International Energy Agency's User-Centred Energy Systems Technology Collaboration Program:

Social License to Automate Annex Launch Workshop and Public Lecture

10am-4pm, 25 October 2019
UNSW, Kensington Campus, Sydney
Level 2 Staff Room, School of Law, Law Building (F8)

Morning session, 10-12am

Welcome to the workshop, Iain MacGill, UNSW

Acknowledgement of country, Declan Kuch, UNSW

Introduction to the UsersTCP, David Shipworth, UCL and Chair of the IEA Users TCP

The Demand-Side Management Technology Collaboration Programme (DSM-TCP), which has operated for almost 30 years within the auspices of the International Energy Agency, was this week relaunched as the Users-Centred Energy Systems Technology Collaboration Programme (Users TCP). This refocuses the TCP on the role of energy consumers in the future decentralised, renewable and smart energy grid. Research projects currently being undertaken within the Users TCP include the Social License to Automate Annex, led by Monash University and UNSW and being launched here at UNSW today, along with the Business Model and Systems Annex; the Hard-to-Reach Energy Users Annex; the Global Observatory on Peer-to-Peer, Community Self Consumption, and Transactive Energy Models (GO-P2P). Attention to the engagement of energy users is vital given that, although in general there is household confidence in the potential of advances in technology, people have lost faith in the electricity sector around issues of pricing, reliability and security – and not without some good reason.

During introductions participants shared what they see as currently missing in discussion about the future energy grid:

- excitement about the potential of automation
- clarity around the benefits for customers, including who benefits, where and when. To articulate these benefits, we need to understand what customers see as being in their interest.
- an understanding of what shapes responses from energy users, including the role of pricing; messaging (and where it has been lacking or gone wrong); institutional transparency, credibility and accountability; regulation (and whether the law can be a foundation for trust or whether it poses a risk or impediment as it is often framed)

- attention to the quality of relationships among actors in the energy system, how to maintain these relationships in a highly automated world, and who users trust. We need to understand where the industry has gone wrong in these relationships. We need to look at resistance to automation and demand response, rather than at adoption, because resistance is currently where we are at.
- connections between the challenges of the energy systems and the issues that people care about and identify with. To make these connections we need to understand the different values associated with energy and how people want to engage.
- an understanding of how the challenges facing the energy sector are connected to those facing other sectors: there may be value in looking beyond energy sector given that there is evidence that trust in 'the system' more broadly is waning. Part of this broader context is the state of politics, the prevalence of misinformation, and the sense that people don't understand why things are the way they are.
- an understanding of how these challenges differ across cultures and across the political, economic and social contexts of different regions and countries. These specific contexts include historical events that have affected users' trust in governments.
- an understanding of the difference between marketing ("educating the opportunity") and meaningful user engagement
- an appreciation that some level of distrust from users may often actually be healthy?

Introduction to the new Social License to Automate Annex of the Users TCP, Declan Kuch:

The Social License to Automate Annex consists of collaborative research by social scientists and engineers at UNSW and Monash University, in partnership with colleagues in participating countries. At present these international partners include academics at the Austrian Institute of Technology, ZHAW Zurich University of Applied Sciences, University of Geneva, Delft University of Technology and KTH Royal Institute of Technology in Stockholm, with prospective collaboration of Arizona State University, National University of Singapore and NTNU Norwegian University of Science and Technology.

The research seeks to understand what would constitute a 'social license' for the use of automation for the management of the grid, including in direct load control, demand response, load shifting and virtual power plants. It will investigate user acceptance and trust by looking at automation from the perspective of households and by treating trust as a verb specifying an action as well as a quality of 'trustworthiness' – this dual quality means trust is an impermanent, fragile quality of ongoing relationships. Through close analysis of case studies within the participating countries we will build a picture of the patterns that exist across these diverse contexts.

We will investigate a number of themes and hypotheses emerging from an initial review of the academic literature, including:

- context is critically important
- time frames and the energy consumption practices matter
- preferences for levels of 'visibility' or perceptibility may vary – e.g. direct load control may be preferred to load shifting
- factors that influence user acceptance of automation include: ability of users to retain control; fair compensation; transparency about the rationale for the automation, as well as who benefits from it and how; and ownership and a sense of a stake in the grid

The research consists of two work streams:

- country-specific profiles documenting key cultural and policy factors
- subtasks led by partners from participating countries, centred on the following proposed themes:
    - the user's sense of control over their energy use: trusted infrastructures
    - socio-technical making of automation and load flexibility
    - designing and aligning institutional interests
    - policy and regulatory analysis

Any questions, comments or suggestions to d.kuch@unsw.edu.au are very welcome.

Issues raised in discussion with workshop participants:

In response to the idea that trust is best thought about as a verb, we need to not lose sight of the fact that trust is something accumulated. Seeing it as an outcome allows us to look at the factors that lead to it.

Some factors that have undermined trust:

- electricity networks are common pool resources but we have been operating them as markets
- private monopolies have undermined trust in e.g. Sweden

Some factors that build trust – or how we need to start approaching this differently:

- people need to feel respected
- people need to know that energy companies are operating in their best interests; e.g. ECA research shows that trust would follow from the knowledge that their utility is ensuring the best deal possible.
- transparency in automation is important, e.g. people need to know whether they are having a cold shower because of their hot water heating has been remotely curtailed or just because their hot water has run out
- we need to flip the conversation to address what people want and need
- we need to address the importance of people's sense of control. new smart homes have components that will be used for different things to what they were intended for; this will raise problems for trust when people are furnished with technologies with uses that they feel they don't have control over
- we need to acknowledge the time and effort required for users to engage
- we need to understand how consumers think about different appliances differently, e.g. direct load control of EVs is more acceptable than that of AC
- thorough engagement with consumers builds trust – but there is a paradox in the promise of automation on the one hand and the close personal engagement with users (e.g. 6 BBQs with one community) that is required to ensure its acceptance on the other!
- we need to think about who we are trying to engage – maybe we actually don't need everyone to be involved? There is potentially a paradox in that the most engaged users tend to already be very efficient in their energy consumption and therefore may not be able to contribute much demand response. There may be greater potential with users who are at present 'hard to reach'?
- government has a role to play through education and regulation. This is particularly important to manage the paradoxical interests of energy efficiency initiatives and of profit-making energy companies (in other sectors efficiency is not actually driven by

the commercial actors): it is possible to regulate energy companies in a way that ensures companies do things even if they don't align with their commercial interests. There is a need for consumer protection across all technologies and generation sources. There is a need for an independent voice and a monitoring and verification body.
- to rebuild trust, the energy industry needs to start working from a position of deficit and to specifically address this deficit.

Case studies and models to consider:

- direct load control of hot water management has been in place in some jurisdictions for decades, with some degree of trust from households
- what effect does Victoria's best default offer policy have on trust?
- what is the scope of the forms of automation included in the analysis? E.g. does automation include static settings of e.g. inverters in homes?
- there is potential to learn from other sectors, e.g. to compare with the case of water restrictions (although it is noted that there are number of differences between water and energy, including that energy efficiency schemes have required more of an outlay of resources than water savings, and that water is more visible and associated with ideas about what it means to be Australian while energy has become politicised and consumers are switching off)
- need for a research framework that ensures that lessons can be learned across diverse cases
- it may be worth looking at the field of change management

'Reshaping energy – reshaping society' public lecture, David Shipworth, 12-1pm

The full video recording of this lecture is available here:

https://www.youtube.com/watch?v=bxTuy7vFFGQ&feature=youtu.be

Afternoon session, 2-4pm

'User attitudes to smart HEMS and automation', Mike Roberts, UNSW

The CRC-P Smart HEMS project is seeking to help users to shift load to increase solar self-consumption and enabling users' DERs to respond to network signals. This model is attempting to move from telling users to shift load to asking them how we can help them shift load for their own benefit and then to how we can help them use their DERs in demand response. It is trying to shift the conversation about demand response from one about purely economic transactions to one about energy as a community resource.

The project has involved trying to understand prosumer motivations, behaviours, attitudes and needs through surveys and semi-structured interviews. Among the motivations identified, bill saving is dominant, but most participants ranked other motivations including environmental, social, comfort, and independence equally highly.

Observations of the existing load-shifting behaviour of participants include that they are time-shifting their use of appliances, but less so air-conditioning, pumps, hot water. This contrasts

with the approach of engineers, who are typically interested in the scope for load-shifting associated with AC and hot water.

The analysis suggests a need to segment users into groups according to preferences and capacity for demand response, which often corresponds to their occupancy of the home during the day. There is polarisation around the preference for automation on the one hand, and desire to retain control on the other.

Main themes identified:

- trust/distrust (of energy companies, which are undifferentiated in the minds of users). This project shows that talking about the benefits of automation *for users* first and foremost helps to maintain trust.
- fairness (perception depends on transparency, compensation, geographical/social considerations, control, among other factors)
- responsibility (to ensure fairness/regulation, maintain grid, lead transition, and to educate)

Issues raised in discussion with workshop participants:

There is a risk of that the savings that households may make participating in these sorts of programmes will fall short of expectations. This points to the need to engage with users around how to effectively achieve load shifting. Automation may make load shifting less burdensome for households and could thereby mitigate against disappointments if the financial gains are less than expected.

Generally speaking, people don't have realistic sense of significance of the energy saved or shifted by different sorts of measures – e.g. turning off a LED lamp versus turning off air-conditioning. There is therefore a danger that people make disproportionate efforts to save energy in relatively ineffectual ways. There is also a danger that that people will go to great lengths to use their own solar energy and paradoxically may use more energy overall, or that they employ a different mental arithmetic whereby they use energy because they perceive that they can afford it financially.

'Does it spark joy? Householder responses to network aware coordination on Bruny Island', Hedda Ransan-Cooper, ANU

The CONSORT Bruny Island Battery Trial in Tasmania involved the development of a system to manage solar trading amongst households on the island according to household consumption, solar forecasting and tariffs. The analysis by the Social Research Team involved longitudinal engagement with householders. The full reports from each team involved are available here http://brunybatterytrial.org/

Salient findings:

1. The multiple components of this complex system, which required a high level of support to maintain, raise questions about accountability
2. Householders exhibited a cautious response to automation; some attempted to game the system to ensure that they were using their solar optimally
3. When people feel overwhelmed they have more emotional and gut-feeling responses. In this context inter-personal trust becomes even more important (e.g. people liked that they could choose between battery installers but also found it confusing and stressful and then tended to rely on rapport when selecting their installer). The other values

provided by the technology (e.g. for personal benefit or alternatively for community benefit) also become more important.

Positive experiences:

- People found it empowering to understand and control their load
- They perceived the technology to be in line with their environmental and community values
- Back-up necessary and had economic benefit for the community
- People experienced a sense of personal growth through learning about the new technology.

Issues raised in discussion with workshop participants:

Why did the trial install household batteries rather than a centralised community battery? The decision to go with distributed generation and storage was made before community engagement commenced. In fact, some participants raised questions about this approach and preferred a more centralised model, which points to the need for engagement of the community and not just of the user per se.

'The impact of artificial intelligence on the energy revolution', Penny Crossley, University of Sydney Law School

The law tends to lag behind technological developments, although it should act as a facilitator rather than only stepping in later to block developments.

The future smart grid is emerging with digitisation and the use artificial intelligence as well as new prosumer models. It is facilitated by blockchain technology, digital ledgers and smart contracts in particular. These technologies are making possible a shift from medium-term contracts to transactive contracts, which represents a massive shift in contract law.

The biggest shift is associated with the use of disaggregated energy data generated by AI. These data are used to:

- Undertake predictive maintenance
- Provide consumers with data
- Improve grid stability and system balancing

Data can also be used to generate detailed insights about people's personal lives and to enable better marketing of products and services.

Key risks arising in the shift to the smart grid:

- The use of big data
- Increasing complexity; people only understand individual components not whole system
- Changing market structure
- Inadequate consumer protection and changing legal standards
- Breach of contracts

Regulators are not keeping pace with these risks and delayed action has in turn led to concerns about regulatory uncertainty. It is necessary to be more agile and communicate more openly. We can also learn from other jurisdictions such as the Finnish model, where AI and big data are used to engage in long-term planning and centralised justification and control.

This more holistic approaches has the potential to address some of the gaps that exist in the Australian approach.

Roles for regulators in the future smart grid include:

- consumer protection and safety
- system resilience and security
- privacy
- providing data or mandating the provision of information suitable for cost comparison
- providing incentives to optimise the system as a whole
- managing competition

Start-ups and new business models emerging in the sector recognise that their biggest risk is regulation. There is a need for some fresh thinking about how to approach some of these challenges.

Issues raised in discussion with workshop participants:

We're seeing a shift in regulatory approach from a product-based industry to a performance or outcome-based industry.

We need a co-evolutionary model that includes both regulators and start-ups, and perhaps need for risk-based insurance model.

Closing remarks, Iain and Declan:

We're seeking involvement from you and your organisations. We know there's a lot happening in this space in Australia, for example with the Energy Charter. Our project is complementary to this. We have resources we're looking to deploy to fulfil the collaborative mission of the program! This can take several forms:

- knowledge sharing and results dissemination through the TCP – it's the perfect platform to ensure global impact;
- an interview with you or roundtable discussion with your organisation about your pilot in the context of local, national and international policy and practice;
- assistance in framing project design and scope as they relate 'social license' and trust issues;
- assistance in data analysis and handling (both quantitative energy use and qualitative data sets).