

Who 'Uses' Smart Grids?

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“Uses and misuses of connected devices”

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Article

Who 'Uses' Smart Grids? The Evolving Nature of User Representations in Layered Infrastructures

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Abstract: This article addresses the anticipated use and users of smart energy technologies and the contribution of these technologies to energy sustainability. It focuses on smart grids and smart energy meters. Qualitative accounts given by European technology developers and experts reveal how they understand the final use and social impacts of these technologies. The article analyzes these accounts and compares the UK's smart meter rollout with experiences from other European countries, especially Finland, to provide insights into the later adoption stages of smart energy and how its impacts have evolved. The analysis highlights significant differences in the likely intensity and manner of user engagement with smart grids and meters: depending first on whether we are considering existing technologies or smart technologies that are expected to mature sometime in the next decade, and second on whether the 'user' is the user of smart meters or the user of an entire layer of new energy services and applications. By deploying the strategic approach developed in the article, smart grid developers and experts can give more explicit attention to recognizing the descriptions of 'users' in smart-grid projects and to the feasibility of these expectations of 'use' in comparison to the possibilities and limits of energy services and applications in different country contexts. The examination of user representations can also point out the need for further technology and service development if some of the envisioned user profiles and user actions appear unrealistic for presently available technologies.

Keywords: expectations; infrastructure; Science and Technology Studies; smart grid; smart meters; sociology of user representations.

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<https://www.mdpi.com/2071-1050/10/10/3738>

Research questions

1. What kind of user-related **expectation work** is carried out in smart grid projects?
2. What do these **representations of users** reveal about the possibilities and limitations of engaging the public as agents, subjects, and critics in 'smart' contexts?

Sociology of user representations

- **economic configuration** (making 'users' more active in an economically rational way)
- **technical configuration** (automation of energy consumption and bypassing active forms of use)
- **social science configuration** (comparing visions of imagined users to 'real' users, whoever they may be)

Thronsen, W. What Do Experts Talk about When They talk about Users? Expectations and Imagined Users in the Smart Grid. *Energy Effic.* 2017, 10, 283–297.

Further reading

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- Heiskanen, E.; Matschoss, K. Consumers as innovators in the electricity sector? Consumer perceptions on smart grid services. *Int. J. Consum. Stud.* 2016, 40, 665–674.
- Sumpf, P.; Klemm, M.; Throndsen, W.; Büscher, C.; Robison, R.; Schippl, J.; Foulds, C.; Buchmann, K.; Nikolaev, A.; Kern-Gillard, T. Energy System Optimisation and Smart Technologies—A Social Sciences and Humanities Annotated Bibliography. 2017, SHAPE ENERGY.

Multi-sited analysis of infrastructure?

In infrastructure, user representations and expectations can vary considerably between:

- Design teams
- Energy regulatory formulas
- Network management activities
- Automation analysis software
- Marketing and promotional actors
- 'Actual' end-users in their homes
- Etc.

⇒ Use **UK-Finland** comparison as a 'proxy' for a multi-sited ethnography

Silvast, A. & Virtanen, M. An Assemblage of Framings and Tamings: Multi-Sited Analysis of Infrastructures as a Methodology. Manuscript under review.

Data from the CANDID H2020 project


Total responses	21	Women	8
Engineering	12	Men	13
Social sciences and humanities	9	UK	15
Universities	16	Finland	2
Other (citizen advice, consultancy, energy conservation, metering, smart energy campaign)	5	Other (Austria, Italy, Australia)	4

www.candid.no

1. Layered infrastructure and layered use

1.1 Smart meter 'users'

1.1 Smart meter 'users'



EUROPEAN COMMISSION

Brussels, 30.11.2016
COM(2016) 864 final
2016/0380(COD)

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on common rules for the internal market in electricity

(recast)

⇒ new

Article 319

☒ Smart metering ☒

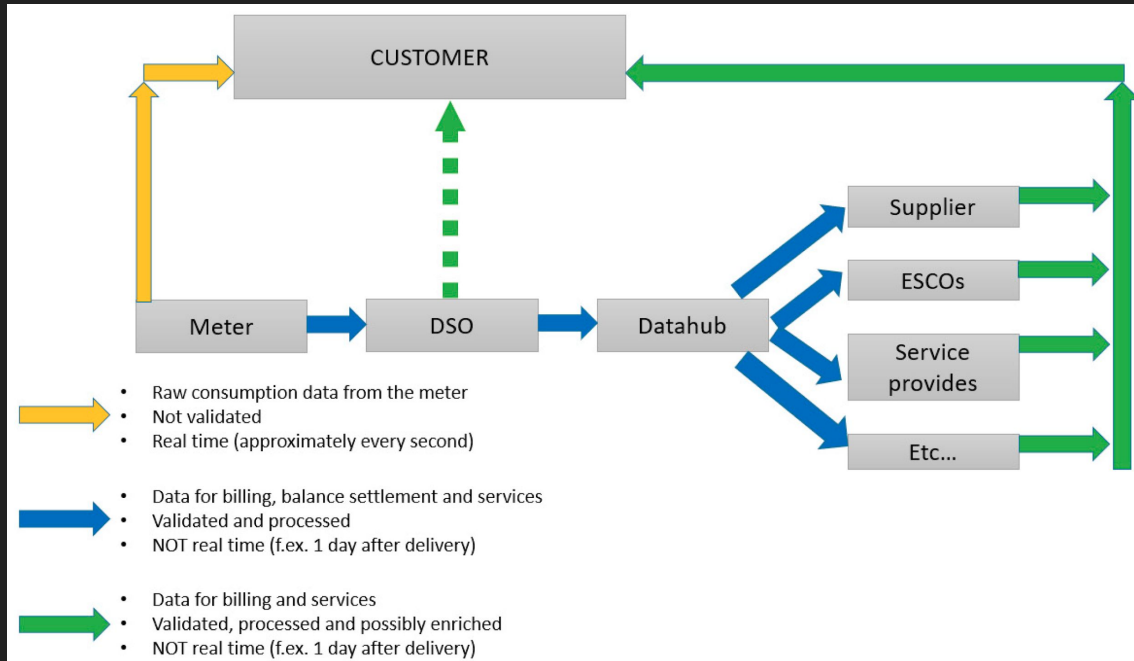
1. ~~10~~ In order to promote energy efficiency ⇒ and empower customers ⇨, Member States or, where a Member State has so provided, the regulatory authority shall strongly recommend that electricity undertakings ⇨ and aggregators ⇨ optimise the use of electricity, ~~for example inter alia~~ by providing energy management services, developing innovative pricing formulas, or introducing ⇒ interoperable ⇨ ~~intelligent~~ ⇒ smart ⇨ metering systems or smart grids, where appropriate.

⇩ new

2. Member States shall ensure the implementation of smart metering systems in their territories that shall assist the active participation of customers in the electricity market. Such implementation may be subject to a cost-benefit assessment which shall be undertaken according to the principles laid down in Annex III.

1. Layered infrastructure and layered use

1.2 'Users' of smart energy services



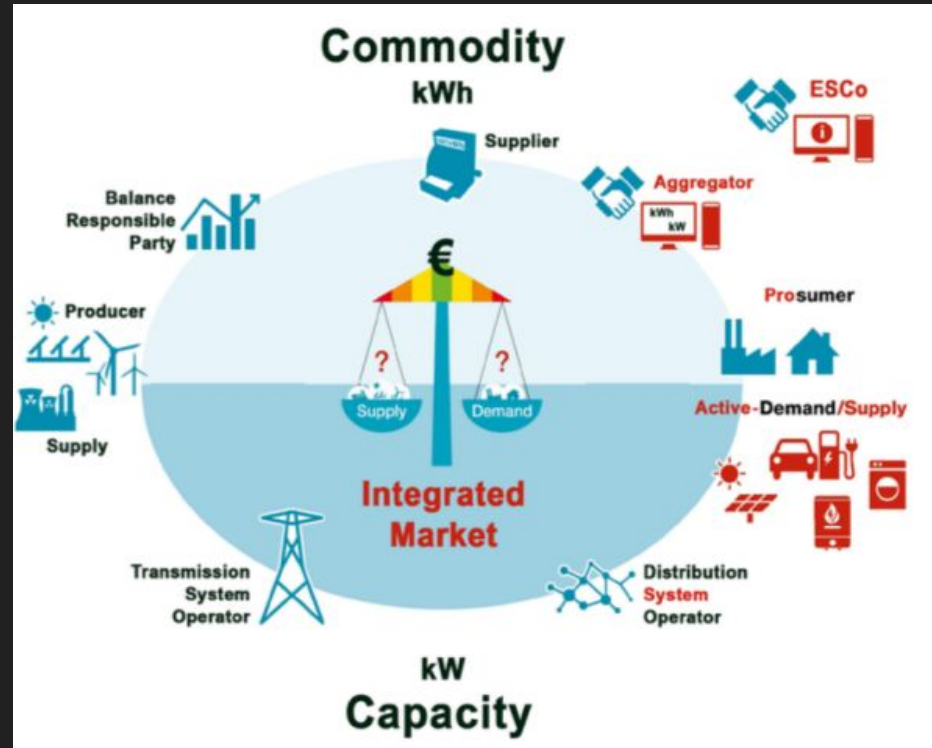
1.2 'Users' of smart energy services

“An IoT-Based Home Energy Management System over Dynamic Home Area Networks” (Kim et al., 2015)

2. Differing Time Spans of Benefits

2.1 Users of current Smart Grid configurations

2.2 Users of future intelligent networks



Source: [Smart Energy Collective, 2013](#)

3. Differing Perceptions of What is a Smart Grid

3.1 Everyone is in a grid

3.2 Specific and differentially impacted groups of users

For some, mealtimes are often routinised, a practice carried over from family, or previous employment patterns:

Start it [dinner] about 7 o'clock. ... Habit we got into when we were both working. (ML23)

I can't see us changing our eating habits – which is what uses most power... So firmly ingrained that we have our main meal in the evening. (ML23)

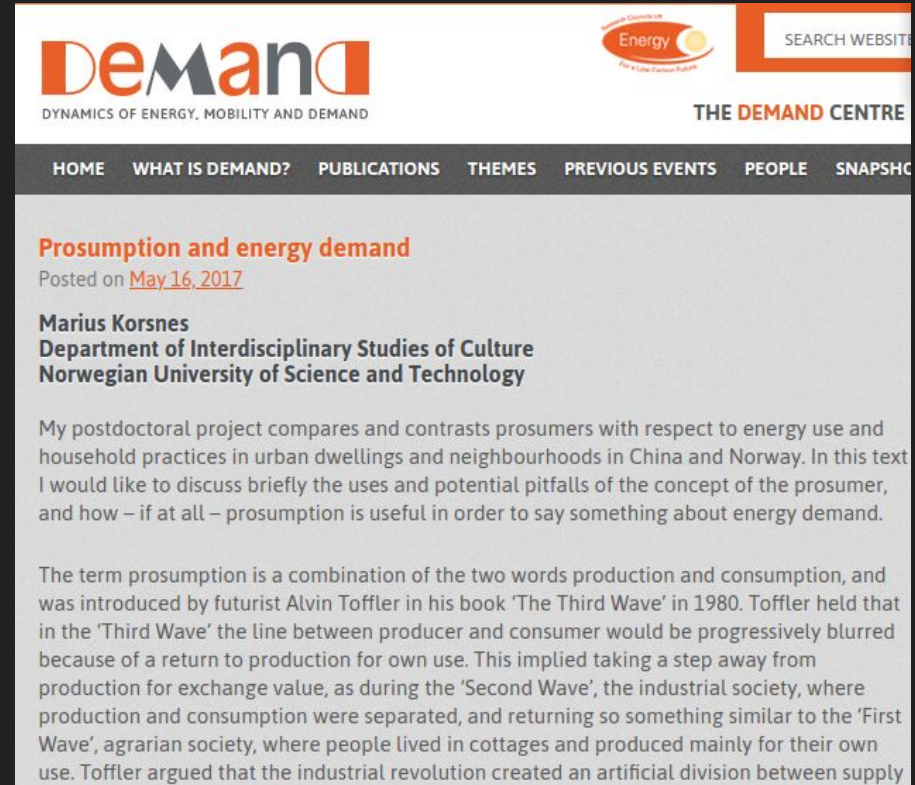
As a family, we've always had our meals early evening, and if you go past 8 o'clock at night you're getting late, and I'm starting to want to go to bed earlier, so it's difficult to get out of that of using the oven at that time. (DL0602)

Source: <http://www.networkrevolution.co.uk>

4. Varying Certainty of User Representation

4.1 Parts of Smart Grids where their benefits are evident

4.2 Parts of Smart Grids where their benefits are difficult to evidence



The screenshot shows the website for the Demand Centre, which focuses on the dynamics of energy, mobility, and demand. The page features a navigation menu with links to Home, What is Demand?, Publications, Themes, Previous Events, People, and Snapshots. The main content area displays a blog post titled "Prosumption and energy demand" by Marius Korsnes, dated May 16, 2017. The author's affiliation is the Department of Interdisciplinary Studies of Culture at the Norwegian University of Science and Technology. The post discusses the concept of prosumption, comparing it to energy use in urban dwellings in China and Norway, and references Alvin Toffler's "The Third Wave" (1980) to explain the blurring of lines between producer and consumer in modern society.

DEMAND
DYNAMICS OF ENERGY, MOBILITY AND DEMAND

Energy
For a Low Carbon Future

SEARCH WEBSITE

THE DEMAND CENTRE

HOME WHAT IS DEMAND? PUBLICATIONS THEMES PREVIOUS EVENTS PEOPLE SNAPSHOTS

Prosumption and energy demand
Posted on [May 16, 2017](#)

Marius Korsnes
Department of Interdisciplinary Studies of Culture
Norwegian University of Science and Technology

My postdoctoral project compares and contrasts prosumers with respect to energy use and household practices in urban dwellings and neighbourhoods in China and Norway. In this text I would like to discuss briefly the uses and potential pitfalls of the concept of the prosumer, and how – if at all – prosumption is useful in order to say something about energy demand.

The term prosumption is a combination of the two words production and consumption, and was introduced by futurist Alvin Toffler in his book 'The Third Wave' in 1980. Toffler held that in the 'Third Wave' the line between producer and consumer would be progressively blurred because of a return to production for own use. This implied taking a step away from production for exchange value, as during the 'Second Wave', the industrial society, where production and consumption were separated, and returning so something similar to the 'First Wave', agrarian society, where people lived in cottages and produced mainly for their own use. Toffler argued that the industrial revolution created an artificial division between supply

5. Metaphors of System Evolution

5.1 Active, rational consumer: real-time measuring and control devices

5.2 Routinized user of optimization services: interoperable systems, smart meters
the infrastructural basis

6. Cui Bono?

6.1 Early assessment about the harms and benefits of smart grid projects

6.2 Evolving user representations along with technological advances and experiences from early assessments

Conclusion: confirming earlier findings

- A range of competing user representations in an emerging technology
- Developers reduce the complexity of these representations through simplifying user characteristics
- User representations play important roles in the expectation work of mobilizing resources and support as well as for developing emerging technologies, such as smart grids and smart meters

Representation of users in layered infrastructures

- The likely intensity of users' engagement: limited optimization of consumption v. 'prosumers'
- Significant temporal differences: using currently existing smart-metering solutions v. intelligent optimization software and services envisaged to emerge in the 2020s
- Different kinds of user: user of smart meters v. adoption of further layers of services and applications