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# Flexbuild
# Summary of results so far

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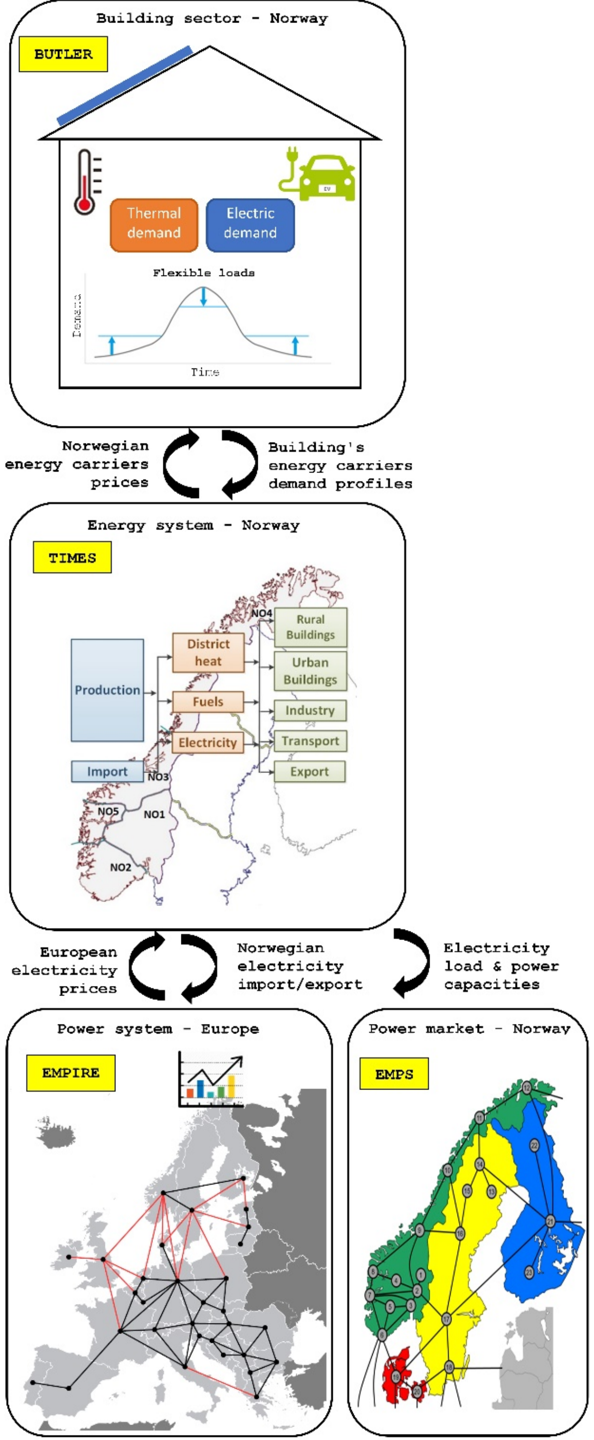
Technology for a better society

# FLEXBUILD
# The value of end-use flexibility in the future Norwegian energy system

- KPN, 4 years, 13 partners
- Project leader: SINTEF
- Budget: 16.6 mill / 13 from NFR
  (18.2 with in-kind)
- 1 international partner
- 1 postdoc

**Primary objective**: to provide knowledge on how end-use flexibility available in the building stock will impact the development of the overall energy system.



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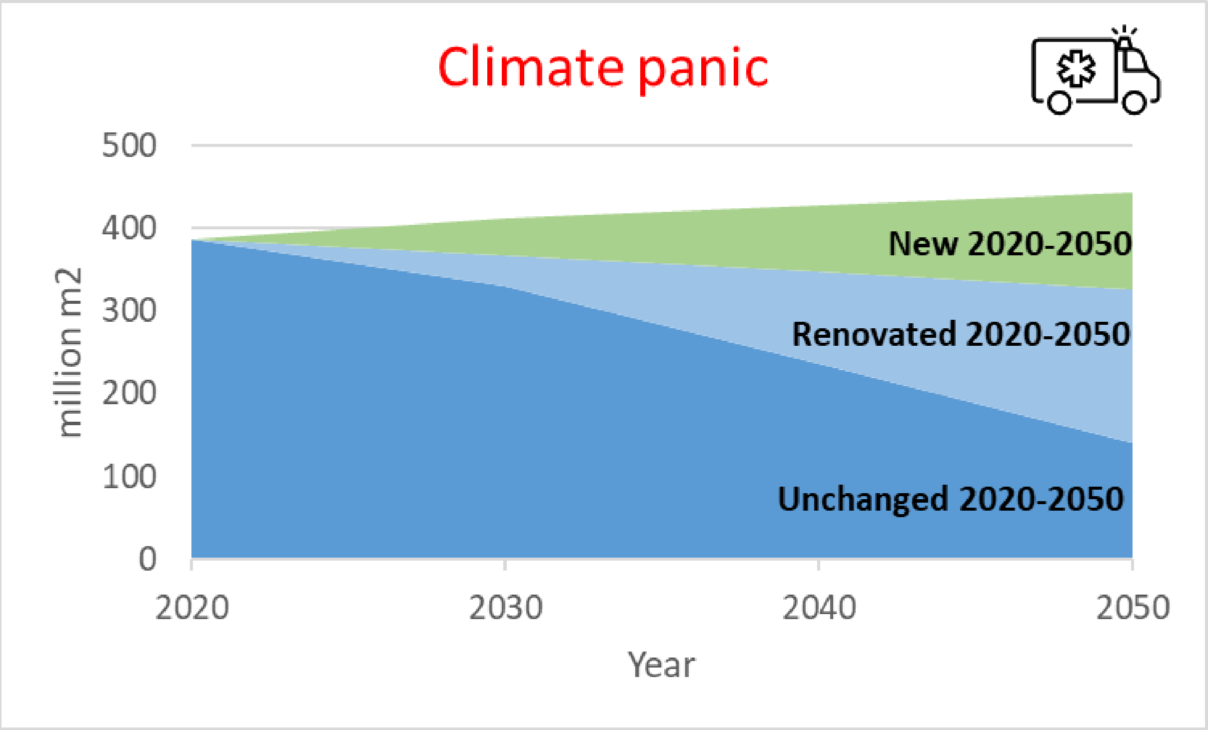
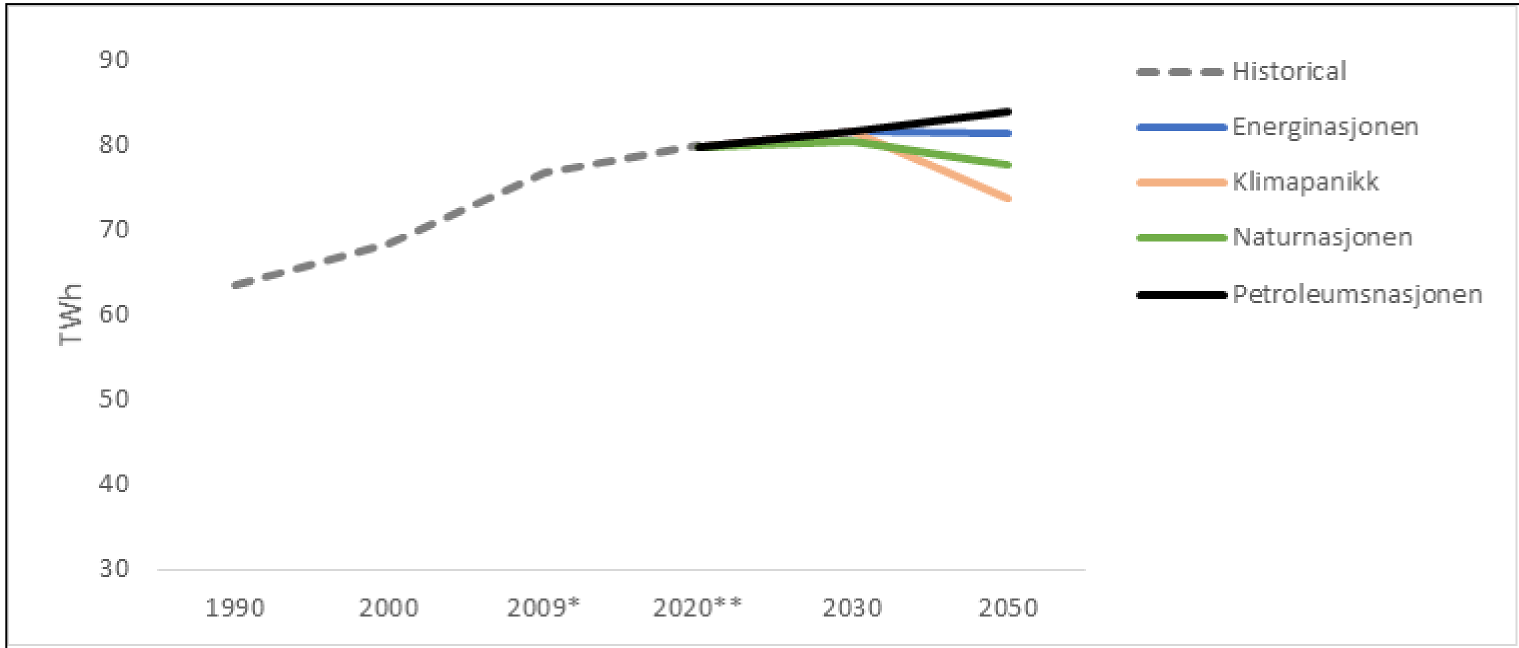
# Flexbuild partners

| Industrial branch / Partners |
| --- |
| Building owners (x3) |
| District heating association (x1) |
| Grid companies (x2) |
| Public actors (x2) |
| Research institutes (x5) |

# Building stock

- The building stock changes slowly in all Storylines
- In all Storylines in 2050 the building stock will consist of ca. 70% of buildings already existing today, which will be responsible for ca. 80% of the energy demand
- Calibrated and validated for year 2020: in the breakdown per building category (Residential and Commercial) and energy carrier the error is < 0.5 TWh/y

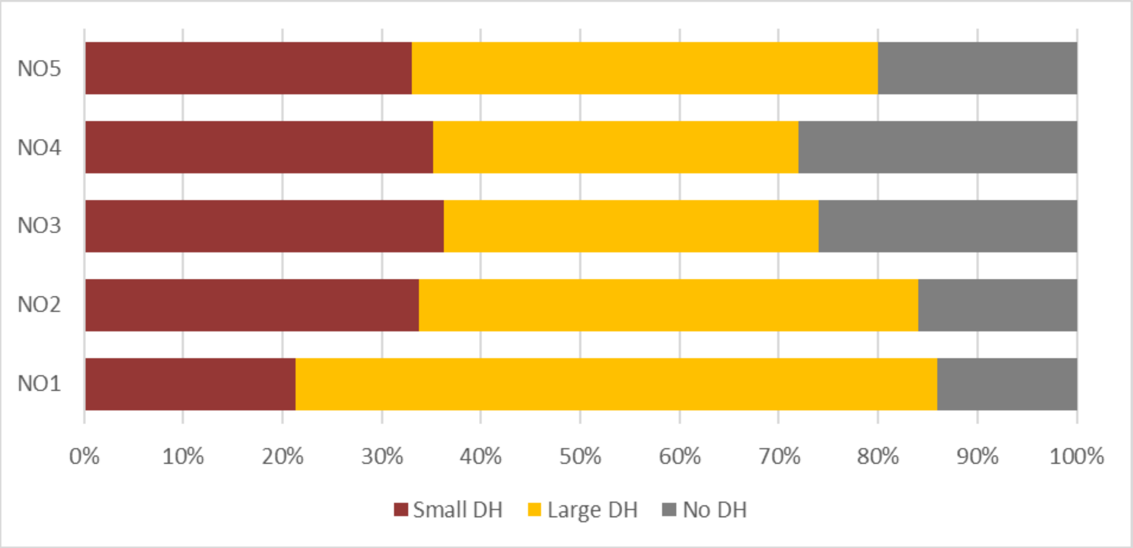


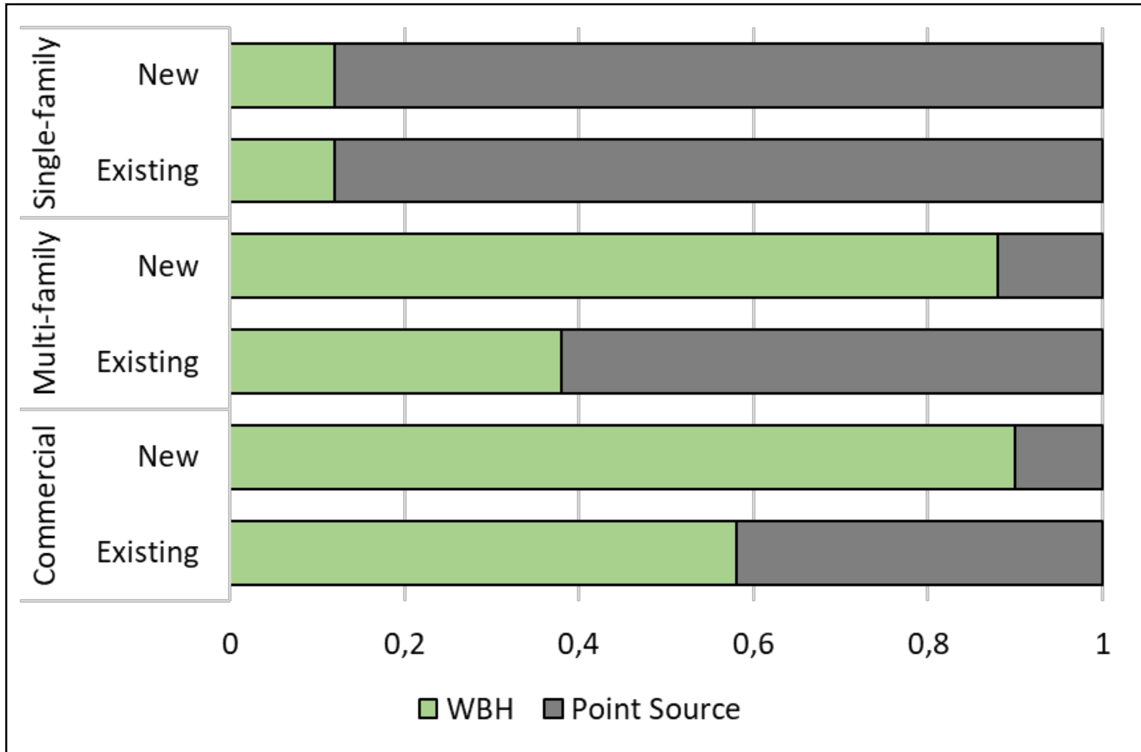



# District Heating

- Supply side, each market area:
  - Large-scale district heating (*fjernvarme storskala*) sub-area
  - Small-scale district heating (*småskala fjernvarme*) sub-area
  - No Therma Network sub-area

- Demand side:
  - Waterborne heating
  - Point source heating



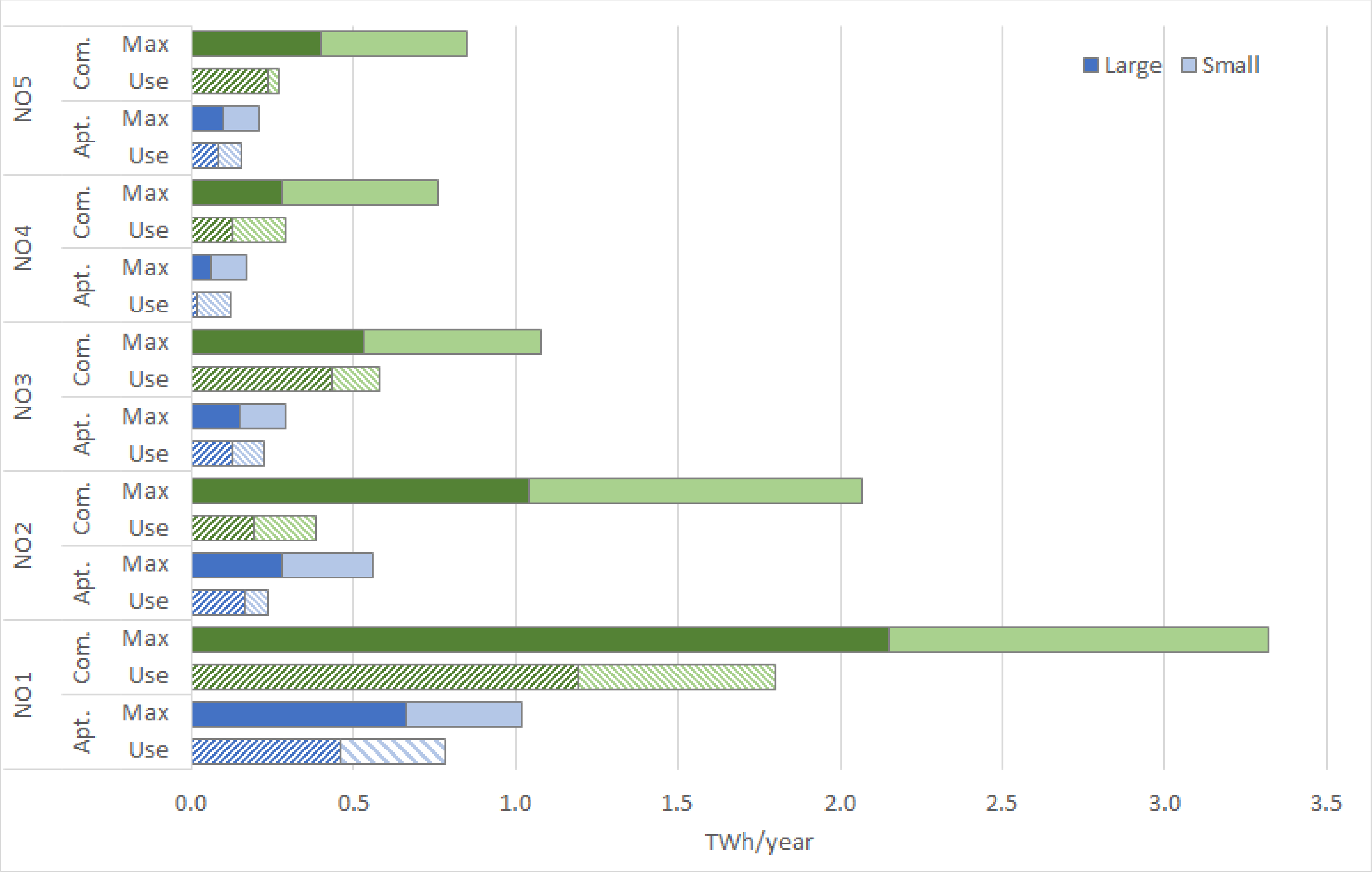



# District Heating

- Potential for district heating expansion in buildings towards 2030: doubling from today's 4.9 TWh to 10.3 TWh

- Commercial buildings:
  - Small-scale: from 1.1 TWh today to 3.7 TWh in 2030
  - Large-scale: from 2.2 TWh today to 4.4 TWh in 2030

- Apartment blocks
  - Small-scale: from 0.7 TWh today to 1.0 TWh in 2030
  - Large-scale: from 0.9 TWh today to 1.3 TWh in 2030



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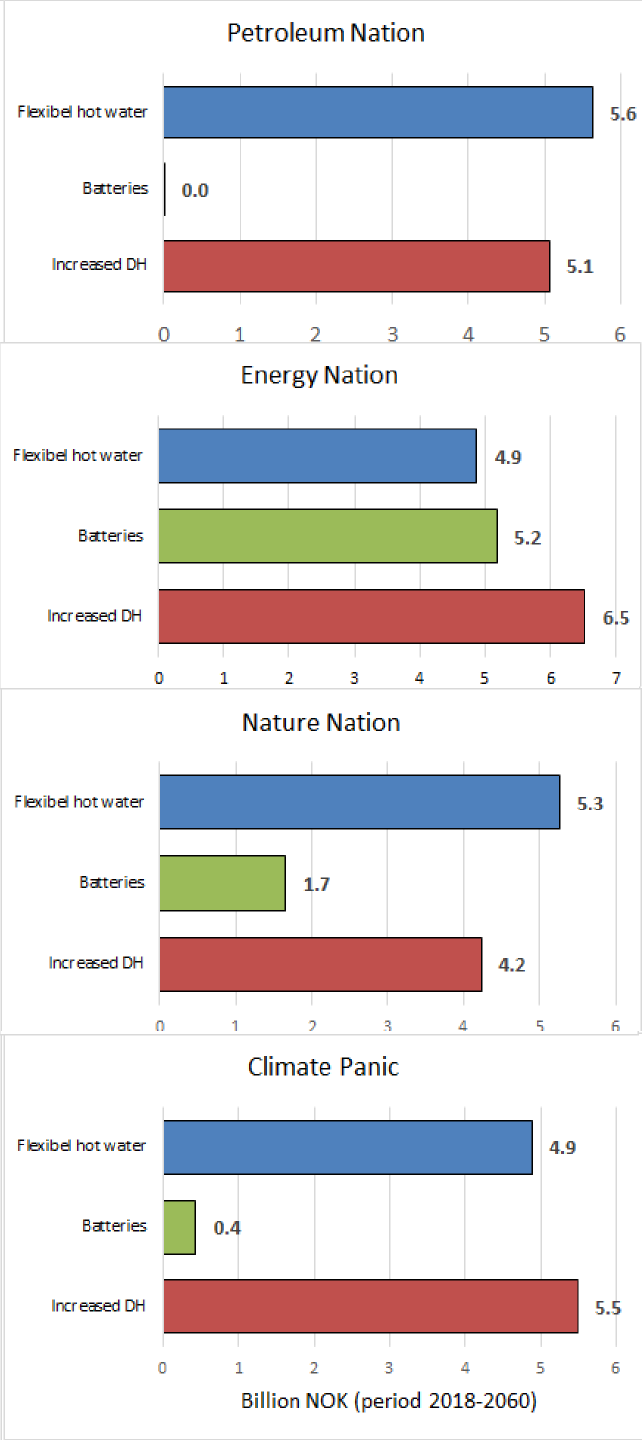
# Supply side

- Price variability is Storyline dependent, mainly related to CCS development in EU
- Electricity use and peak load in the building sector in 2050 are lower than in 2020 due to renovations and higher penetration of heat pumps and PV
- **End-use flexibility** has a positive value for the energy system, **reducing peak demand** and **favouring integration of** building applied **PV**.
- Hydropower flexibility shows a difference of ca. +1 EUR/MWh (10 NOK/MWh) for the regulated plant vs. run-off

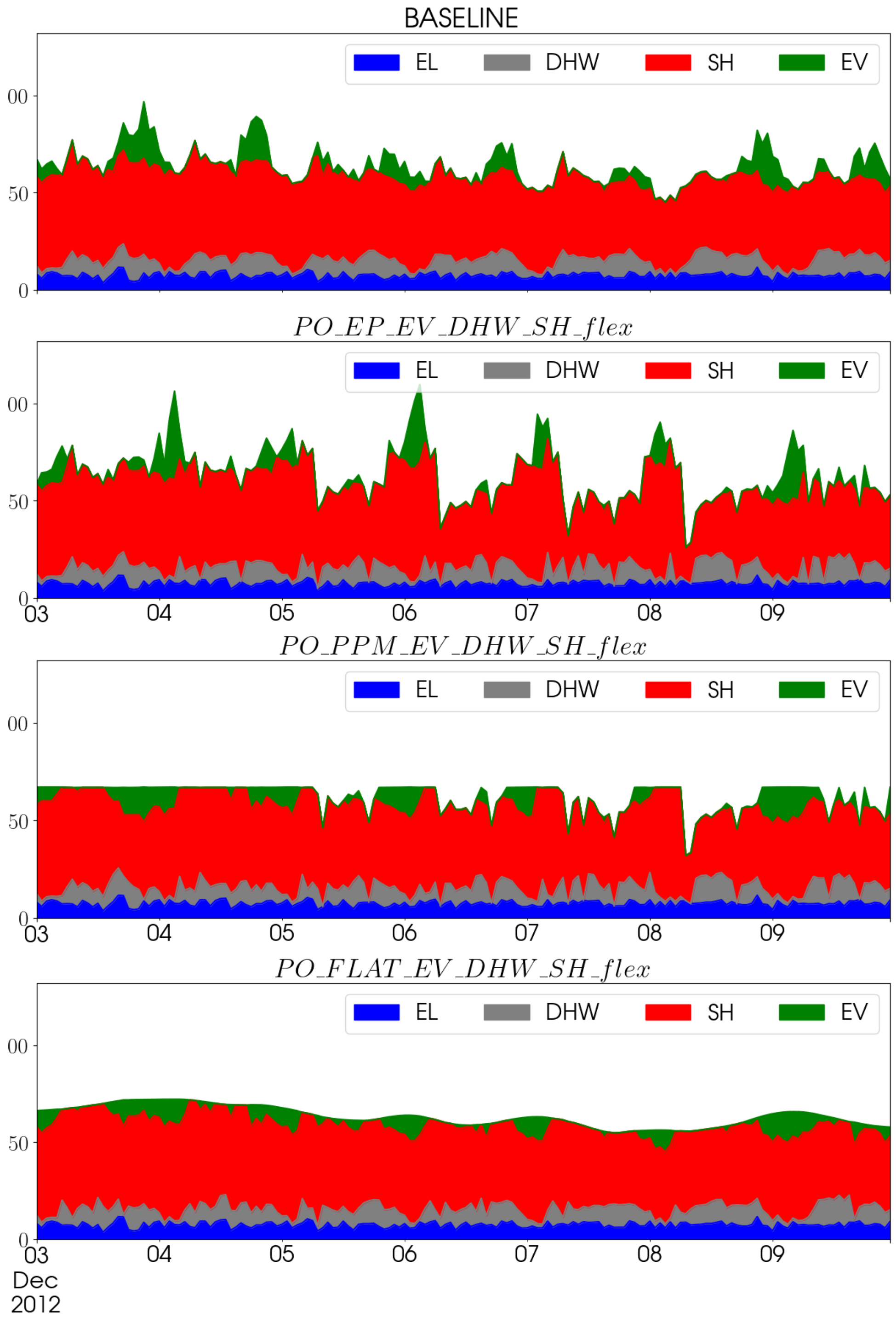


# Demand side case study

- Single building, representative of a **typical Apartment** in the Regular efficiency level and with panel ovens (PO) as heating technology (62% of the stock)

- **Effect of different flexibility sources**:
  - Domestic Hot Water tank, DHW
  - Space Heating, SH
  - Electric Vehicle charging, EV

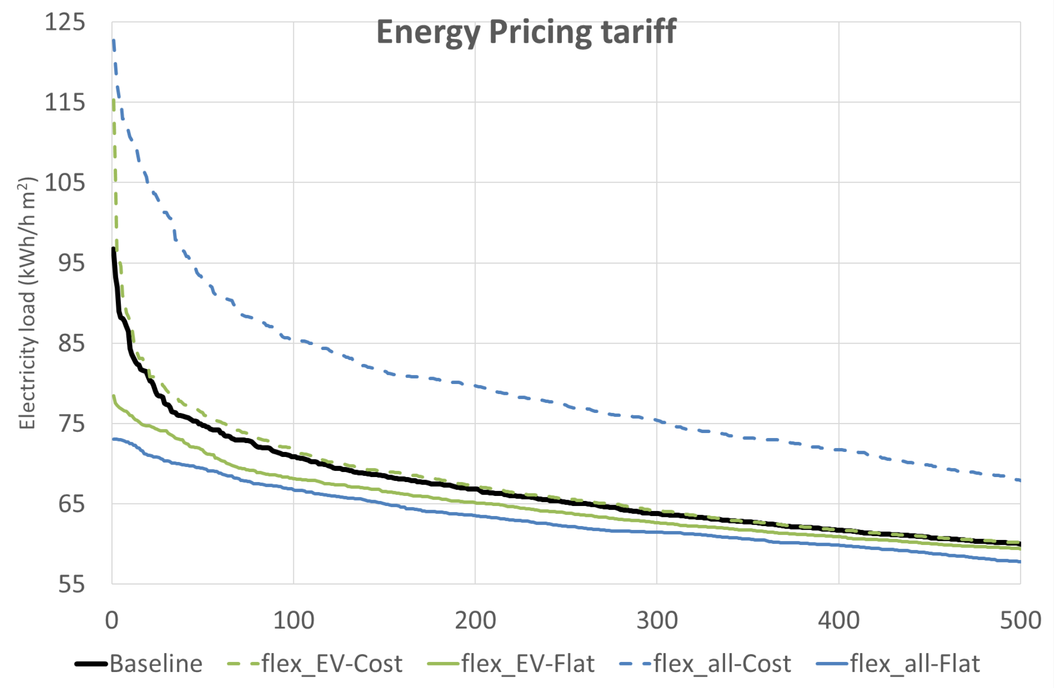
- Two alternative goals:
  - minimize operational costs for the user
    - With 2 grid tariffs: Energy Pricing (EP), Peak Power Monthly (PPM)
  - pursue a flat profile (FLAT)

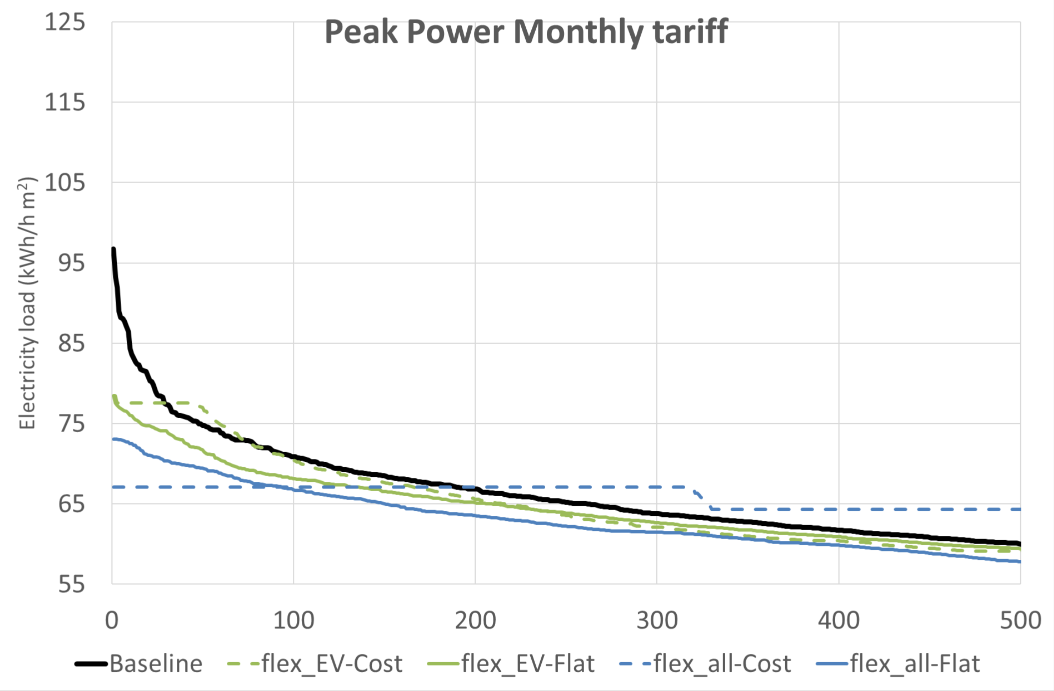


# Demand side case study

- Energy Pricing grid tariff:
  - Minimum cost (EP): marginal savings, in the order of -1%, at the cost of increasing the peak load by up to +27% (although this is shifted to the cheapest hours)
  - Flat profile (FLAT): **reduce the peak load by up to -24% with no significant additional cost (~0%)**

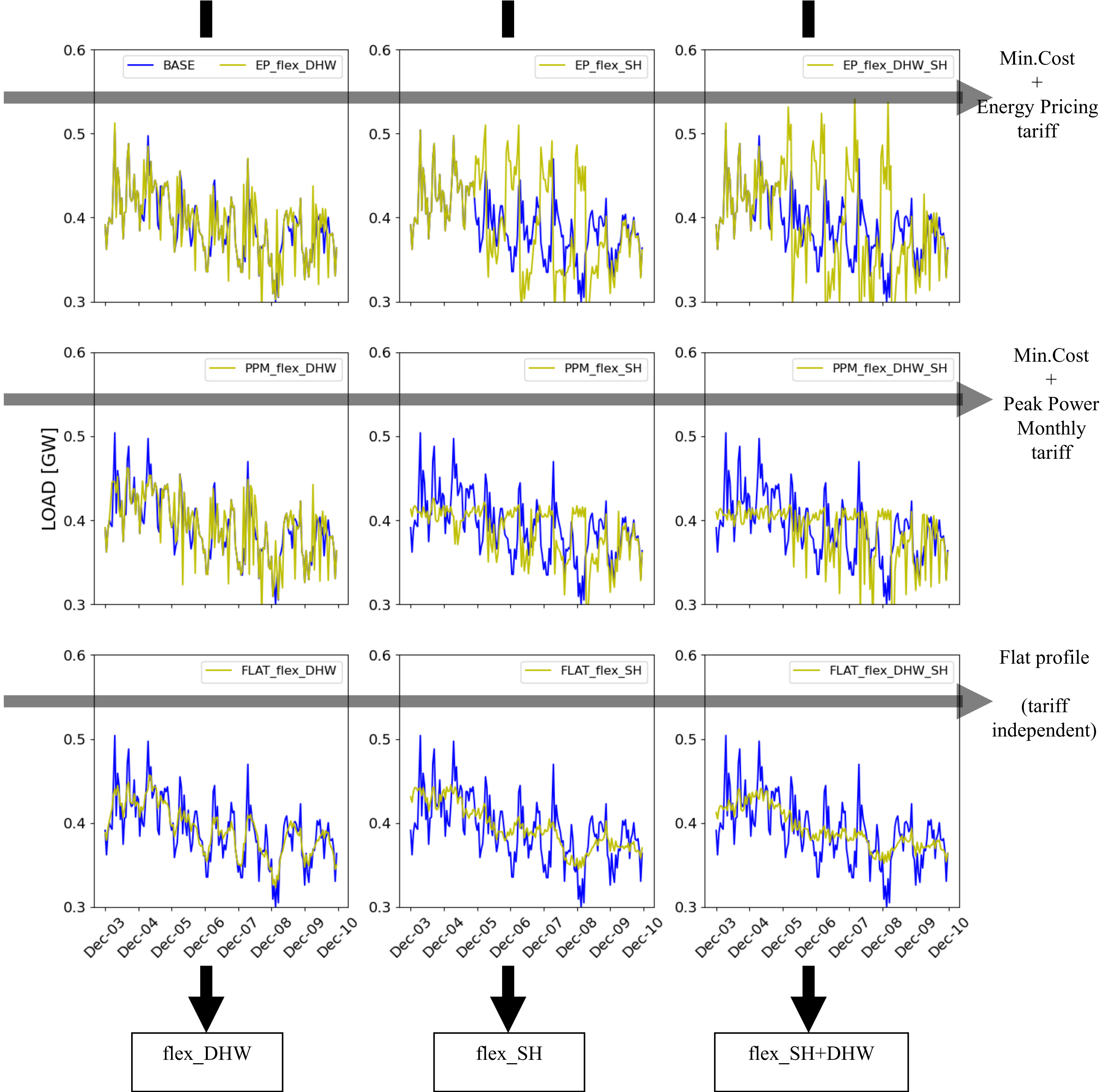
- Peak Power Monthly grid tariff:
  - In all cases achieves both cost savings and peak load reduction, with the best results achieved when the goal is minimizing cost
  - **All** three flexibility source**s together achieve -31% peak load with -6% cost savings**
  - **Space heating alone achieves -19% peak load with -4% cost**



# Aggregated electricity use

From all Apartments in area NO1



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