Modelling of demand response in distribution systems

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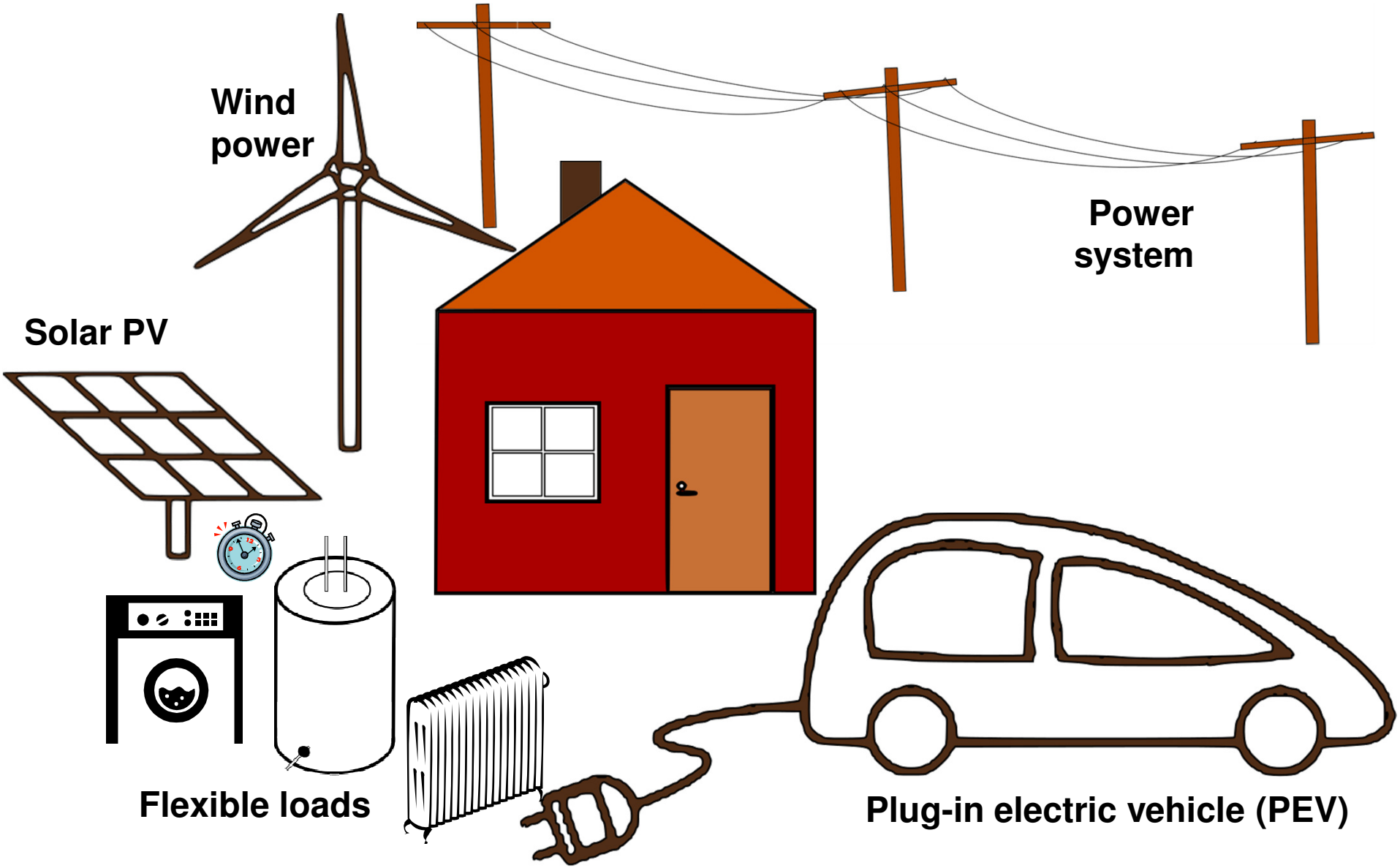
Last week

Yesterday

Why demand response?



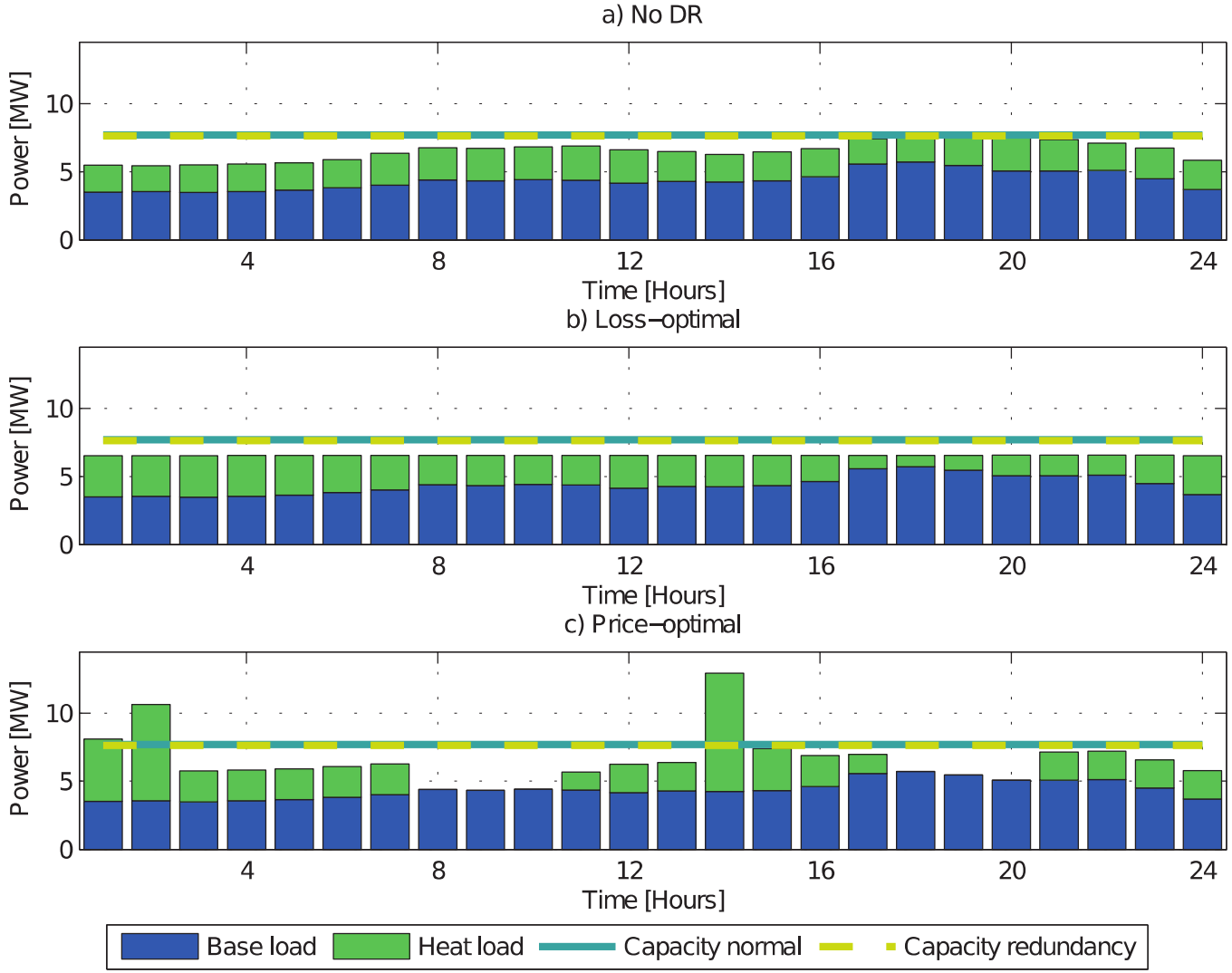
Strategies to implement demand response

- Business as usual
  - No demand response, use the electricity as today.

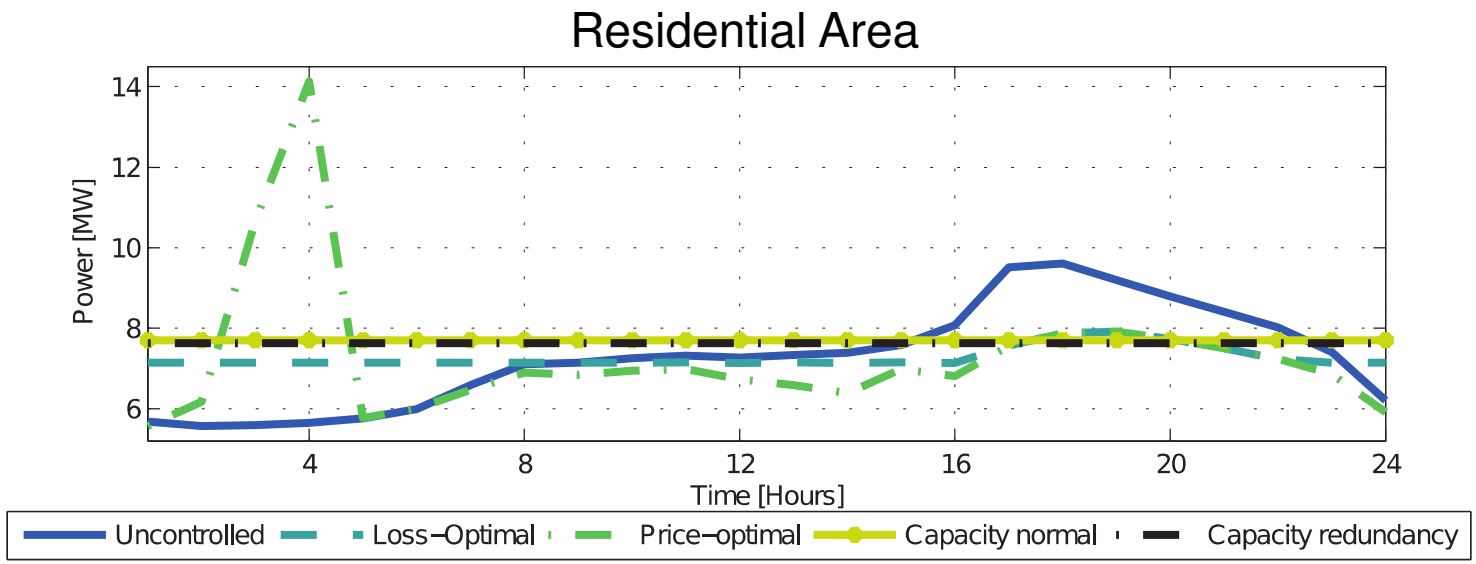
- Loss-optimal strategy
  - The electricity consumption is shifted in time to minimize the losses in the power system.

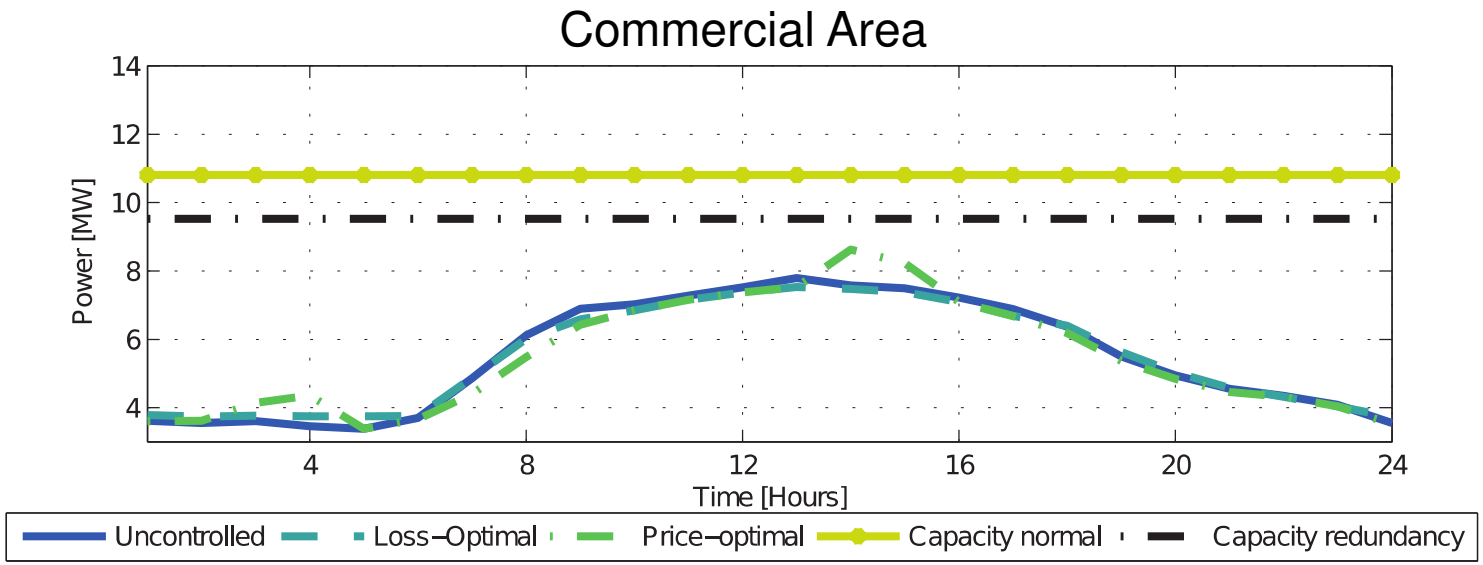
- Price-optimal strategy
  - The electricity consumption is shifted in time to minimize the electricity cost.

Potential for demand response - Space-heating



Potential for demand response - PEVs

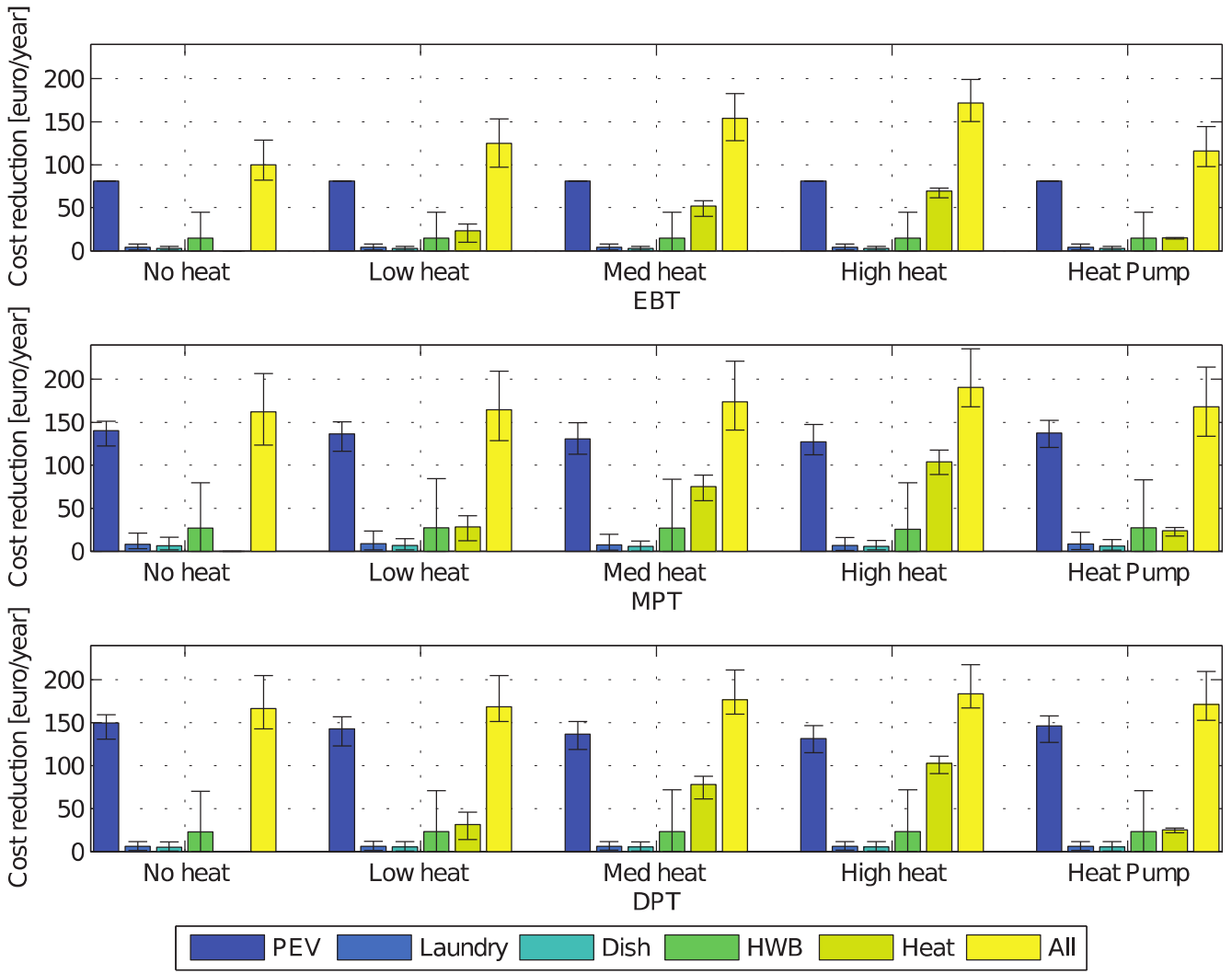




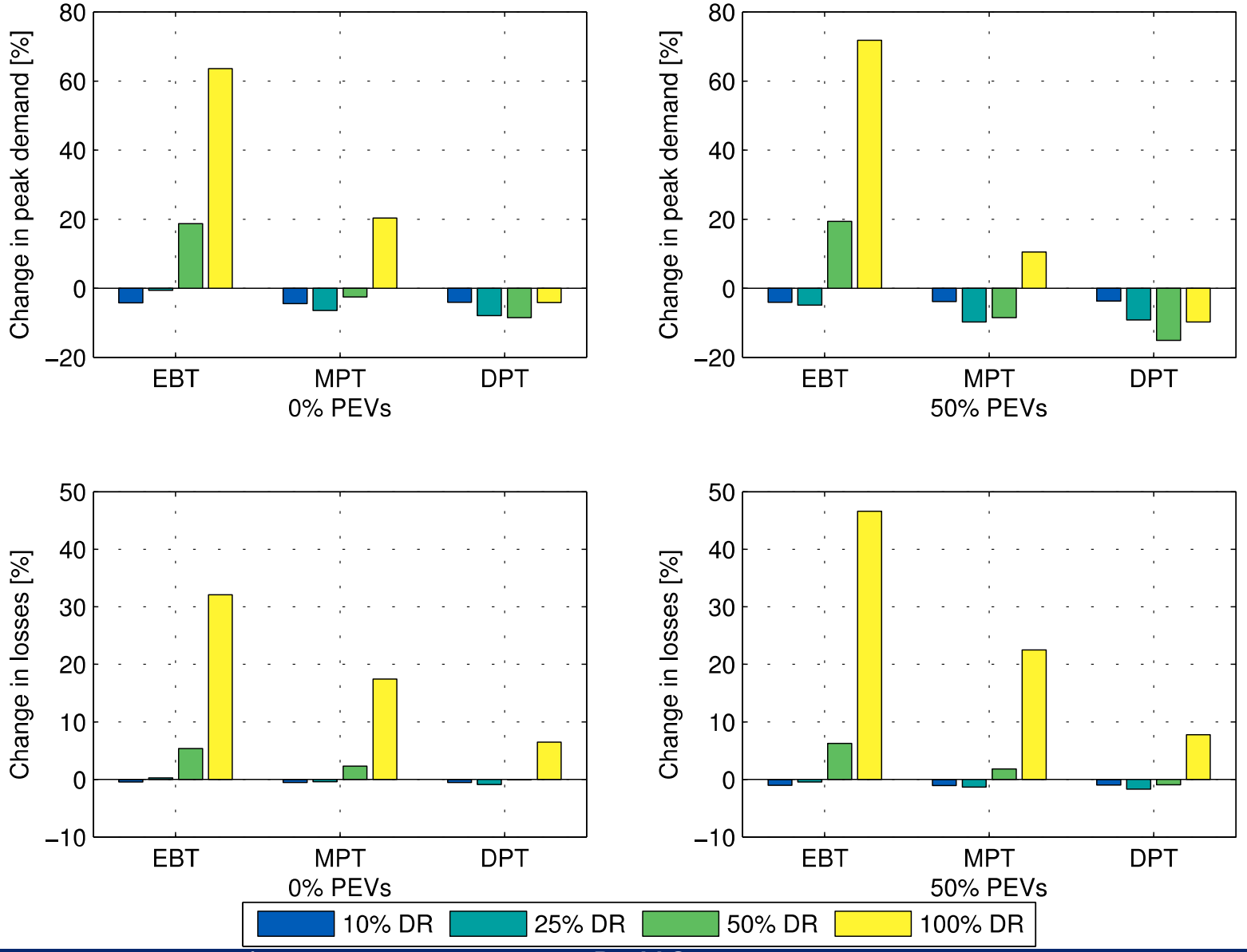
Effects of network tariffs

- Energy based network tariff (EBT):
  - Based on the electricity transferred over the grid.
- Monthly power based network tariff (MPT):
  - Based on the monthly peak demand.
- Daily power based network tariff (DPT):
  - Based on the daily peak demand.

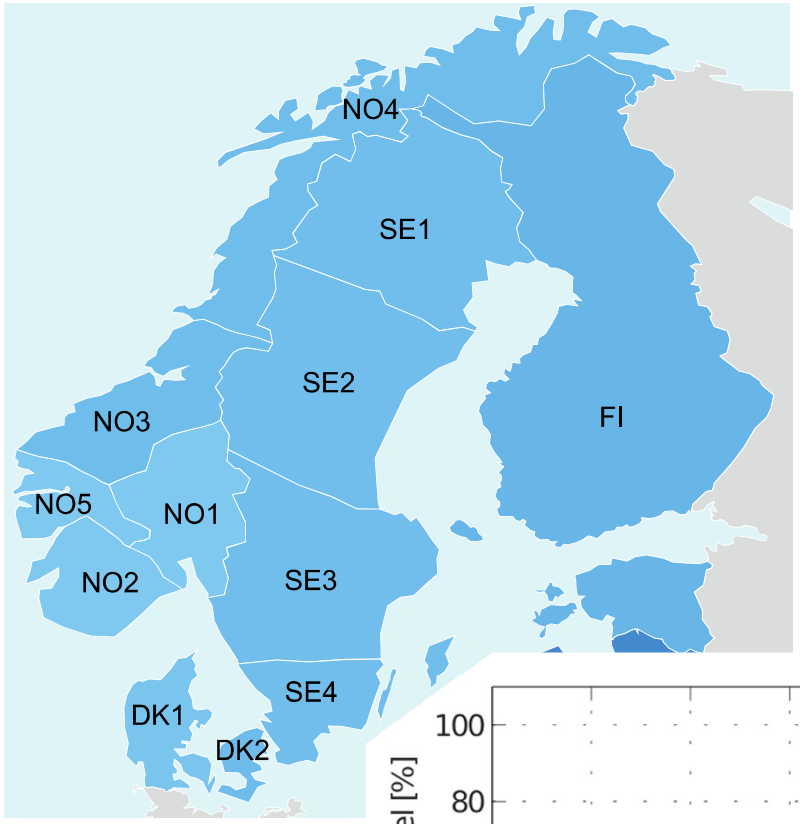
Effects of network tariff - Customers benefit's



Effects of network tariff - Peak demand & losses

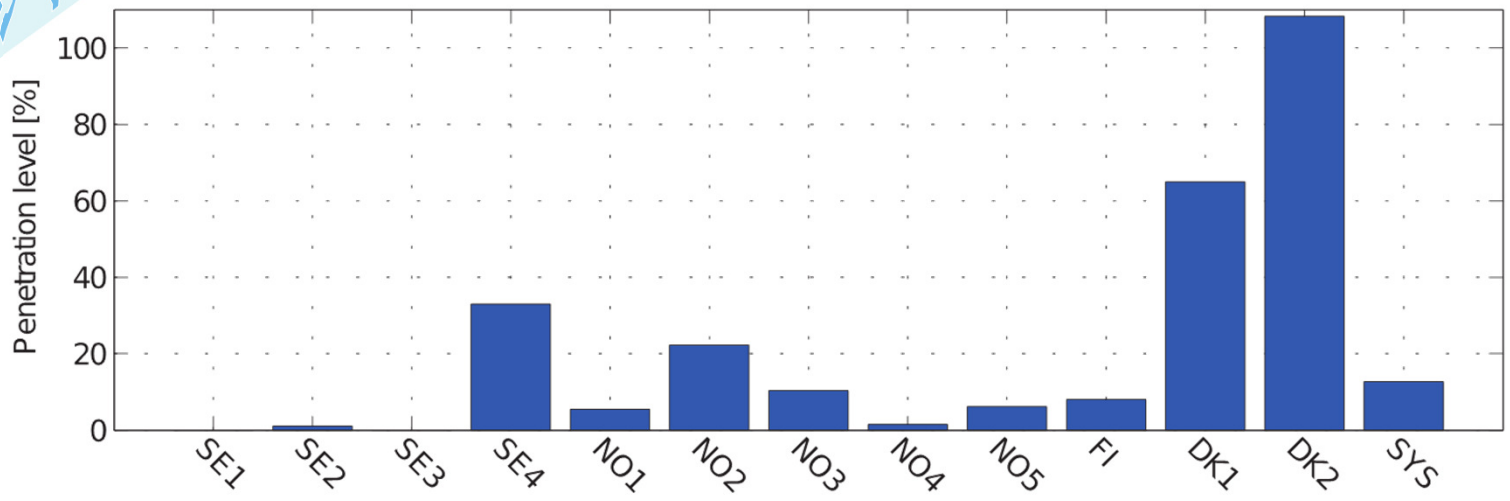


DR & wind power - Wind power penetration

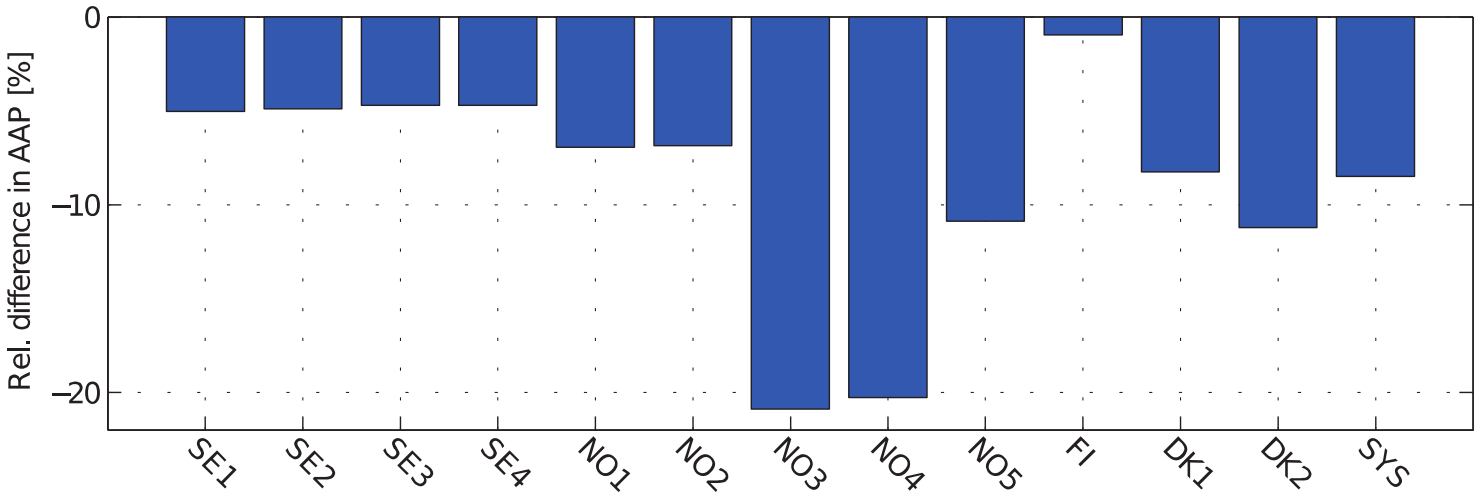


A future scenario with a high wind power share.

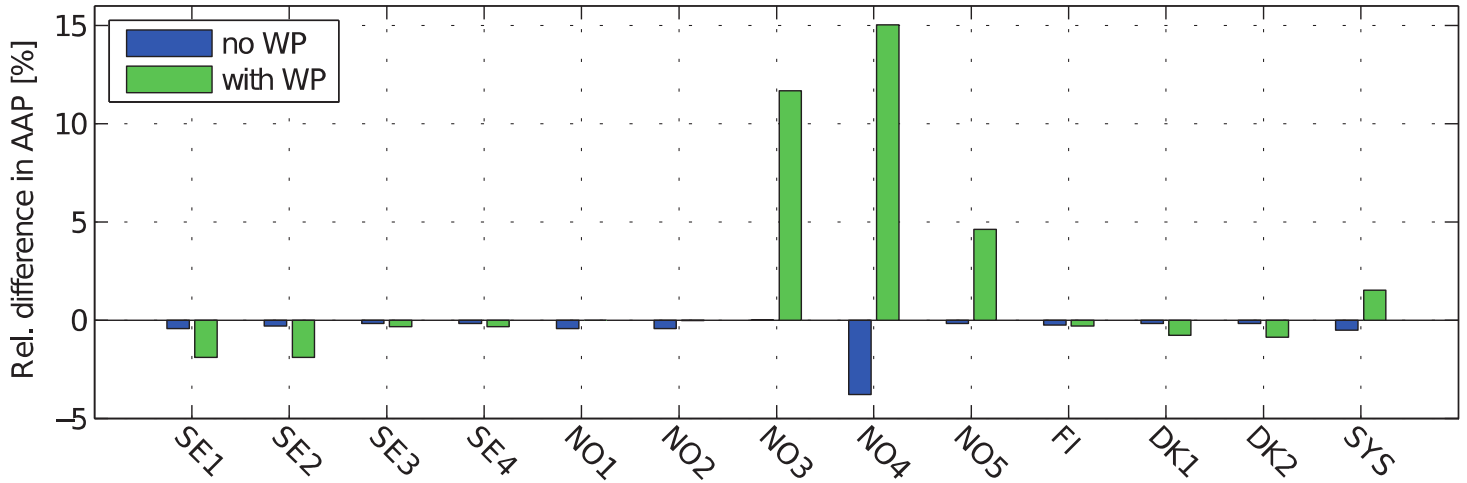
→ Wind power placed in most profitable areas.



DR & wind power -Average area price (AAP)

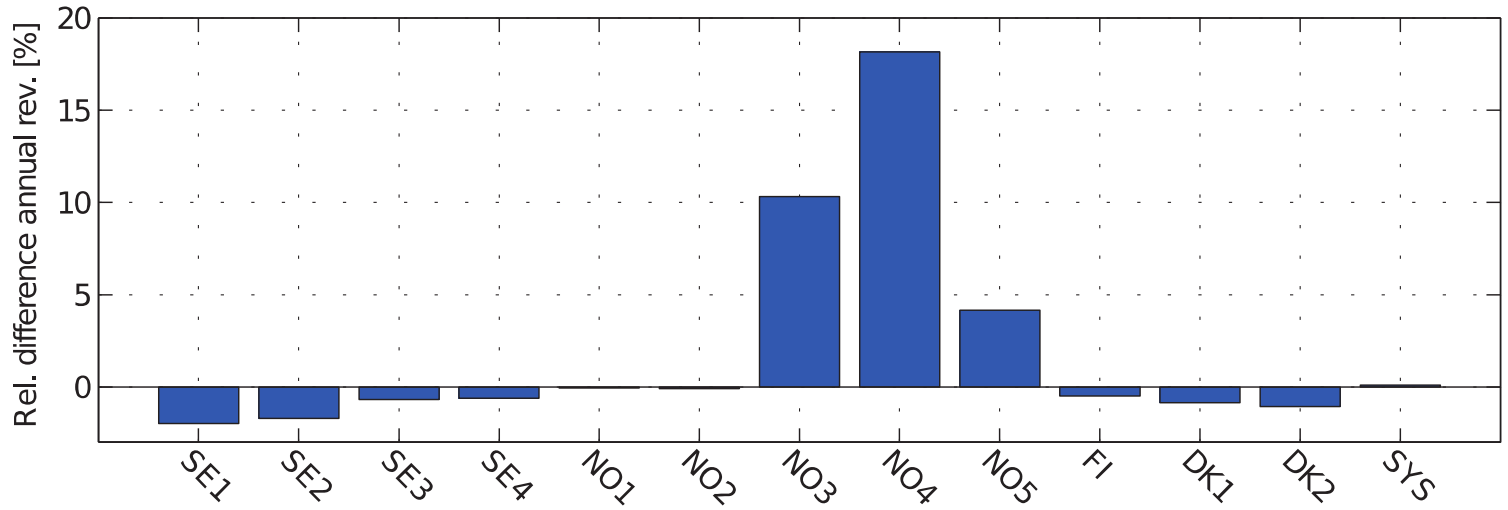


Average area price for the case with wind power compared to the reference case

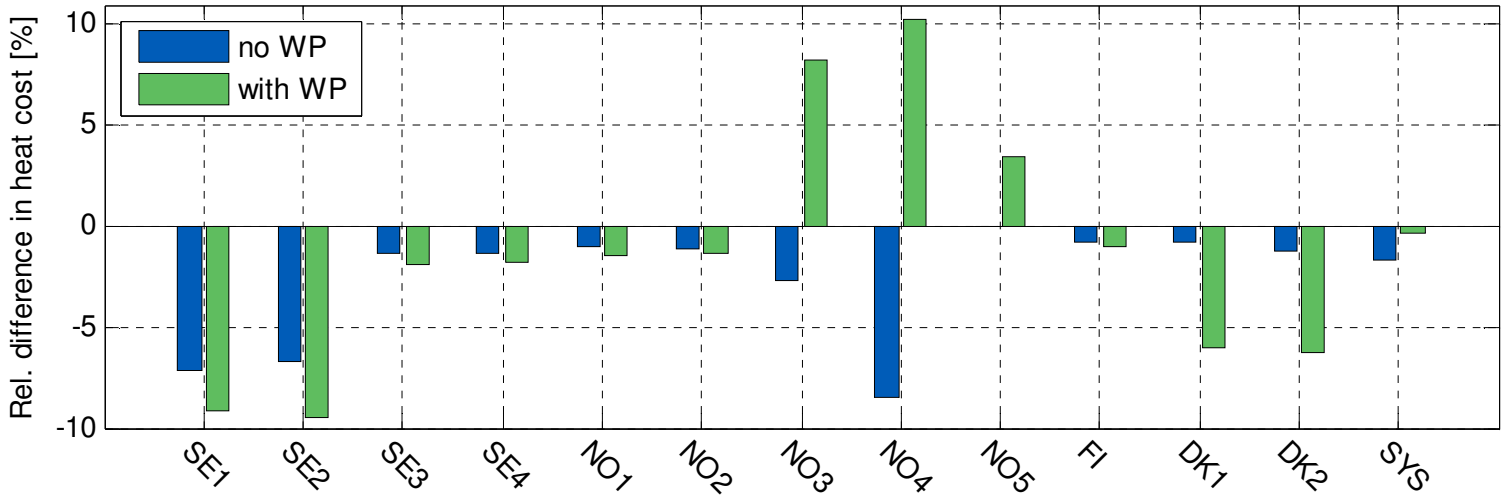


Average area price for the case with DR compared to the case without DR

DR & wind power - Revenue & cost reduction



Revenue for wind power producers for the case with DR compared to the case without DR



Cost for heating for the case with DR compared to the case without DR

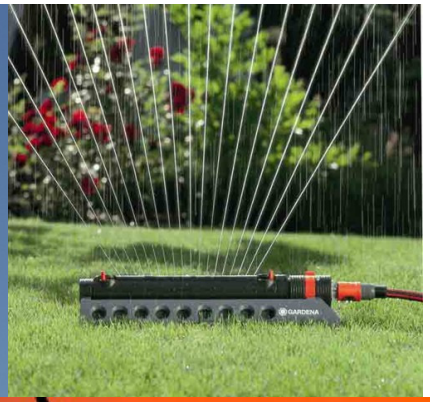
Conclusions

Increased electricity demand could result in overloading of components in distribution systems.

Peak demand could be greatly reduced with demand response, however...

…its important how to implement demand response.

Conclusions cont.



Power based network tariffs would increase the benefit for customers with large variation in demand.

Wind power producers would generally reduce their profits if customers would be responsive.

Thank you for listening!

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