



# Consumers as active players in the energy system (1/2)



## Demand Response

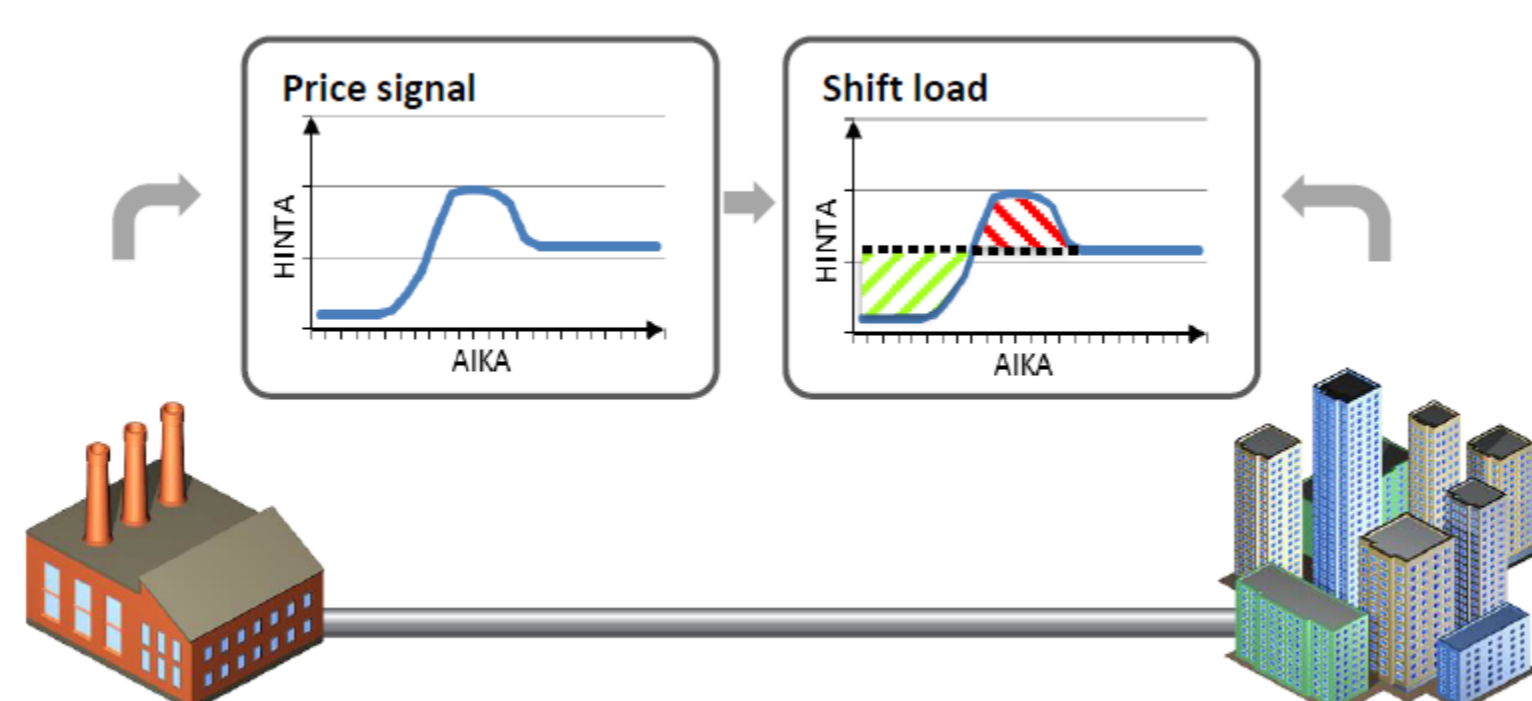
### LeanHeat

#### Problem/Question

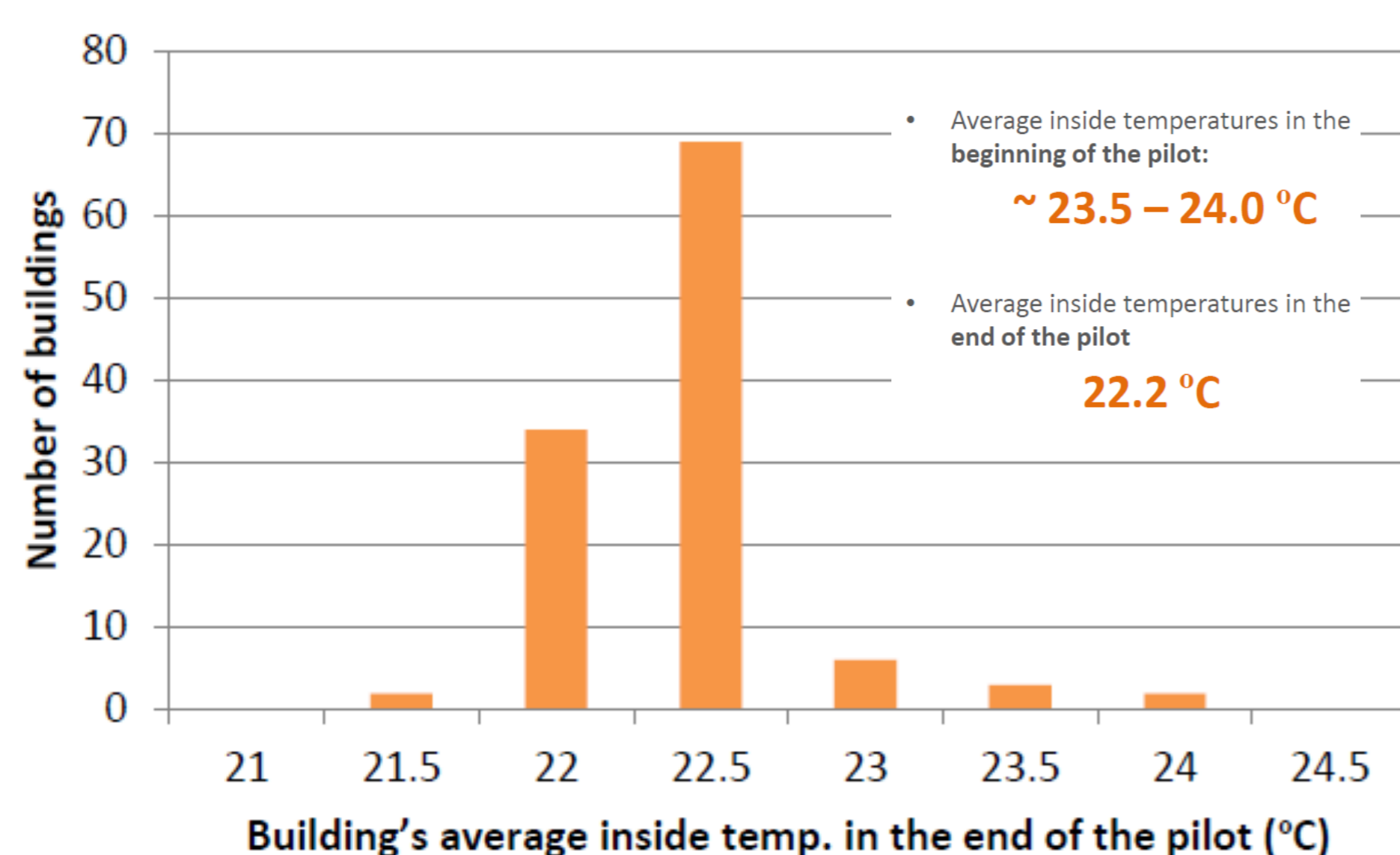
- Aim was to get good inside temperatures through proactive improvement of heating system balance

#### Method

- Research was done in 122 buildings / 6012 apartments of which 2100 participated in load shifting
- A price signal was used to act as a command to start load shifting in buildings



#### Observations



Total number of customer complaints known during LeanHeat's 2 years: 0,7 % of occupants\*

#### Conclusions

- Complaints do not correlate with inside temperature. Most complaints came from inside temperatures 20-24 °C
- Typical reason for complaint is a problem in a single room's insulation / radiator. If maintenance quality is normal, the problem is easily fixed on flat level with high occupant satisfaction
- Occupant satisfaction did not suffer during the pilot, on the contrary an easy way of fixing real problems in apartments was provided

### Virtual Power Plant

#### Problem/Question

- A pioneering virtual power plant based on demand flexibility built together with customers

#### Method



- Over 100-kilowatt virtual power plant (VPP) from aggregated network of roughly 70 water heaters located in single family homes
- The VPP pilot based on water heaters does not produce electricity but reschedules the usage of a certain amount of electricity. This capacity can be used to balance the electricity system in the same way as the output produced by a power plant.

#### Observations

- The system worked as planned although there were some uncertainties on the total controllable load due to technical reasons like incorrect parameters and weak mobile network signal in some pilot sites
- The online-energy-monitor-app, developed during the pilot, got mainly positive feedback

#### Conclusions

- Operating together, households can play a significant part in the power system stabilization
- Residential type of regulating power can, on a large scale, balance the electricity network and reduce the need for fossil fuel-fired peak capacity plants



Solution Architect for Global Bioeconomy & Cleantech Opportunities

\* Statistically at least 5 % are always unhappy regardless of the thermal conditions according to PPD calculation, ASHRAE. 2010. ANSI/ASHRAE Standard 55-2010