

# **The Energy System in 2020, Data Analytics and ICT**

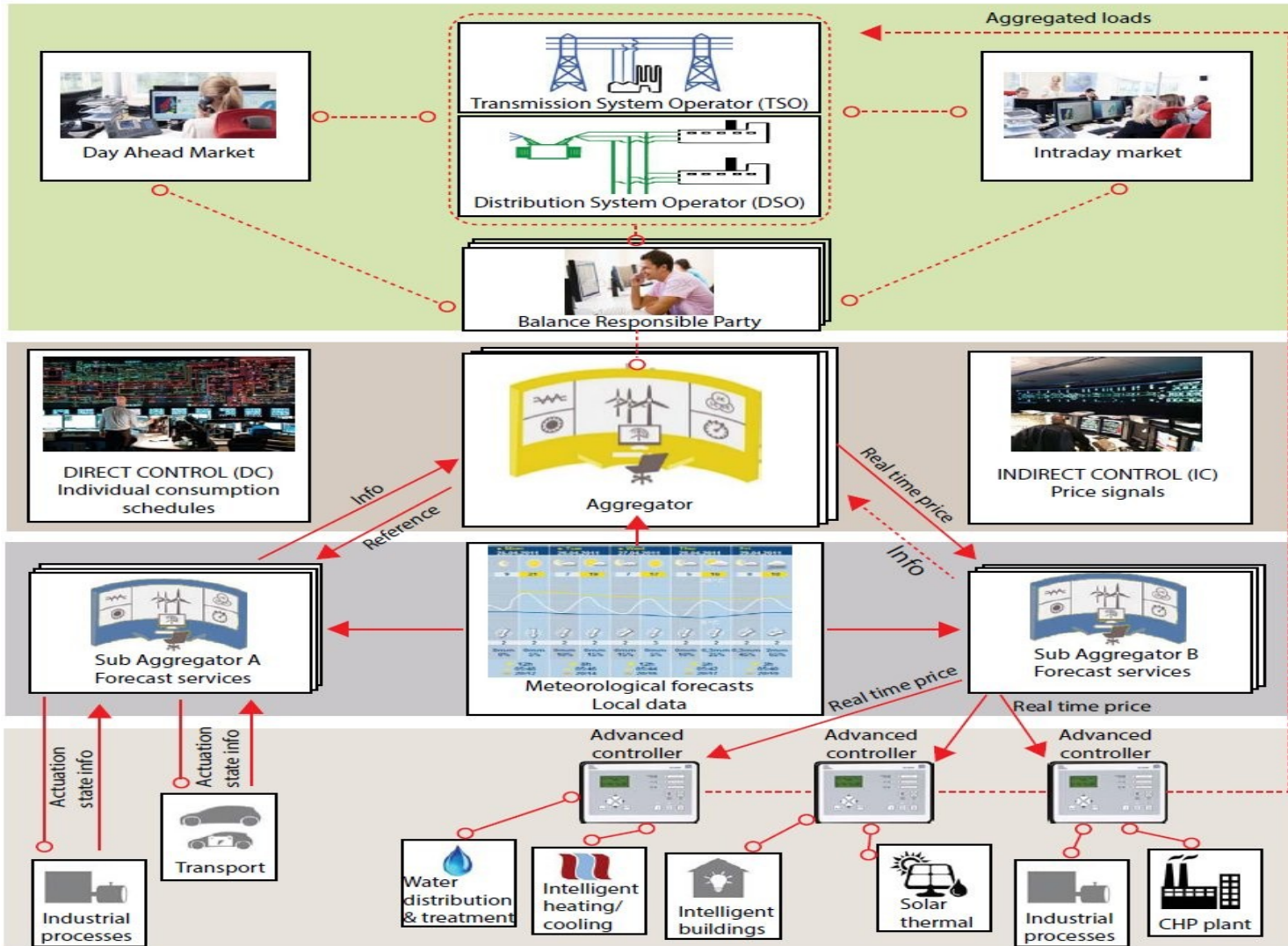
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# Trends

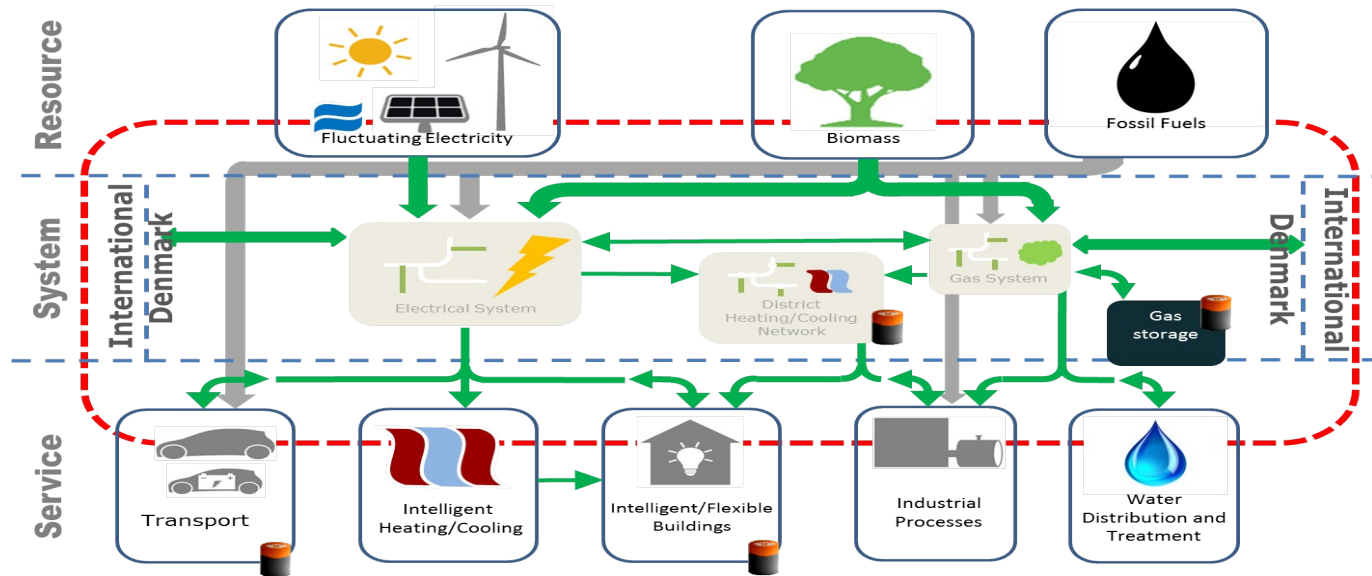
- Energy Systems 2020:
  - Use of (smart) meters and many sensors
  - Communication between energy systems
  - Aggregation (on all scales)
  - Intelligent data analytics
  - Demand response
  - Energy flexible automated manufacturing
  - Big Data, IoT, IoS technologies
  - Robust methods for planning and operation (wind and solar lead to more variability)
  - Adaptive methods for forecasting and control



# Smart-Energy OS



# ESI and Storage



- With more than 25 pct wind/solar power the main focus is on energy storage (rather than electricity)
- (Virtual) storage principles using ESI:
  - Buildings (thermal mass) can provide storage up to, say, 5-12 hours ahead
  - District heating/cooling systems can provide storage up to 1-3 days ahead
  - Gas systems can provide seasonal storage

# Meter data and buildings

- Reliable Energy Signature
- Energy Labelling
- Automated Proposals for Energy Savings (buildings):
  - Replace the windows?
  - Put more insulation on the roof?
  - Is the house too untight?
  - .....
- Integration of Solar and Wind Power using DSM



# Discussion

- **Intelligent Energy Systems Integration can provide (virtual) storage solution**
- **ICT methods for coupling of energy systems**
- **Big Data, ICT, IoT, Data Analytics, and an Energy-Systems Operation System (ES-OS) are essential for implementing future low carbon energy systems**
- **Focus on zero emission buildings - and less on zero energy buildings (the same holds supermarkets, wastewater treatment plants, etc.)**
- **Intelligent use of sensor (and meter) data is important**
- **Cloud based solutions for forecasting and control**
- **A large potential in Demand Side Management using data analytics**