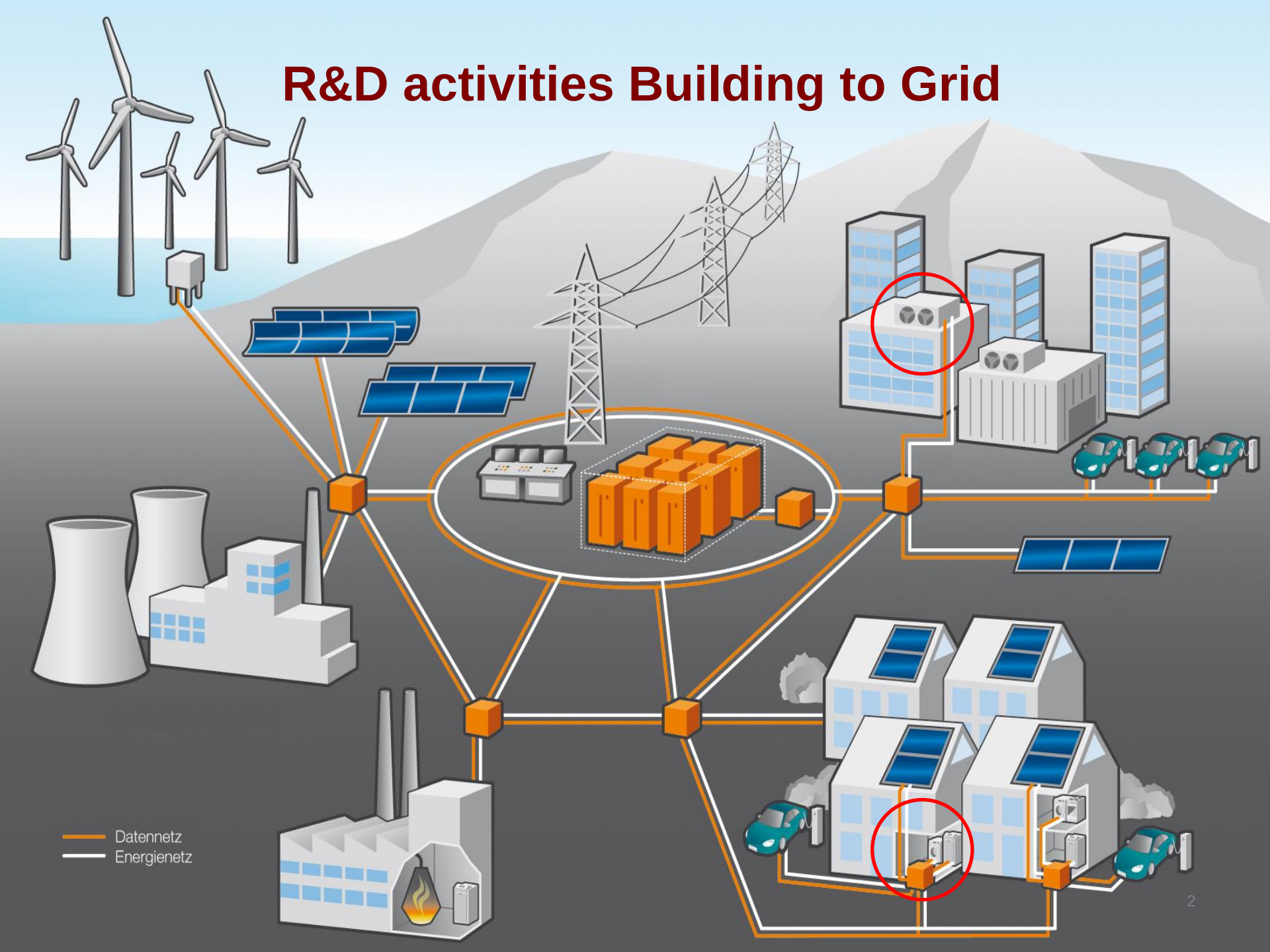
AIT Austrian Institute of Technology

AIT Energy Department

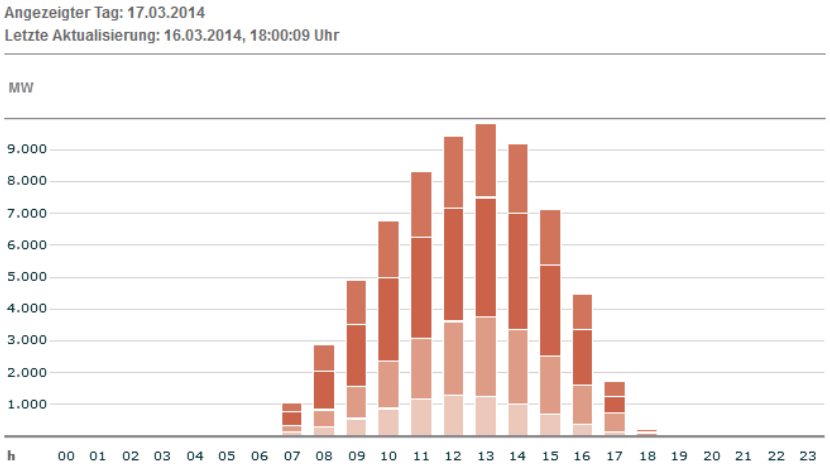
Florian Judex

R&D activities Building to Grid



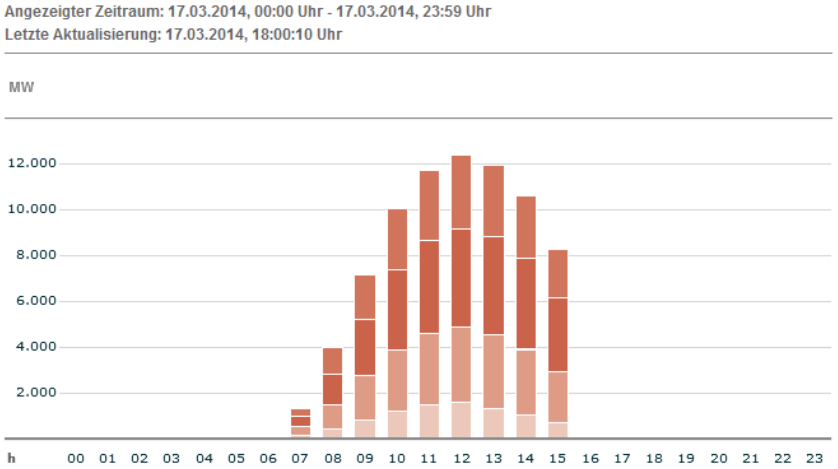
solar power – prediction vs. generation

Actual Generation



Source: EEX Transparency Platform

Estimated Generation



Source: EEX Transparency Platform

Difference: up to 35% or 3000 MW

Possible Solution: shift the demand to the right moment

- create incentives for consumers to use energy when it is available
- therefore match the consumption to the production
- get the demand to respond to the state of the energy grid

  ➔ demand response (DR)

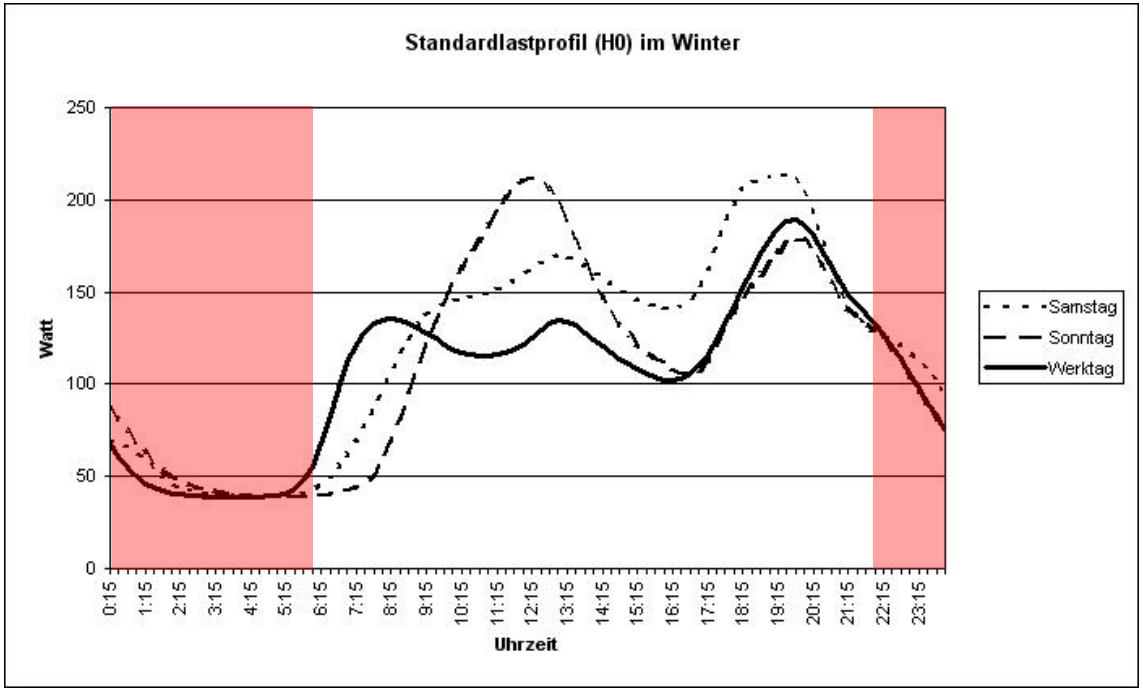
Types of demand response

- load shedding
  - systems are turned off if demand is to high (cooling stops)
  - a loss of comfort or performance is accepted (the room will get too hot)
  - is often load shifting in disguise (the room will be cooled down again after some time)
- load shifting
  - a process shifted backwards or forward in time to consume at the right moment
  - knowledge of the process is involved (you now the physical parameters of the room in comparison to the cooling systems)
- load forcing
  - a process which is not needed is run to consume overproduction (cool down an unused room)

Simple Demand Response with HVAC systems

- On the basis of the average load profiles, e.g. usage during the night
  - in night-storage heaters
  - in hot water boilers
  - using ripple control

- H0 profile with usual enabling of the heating unit by the ripple control in red



Source: Wikipedia / VDEW

when is a system suitable for load shifting

- to be able to perform load shifting the system should be usually running at the time when the DR is needed
  - if it is not running, it is not using energy any way

- the system should be able to turn off at time the DR is needed
  - else DR is impossible

- the system should be able to stay turned off during the whole duration of the peak
  - which means the building can run without the system for some time

➔ these criteria contradict each other

example: cooling at different temperatures

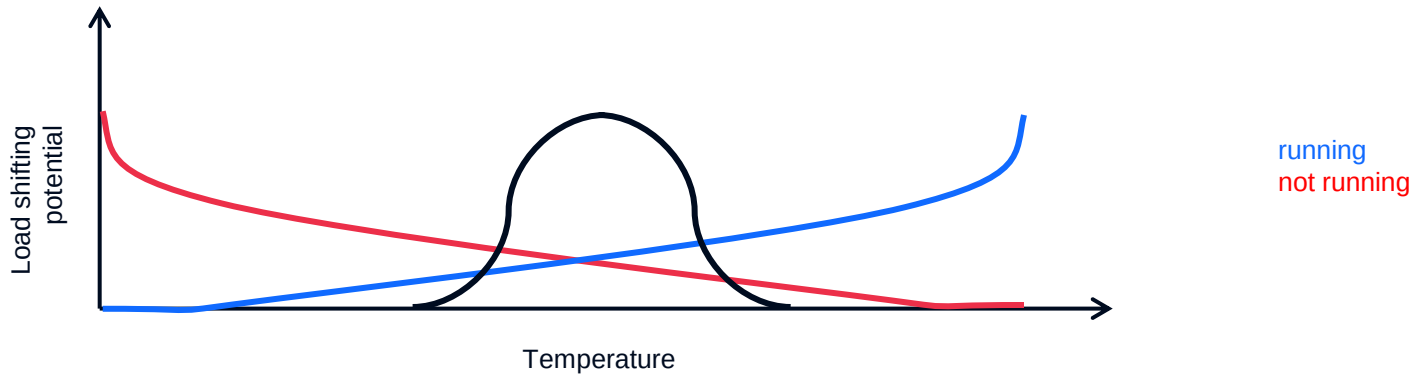
- higher temperature: **heating up** is quite fast,
- **cooling down** of the room takes quite long (losses occur also during heating)

- lower temperature: **heating up** takes longer **cool down** of the room is faster

➔ load shifting potential also changes with outside temperature

impact on potential

- lower temperature
  - system can be turned off longer
  - probability that the system is actually running is lower
- higher temperature
  - system can be turned off not as long
  - probability that the system is actually running is lower



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Florian Judex
florian.judex@ait.ac.at