

Energy consumption in perspective

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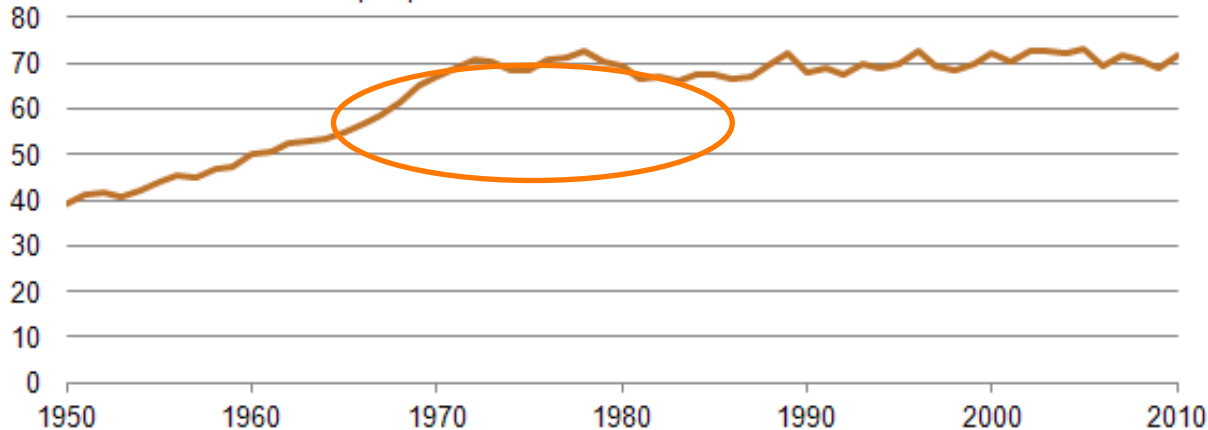
1a. Introduction: problematizing domestic energy consumption

- Early days of the grid: getting people to buy appliances to justify further investment
 - Consuming energy safely
- **Scarcity** & env. impact meant energy consumption was problematized as (potentially) wasteful → conservation
- Convincing people to buy the right light bulbs, isolate homes, turn off appliances, stand-by consumption
 - Advent of energy labels
- Now & in the smart grid: *timing of use* is problematized
 - Scarcity of energy is no longer the #1 problem
 - **Quality** of energy matters now (renewable)

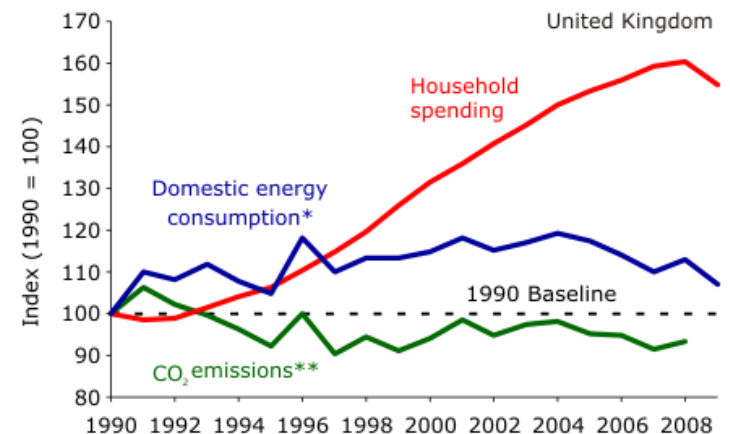
1b. Does domestic energy consumption matter?

U.S. annual residential energy consumption, per capita, 1950-2010

million British thermal units per person



<http://www.eia.gov/todayinenergy/images/2011.10.21/AER2011ResConsump.png>



*Electricity, gas, oil and other fuels used in the home.

** includes an estimate of share of energy industry emissions

Source: AEA Energy and Environment, DECC, ONS

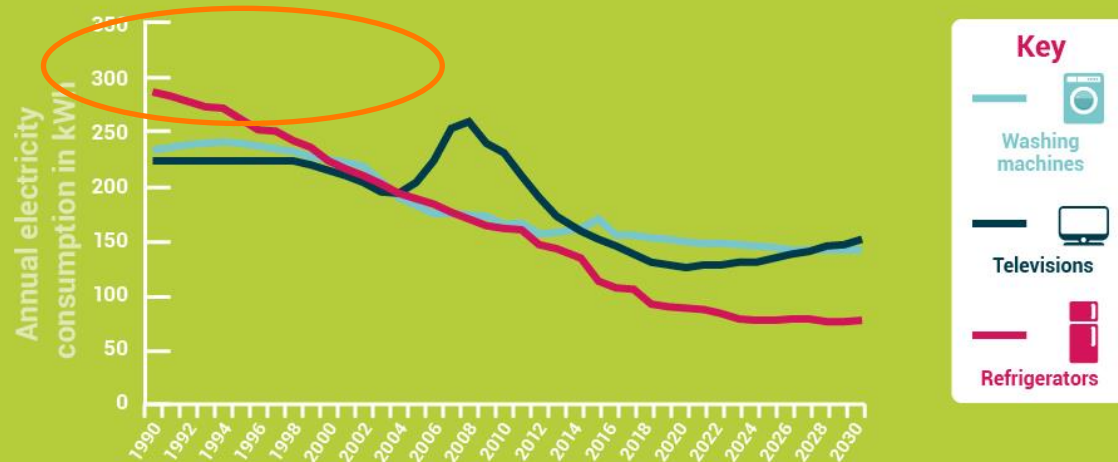


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1b. Does domestic energy consumption matter?

Annual household appliance electricity consumption from 1990 to 2030

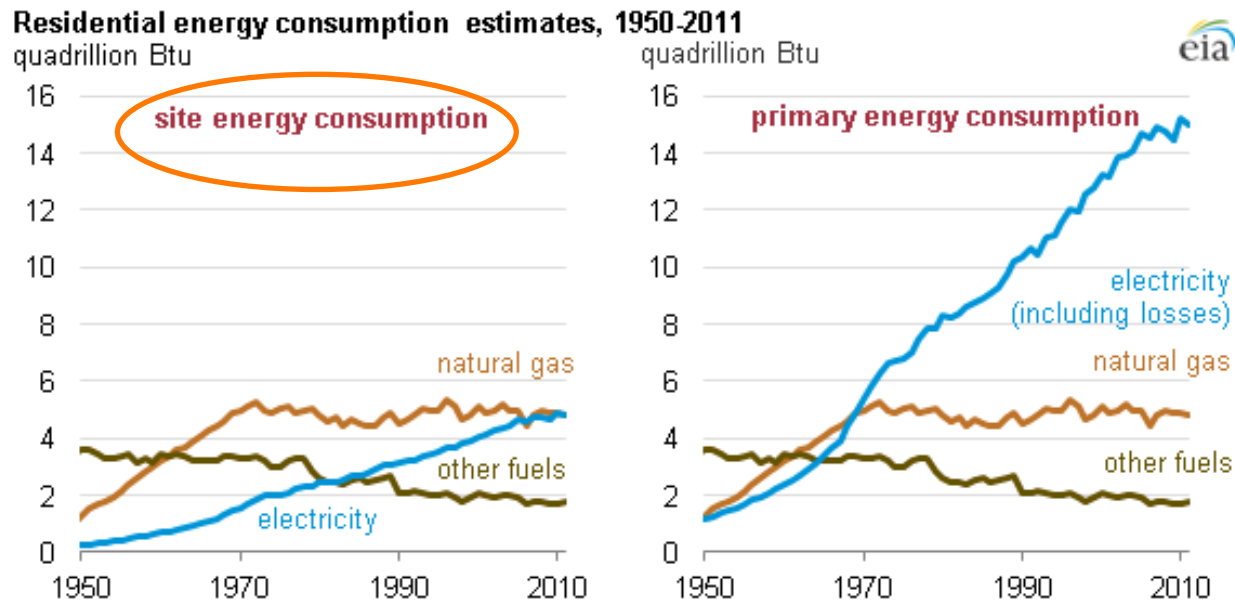


Changes to European Union and national policies since the 1990s have influenced the downward trends of energy consumption.

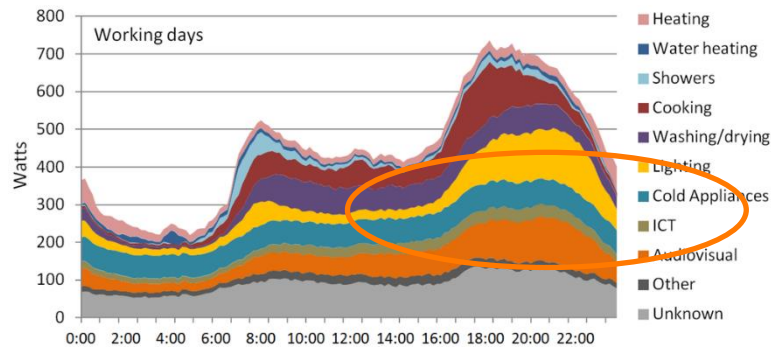
The peak in television energy consumption is due to uptake of plasma screen TVs in the 2000s, which have now largely been replaced by LCD and LED technologies.

Source: Figures are based on the Department of Energy and Climate Change 'Energy efficient products – helping us to cut energy use' report, July 2014.

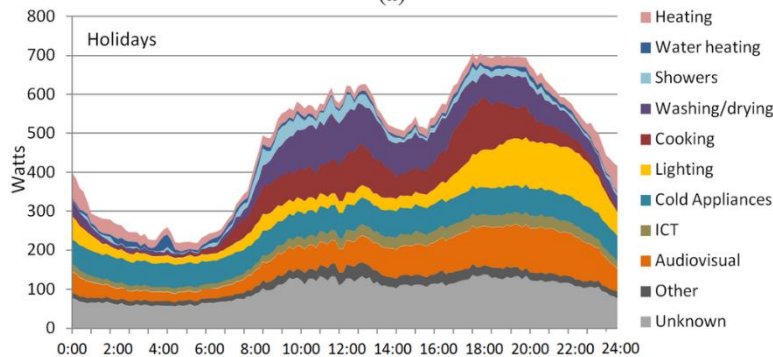
1b. Does domestic energy consumption matter?



1b. Does domestic energy consumption matter?



(a)



(b)

Godoy-Shimiu et al., 2014



- Plugging in 1 EV is equal to suddenly connecting 1-3 extra houses

<http://www.technologyreview.com/news/518066/could-electric-cars-threaten-the-grid/>

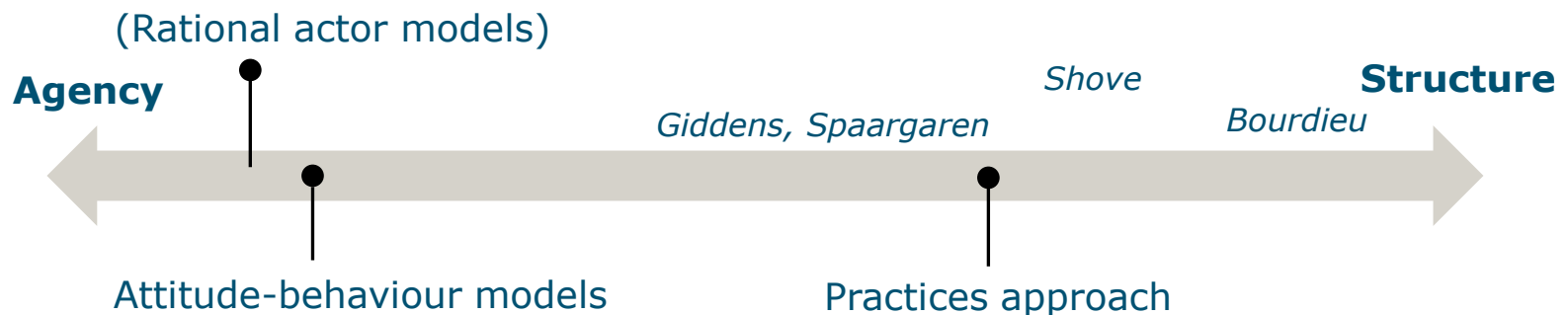
- Energy use of identical apartments can differ 300 – 400% (Gram Hansen, 2009)

1c. The bigger picture: sustainable behaviour

- Fostering sustainable energy consumption behaviour because it is **part of a bigger transition**
 - Governance, distributed responsibility
 - Spill-over: sustainable behaviour can spread
 - Ecological modernization (not the same as austerity!)
- In the future: rising energy prices, e-mobility, heat pumps, distributed renewable generation, etc.
- In part contrary to *automation* (many technological solutions not requiring behavioural change of consumers)
 - Automation vs. behavioural change? Needs nuance

2. Juxtaposing two dominant perspectives

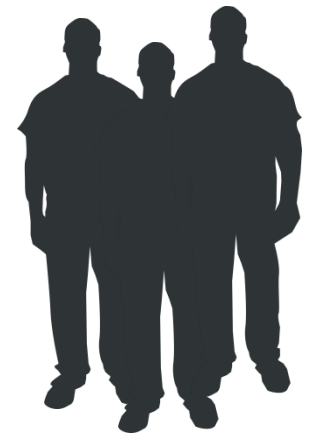
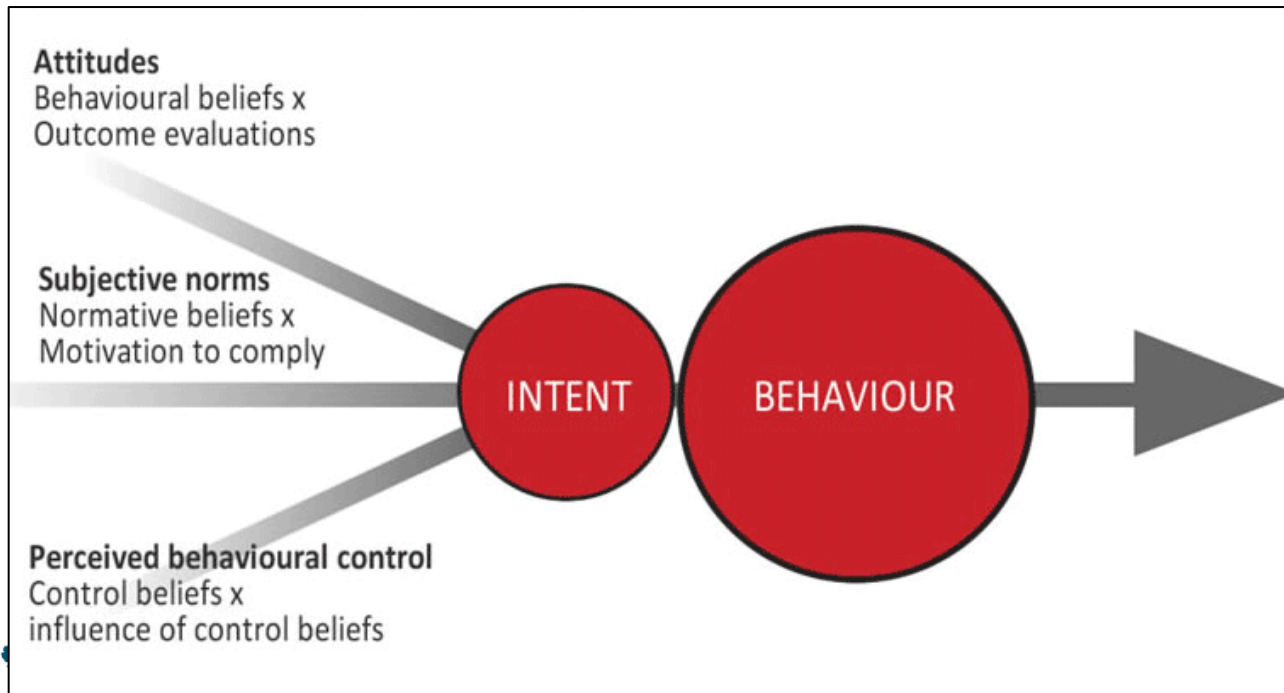
- Juxtaposing **attitude-behavioural models** with **situated approaches**
- Energy users as individuals
 - (Social) psychology & economic models
- Energy consumption as shared practices
 - Practice theory



3a. Energy users as individuals

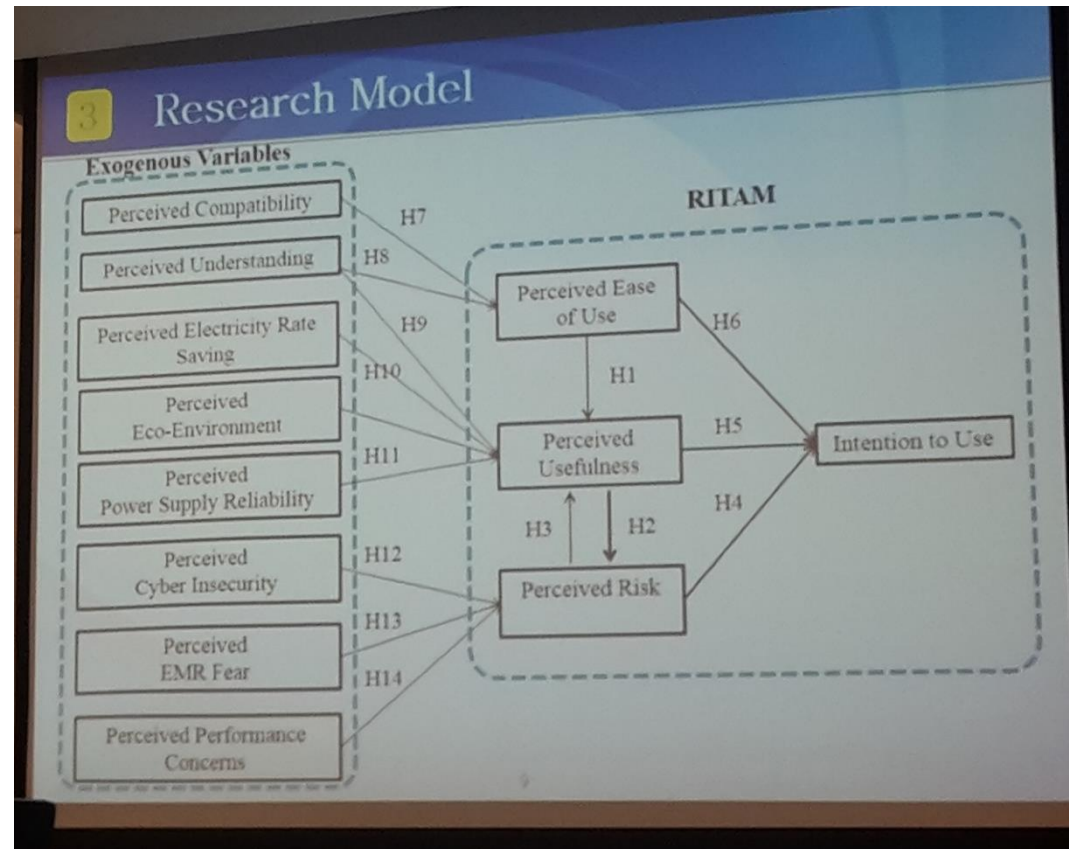
- Social-psychology
- Attitude-behaviour models
- $n > 30$, surveys, interviews, statistical analysis

Ajzen's Theory of Planned Behaviour, 1991



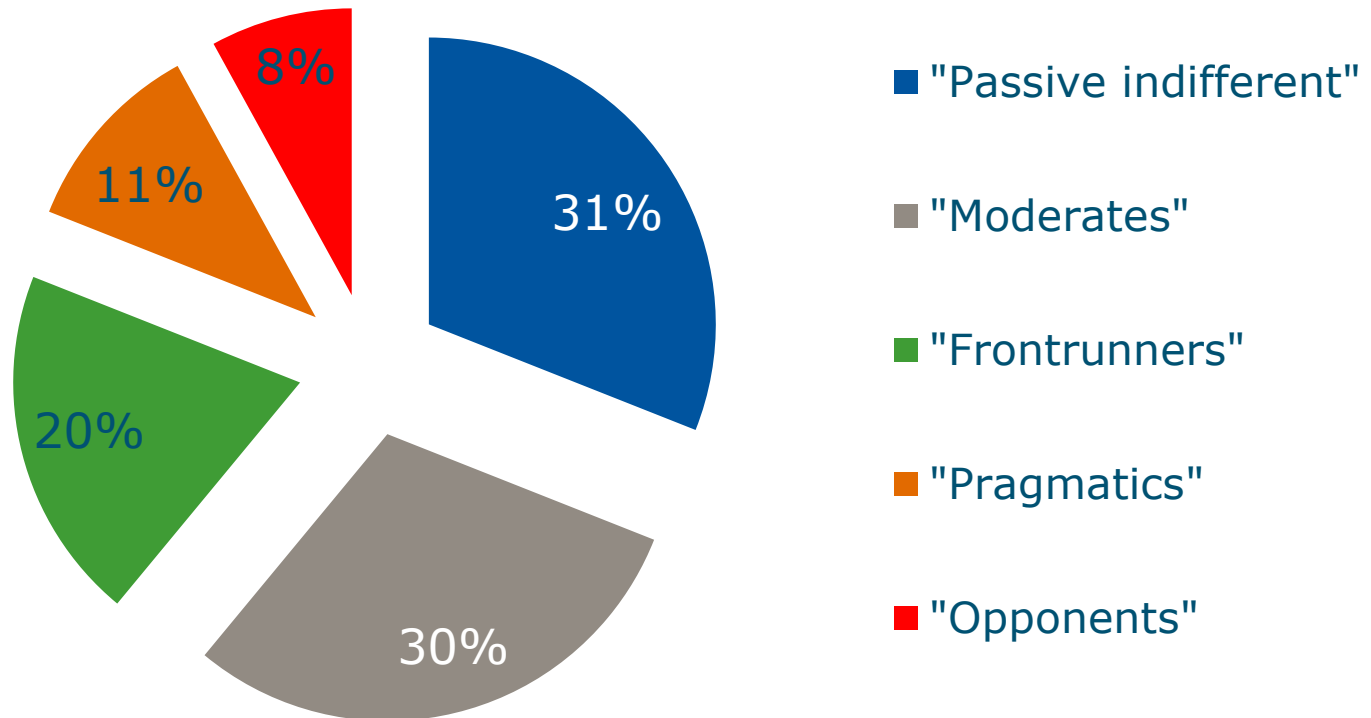
3b. Energy users as individuals

- E.g. Dr. Park's technology acceptance model
- Regression analysis
- Identifying key 'barrier' attitudes, values, knowledges, demographics to desired behaviour



3c. Energy users as individuals

Segmentation of Dutch householders 'acceptance of energy innovations'



4a. Energy consumption as shared practices

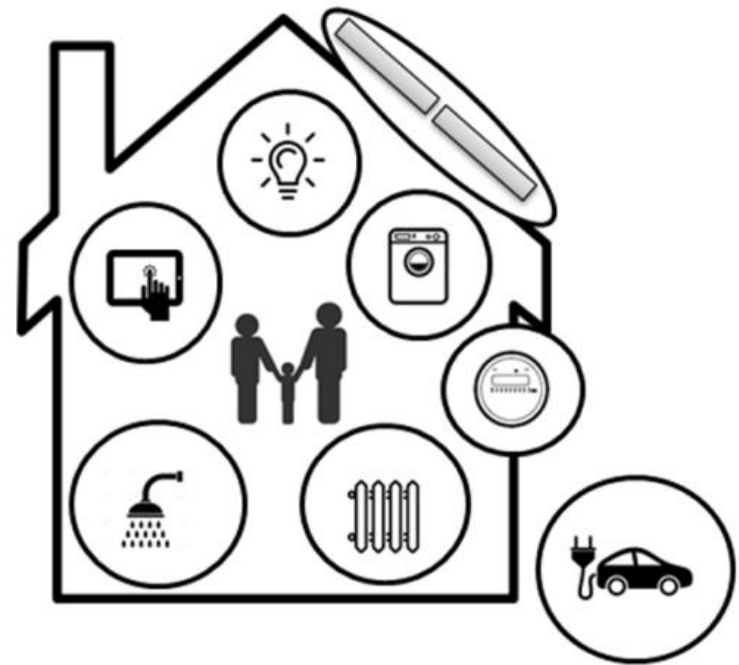
- It's not people, it's practices
 - People are carriers of practices
 - Practices have histories, rhythms, rationales, goals & emotions, objects, meanings, rules...

Reckwitz (2002): “a ‘practice’ ... is a **routinized** type of behaviour which consists of several **elements**, interconnected to one other: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.

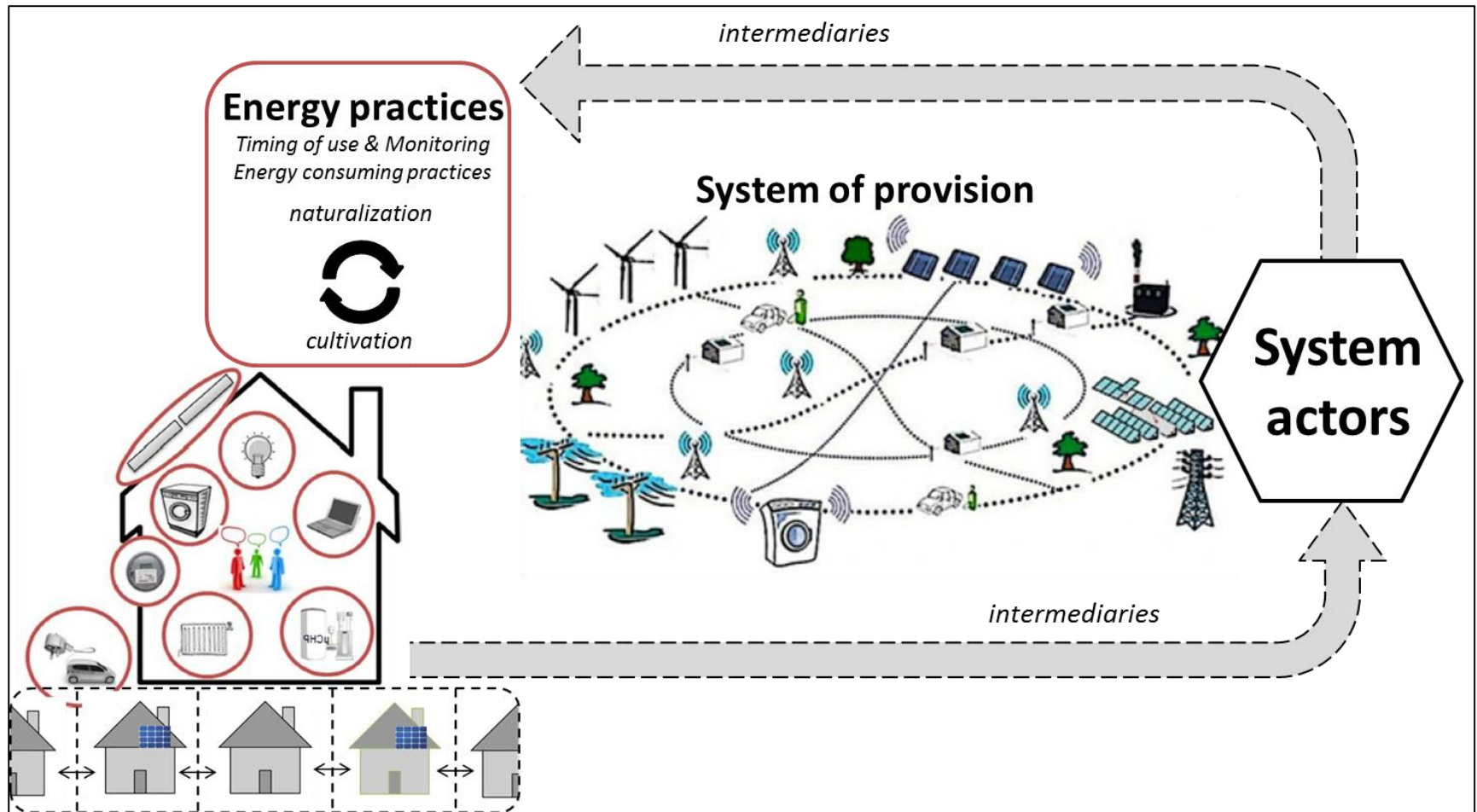
- A practice is like a ‘block’: relatively enduring, self-stabilizing pattern whose elements seemingly “glue together”
- Ontology of the social world (Schatzki)

4b. Energy consumption as shared practices

- People don't consume energy: they use energy to perform daily activities
- Energy consumption is: (often) routinized, contextual, situated, non-rational behaviour (attitude behaviour gap)
- Energy management practices & energy consuming practices
- Mix of methods: ethnography, participation, observation (people are informants of practices)



4c. Energy practices model



5a. Case study: consumption in the smart grid

- In the smart grid, energy (electricity) consumption is of renewed importance
- ICT offeres **new opportunities** to boost sustainable behaviour, ranging from grid co-managemen, to EV proliferation, to further incentivising decentralized renewable energy generation

Smart practices in smart homes



Timing of use

Residents coordinate their energy use with renewable energy availability and prices.



Key tool: in-home displays & apps



Monitoring

Residents have real-time insight into energy consumption, stimulating conservation and continuous improvement.



Social

Energy is visible as topic both at home and in the community. Residents form local and regional energy collectives.



Mobility & E-storage

Residents charge and discharge energy storage devices (incl. electric cars) in coordination with the smart grid.



Key challenges to making smart work



Smart grids rely on smart routines. How can residents be involved in the long run?



Smart grids may produce uneven benefits. How can smart energy systems be inclusive?



Routines are hard to break. How flexible are residents in timing their daily activities?



Residents are as diverse as their wishes. How can utility providers service diversified customers?



5a. Case study: consumption in the smart grid

Energy management practices	Private	Horizontal	Vertical
Energy monitoring	Self-monitoring	Information sharing	Feedback & advice
Renewable energy production	Domestic production	Collective production	Large-scale production
Time-shifting of energy use	Domestic time-shifting	Communal time-shifting	Demand control

Adapted from: Naus et al., 2015

5b. Two videos: dark & light scenarios

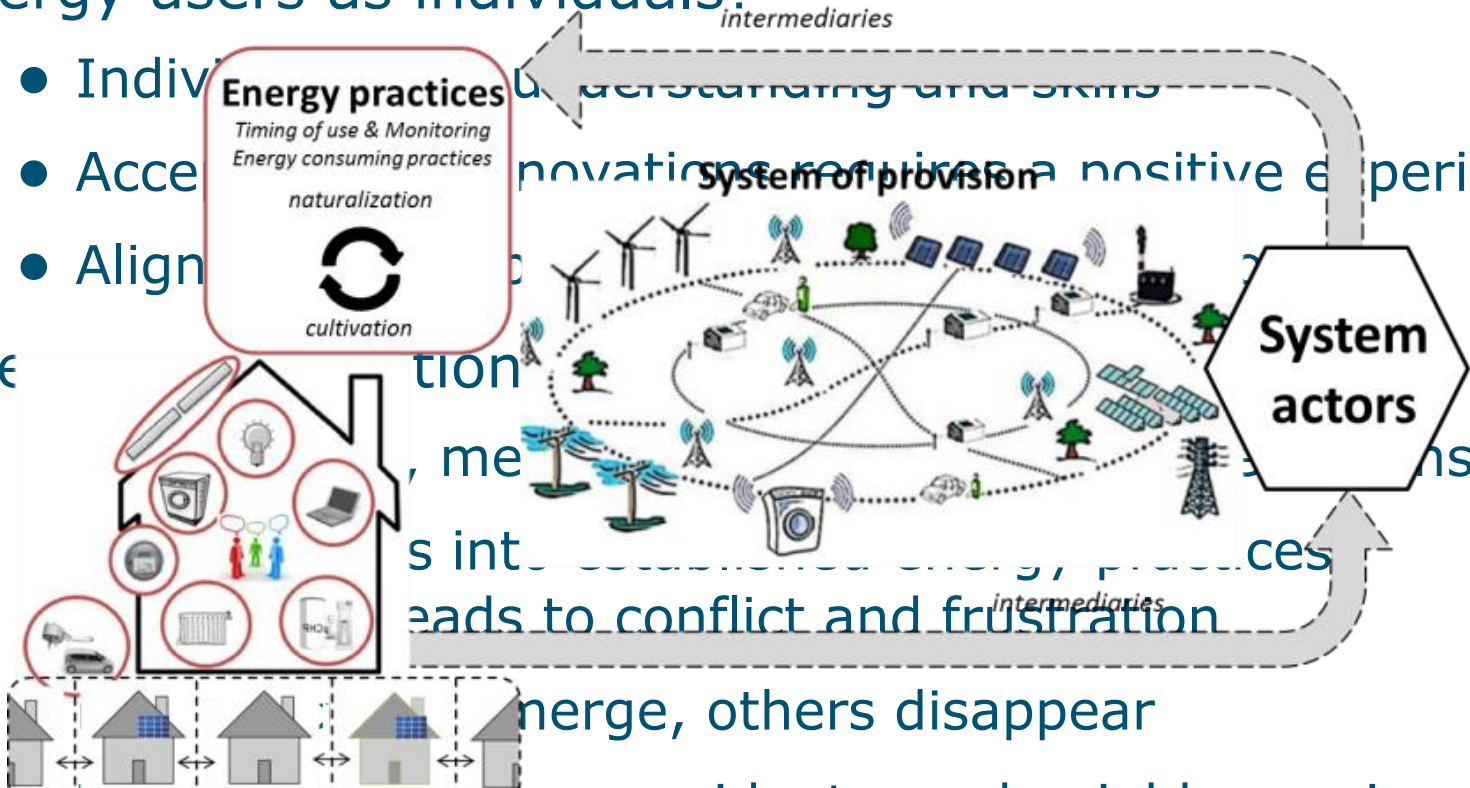
- Nottingham, UK
- Created in 2011 as part of the DESIMAX Project and Horizon's Smart Living research programme, looking into sociological and psychological dimensions of near-future Smart Grid technologies
- A family, a student house, and a young couple
- Light: <https://www.youtube.com/watch?v=dr2OgiH4DWI>
- Dark: <https://www.youtube.com/watch?v=6EYt-g6Wi-c>

5c. Interpretation

■ Energy users as individuals?

- Individual
- Acceptance
- Alignment

■ Energy



- Interaction between residents, and neighbours, is crucial

6a. Implications for behavioural change

- In general: how to change behaviour?
- Attitude-behaviour model:
 - Communication on the basis of segmentation
 - Persuasion, attitude change, information, nudging
 - Goal: public acceptance of technologies, policies
- Practices approach:
 - Routine behaviour requires intervention in routines
 - Manipulation of the elements of practices
 - Goal: uptake and spread of desired sustainable practices

6b. Implications for behavioural change

- **Example:** how to avoid the Dark scenario?
- Attitude-behavioural model:
 - Custom **information** for different segments (on the basis of household composition, attitudes, values, ...)
 - Spreading and enhancing acceptance by targeting/collaborating with key demographics (e.g. frontrunners)
 - Making clever use of revealed dispositions (environment & money both matter? Double incentive)
 - Taking away **barriers** between intent and action (e.g. presenting energy data in attractively and logically)
 - Social **norm** setting via PSAs, government campaigns

6c. Implications for behavioural change

- **Example:** how to avoid the Dark scenario?
- Practices approach:
 - Pinpoint which practices should be targeted
 - Analyse which practices are (not) inherently compatible with new 'program'
 - If practices are social, their change is social too...
 - Realignment of practices involves **renegotiation** of the residents' shared norms about comfort, privacy, convenience, etc. and distrib. of household tasks
 - ?? Target this renegotiation?

6d. Implications for behavioural change

- **Example:** how to avoid the Dark scenario?
- Rational choice economic modelling:
 - Obviously emphasizes incentive structures (carrots & sticks)
- Much used in developing and testing dynamic pricing schemes (game theory)
- Overlap with attitude-behaviour models

6e. Interaction with political ideology

- Understandings of behaviour are also political
 - Theories are (also) cultural language structures
- Of course, not all soc.-psychologists & economic modelers are neo-liberals, but...
- ...a practices approach to behaviour **challenges** neo-liberal understanding of behaviour as result of individual choice
 - Energy consumers as individual actors in neo-liberal governance (government is facilitator)
 - Practices approach: behaviour is contextual → interventionist governmental policy rather than incentives
- Not necessarily! But more attractive...

7a. Reconciling the two approaches

- What to make of the differences?
 - E.g.: What is the difference between *nudging* and the strategic insertion of elements into existing practices?
 - Different understandings of human agency lead to different concepts, methods, questions and interventions
 - Differences are sometimes exaggerated so that the camps can better distinguish themselves

7b. Reconciling the two approaches

Strong points for the analysis of energy consumption

Social-psychology

- Generates highly practical insights
- Gives tools to differentiate and segment householders in their relation to energy
- Links between theory, analysis and possible interventions are well-developed and established
- Some energy behaviours fit the rational-choice model more (e.g. investments in renewables, or purchasing appliances)

Practices approach

- Acceptance is one step. Uptake of new behaviours/participation is another
- Gives tools to analyze and differentiate routinized energy-related behaviours
- Useful framework for analyzing collective rhythms and changes over longer time
- Some energy behaviours fit the practices approach more (e.g. doing the laundry, heating/lighting spaces)



7c. Synthesis example: energy culture

- Barton et al. 2013: Energy cultures: Implications for Policy Makers (New Zealand)
- Focus on energy efficiency
- “...**interdisciplinary** in drawing together the perceptions and methods of several different modes of inquiry”

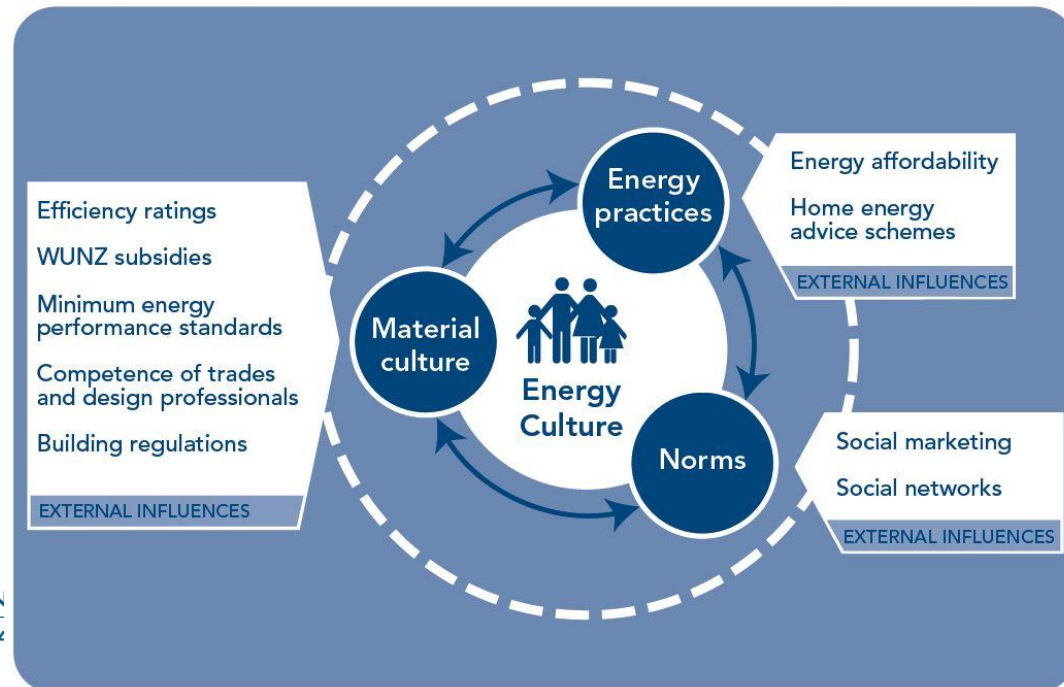


Table 5: Energy Cultures or Clusters

	Energy Economic	Energy Extravagant	Energy Efficient	Energy Easy
% of population	24%	19%	20%	31%
Demo-graphics	Younger, poorer and smaller households. Students and unemployed.	Families – dependent children aged under 50. Highest income.	Older – often empty nesters, part time work. Owner occupied Mostly in small centres/rural.	Middle-aged older Europeans. Few children. Second highest income, but many retired, Auckland and Wellington.
Norms	Environmentally aware. Confident in energy decisions.	Few distinctive features but appear less confident in energy decisions, value enjoyment and pleasure in life.	Value practicality.	Least concerned about environmental issues.
Material Culture	Often rented flats or apartments. Poor insulation	Largest houses but not best insulated or	Separate freezers but lower ownership of	Owner occupied – often debt free. High users of

7c. Synthesis

- Barton et al. (New Zealand)
- Focus on energy
- “...interdisciplinary and method

re

for Policy

ceptions”

7c. Synthesis example: energy culture

- Barton et al. 2013: Energy cultures: Implications for Policy Makers (New Zealand)
- Focus on energy efficiency
- “...**interdisciplinary** in drawing together the perceptions and methods of several different modes of inquiry”
- What is lost and what is gained when combining approaches?

Table 18: What Happens the Most in Discussions about Energy Use

your friends tell you about energy efficiency	17.8%
both tell each other	61.8%
you tell your friends about energy efficiency	20.4%

7c. Synthesis example: energy culture

- Barton et al. 2013: Energy cultures: Implications for Policy Makers (New Zealand)
- Focus on energy efficiency
- “...**interdisciplinary** in drawing together the perceptions and methods of several different modes of inquiry”
- What is lost and what is gained when combining approaches?
 - Very practical and insightful:
 - E.g. “The lowest energy users tend to have substandard housing and inefficient energy technologies, yet have very economical energy practices.”
 - But lacks perspective? Lipservice to practices? No rhythms, etc.

8a. Extra dimension: international comparative perspective

- What can an international **comparative** perspective contribute to the study of energy consumption?
- Different institutional actors (energy sector), regulations
- Different practices and their histories
- Different dispositions, attitudes, values, norms
- Different national and sub-national discourses
- In practices research: improving the validity of ethnographic findings
 - **Two examples** of my faculty (practices & international)

8b. Research project: Energy storage



S. Kloppenburg

- Exploring novel practices surrounding *energy storage* in different national settings
- Energy: service → commodity (cultural shift?)
- Distributional effects: roles, responsibilities, benefits
- International collaboration:
 - With the DEMAND Centre, Lancaster, UK
 - With partners in Italy
 - With partners in Asia?

We welcome collaboration!!

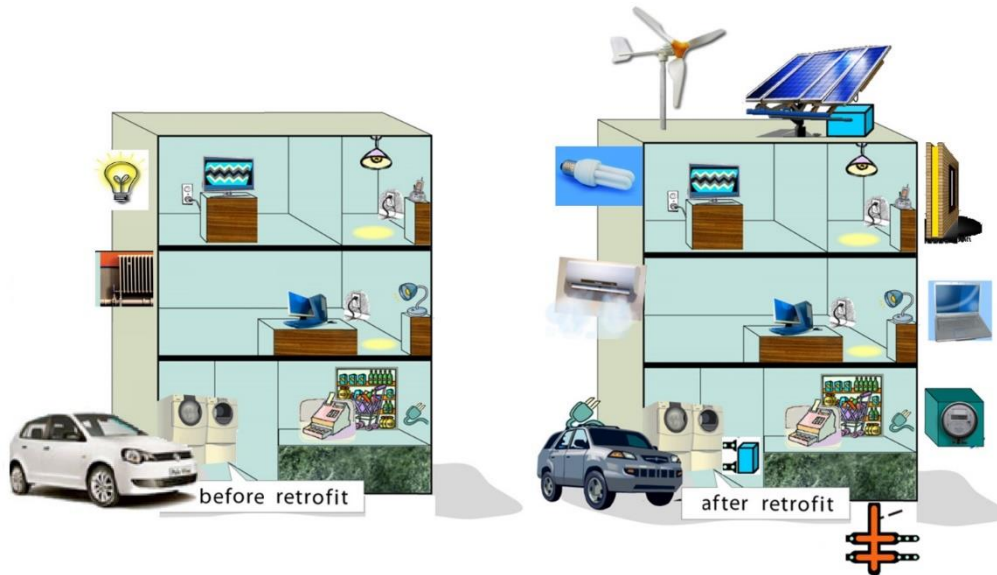


8c. Research project: Urban retrofitting



F. de Feijter

- Comparative case study: **smart urban retrofitting** in China (Mianyang) and The Netherlands (Amsterdam)



Focus on: improvement of isolation,
fresh air system, solar panels,
geothermal heat systems
Use of smart techniques, type of
lights. Combined Heat Power Units



8c. Research project: Urban retrofitting



F. de Feijter

When is urban retrofitting **smart**?

Inclusive modes
of governance



Inspired by Connode, 2012



8c. Research project: Urban retrofitting



F. de Feijter

- Opportunities are missed to differentiate, improve or adapt towards users' needs in the retrofit processess
- Energy retrofitting may be counter-productive if residents do not adapt everyday practices (rebound effects)
 - Retrofitting practices as well as houses?
- What are the **institutional** and **socio-technical** conditions for potential replication of citizen-inclusive retrofitting projects in the and China?

9. Conclusion

- Yes, domestic energy consumption matters
- Different theories imply different opportunities for intervention in behaviour
- International comparative perspective is valuable
- It is important to imagine human behaviour complexly
 - For that, one must be aware of multiple perspectives
 - Even if only one perspective can be fruitfully and practically applied in a concrete study of energy consumption

Further reading on practices

- Key authors who apply practices approach to energy demand: Shove, Hargreaves, Gram-Hansen, Spaargaren
- Strengers and Maller (2015): Social Practices, **Intervention** and Sustainability: Beyond behaviour change
- Main journals for behavioural aspects of smart grids:
 - Energy Policy
 - Energy Research & Social Sciences

Thank you

Are there any questions?



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