POWERHOUSE KJØRBO

23.05.13

Agenda

- About Entra Eiendom and strategi
- About Powerhouse
- A active house (building)
- How to buildt active house and use of IED/ID

About Entra Eiendom

- Entra is a leading Norwegian real estate company
- Creates value by developing, letting and operating attractive and environmentally leading premises
- Owns 120 properties - 1,2 million m2
- Property value about 25 billion NOK
- Owned by the Norwegian government

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Main strategic choices

POWERHOUSE

ZERO

HYDRO

SNØHETTA

SKANSKA

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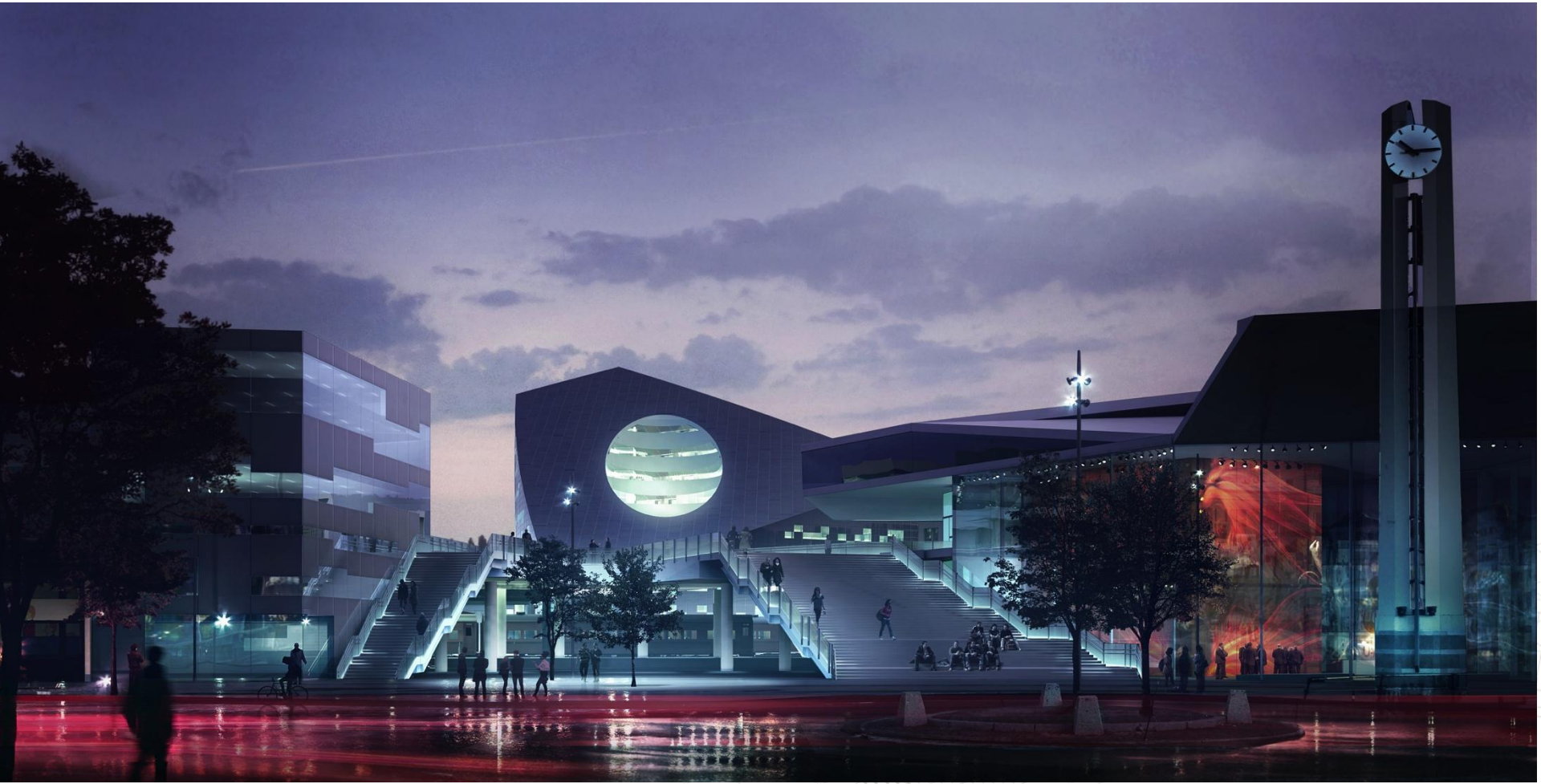
POWERHOUSE "ONE"



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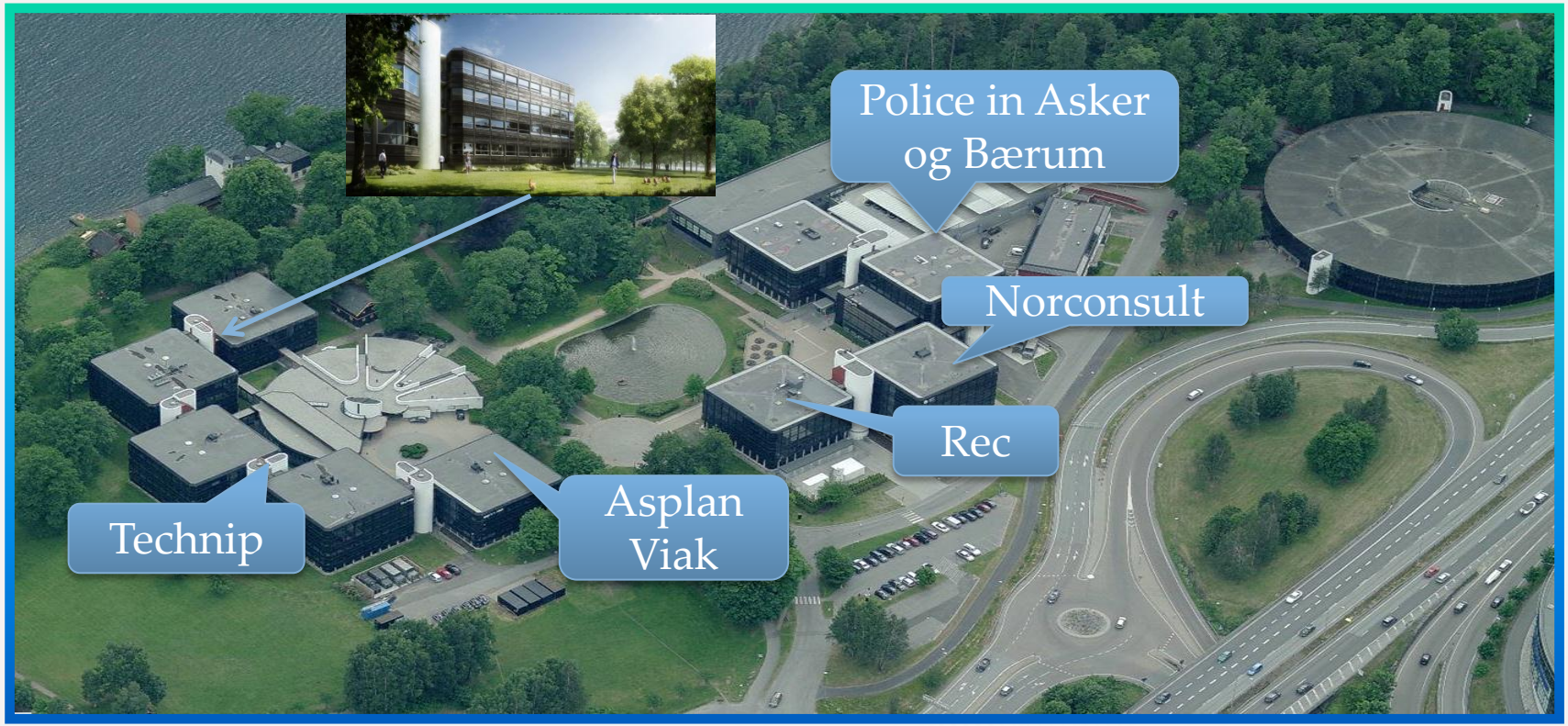
Powerhouse Kjørbo

Powerhouse Kjørbo, Sandvika

KJØRBO



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The project of Powerhouse Kjørbo

- Existing buildings from the 1980s
- Area about 5500 m2
- Current regulation plan
- Today's facades expression to be retained
  Rehabilitate to energy-positive buildings
- BREEAM Outstanding
- Creating attractive premises
- Economy

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Environmental goals in Powerhouse Kjørbo

Active house

POWERHOUSE

Creadle to Creadle

cradletocradle

BREEAM OUTSTANDING

BREEAM®

Future-Built

FUTURE BUILT

CLIMATE FRIENDLY ARCHITECTURE AND URBANISM

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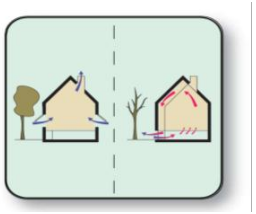
Active House/ energy-plus house/ zero-energy building

An **energy-plus-house** produces more energy from renewable energy sources, over the course of a year, than it imports from external sources

An energy-positive building is a building which during its operational phase generates more energy than what was used for the production of building materials, its construction, operation and disposal



Energy for the operation

+

Embodied energy

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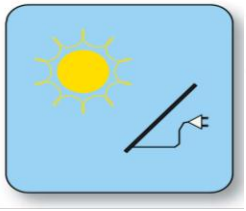


Production of renewable energy

Diagrammer: SNØHETTA / Andreas Eggertsen

IED/ID and Powerhouse Kjørbo

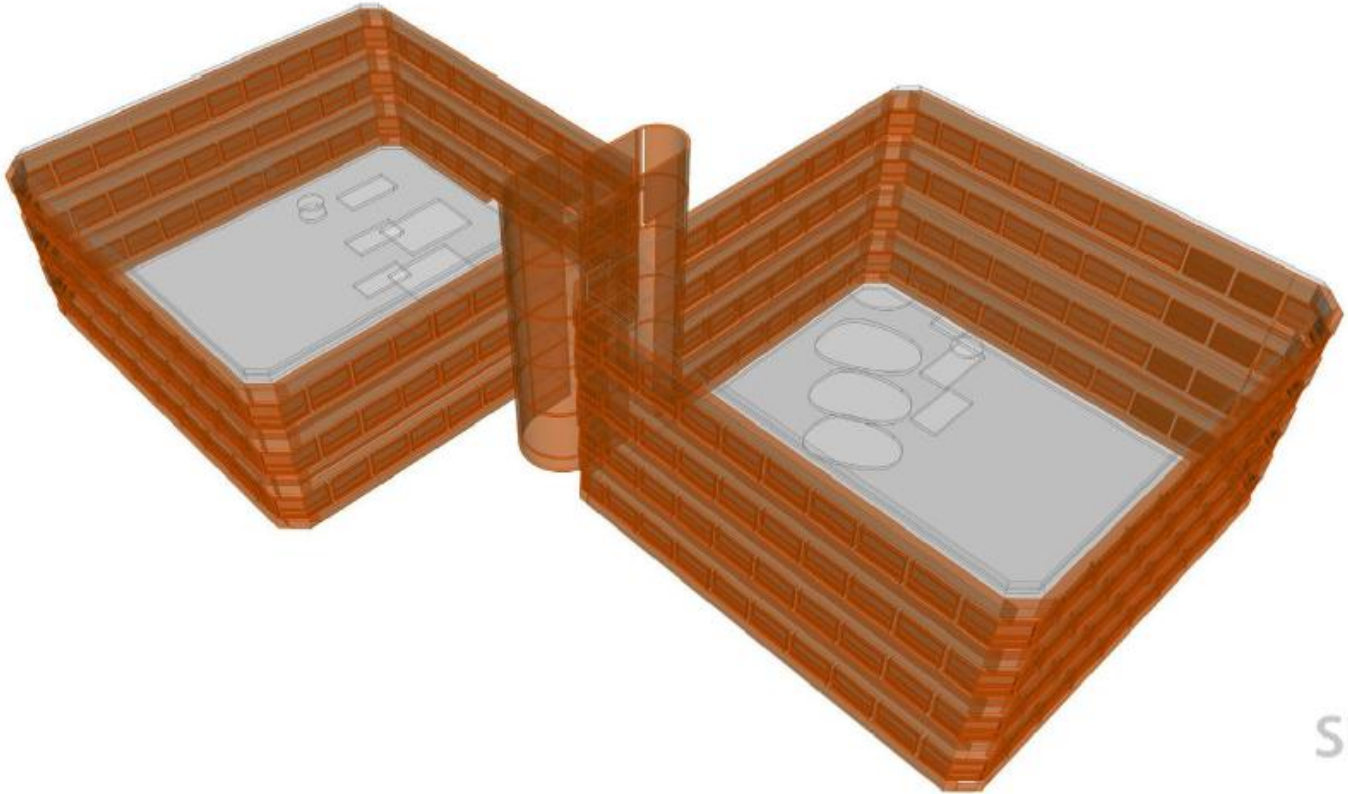
Definition from ID process guideline

ID is defined as a combination of;

1. Integration or cooperation between stakeholders (client, architect and other consultants, and eventually users) from early on in the design process.
2. In achieving high energy/ environmental ambitions, the implementation of integrated architectural solutions or passive qualities are prioritized before active systems.

1

Facade



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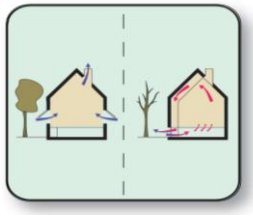

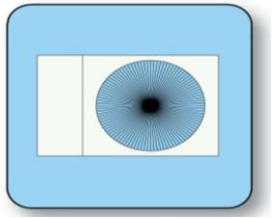

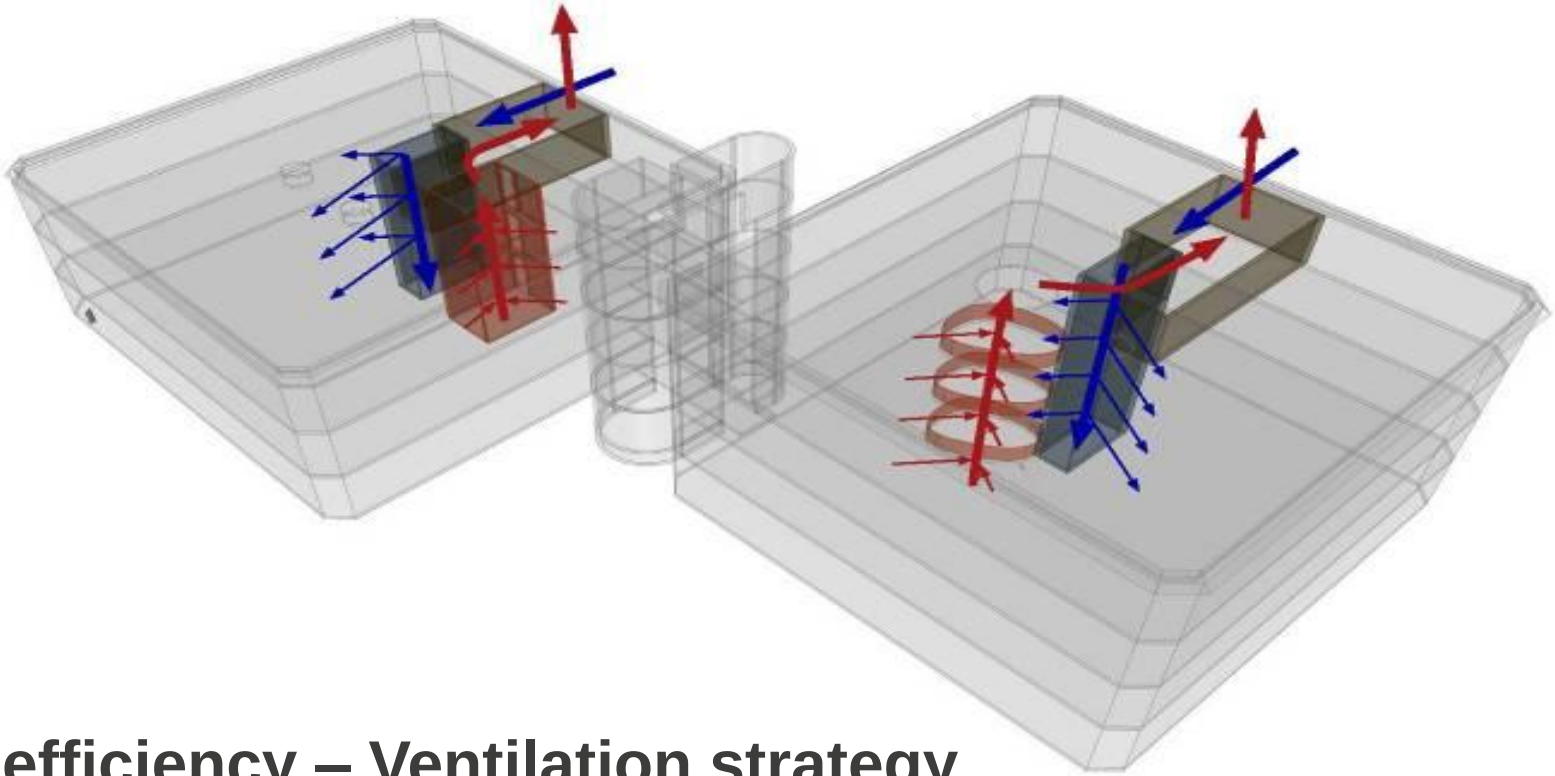

Energy efficiency – Ventilation strategy

Illustrasjon: SNØHETTA
Diagrammer: SNØHETTA / Andreas Eggertsen

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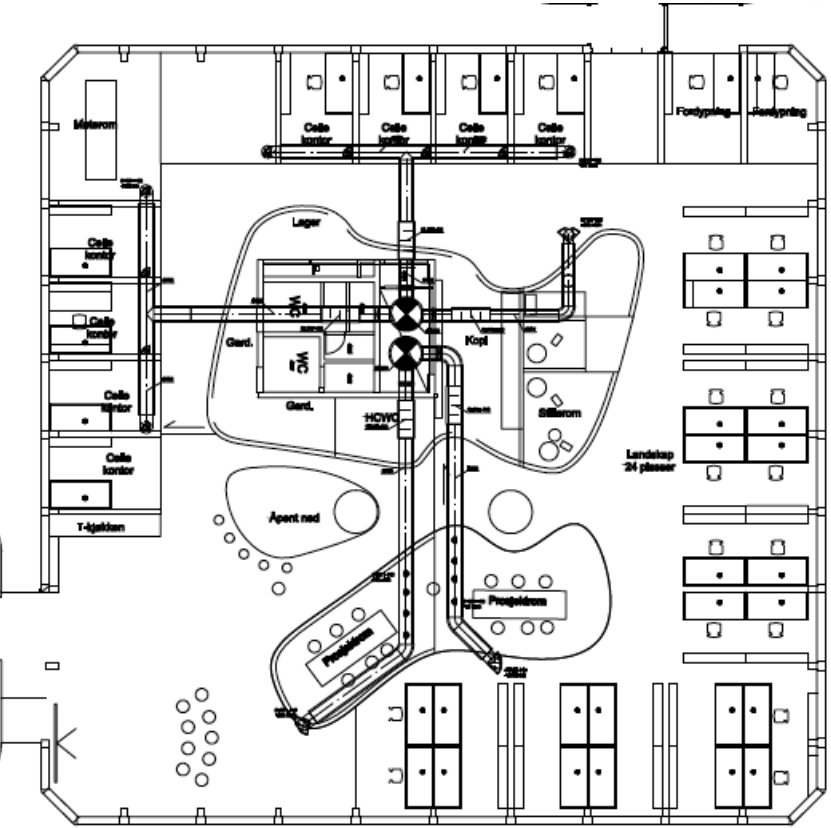
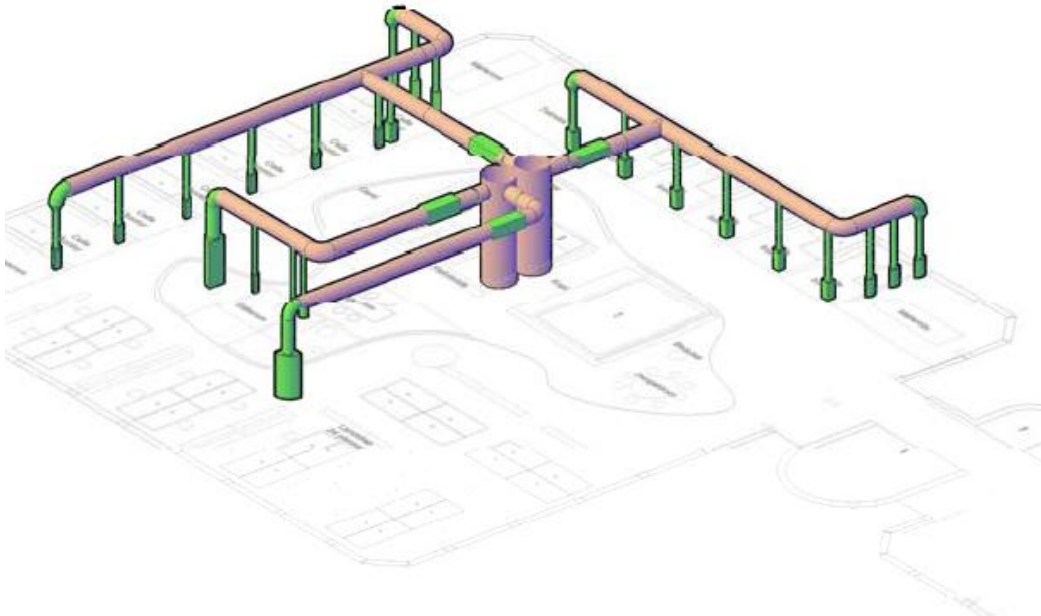
Ventilation principle in the floors





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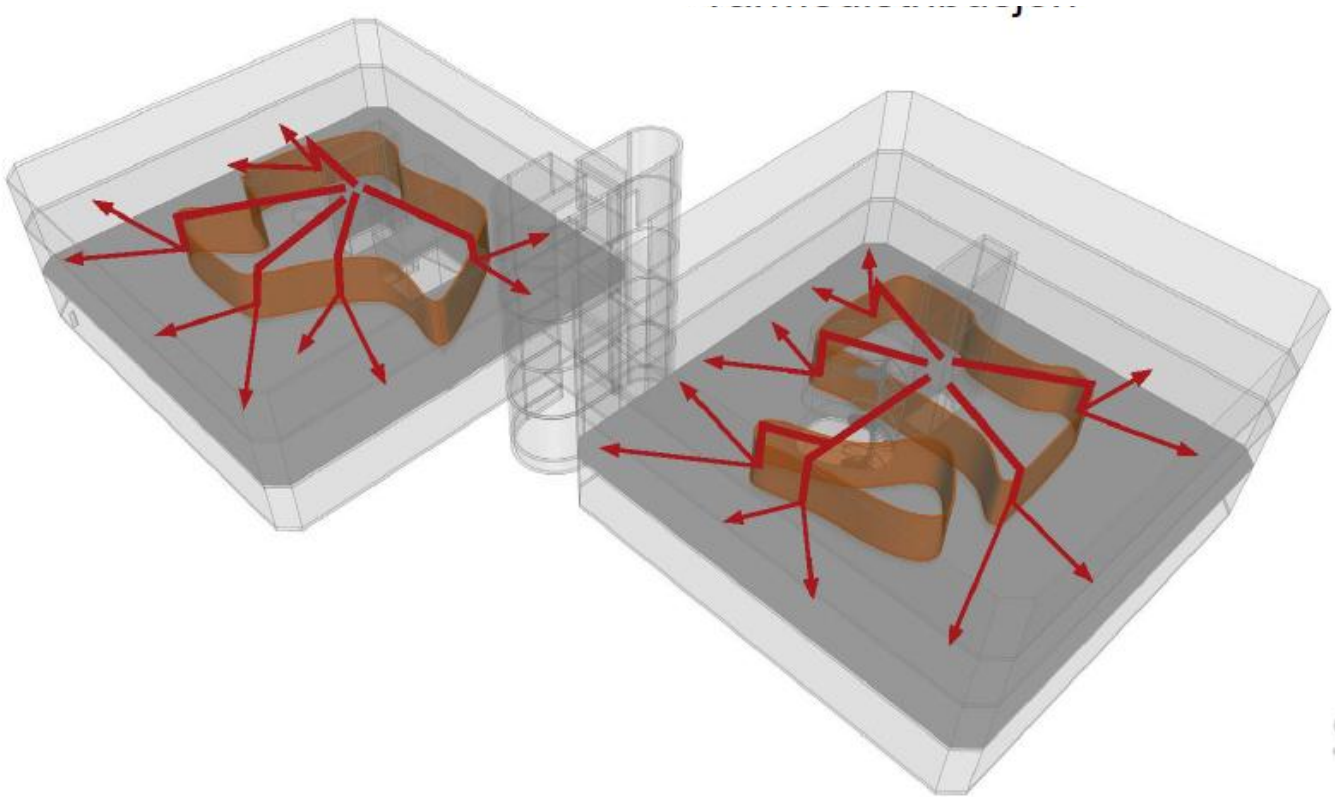
Optilmal energy use
- Heat distribution



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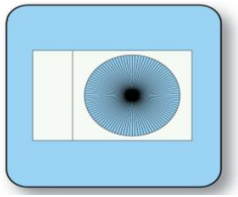
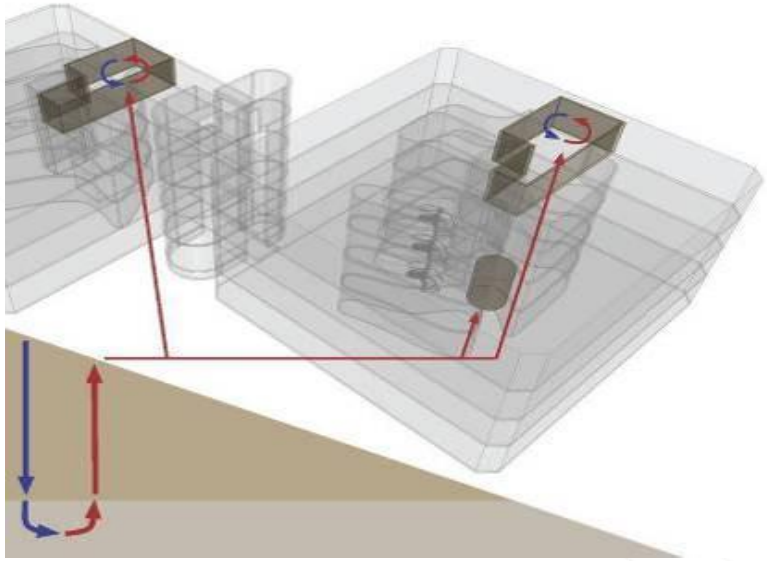
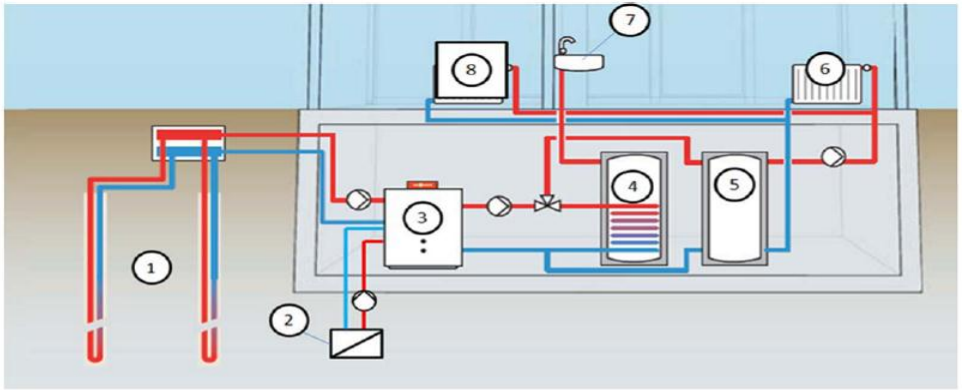
Thermal energy supply





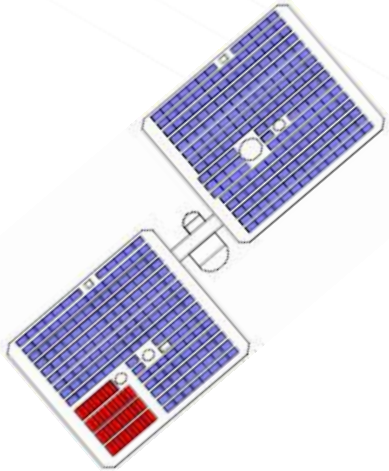


Figur 5: Forenklet skisse med hovedkomponenter for varmesystem basert på grunnvarme og varmepumpe

1. Energibronner 10 x 200 m
2. Kjoling datarom 10 kW
3. 2 x 30 kW varmepumpe
4. Akkumulatortank varmt tappevann
5. Akkumulatortank oppvarming
6. Lavtemperatur varmedistribusjon (for eksempel veggvarme)
7. Varmt tappevann
8. Ventilasjonsvarme

Calculated solarpower production : **40,7** kWh/m2/y

Figure 8: Project Location, the available PV surfaces are highlighted with blue colour.



Renewable energy

Solarpower production

Illustrations: HYDRO – finalreport Powerhouse Kjørbo

Diagram: SNØHETTA / Andreas Eggertsen

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Calculated embodied primary energy divided over 60 år: 22,1 kWh/m2/y

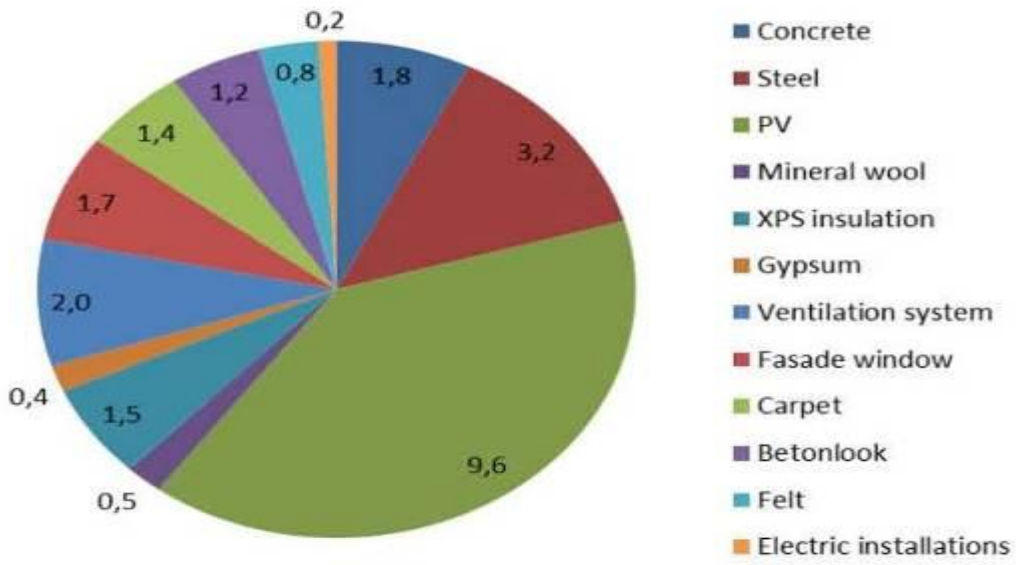
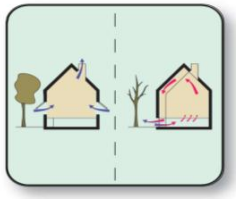


Table: SINTEF/ZEB – final report Powerhouse Kjørbo

Primary Energy vs electrical energy over a lifetime:

1 kWh el ~1,46 kWh primary energy



	Spesifikt behov for levert energi [kWh/m²·år]		
	Energimerke C kontorbygg	Powerhouse Kjørbo	Reduksjon vs energimerke C
Romoppvarming	43,4	5,5	87,4 %
Ventilasjonsvarme	27,6	0,9	96,9 %
Tappevannsoppvarming	6,6	2,1	67,8 %
Vifter og pumper	22,0	3,0	86,6 %
Belysning	25,0	7,7	69,4 %
Utstyr- generelt	34,0	12,0	64,8 %
Utstyr - datarom (serveranlegg)	Ikke medregnet	16,9	
Romkjøling/komfortkjøling	0,0	0,0	
Dataromskjøling	Ikke medregnet	1,1	
Ventilasjonskjøling	9,6	0,2	97,6 %
Totalt		49,3	
Totalt eksklusive serveranlegg	171,5	32,4	81,1 %
Totalt eksklusive serveranlegg og generelt utstyr	137,5	20,4	85,1 %

Calculated energy for operation

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Energy-budget powerhouse kjørbo

Description	KwH/m2/Year
Need for delivered energy	- 20,4
Embodied energy over 60 år	- 22,1
Production of renewable Energy "PV"	+ 40,7
Resultat	- 1,8 ??

Description	KwH/m2/year	Primary energy factor	Primary energy KwH/m2/year
Need for delivered energy	20,4	1,46	- 29,8
Embodied energy over 60 år			- 22,1
PV 2010-2040	40,7	1,98	80,5
PV 2040-2070	61,1	0,93	56,9
PV 2010-2070 average			+ 68,7
Results			+ 16,8

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Thank you