Session #1: Demand side activation & electrification* in Germany

*idiosyncratically called “sector coupling” in Germany

Michael Pahle (PIK)
AHEAD Pathfinder Workshop
Davis, 3 December 2018
Household retail rates get higher & more rigid

- Side remark: **industrial consumers** is a different story, (very) energy intensive firms **exempted from all fees & taxes**

![Diagram showing the change in household retail rates from 2008 to 2017](chart.png)

- **Other levies & taxes**: 7.37 €ct/kWh in 2008, 9.18 €ct/kWh in 2017
- **Renewable levy**: 1.16 €ct/kWh in 2008, 6.88 €ct/kWh in 2017
- **Grid fees**: 5.9 €ct/kWh in 2008, 7.5 €ct/kWh in 2017
- **Wholesale price**: 7.22 €ct/kWh in 2008, 5.67 €ct/kWh in 2017

*Fixed costs components*

Source: BDEW / AHEAD comparison report
CA & DE aim to make demand more flexible to facilitate renewable integration & electrification

Two options to make demand more flexible:

- Demand response (DR)
  - consumer controls switch

- Demand side management (DSM)
  - someone else controls switch, consumer sets constraints

Source: AHEAD renewable comparison report
**Smart metering rollout precondition for both**

- Rollout timed according to consumption thresholds
- Next: consumers ≥ 6000 kWh, optional for others (cost limit)

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**Rolloutszenario nach dem Gesetz**

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- **Ab 2017:** Verbraucher ab 100.000 kWh: ohne Deckel
- **Ab 2017:** Verbraucher 50.000–100.000 kWh und Erzeuger 30–100 kW: 200 €/a
- **Ab 2017:** Verbraucher 20.000–50.000 kWh
- **Ab 2017:** Verbraucher 10.000–20.000 kWh und Erzeuger 15–30 kW: 130 €/a
- **Ab 2017:** Erzeuger 7–15 kW: 100 €/a
- **Ab 2018:** Erzeuger 1–7 kW: 60 €/a
- **Ab 2020:** Verbraucher 6.000–10.000 kWh: 100 €/a
- **Ab 2020:** Erzeuger ab 100 kW: ohne Deckel
- **Ab 2020:** Verbraucher 4.000–6.000 kWh: 60 €/a
- **Ab 2020:** Verbraucher 3.000–4.000 kWh: 40 €/a
- **Ab 2020:** Verbraucher 2.000–3.000 kWh: 30 €/a
- **Ab 2020:** Verbraucher <2.000 kWh: 23 €/a

Source: BMWi
Rollout deterred due to certification problems...

SMART METER

Regierung bremst intelligente Stromzähler aus

von: Klaus Stratmann
Datum: 28.11.2018 10:47 Uhr

Für die Smart Meter fehlt es hierzulande noch immer an der erforderlichen Zertifizierung. Die Branche beschwert sich bei Bundeswirtschaftsminister Altmaier.

Source: Handelsblatt, 28 Nov 2018

...but “industry complains”, this should solve it sometime soon
Demand response vs. management

- Consumers **notoriously non-respond to prices**: behavioral biases (e.g. inattention), transaction costs, “fear” of volatile prices etc. (Borenstein XXXX)
- Some retailers offer **dynamic rates**, but **adoption is low** and cannot be mandated (liberalized market)
- **ToU** not a good second best in DE (Gambardella et al.)
  - **High(?) barriers**, more research and experimentation is needed

- In contrast, **lower barriers** for **managing demand** (DSM)
- Consumers can be **compensated** (exemptions) according to their **“willingness-to-be-managed”**
- Wide menu of contractual options, similar to **complex bidding** in power & balancing markets
  - **DSM** is the apparent **way forward in DE**
Bringing DSM to household consumers

• 2016 amendment of Energy Industry Act (§ 14a) introduced **interruptible load (IL)** in: EVs, heat pumps, etc.
• DSOs through retailers entitled to offer IL rates with **reduced grid fees** (avoided **grid expansion costs**)
• DSO can **activate IL** according to contractual provisions, e.g. twice up to 3 hours per day
  ➔ In essence local consumer-based negative balancing market

![Graph showing grid fees for regular and interrupt load](image)
DR and DSM from a sequencing perspective

- DSM an important step to eventually **tap the potential of DR** and bring EVs into the market? Potential **enforcing sequence**:
  1. Extend IL contracts to **discharging** (balancing or wholesale market) ➔ additional revenue stream from battery
  2. Getting accustomed to making money creates appetite to actively respond to prices in general ( ➔ *Nina’s talk*)

- Or will DSM **block the path to DR** and lead to **lock-in**?
  1. **Managed participation** in balancing market may be more profitable (higher margins) and convenient (non-dynamic fees), high **re-distributional leverage** for policy makers
  2. Little incentive to participate in dynamic wholesale market ➔ **DR remains low**, no response to wholesale prices / renewable generation
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BACKUP
Sequencing to weigh the alternatives

- **Policy sequencing** is an approach in which the barriers to future, more stringent climate policy guide current policy choices to the end of overcoming these barriers over time.

![Diagram](image)

**Fig. 2 | Sequencing to overcome barriers to stringency.** Barriers (circles) and dynamic climate policy stringency (blue arrows) are shown for two subsequent periods ($t_1$, $t_2$). Relaxation of the most constraining barrier (here, $A_1$) in the first period enables increased policy stringency over time, to the level of the new most constraining barrier ($D_2$).

Source: Pahle et al.(2018), available [here](#)