What's in an algorithm? Towards inclusive and user-centred development for energy optimization (*working title*)

Proposed by Dr. Sylvia Breukers (Duneworks) NL, Dr. Tracey Crosbie (Teesside University) UK and Dr. Ruth Mourik (Duneworks) NL

Bern IEA DSM exco meeting 2019

Energy industry transformation & flexible consumers

- The energy industry is in 'transition' it is changing from its present state into a future one which involves integrating innovative smart technology and control systems in order to help optimise the effective use of energy and minimise primary energy demand,

- This transition requires consumers to be more flexible in their energy demand and numerous products, tariffs and processes are being developed, tested and rolled out to encourage these new flexible energy consumers.

- The new products to encourage flexible consumption patters and energy system optimisation are underpinned by algorithms which determine customer compensation for participation

- For example
  - The "baseline" used to measure shifts in electricity use arising out of demand response determines the magnitude of the resource and plays an important role in determining the value it has to the different stakeholders in the electricity supply chain. This not only influences the number and types of customers for whom DR programs appear attractive, it also solidifies the value of DR for different stakeholders in the 'technological text' of the algorithms used to calculate the DR baseline.

ieadsm
energy efficiency

Algorithms and energy optimisation software products are not neutral !

The algorithms which determine customer compensation for participation in the new energy flexibility products have assumptions built within them about how valuable different customers are in terms of flexibility and which stakeholders will benefit from energy flexibility.

Research has shown that technology development and implementation in the area of flexibility through DR and DSM is based on the developers'/designers' assumptions about:

- Future market developments (e.g. for DR, aggregation of household level flexibility; the possibilities to earn profits in this market by acting as developers/intermediaries

- The behaviours of the different types of end-users/consumers (within households for instance) in response to the technologies (e.g. acceptance of changes in comfort; willingness and ability to actively participate in DR or DSM)

- The organisational context (e.g. in Blocks-of-buildings) where meso-level solutions are envisaged (e.g. the extent to which building managers/owners are able and willing to participate and see added value for themselves)

Designers assumptions have implications for access to energy services

- The energy transition is a societal challenge, technological innovation needs to be informed by a clear understanding of social dynamics, societal needs must be considered in an equitable society.

- We are at the forefront of a radical change in the ways in which households and other medium-level actors consume, produce, pay for and choose energy consumption options, whereby the radical changes are strongly influenced by the exploitation of new innovative technological 'solutions' that are brought on the market by a diversity of new and incumbent techno-energy sector businesses.

- The design and consumption of these technologies, as well as the ways in which they contribute to newly emerging user and business practices cannot be seen as separate from issues like access to energy as a basic social right/common (which means that the market alone cannot be held responsible for a just allocation of value).

The key questions to be addressed

- How, are users configured in the current algorithms used to e.g. calculate the baselines for DR?
    - What are the expectations about their willingness and ability to participate in or accept the interventions?
- What are the potential distributional impacts of calculation methods and algorithmic approaches and how are these different for different groups of users (and societal groups)? (and what are the risks that e.g. customer segmentation and targeting techniques may at some point even result in the withdrawal of services from 'less profitable customers' in the residential sector? (Crosbie 2016).
- How to ensure that different groups of uses are able to understand the value allocation mechanisms so that they are able to judge contracts on their merits, in financial and other terms (e.g. changes in routines/practices) on the short, medium and longer term (e.g. when does their changed behaviour become the new baseline and will they be asked to perform additional changes in order to remain eligible for rewards)?

ieadsm
energy efficiency

Synergies with related tasks

- While the DSM TCP Social Licence task addresses how social, organisational and institutional conditions affect successful customer engagement in automated DSM, **this task zooms in on the distributional effects of the technologies themselves.** As such this tasks looks at the phase before implementation of (among others) automated DSM by asking how various assumptions about the users, contexts in combination with company ambitions shape technologies and that assesses the extent to which these technologies inherently have socially undesirable distributional impacts. This tasks therewith will enable an important complementary dimension to the work performed in both the Social Licence Tasks as well as to the work done for the P2P Observatory, and will actively seek synergy through e.g. addressing similar cases of technologies, but with a different approaches and set of research questions.

- In addition, the findings from this task can be used also to further inform the development of user centered business models in Task 25.

Envisaged actions within the task

- **Scope definition:** the type of technologies and socio-technical configurations to focus on: e.g. virtual power plant configurations; local smart grid configurtions; DR propositions offered to meso- and micro-level prosumers/users by aggregators; …..

- **State of the art: review** to assess current state of the art in knowledge, types of pilots and the main challenges to further investigate

- **Framework and methods for analysis** for international comparative case studies (multi-methods), indentification of useful cases and topics, specifiying the research questions and methods, templates, training workshops, development of analytical comparative framework etc

- **Engage with policy makers and other relevant stakeholders to inform the analytical framework and identify policy-related needs**

- **Conduct, collect, analyse the case-study data**

- **Assess the main challenges and potential solutions to achieve algorithmic approaches that enable an inclusive, transparent and user-centred energy transition for different types of propositions, contexts and user-groups**

- **Write and disseminate policy briefs based on each sub-task's domain**

- **Conduct bi-annual Task meetings in different member countries**, in which findings from different national teams are presented and which support the development of communities of practice (technology developers; market stakeholders; researchers; policy actors etc) in these countries.

- **Share Outputs** on IEA website, through publications and at conferences.

Operating Agent & Funding Approach

- We are proposing Teesside University and Duneworks will share the role of operating agent

- We are proposing the task –shared approach to funding in which participants in the task pool funds to pay for the Operating Agent's time

8

Any Questions?

Email: *T.Crosbie@tees.ac.uk*

Email: *sylvia.breukers@duneworks.nl*

Email: *ruth.mourik@duneworks.nl*

ieadsm
energy efficiency