REACT

Renewable Energy for Self-Sustainable Island Communities

Informing an equitable transition to clean energy: results from a resident survey on three islands

Dana Abi Ghanem & Tracey Crosbie
Teesside University

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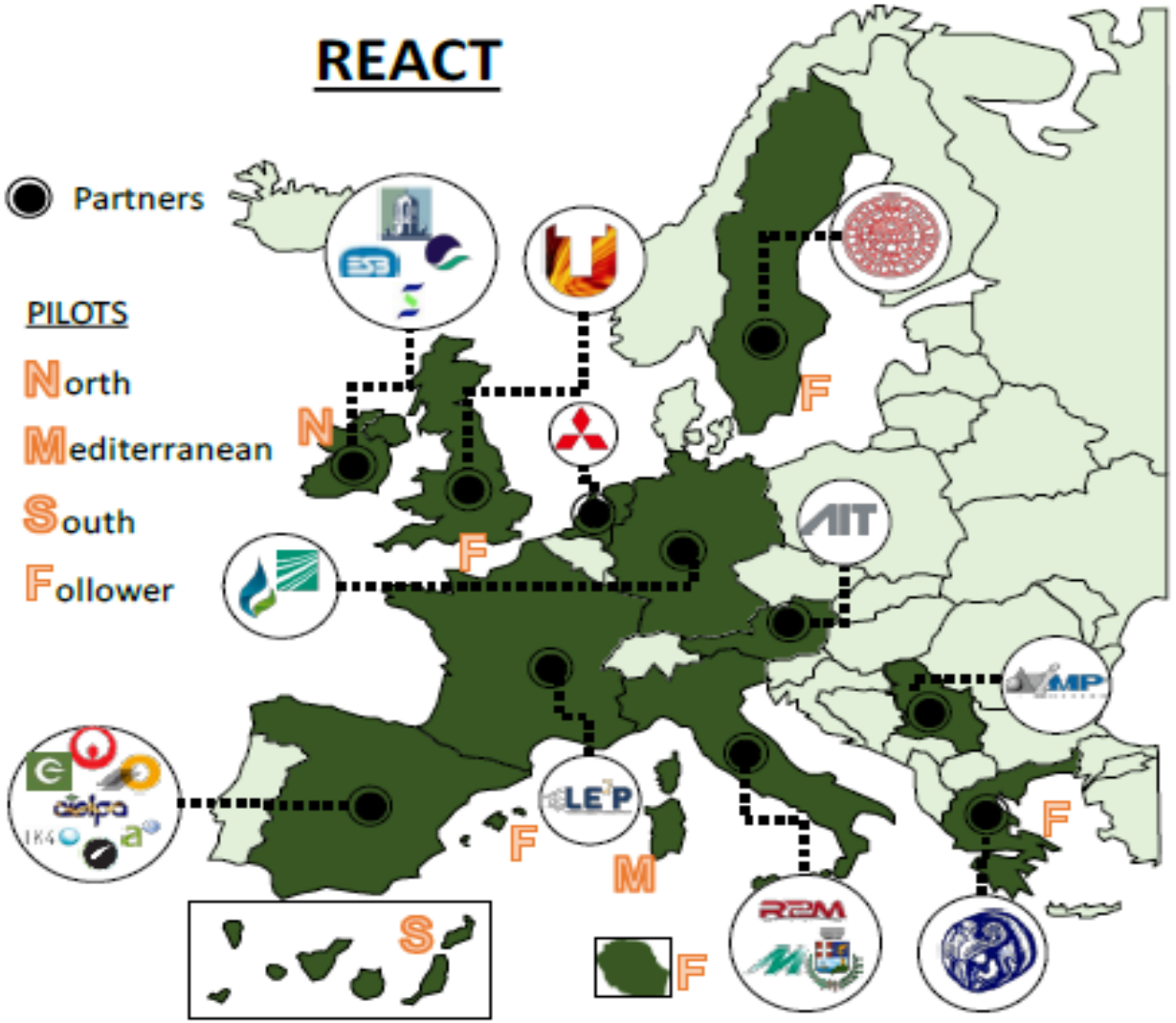
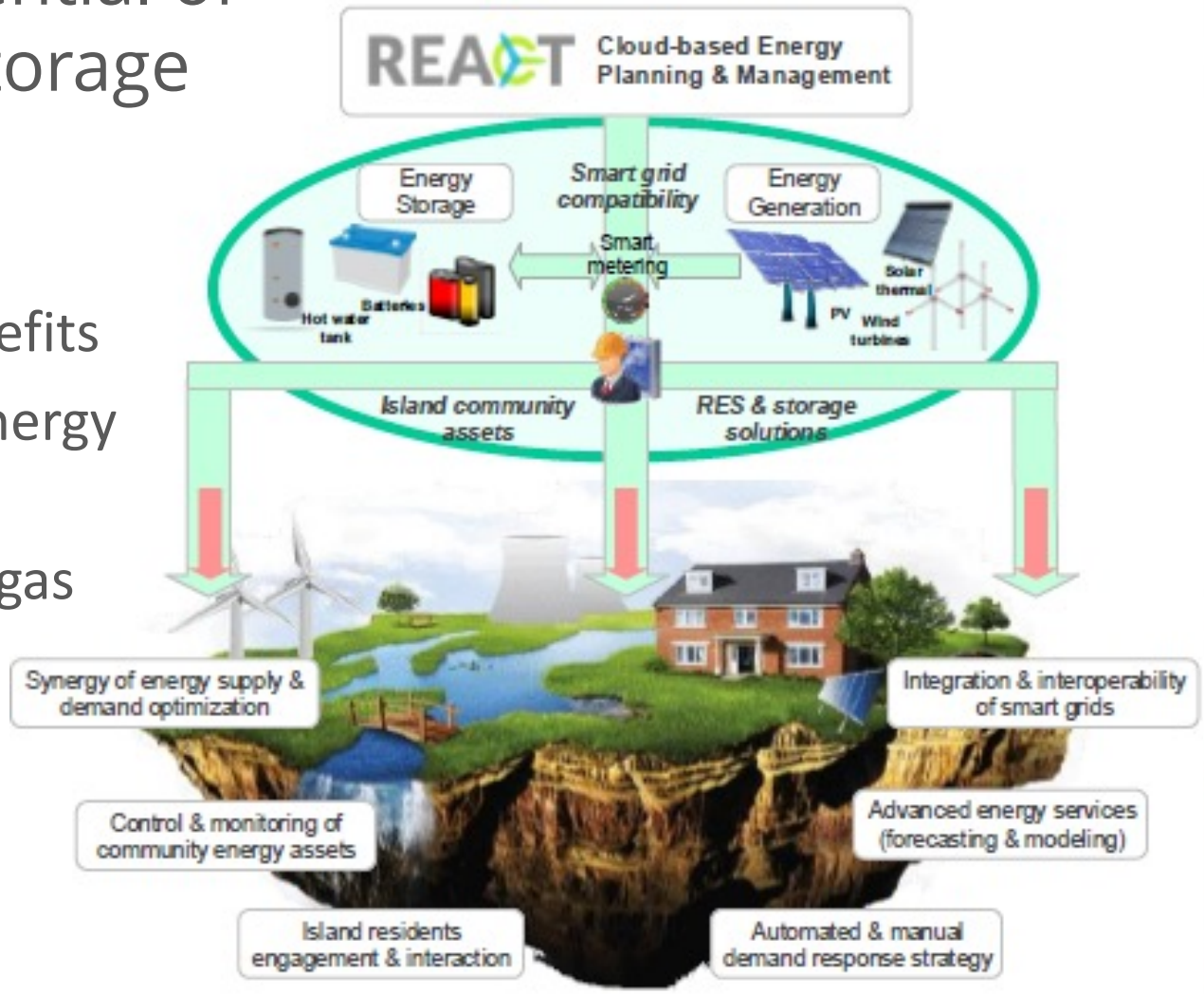
- H2020 funded project
- Jan 2019 - June 2023
- LC-SC3-ES-4-2018-2020: Decarbonising energy systems of geographical Islands
- 10 million budget
- 23 partners industry, energy authorities universities and research institutes



- REACT aims to demonstrate potential of RES and energy storage on islands to
  - bring economic benefits
  - decarbonise local energy systems
  - reduce greenhouse gas emissions
  - improve air quality



REACT PILOT ISLANDS

La Graciosa - SPAIN

San Pietro - ITALY

Aran Isles - IRELAND

REACT FOLLOWER ISLANDS

Gotland Island SWEDEN

Lesbos Prefecture GREECE

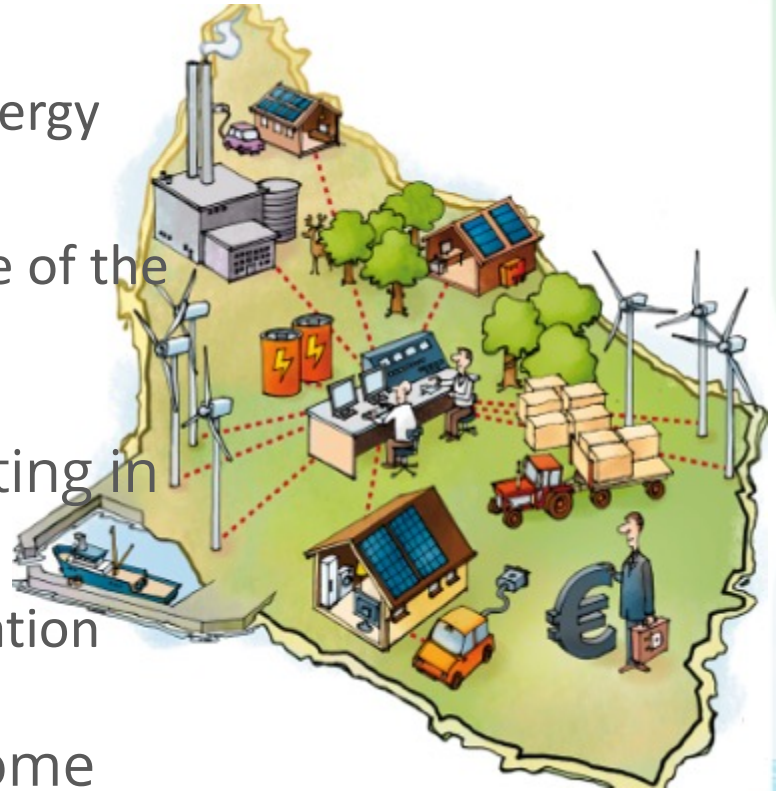
Isle of Wight UNITED KINGDOM

Majorca Island SPAIN

Reunion Island FRANCE

WHY ISLANDS?

- The transmission of energy is costly & inefficient
  - Affects energy security & increases the energy costs
  - Energy costs up to 400% higher than those of the mainland
- Significant population fluctuations resulting in highly variable energy load profiles
  - Reliance on diesel powered energy generation
- Islands offer a great opportunity to become first adopters of innovative technologies and smart grid solutions because they can be independent from traditional grid constraints



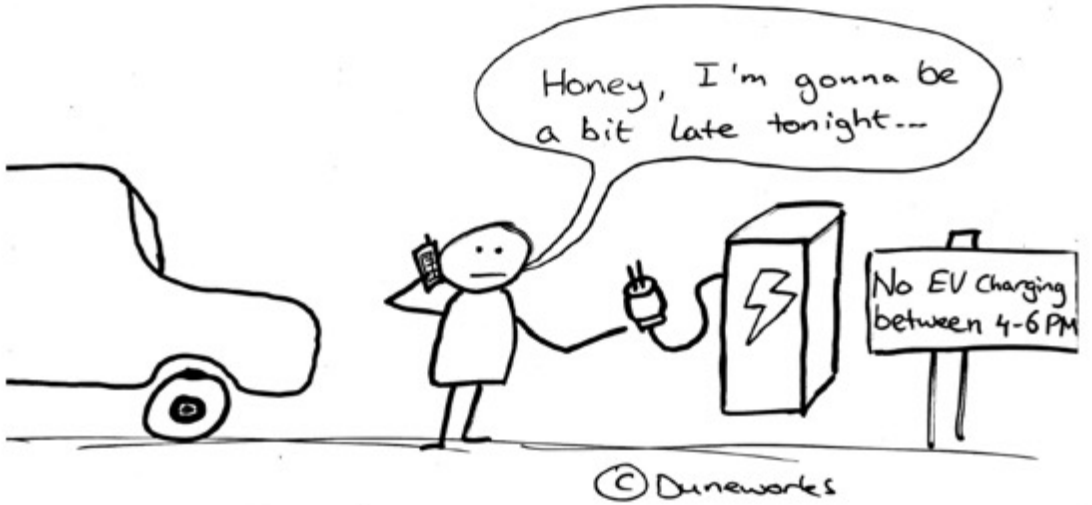
Not merely an engineering problem!

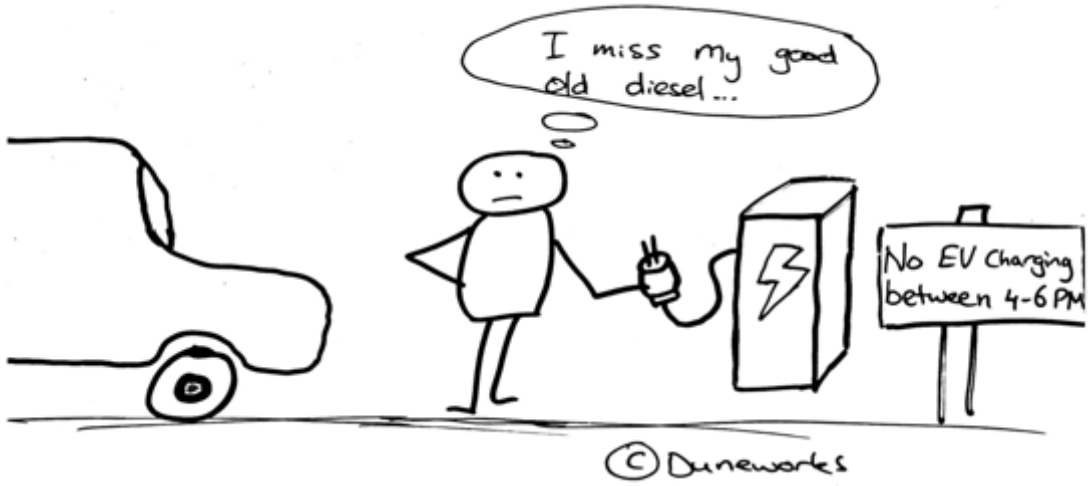
How do we make sure smart grid solutions integrate well with people's normal everyday life?

How will the smart grid solution affect people's routines and lifestyles?

What changes in people's comfort and convenience are possible?

How willing are people to adjust their everyday routines?

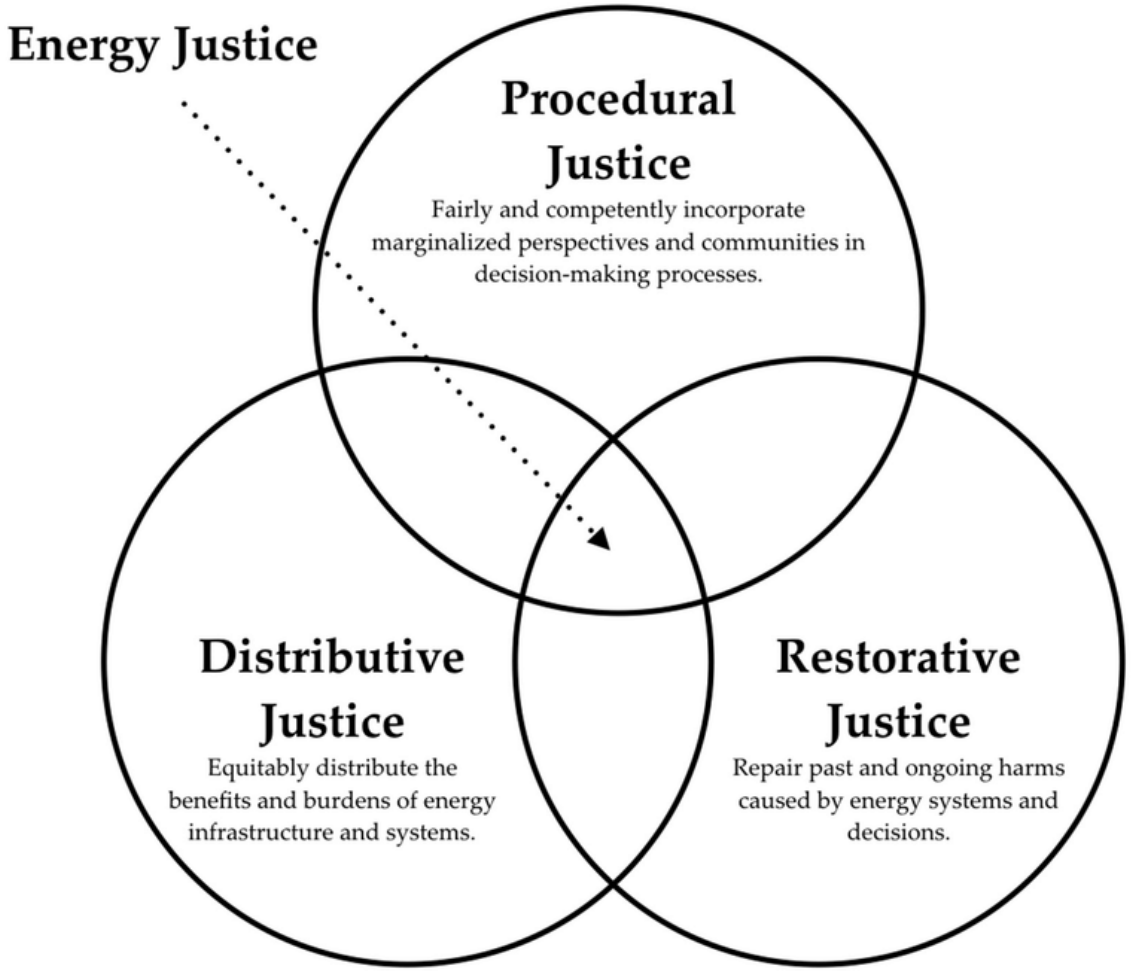




DR and users

- Familiarity with the SG concept and DR important (Li *et al*., 2017)
- Perceptions of what these technologies can and cannot do (Krishnamurti *et al*., 2012) crucial for their long-term success
- Adverse social outcomes
  - Disrupted household routines (Murtagh et al., 2014)
  - Lack of choice and autonomy (Calver et al., 2022)
  - Importance of contextual factors in demonstrations and deployment (Crawley et al, 2021)

Energy justice and DR in homes



Unequitable outcomes of SG and DR

Impacts

- Increased risk of fuel poverty among elderly & disabled (White et al., 2020) and risk of under-consumption (Calver & Simcock, 2021)
- Flexibility capital not equally distributed (who can offer it, when and at what price) (Powells & Fell, 2019)

Process

- Limited user engagement in SM deployment (Jenkins et al., 2018)
- Lack of connectivity in poorer areas (Sovacool et al., 2019) and prepayment meters (Crosbie, 2004)

Barriers/intersections

- Risk-averse behaviour (Marikyan et al., 2019) increasingly amongst disabled and vulnerable groups (de Chavez, 2018; Snell et al., 2015)

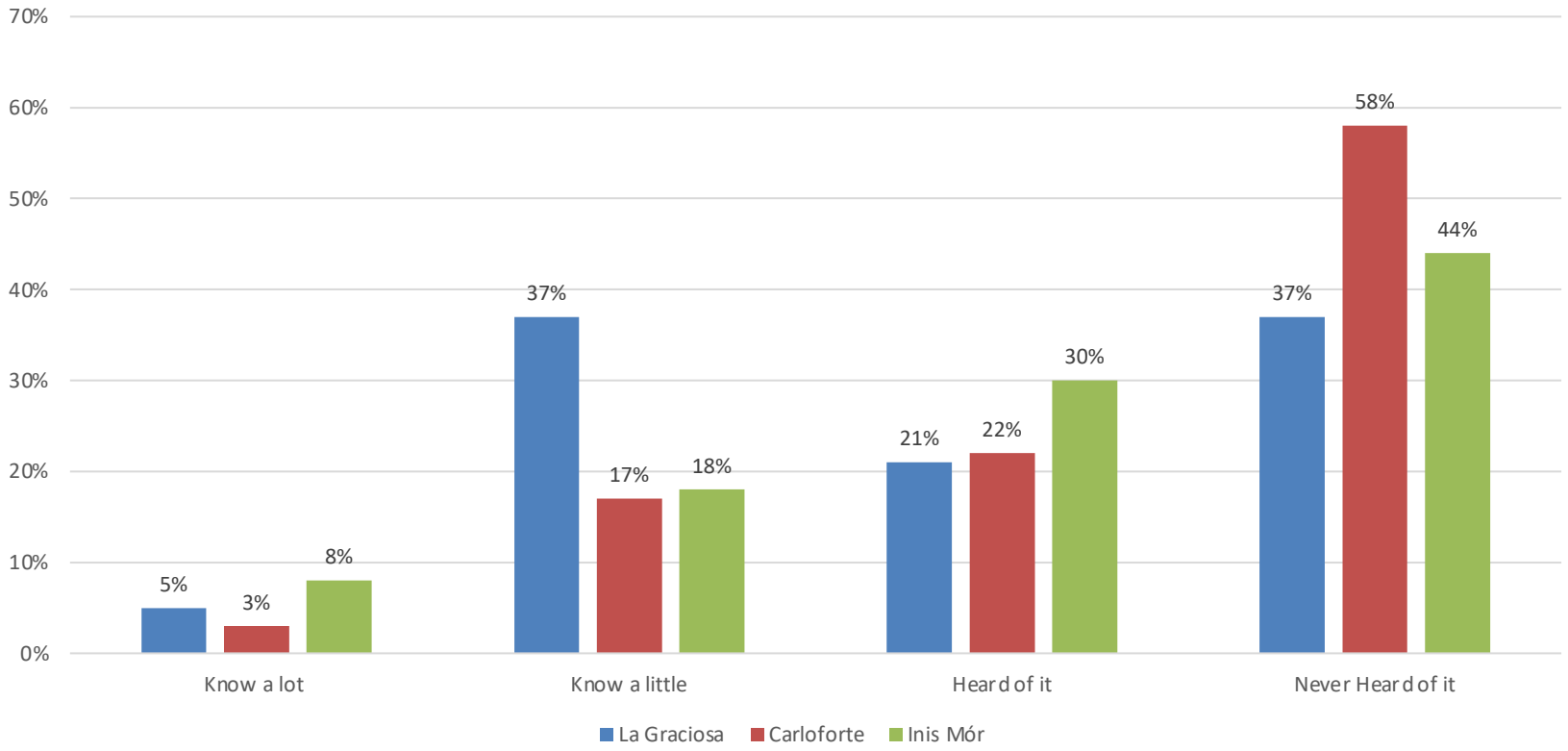
Methods

Data collection: survey questionnaire

- One survey conducted in the three islands
- 31 questions
  - Caleta del Sebo in La Graciosa (Spain)
    - 21 surveys collected 13% of pop
  - Carloforte in San Pietro (Italy)
    - 77 surveys collected 3% of pop
  - Kilronan, Inis Mór one of the Aran Islands (Ireland)
    - 81 surveys were collected 35% of pop

Data analysis: using Generalised Linear models / regression analysis

Results
Familiarity with the SG

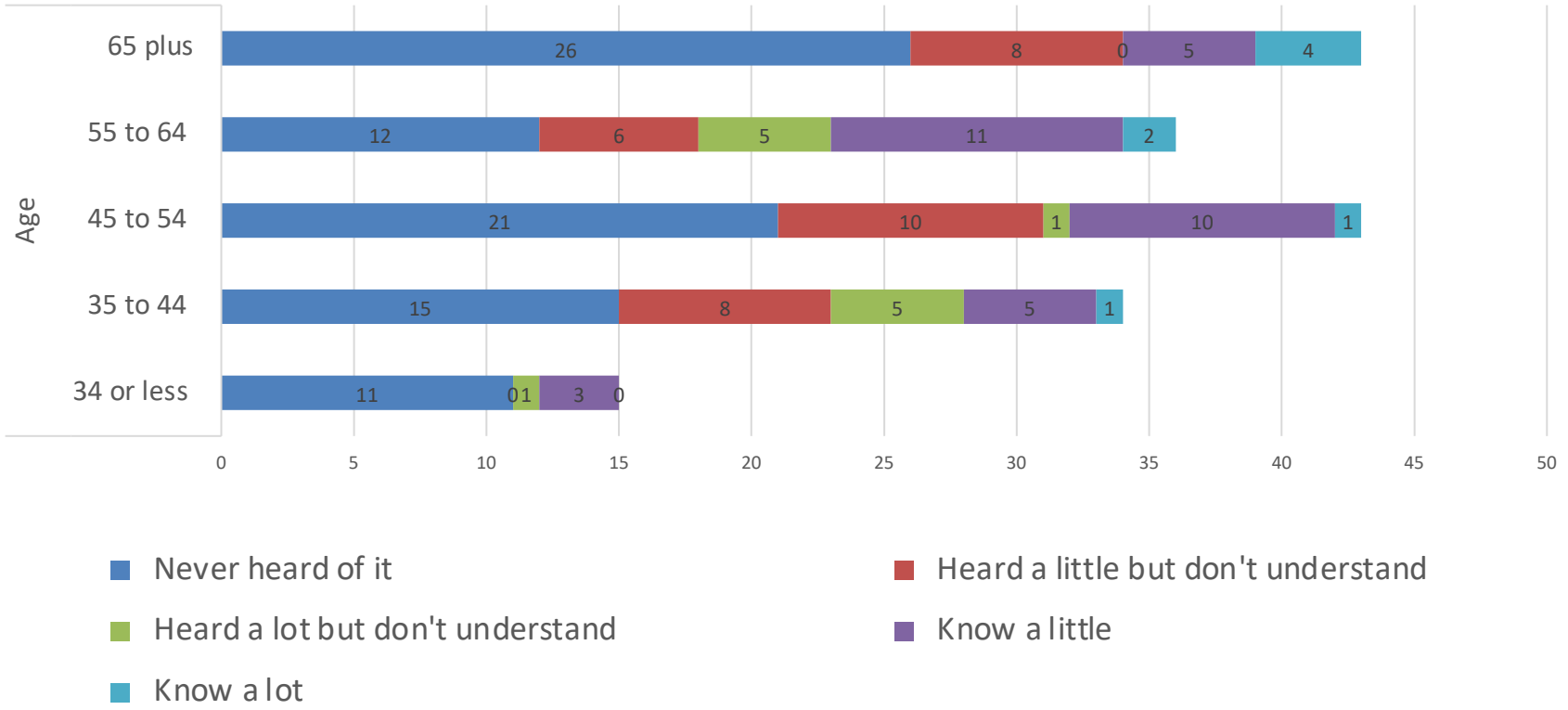


In response to the question “How familiar were you with the concept of smart grids before this questionnaire/before being contacted by REACT?

Results

Factors influencing knowledge/familiarity with SG:

Model 1: *Familiarity with SG ~ Age*



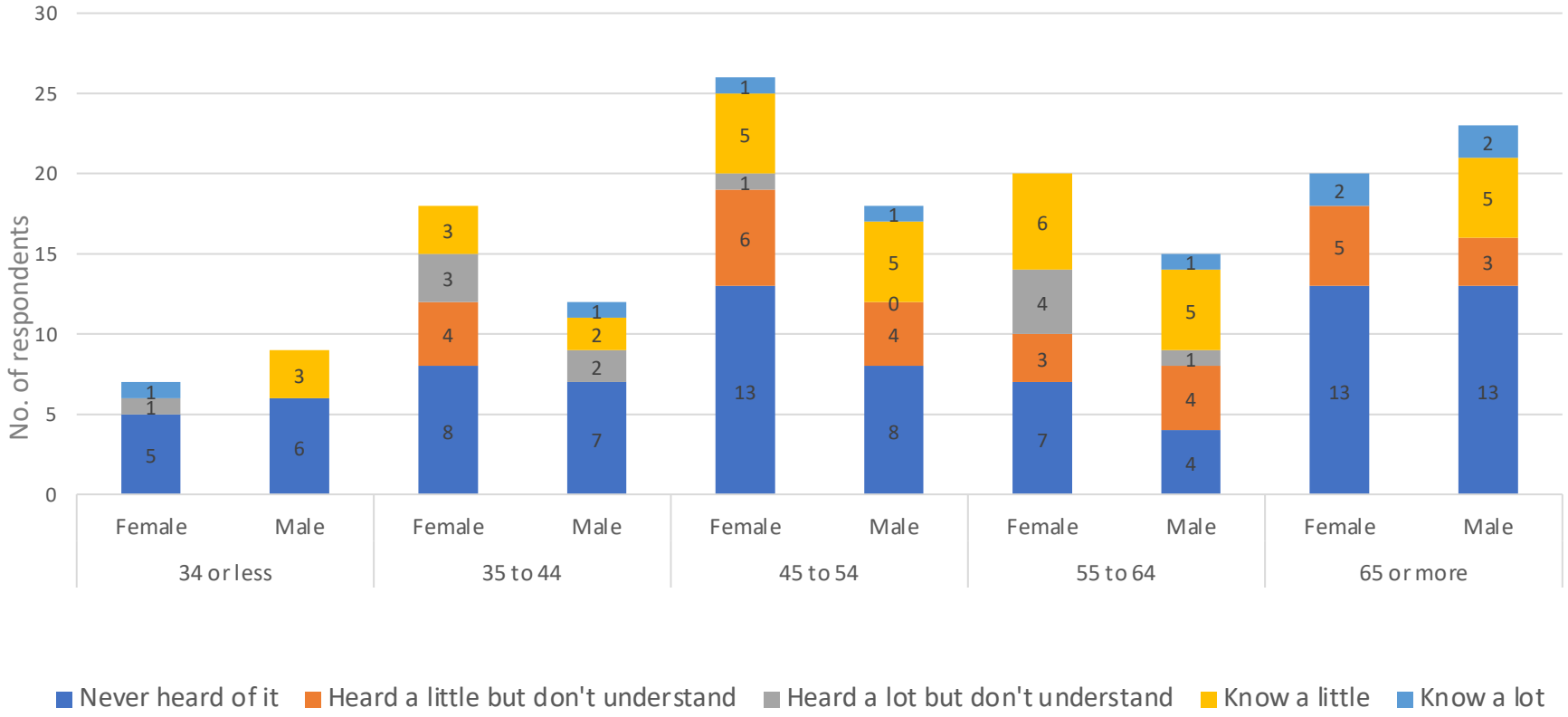
Comparing familiarity with the SG concept with age

Older age groups **tend** to be less familiar with SG concept

(chi-sq.= 0.012)

Results

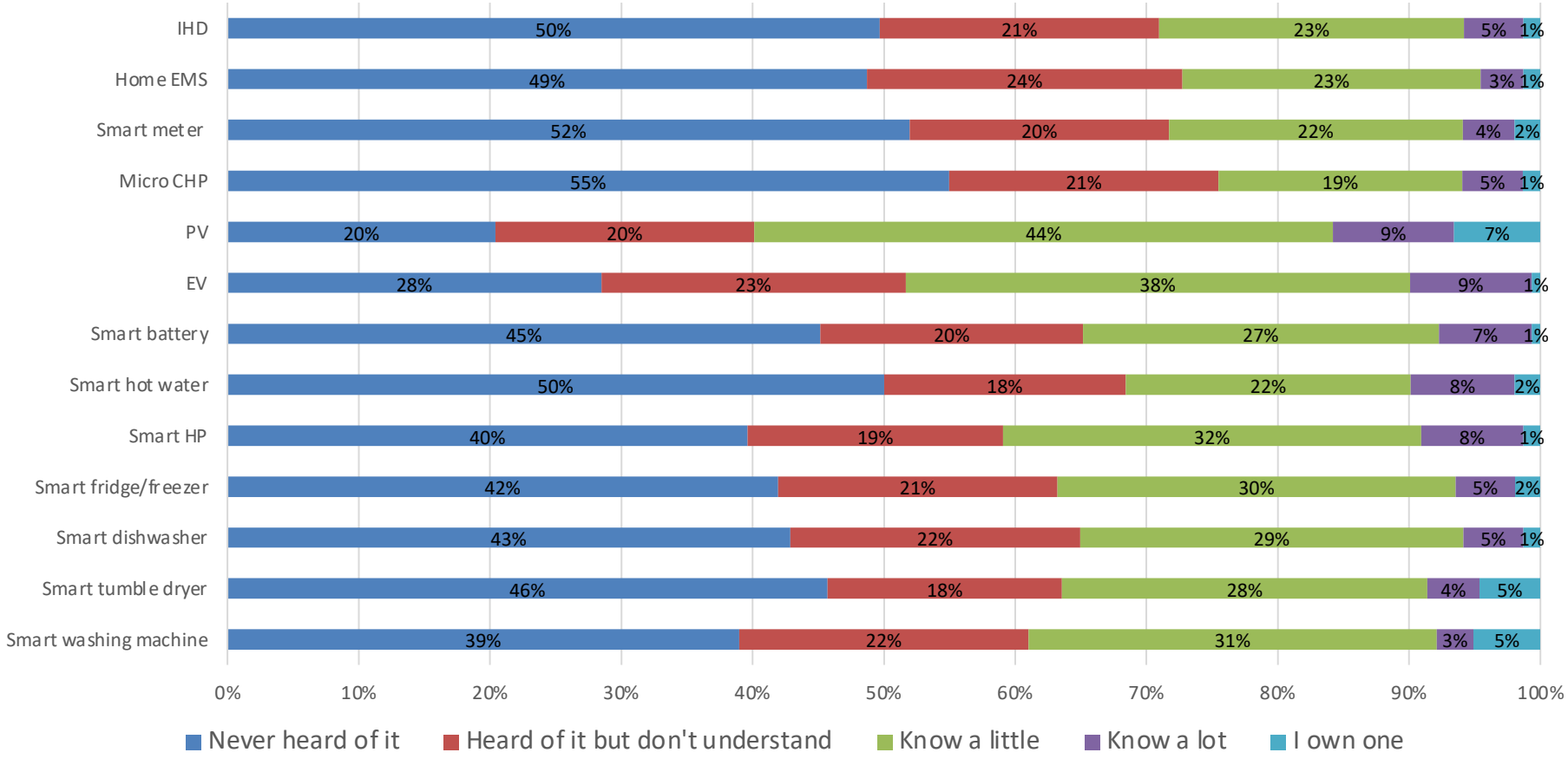
Factors influencing knowledge/familiarity with SG: Model 2: *Familiarity with SG ~ Age + Gender*



Familiarity with the SG concept strongly related to age when controlling for gender

(chi-sq.= 0.008)

Results
Familiarity with DR technologies

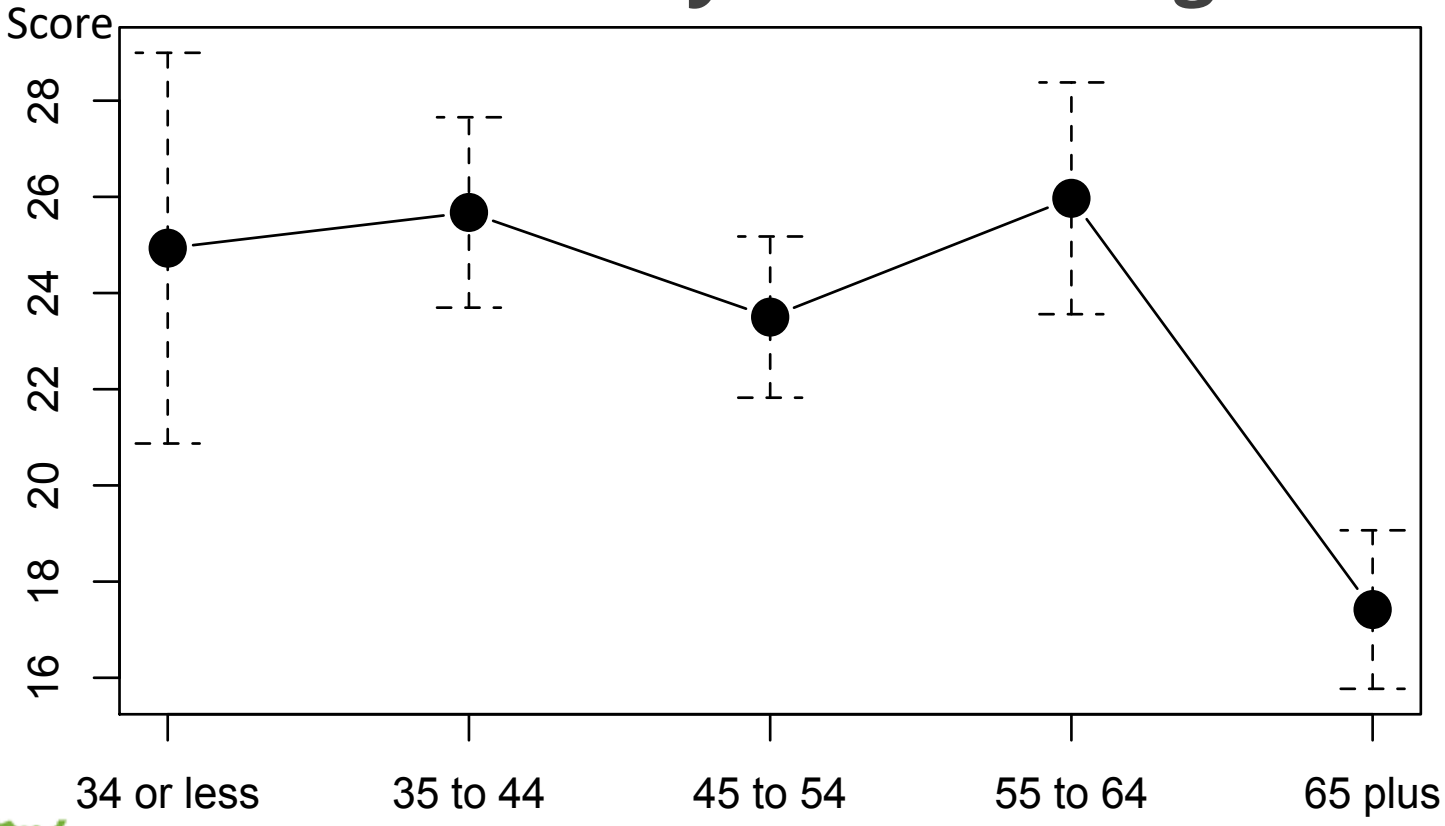


Question “how familiar are you with the following technologies?”

Results

Factors influencing familiarity with DR technologies

Model 3: *Familiarity with SG ~ Age*

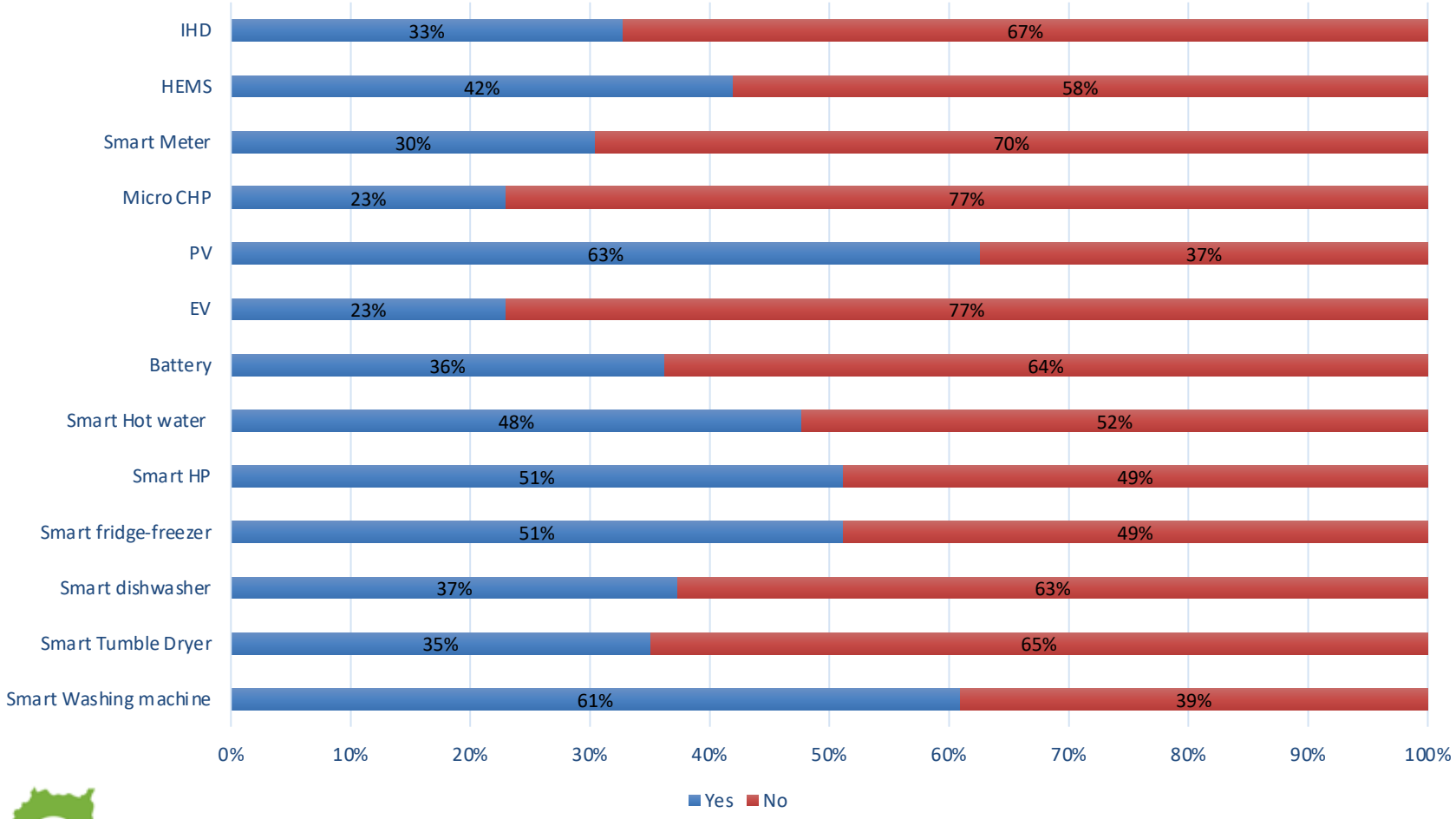


Knowledge of DR technologies across different age groups

Older age groups less likely to know about DR technologies

(chi-sq.=0.0415)

Results
Acceptance of DR technologies

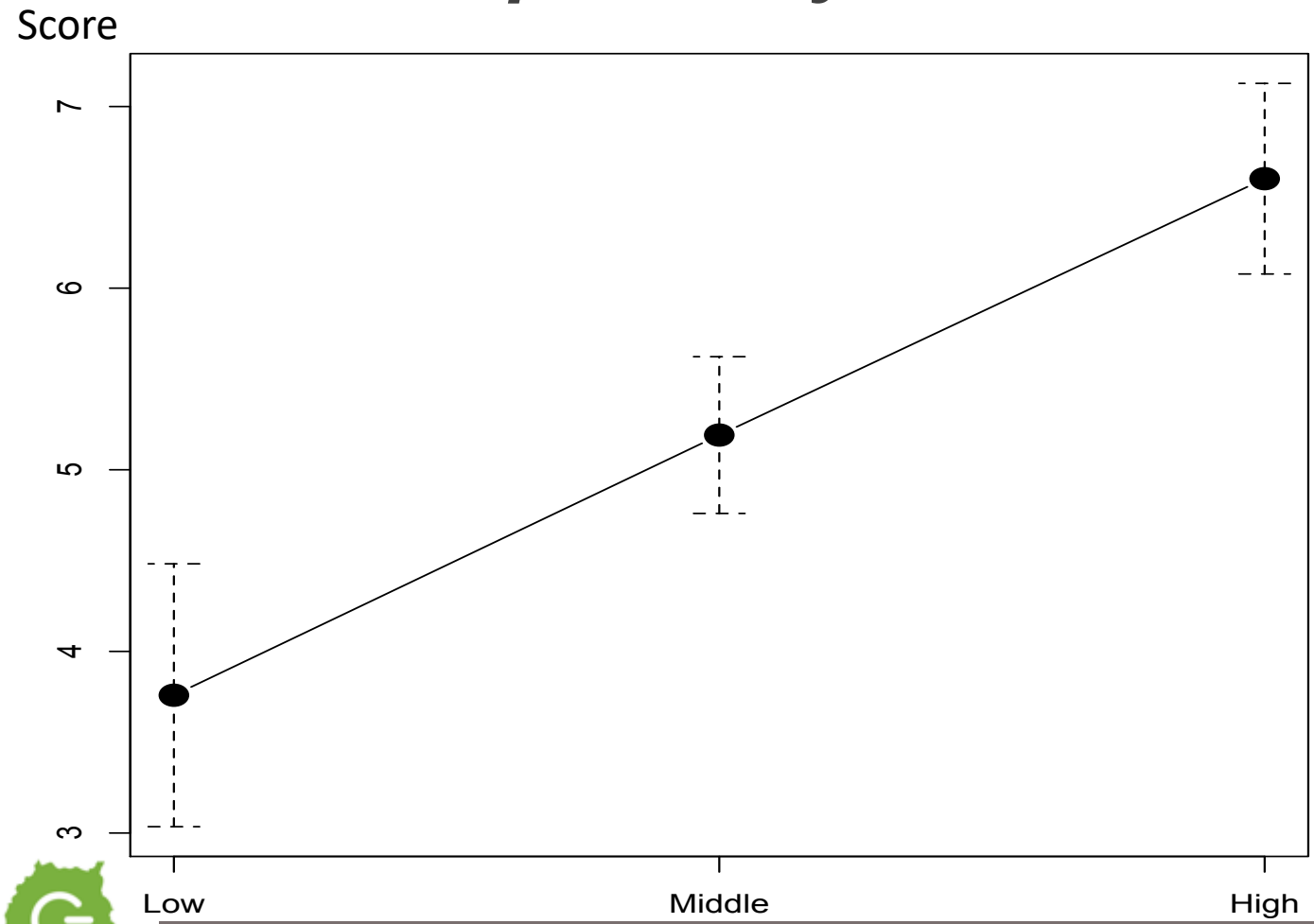


Question: “Which of the following appliances/systems would you like to use? (Please select all those that apply)”

Results

Factors influencing acceptance of DR technologies

Model 4: *Acceptance of DR ~ education*



A score for acceptance was calculated

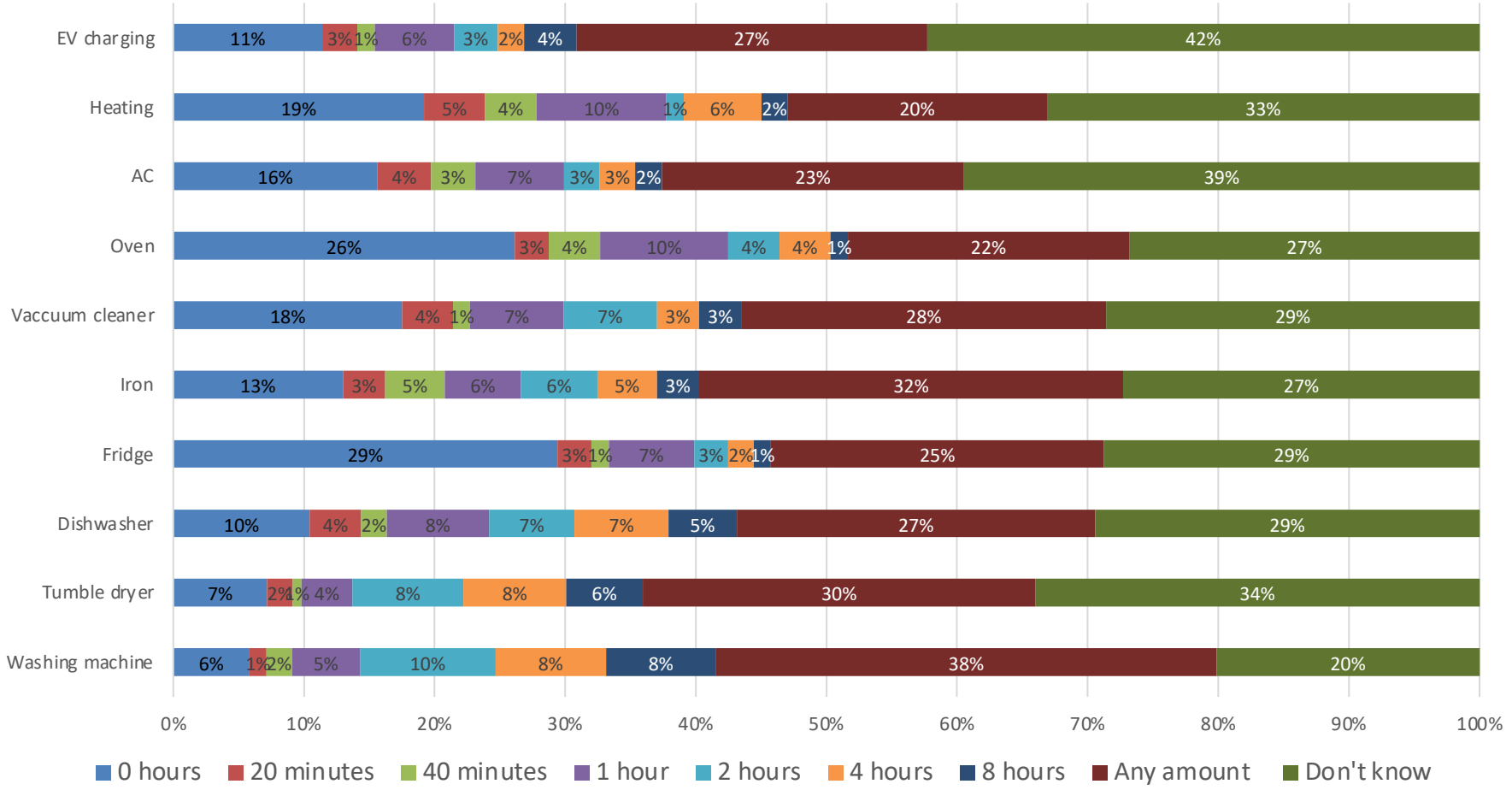
Acceptance of DR (score) compared across education levels

Those with higher education are more likely to accept DR

(Chi-sq.=0.01992)

Results

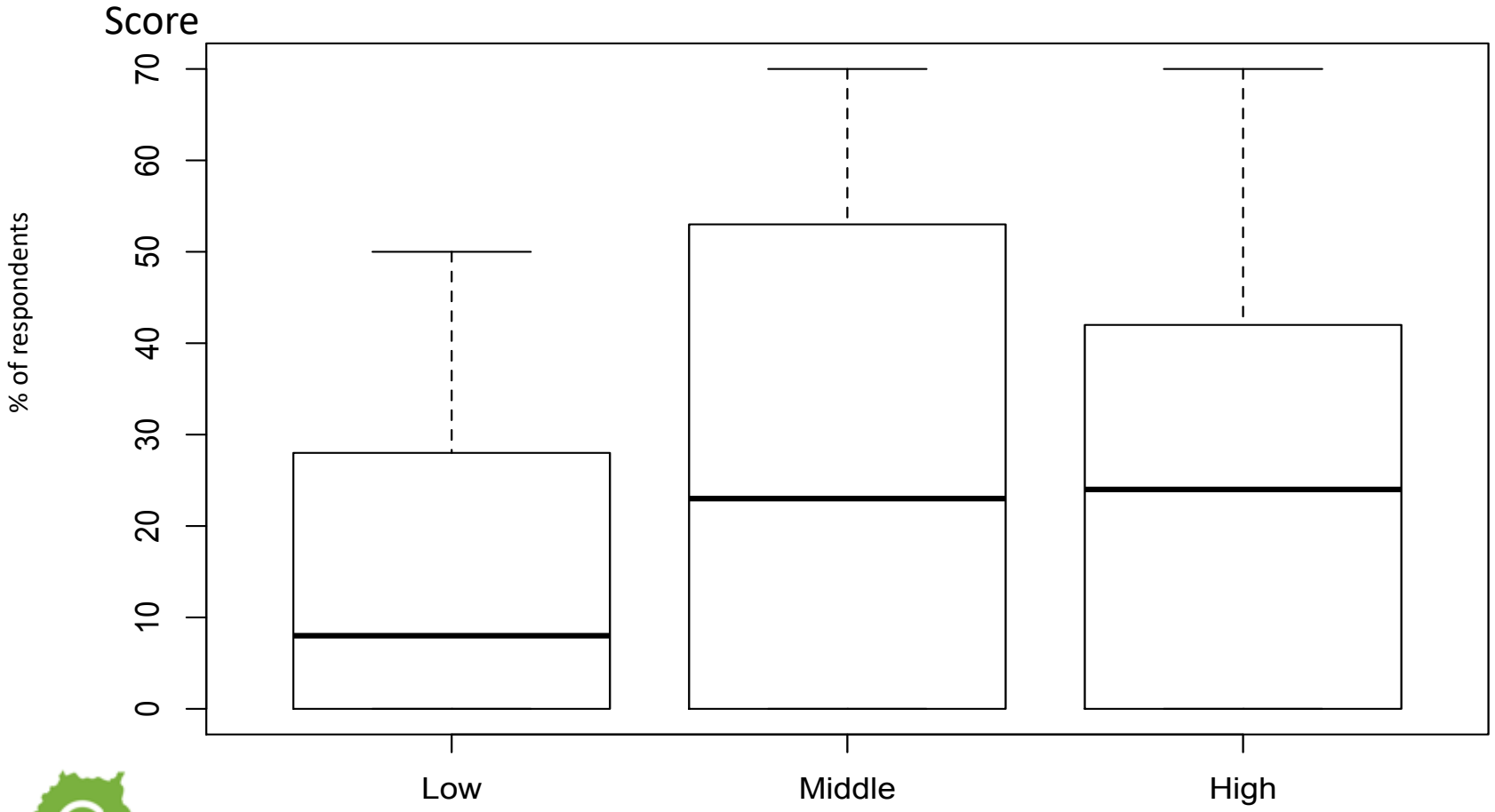
Modifying time of appliance use



Question: “How long are you willing to postpone the start of the following appliances in order to use cheap energy?

Results

Model 5: Flexibility ~ *education* + *Familiarity with SG* + *Familiarity with DR technologies*

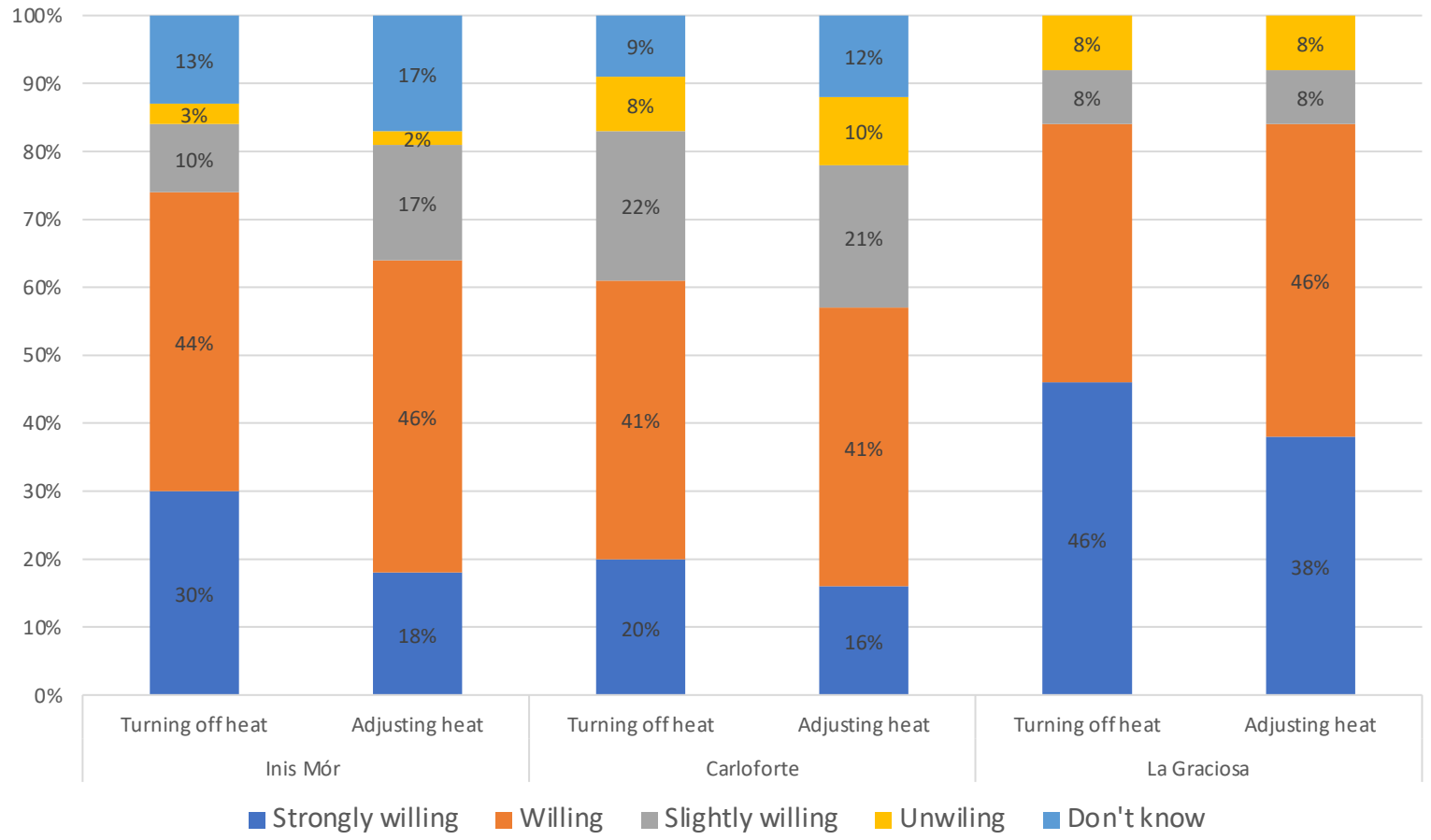


Flexibility (score) across different levels of education

Control for familiarity with DR and SG

Those with higher education **tend** to accept flexibility

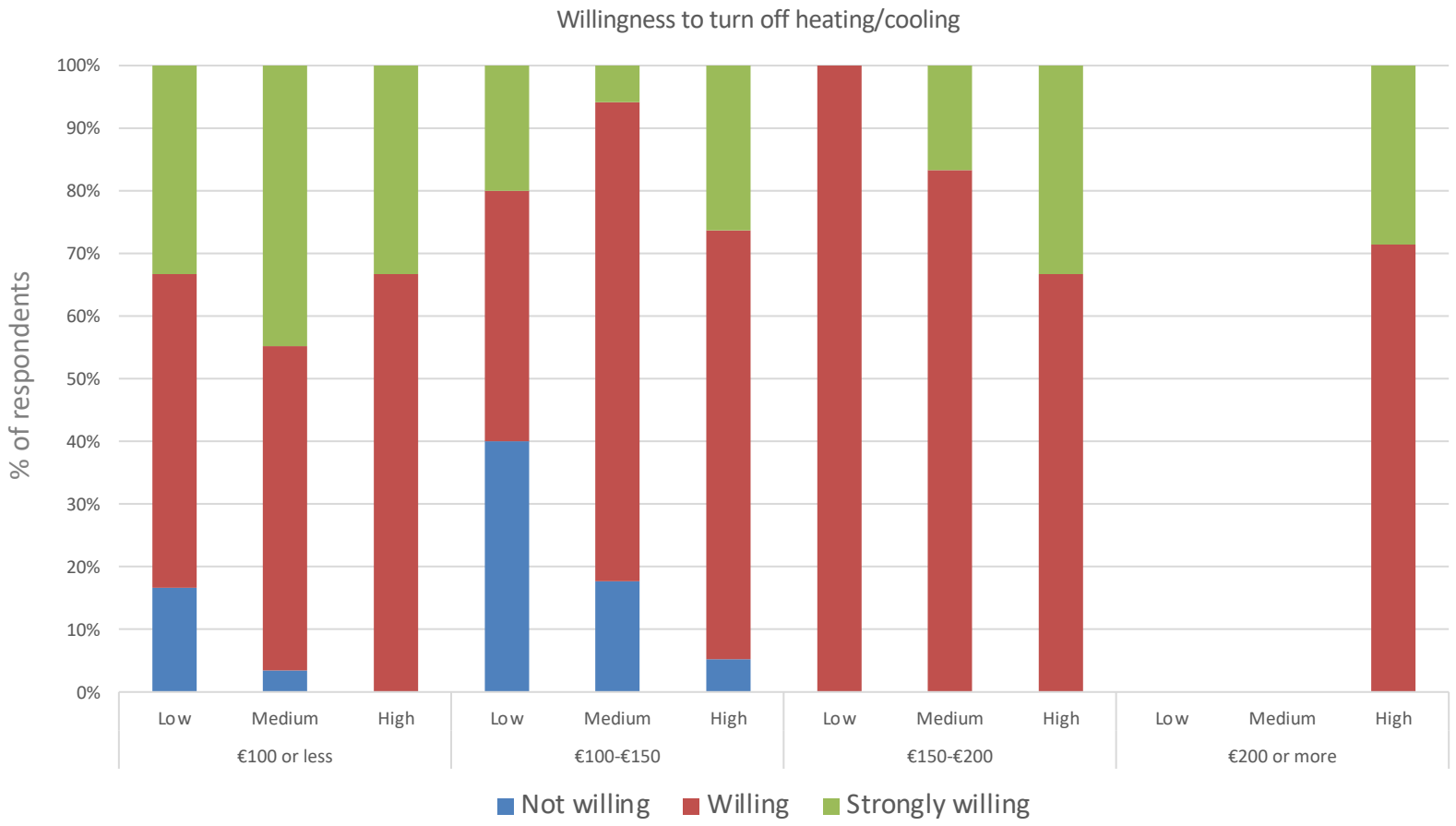
Results
Flexibility and thermal comfort



Heating/cooling flexibility (turning off and adjusting temperature) across the three islands.

Results

Model 6: Turn off heating/cooling ~ *Cost* + *Impact*



Willingness to turn-off heating/cooling compared across energy bill impact (low, medium, high) and reported cost

Willingness related to cost of energy (chi sq=0.11) and felt impact (chi sq=0.66).

Results

Model 6: Modifying heating/cooling temp ~ *Cost* + *Impact*

Willingness to <u>modify temp. for heating/cooling</u> compared across energy bill impact and reported cost

Strong tendency between will to modify temp and cost (chi-sq= 0.02252)

Conclusions (1/2)

- Familiarity with DR technologies and familiarity with the SG concept is key to engaging with DR and solutions like REACT.

- Higher energy costs linked to increased willingness to change behaviour, suggesting important arguments to make for DR as an energy saving strategy or households.

- Marginalised individuals (older people, women and people with lower educational attainment) within society are the less likely to engage in and benefit from DR and SG initiatives.

What does this mean for DR (2/2)

- Restore: Efforts towards making DR corrective for fairness of energy services for society
  - Investment in marginalised/lower-income areas
- Distribute impacts fairly
  - Over-ride option and other design solutions to widen engagement
- Process fairly and transparently
  - Who is having their say?
  - Are people having a choice?
  - Are we reaching the ones who are most in need?
  - Do they understand what they're getting into?
- Recognise: DR and the SG can have inequitable and unjust outcomes in the energy transition

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THANK YOU FOR YOUR ATTENTION

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