

Institute for Advanced Sustainability Studies IASS in Potsdam

Demand Response in US Capacity and Ancillary Service Markets

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Reference literature



Demand Response: Was können wir von Kalifornien lernen?,
Energiewirtschaftliche Tagesfragen, 04-2014

Demand Response – sind die USA ein Vorbild für Deutschland?, IASS Working
Paper, 06-2014

1. Structure of US electricity markets

2. Myths about demand response

- Demand response is all about managing flexible loads
- Demand response plays an important part in all market segments
- Demand response covers up to ten per cent of system peak load
- Demand response covers up to 50 per cent of ancillary services
- Demand response is the most cost effective flexibility option
- Demand response gets capacity payments
- Demand response is successful in the US because it is cost effective

3. Conclusions

1. Structure of US electricity markets

Structure of US electricity markets



Energy market	Ancillary services market	Capacity market
Day-ahead	Regulation reserve	Generation
Intraday	Spinning reserve	Demand response
Real-time	Non-spinning reserve	

(New England, New York, PJM)

Markets tasks



US	Energy market		Ancillary services market		
	Intraday	Real-Time	Regulation	Spinning	Non-Spinning
Random fluctuation (<15min)		x	x		
Forecast errors (>15min)	x	x			
Contingencies	x	x	x	x	x

DE	Energy market		Ancillary services market		
	Intraday		Primary	Secondary	Tertiary
Random fluctuation (<15min)			x	x	
Forecast errors (>15min)	x				x
Contingencies	x		x	x	x

2. Myths about demand response

Myths about demand response



Myth: Demand response is a about managing flexible loads

- Demand response is about managing flexible loads and on-site generation and occasionally also includes energy efficiency
- In practice only interruptible loads (as opposed to additional loads) play an important role

Myth: Demand response is an important resource in all market segments

- In PJM and New England, for example, over 90 per cent of the revenue streams for demand response are generated in the capacity market
- EnerNOC, the largest demand response provider in the U.S, noted that economic demand response makes up only 2 percent of its revenue.

Myths about demand response

Myth: Demand response covers up to ten per cent of system peak load

	PJM	New York	New England
Demand response	7.449	1.741	745
- Loads	5.713	*	446
- On-site generation	1.736	*	299
Unforced capacity requirement	157.489	35.076	31.965
- Share of loads	3,6%	*	1,4%

* no data available

numbers in MW

Myths about demand response



Myth: Demand response covers up to 50 per cent of ancillary services

	PJM	Texas	Kalifornien	New England	New York
Regulation Reserve	x	x			x
Spinning Reserve	x	x			x
Non-Spinning Reserve		x	x		x

Texas – Spinning Reserve	
Average participation of demand resources[MW]	900-1.300 (32–46%)

	2010	2011	2012	2013
Call-ups	5	7	3	3
Call-up duration (hours)	3	15	1	1

Myths about demand response

Myth: Demand response is the most cost effective flexibility option

	PJM	New York	New England
Capacity payments	Auction		
[USD/MW-year]	18.730 - 98.640		
Energy payments	Locational marginal price / energy offer		
[USD/MWh]	1.500	500	500

Myths about demand response

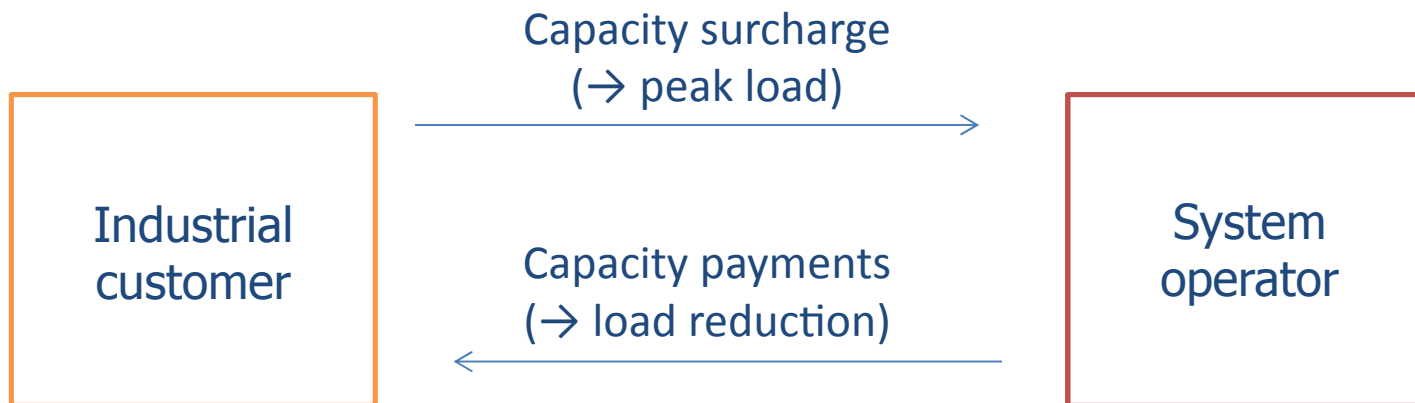
Myth: Demand response is actively participation in the market

Capacity year	Max. call-up duration per year [hours]			Max. call-up frequency per year		
	PJM	New York	New England	PJM	New York	New England
2009/2010	1	4	2.5	1	1	1
2010/2011	20	16	0	→ 4	2	0
2011/2012	10	15	7	2	3	2
2012/2013	4	→ 28	3	2	4	1

Myths about demand response

Myth: Demand response gets capacity payments

- The capacity payments corresponds to a refund of the capacity levy already paid.



Myths about demand response



Myth: Demand response is successful because it is cost effective

- Demand response programs serve as an indirect subsidy for domestic industry, which was to be kept from leaving the state.
- The system benefits sometimes played a minor role, and the design of the demand response programs meant that loads were practically never curtailed.

3. Conclusions

Demand response in capacity markets

- DR programs are not an enabler for “flexibility”
- DR programs may have a (small) economic benefit
- DR programs may be of great significance from an industrial viewpoint

Demand response in ancillary services markets

- Purpose of spinning reserve is not comparable to Germany’s ancillary services

Contact



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- Load shifting is hardly possible due to high usage rate of industrial processes

	von Scheven und Prella (VDE report)	Paulus und Boggrefe (DENA report)	Klobasa
Aluminum	Sheddable (load shifting partly possible)	Sheddable	Shiftable
Chlorine	Sheddable	Sheddable (load shifting partly possible)	Shiftable
Paper	Sheddable	Shiftable	Shiftable
Steel	Sheddable	Sheddable	Shiftable
Cement	Shiftable	Sheddable (load shifting partly possible)	Shiftable

- Sheddable loads face high variable costs (opportunity costs / costs of lost load)

	Gruber et al.	Paulus et al.		Praktiknjo
Chlorine	96	> 100	Chemicals	870 – 1190
Aluminum	164	500 – 1,500	Pig iron, Steel, non-ferrous metals, ...	620 – 1080
Cement	317	400 – 1,000	Crude and manufactured minerals	1750 – 3560
Paper	433		Wood pulp, paper, board, ...	470 – 820
Steel	392	> 2.000	Pig iron, Steel, non-ferrous metals, ...	620 – 1080

Numbers in Euro/MWh