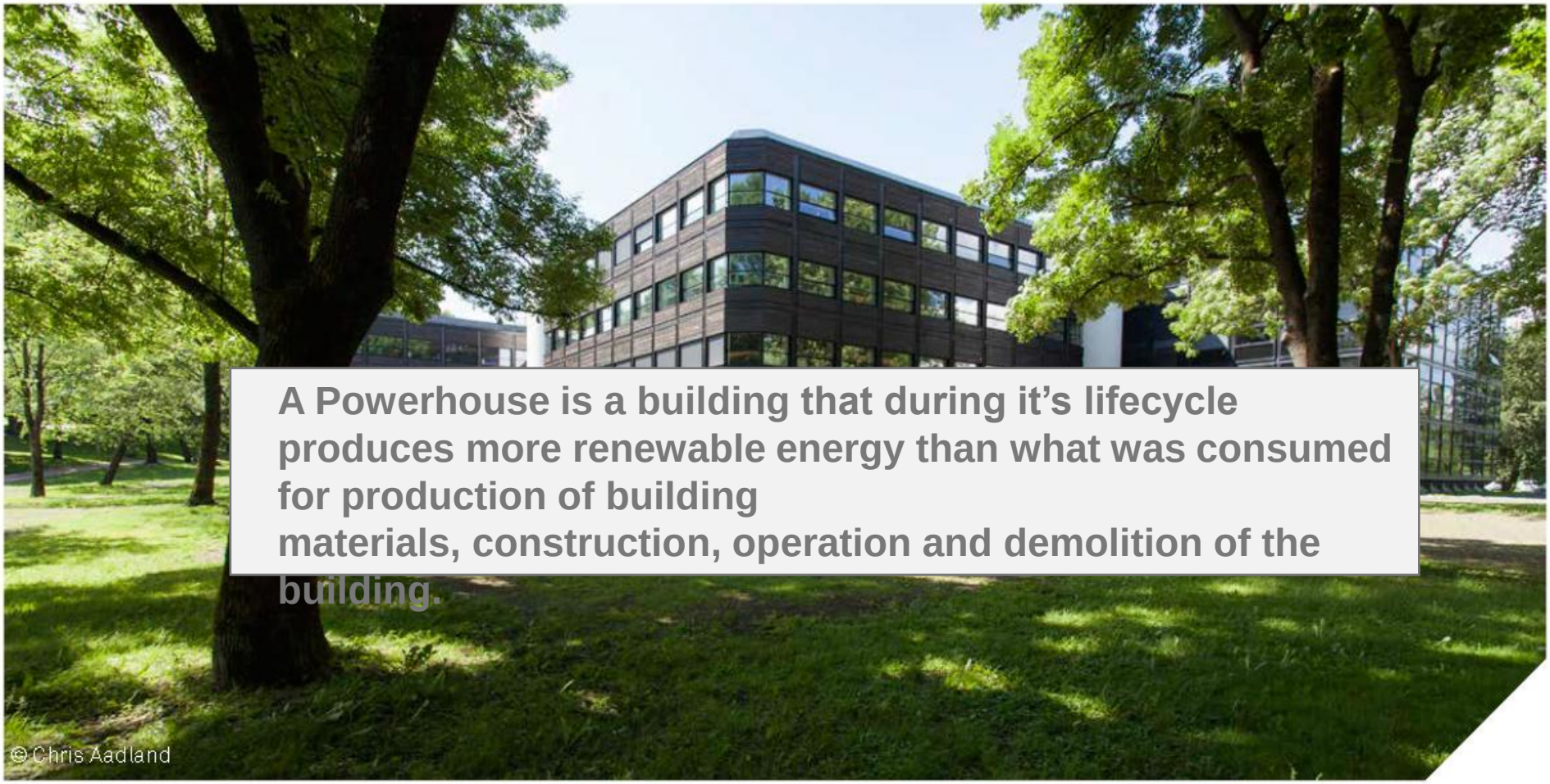
Definition of a Powerhouse



A Powerhouse is a building that during it's lifecycle produces more renewable energy than what was consumed for production of building materials, construction, operation and demolition of the building.

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The Powerhouse collaboration

«Nobody can develop a Powerhouse plus energy building alone – but together with our partners we can do it.»

ZERO

entra

SNØHETTA

sapa:

HYDRO

SKANSKA

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Research partner Powerhouse Kjørbo:
ZEB - The Research Centre on Zero Emission Buildings

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Project details and objectives

Objectives

- Renovate to an energy positive building
- Build within commercial market conditions
- BREEAM-NOR «Outstanding» – the highest of the five levels of this environmental classification system

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Process and Methodology

- New collaboration models with emphasis on interdisciplinary design processes.
- Cooperation between all disciplines from day one
- It has been essential for the team to work towards a clear defined goal.
- Broad communication of the energy and environmental goals
- Ambitious leadership.
- Dare to take risks and try new solutions.

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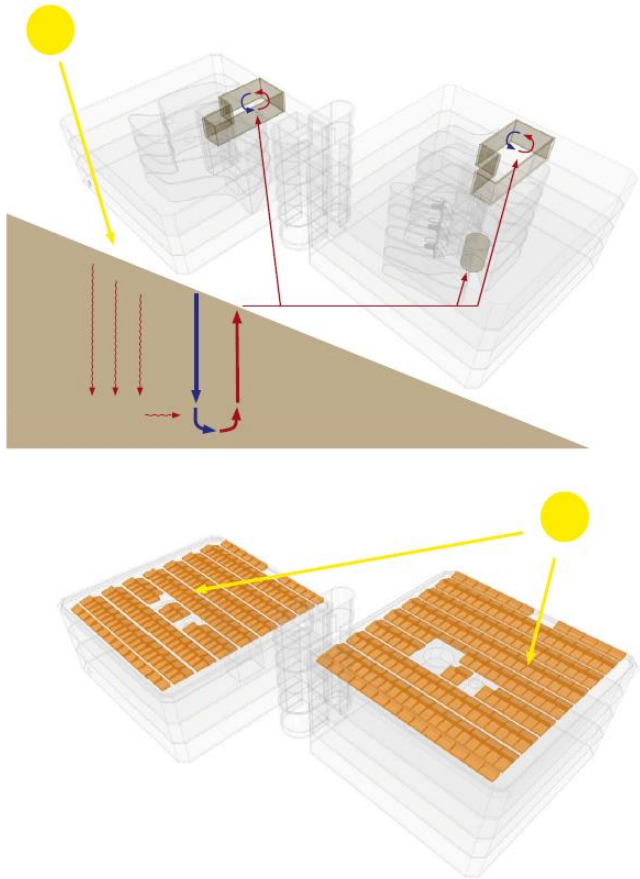
Energy concept

- Consequent reduction of energy demand.
- Energy wells and heat pumps provide heat and free cooling.
- Recycling of heat from server room.
- Local electricity production.



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Heat and cooling from the ground

Heating is provided by a 80 kW heat pump system, which is connected to ten energy wells, each approx. 200 meters deep.

Free cooling: 8 –10 °C cold brine from the energy wells is pumped through a heat exchanger to directly cool the building.

As a backup solution, the Powerhouse is connected to the local district-heating.

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Building Adapted Photovoltaic System

- Installed capacity: 312 kW_p
- 1550 m^2 solar panels.
- Annual energy production: approx. 220 000 kWh.
- Norway's second largest Solar power installation.

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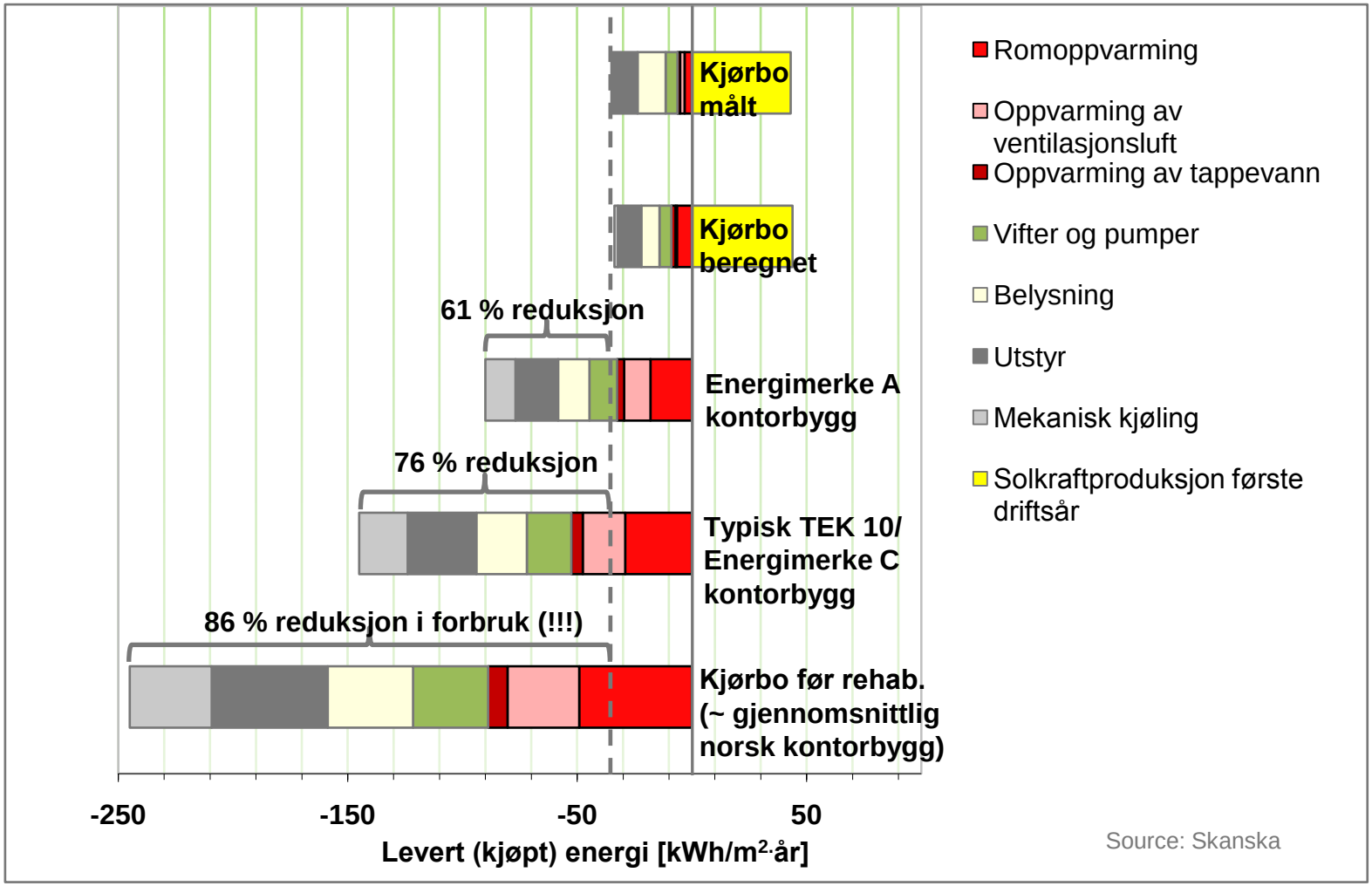
Energy use compared with different building codes



Source: Skanska

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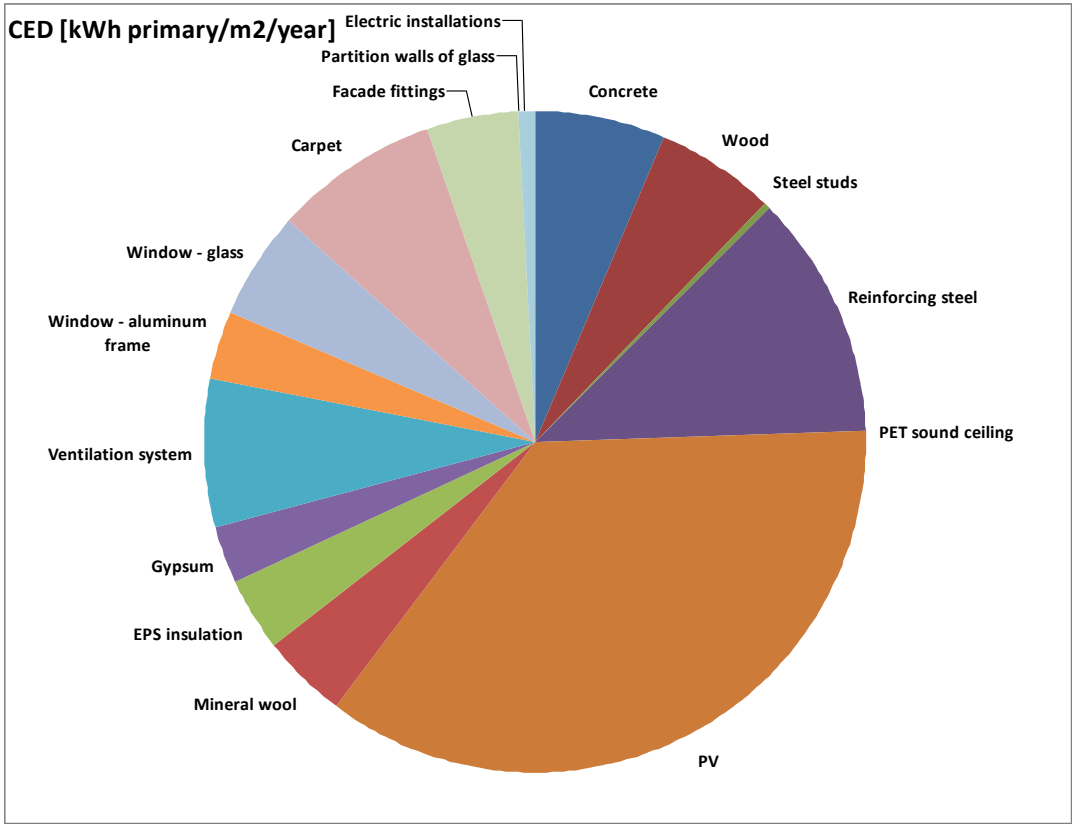
Embodied energy matters

Key finding:
The embodied energy outweighs the energy consumed during the building's operation as the latter has been radically reduced in this highly energy-efficient building.



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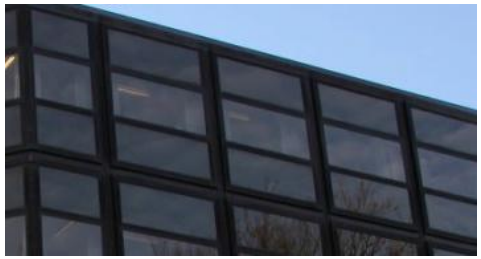
Minimize embodied energy - Materials

- The buildings' structural systems remained
- All new materials were carefully chosen to ensure that the materials had low embodied energy.



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Glass panels from the original façade are used as doors and glass walls inside the building.

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Visualization of energy performance

The «Energy Dash Board» shows real time energy consumption and production

http://powerhouse.asplanviak.no/energikiosk/

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More information about Powerhouse Kjørbo

Brochure in English:

http://powerhouse.asplanviak.no/

Powerhouse Kjørbo: MIPIM Awards nominee for *The Best Innovative Green Building Award* and *The People's Choice Award* 2015

Video in English:

https://www.youtube.com/embed/JGYu1lp5tu0

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Thank you for your attention!

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