

A grassroots energy revolution? The rise and transformative impacts of bottom-up smart grid experiments

Citation for published version (APA):

van Summeren, L. F. M. (2022). *A grassroots energy revolution? The rise and transformative impacts of bottom-up smart grid experiments: The case of the community-based Virtual Power Plant*. Poster session presented at TU/e Research Day - Celebrating Science, Eindhoven, Netherlands.

Document status and date:

Published: 12/05/2022

Document Version:

Other version

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.

A grassroots energy revolution? The rise and transformative impacts of bottom-up smart grid experiments

The case of the community-based Virtual Power Plant

Luc F.M. van Summeren (l.f.m.v.Summeren@tue.nl)

1. Introduction

This research explored the transformative potential of the community-based Virtual Power Plant (cVPP), a community-driven model for generation, consumption, distribution and management of electricity. The cVPP concept combines elements from Community Energy & Smart Grids.

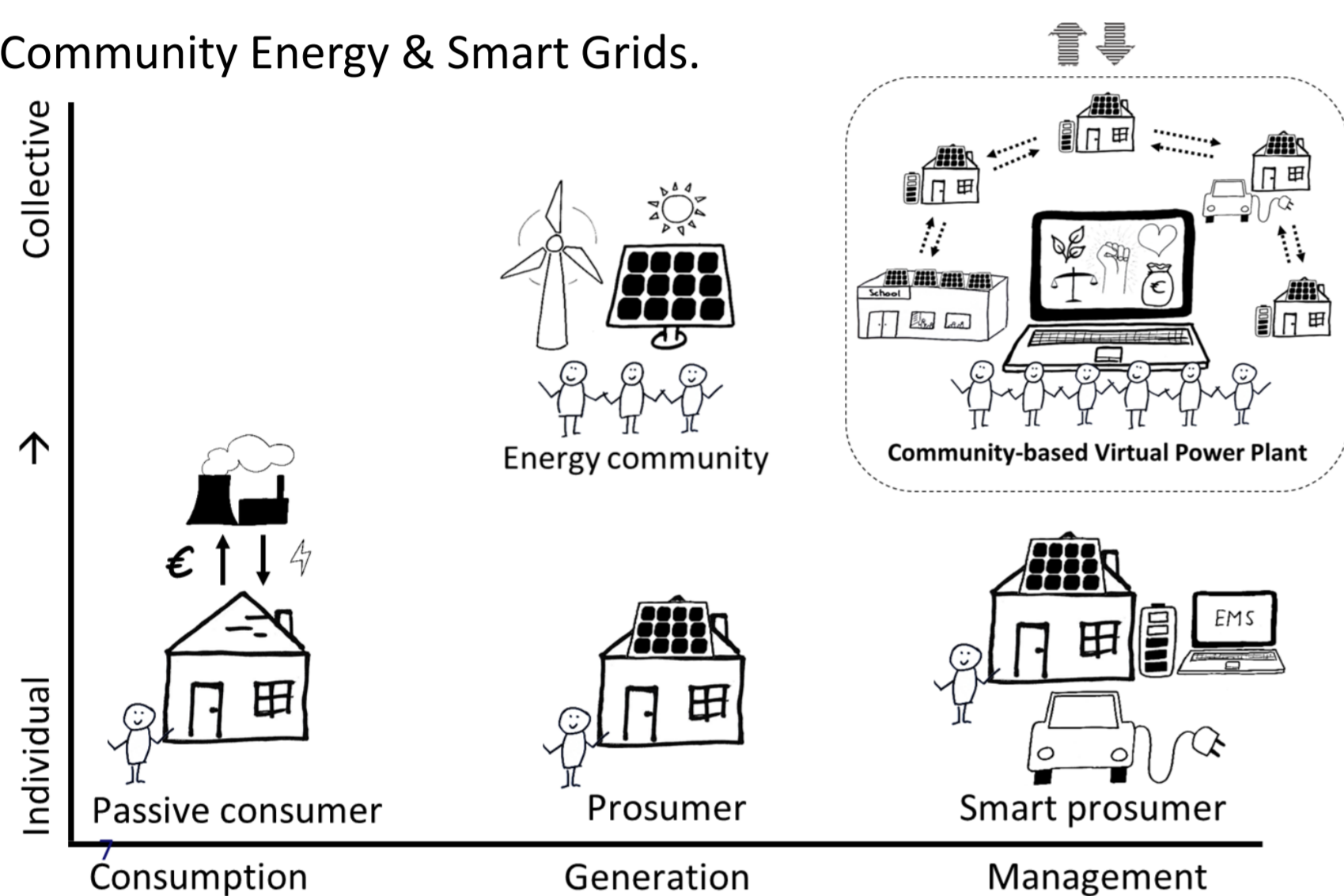


Figure 1: Visualisation of the different roles citizens and energy communities can play

Close involvement with energy communities involved in cVPP experiments allowed for answering the following research question:

How do community-based Virtual Power Plant experiments scale up and contribute to the sustainable transformation of the energy system?

2. Conceptualising cVPP

In chapter 2, Family Resemblance conceptual structures were mobilised to conceptualise cVPP as ‘a portfolio of DER aggregated and coordinated by an ICT-based control architecture, adopted by a (place- and/or interest-based) network of people who collectively perform a certain role in the energy system. What makes it community based is not only the involvement of a community, but also the community-logic under which it operates’.

Publications:

- L.F.M. Van Summeren, A.J. Wiecek, G.J.T. Bombaerts, G.P.J. Verbong, Community energy meets smart grids: Reviewing goals, structure, and roles in Virtual Power Plants in Ireland, Belgium and the Netherlands, *Energy Res. Soc. Sci.* 63 (2020).
- L.F.M. van Summeren, S. Breukers, A.J. Wiecek, Together we're smart! Flemish and Dutch energy communities' replication strategies in smart grid experiments, *Energy Res. Soc. Sci.* 89 (2022).
- L.F.M. Van Summeren, A.J. Wiecek, G.P.J. Verbong, The merits of becoming smart: How Flemish and Dutch energy communities mobilise digital technology to enhance their agency in the energy transition, *Energy Res. Soc. Sci.* 79 (2021).
- L.F.M. Van Summeren, A.J. Wiecek, G.P.J. Verbong, G.J.T. Bombaerts, "Blending in, to change the regime from within": Niche hybridisation strategies of Irish energy communities, In Preparation.

Department of Industrial Engineering and Innovation Sciences

3. Replication of cVPP

Chapter 3 explored what replication of cVPP experiments means in practice. Replication challenges were identified related to the complex, high-tech, and digital nature of the cVPP concept. Central to the strategies of energy communities was the aggregation of smaller energy communities by an overarching (supralocal) cVPP.

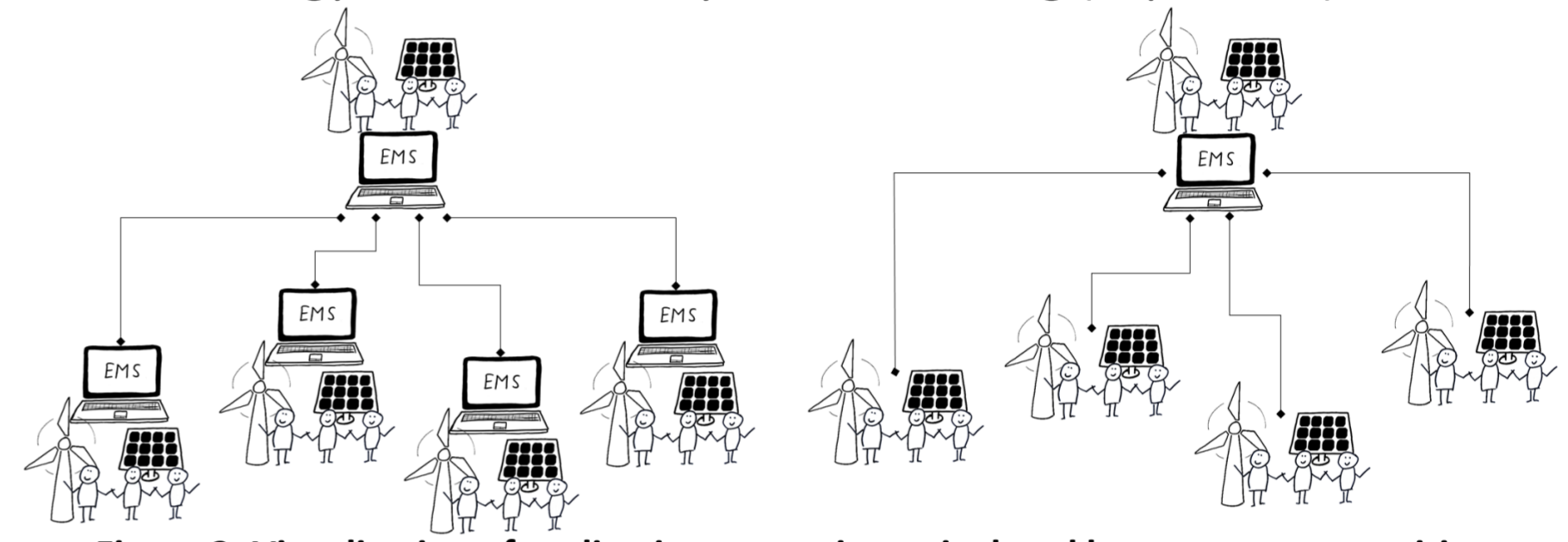


Figure 3: Visualisation of replication strategies articulated by energy communities

4. Agency of energy communities

Chapter 4 explored how energy communities mobilised digital technology to enhance their agency in the energy transition, e.g. their ability to impact institutions, actors, and technology.

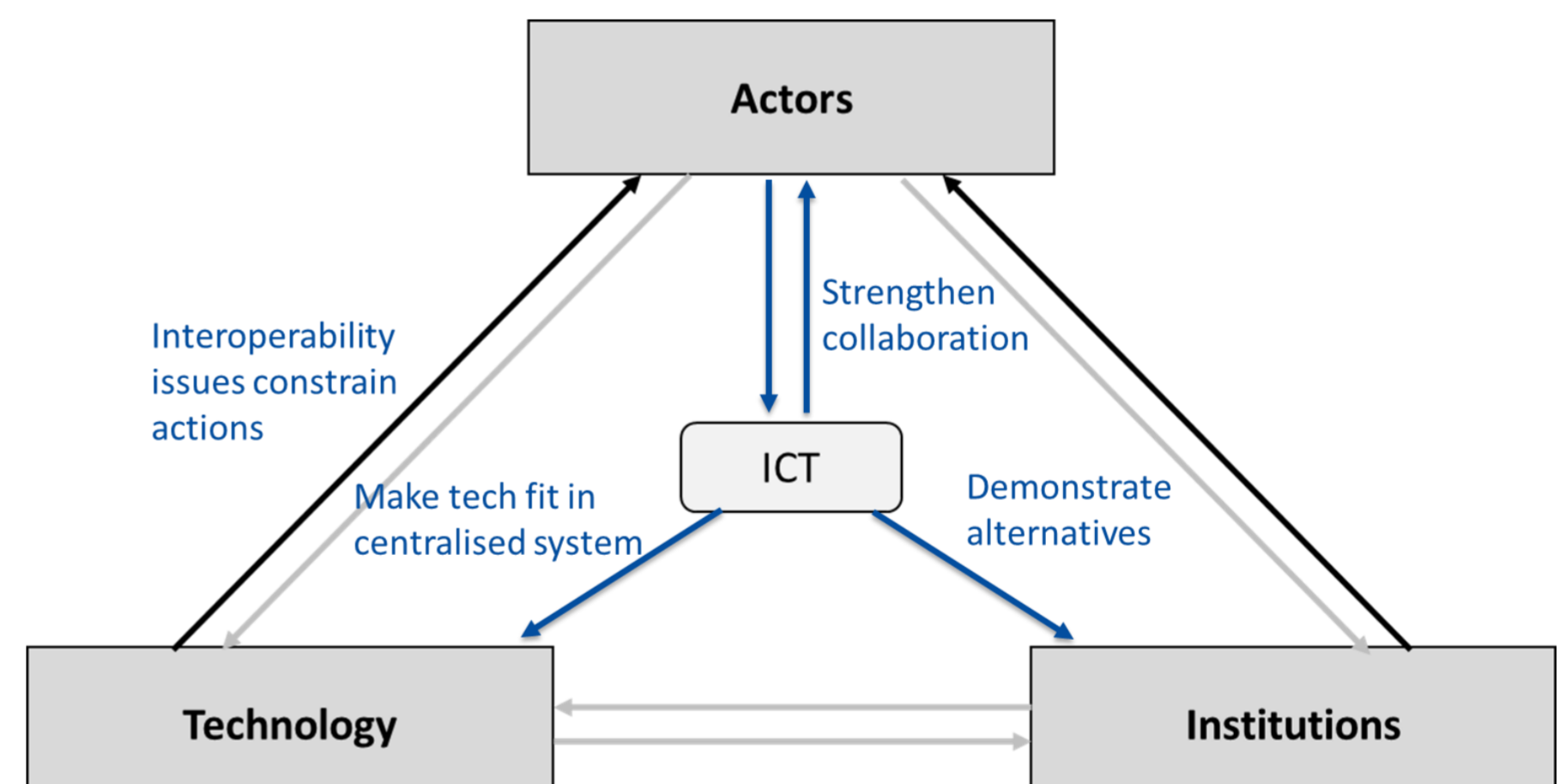


Figure 3: Visualisation of the ways in which energy communities can mobilise ICT to impact institutions, actors, and technology

5. Niche hybridisation strategy

Chapter 5 explored how hybridisation of regime and niche logics facilitated the empowerment of Irish energy communities. The establishment of Community Power, a community-owned supply company, empowered energy communities to trade energy, enabling them to survive and change the system from within.

6. Conclusion

Core to upscaling and empowerment strategies was the aggregation of DER from multiple energy communities to enable trading of energy and flexibility. Aggregation potentially increases competitiveness of cVPPs, while supporting their replication and growth, which is critical for realising wider transformative impacts.