Environmental *Change* Institute

# Smart and sustainable, fast and slow

*Sarah Darby*



ECEEE summer study, 6th June 2019

INTEGRATING RENEWABLE ENERGY

# Pressure for change … and inertia

EU Overshoot Day 2019: If EU consumption was the global norm, the Earth's yearly budget would be exhausted on 10 May

# Smart tech – disruptive or business-as-usual?

Can play a role in

- Electrification with renewable supply - balancing demand, supply and storage
- Locating, diagnosing and isolating grid/network problems
- Changes in metering, tariffing, market operation
- Improving system visibility

BAU-type questions remain about

- Scale of expected demand (sufficiency)
- Distribution of knowledge and know-how
- Distribution of energy services and costs of providing them
- Asset ownership and control; accountability
- Security risks, as ICT and electrical systems rely on each other
- Diversity, flexibility / lock-in
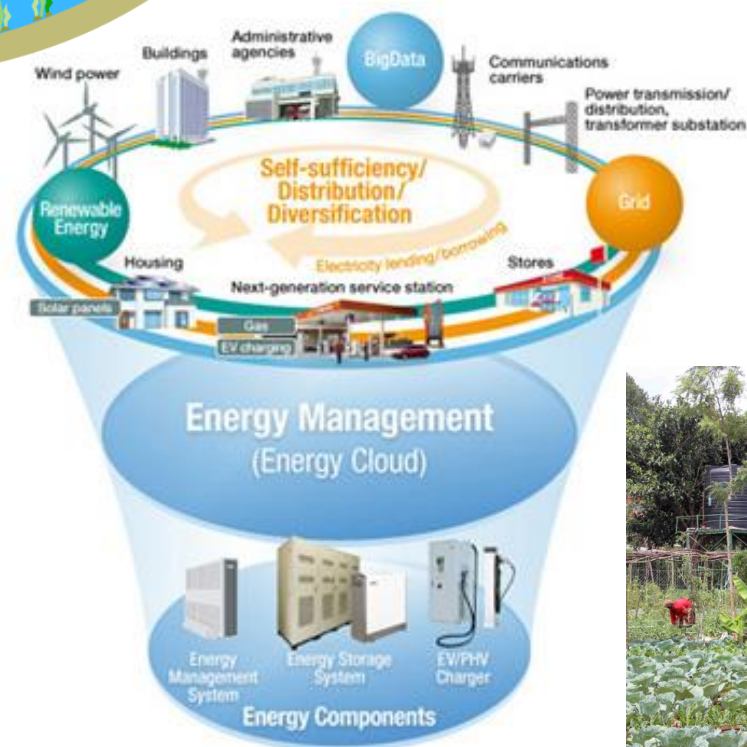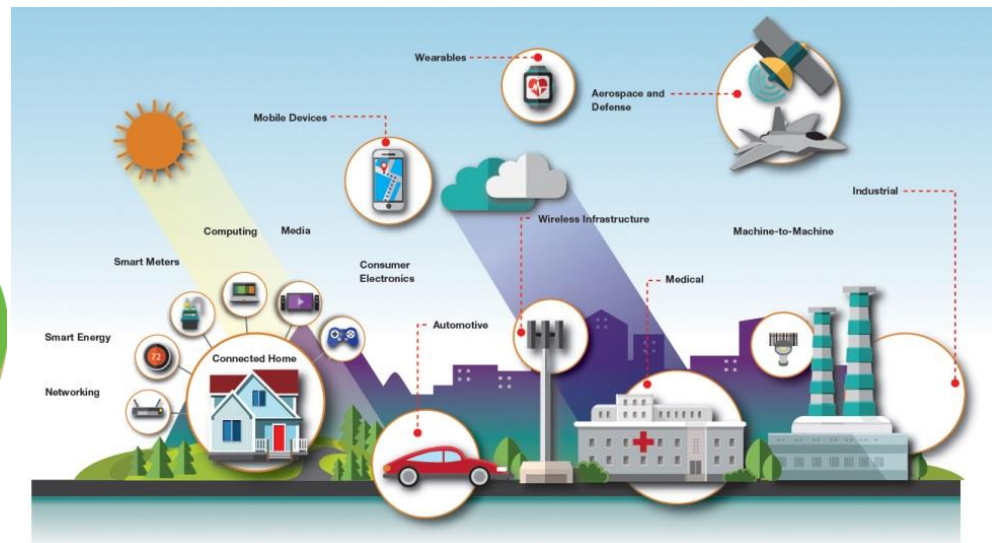
# Small-scale project to promote low-carbon transition and community welfare (community of place)



**Energy Local**

Adjacent to Westmill: community-owned solar and wind farms.

**48 properties:**
**14 Solar PV**
**6 Elec heating**
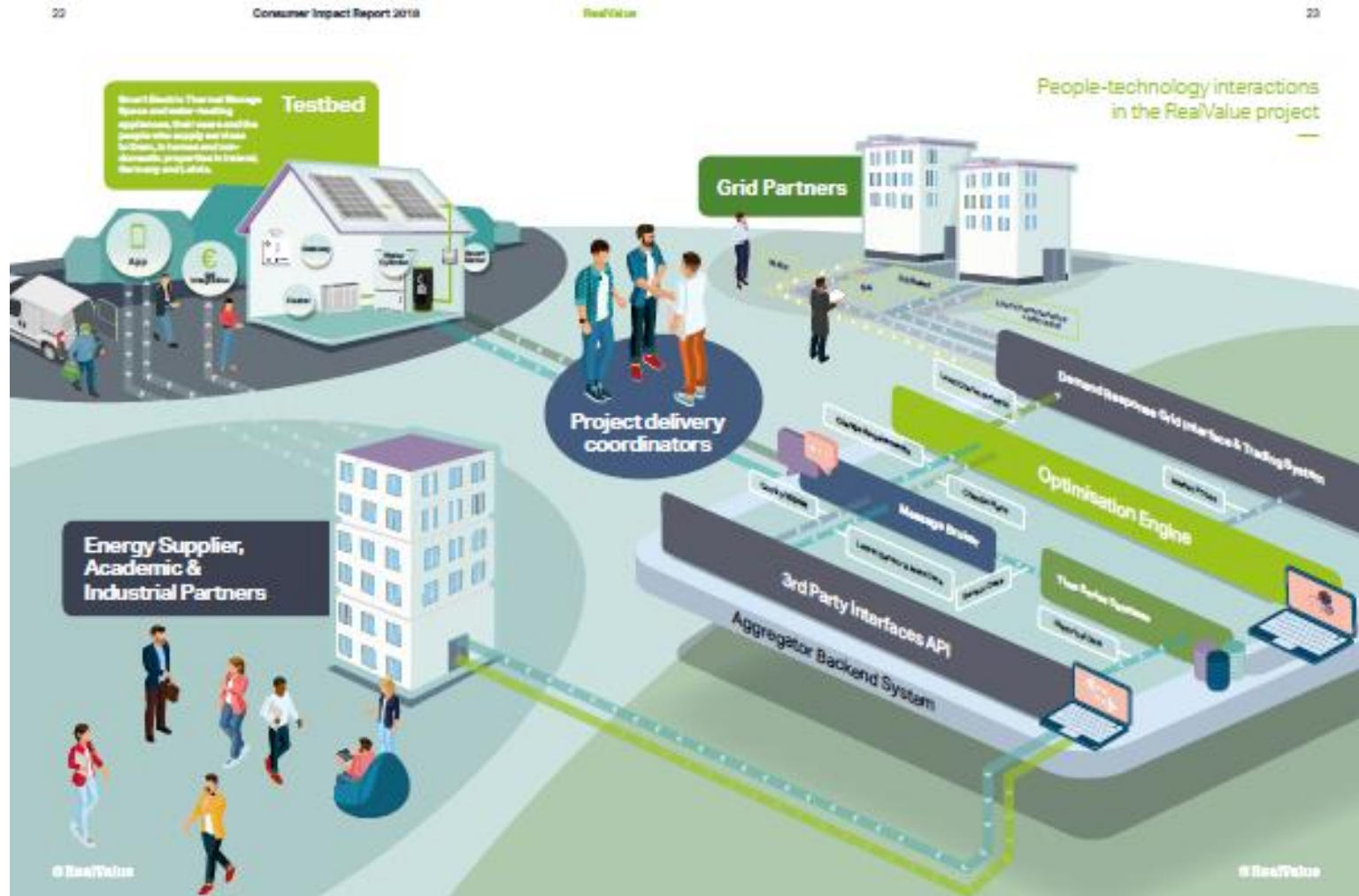**2 Electric cars**

**Trial added:**
**48 Hestia hubs**
**6 switch units**
**48 plugs**
**9 Batteries**
**Tablets**

Map uses open data © Ordnance Survey

SWELL Celebration 17 March 2017 2

Peter Boait, 2017; Boait et al., 2017, 2019

# Large-scale 'RealValue' trial to demonstrate how 'smart' thermal storage in three EU countries could benefit all energy market participants (technology-based community)

# (this was the original draft)

# Actors who made smart thermal storage work for customers and for the system

Customers
Installers
Neighbours







Housing managers

Designers and manufacturers of equipment, controls, apps
Software engineers

Energy retailers, call centre staff
Demand aggregators
Network operators
Grid operators

Storage heaters
Hot water cylinders
Buildings
Controls
Apps, tablets
Gateways, smart meters
Aggregation platform

# Actors needed to manage customer problems with smart thermal storage

| Customer problem | Retailer / supplier | Appliance provider | Gateway provider | Product installer | Housing provider / adviser | Broadband provider |
|---|---|---|---|---|---|---|
| Invoice / bill / usage | √ | | | | √ | |
| Heater/ cylinder | √ | √ | | √ | | |
| Broadband | √ | | | | | √ |
| Smart meter | √ | | | | | |
| Gateway | √ | | √ | | | |
| Plumbing | | | | √ | √ | |
| Comfort levels | √ | | | | √ | |

Information from SSE Airtricity

# Did the projects achieve their aims?

Yes - but it took > 2 years before most households in the large project were in regular contact with the aggregator; 18 months for the small one to be fully operational.

- Tech **connectivity** is hard, even when all components are market-ready;

- New forms of **control** take time for adoption and adaptation;

- **Care** in recruiting and engaging participants takes time, training and effort;

- There were regulatory and infrastructure delays, e.g. smart meter rollouts, time-of-use tariffs
*Internet of Things is in the news... clean technology, all these buzzwords are always being used, but yet, when it comes to the practicalities of doing a project, it was ... simply difficult in all those other technology categories...*

*RealValue* Project delivery coordinator, Ireland

# Changes were taking place in these projects on at least three levels

- Policy and regulatory (influenced by politics, crises, industry pressure)

- System operation (needs reliable equipment and data, skilled operators, accountability, trust)

- User operation (needs user cooperation/ compliance, adoption, adaptation)

Different actors, processes and speeds.



Different actors, processes and speeds.

# Summary

Energy transitions are

- socio-technical: actors, technologies, infrastructures, rules and governance operate at different scales and change at different speeds, depending on resources, learning ability and power/influence.

- local: geography and demography matter!

- relational. To be effective and sustainable, smart-enabled communities have to be 'humanised', with

**connectivity (tech-tech) + control (tech-person) + care (person-person)**

The 'smart revolution' can be quite slow and ordinary, facing familiar structural, technical and human issues. ICT enables new functions but adds complexity + risk and can raise questions about responsibilities + accountability.

# Questions

What does experience of smart energy tell us about where to invest policy capital + other resources, to address urgent CC and SD commitments?

What are the most significant research needs for sustainable communities?

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**Table 10: Reasons customers did not use the app, across all three countries (final survey)**

| Reason for not using the mobile phone app | Responses (all countries) |
| --- | --- |
| Too complicated (don't know how to install it/ how to use it) | 30 |
| Don't need it (use manual control /home all day) | 28 |
| Availability (Don't know it was available/Don't know how to get it) | 14 |
| Connectivity (No smartphone/not compatible with smartphone/no Internet) | 10 |