Die Berater der Energie- und Wasserwirtschaft

Lastmanagement in Metropolregionen: Ein Geschäftsmodell für Unternehmen?

Vortrag auf der Konferenz „Flexibilisierung des Stromsystems in Deutschland und Frankreich“

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Demand response, load shift, load reduction and load increase – the usage of these terms is not yet consolidated, here are our definitions

load management / demand response

load reduction

- load reduction means reduction of electricity consumption during a period of time with implication on the total amount or the quality of goods / services produced
- e.g. reduced production of paper in a paper mill compared to usual production schedule, reduced lighting in hardware store

load shift

- load shift forward

- load shift backward

- load shift means a shift of electricity consumption without implication on the total amount of goods /services produced
- load shift forward: a period of reduced electricity consumption is followed by a period of increased electricity consumption
- load shift backward: opposite direction in time

load increase

- load increase means increase of electricity consumption during a period of time with implication on the total amount or the quality of goods / services produced
- e.g. heat generation using electric boilers in a district heating system

There are several markets on which demand response potentials can realise revenues

spot markets (day ahead & intraday)

- **market size:** in principle unlimited, no eligibility criteria
- **prices day-ahead:** in connection with negative prices price spreads of up to 100 €/MWh
  prices intraday: occasionally, spreads above 100 €/MWh up to 1.000 €/MWh
- **remark:** Many experts expect higher price volatility from 2020 onwards

ordinance on interruptible loads (AbLaV)

- **market size:** 3.000 MW procured by TSOs
- **prices:** upper limit 400 €/MWh. Capacity payment of 30.000 €/MW/year payed to all successful bidders.
- **remark:** ordinance so far runs out in 2015

control energy markets

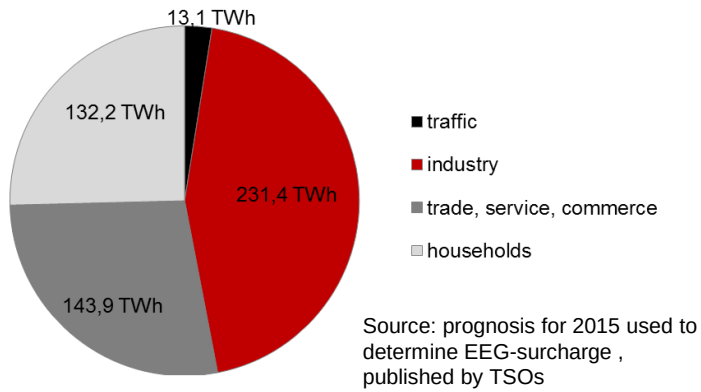
- **market size:** 600 MW primary reserve, 2000 MW secondary reserve, 2400 MW tertiary reserve
- **prices:** capacity payments and price per MWh
- **remark:** capacity payments for neg. tertiary and neg. secondary reserve have gone down significantly, merit order contains prices up to several 1.000 €/MWh

electricity grid fee optimization

- **market size:** 342.000 customers
- **prices:** dependent on individual situation
- **remark:** special rules for energy intensive industry (§ 19 StromNEV) make optimisation very profitable

In principle there are many potential providers of load management potentials in Germany. Metering on 15 Min basis – a necessary condition for usage - exists in industry, trade, services and commerce

net electricity consumption



Source: prognosis for 2015 used to determine EEG-surcharge , published by TSOs

industry

- 2.700 energy-intensive firms & 40.000 non-energy-intensive firms – all metered in 15 Min intervals
- Top 5 sectors regarding electricity consumption 2012:
  - chemical industry (50,1 TWh)
  - metal generation and processing (39,6 TWh)
  - paper industry (20,4 TWh)
  - automotive industry (16,5 TWh)
  - food industry (15,5 TWh)

Source: Destatis

private households

- 40,2 Mio. households in Germany
- smart-meter rollout planned beginning 2017
- Voluntary smart metering already possible, yet tariffs are not on hourly or 15 Min basis

trade, services, commerce

- 3,6 Mio. firms, 300.000 of these are metered in 15 Min intervals
- Top 2 sectors regarding electricity consumption 2012*:
  - offices alike firms (29,5 TWh)
  - commerce (22,3 TWh)
- Smart-meter roll-out planned beginning 2017
- Voluntary smart metering (see private households)

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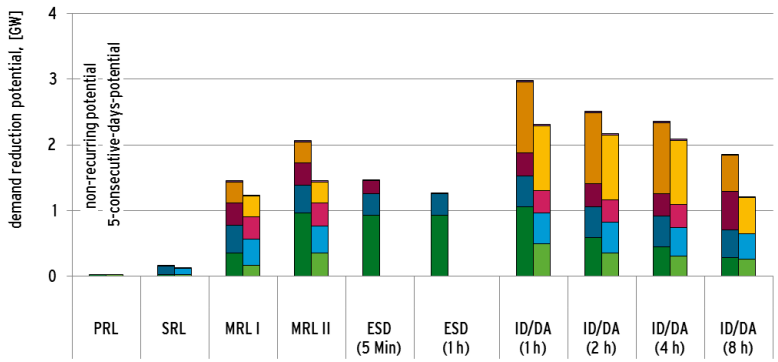
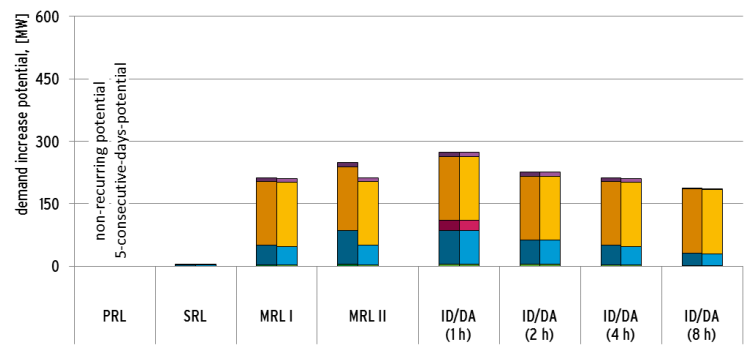
* Source: Schlomann et al, (2015), Energieverbrauch des Sektors GHD in Deutschland für die Jahre 2011 bis 2013

The energy intensive industry offers significant load shift and load reduction potentials. Potentials in the non-energy intensive industry are not known yet

load shift forward / load reduction potentials



load shift bw. / load increase potentials



remarks

- Potentials are shown according to type of use (control energy markets, emergency shutdown, spot markets) for the energy intensive industry
- Energy intensive industry offers large single point potentials with high availability
- Load shift forward / load reduction potentials are larger than load shift backwards / load increase potentials
- Costs for load shift: 0-500 €/MWh / cost for load reduction: up to 2000 €/MWh
- Non-energy intensive industry is extremely diverse. Potentials are not yet tapped and not yet known

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- Aluminium electrolysis/air separation
- Chlorine electrolysis
- Electric steel production
- Paper production
- Cement/container glas

Source: Umweltbundesamt: (2015) Climate Change 19/2015, Download

Control energy markets, ordinance on interruptible load and electricity grid fee optimisation offer attractive revenue for industry

spot markets (day ahead & intraday)

- Low price volatility limits revenues potential, negative prices are perceived as interesting option for load increases
- Capacity element of grid fees and special grid fees for energy intensive industry are biggest barriers to load management
- Charges and taxes on electricity also hamper usage of load increases

ordinance on interruptible loads (AbLaV)

- Four companies with six installations take part (aluminium electrolysis and chemical industry)
- Tender volume (3.000 MW) not reached so far, eligibility criteria too narrow
- Ordinance runs out end of 2015

control energy markets

- Active participation in tertiary and secondary reserve
- Aggregators pool demand resource potential and small generation facilities

electricity grid fee optimization

- Energy intensive industry uses special clauses in order to minimise grid fees
- Several thousand companies in non-energy intensive industry use company internal demand response in order to optimise capacity element of grid fees

Load management potentials in the trade, services and commerce sector are substantial - in theory

load shift forward potentials

The shown graphs contain unpublished material and are therefore excluded from this publicly available presentation.

load shift backward potentials

The shown graphs contain unpublished material and are therefore excluded from this publicly available presentation.

remarks

- BET has surveyed literature on potentials in this sector
- Load management potentials are diverse with regard to availability, length of call and length of total shift period*
- Pooling of so-called cross-sectional technologies (heating, cooling, compressed air, hot water generation) is common approach in studies on potentials
- Potentials shown are for 1h length of call and 2h length of shift period**.
- Backward potentials are larger than forward potentials

*length of call = Abrufdauer / length of total total shift period = Verschiebedauer

**1h electricity consumption can be shifted by 2h

Electricity grid fee optimisation is the only possibility to realise attractive revenues in the trade, services and commerce sector

spot markets (day ahead & intraday)

- Low price volatility limits revenues potential, negative prices are perceived as interesting option for load increases
- Capacity element of grid fees and special grid fees for energy intensive industry are biggest barriers to load management
- Charges and taxes on electricity also hamper usage of load increases

ordinance on interruptible loads (AbLaV)

- Not applicable due to eligibility criteria

control energy markets

- Presumably relatively little participation

electricity grid fee optimization

- Many use company internal demand response in order to optimise capacity element of grid fees
- One special clause (Höchstlastzeitfenster) is used by trade, services and commerce sector

Load management potentials in private households are theoretically widespread. A lot of experimenting has not yet brought about a clear picture of the potential

load management potentials

remarks

- Many pilot projects have tested the load management potential of private households
- As of yet, metering in 15 Min intervals is far from common.
- Therefore technical conditions for load management in households are missing
- Often electric night storage systems and heat pumps are seen as having the biggest load management potential

Summary and conclusion

Types of load management

Load shifting and Load increase are the two types of load management that play a role currently. Load reduction is typically too expensive and therefore not used much.

Potentials

The energy intensive industry offers significant load management potential. This potential offers high availability and is concentrated to single points. Potentials in the non-energy industry and trade, services and commerce sector are much more diverse and therefore more difficult to grasp.

Barriers

As of yet there are significant barriers to the usage of demand response, particularly due to the structure of the grid fee system. This applies to all sectors but especially to the energy intensive industry. The German regulator announced it wants to remove these barriers.

Markets

There are several markets in Germany which play a role for load management. Most important are currently the control energy markets and the optimisation of grid fees.

Outlook

The markets for load management will change. The current emphasis on grid fee optimisation may change to usage in control energy markets and within the framework of spot markets.

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BET's clients include public utilities, energy suppliers, energy traders, power plant operators, business co-operations, industrial enterprises, local authorities and ministries, national and international regulatory authorities, scientific and research institutions, political decision-makers and financial investors.

The company was founded in Aachen in 1988 by Dr Wolfgang Zander and Dr Michael Ritzau, who are still working as its managing directors. BET's shareholders are the two managing directors and other members of the management team.

Since its foundation BET has played a significant role in helping to shape the liberalization and regulation of the German energy market. Some of the milestones in BET's history have included the development of a regulation on grid access in 1995, the assessment of competitive development for the German Federal Ministry of Economics and the development of the current German gas grid access model in 2003. In 2011 BET launched the discussion in Germany about the future market design with the first major analysis and an own new recommendation. BET stayed closely involved in the professional discussion until the decision of the Federal Ministry for Economic Affairs and Energy was made in summer 2015. Germany, Austria and Switzerland are BET's core markets, but the company is also increasing its focus on European energy markets since some years.

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