Demand-response participation in US capacity mechanisms

Strommarkttreffen - 19.4.2024
Agenda

1. Introduction to CM in the US
2. Experience with DR in PJM
3. DR in a decentralized system - California
4. Summary and open questions
Intro

Extensive experience with Capacity Markets (CM) in the US

Germany

Green Book / White Book process by German Gov

2014/15

Discussions around power plant strategy (KWS)

2023/24

USA

Late 1990s

Partial liberalization

1999

PJM created capacity market

2011

FERC Order 745 stipulates same rates for DR providers as if they met that demand with generated electricity

2016

Lawsuits from generators (2014) but final confirmation by Supreme Court upholds DR in wholesale

Learnings from 20+ yrs?

Focus: Demand side participation
Intro The need for CMs & the role of the demand side

Several **market imperfections** in Energy-Only-Markets (EOM) contribute to the need to introduce CM:

- Price restrictions/caps
- Imperfect information
- Regulatory uncertainty and restrictions
- Risk aversion
- Uncertainty of input markets and other externalities
- Absence of price-elastic demand

Two options are available to enable the demand side to **express** their **willingness-to-pay for reliability**:

1. Enable demand side to directly express value to Energy-only-market, e.g. via real-time pricing
2. Introduction of market mechanism to value reliability (CM)
US CM Demand side integration in selected CMs

CM Types*

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DR Integration

- Stand-alone DR programs
- Unified markets for generation and DR

**CAISO**
Decentral capacity procurement & CAISO backstopping

**ISO**
Decentralized capacity procurement

**PJM Reliability Pricing Model**

PJM Evolution of DR participation in PJM’s CM

Status quo

- CM still most important market for DR (>90% of revenues)
- Prices down to ~$40/MW-day (from long-term levels of >$100/MW-day)

Onsite generation
HVAC
Refrigeration
Lightning
Manufacturing
Water heating
Other

DR technologies

Data Source: Monitoring Analytics – PJM State of the Market Report 2023

18 April 2024
California DR in decentralized capacity procurement with backstops

**Definition of system requirements by CEC** (CAISO for local & flex requirements)

- Load-serving entities (LSEs) engage in procurement
- Regulators allocate requirements
- CAISO determines deficiency
- CAISO procures backstop capacity

**California Resource Adequacy process**

- Gap identified
- LSEs report to regulators
- LSEs cure deficiency

**Load-Modyifying DR**

- Various utility programs incl. ToU, special EV rates.
- Reduces capacity requirements. Minor significance (only ca. 5% of DR)

**Supply-Side DR procurement by Load-Serving Entities**

- e.g., Capacity Bidding Program: capacity payment for 20kW+ reduction monthly pledge (May-Oct, 2-8h, day-ahead / day-of)
- Demand-Response Auction Mechanism DRAM – Third parties sell DR capacity to LSEs in monthly auction.

**Capacity Procurement Mechanism (CPM)**

- Year-ahead or month-ahead for system, local & flexible cap with separate requirements.
- Competitive solicitation with soft offer cap
- DR absent

**Emergency Events (CAISO triggered)**

- Emergency Load-Response Program ELRP (2$/kWh reduction, max. 5h/event, max. 60h/y)
- Reliability DR Resource RDDR Product (40 min lead, min. 4h/event)

**For all DR: CPUC guidance on reliability value of DR & assessment**

- May enroll in ELRP / bid into CAISO reliability product

- Capacity compensated by LSEs, energy by CAISO if dispatched (either as proxy demand resource or reliability DR resource)
California Drivers for reform and outlook

- **Ambitious DR goal**, but stagnation in DR share in RA obligations
- **Suppliers deplore complexity** of DR programs
- **Fragmentation of programs** makes participation for larger players difficult
- **DR reliability concerns** (summers of 2021/2022, only ca. 2/3 of DR available when called upon) prompt reform discussions regarding baselining, assessment
- Implementation of **FERC Order 2222** – ensures participation of distributed resources in all parts of the market – CA ahead in implementation

**FERC Order No. 2222: A New Day for Distributed Energy Resources**

Seeking a Better Way to Pinpoint the Value of Demand Response in California

State agencies say data from August grid emergencies points to a performance failure. Demand response providers say the state’s market structures undercount their value.
Summary Are US experiences transferable to Germany?

- US experiences are diverse, **differentiated view** is necessary
- **Differing** regulatory **framework**, institutional setup and power market characteristics in the US to be kept in mind
- Nevertheless, different CM setups in the US provide **learning opportunities**, in particular for integration of **demand-side resources**
  - Overall **positive experience with DR participation** in CM
  - **Important questions**: coordination between different market segments for demand side participation, avoiding complexity and fragmentation of programs; **methodological questions** to accurately assess DR contribution & reduce entry barriers
Guidehouse ES&I in Europe & Middle East

**Company**

- Energy, Sustainability & Infrastructure (ES&I)
- Healthcare
- Financial Services

**Industries**

- Utilities and energy companies
- Investors and large corporations

**Committed to Science Based Targets**

- to reduce our greenhouse gas emissions
- Purchased 100% renewable electricity for most of our offices

**People**

- 400+ employees
- 32 languages spoken
- 45% female
- 55% male
- All consultants hold university degrees

**Global commitment to Inclusion, Diversity and Belonging**

**Projects**

- "Electricity Market Design for Climate Neutrality" for Agora Energiewende
- "Scientific support to Platform Climate Neutral Power System" for BMWK
- "Scientific support on methodological improvements of RAAs" for BMWK

**Locations**

- **Europe**
  - United Kingdom
  - Germany
  - Berlin, Cologne
  - The Netherlands
  - Utrecht
  - Lithuania
  - Vilnius
  - France
  - Paris

- **Middle East**
  - United Arab Emirates
  - Abu Dhabi, Dubai

**Clients**

- Selection

- Federal Ministry for Economic Affairs and Climate Action
- European Commission
- Guidehouse presence
- Project experience

**Goverments and NGOs**

- United Kingdom
- Germany
- Berlin, Cologne
- United Arab Emirates
- Abu Dhabi, Dubai

**Utilities and energy companies**

- Google
- DP World
- AVEVA
- Carrefour

**Investors and large corporations**

- Deutsche Telekom
- ENEL
- E.ON
- ENGIE
- TenneT
- TAQA

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Thank You
Backup US Power System 101

• Weakly interconnected system, partly liberalized, nodal systems

• Independent System Operators (ISOs)/Regional Transmission Organisations (RTOs):
  • Operate transmission system (not own) similar to European TSOs
  • Operate wholesale markets similar to European NEMOs

• 6 ISOs/RTOs serve two thirds of US electricity loads
  • PJM, 165 GW (summer of 2006)
  • MISO, 127 GW (summer of 2011)
  • ERCOT, 80 GW (summer of 2022)
  • SPP, 53 GW (summer of 2022)
  • CAISO, 52 GW (summer of 2022)
  • NYISO, 34 GW (summer of 2013)
  • ISO-NE, 28 GW (summer of 2006)

• Remainder (NW, SW, SE): (mostly) served by vertically integrated utilities, long-term wholesale trading via bilateral contracts

• National regulator: Federal Energy Regulatory Commission (FERC) (ERCOT independent from FERC)