User-Centred Energy Systems

Users TCP Overview, strategic plan and highlights

Users TCP Day - 06 April 2022

David Shipworth - Chair

Users TCP is a Technology Collaboration Programme by IEA

Users TCP is **functionally and legally autonomous** from the IEA

Users TCP's views and findings do not necessarily reflect those of the IEA

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The Mission

The Mission of the UsersTCP is to provide evidence from socio-technical research on the design, social acceptance and usability of clean energy technologies to inform policy making for clean, efficient and secure energy transitions.

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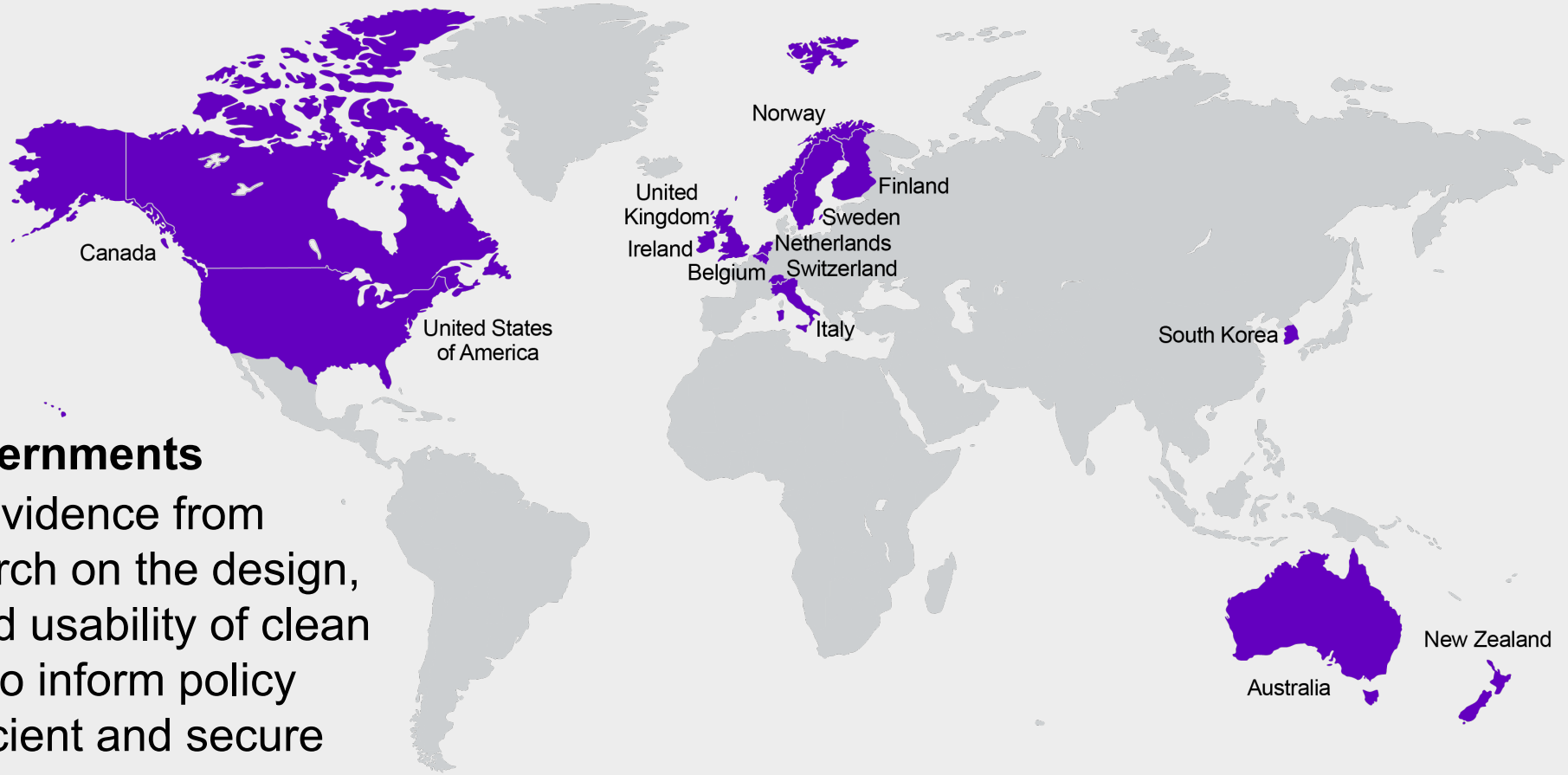

5 active Tasks

15 participating governments

Mission: to provide evidence from socio-technical research on the design, social acceptance and usability of clean energy technologies to inform policy making for clean, efficient and secure energy transitions.

Tasks

UsersTCP | Hard-to-Reach Energy Users

UsersTCP | Peer-to-Peer Energy Trading

UsersTCP | Social License to Automate

UsersTCP | Behavioural Insights Platform

UsersTCP | Gender and Energy

Behaviour exist in a technical, economic and social context

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You can only make choices between:

- Technologies that exist
- That are available to you
- That you can afford
- That you have the time to use
- That you are physically able to use
- That you know how to use
- That are socially acceptable to use

Today's choices shape tomorrow options:

- Choosing reinforces familiarity & social acceptance
- Businesses make more of the things people choose
- Businesses make things like what people choose
- Systems get 'locked-in' by reinforcement learning
- Incumbents seek market and regulatory dominance

People choose largely based on cost, convenience, and social familiarity

Changing behaviour = changing people's landscape of options

- Creating new products and services (innovation)
- Changing comparative costs (scaling, taxes)
- Changing comparative convenience (usability, service quality, infrastructures, regulations)
- Changing comparative social acceptability/connectivity (media campaigns and interoperability)

Estimating behavioural contributions to Net Zero

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IEA Net Zero Report (2.5.2 Behavioural change)

- "The …transformation of the energy sector …cannot be achieved without the active and willing participation of citizens." (p.67)
- NZE emissions reduction requirements:
  - 55% require a mixture of the deployment of low-carbon technologies and the active involvement or engagement of citizens and consumers
  - 8% from direct behavioural changes and materials efficiency gains

IPCC 6th Assessment Report

- "The indicative potential of demand-side strategies across all sectors to reduce emission is 40-70% by 2050 (high confidence)"
- "Alternative service provision systems, for example those enabled through digitalization, sharing economy initiatives and circular economy initiatives, have to date made a limited contribution to climate change mitigation (medium confidence)."

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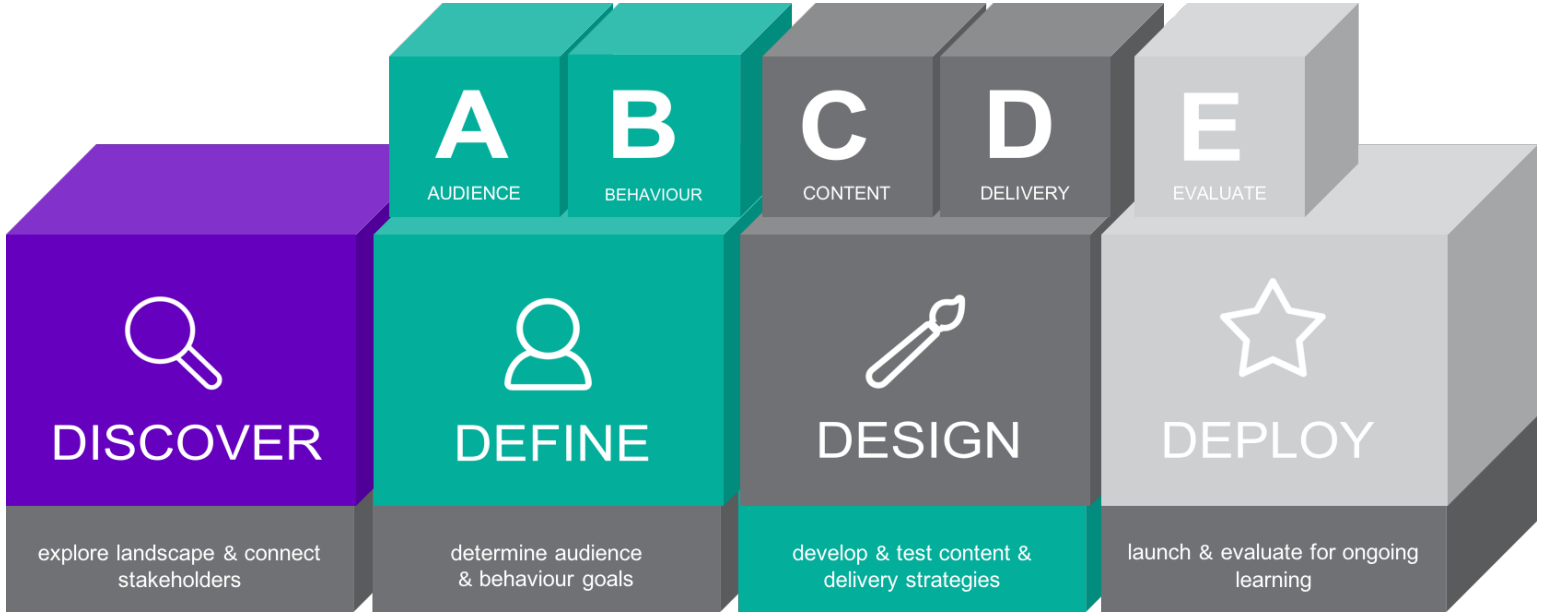
Hard-To-Reach Energy Users Task

“Our shared goal for this Task is to identify, define, and prioritise HTR audiences; and design, measure and share effective strategies to engage those audiences to achieve energy, demand response and climate targets while meeting access, equity, and energy service needs.”



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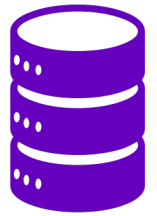
Energy Sector Behavioural Insights Platform

The Energy Sector Behavioural Insights Platform brings together government policy makers and other experts to share knowledge and experiences applying Behavioural Insights to energy policy.

What is a "Platform"?

A global network of policy makers



A database of policy case studies

Guidance for policy makers

The overall aim of the Task is to improve the efficacy of demand-side energy policies by ensuring that human behaviour is accounted for at all stages of the policy cycle.

Global Observatory on Peer-to-Peer, Community Self-Consumption & Transactive Energy [GO-P2P]

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Aim: Maximise self-consumption, minimize imbalance, and flatten aggregate profile within the LEC boundary

Imbalances socialised by supplier/aggregator

Additional embedded generation

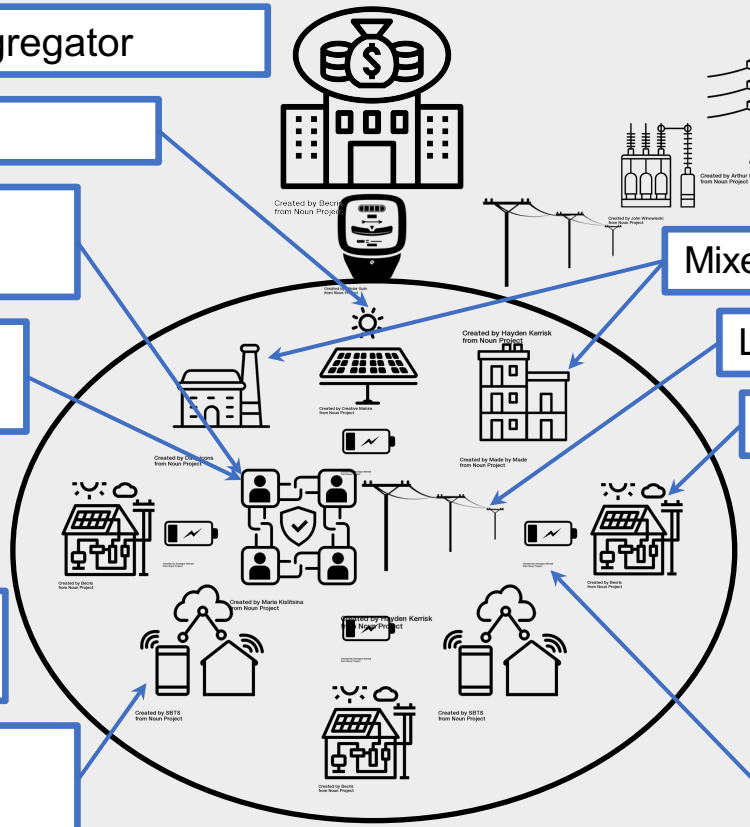
Smart contracts + IoT control desynchronisation of heavy loads

DLT + smart contracts = transaction layer for balancing & settlement

Forward facing markets align flexible demand with intermittent generation

ML/AI based generation ‘now-casting’ permits optimization of storage/markets

DSR from IoT adjusts load shape to balance schedule



Power system

Mixed use developments diversify load profiles

Local DSO transmits power between peers

Prosumers supply LEC/P2P market

Balance group size & diversity promotes load smoothing

ML/AI based demand ‘now-casting’ permits optimization of storage

Storage buffers variations between scheduled and realised demand.

P2P/CSC balance group boundary

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‘Plug & Play’ Smart Home Technologies: A joint scoping project with 4E EDNA

Current challenges:

• Misrepresenting SHT benefits causes distrust disengagement.

• SHTs frequently don’t accommodate user’s complex, diverse and dynamic needs.

• The onboarding experience often fails to prepare users to operate their SHTs,

• Many users feel intimidated by the complexity of the systems.

• Installation errors make using the technologies harder and the feedback less useful.

• Automation is liked – provided users remain in control.

• Poor automation undermines user trust and they intervene.

Recommendations:

• Encourage business to create usable, holistic solutions

• Develop shared infrastructures to help speed up understanding of usability issues in the energy sector

• Governments should design markets that flow the value of increased flexibility to the right place in the system, including the demand side.

• Don’t wait for usability issues to emerge, actively seek to uncover them. The development of shared learning infrastructures can help speed this up.

• Invest in innovation to help the sector understand how to deliver positive and engaging user experiences.

Behavioural contributions to energy system flexibility and resilience

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Normal conditions (Unknown -> Good)

- Local flexibility markets aggregating and automating DER assets increase renewables penetration, and provide flexibility and resilience in power systems.
- GO-P2P highlights the importance of automated balancing and settlement of local energy markets to maximise self-consumption and minimise grid constraints.
- The Smart Home Technologies joint UsersTCP/4E project showed users want to retain control over their DER assets.
- The Social License to Automate Task found users accept automation where users' and networks' goals were aligned.

Extreme conditions (Unknown -> Bad)

- Under extreme conditions will users withdraw consent for use of their assets ('market defect')?
- If network headroom assumes 'normal' market participation, market defection could accelerate system failure.
- If warned of a 50% chance of power rationing – would you let the grid discharge your battery?

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Contact Us

For more information,
visit userstcp.org
or email TCP Secretariat
at admin@userstcp.org