CLEEN
Cluster for Energy and Environment

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Smart Grids and Energy Markets

Home energy management system

Sami Repo
Tampere University of Technology
sami.repo@tut.fi
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Why DSO is interested in HEMS?

- **Real-time monitoring of MV and LV networks**
  - Monitoring of whole distribution network (measurements + alarms)
  - Operate closer to limits (improve utilization of network capacity)
  - Network planning risks have increased (DG, load changes)
  - Role of LV networks have increased (PV, EV, heat pumps, ...)

- **Integration of Distributed Energy Resources (DERs)**
  - Load shifting to low load periods to avoid network congestion in MV or LV networks
  - Load shifting to high local production periods to avoid LV network voltage rise
  - Controlled island operation during disturbances becomes possible

- **Multipurpose ICT system for smart grid is needed**

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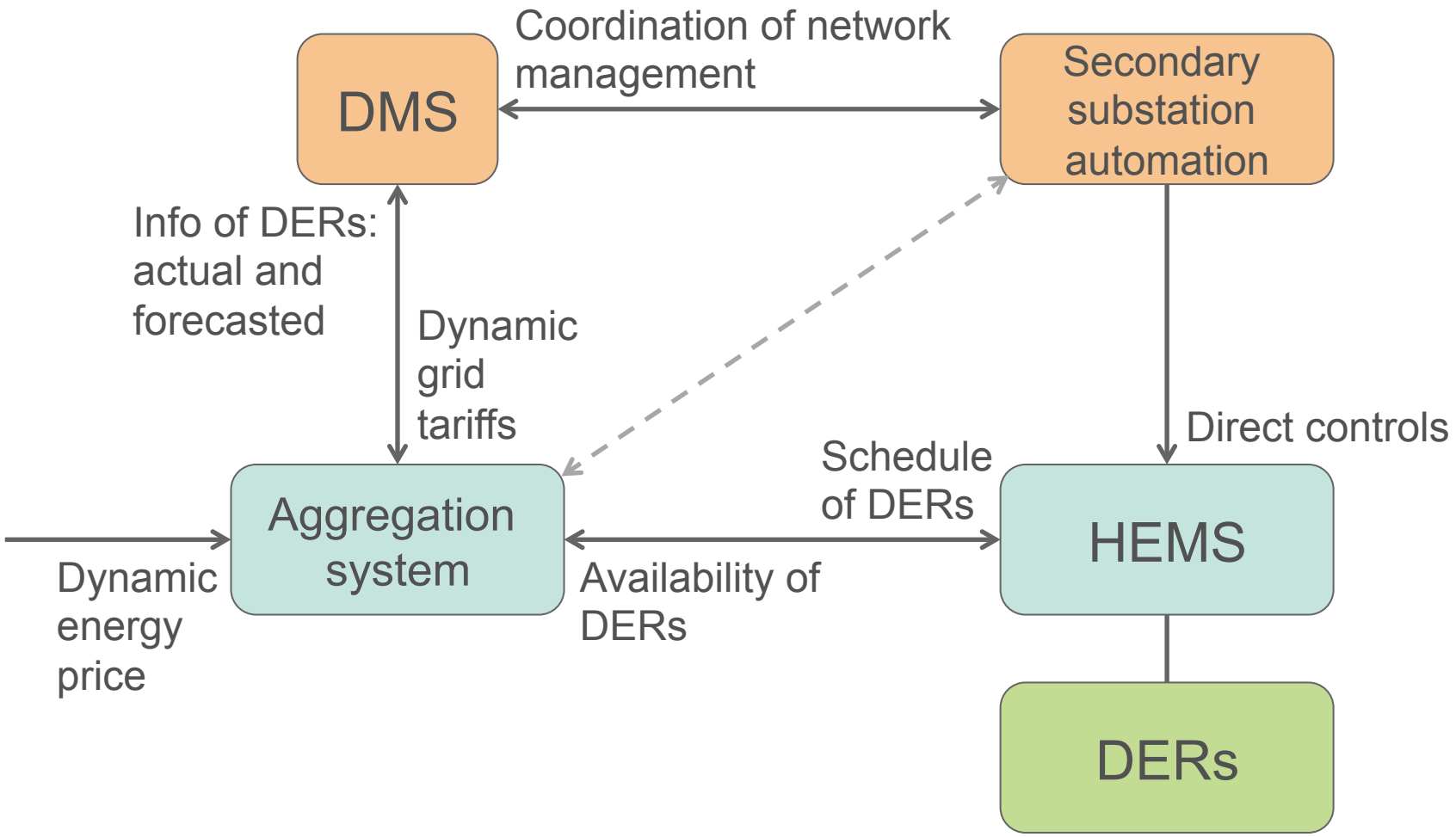
HEMS in distribution network automation



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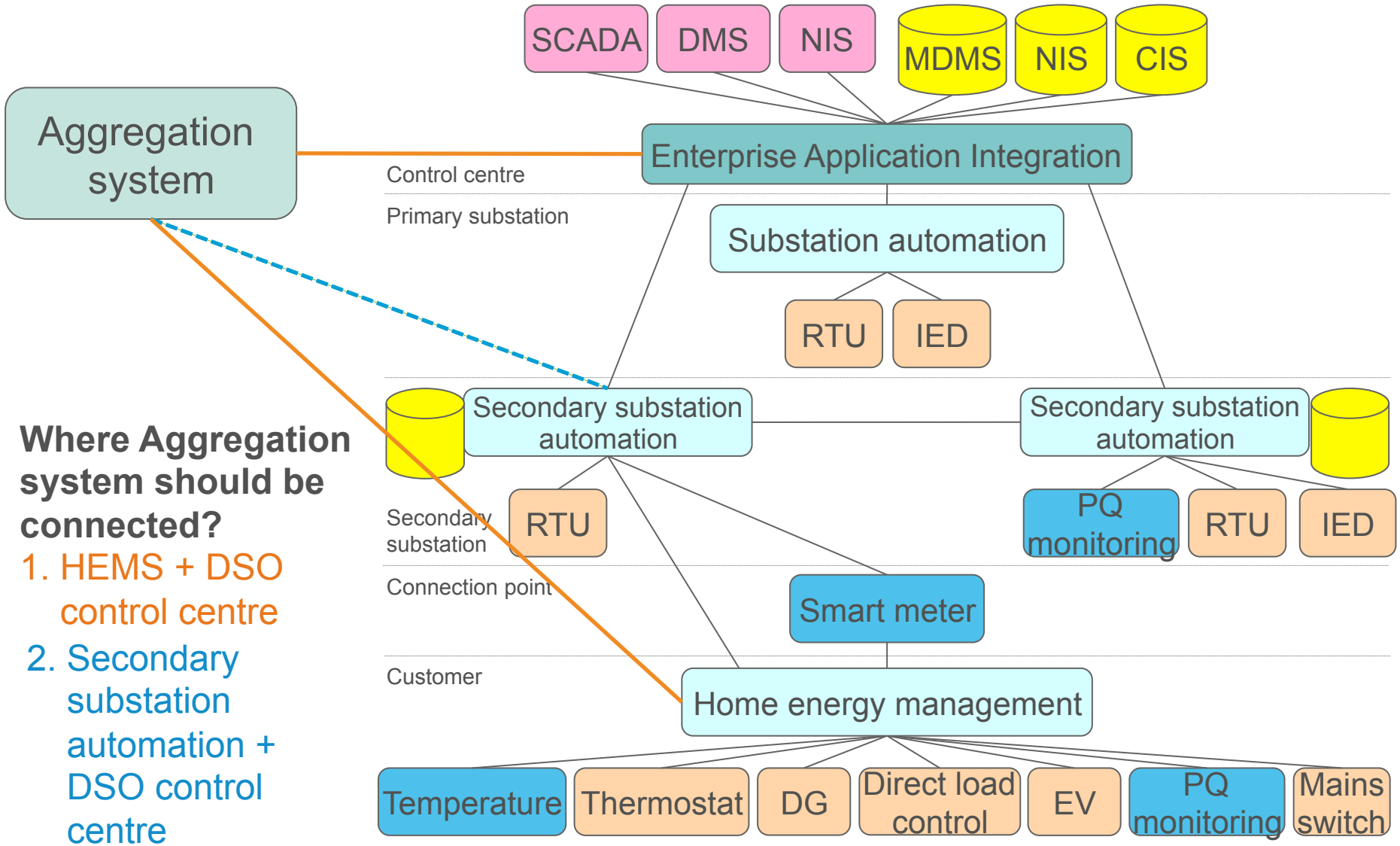
HEMS in distribution network automation



Where Aggregation system should be connected?

1. HEMS + DSO control centre
2. Secondary substation automation + DSO control centre

Vision of HEMS in distribution network automation

- **Integration of Aggregation system with secondary substation automation**
  - Needed where LV network is the bottleneck of the whole system
  - Secondary substation automation collect information from HEMS first and then provides this information to Aggregator system
    - Aggregator system may not overload LV network
    - Fast response in case of emergency (fast changing) situations
    - Control centre level management is too slow (used only for coordination purposes e.g. in day-ahead planning phase)
- **DSO provides automation system to end customers and market participants**
  - All market participants may use the same system
    - DSO is a neutral participant in energy market
    - National HEMS solution
    - Compare to smart meters
  - Owns secondary substation automation + smart meters + HEMS
  - Neighbourhood energy management realized by end customer

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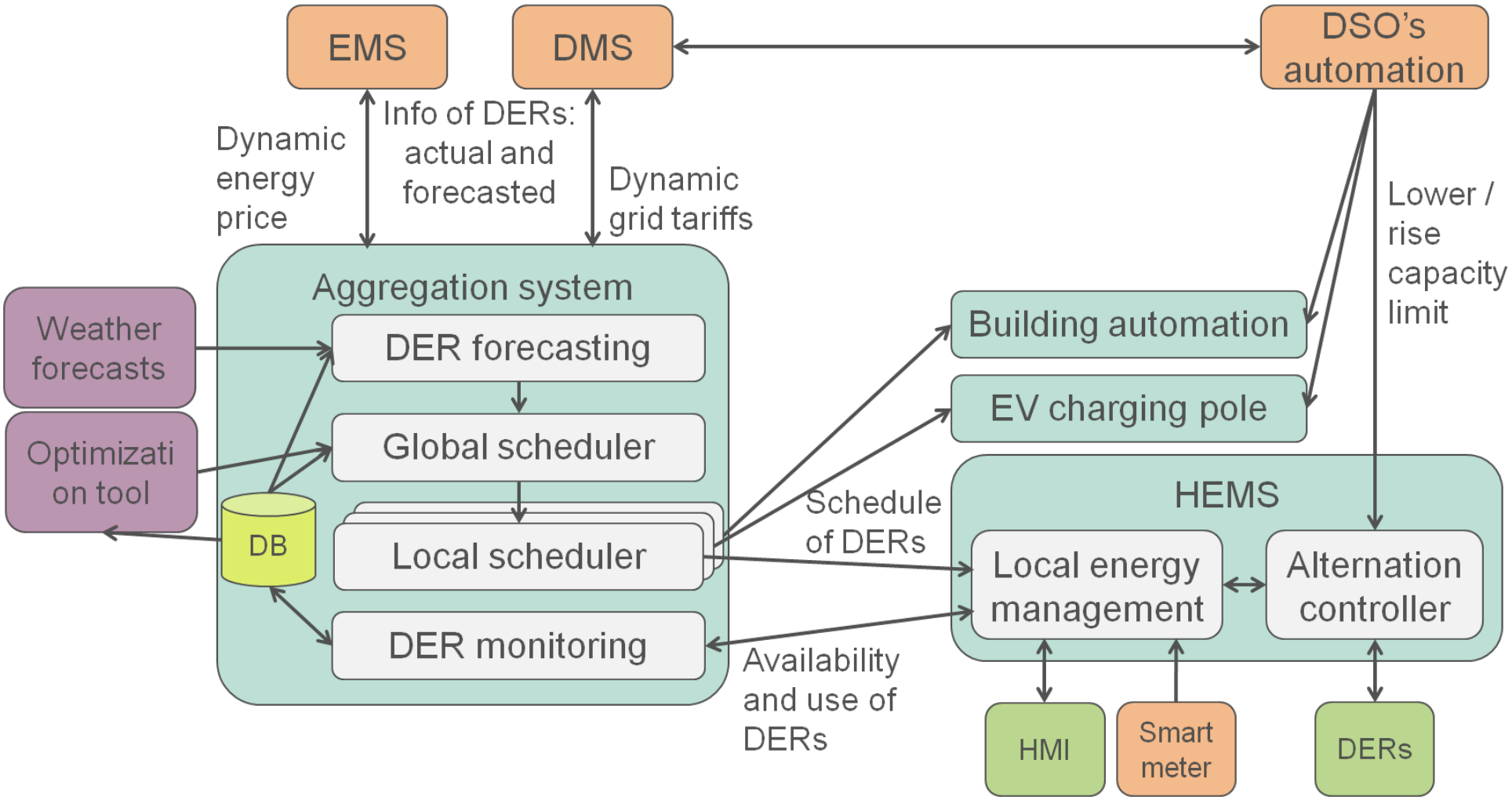
HEMS in distribution network automation



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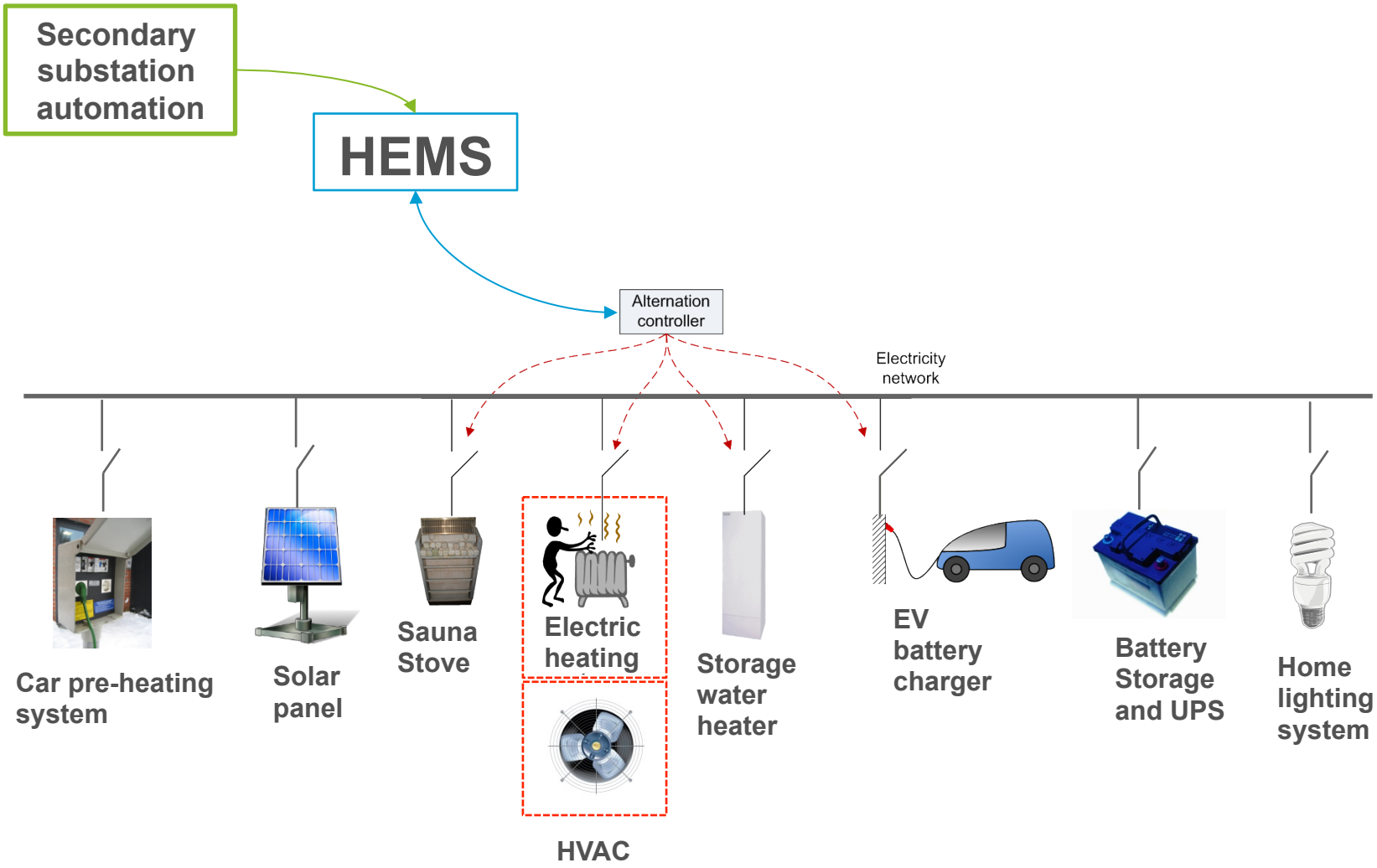
Alternation controller



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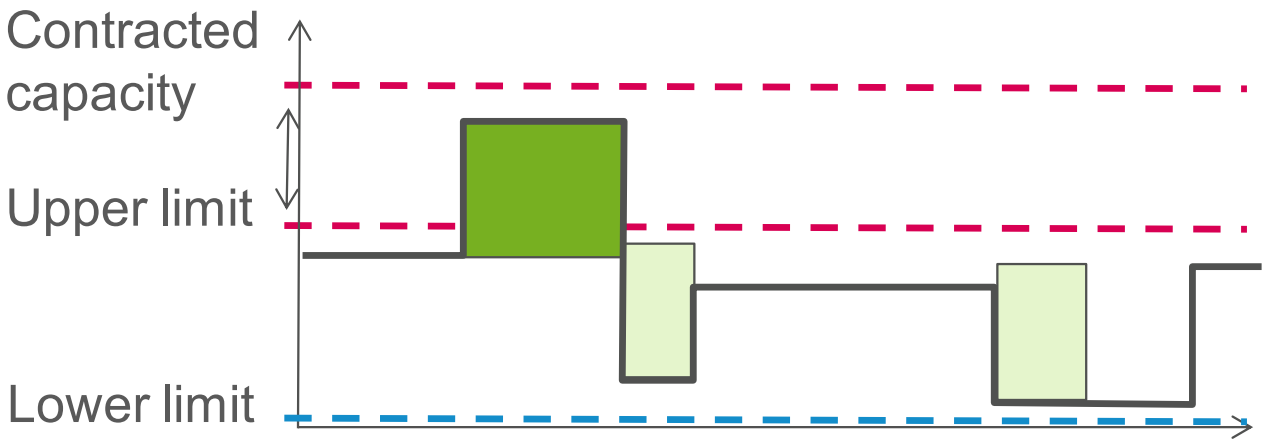
Alternation controller

Connection capacity will be shared by controllable DERs prioritized by a customer

- Home / away status → Energy / cost saving
- Ancillary services → Sell flexibility of DERs
- DSO's direct control in emergency situations

Green "box" is shifted to light-green timeslots due to reduction of allowed connection capacity



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Example