eviny

Energy solutions in the most sustainable neighborhood in Bergen

Louise Sondrup

Leder Innovasjon Eviny AS

Anne Jordal

- Forretningsutvikler Storkunde Volte AS (Tidligere Termo)

Ravneberget

An old and undersized transformer with the most beautiful view of the city

What to do?

The ambitions

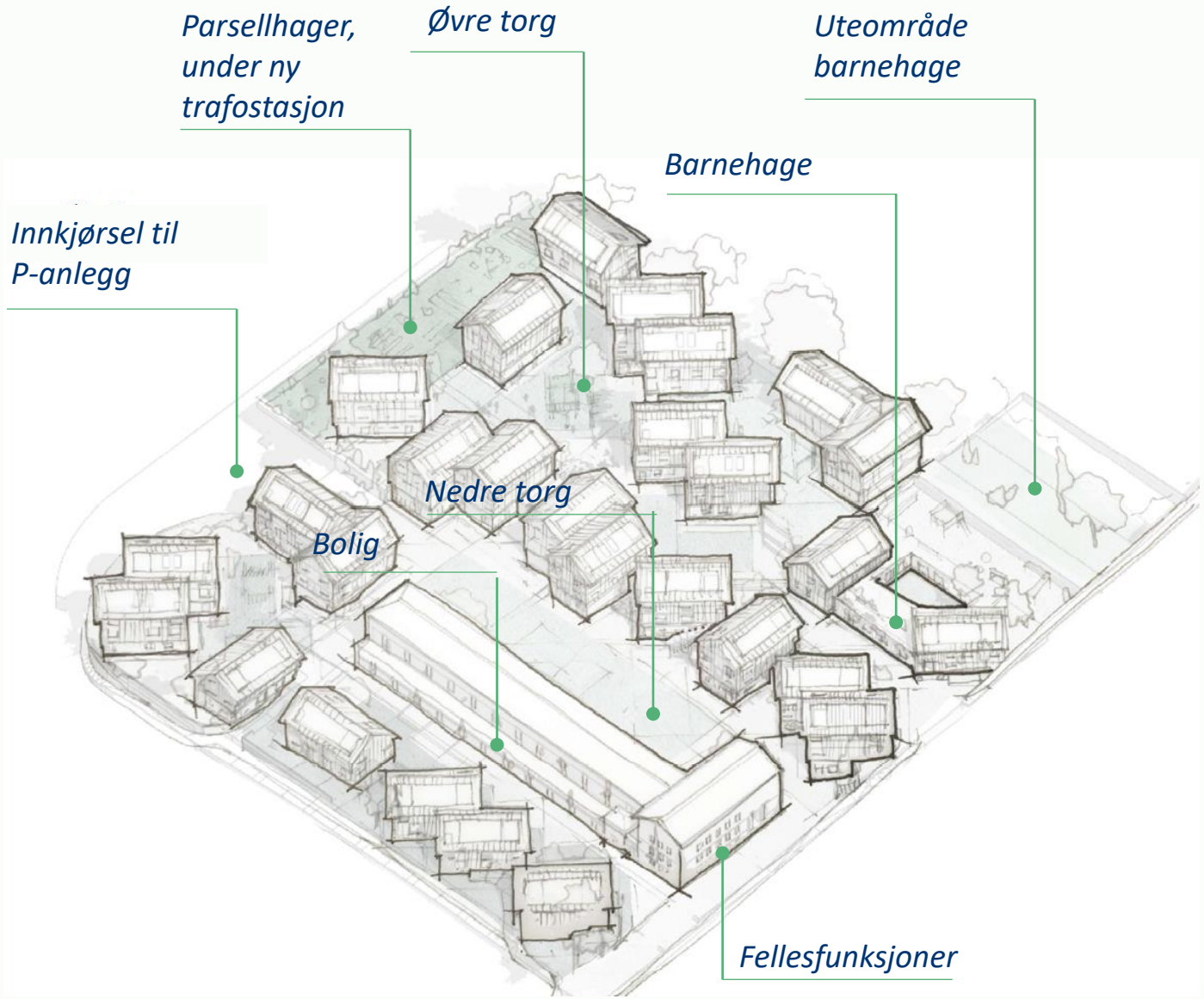
- Contribute to 1,5 graders byen Bergen. (reducing CO2 emissions by 50%)
- Cover the extra cost to build a compact transformer (BKK Nett)

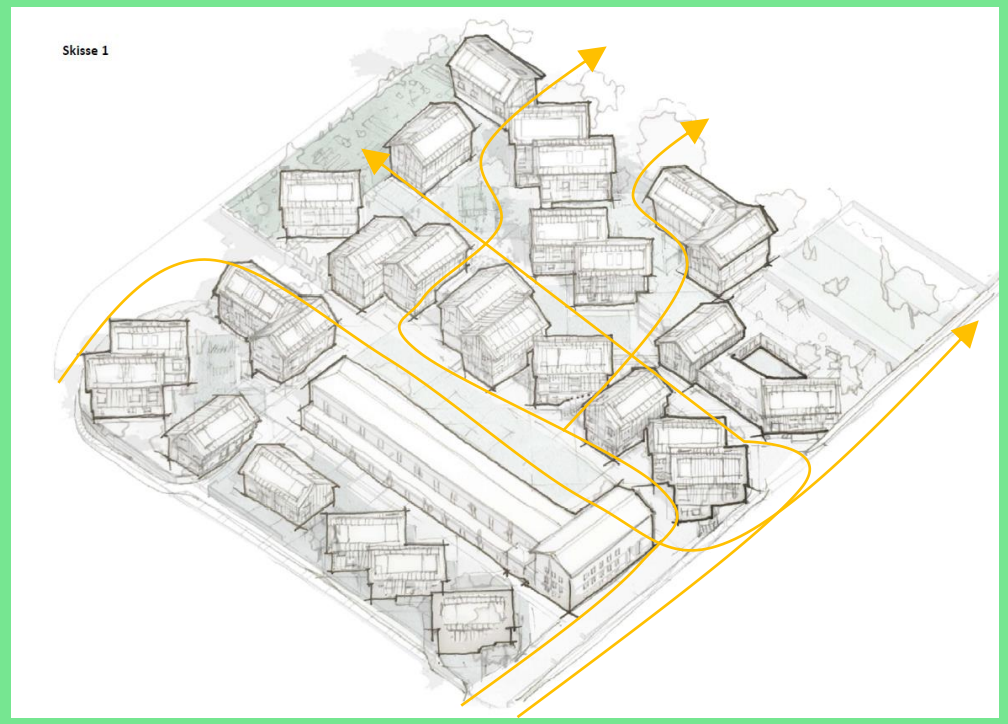
Sustainability:

- Use of material
- Use of energy
  - Utilizing the excess heat from the transformer
  - Maximizing Solar power
  - District heating
  - Batteries?
- Coherent solutions for mobility to reduce use of car
- Shared solutions for cars, bikes etc.
- Coworking space, greenhouse etc.

Overall plan

- 130 homes organised around together
- Variety of sizes 20-120 m2
- Rehabilitation of existing building
- Kindergarten near Mount Ulrikken
- New compact trafo in the vestern corner

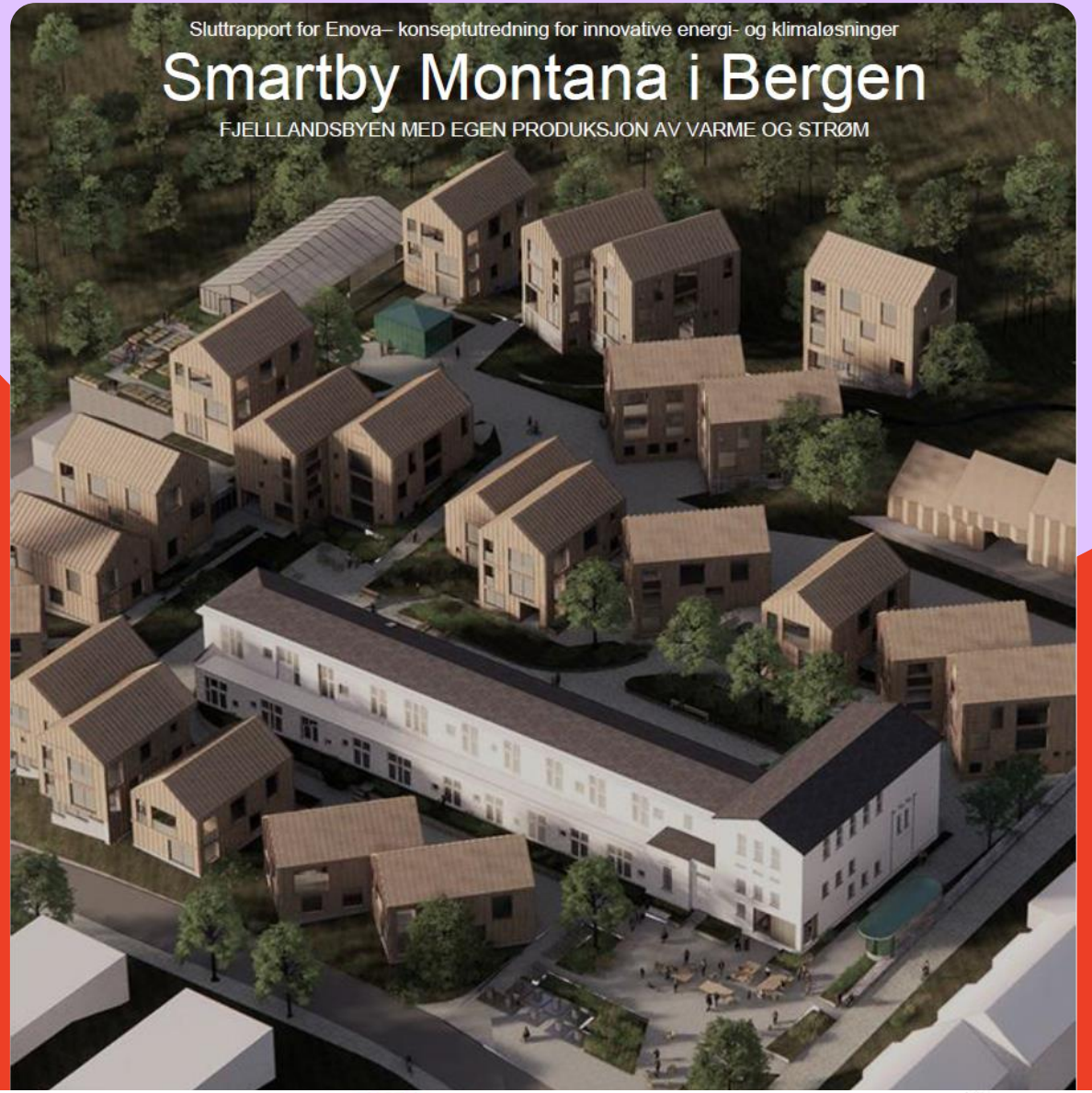




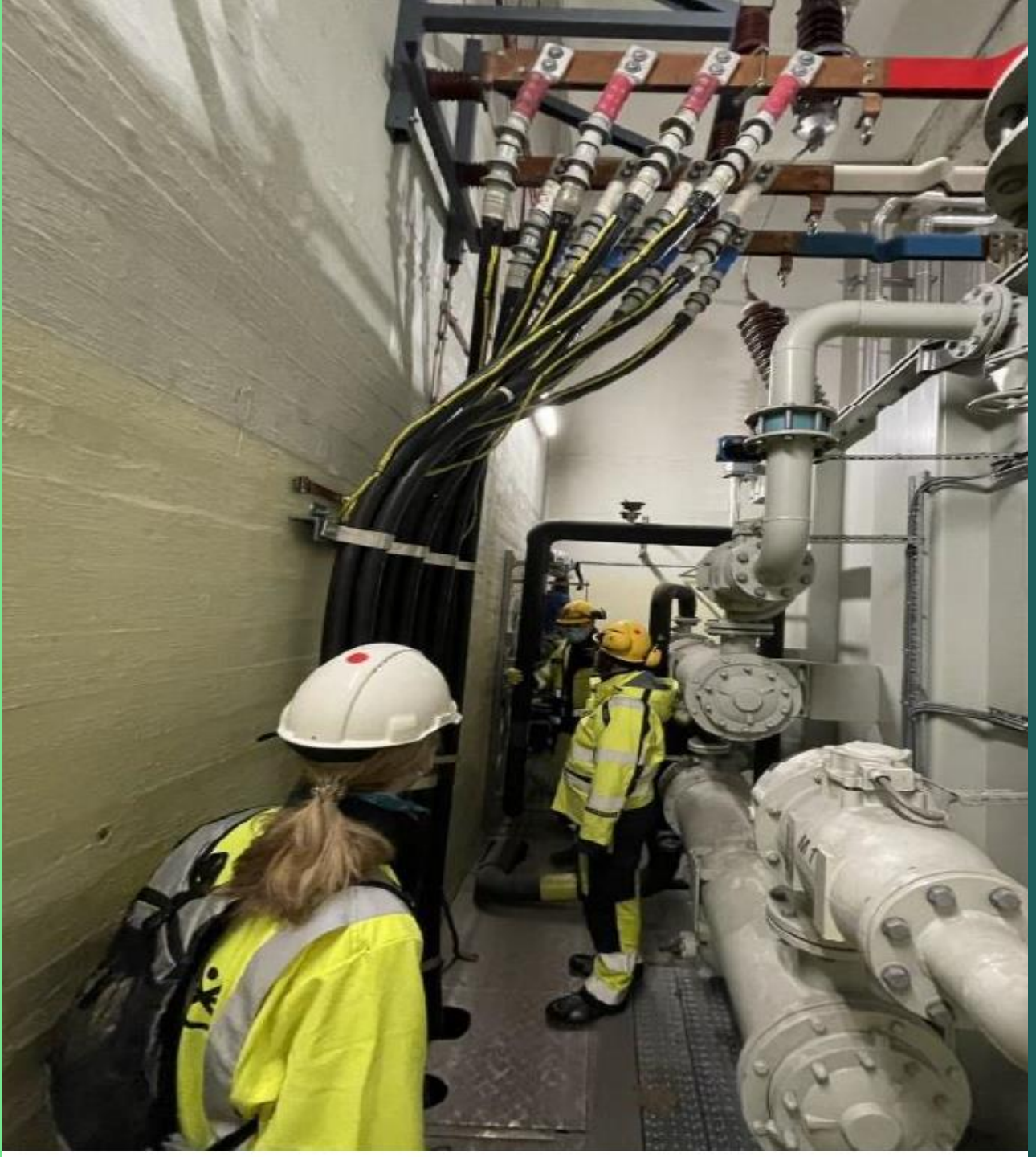
Today the transformer is a closed area

We are giving acess

Support from Enova to complete: “Konseptutredning for innovative energi og klimaløsninger”



ENOVA eviny SWECO



Focus of the energy analysis

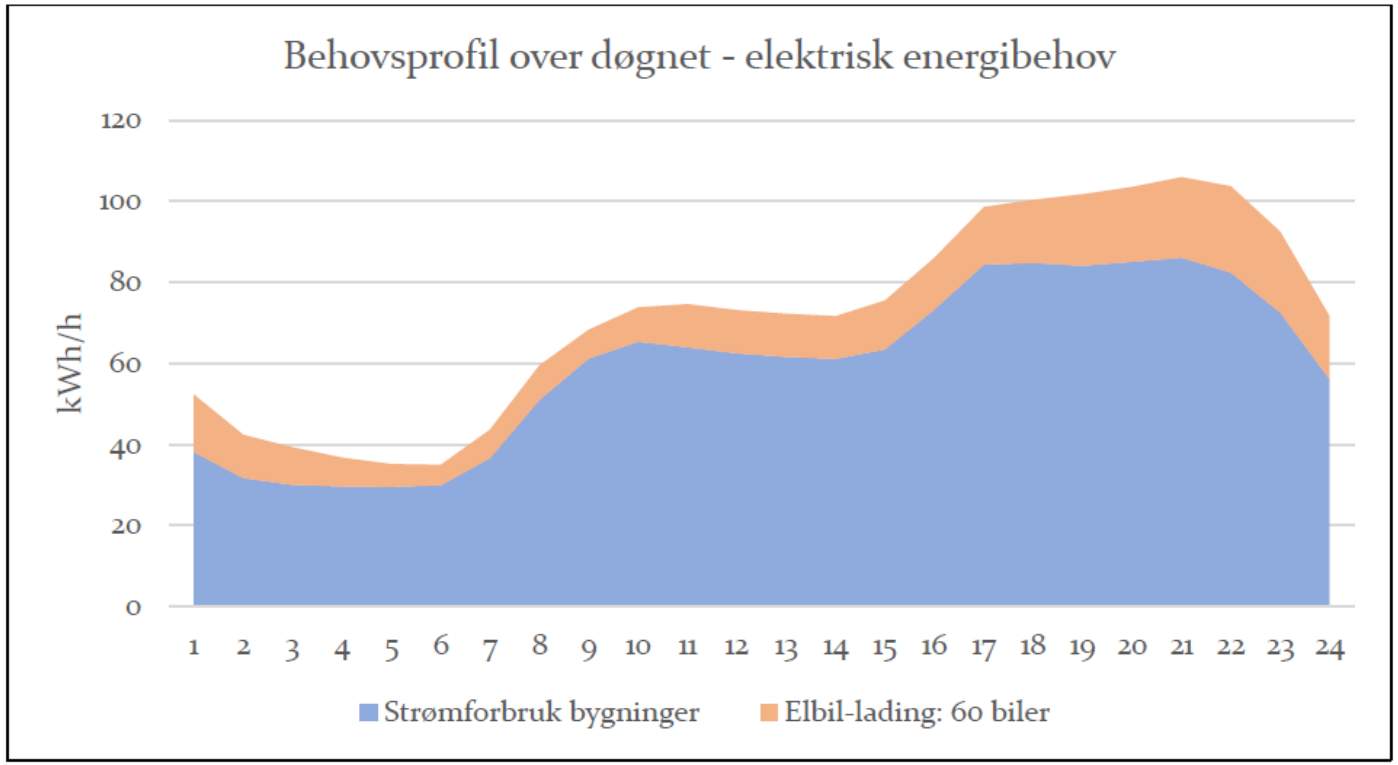
- Analyzing the energy needs for the area
- How to best utilize the excess heat from the transformer
  - Gathering information from similar projects
  - Analyzing different options based on economy and sustainability
  - Choosing the preferred energy system
- Designing the optimal electric system for the area
  - Regulatory challenges
  - Maximize solar production
  - Options for smart control
- Business model and different roles and interfaces

Energy-need for the area

Når vi oppsummerer nettotallene og korrigerer for tap medfører det at levert energi fra energisentral må dekke følgende behov:

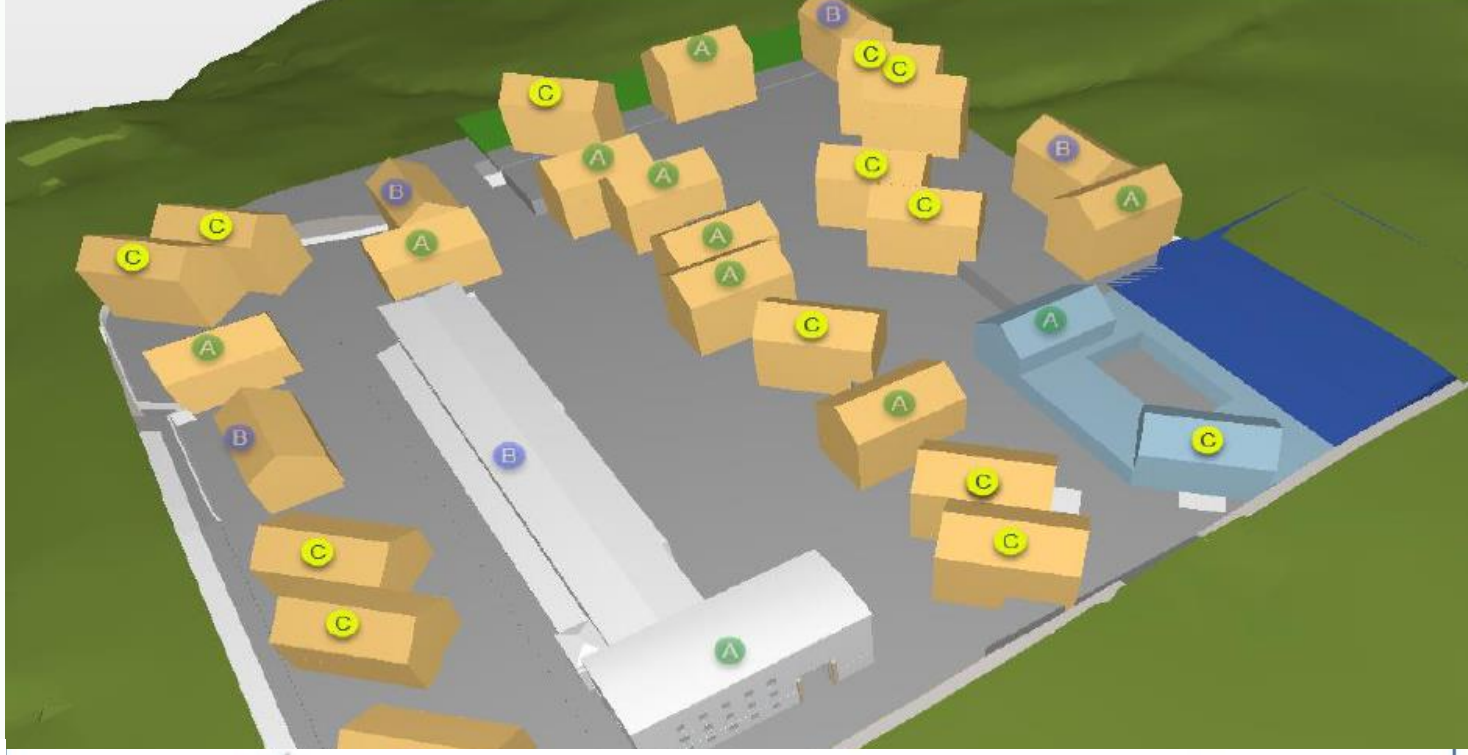
	Energibehov	Effektbehov
Romoppvarming og ventilasjonsvarme	310 000 kWh/år	350 kW
Varmt tappevann	410 000 kWh/år	ca 50 kW ved ideell akkumulering ca 150 kW ved ingen akkumulering
Sum varmebehov for energisentral	**720 000 kWh/år**	**400 kW ved ideell akkumulering** **500 kW ved ingen akkumulering**

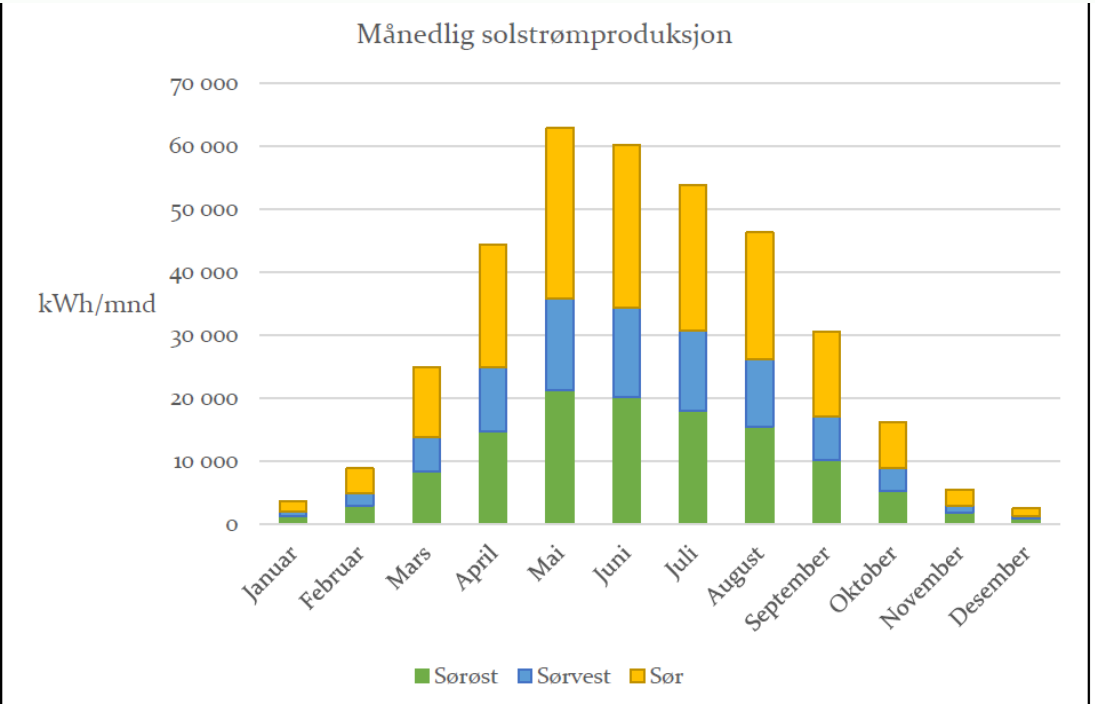
Beregnet årlig strømforbruk er 466 000 kWh/år.
Beregnet maks effekt er 86 kW.

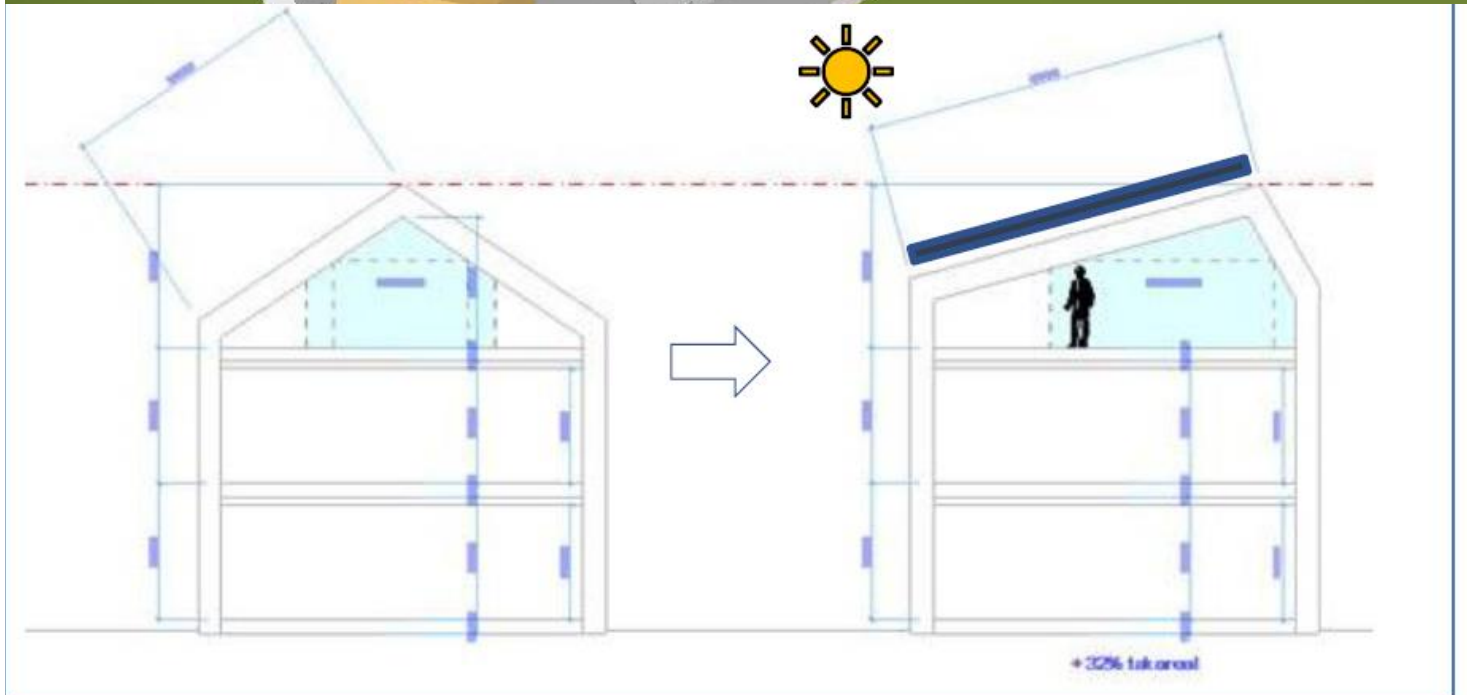


Solar production

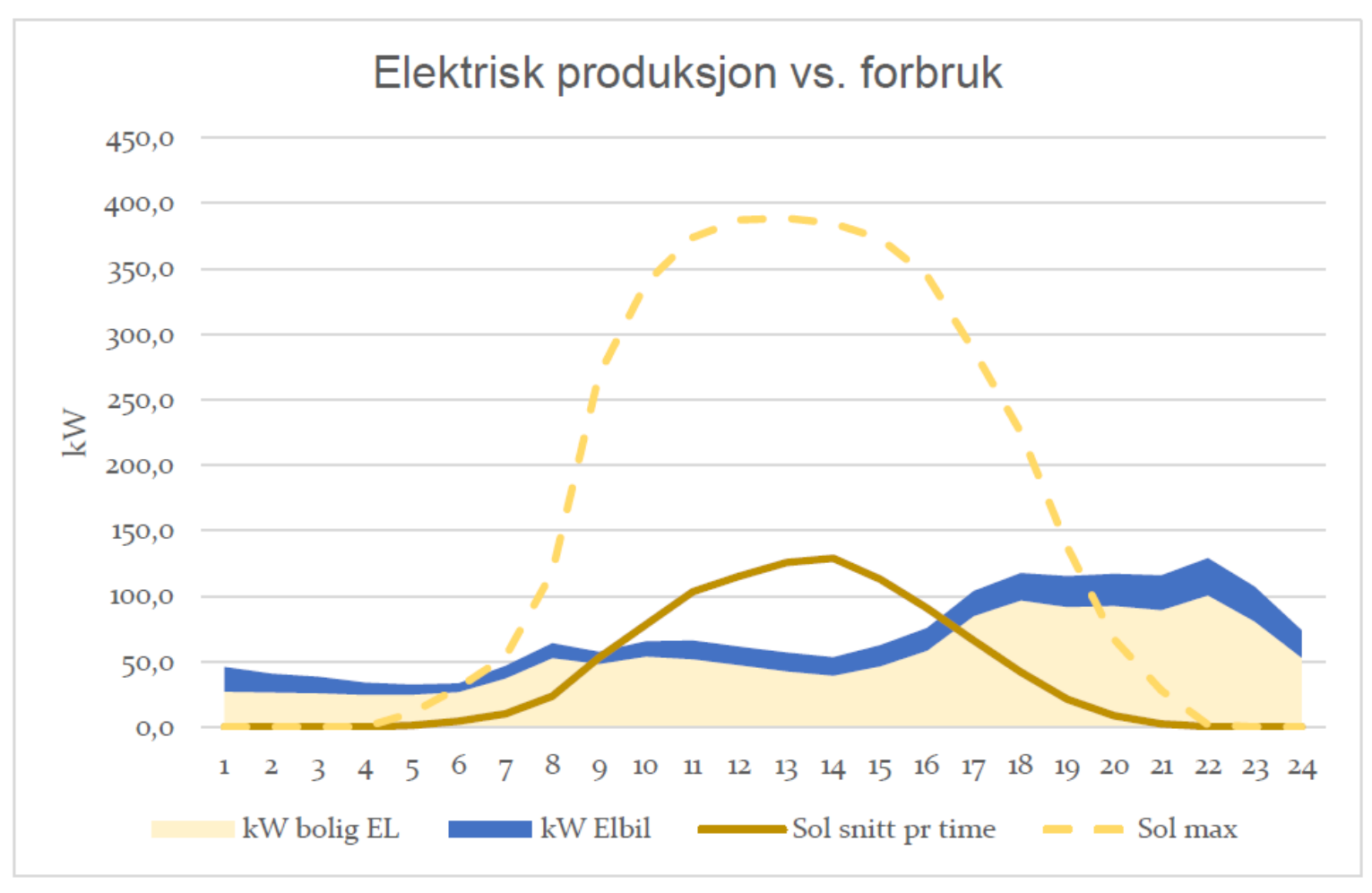
- Place houses to maximize solar production during hours of use
- Change the roof angel in order to increase production
- Regulatory limits sets boundaries to how much it is possible to export and share in a neighborhood – this is subject to change







Battery or digital/ physical smartgrid?



Excess heat - Similar projects

- BKK Nett (Kokstad and Strømgaten)
- Fortum Varme/Elvia
- Danish Central heating
- Siemens, Highbury – London
- IKB, Innsbruck – Østerrike

- Most projects was built because the “Grid-owner” needed the heating for own purpose or because of external demands (London).
- None of the projects was build for commercial purposes
- The “wellbeing” of the transformer is the main purpose (transforming the power) and one should not run a transformer suboptimal to produce heat.
- NVE points out the monopoly can not pay extra cost to enable utilizations of excess heat
- The cooling system of the transformer is key to accessing the excess heat

Expected amount of excess heat from the transformer: Simplified year-profile (calculated load, subtracted no-load losses and load losses)

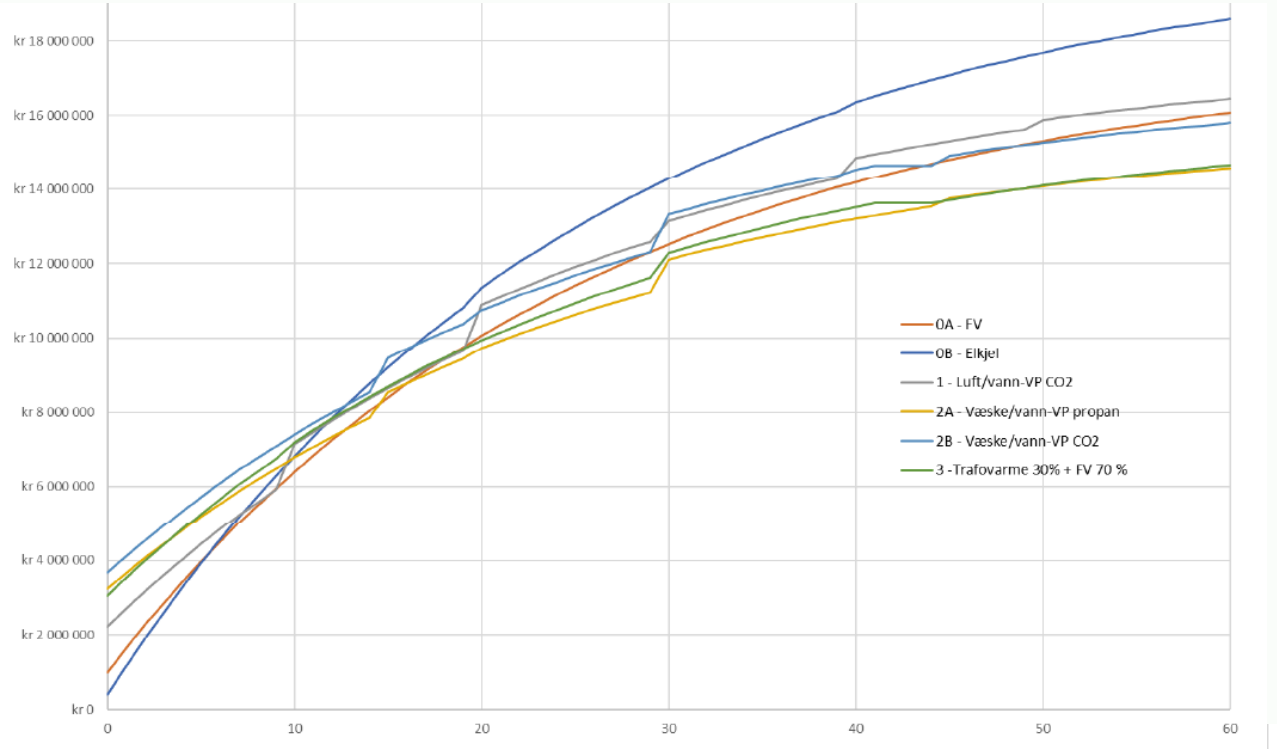
	Sommer natt	Sommer dag	Mellom-sesong natt	Mellom-sesong dag	Vinter natt	Vinter dag	Snitt effekt/ sum energi
Effekt trafo [MW el]	25	30	27	35	30	40	**31**
Lastpådrag trafo [%]	26 %	32 %	29 %	37 %	32 %	42 %	**33 %**
Varmeutbytte [%]	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	**0,2 %**
Varme vannside [kW varme]	50	60	54	70	60	80	**62**
Antagelse om driftstimer (10 t natt og 14 t dag):	1230	1722	1800	2520	620	868	**8760**
Energimengde [kWh]	61 500	103 320	97 200	176 400	37 200	69 440	**545 060**

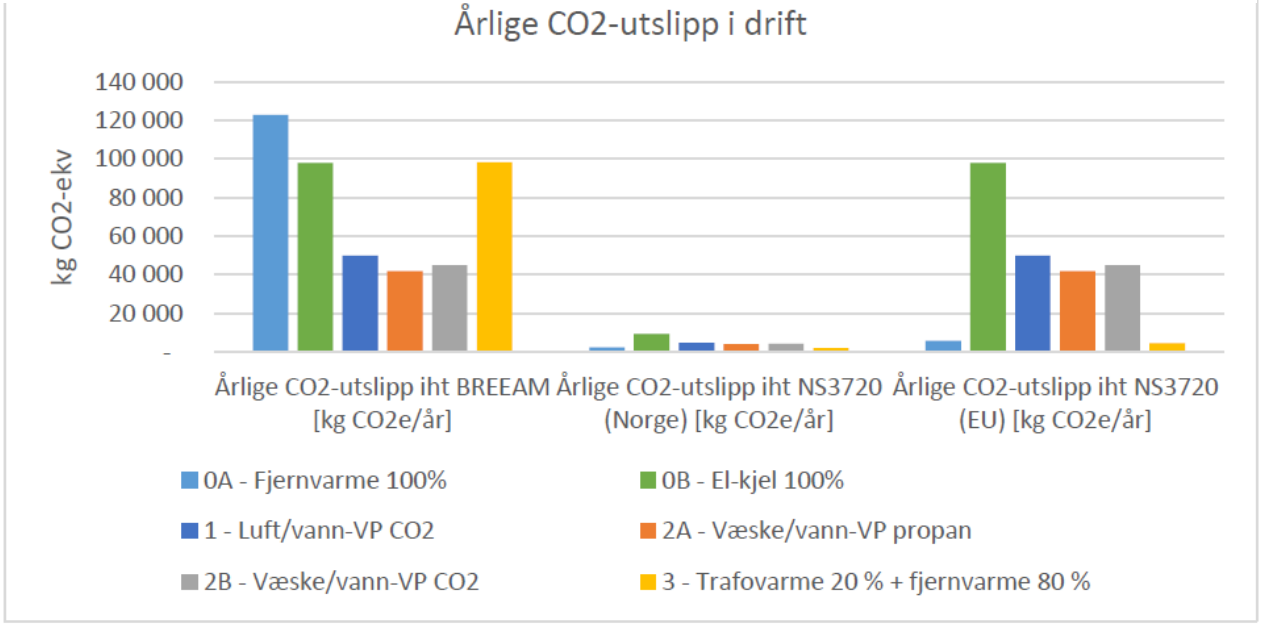
- Summer: Mai, June, July, August; Middle season: Sept, okt, nov + feb, mars, April; Winter er December and januar.

Choosing the best options was not easy

- Different options:

Alt	Energy source
0A	District heating
0B	Eletric heat pump
1	Air/water co2 heatpump 100 KW
2A	Fluid/water propan heatpump 50Kw
2B	Fluid/water co2 heatpump 100 KW
3	Excess heat used to preheat water combined with district heating





Preferred solution

- The excess heat covers around 30% of energy need
- District heating (fjernvarme) covers the remains
- This makes for a robust technical solution utilizing both excess heat and district heating

- Biggest uncertainty is connected to the actual amount of excess heat and high investment cost and the business model concerning who owns the water-cooling system