Webinar: User-Centred Energy Systems TCP Academy

Behavioural Energy Economics: Promises, Lessons & Challenges for Sustainable Energy Use

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Promises

Behavioural Energy Economics

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Implications for Policymaking

01
Promises

Behavioural Energy Economics

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Aims

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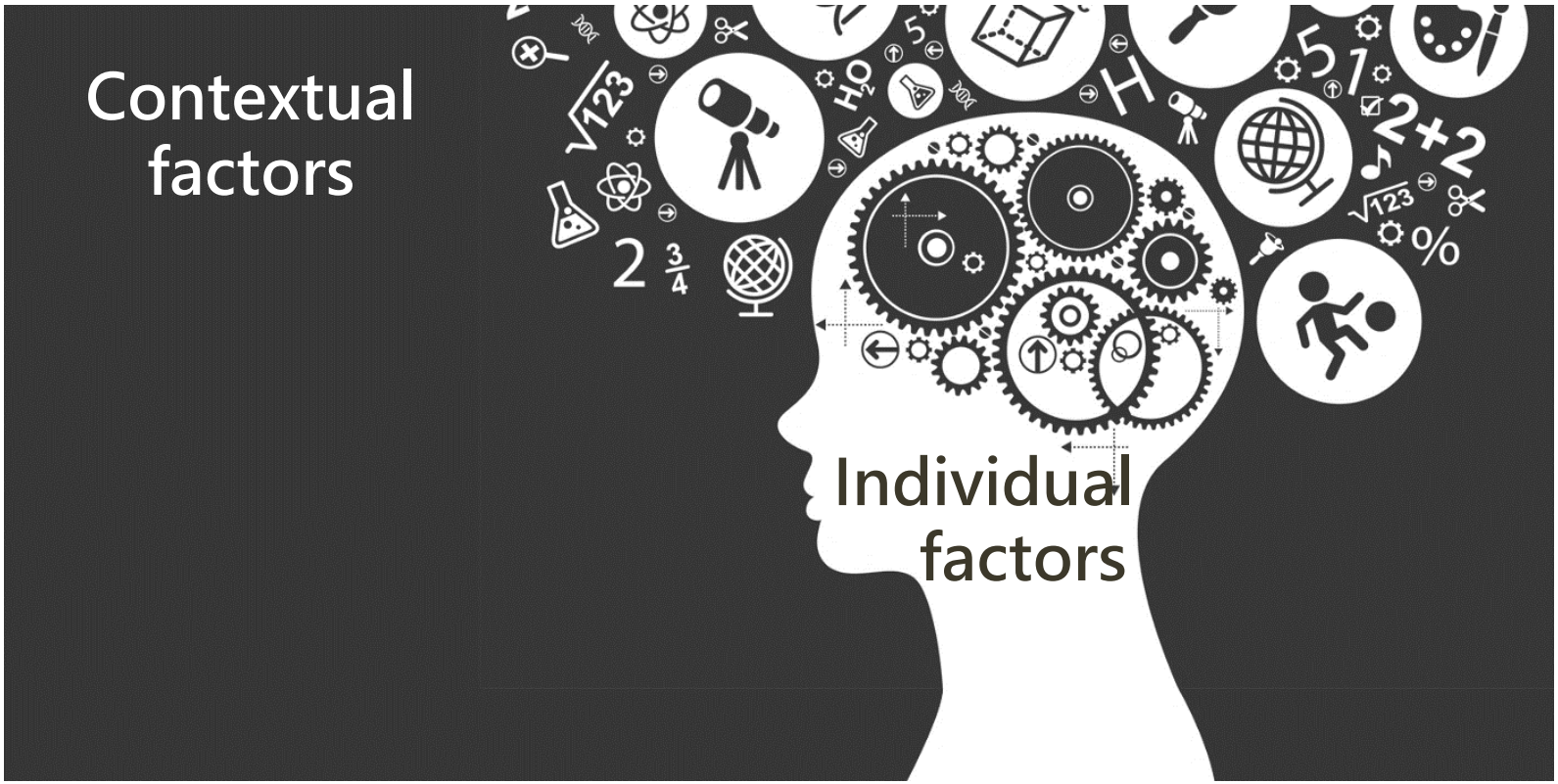
Foci



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Behavioural anomalies → Barriers

- Heuristics
- Choice overload
- Limited attention
- Loss aversion
- Status quo bias
- Procrastination

Photo credit: Jenniffer MacCormack

Choice interventions & assessment

- Main taxonomy (Münscher et al., 2016):
  - **Decision information**, e.g. feedback, social comparisons
  - **Decision assistance**, e.g. goal settings, committment
  - **Decision structure**, e.g. choice defaults, framing
- Assessment criteria:
  - Effectiveness (short-term)
  - Persistence (long-term)

Behavioural Economics

Theoretical framework for sustainable energy use and decarbonisation

Prospect Theory

- *Endowment effect/reference* (Kahneman et al, 1990, 1991; Thaler, 1981; Knetsch, 1989; Dinner et al, 2011)
- *Status-quo bias/reference* (Kahneman et al, 1991; Samuelson & Zeckhauser, 1988; Ritov & Baron, 1992; Camerer & Lovalo, 1999; Terrell, 1994)
- *Value function* (Tversky & Kahneman, 1992; Kahneman & Tversky, 1984; Tversky & Kahneman, 1981)
- *Loss aversion/reference* (Kahneman & Tversky, 1979; Shogren & Taylor, 2008)

Intertemporal Choice

- *Discounting* (Hyperbolic/implicit) (Loewenstein & Thaler, 1989; Thaler, 1981; Shane, Loewenstein & O'Donoghue , 2002; Coller & Williams, 1999)
- *Risk (aversion) and time-varying decision* (Camerer & Loewenstein, 2004; Frederick et al, 2004; O'Donogue and Rabin, 2000; Loewenstein et al. 2003; Bell, 1985; Thaler & Shefrin, 1981)
- *Value commitment* (Ashraf et al, 2006; Green & Myerson, 1994; Della & Malmendeir, 2006)

Norms and Moral Behaviour

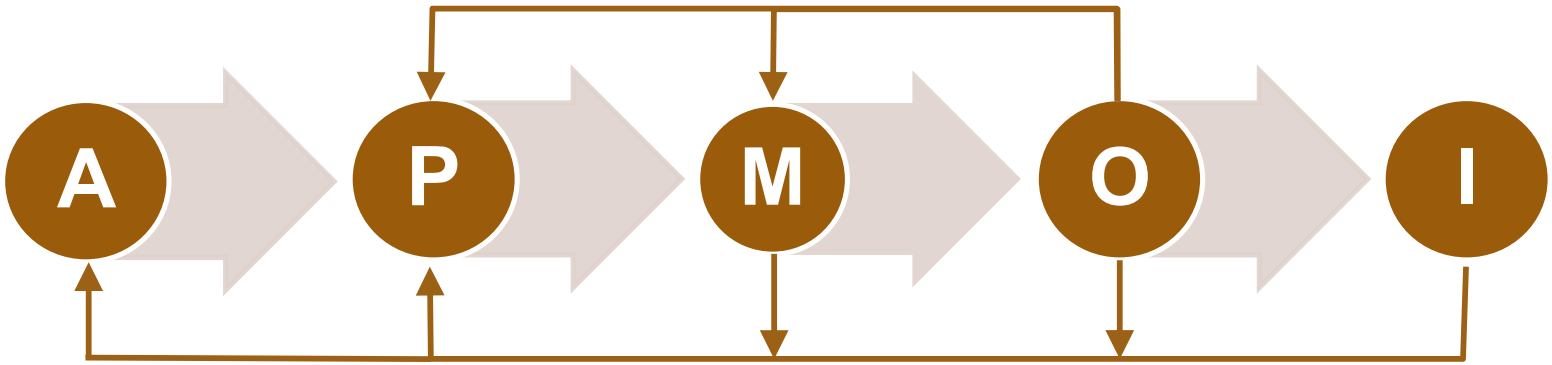
- *Fairness* (Kahneman et al., 1986; Cardenas & Carpenter, 2008; Fehr & Schmidt, 1999; Falk et al, 2008; Forsythe et al, 1994)
- *Cooperation* (conditional) (Ostrom, 1998; Frey & Meier, 2004; Fischbacher et al., 2001)
- *Reciprocity* (Croson et al, 2005; Fehr & Gächter, 2000; Gouldner, 1960; Falk & Fishbacher, 2006; Berg et al, 1995)
- *Warm-glow effect* (Andreoni, 1990; Crumpler & Grossman, 2008; Isen & Levin, 1972; Menges et al., 2005; Gneezy & Rustichini, 2000)
- *Norm-based motivation* (Andreoni et al, 2009; Brekke et al, 2003; Nyborg et al, 2006; Biel & Thogersen, 2007; Goldsmith 2011)

Cognitive Science & Bounded Rationality

- *Choice overload* (Schwartz, 2004; Iyengar & Lepper, 2000; Scheibehenne et al, 2010; Reed et al, 2011; Hogarth & Reder 1987; Smith, 1991; Fehr & Rangel, 2011)
- *Heuristics* (sub-optimal) methods (Simon, 1947; 1957; Camerer & Loewenstein, 2004; Thaler, 1991; Heath & Soll, 1996; Tversky & Kahneman, 1981; Tversky & Shafir, 1992)
- *Salience* (Kahneman, 2003; Avineri, 2012)
- *Satisficing behaviour* (Simon, 1947, 1972, 1979; March & Simon, 1963; Winter, 2000; Augier & March, 2002)
- *Self-deception* (Mijovetic & Prelec, 2010; Mazar & Ariely, 2006)

Source: Mundaca et al. (2019)

Policy-oriented analytical framework



Anomalies:
- Loss aversion
- Heuristics
- Choice overload

Intervention:
- Decision information
- Decision structure
- Decision assistance

Mediators:
- Pro-env'l behaviour
- Psychographics
- Context

Outcomes:
- Tech adoption
- 'New' behaviour

Impacts:
- Energy use
- Carbon emissions
- Well-being

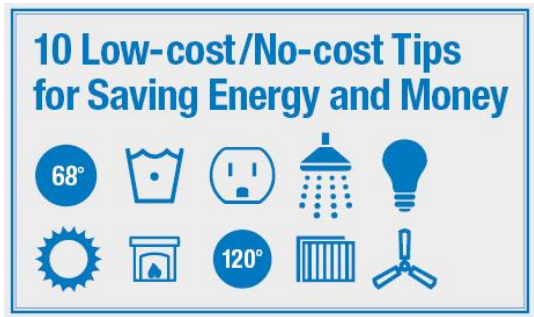
Adapted and expanded from Ludwig et al. (2011)

02

Lessons

Experience

Decision information: Simplified feedback



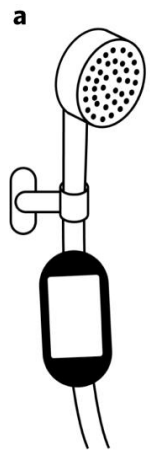


Photo credits: PBC, Social Energy, Tibber, Tiefenbeck et al (2018)

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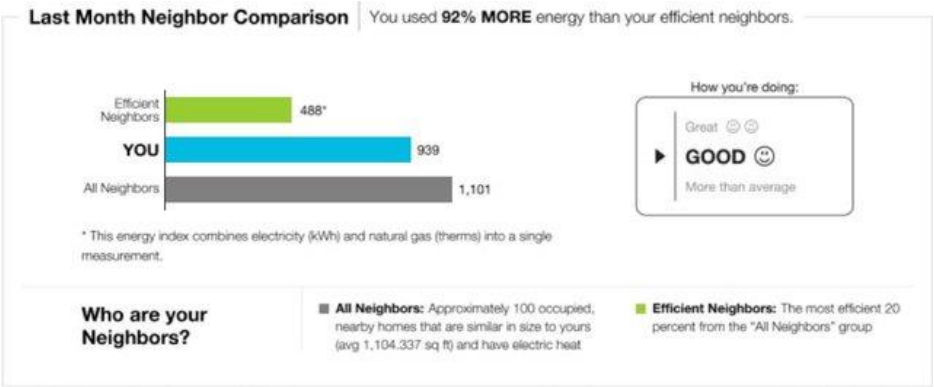
Decision information: Simplified feedback

- **Effectiveness**:
  - 0% (Sexton et al., 1987 [US])
  - 4-5% (Hutton et al., 1986 [US/CAN]; Schleich et al., 2013 [AT])
  - 3-6% (Faruqui and Sergici, 2010 [US, FR, AUS])
  - 7-11% (Bager & Mundaca, 2017 [DK])
  - 8-10% (Ruokamo et al., 2022 [FI])
  - 10.5% (Seligman & Darley, 1977 [US])
  - 5-15% (Darby, 2006 [US, UK, CAN, NL, Nordics])
  - 5-20% (Agarwal et al., 2023) (meta-analysis, 33 studies)
- **Persistence**: Often unknown, but it decreases (Ruokamo et al., 2022 [FI]), and energy use can also increase (Hayes & Cones, 1981 [US])
- **Policy lessons**: Potential! But….

Decision information: Social comparison



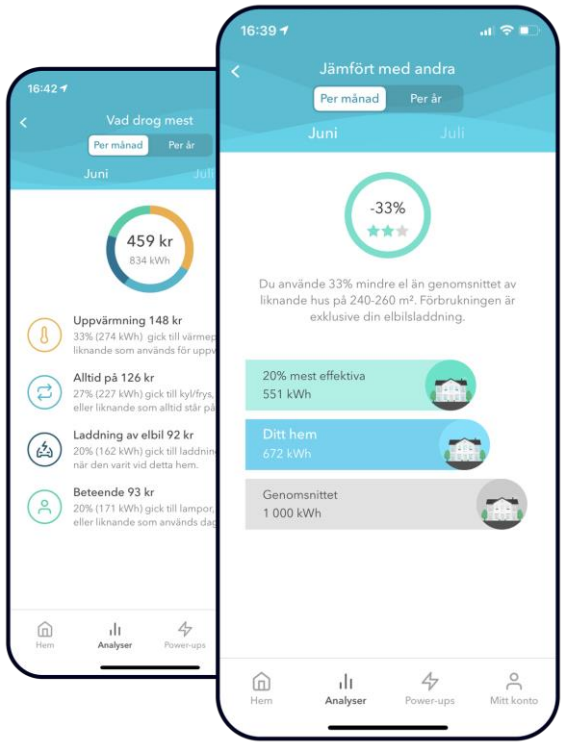


Photo credits: Opower, Tibber

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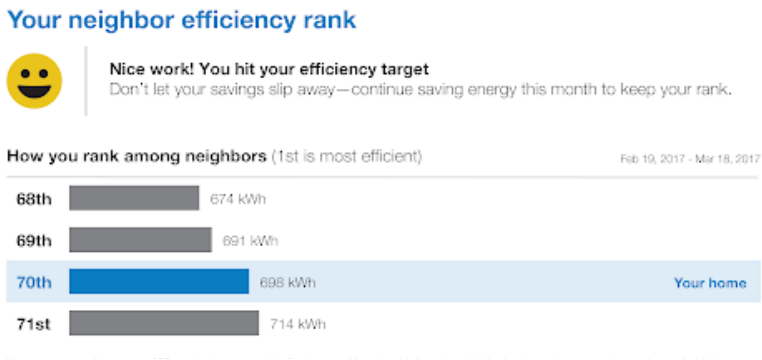
Decision information: Social comparison

- **Effectiveness**:
  - Consistent small effects (Nisa et al., 2019) (meta-analysis, 22 studies)
  - Does not induce statistically significant changes (Ruokamo et al., 2022 [FI])
  - Net effect close to zero (Kaestnera & Vanceb, 2022 [AT])
  - 1.2-30% (Andor et al. 2018) (meta-analysis, 24 studies)
  - 1.4-3.3% (Allcott, 2011 [US, Opower])
  - 1.4% (Mukai et al., 2022 [JP])
  - 9% first week, 7% third week (Schultz et al., 2015 [US])
- **Persistence**: Decrease, but positive indications from Opower
- **Policy lessons**: Cost-effective potential, but…

Decision assistance: Commitment & goal settings



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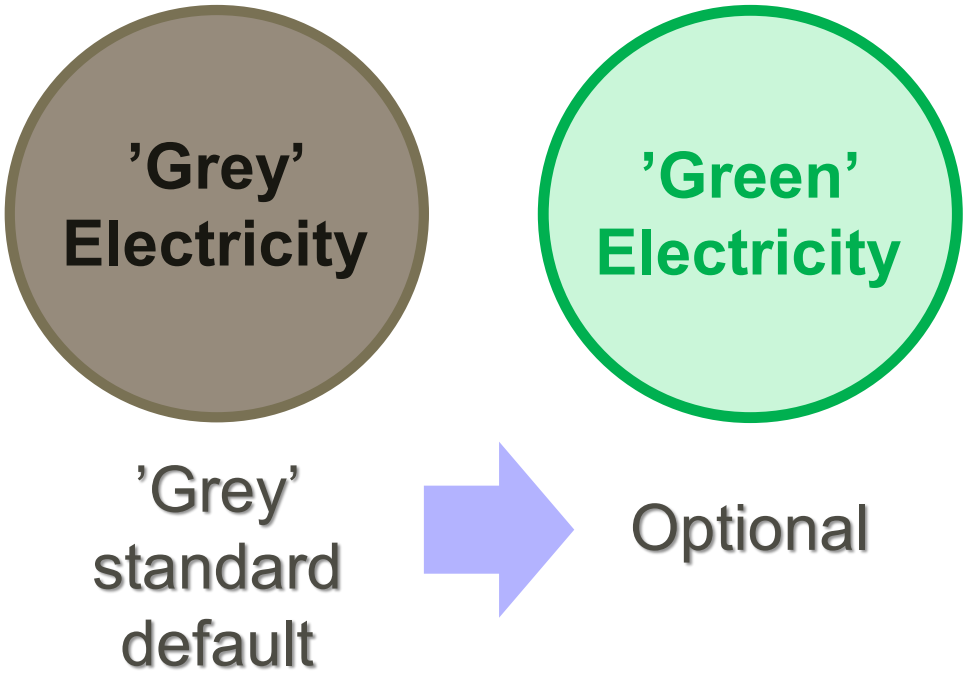
Decision assistance: Commitment & goal settings

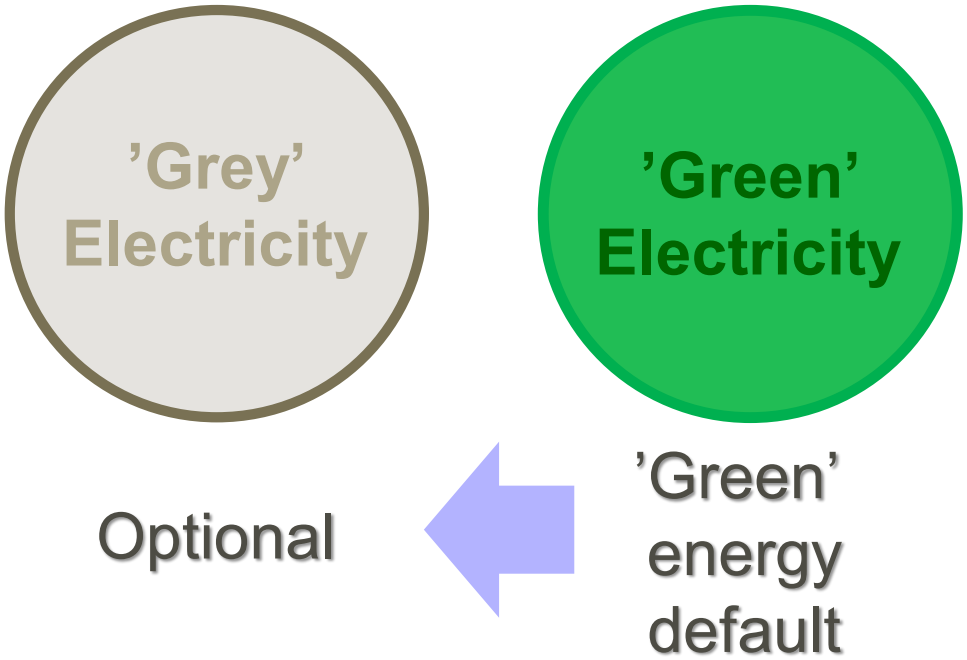
- **Effectiveness**:
  - When goal is 0-15% → 11% savings (Hardin & Hsiaw, 2014 [US])
  - When goal is 10% → 12.3% savings (von Houwelingen & Raaj, 1989 [NL])
  - When goal is 15% → 11-22% savings (Winett et al., 1982 [US]), 24% savings (Lazaric & Toumi, 2022 [MC])
  - When goal is 25% → 19% savings (Lazaric & Toumi, 2022 [MC])
  - But lack of effectiveness also identified (Becker, 1978 [US])
- **Persistence**: It can show up in the long-term (Katzev & Johnson, 1983 [US]).
- **Policy lessons**: Potential! But…..

Decision structure:
Green energy defaults



'Opt-in' decision framework

Decision structure:
Green energy defaults



'Opt-out' decision framework

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Decision structure: Green energy defaults

- **Effectiveness**:
  - Lab experiments: 68% (vs. 41%) (Pichert and Katsikopoulos, 2008 [GER]); 69% (vs. 48%) (Momsen and Stoerk, 2014 [GER]); 69% (vs. 7%) (Ebeling and Lotz, 2015 [GER]); 76% (vs. 69%) (Hedlin & Sunstein, 2016 [USA]): 20%—83% (vs. 65%), (Ghesla, 2017 [CH]); 42% (vs. 48%) (Mundaca & Moncreiff, 2021 [UK]).
  - Natural experiments: 99% (Pichert and Katsikopoulos, 2008 [GER]), 80% (Lieve et al., 2021 [CH]).
- **Persistence**: Yes, after 4 years (Ghesla et al., 2020 [CH]) and 6 years (Lieve et al, 2021 [CH])
- **Policy lessons**: High potential! But….

03

Challenges

Implications for Policymaking

Direct policy implications

- Behaviour and decision processes are driven by individual, social and structural variables
- Sustainability of interventions over the long term
- Important between-study differences → heterogeneity
- Effective, but cost-effective and economically efficient?
- Improvements & synergies with 'traditional' policy instruments
- Ethical issues

Indirect policy implications

- Still unknown how behavioural insights are incoporated into energy policy design and implementation
- Role of evidence-based evaluation
- Contribution and discussion beyond ’nudges’
- More attention to side-effects, (subjective) well-being and organisations
- Role of policy makers → Governance of BEE for policy-making

Concluding remarks

- ✓ Behavioural energy economics has shown promise in identifying and overcoming barriers to sustainable energy use. Experimental research has been central
- ✓ Key lessons include the importance of defaults, social norms, and feedback in influencing energy behaviours
- ✓ Interventions offer potential, but not the panacea; price mechanisms are still important
- ✓ Challenges include scalability, long-term behaviour change, equity, and the need for interdisciplinary collaboration

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Thank you! Any questions?

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