

Now or later: Load shifting and Demand Side Response

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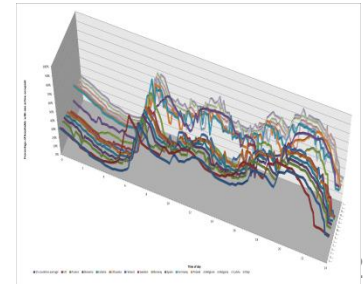
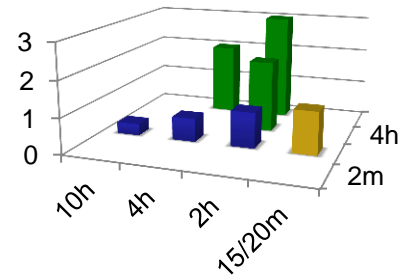
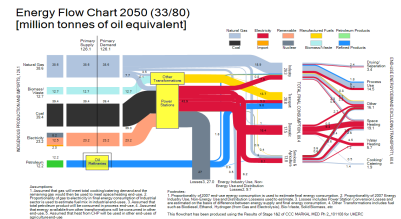
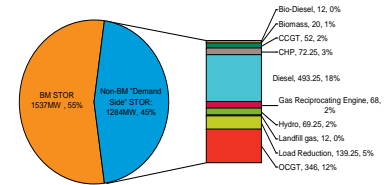
With thanks to Philipp Grünewald

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Outline

- Demand Side Response (DSR) slow to emerge (now)
- Reasons - the case for DSR
- Potential contribution of DSR to capacity mechanisms
- The quest for flexibility of residential customers (later)



Load reduction programmes

Response
time

months

- Interruptible Programmes for large industries

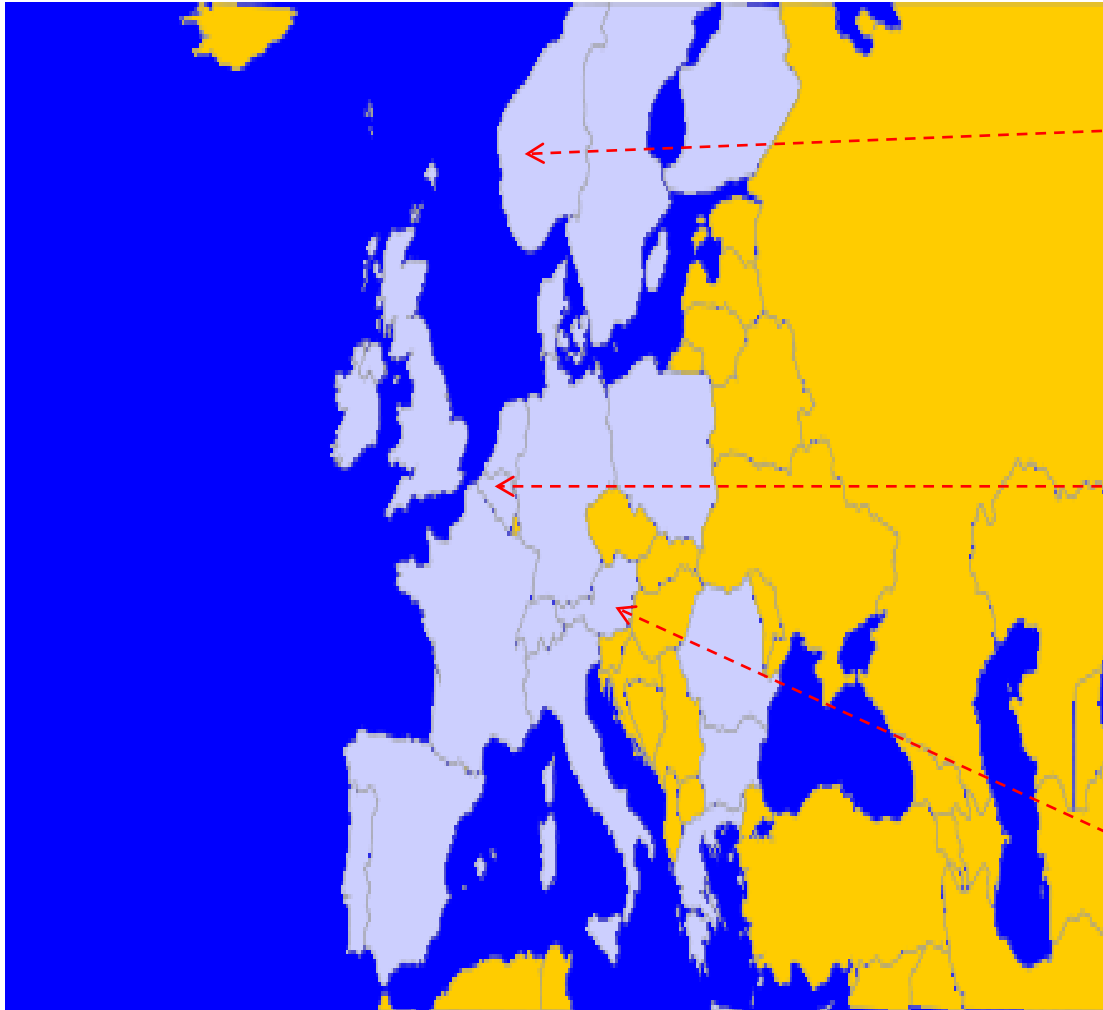


Hours /
minutes

- DSR programmes: load reduction/shifting from commercial (and residential) customers



DSR programmes in Europe: Examples

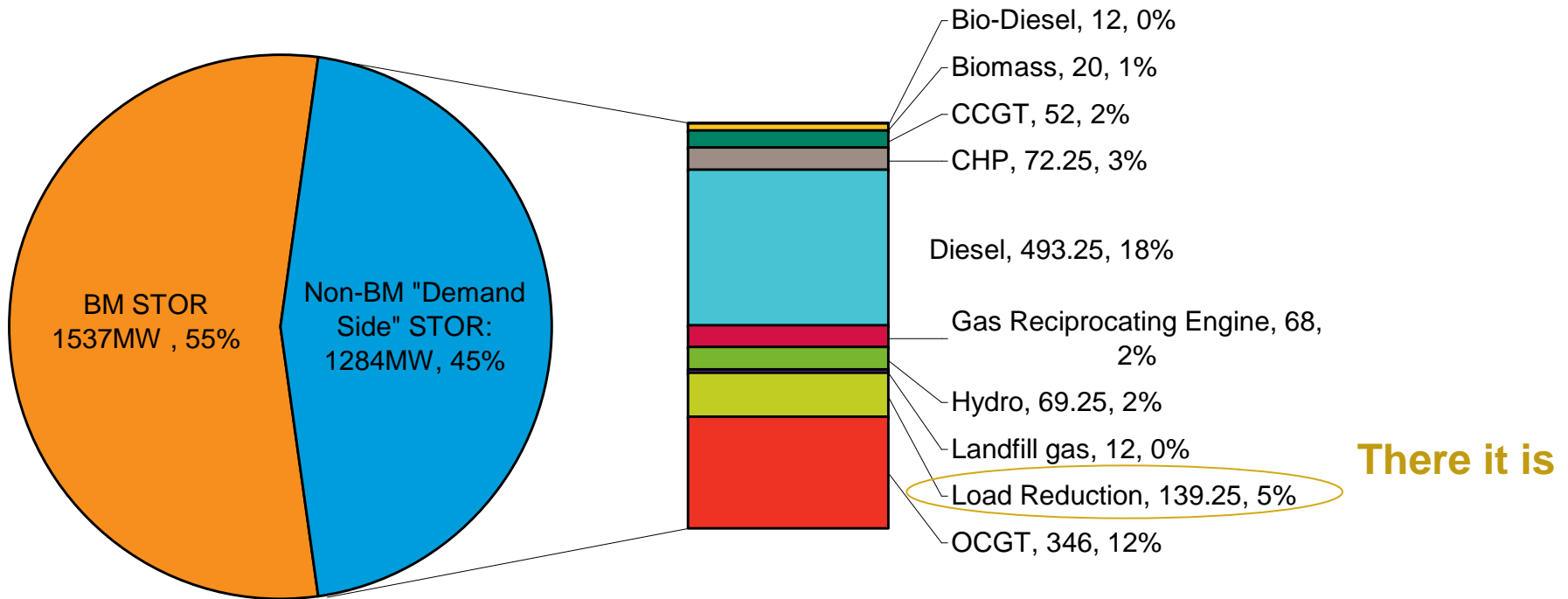


DSR: Remote load control on hot water space heating

DSR: Cold storage facilities

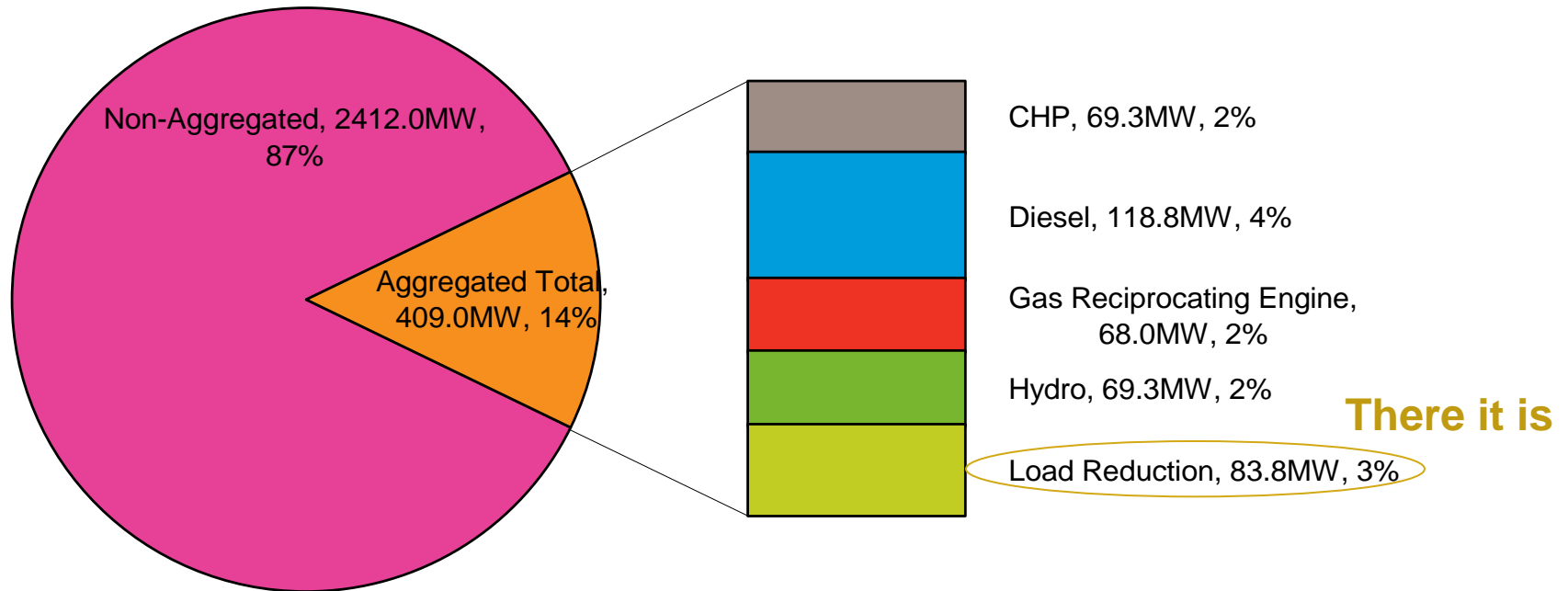
DSR: Virtual power plant

DSR slow to emerge (1)



The majority of “Demand Side” reserve is still “Generation”

DSR slow to emerge (2)

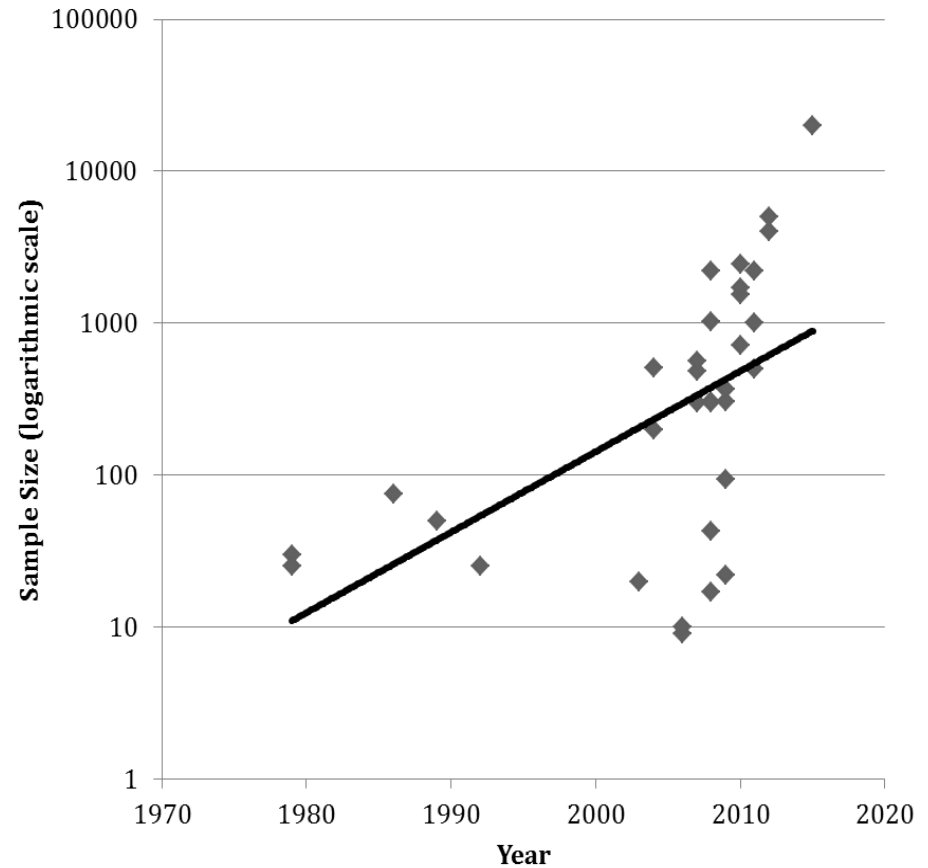
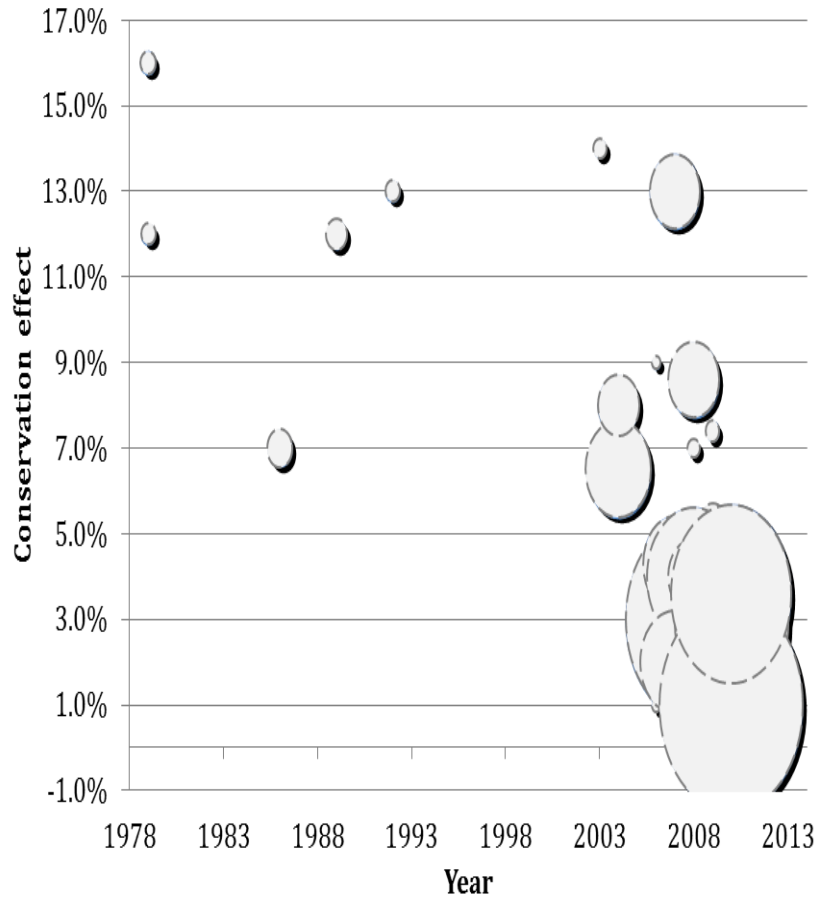


The majority of “Demand Side” reserve is still “Generation”

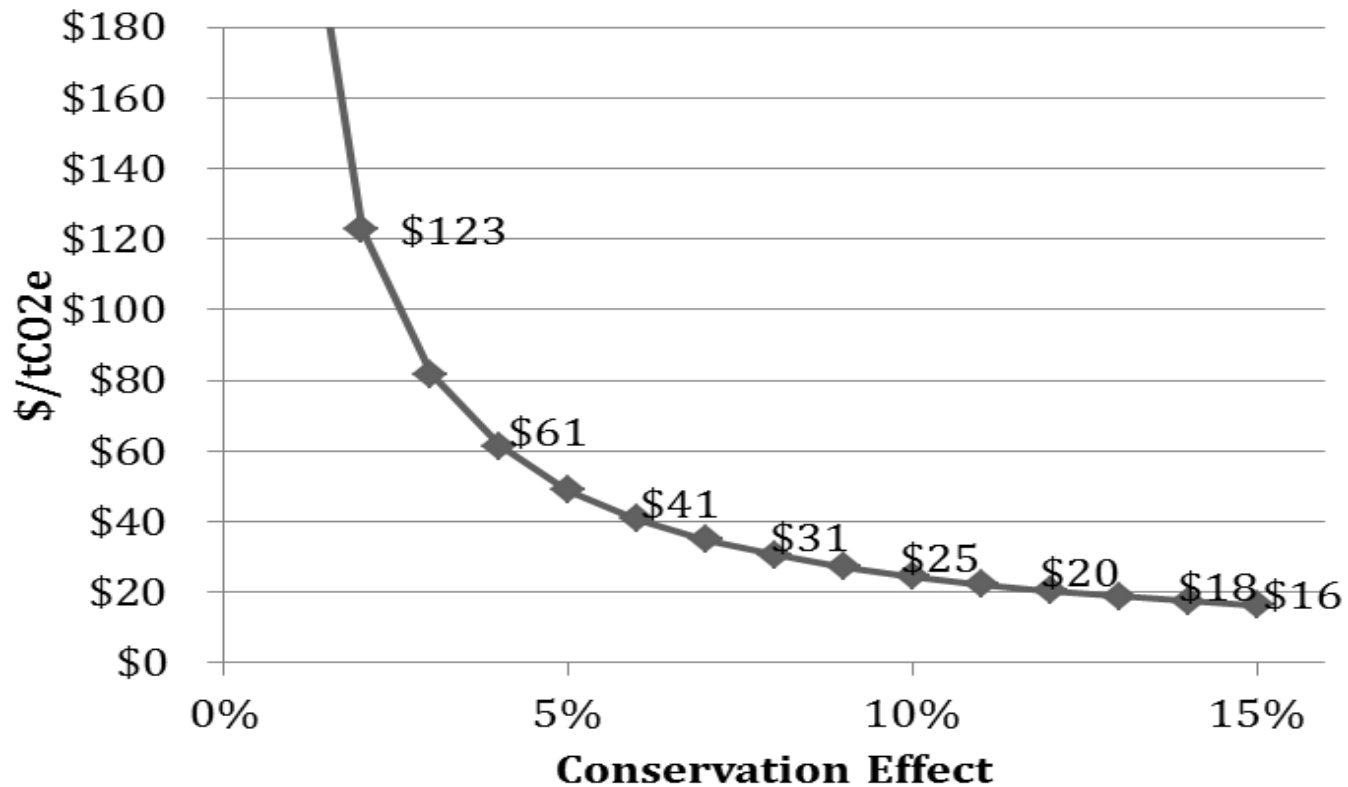
DSR slow to emerge: why?

- limited evidence on DSR net conservation effects
- high cost estimates for DSR technologies and infrastructures
- no significant afternoon peak load (e.g. from air conditioning)
- Regulation holding back DSR?

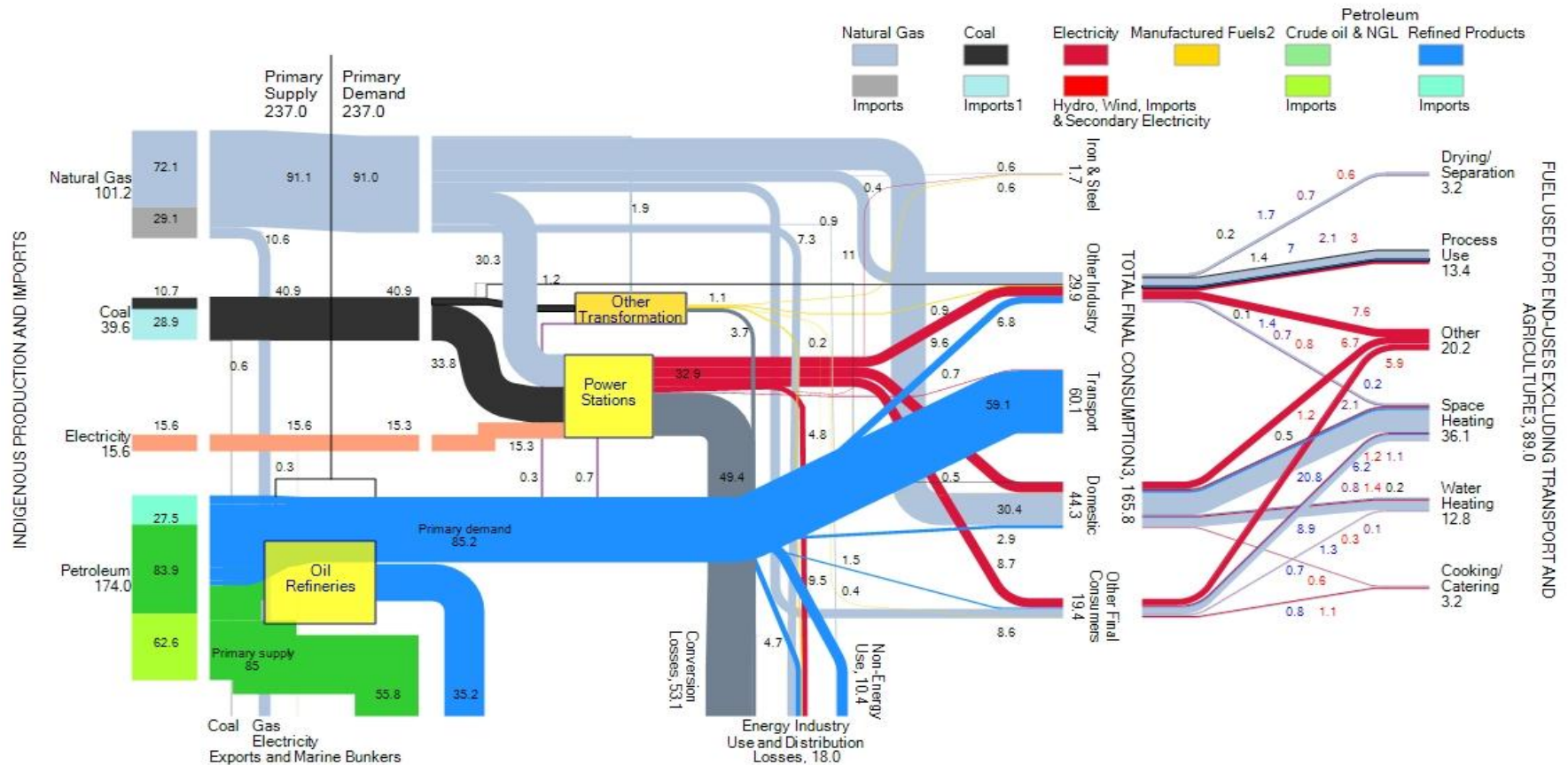
Conservation effects: meta-studies residential sector



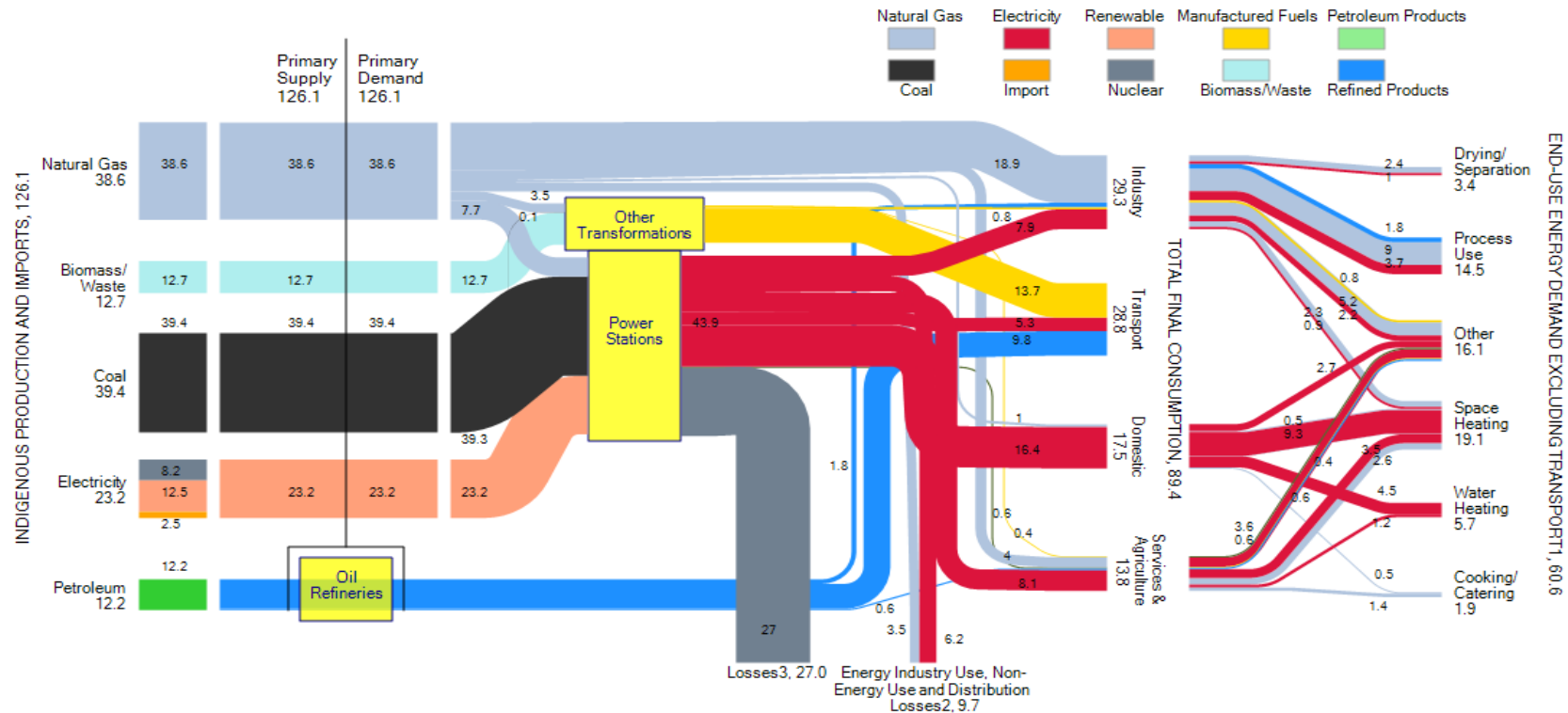
It only makes economic sense if...



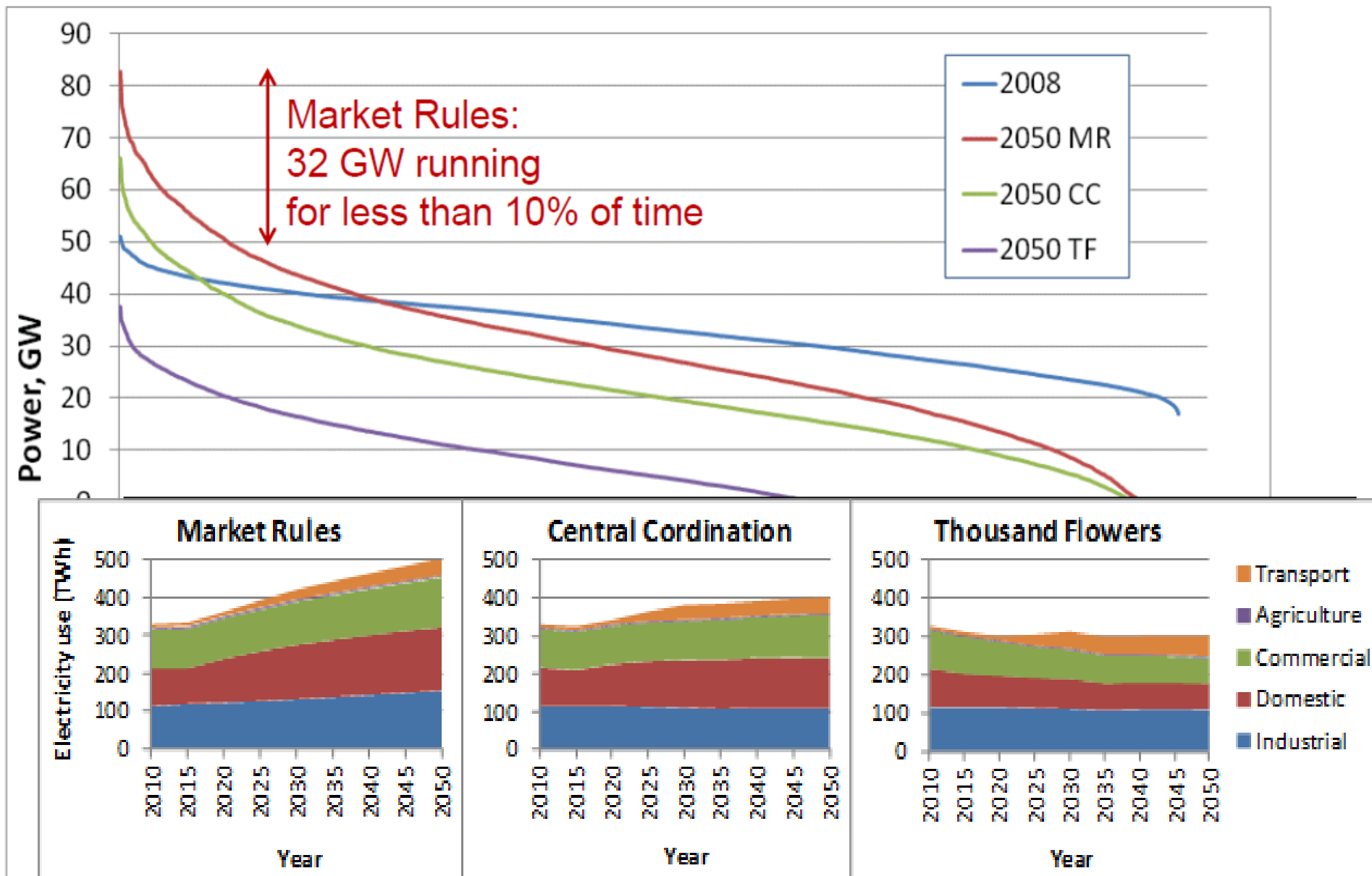
Energy flow diagram of the UK (adapted from DECC, 2009)



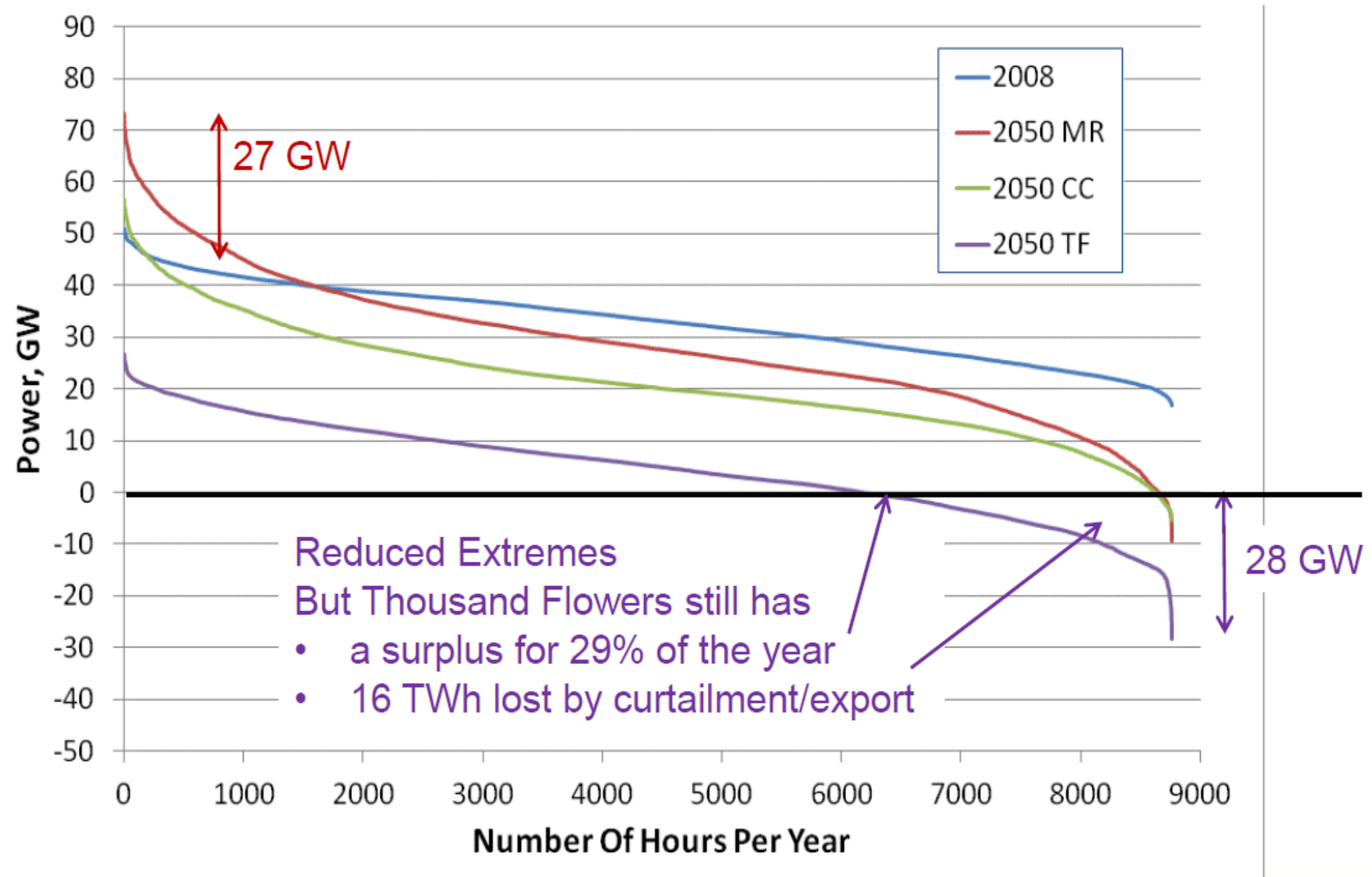
Energy flow diagram of Committee on Climate Change 33/80 scenario for UK in 2050



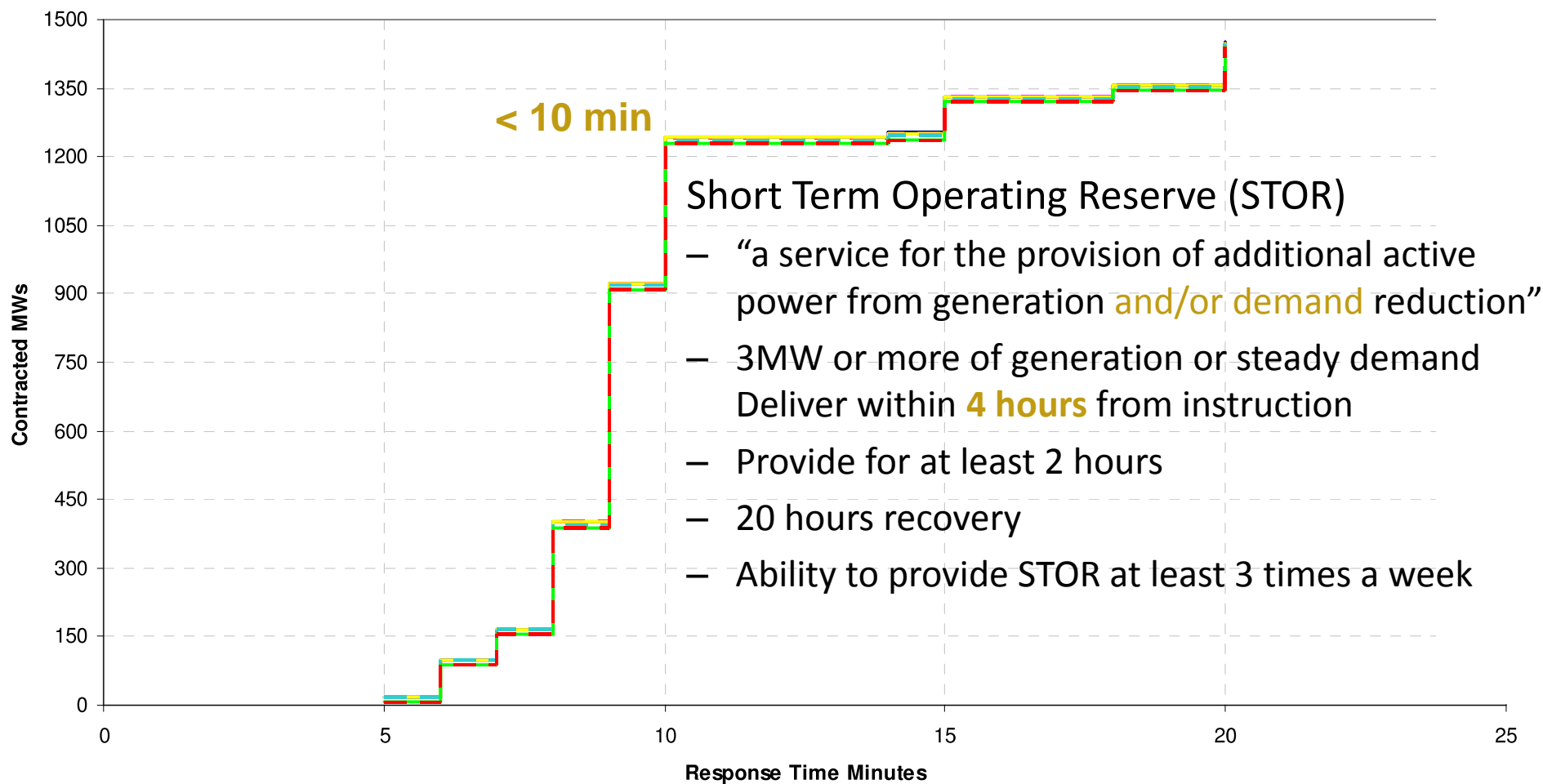
Net demand duration curve before DSR



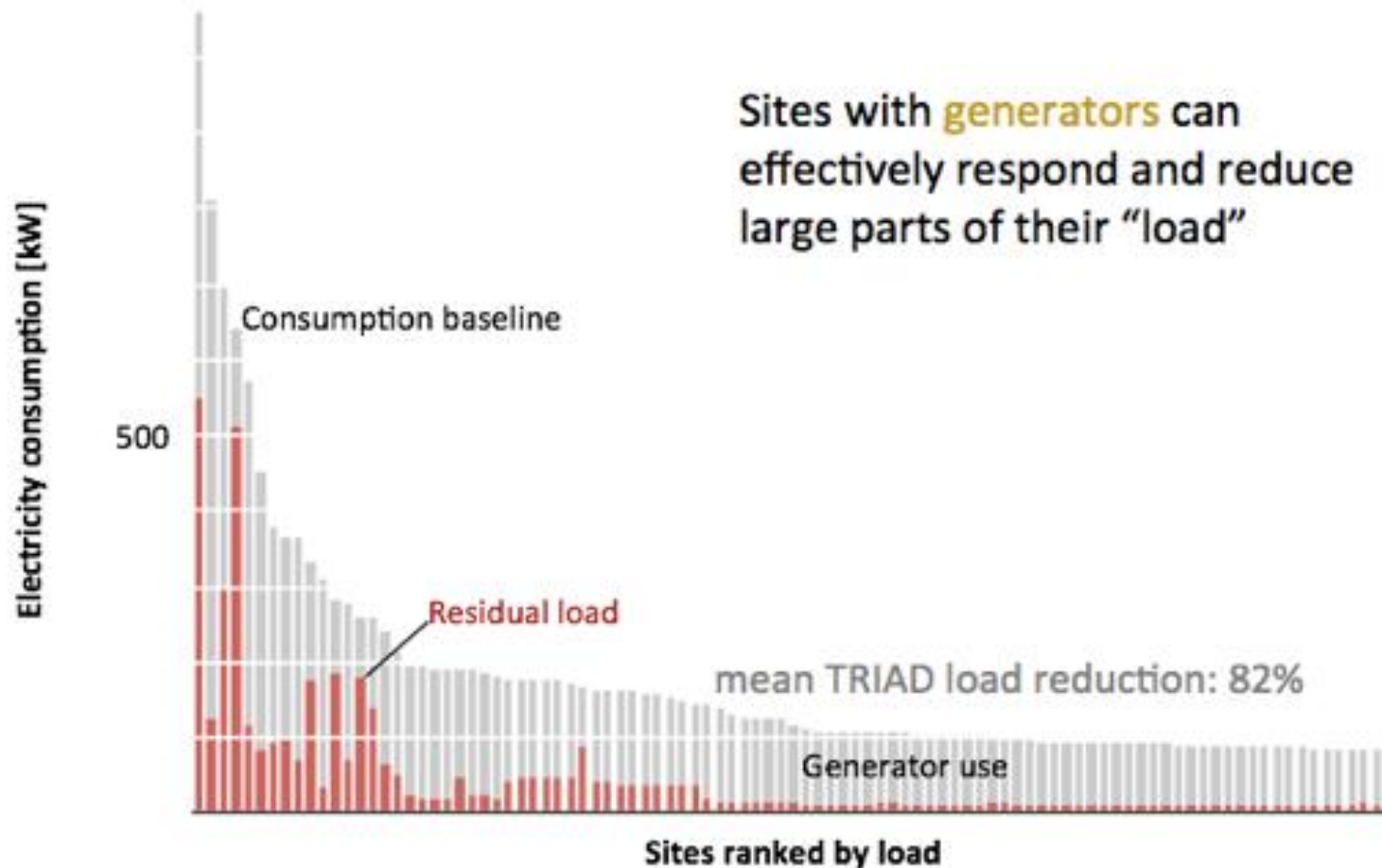
Net demand duration curve after DSR



Does regulation hold DSR back?

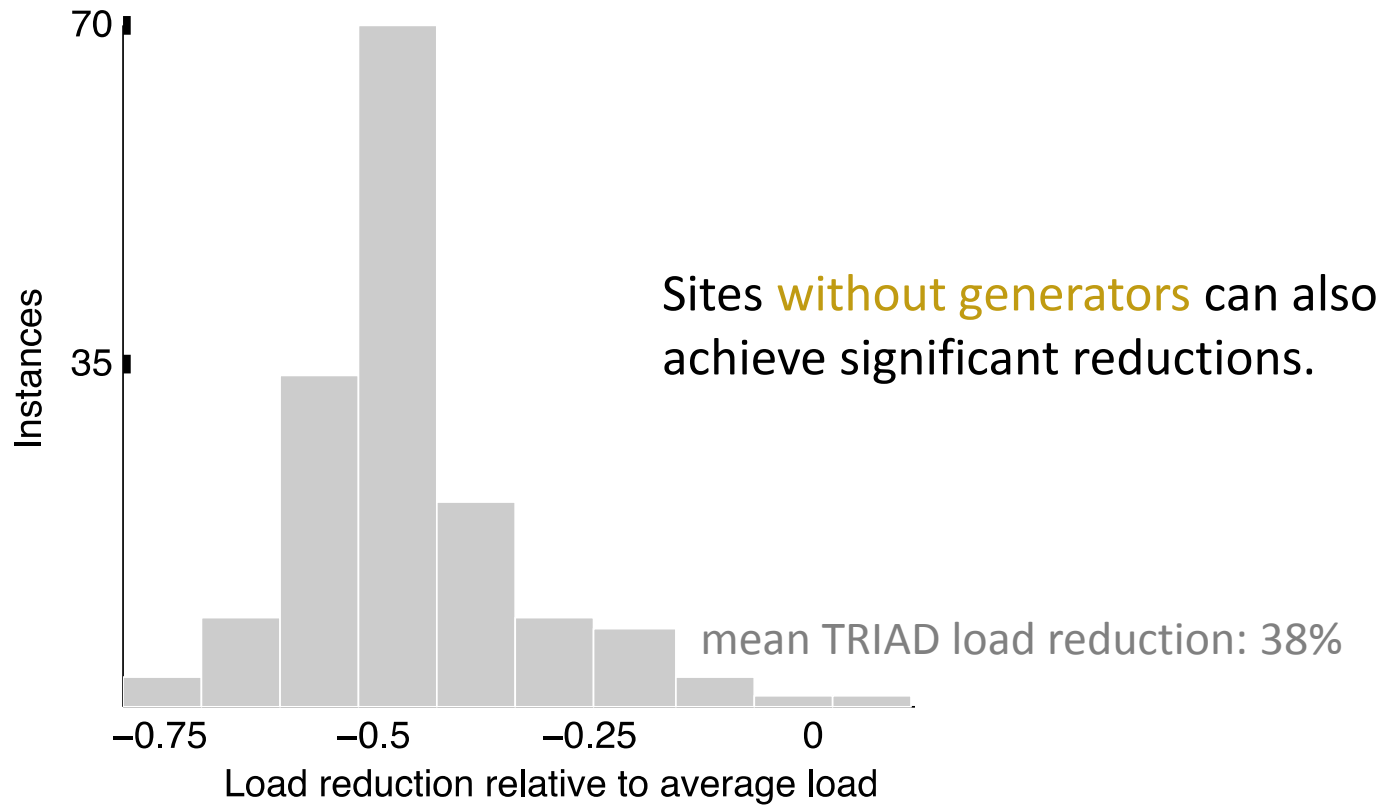


Does regulation hold DSR back?



Virtual load reduction in the telecoms sector where generators are present

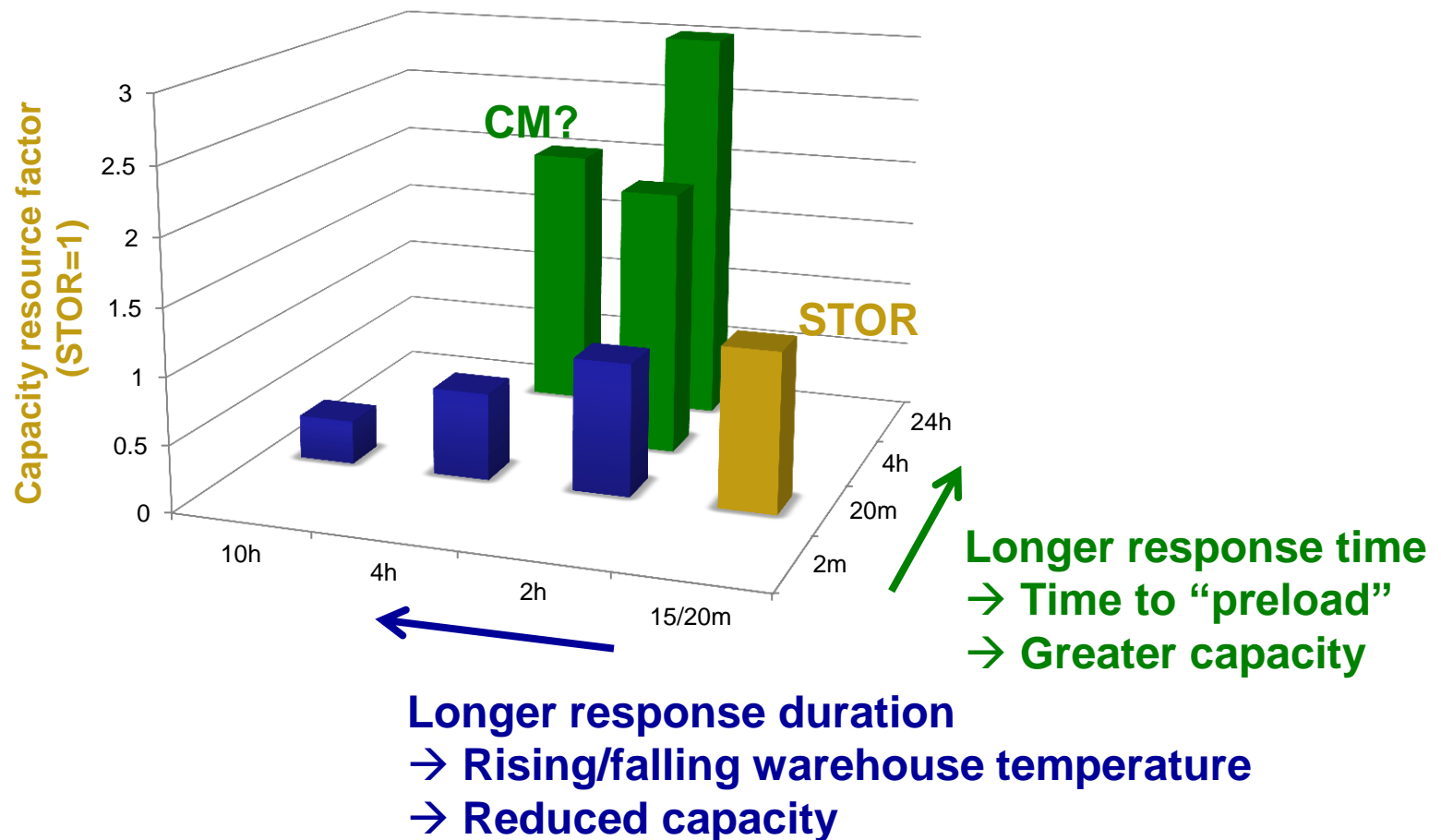
Does regulation hold back *demand* response?



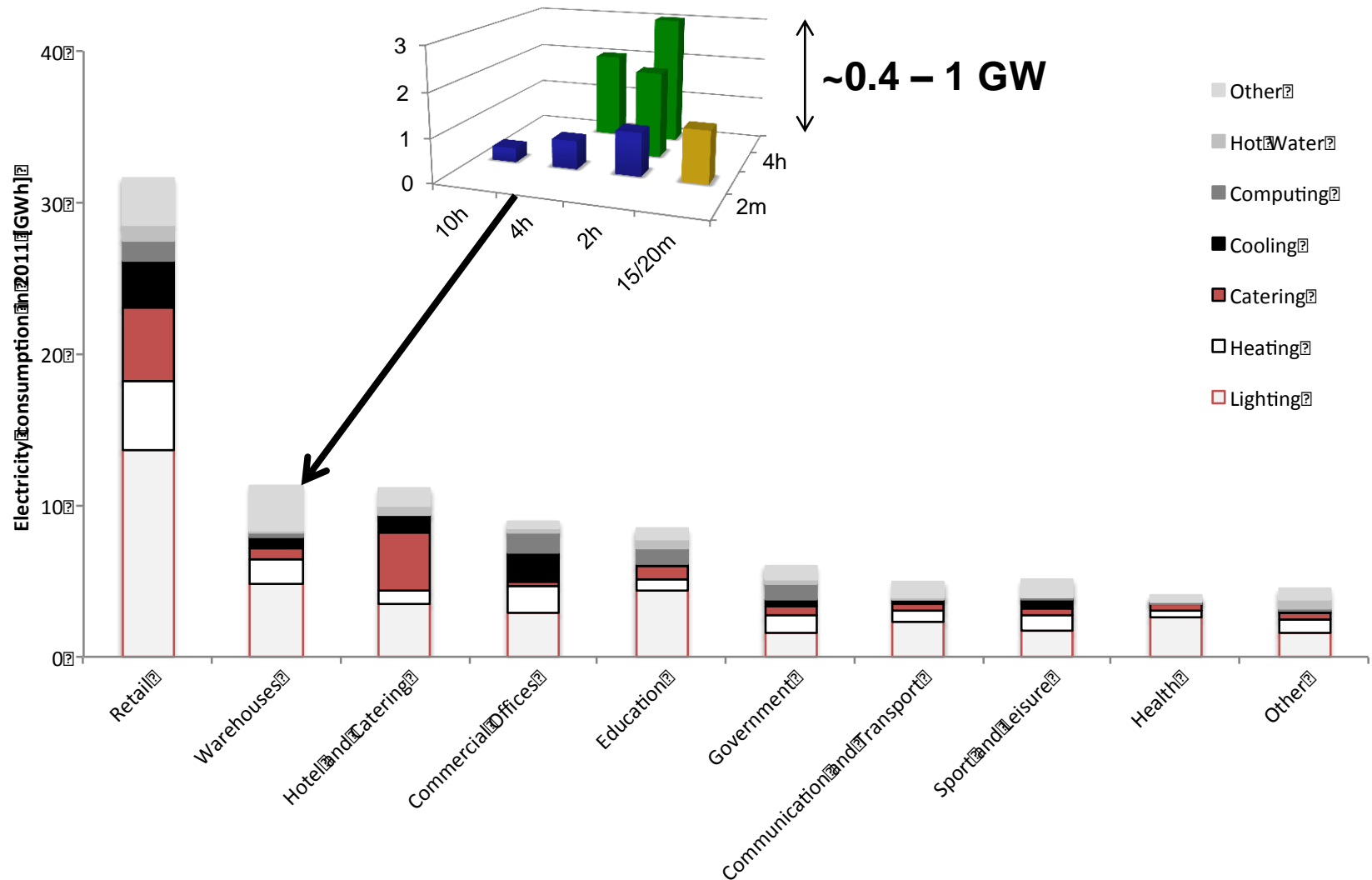
“Real” load reduction in the hotel sector based on TRIAD response of 98 hotels

What if conditions were relaxed?

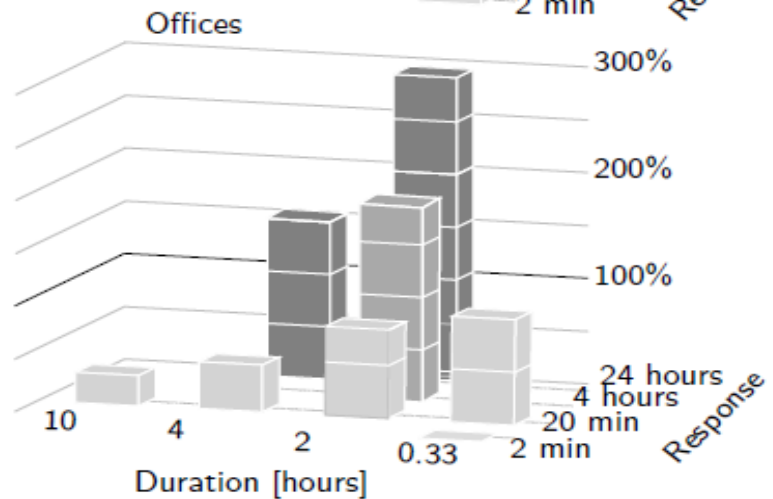
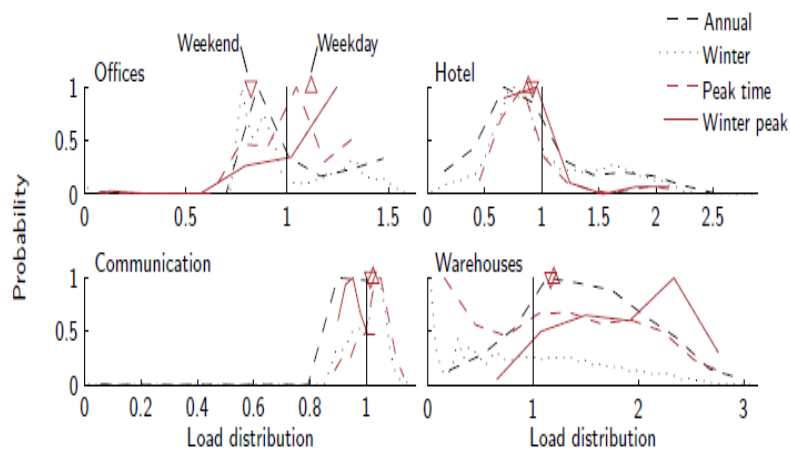
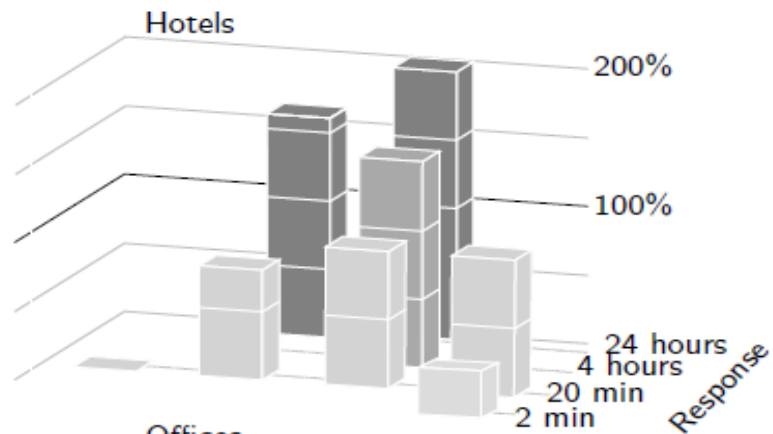
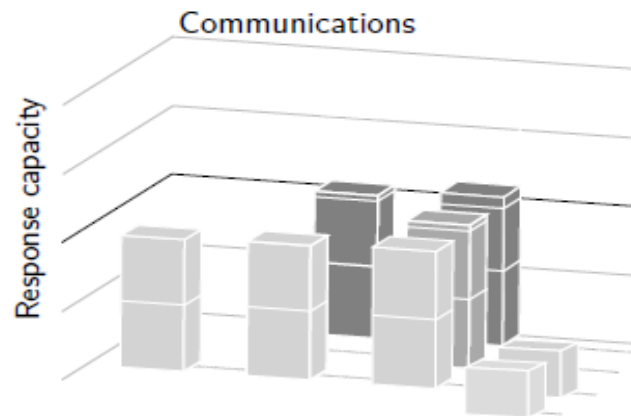
Response capacity availability from UK warehouses
(illustrative example)



What if conditions were relaxed?

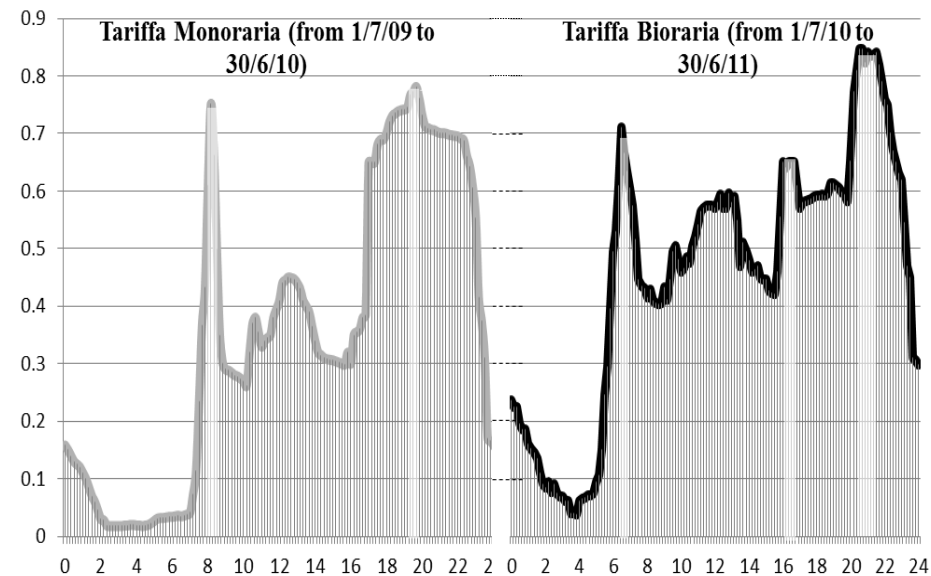
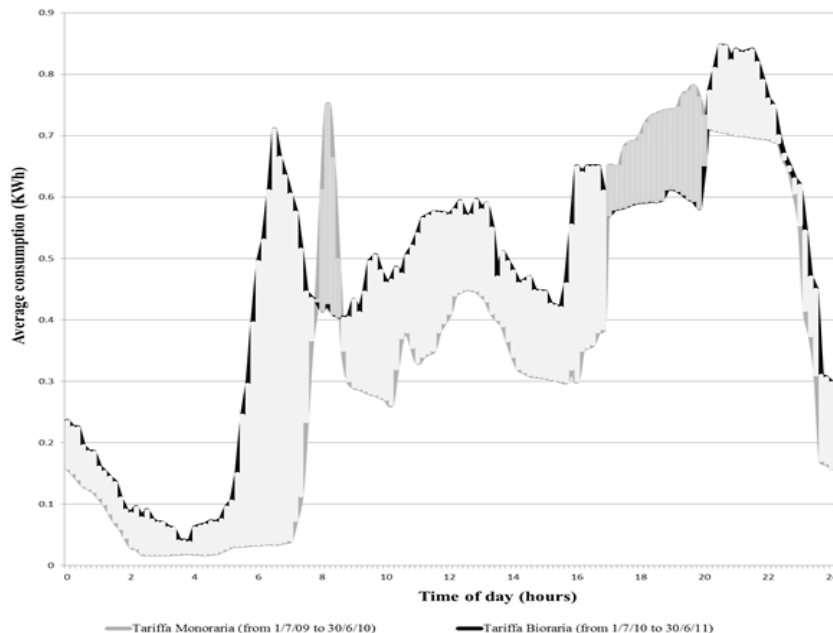
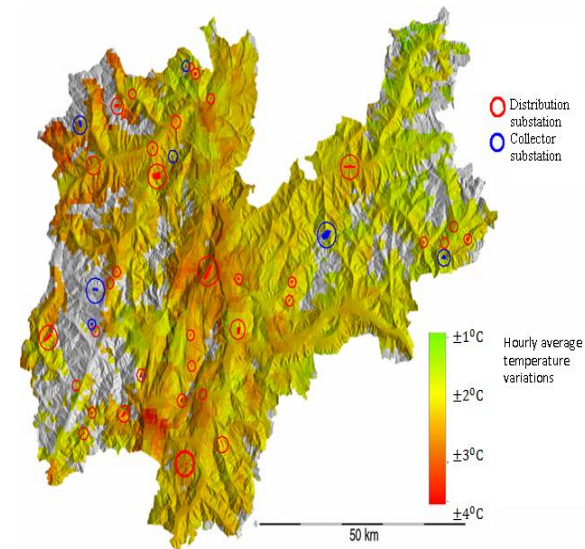


Examples of expected response capacity for given response time and durations relative to present provision under STOR



The quest for flexibility: price

- 1,446 smart meters
- After TOU tariffs were introduced negative conservation effect (consumption increased by 13.7%)
- Consumers' electricity bills decreased by 2.2%
- Peak load shifting took place for morning peaks and created a split in two peaks for evening periods



The quest for flexibility: practices

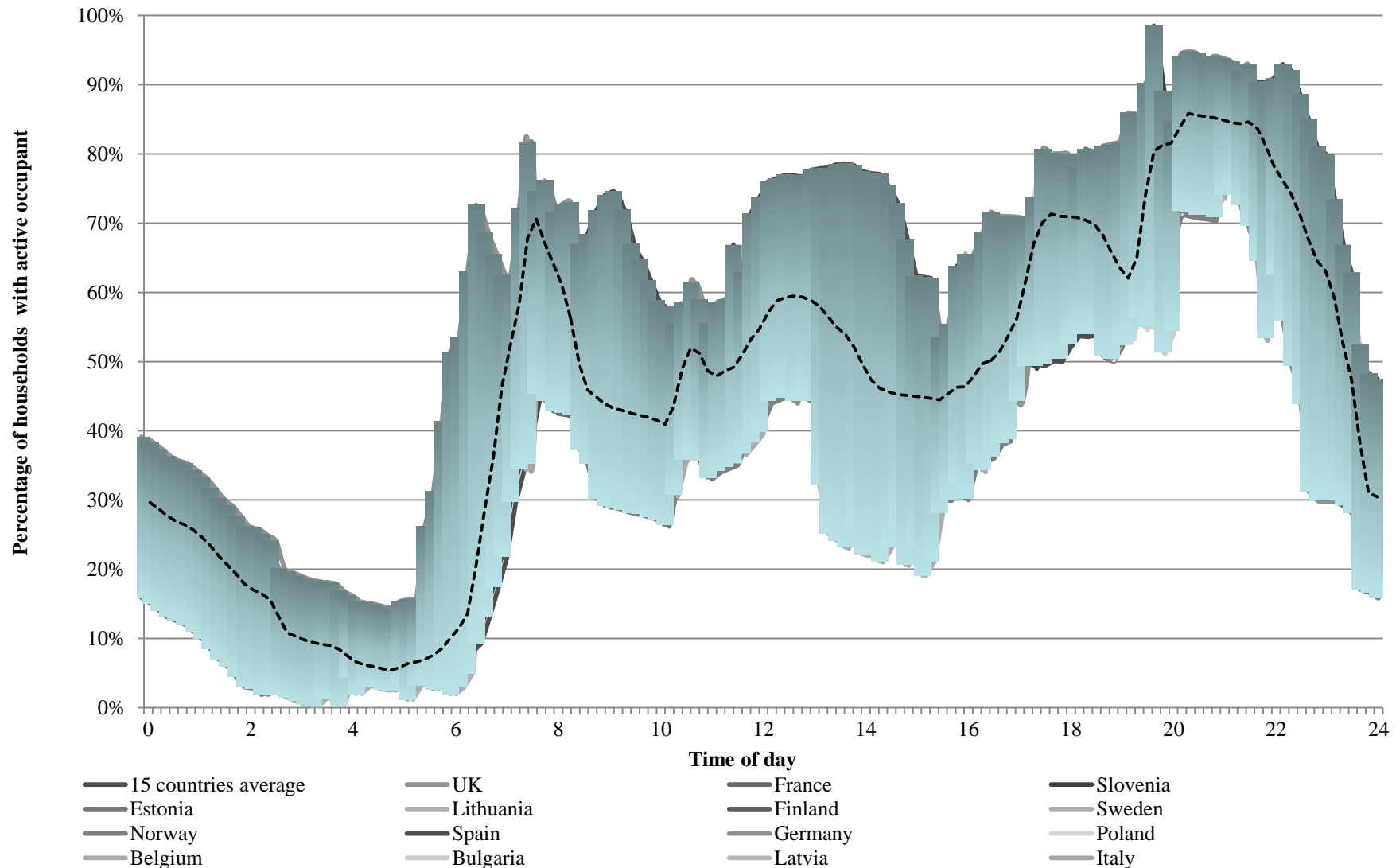
- The timing of energy demand depends on activities / practices
- DSR initiatives are aimed at making demand flexible
- Simultaneity of practices / hot spots during the day are vital for peak demand issues

Time use data

- The Harmonised European Time Use Survey (HETUS) database consists of 220,464 residential users across 15 countries
- Focus on single households

Diary/ person id	Starting Time	Ending time	Main activity	Parallel activity	Who with:				Where/mode of transport
					Alone	Spouse	Small child	Other pers.	
a	04:00	07:20	Sleep						At home
a	07:20	07:50	Shower						At home
a	7:50	08:30	Had breakfast	Read newspaper			Ch		At home
a	08:30	08:40	Walked to bus		A				By foot
a	08:40	09:00	Bus to job					OP	By bus

Relative occupancy curves of single households in 15 European countries



Percentage of households with one active occupant

100%

90%

80%

70%

60%

50%

40%

30%

20%

10%

0%

0

2

4

6

8

10

12

14

16

18

20

22

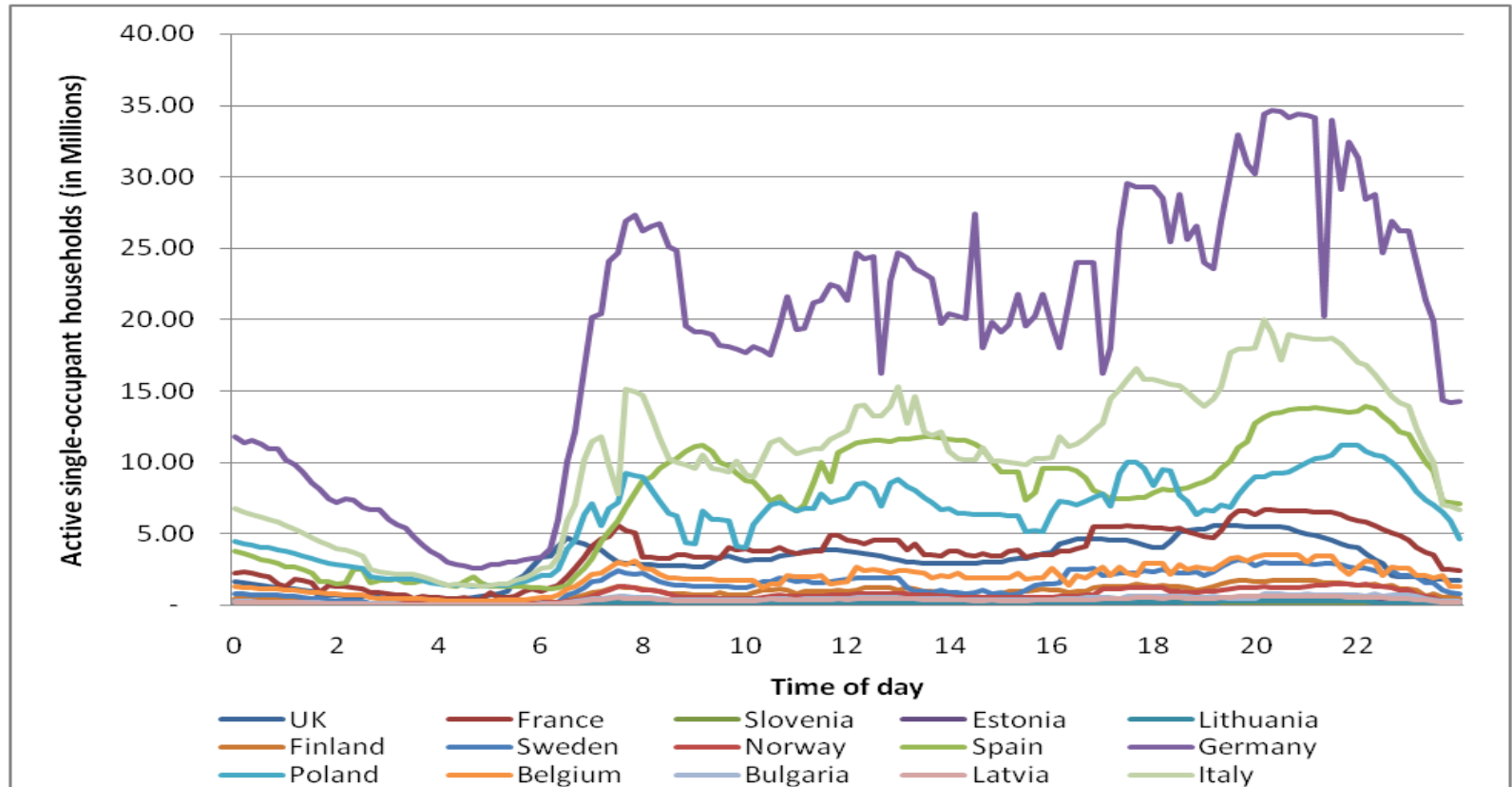
24

Time of day

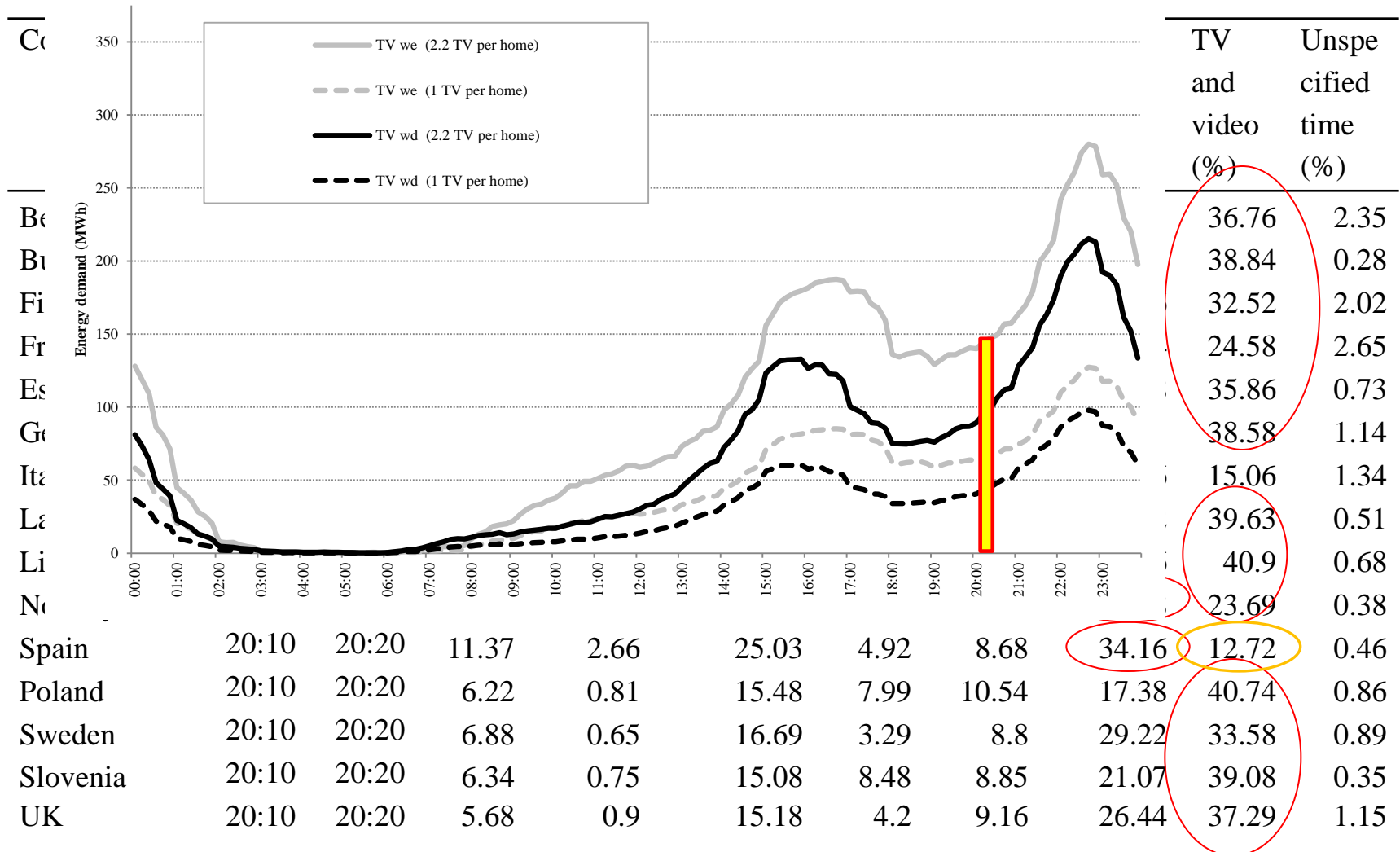
15 countries average UK France Slovenia Estonia Lithuania Finland Sweden Norway Spain Germany Poland Belgium Bulgaria Latvia Italy

I...
L...
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I...

Absolute occupancy curves of single households in 15 European countries



Activities at home of single households between 20h20 and 20h30



Final remarks

- Current “demand side” arrangements favour generation rather than DSR
- The factors which slowed down DSR in the past are likely to change in the future
- Potential in the residential sector: flexibility where?

References

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Thanks

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