User-Centred Energy Systems

userstcp.org

PROJECT OVERVIEW

Social License to Automate 2.0

Participating Countries:

Austria (coordinator),
Ireland, Netherlands,
Norway, Sweden,
Switzerland
Supporting: Australia

Runtime:

Nov 2022 – Oct 2024

Participating Institutions:

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY
TOMORROW TODAY

FH University of Applied Sciences TECHNIKUM WIEN

ENERGIE INSTITUT an der Johannes Kepler Universität Linz

CHALMERS UNIVERSITY OF TECHNOLOGY

UNIL | Université de Lausanne

NTNU

UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh

TUDelft

WESTERN SYDNEY UNIVERSITY

UsersTCP

Social
License to
Automate 2.0

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY
TOMORROW TODAY

FH TECHNIKUM WIEN
University of Applied Sciences

CHALMERS
UNIVERSITY OF TECHNOLOGY

UNIL | Université de Lausanne

ENERGIE INSTITUT
an der Johannes Kepler Universität Linz

WESTERN SYDNEY
UNIVERSITY

NTNU

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

TUDelft

Publications

1. Bernadette Fina, Selin Yilmaz, Frederike Ettwein, Na Li, Andrea Werner (2023) Typologies of energy community initiatives and their social implications. IAEE 2023, July 24-27, Milan, IT

2. Ida Marie Henriksen, Helena Strömberg, Lisa Diamond, Jennifer Branlat, Lenart Motnikar, Giulia Garzon, Declan Kuch, Selin Yilmaz, Tomas Moe Skjølsvold (2023) The Role of Gender, Age and Income in Demand Side Management Participation: A Literature Review. BEHAVE 2023, Nov 28-29, Maastricht, NL

3. Giulia Garzon, Selin Yilmaz, Na Li, Andrea Kollmann and Benjamin Kirchler (2023) Unveiling Energy Consumption Flexibilities from a Gender and Diversity Perspective. BEHAVE 2023, Nov 28-29, Maastricht, NL

4. Bernadette Power*, Dr. Gordon Sirr, Geraldine Ryan, Dr. John Eakins (2023) Community owned/co-owned wind farms: The extent and the determinants of citizens' willingness to participate under different types of arrangements. BEHAVE 2023, Nov 28-29, Maastricht, NL

5. Geraldine Ryan, Bernadette Power, John Eakins (2023) Sparks of Change: How do Age and Gender Impact the Actions Taken to Reduce Energy Use? BEHAVE 2023, Nov 28-29, Maastricht, NL

6. Lisa Diamond, Frederike Ettwein, Bernadette Fina, Giulia Garzon, Benjamin Kirchler, Andrea Kollmann, Lenart Motnikar, Andrea, Werner, Jennifer Branlat, John Eakins, Ida Marie Henriksen, Declan, Kuch, Na Li, Bernadette Power, Geraldine Ryan, Tomas Moe, Skjølsvold, Helena Strömberg, Selin Yilmaz (2024). An Inclusive and Community-Oriented Social License to Automate: First Insights. EnInnov 2024, Feb 14-16, Graz, AT

7. Ange Nkonko Kibelo Martin's, Benjamin Schmid, Lisa Diamond, Arbogast Nyandwi, Mélanie Michel, Selin Yilmaz (2024) Social Processes in Renewable Energy Communities Insights from Stakeholder Interviews in Switzerland and SSA, DigiCarbon 2024,

8. 2 presentations without abstracts (at Highlights of Energy Research 2024, AT; MIA 2024, AT)

9. 3 journal papers submitted, 1 in development
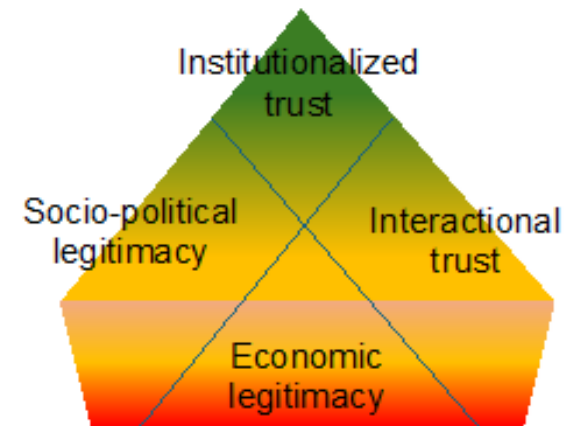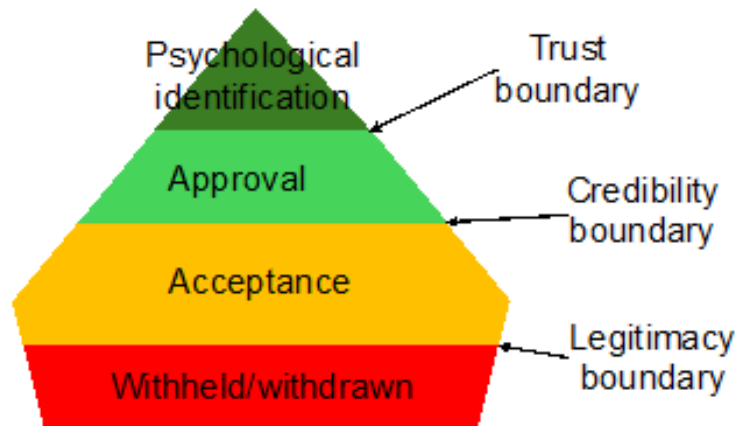
10. Final report in development

Social License to Automate Concept

The *Social Licence to Automate* concept refers to:

"…the extent to which an initiative has **the approval or acceptance of communities of stakeholders**, and captures a cluster of factors **beyond that of formal legal approval** which can shape its reception"

Adams, S., Kuch, D., Diamond, L., Fröhlich, P., Henriksen, I. M., Katzeff, C., Ryghaug, M., & Yilmaz, S. (2021). Social license to automate: A critical review of emerging approaches to electricity demand management. *Energy Research & Social Science*, *80*, 102210. https://doi.org/10.1016/j.erss.2021.102210

Social License to Automate Concept

R. G. Boutilier und I. Thomson, „Modelling and measuring the social license to operate: fruits of a dialogue between theory and practice", Social Licence, Bd. 2011, S. 1–10, 2011.

Motivation & Background

Results of SLA have shown that

- **DSM programs are typically still designed for generic users**, overlooking the impact user diversity has on their awareness, motivation, benefit perception, actionable knowledge and ability to participate
- Are typically addressing end-users as individuals, **struggling to achieve a sufficient reach** and are **missing opportunities** to harness the power of different types of **stakeholders** such as middlemen to help with achieving a social license
- **Fail to offer different types of involvement** to end-users depending on their ability and willingness to participate and expend effort, partly due to **missing insights and data** that would allow to differentiate between users with regards to their potential to respond to demand side needs

Objectives

1. **Understand the role of gender and diversity factors** in energy consumption flexibility and identify associated engagement approaches

2. **Identify flexibility consumption profile markers via load profiles** and define **criteria for data quality and standardization** of flexibility profiles through a consolidated assessment

3. **Identify the contribution potential of energy communities** (EC) and other community energy approaches towards establishing/ granting a *Social License* to automate
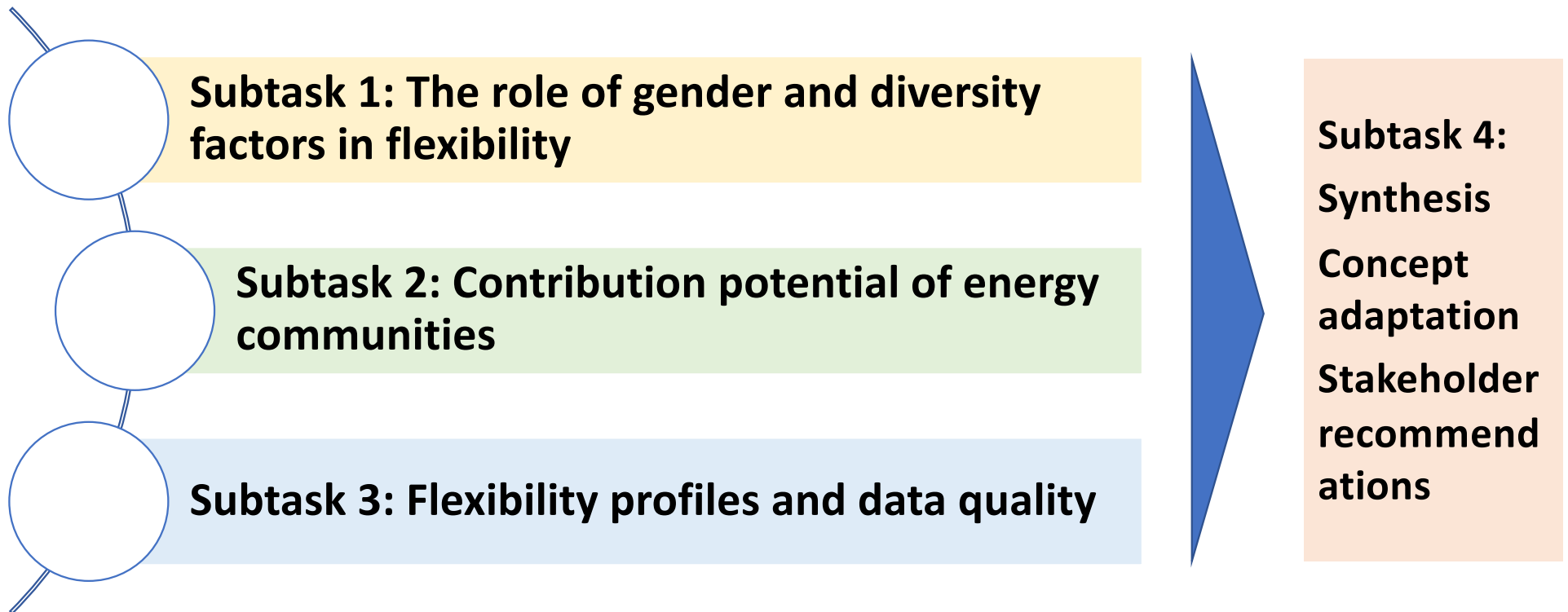
Image source: Freepik.com

Objectives

4. **adapt the social license concept towards** an integration of more diverse user groups and community approaches and the roles of different stakeholders

5. **develop stakeholder-specific recommendations** regarding flexibility-profiles, engagement approaches based on them and the use of community energy projects to reach more diverse user groups and increase acceptance and scalability

Image source: Freepik.com

Task Structure

Subtask 1: The role of gender and diversity factors in flexibility

Subtask 2: Contribution potential of energy communities

Subtask 3: Flexibility profiles and data quality

Subtask 4: Synthesis

Concept adaptation

Stakeholder recommendations

Technology Collaboration Programme
by iea

Social License to Automate 2.0
UsersTCP

Gender and Diversity Factors of Flexibility

Subtask 1: Diversity & Flexibility
Literature Research

- **Gender**
  - DSM technology and communication is typically **designed with male, technology-affine users in mind**, not reaching women sufficiently
  - **Gender roles** challenge DSM implementation with the home as a feminine domain, technology as masculine domain

- **Income**
  - **Energy saving practices are already part** of the everyday life of the energy-poor but homes they live in are often **energy-inefficient**
  - **Risk of excluding low-income households** from the cheapest available energy when it is made dependent on being able to afford the necessary technology

- **Age**
  - Participation of the **elderly** is challenged by **lacking digital literacy and apprehension** towards new technology
  - Flexibility of **younger consumers** is limited by social constraints (lack of choices)

Subtask 1: Diversity & Flexibility
Flexibility Framework

- **Gender**
  - **Women** are more willing to **manually** shift and have more **socially derived** ability
  - **Men** are more **willing if they can automate** shifting with more **technology-derived** ability

- **Age**
  - **Willingness** to shift is a **U-curve**, while willingness to accept **external control decreases** with increased **age**
  - **Ability to be flexible** does not seem to be affected by age in and of itself, but by circumstances often connected **life stages** (e.g. parenthood)

- **Income**
  - **Mixed findings** regarding willingness (link to benefits)
  - Intersection between **income and ownership**, links to **technologically-derived ability**
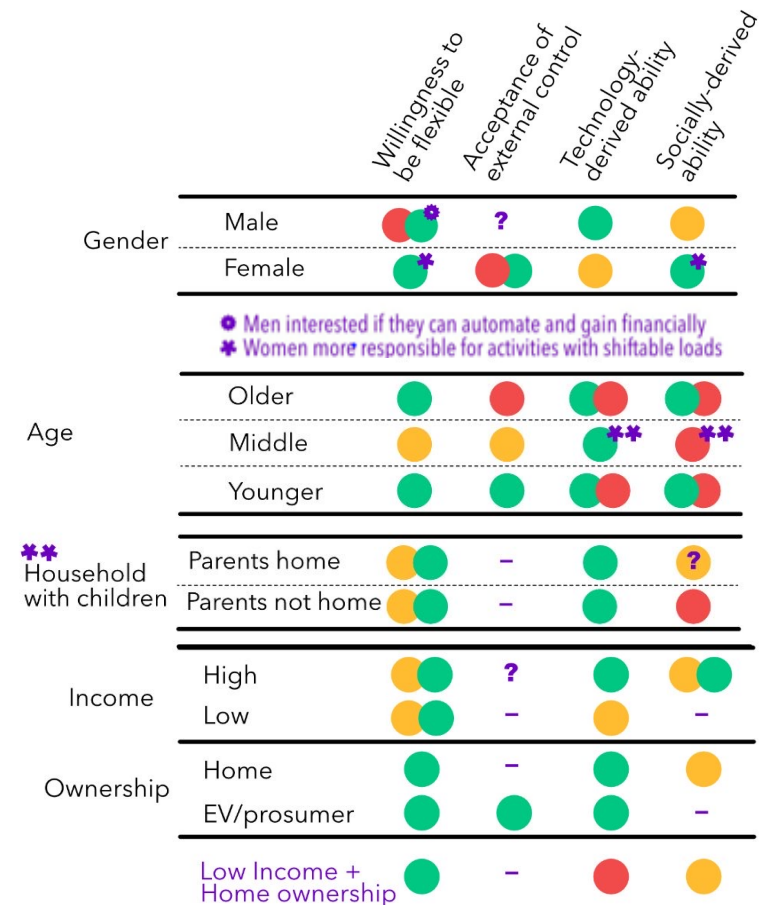
Subtask 3: Flexibility Markers
Analysis of load profiles

- Definition of Flexibility: ability of households, to distribute their consumption according to needs through adjustment of time or magnitude (Afzalan & Jazizade, 2019)

- Methods applied:
  - Shape of consumption pattern (peaks, valleys)
 - Consistency of consumption pattern
  - Response to financial incentives

Image source: Freepik.com

Subtask 3: Flexibility Markers
Analysis of load profiles

- Gender
  - Men have higher baseline consumption and respond more to financial incentives
  - Women have higher consumption peaks, especially in winter

- Income
  - Households with higher income show higher consumption
  - Variations with household composition (higher peaks with kids)

- Age
  - Young and old have lower consumptions and different patterns
  - highest consumption and peaks with middle age.
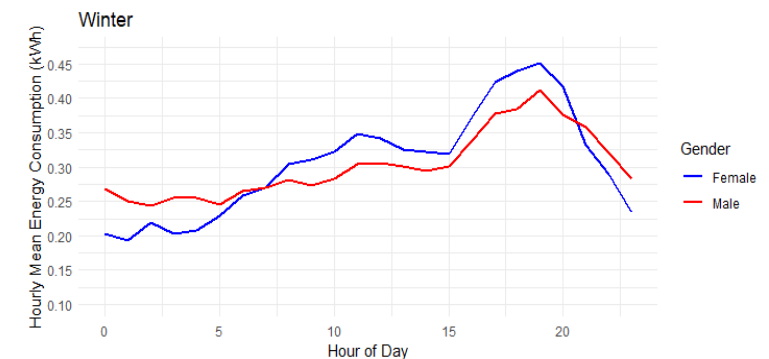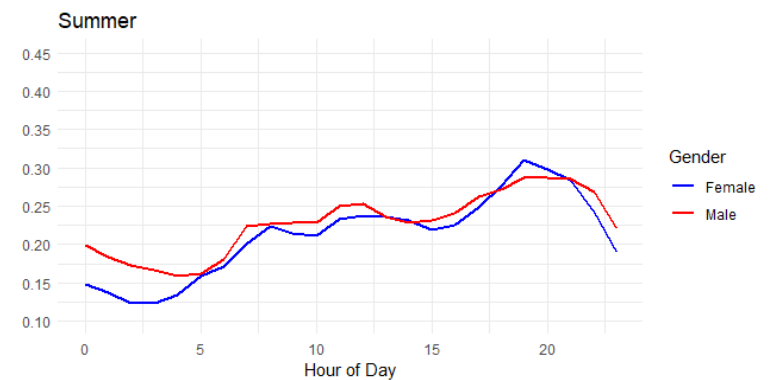
Flexibility Profiles and Recommendations

Flexibility Profiles: Flexibility Dimensions

Flexibility Capacity

- Household loads
- Prosumer technologies
- Enabling technologies
- Temporal capacity

Flexibility Ability

- Awareness
- Information availability
- Knowledge
- Skills
- Energy practices
- Flexibility of energy practices
- Ability to control
- Ability to transform

Flexibility Willingness

- Motivation
- Incentivization
- Technology affinity
- Social norms

Flexibility Profiles: Diversity & Flexibility

- With **gender**, men and women show **different types** of capacity, ability and willingness with men more often having advantages
- **Age** impacts especially **capacity and willingness**; with capacity, both elderly and younger consumers have disadvantages, with willingness-factors, elderly score lower
- **Income** impacts all dimensions but especially **capacity and ability**; high-income households have advantages
- **Family status** has mixed impacts on capacity and ability and a somewhat positve impact on **willingness** for households with children
- **Housing** impacts especially **capacity and willingness** with homeownership impacting both positively

Flexibility Profiles: Diversity & Flexibility

- **High Flexibility Readiness** (high on capacity, willingness and ability factors):
  - High-income
  - Home-ownership
  - Tech-savvy (male)
- **Medium Flexibility Readiness** (enabling factors but also barriers):
  - Younger consumers
  - Households with childen
  - Tenancy
- **Low Flexibility Readiness** (more barriers than supporting factors)
  - Low-income
  - Elderly consumers

Recommendations for inclusivity in DSM Programs

- **No Financial or Technology Barriers to Participation:** Ensure that there are ways of participation that don't require financial investments or new technology purchases (e.g. participation via apps)
- **Low-tech Solutions for Limited Digital Skills:** Ensuring that technological advancements do not exclude users who may not be comfortable with or able to use advanced technology
- **Accessible Solutions Integrated with Everyday Activities:** Make solutions more intuitive and accessible, also in terms of language
- **Support for Digital and Energy Literacy:** Provide accessible information materials, workshops, and community engagement efforts
- **Tailored Support for Low-income Households:** Implement subsidizing programs and financial incentives to help low-income groups
- **Understand habits, routines and household roles:** Collect diversity-specific data to better understand household dynamics and improve tailoring of participation opportunities
- **Understand the impact of measures taken:** Collect diversity-specific data on who makes use of funding and the impact incentives and support schemes have

The Potential of Energy Communities to Support a Social License

Subtask 2: Energy Communities EC Initiatives Analysis

- Energy Community (EC) initiatives were reviewed on a European and national level regarding their legislative background to understand key features, differences/similarities

- Core questions
  - How are social aspects (SA) addressed
  - Potential to gain a social license (SL)
  - Potential to gain a social license to automate (SLA)

- ECs were categorized according to type and identified potentials

Image source: Freepik.com

Contributing countries: CH, AT, NL

Subtask 2: Energy Communities Initial Results

- Renewable/citizen energy communities
  - High potential for all SA, SL & SLA to EU directive demands (energy poverty, citizen engagement), incentivisation, wide reach, automation opportunities common
- Energy community projects
  - High for SA due to high sense of responsibility & community, medium for SL due to remoteness & limited reach but local awareness and acceptance
- Energy cooperatives
  - SA potential low due to high number of participants, geographical distribution, membership through purchasing; SL potential high through joint investments and wide reach; SLA potential low as direct incentive is missing
- Micro-scale energy communities
  - Very high potential to address SA due to small number of participants and high levels of trust & responsibility but medium for SA & SLA (need for proximity, geographical constraints, limited rooftop areas)

Subtask 2: Energy Communities
Initial Conclusions

- Strengths and weaknesses vary between the different types of identified EC initiatives

- In order for successful scaling of EC initiatives and a contribution towards the building of a social license (to automate), social impacts need to be considered

- A clear understanding of how different EC features such as initiating actors, financing models and included technologies impact the potential of an EC to address social aspects and further the granting of a social license (to automate) can play a key role in the success of an EC initiative

Subtask 2: Energy Communities
Interviews

Social
License to
Automate 2.0
UsersTCP

Subtask Energy Communities *Stakeholder interviews*

Case country / region	Name of the project	People interviewed	Documentation
Switzerland	Lugaggia Innovation Community	Academia (part of initiating stakeholders)	• Paper • Report ofen
Switzerland	Connect	Academia partners and citizens	• Report ISE
Austria	Poechlarn	Engineer	• Website
Austria	Göttweigblick	Board member	• Website
Austria	Grätzl Energie	Co-founder, Board member	• Website
Austria	EEG Scheibbs	Chairman	• Website
Austria	EEG Bad Schallerbach	Board member	• Website
DRC	Altech Group	Project manager, CEO	• Website
DRC	NURU	Project managers, Business manager	• Website
DRC	GoShop Energy	Environmental engineer	• Website
Tanzania	Photons Energy	Head of Engineering	• Website
Tanzania	D.light	Head of engineering, head of HR	• Website
Brazil	RevoluSolar	CEO	• Website
Senegal	ASER300	Project Manager	• Website • Project brief

Subtask 2: Energy Communities Interview Results

Obstacles to the SLA

- Lack of information impacts trust
- Historical experience (SSA)
- Lord-tenant problem

Enablers for the SLA

- EC membership fosters acceptance for automation
- Information and transparency
- Correlation between economic savings and technology acceptance
- Adapt information & channel to the receiver

Image source: Freepik.com

Subtask 2: Energy Communities
Qualitative Assessment

- **Technical equipment** is already **available**

- **Policies supporting ECs** should be implemented (Switzerland could become an interesting case study)

- **Acceptance and familiarity** with renewable technology seems to be an enabling factor for automation

- It is central to **avoid information asymmetry** and **centralisation of information**
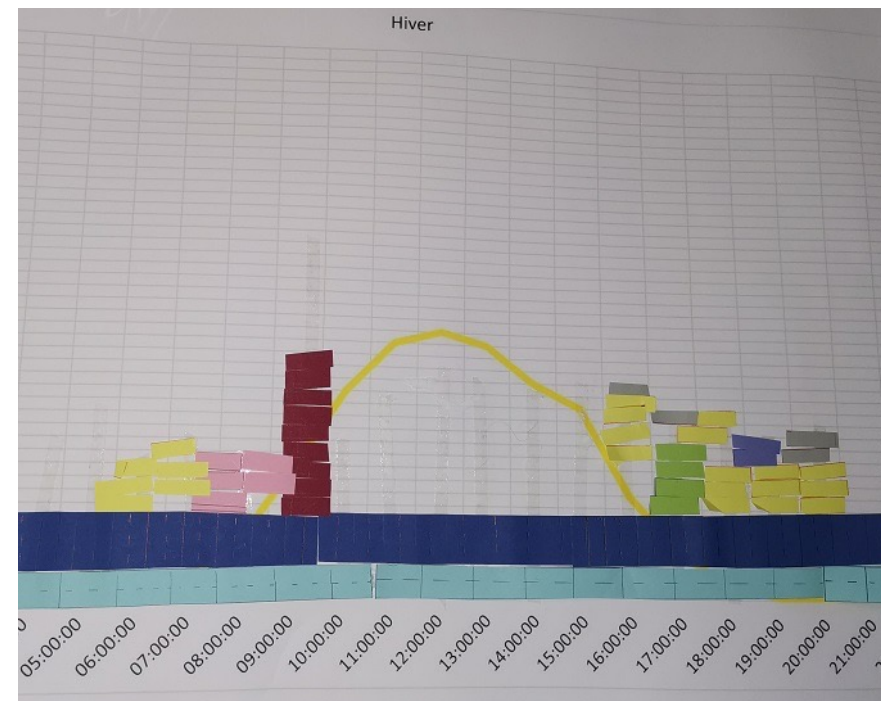

Image source: picture from Ecoquartier les vergers' workshop

Subtask 2: Energy Communities
Recommendations

- **Access to information and support** : Ensure citizens have access to clear information and (technical) support by establishing a community or utility contact point and promoting its existence.

- **Continued engagement and trust building:** Establish and maintain relationships with local communities through continued engagement and relationship building, using different channels to address and connect diverse groups

- **Leaving no one behind**: Include local actors in the transition

- **Equity-focused Approaches:** Adopt equity-focused approaches to energy community participation with participation opportunities tailored to specific groups

- **Policy and legislative support:** Public policies should support ECs through economic incentives and legislative support

- **Reduction of Cost Burdens and Benefit Sharing:** Implement financial mechanisms within ECs to reduce cost burdens and fairly distribute benefits also for low-income-members

Knowledge Gaps and Open Questions

Gender & Diversity
Knowledge Gaps

- Scarcity of data: Insufficient knowledge about **impact of intersections** of diversity dimensions

- Missing insights about **negotiations processes** within households

- Better understanding about how **technology design** interacts with diversity dimensions and impacts flexibility potential.

Energy Communities
Knowledge Gaps

- Little and diverse understanding of how social dimensions such as democracy and energy justice are addressed in energy communities:

- Little insights on the processes, including the governances and activities, that can successfully support the building of social license and achieve autonomous, sustaining energy **communities.**

Flexibility Profiles
Knowledge Gaps
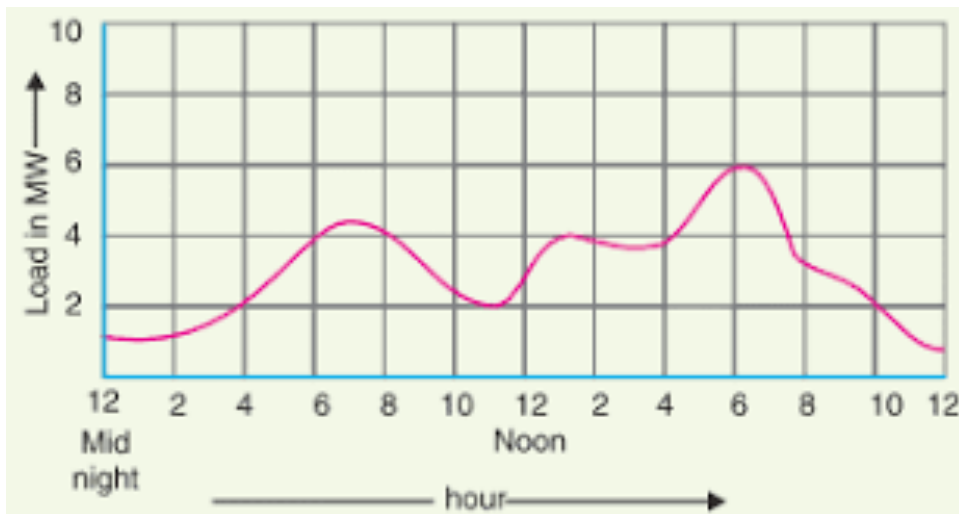
- We don't know how the consumption profiles in **multi-person households** are composed

- There is **insufficient data** to reliably identify interconnectedness between load profiles.

Future Outlook

Future Research Directions towards more collective approaches

- Households and energy communities are 'collectives' rather than dichotomic entities.

- A novel approach i.e. a constructivist perspective with an analytical focus on the collectives of engagements in the making of Social License to automate

Future Research Directions towards more collective approaches

- **Intersectionality and Flexibility**
  - How do the intersections of diversity dimensions interact with the factors that impact flexibility potential? Which particular challenges and opportunities can be identified and how should they be addressed?

- **Household Dynamics and Flexibility**
  - How are flexibility decisions negotiated within households and how do this negotiations interact with household roles of household members

Future Research Directions towards more collective approaches

- **Processes within the energy communities**

  i) the processes, diaologues, organisational and governance structures and participatory approaches to build social license with multiple actors with diverse profiles & capacities

  and

  ii) measurement of co-created collective benefits and social sustainability outcomes (cohesion, empowerment), and social license for renewable technologies, automation and other DSM activities.

THANK YOU!

Lisa Diamond
Scientist
AIT Austrian Institute of Technology
Center for Technology Experience
Lisa.Diamond@ait.ac.at

Ange Nkonko Kibelo Martin's
PhD student
University of Lausanne
Faculty of Geosciences and Environment & Institute of Geography and Sustainability

Selin Yilmaz
Assistant Professor
University of Lausanne

Faculty of Geosciences and Environment & Institute of Geography and Sustainability
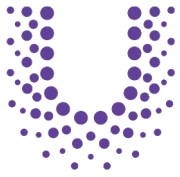
Technology Collaboration Programme
by iea

UsersTCP

Contact:
admin@userstcp.org

IEA EBC HOME   LINKS   SEARCH   SITE MAP   EBC-LOGIN

EBC
Energy in Buildings and Communities Programme

HOME   ABOUT   SUBTASKS   PUBLICATIONS   PARTICIPANTS   NEWS   MEETINGS   MEMBER AREA

IEA EBC - Annex 95 - Human-Centric Building Design and Operation for a Changing Climate

Building upon the success of Annex 66 and 79, this new IEA EBC Annex/Users TCP project will undertake a comprehensive exploration to understand the evolving role of humans in the energy transition to address climate change. As building envelopes and mechanical and electrical equipment become more efficient, the influence of occupants on building energy consumption hasing decisions to how they act within buildings, interact with nsition is not solely about the building inhabitants; it will also signers to operators.

ANNEX INFO & CONTACT
Status: Ongoing (2024 - 2029)
OPERATING AGENTS
Julia Day
Washington State University
UNITED STATES OF AMERICA
Zoltan Nagy
University of Texas Austin
UNITED STATES OF AMERICA
Liam O'Brien
Carleton University
CANADA
Marianne Touchie
University of Toronto
CANADA

ANNEX EVENTS
IEA EBC Annex 95/Users TCP:
1st Working Meeting
November 18-20, 2024 - Seville, Spain

Technology Collaboration Programme
by iea

UsersTCP

User-Centered Energy Systems

About Us

The User-Centred Energy Systems mission is to provide evidence from socio-technical research
on the design, social acceptance and usability of clean energy technologies to

---

U | **User-Centred Energy Systems** Academy

UsersTCP | Social License to Automate

UsersTCP | Public Engagement for Energy Infrastructure

UsersTCP | Peer-to-Peer Energy Trading

UsersTCP | CampaignXchange

UsersTCP | Hard-to-Reach Energy Users

UsersTCP | Behavioural Insights Platform

UsersTCP | Gender and Energy