# “Stjärnhus” Stacken: Step-by-step deep retrofit and building integrated façade/roof on a ‘million program’ house

20th Passive House Conference 2016

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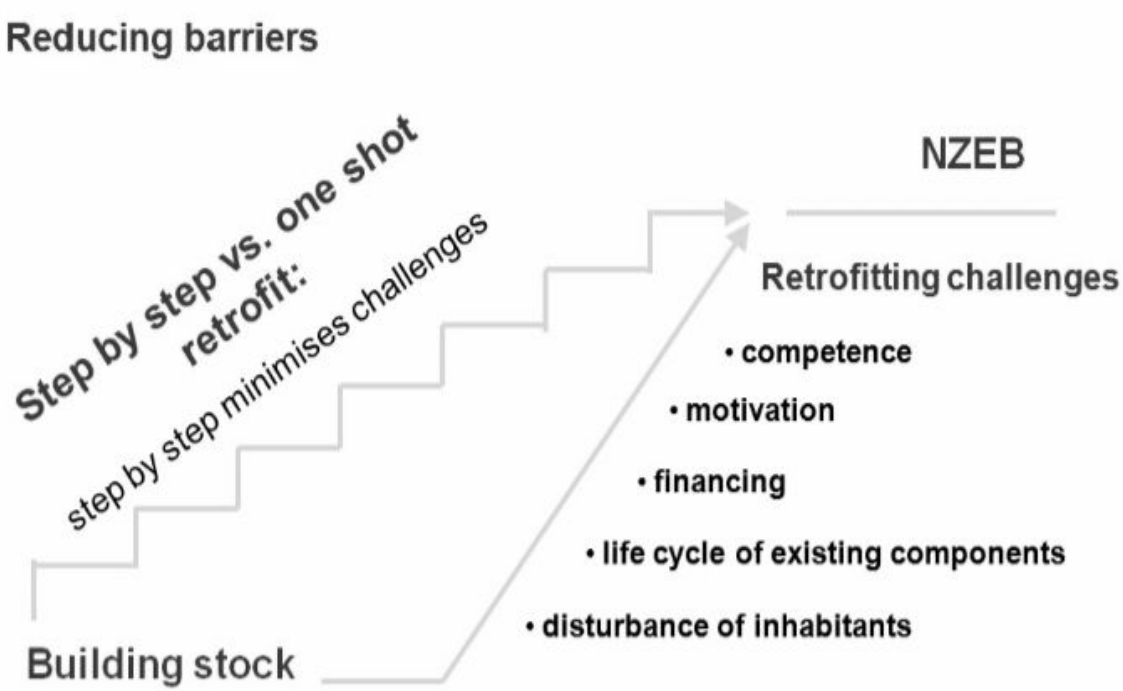
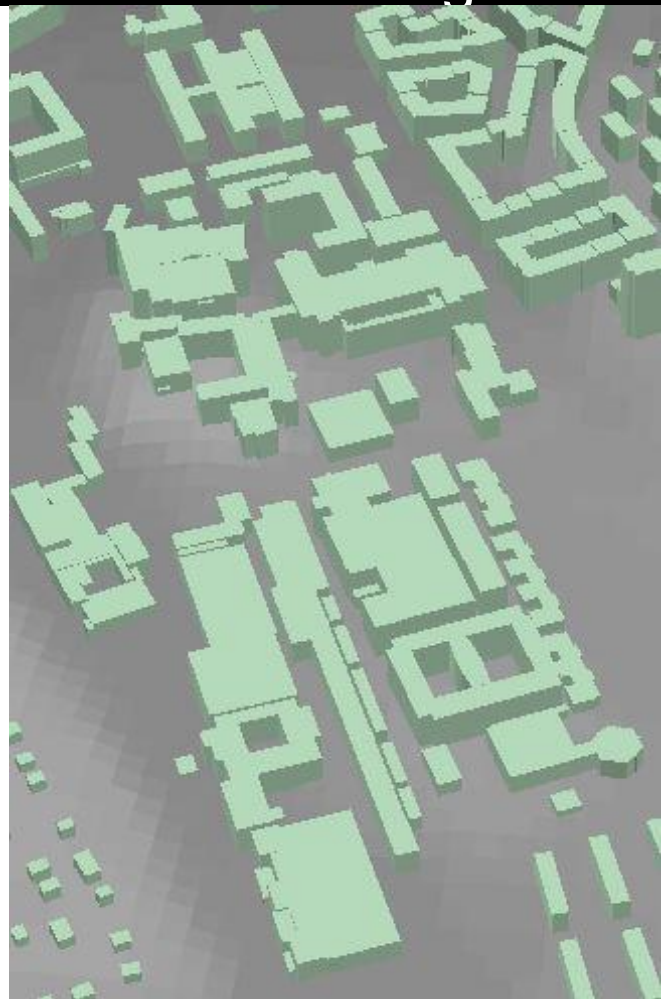
# Step-by-step deep retrofit and building integrated façade/roof on a ‘million program’ house

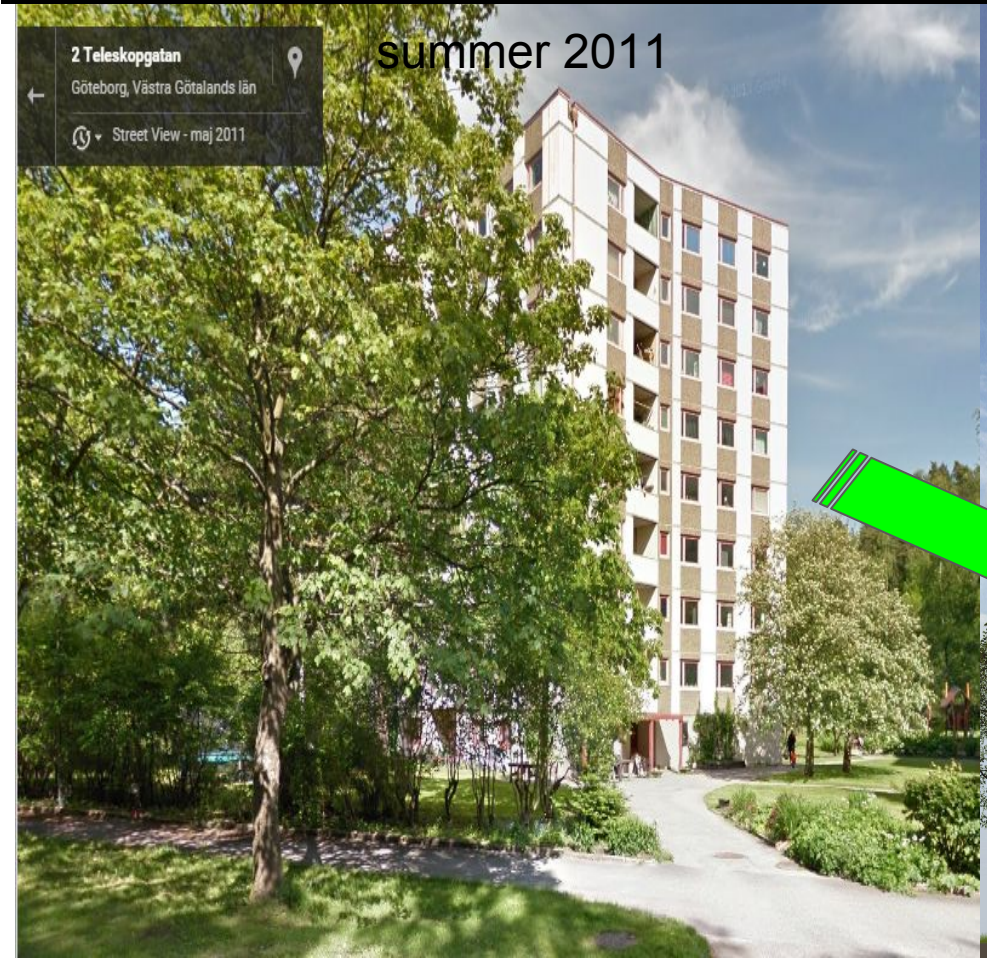



# transform the building stock

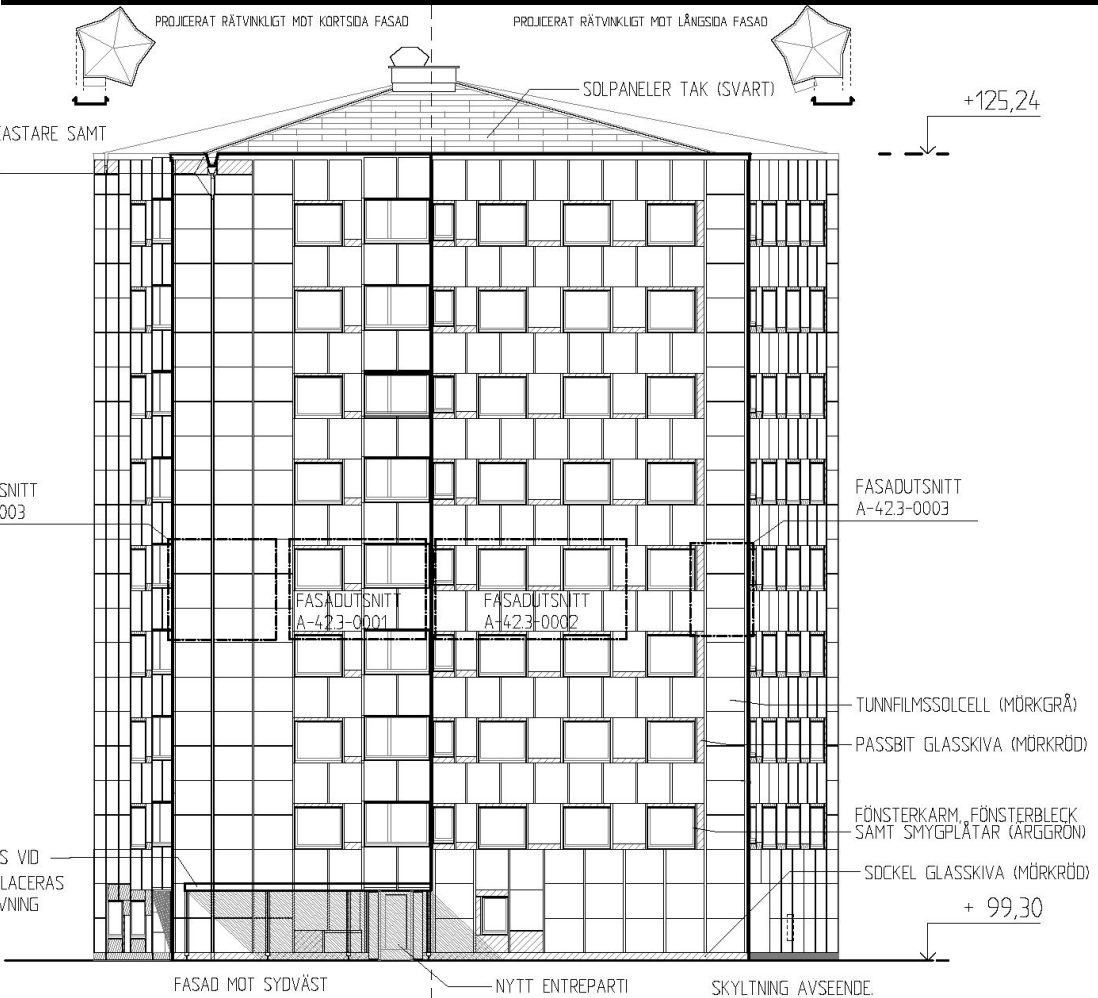
- Many “million program” buildings need to be renovated.
- Sweden has an ambitious political goal to be net zero greenhouse gas emissions by 2045.
- A cost effective way to reduce energy consumption and generate renewable energy could be:
  - to cover most/all of the buildings energy needs with solar PV
  - that functions at the same time as a protective facade and roof for externally applied insulation.

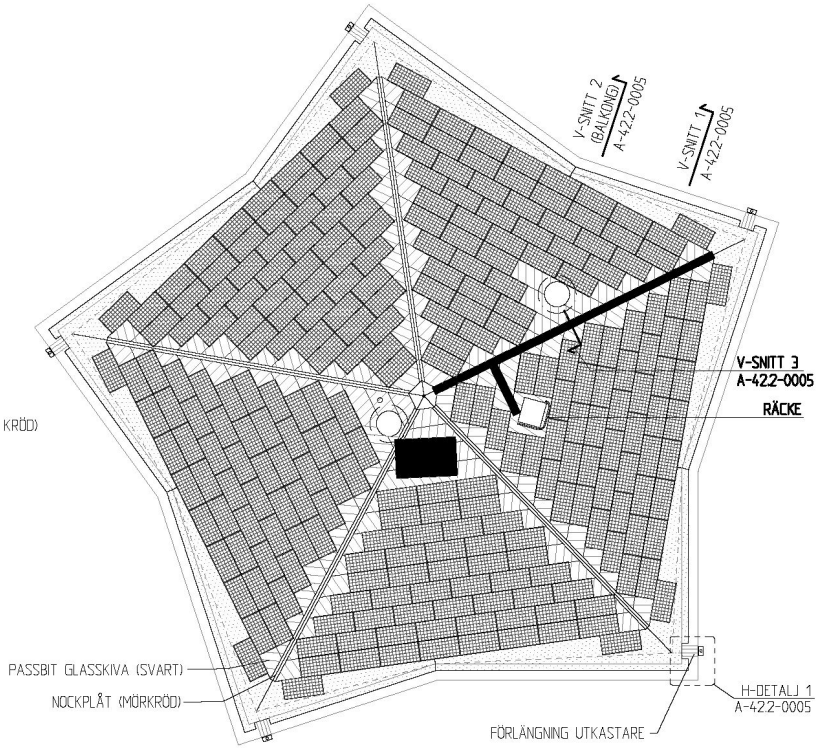


# case study - Kollektivhuset Stacken

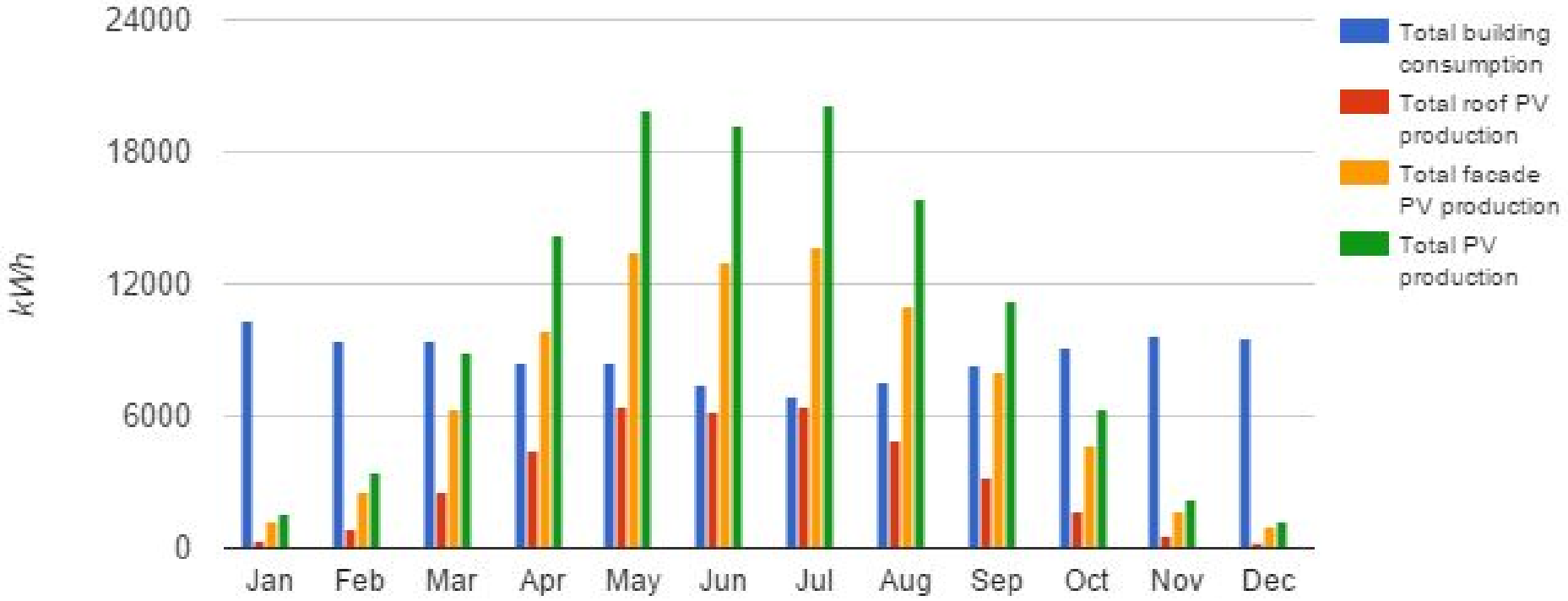



# construction drawings - solar modules

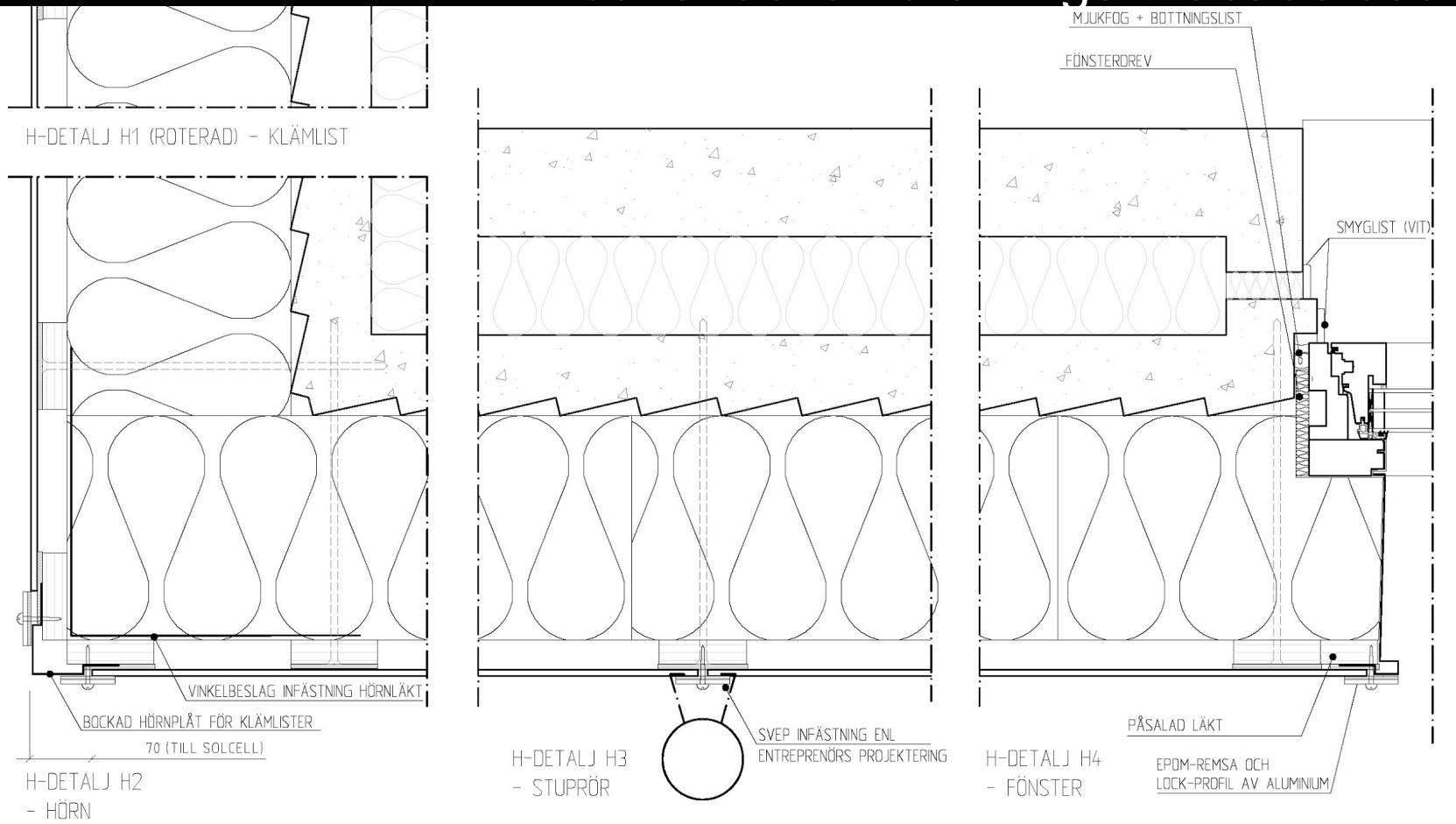


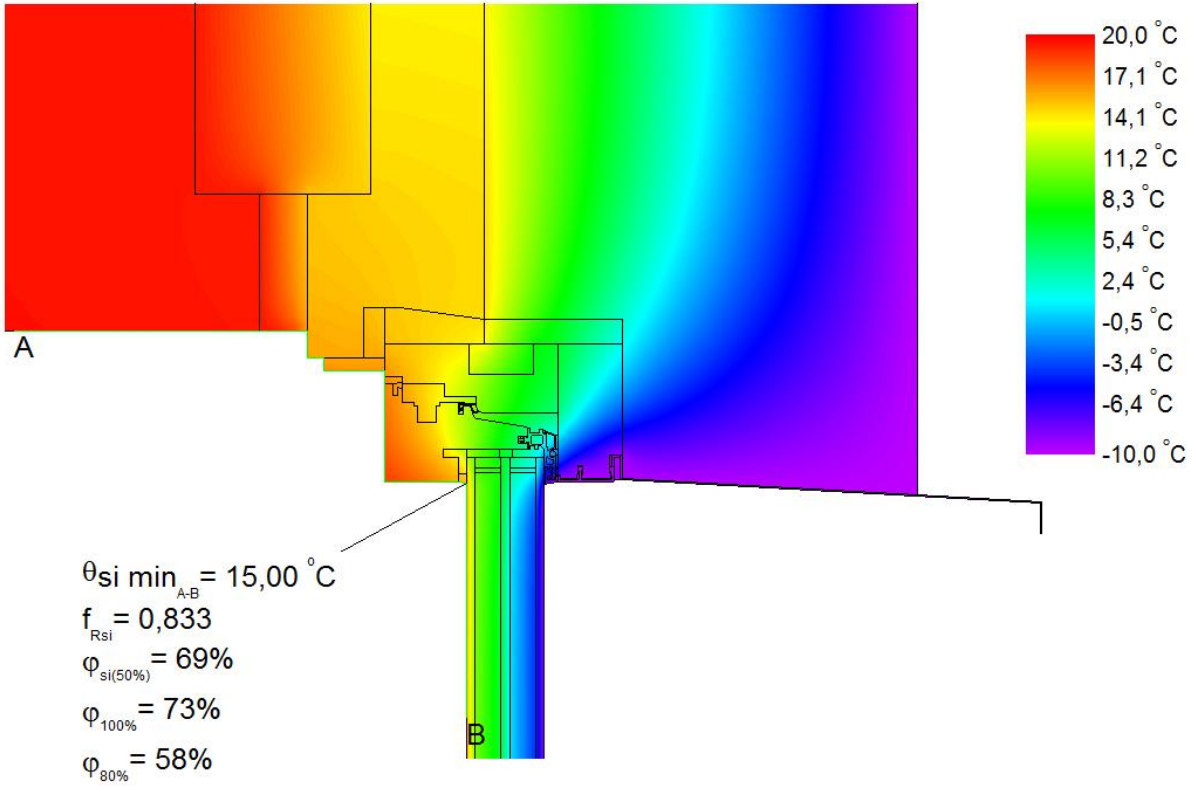
# solar electricity vs. bought electricity



# construction drawings - facade section



# thermal bridging evaluation - window installation




Psi(install) = 0.016 W/(m*K)

# Kollektivhuset Stacken - step by step retrofit

| Step 0 | Step 1 | Step 2 | Step 3 | Step 4 |
|---|---|---|---|---|
| Built in 1968, a (simple) triple-glazed window upgrade has been implemented | Add a heat recovery ventilation (MVHR) unit; that since then has been PHI-certified, with 85% heat recovery efficiency | Insulate attic – 500mm cellulose insulation, resulting in a U-value of 0.079 W/(m2×K) | Install new PHI-certified windows [Uw-value ~ 0.7 W/(m2×K)] & sort out air tightness, upgrade MVHR control. | Insulate façade and include balconies into thermal envelope (adding 134m2 TFA and reducing thermal bridges); resulting U-value of external wall 0.102 W/(m2×K). Add BIPV to façade and roof |
| **145 kWh/(m²×a)** specific heating demand, 53W/m² specific heating load | **75 kWh/(m2×a)** specific heating demand, 33W/m2 specific heating load | | **15 kWh/(m2×a)** specific heating demand, 11 W/m2 specific heating load | |
| | 46,600 € | 9,620 € | ~350 000 € | ~500 000 € |
| | Done | Done | Planned | Planned |

# tack!

Kollektivhuset Stacken

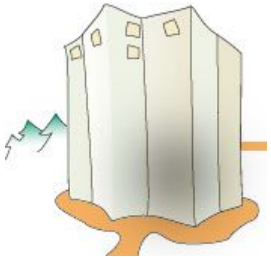
Passivhusbyrån

Helhetshus Arkitektstudio

Naturskyddsföreningen

Västra Götalandsregionen

Energimyndigheten



Naturskyddsföreningen

passivhusbyrån

VÄSTRA GÖTALANDSREGIONEN

HELHETSHUS

Energimyndigheten