



Understanding consumers and everyday practices in a reconfigured energy system

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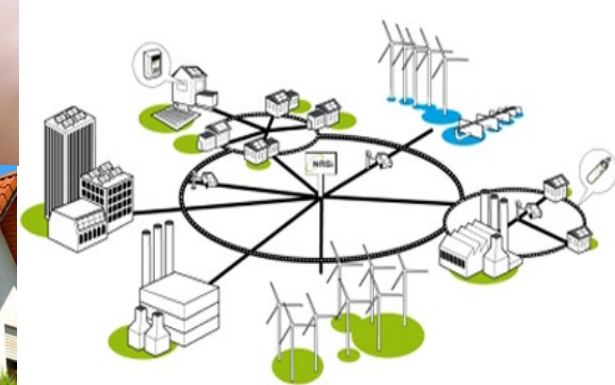
The Energy Industry in Transition: Markets,
Innovation and Strategies. CBS 6/11 2023



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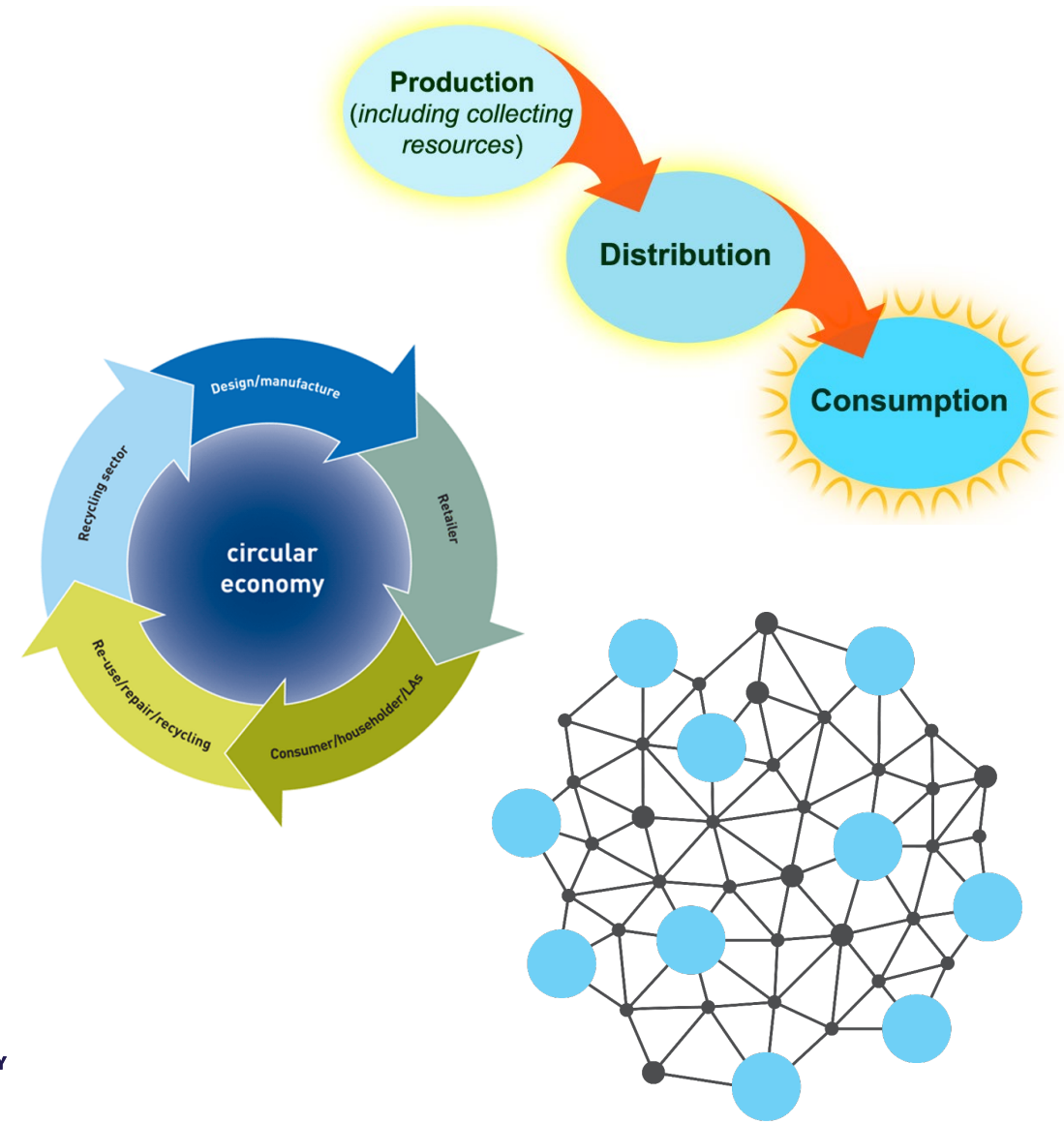
What I will talk about...

- ▶ Describe the transition to a new energy system and the new roles of consumer
- ▶ How to understand new and old consumer roles – introducing to theories of practice
- ▶ Recent research in new consumer roles
- ▶ What new research questions do this raise?



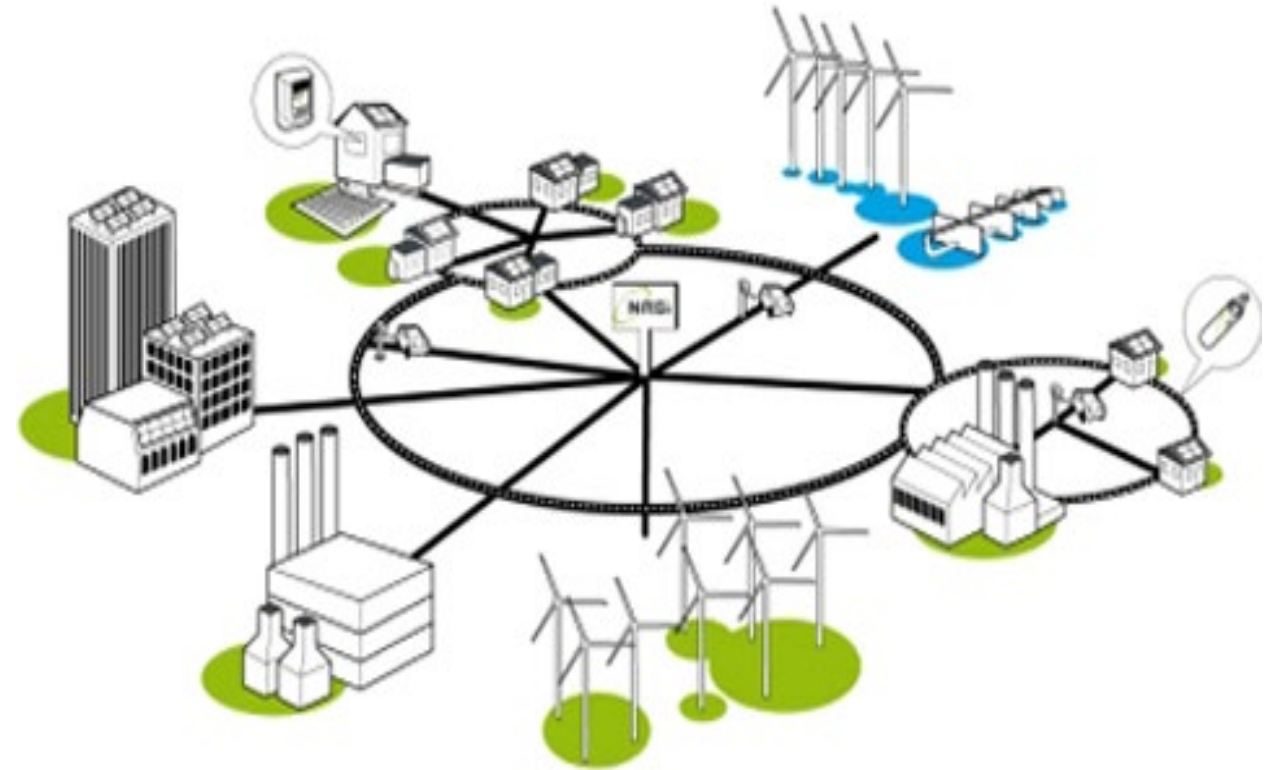
New relations between consumption and production?

- **Going from a linear: production – distribution – consumption system**
- **Going to something which is circular in the sense that energy sources are renewable**
- **Going to something which is network based in the sense that production and consumption happens everywhere**



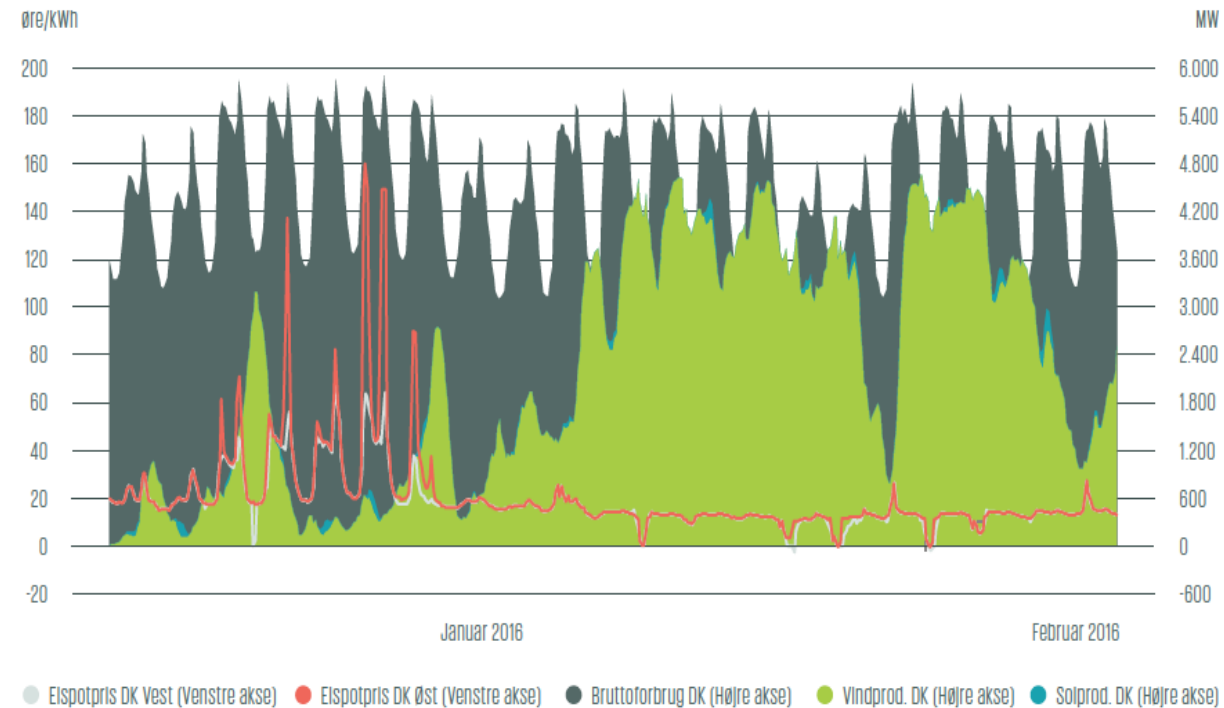
The future energy system

- ▶ 100% renewables in the grid
- ▶ Microgeneration
- ▶ Utilisation of excess and waste heat
- ▶ A need to balance production/consumption
- ▶ Buildings and cars for storage and flexibility
- ▶ Digitalisation, automation and market liberalisation



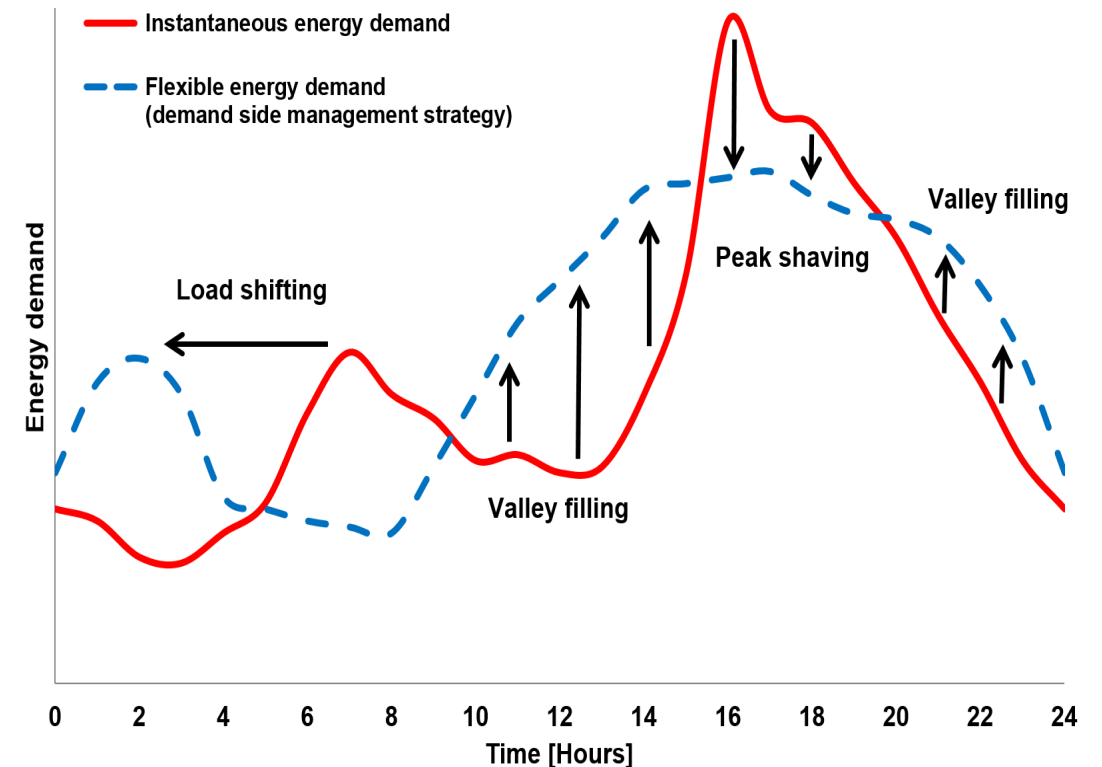
Fluctuating production and rhythmic consumption

- ▶ Production follows wind and sun, resulting in peaks and valleys
- ▶ Demand follows societal rhythms resulting in other peaks and valleys
- ▶ Delivering in peaks are environmental and economically costly
- ▶ Sometimes we produce energy that cannot be used



New roles for consumers in a reconfigured energy system

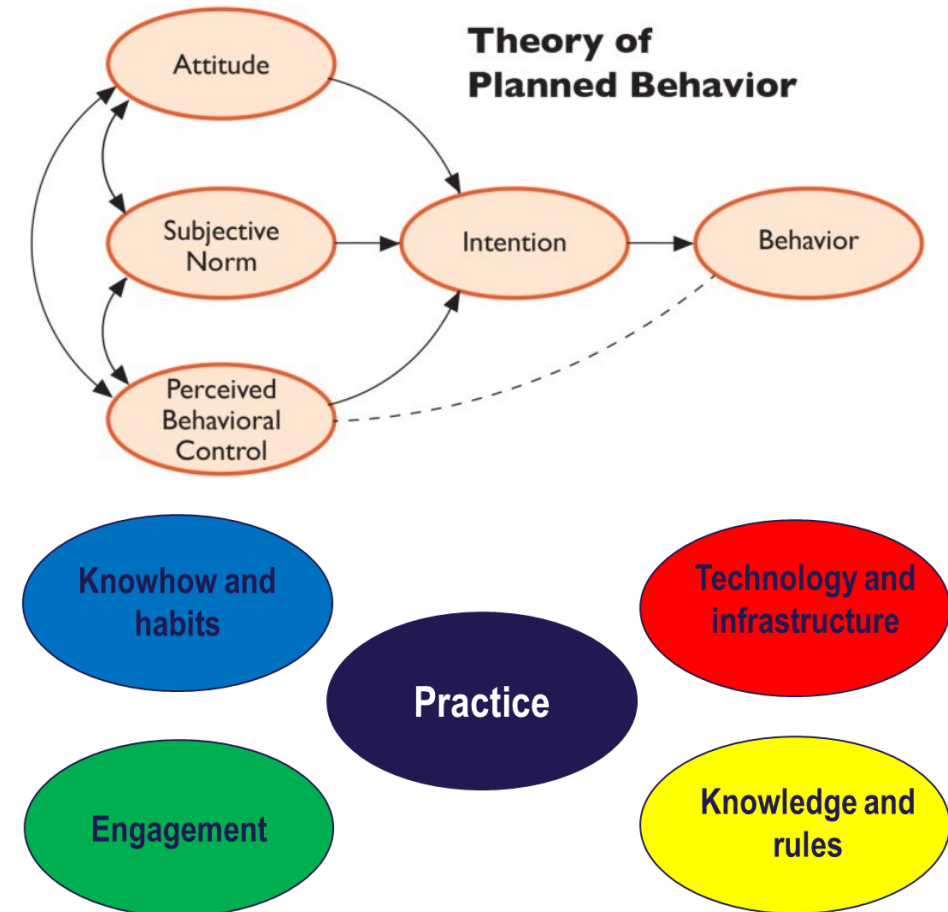
- ▶ We still need to reduce consumption – “**redusumers**”
- ▶ Deliver flexibility to heating and electricity network by postponing and reducing peak consumption – “**flexumers**”
- ▶ Produce energy for the grid or for self consumption – “**prosumers**”



**Consumers are important
- how to conceptualise
them?**

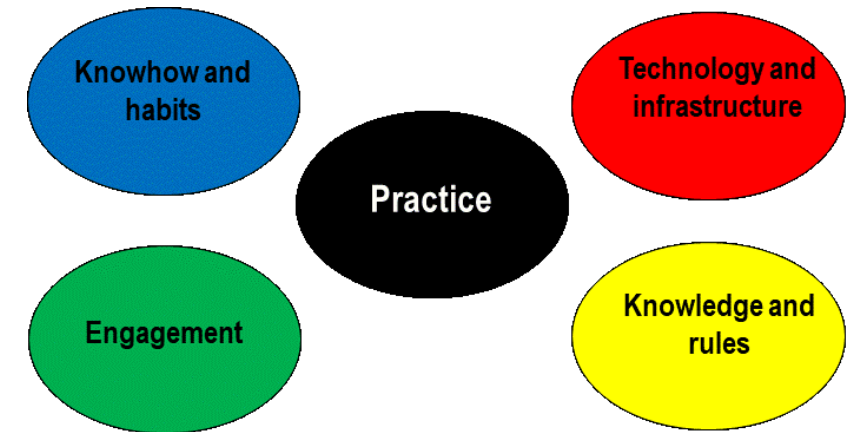
Behavioural *versus* Practice Theoretical approaches

- Individual *versus* collective
- Rational *versus* habitual
- Focus on the individual *versus* on the practices
- Technology and infrastructure not included *versus* included



Fundamentals of theories of practices

- ▶ Saying and doings hold together by various elements
- ▶ Recursive relation between practice as entities and as performance – individuals as carriers
- ▶ Relates to each other as compounds, boundless or complexes – the individual as the intersection
- ▶ The social world as the plenum of practices
- ▶ Consumption are moments in practices



Time and practice

- Practices consume time and compete for time
- Practices are ordered in time:
 - They are rhythmic according to days, weeks, seasons
 - They have a duration – which can vary
 - They are ordered in sequences – some practice follow other practices



Practice theory is strong in understanding technology-practices connections in a longer (historical) timespan

- ▶ New infrastructures of water, sewage, energy and communication made way for new appliances and changing practices in the home
- ▶ New norms of communication, comfort and cleanliness developed collectively
- ▶ Norms and needs are socio-technically constructed
- ▶ These norms are collectively shared



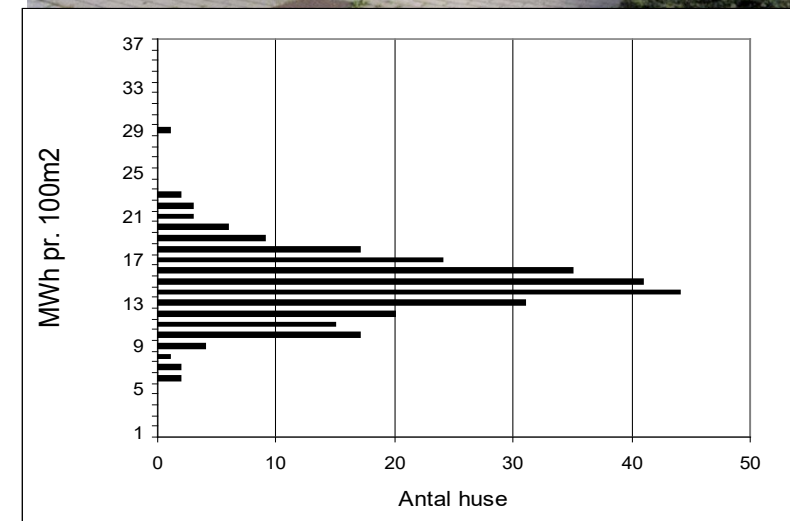
Practice theory can also elucidate variations in consumer practices

(in other ways than individual behaviour approaches)

Even with identical buildings and technologies we see huge variation of factor 2-3

- We carry tacit knowledge from previous social and material settings in our habits
- Social class, and thus social relations and meanings are part of the explanations of variations

(Gram-Hanssen, 2010)



What does theories of practice have to say on energy consumption so far?

- Energy is *not* consumed for its own sake - but while performing practices
- Consuming energy is *not* a practice - it is a moment in different practices
- Practitioners do *not* focus on energy but on carrying through practices
- Practices are collective though the performance may vary among practitioners
- Practices change historically by introducing new technology or by other changes in society



Questions and comments?

New consumer roles are needed: What do we know from research?

- ▶ **“Prosumers”**: producing for the grid and for own consumption
- ▶ **“Flexumers”**: change timing of practices or providing storage through adjusted practices
- ▶ **“Redusumers”** overall reduction in households energy consumption

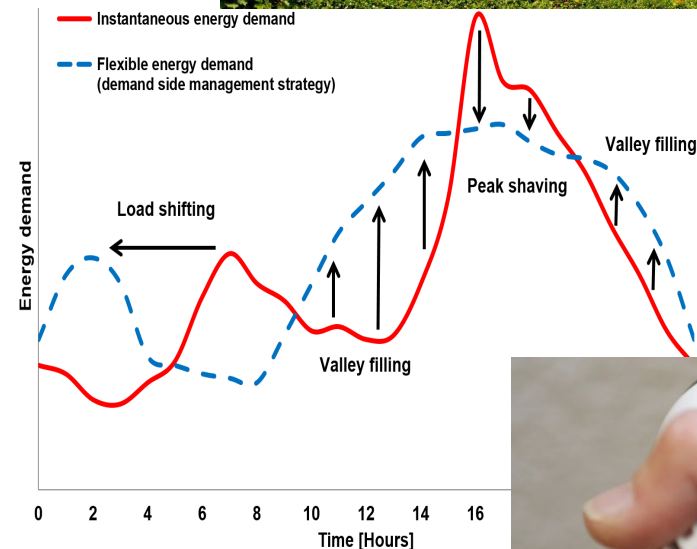
Introducing research from our research group:

Sustainable Cities and Everyday Practices

SCEP



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Reducing energy consumption

Energy policy: efficiency, efficiency, efficiency!

- EU Efficiency directive
- Energy labels on appliances and buildings
- Buildings regulations on efficiency
- Incentives to promote efficient technologies and retrofiting



But efficiency do not deliver the expected savings

- ▶ Comparing calculated and actual heating in homes show systematic huge difference
- ▶ G-labeled homes use much less than expected - and A-labeled much more
- ▶ The building efficiency impact behavior
- ▶ This has policy relevance for reducing energy consumption

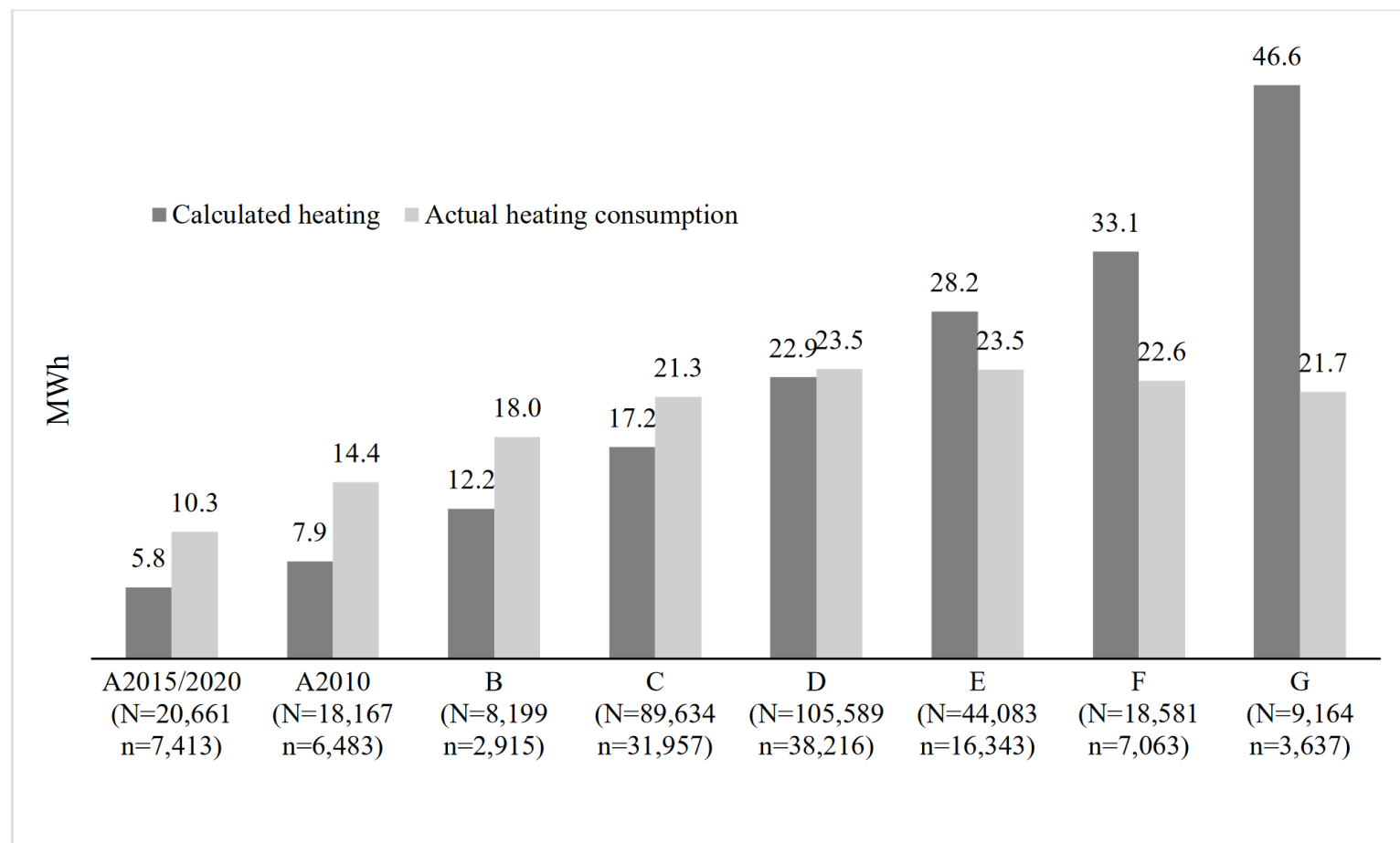
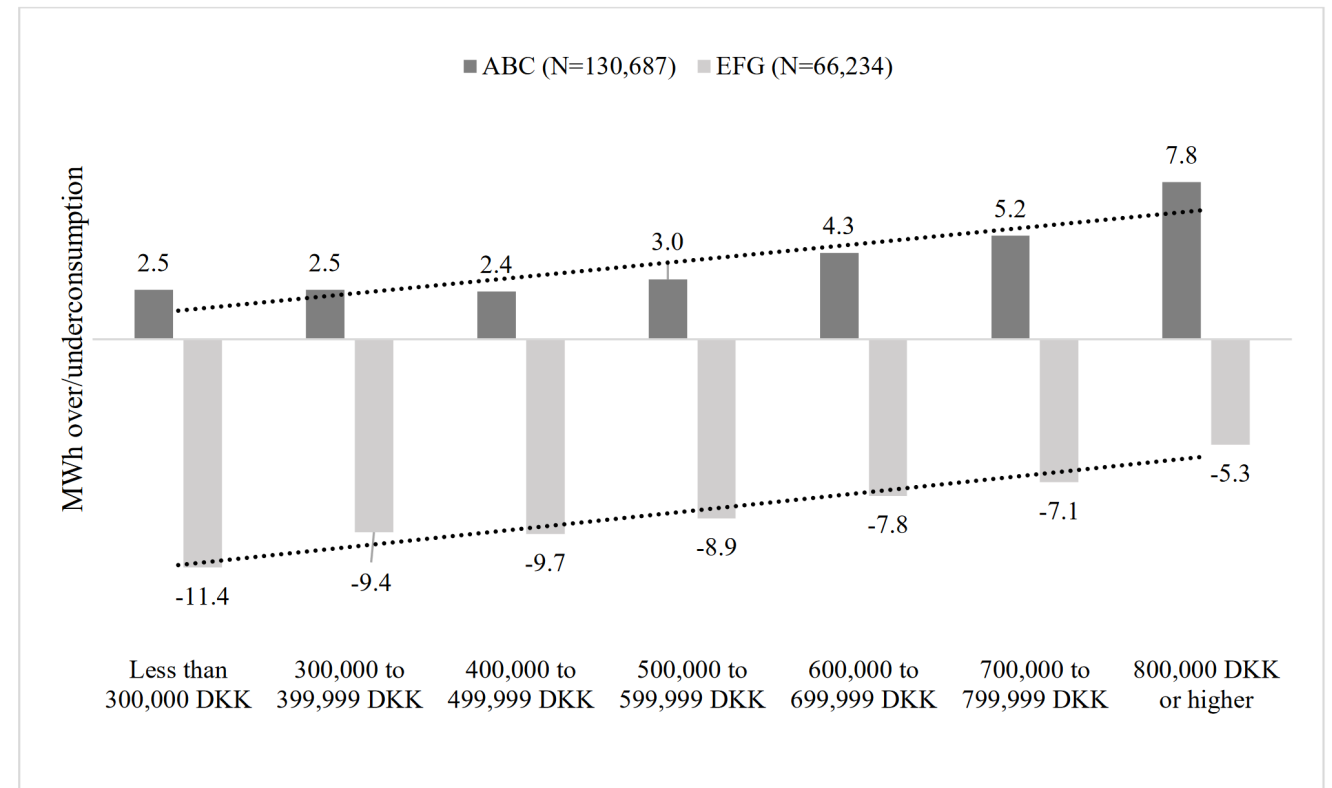


Figure 1. Comparison of means of calculated heating demand and actual heating consumption in houses in MWh for 2019 to 2021 across labels. N=314,078 observations. n=114,022 households.

Do income explain all this discrepancy?

- ▶ There are over-consumption in all ABC-labeled houses
- ▶ There are under-consumption in all EFG-labeled houses
- ▶ Households' economy influence how much over- and under-consumption.
- ▶ But economy do not explain all: the efficiency of the house impact behavior

Figure 4. Comparison of over- and underconsumption in MWh from lower to higher income households.



Flexibility in appliance use

Trials, including time-of-use tariffs, show that:

- ▶ Dishwashing and laundering can be moved
- ▶ This is challenged by temporal rhythms and relations between practices
- ▶ Some family types are more constrained than others
- ▶ The energy crisis 2022-2023 had a huge impact on time-shifting

(Friis og Christensen, 2016; Khalid et al;2019)



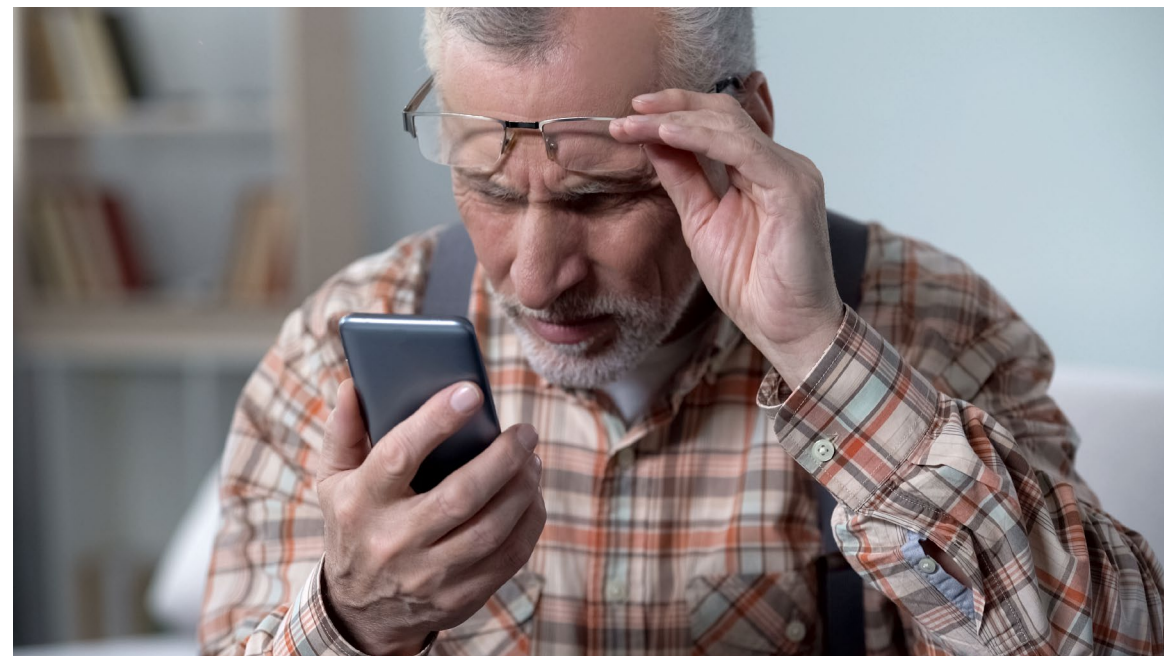
Flexibility in use of heat

- ▶ In district heating buildings can provide flexibility of some hours - by preheating
- ▶ Should utilities or households control?
 - ▶ Can it work without including consumers
 - ▶ Can consumers be engaged?
 - ▶ Is tariffs a solution?
- ▶ Smart control – some can handle it, others cannot – winners and losers?



Socio-economics of smart tech competences and interest

- ▶ The older generation will (long time ahead) not be as good as the young ones to understand and use smart tech
- ▶ The most tech interested are male. Not that females don't have competences - or that all male are tech nerds
- ▶ If AI should be part of the solutions, we need systems that work for *all* users



Becoming an electricity prosumer:

Who becomes owners of Photo Voltaic?

- ▶ Higher income overrepresented
- ▶ Technical educated overrepresented
- ▶ High education overrepresented
- ▶ Couples rather than singles
- ▶ Older (+70) citizens under represented
- ▶ Country side living overrepresented

(Hansen et al, 2019)



Being an electricity prosumer:

- ▶ PV owners produces electricity to the grid and for own consumption
- ▶ It makes a difference for ways of consuming and for understanding energy
 - ▶ More than half of all PV owners adjust their electricity consuming practices to their production
 - ▶ Two thirds state they are more concerned about energy after obtaining PV's

(Hansen et al, 2019)





What to learn from this empirical research on new consumer roles?

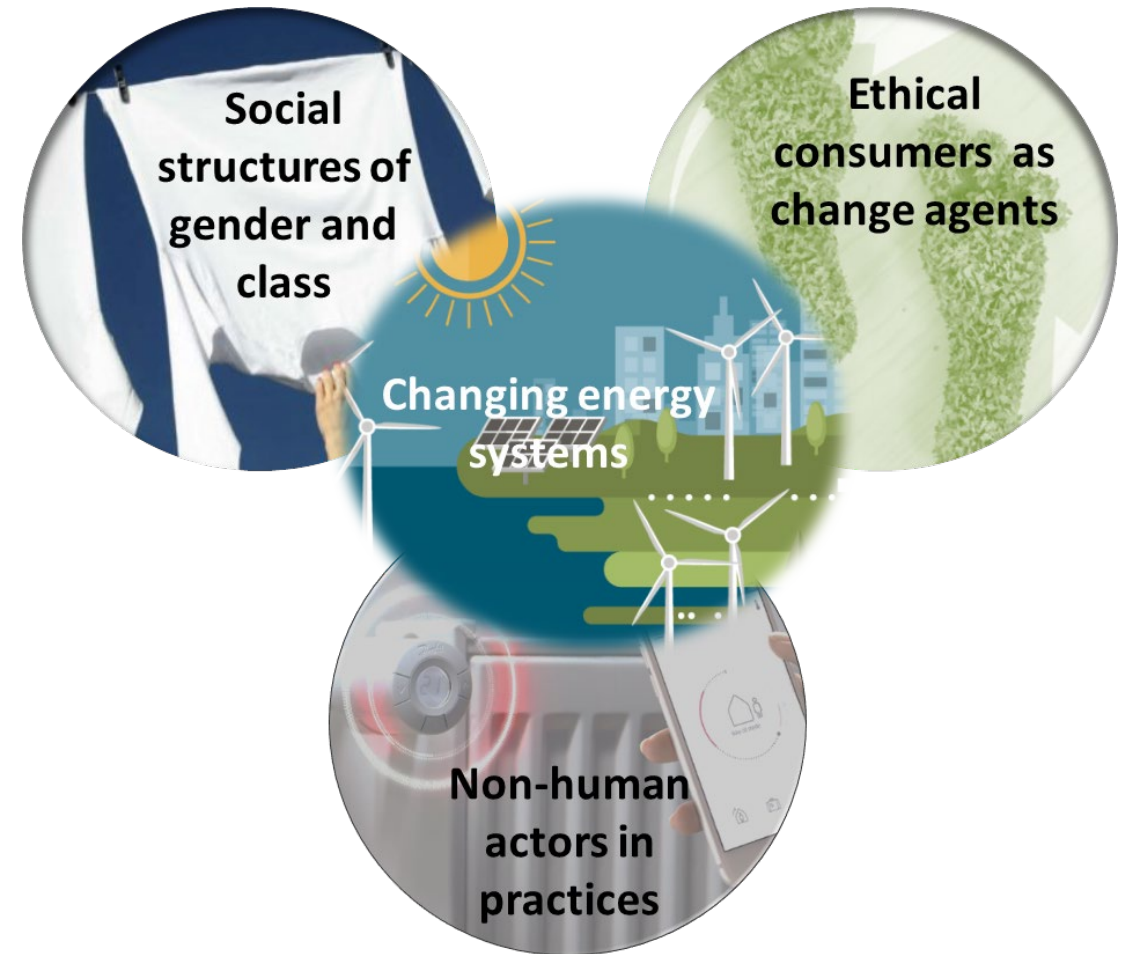
- ▶ New technology and energy systems always go together with changes in practices – policy should be aware of this
- ▶ Can changes in energy systems result in a new practice of energy management and awareness?
- ▶ Everyday practice will be affected – what impact for different types of consumer (gender –age - class)? Winners and losers?
- ▶ Control of energy consumption can be done by different actors – consumers, utilities, facility staff – in combination with automation and Artificial Intelligence (AI)



What is the future research questions related to this?

- ▶ Will some consumers be lost in this transition?
- ▶ Will we see engaged consumers who take part in changing the energy system and their practices?
- ▶ Will non-human actors and AI have a key role in households practices in the future?

And how to conceptualize all this within theories of practices



Questions and comments?

Thank you for your attention
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