Pilot study of 'Our Energy', an app designed to facilitate self-consumption of community solar photovoltaic systems

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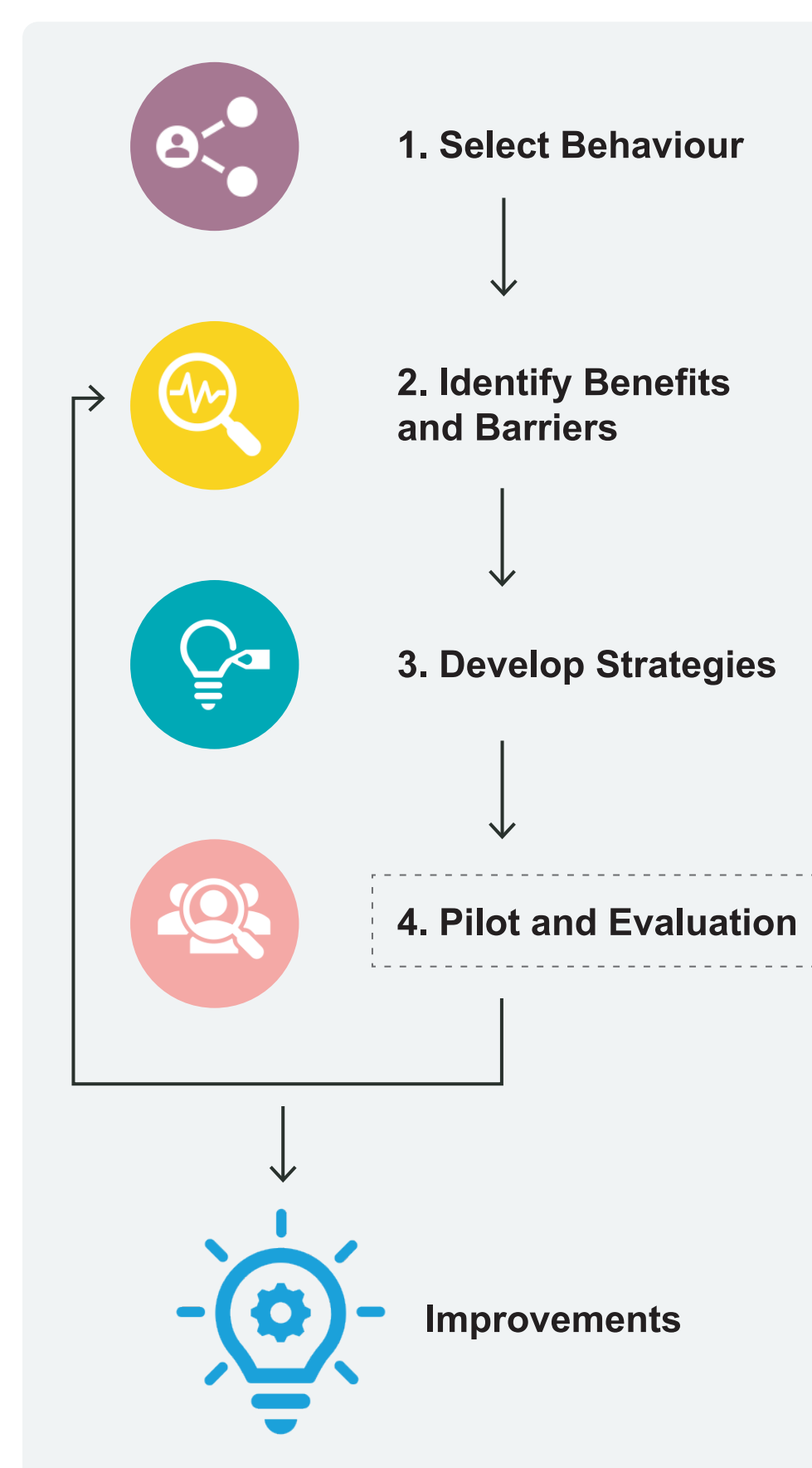
1 Objective

Evaluate if the **community context** positively influences the desired behavior of **load-shifting** to maximize self-consumption of a shared **solar PV system**.

However, **solar PV and metering infrastructure was not available** to our case study participants.

We therefore developed a Mobile application (Fig. 1) to provide **testability** of this **complex task**.

2 Methodology

Community based social marketing approach [1].

1. Select Behaviour

2. Identify Benefits and Barriers

3. Develop Strategies

4. Pilot and Evaluation

Improvements

5. Full implementation

Data collection
32 users in a two-week pilot study:
- 17 community users
- 15 individual users

Fig. 1. Our Energy mobile application after feedback form the pilot study.

Orbs options

DASHBOARD →
1.1 kW Individual solar generation
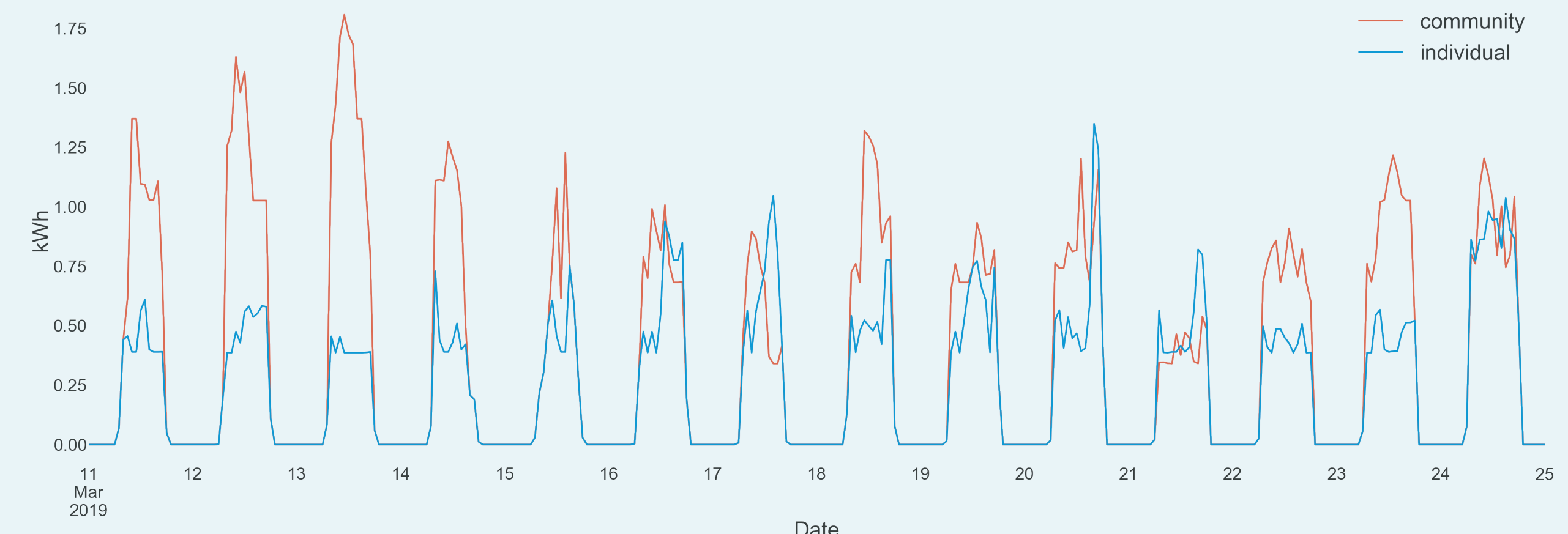
← PV · GRID →
5.2 kW Current consumption
PLAY

← DASHBOARD
-4.1 kW Consuming from the grid

3 Pilot Study Results

Data Analysis

Table 1. Overall community x individual average daily **self-consumption (SC)** and **amount of days participated (DP)**

	Individual	Community
SC	9.85 kWh	12.3 kWh
DP	6.8 days	7.8 days

Graph 1. Two week average hourly electricity self-consumption

Pre-Participation Survey results
- **Access to PV**: only 1 out of 32 have access to solar.
- **Access to electricity data**: 82% receive energy bills every 2-6 months.
- **Energy literacy**: 72% average 'score' to energy quiz.
- **Environmental awareness**: rate as very important or important:
  - 61% to not waste resources;
  - 35% to conserve electricity;
  - 28% to have direct access to renewable energy.
- **Shared facilities:** 82% have and use shared facilities.
- **Likelihood to invest**: 71% in a community system, 45% in an individual rooftop system (not mutually exclusive).

Post-Participation Survey results
- **Reported learning effects about the following topics:**
  - 65% - household electricity consumption;
  - 70% - time-of-use of electricity;
  - 53% - load-shifting.

Application Improvements
- Updated the **demand side response user interface** to improve the learning effect of load-shifting:
  - Appliances are categorized as shiftable, habit & constant;
  - Appliances can be added multiple times per day (previous limitation);
  - Added hourly, daily and weekly statistics (Fig. 1).
- Updated objective to **"experienced what it is like to have direct access to electricity from solar PV"**.
- New **objective is explicitly stated** in the introduction of the app.

4 Conclusions

- The frequency of participation and average daily self-consumption values indicate a slight increased participation and self-consumption values from users of the community-version of the app. However, the large distribution of results and do not indicate a strong generalizable trend.

- Qualitative feedback indicates that participants did not fully understand the context of community without a physical point of connection.

- In the full study, we only keep the community version of the app and focus on the learning effect of load-shifting for all participants. All participants are given the same tasks to 1) develop a baseline energy consumption profile during the first week and 2) improve their self-consumption compared during the second week.

- Future work includes developing a clear concept of community, and testing the set up with place-based communities where participants have a pre-established connection.

Appliances diary

Statistics graph

Statistics legend

Self-consumption visualization

Ranking

References: 1. D. McKenzie-Mohr, Fostering sustainable behavior: An introduction to community-based social marketing. New society publishers, 2011.