



emp-e 2020, Plenary 4 - Sector integration

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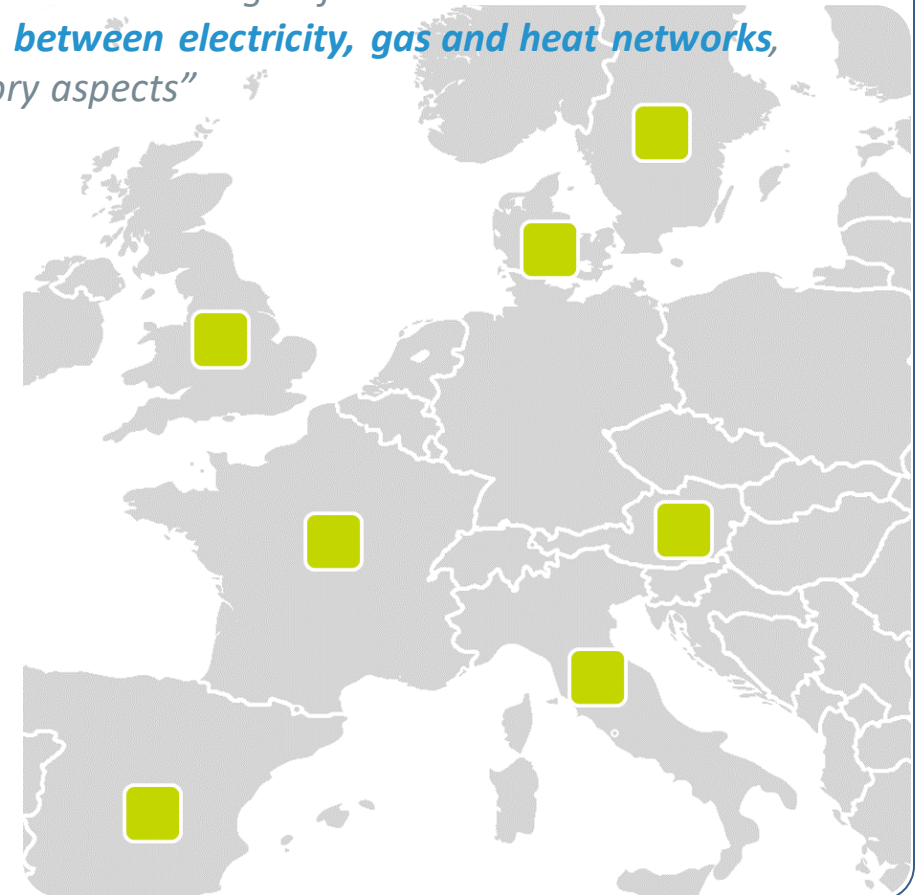
Christoph Gutsch, cyberGRID

SECTOR INTEGRATION FROM THE MULTI-ENERGY SYSTEM OPERATOR AND AGGREGATOR PERSPECTIVE



The MAGNITUDE project

- The Magnitude Project aims at investigating the potentials of **Multi-Energy-Systems (MES)** to provide flexibility for integration of renewables into the electricity network.
- Funded by the European H2020 programme; Call H2020 - LCE-05-2017 “Tools and technologies for coordination and integration of the European energy system” [...] developments for “**Synergies between electricity, gas and heat networks, associated business and market mechanisms and analysis of existing regulatory aspects**”
- The investigations focus on **7 real life case studies**
 - Steel industry and gas network (UK)
 - Pulp & paper industry (Austria)
 - District heating and systems and supply (Italy, Denmark)
 - District heating and cooling systems (France, Sweden)
 - District heating supply (Italy)
 - Wastewater treatment and sewage gas exploitation (Spain)
- The analyses include:
 - Technical simulations and improvements
 - Aggregation and market participation
 - Business models and cost-benefit-analyses
 - Drivers and barriers, policy strategy and recommendations
 - Improved market designs





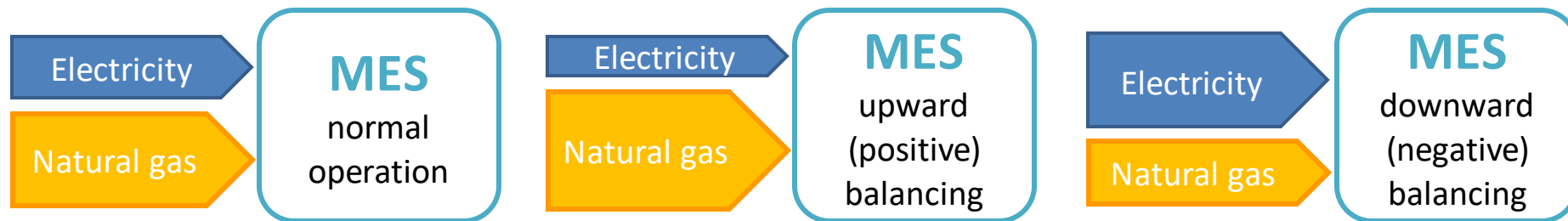
The MAGNITUDE principle



Source:
wikipedia.org



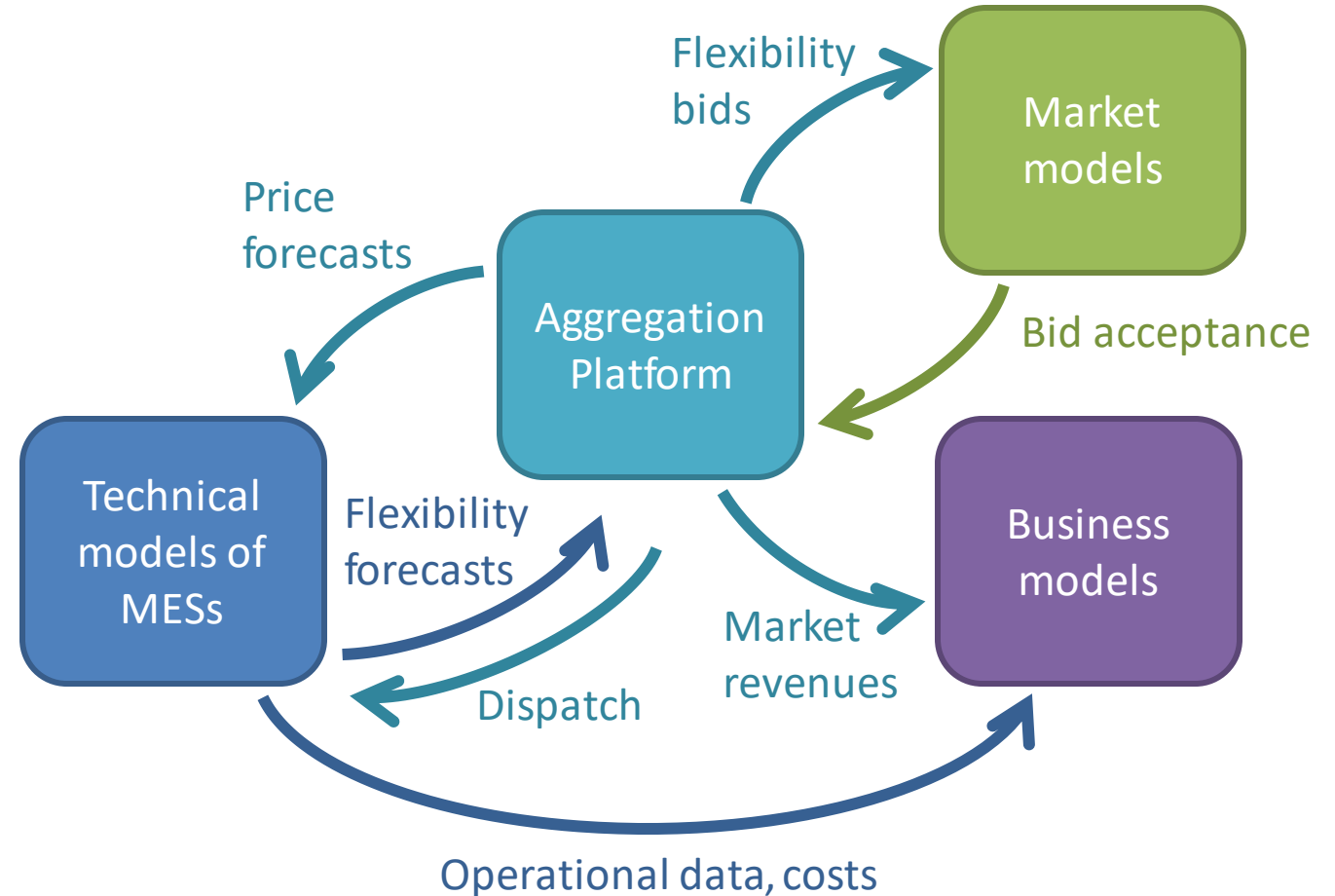
MES could help balancing the electricity grid, by local storage or shifting imbalances to more resilient networks of gas and heat. Storage of heat or gas is easier than storage of electricity, e.g. gas can be stored on the long term (several months) in exploited gas fields.





Simulation of MES operation and trading

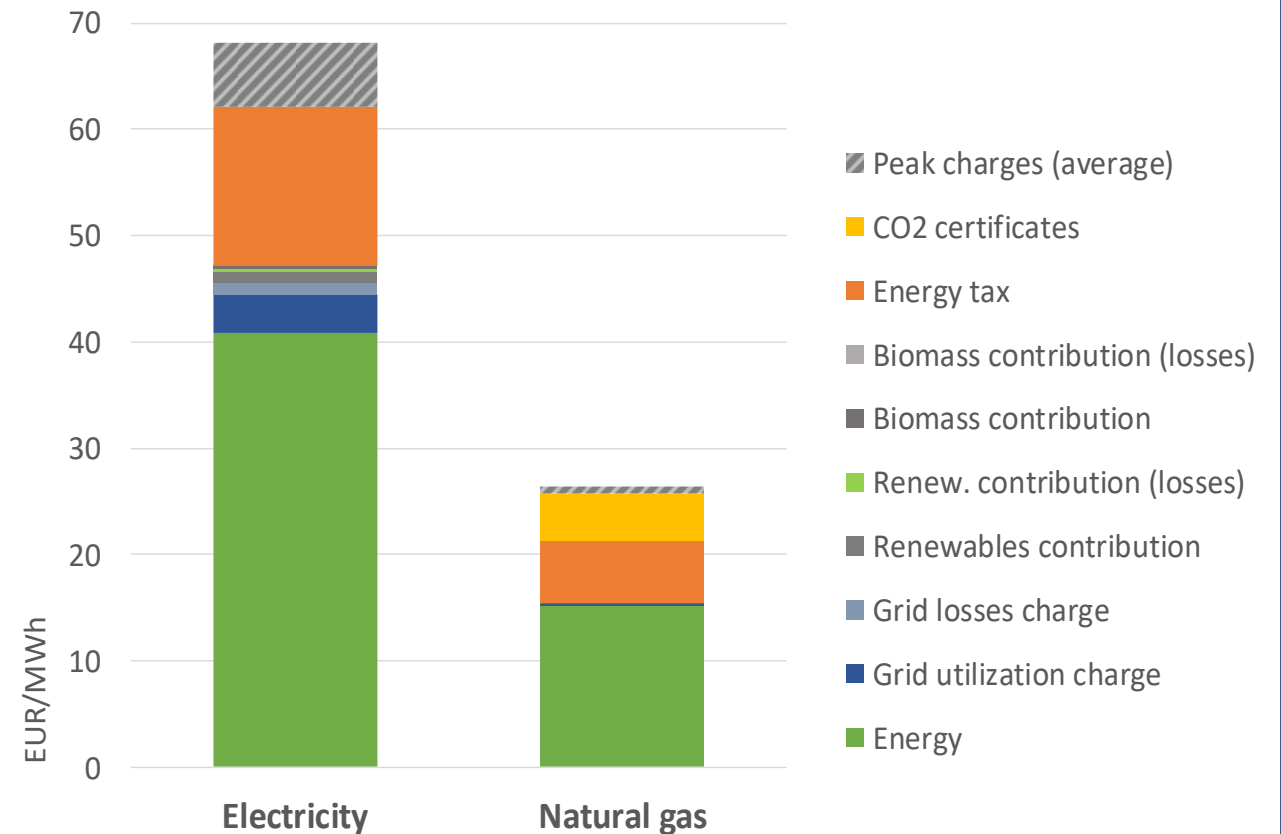
- In MAGNITUDE, we investigate if the existing market services and mechanisms are appropriate to exploit the flexibility potential of MES for the electricity system.
- Investigated markets: day-ahead, intraday, mFRR, aFRR, FCR, redispatch, capacity
- We aim to simulate workflows and decisions close-to-reality.
- Dealing with uncertainty of the aggregator and MES operator is a special aim.





Costs of consumed energy

- Energy consumers need to pay the market price of energy plus overhead costs.
- A low market price of energy does not result in proportionally low costs for the energy consumer.
- Our analyses indicate that **peak load tariffs** are a barrier for MES to dissipate excess feed-in from renewables.
- Focusing on **efficient energy markets will not be sufficient** to facilitate flexibility provision by MES.
- **Grid tariffs, energy taxes and renewable support schemes** also need to be redesigned!



Example: Specific energy costs of an industrial consumer in the medium voltage network in Austria in 2019.



Challenges in providing flexibility by MES

MES and market services

- Product definitions (bid duration, gate closure, minimum bid size, bid increment, symmetry, ramp rates, ...)
- Restrictions of technologies for ancillary services provision
- Missing harmonization in EU limits replicability of ICT solutions
- Increasing complexity of business processes
- Liquidity of intraday markets

Energy system regulation

- Rules for aggregation services undefined
- Complex structure of costs and tariffs for consumers.
- Transparency issues in district heating system in some countries.

Technology, engineering

- Mechanical stress due to frequent switching (increased maintenance)
- Rebound effects
- Start-up issues (duration, current)
- Minimum load levels (CCGT, CHP)
- Transport issues (connection capacity)
- Update of control and communication systems required
- Does not match with industrial process.

MES optimization

- Complex processes that involve several energy carriers converted by generators, consumers and storages devices

Modelling & simulation

- Limited access to market data



THANKS FOR YOUR ATTENTION!



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