establishing Community Renewable Energy Webs - Rolling out a business model and operational tool creating webs of households that jointly manage energy to improve efficiency and renewables uptake

Deliverable 4.1:
Roll-out Tutorial

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Disclaimer

Executive Summary

The aim of this report, 'eCREW's Roll-out Tutorial' is to provide the Lighthouse communities with a document that allows them to quickly assess the necessary to dos to be completed before the roll-out, training materials for administering the app software system and carrying-out the engagement strategy. It provides an overview of all critical steps in the field trials three phases – Installation / Launch / Monitoring – presents and the relevant reports and templates developed in eCREW.

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1 Introduction

WP 4 rolls-out the CREW approach and the smart phone app as the operational tool at the LCs. In Phase 1 the eCREW approach was developed. Now, Phase 2 starts with implementing the respective business model from WP 2 and the corresponding version of the ICT-system at the specific partner. Firstly, administrative processes for handling the new business model and the corresponding IT services (billing, moderation of customer requests, trouble shooting …) are set up and the responsible staff is trained. Secondly, participation to CREWs is advertised broadly to 240,000 households, each with personalised estimates of their benefits in case of active participation (estimates are based on their electricity consumption, where available to the LCs, and an easy-to-follow guide on how to join). Thirdly, once the first household has joined, the CREW concept at each LC is operational and additional recruiting will be done throughout the project's runtime.

Task 4.1 will take care of comprehensive and uniform compliance to the EU data protection Standards and supervise that the comments and suggestions of the National Data Protection Agencies (collected in Task 1.3 Data Management Plan) are implemented. Hence, Task 4.1:

- **defines a check-list of items** (data protection, but also the availability of a communication and troubleshooting strategy, when questions/issues are reported by households, etc.) that have to be satisfyingly addressed before the first household in an LC is invited to download to app,
- **trains the LCs to work with the app administration system**, e.g. how to administrate assignment of participants to CREWs, how to set-up push-messages, how to handle customer support requests,…
- **trains the LCs how best to implement the engagement strategy** and continuously supervises if steps and actions as defined in Task 2.2 are executed as agreed, and if not, why these have not been executed (IT-related, lack of interest of vendors, etc.), and enabling a solution.
- **organises virtual meetings** between LCs and further project partners to discuss achievements, success stories, but also activities that did not show the expected results.
- **enables cross-fertilization with Follower Communities (FCs)**, see WP 6 Dissemination, Exploitation and Communication. In Task 4.1 the respective key messages, best-practises and lessons-learned are derived together with the LCs, and filtered according to publishable content, e.g. avoid that trade secrets are shared with FCs and are thereby made public. Information exchange is then facilitated as detailed in in Task 6.1 Activities with and for Follower Communities.

The aim of this Roll-out Tutorial is to provide the Lighthouse communities with a document that allows them to quickly assess the necessary to dos to be completed before the roll-out, training materials for administering the app software system and carrying-out the engagement strategy. For this aim, the relevant reports and templates developed in eCREW so far are presented in the following according to the field trial phase they belong to. The eCREW field trials are organized in three phases:

- Installation phase
- Launch phase
- Monitoring phase

2 Installation phase: Install the app and make it run

In this phase, the app is installed at the premises of the Lighthouse partners, system tests are performed and the proper working of the app is tested. To facilitate a smooth implementation of the system, the following sections give a general overview of the software system, the technical requirements to be fulfilled for hosting the eCREW-App, the main features of the back-end processing unit, how to test the system and lastly describe the concept of the split-incentives approach and how its tariff system incentivizes CREW participants.

2.1 Overview of the software system

As part of the eCREW project, partner GreenPocket has provided a fast, responsive and scalable back-end processing unit, which is the core element of the eCREW-App. It connects the users among each other and facilitates the interaction with the energy provider. The back-end unit processes all communication to and between clients. This back-end unit is operating from a central server station and stores the incoming consumption data of the households retrieved from their smart meters, stores, forwards and manages the tariff information to each user, handles all requests sent from the households to the system, handles all messages that the provider sends to the customers, and interconnects the households amongst each other. In combination with the front-end, as web-portal and app, it is able to trigger lasting energy savings through behavioral change and continuous engagement.

Figure 1 shows the GreenPocket technology and illustrates the path of the data from the meters to the front-end applications. The single modules are described below.

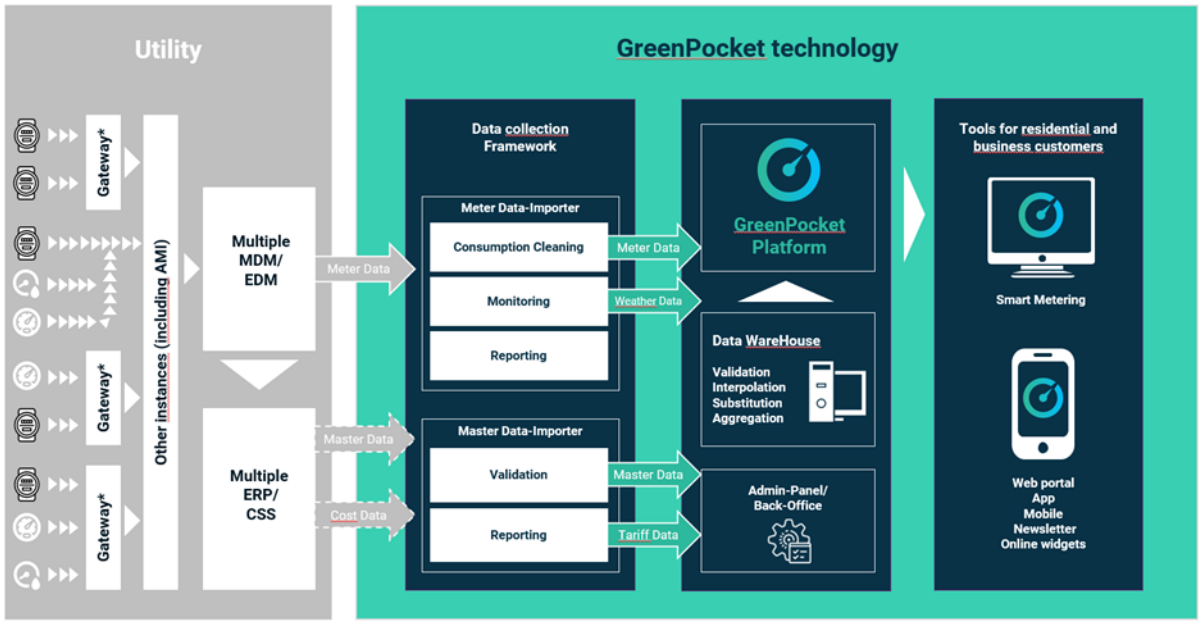

Figure 1: Platform Architecture

The **Data Collection Framework** is a standardized and open interface framework to import meter-data like consumption data and meter readings of different energy types, as well as to import master data like user data and tariff data. Importantly, Figure 2 shows the data formats which can be used for the import and export of master data and consumption data.

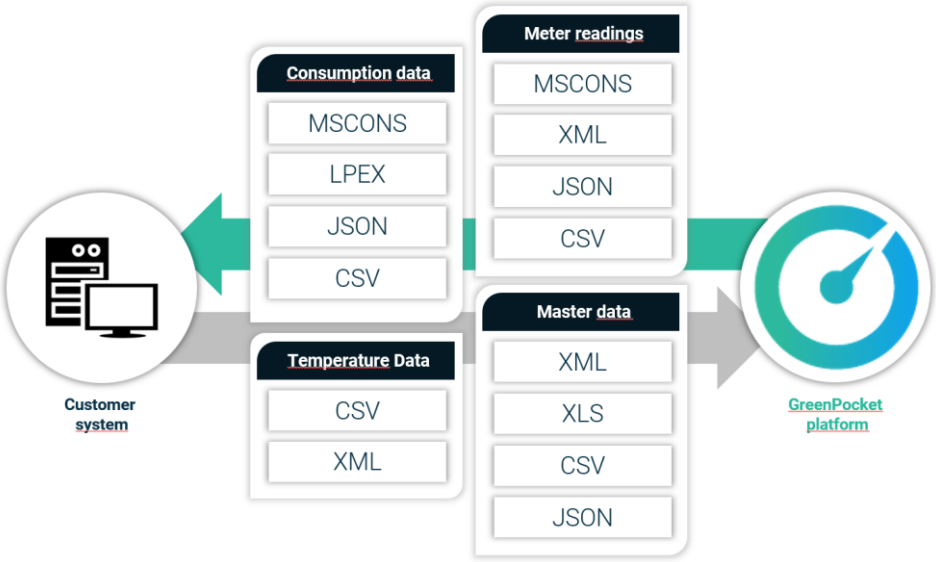

Figure 2: Supported data formats

Next, the **Data Warehouse** is an optimised central database for analytical purposes, which receives data from several, normally heterogeneous sources from the Data Collection Framework and afterwards brings them together and compresses them.

The GreenPocket Platform **Energy Expert Engine** (EEE) is the centrepiece of the architecture. This application summarizes, analyses and visualizes the smart meter data on a PC, tablet or smart phone. The interface enables the connection with a range of Automatic-Meter-Reading and Energy-Data-Management systems, customer databases and billing systems. Digital energy consumption data is initially prepared in the EEE. Additional data, such as environmental indicators, are subsequently included in the calculations and are supported by the Data Collector and Data Warehouse. Datasets are linked and interpreted in line with the requirements of energy consumers on the basis of algorithms and heuristics. The now 'intelligent' data serves as a basis for forecasts, alerts and control functions. For energy consumers, this creates valuable detailed information on their personal energy requirements, which can be accessed within the **Tools for customers**, i.e. the front-end web-portal and app.

Three customized portals for our project partners in the eCREW project have been set up, namely Stadtwerk Haßfurt GmbH (SWH), Ulug Enerji AS (UEAS) and Alginet Distribucion Energia Electrica (ADEE) which can be accessed via the following URLs:

- https://ecrew.stwhas.de (SWH)
- https://energyapp.electricadealginet.com (ADEE)
- https://tasarruf.enerjikcozumler.com (UEAS)

The setup not only includes a customized front-end for each partner, but allows them to transfer their master data, consumption data and tariff data to GreenPocket in order to then display energy flows as well as saving potentials to their users. For this, very simple data formats have been developed which are explained in section 2.2.2.

2.2 Requirements for hosting the eCREW-App and data formats

The following chapter describes the requirements to be fulfilled for hosting the eCREW-App and explains the interfaces for importing master and consumption data.

2.2.1 Hosting Requirements

2.2.1.1 General Requirements Web and Application Server

- **Processors:** at least 16 cores
- **Memory:** at least 32 GB
- **Storage:** at least 250 GB SSD (depends on the number of measurement points and the runtime of the project and takes into account future updates and provision of new services)
- **Operating system:** our recommendation is Ubuntu Server 18 64 bit, alternatively Debian 10 64 bit, CentOS ≥ 8.0 64bit.
- **Physical Server:** Requirements identical, only a slightly larger hard disk capacity should be considered (depends on the number of measurement points).
- The application server must be duplicated:
    - One instance for testing
    - One instance for production

2.2.1.2 Software

- **Incoming protocols:** http and https (are required).
- **If required:** retrieval of weather data from http://weather.greenpocket.de (port 80) must be enabled

2.2.1.3 Application Server and Back-end System

- **Additional requirements for push notifications:** TCP port 2195 and 2196 (Apple Push Server (APSN)) and 5228, 5229 and 5230 "outgoing" (Google Cloud Messaging)
- **Remote access**
    - GreenPocket requires rights to access data and transfer data. SSH or FTP access desired (with root privileges).
    - Site-to-site VPN coupling can be chosen for security.

2.2.1.4 Database Server

- **Processors:** at least 16 cores
- **Memory:** at least 32 GB
- **Storage:** at least 750 GB SSD
    - Depends on the number of measurement points and the runtime of the project
    - Approx. 30 MB per measurement series per year (at 15-minute resolution)
- It is recommended that the database server is duplicated analogous to the application server

► **Database:** Maria DB 10.2

2.2.1.5 Remote Access

GreenPocket needs rights in order to access and transfer the data. SSH or FTP access are requested (with Root-rights). For protection a site-to-site VPN connection can be selected.

2.2.1.6 Additional requirements for Push Notifications

Activated ports for Push Notifications: TCP Port 2195 and 2196 (Apple Push Server (APSN)) and 5228, 5229 and 5230 outgoing (Google Cloud Messaging)

2.2.2 Data Formats and Interfaces

The data collection framework as described in section 2.1 supports two different approaches of importing data to the back-end:

1. The data to be imported and provided by the utility follows a standardized format such as MSCONS or LPEX, or follows a format defined by GreenPocket.
2. GreenPocket implements well defined and documented Application-Programming-Interfaces provided by the utility.

This applies both to the master data as well as the consumption data.

2.2.2.1 GreenPocket XML format for master data

GreenPocket has developed a simple-to-understand and simple-to-use XML scheme for master data. An XML file derived from the scheme file holds only the minimum required data fields plus optional information. Basically, a master data file consists of the user, their meters and the contract information controlling the viewing rights on the consumption data of the meters. The following example shows a master data file for an eCREW user with one meter.

```
<?xml version="1.0" encoding="UTF-8"?>
<hci:homeClientImport xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:hci="http://greenpocket.de/importer/homeclientimport"
    xsi:schemaLocation="http://greenpocket.de/importer/homeclientimport ../homeclientimport.xsd">
<meta>
    <superClientRef businessId="ecrew"/>
    <timestampTimezone>Europe/Berlin</timestampTimezone>
    <exportDate>2017-03-04T14:12:23+02:00</exportDate>
    <referenceNumber>2017-03-24T14:12:23</referenceNumber>
</meta>
<clientList>
    <client businessId="andrea.schaefer@ecrew.eu">
        <gender>FEMALE</gender>
        <firstname>Andrea</firstname>
        <name>Schäfer</name>
        <email>andrea.schaefer@ecrew.eu</email>
        <login>andrea.schaefer@ecrew.eu</login>
        <password>superSecurePassword123!</password>
        <language>de_AT</language>
        <address>
            <city>Linz</city>
            <country>AT</country>
            <street>Altenberger Straße 69</street>
            <zip>A-4040</zip>
        </address>
        <meters>
            <meter businessId="AT00056266802AO6G56M11SN51G21M24S">
                <contractStartDate>2017-03-01T00:00:00+02:00</contractStartDate>
                <contractEndDate>2018-02-28T00:00:00+02:00</contractEndDate>
                <channelRef>1-1:1.29.0</channelRef>
                    <meteringPointNumber>AO6G56M11SN51G21M24S</meteringPointNumber>
                <measuringInterval>QUARTER_HOURLY</measuringInterval>
                <name>Power meter</name>
            </meter>
```

```
        </meters>
    </client>
</clientList>
</hci:homeClientImport>
```

Figure 3: GreenPocket XML master data example

The master data is imported by the EEE (as introduced in Section 2.1). The EEE expects the data to be placed in a configurable directory in the file system and moves the file to either a processed-directory in case of a successful import or to a failed-directory otherwise. This kind of file management allows real-time monitoring tools such as Zabbix to collect relevant information about the outcome and send it to a clearly defined group of recipients.

2.2.2.2 GreenPocket CSV format for consumption data

This format for consumption data is even simpler. Each consumption data point is defined by the metering point ID, a channel (OBIS code), the unit, the measured value and a timestamp. Figure 4 shows an example for a consumption file.

```
MeteringPointNumber;Channel;Unit;Value;Timestamp
AT00056266802AO6G56M11SN51G21M24S;1-1:1.29.0;kWh;0.6529;2017-08-13 22:00:00
AT00056266802AO6G56M11SN51G21M24S;1-1:1.29.0;kWh;0.5241;2017-08-13 22:15:00
AT00056266802AO6G56M11SN51G21M24S;1-1:1.29.0;kWh;0.5015;2017-08-13 22:30:00
AT00056266802AO6G56M11SN51G21M24S;1-1:1.29.0;kWh;0.4935;2017-08-13 22:45:00
```

Figure 4: GreenPocket CSV consumption data example

The consumption data is imported in a separate process which follows the same directory logic as the master data importer.

2.3 The back-end processing unit system

The following chapter gives a brief description of the Back-end Processing Unit and its core features. This unit includes a Java Enterprise Edition (JEE) application running in a Wildfly 11 as well as a JavaScript back-end based on node holding the game logic. Lastly, several aspects concerning security are mentioned.

2.3.1 The JEE Application

The app is based on classic client-server architecture. The client in this case is the smartphone app front-end communicating with the JEE application located on a server reachable over the World Wide Web. The following figure gives an overview of the basic architecture.

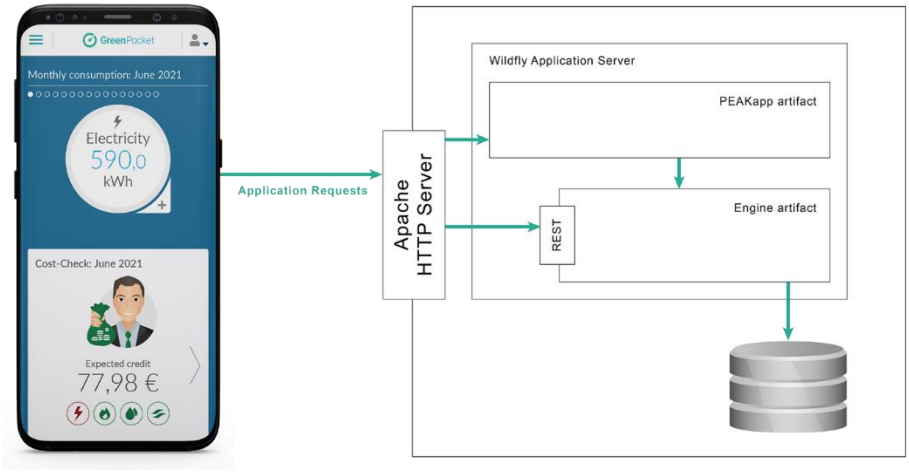

Figure 5: Application Architecture

Figure 5 describes the application architecture. The web server processes all HTTP requests from the Smartphone app and also functions as a reverse proxy retrieving data from different artefacts. Either it proxies client requests to the app artefact, e. g. for resources such as images, or to the REST API of the engine to retrieve user specific data such as meters and consumptions. Next, Wildfly 11 is used as certified application server. Wildfly is an open-source application server supporting the full JEE7 profile and is developed by Red Hat.

The app artefact is a web archive and holds all the static resources such as images, HTML, JavaScript, CSS and language files. Each request to one of the resources is consequently proxied by the web server to the app artefact. The app artefact also handles all the customization. Whenever images, CSS and language files are requested a Servlet looks up customization information in the database and serves patched files to the front-end.

In the Engine artefact all the back-end action and calculations take place. Consumption data is aggregated, forecasts and comparisons as well as viewing rights are calculated and all the personal data is gathered.

The Engine is a JEE application making use of the following features:

- Enterprise Java Beans (EJB)
- Java Persistence API (JPA), Hibernate as JPA-provider
- Contexts and Dependency Injection (CDI)
- Java Architecture for XML Binding (JAXB)
- Java API for XML Web Services (JAXWS)

Especially JAXWS is of particular note as based on this technology the whole front-end API is defined. The following endpoints are defined.

```
POST: /rest/login
POST: /rest/secure/logout
GET: /rest/secure/token
POST: /rest/secure/refresh
POST: /rest/password/sendResetRequest
POST: /rest/password/resetPassword
GET: /rest/secure/peerComparison/benchmark
GET: /rest/secure/peerComparison/questionForm
PUT: /rest/secure/peerComparison/questionAnswers
GET: /rest/secure/configurationProperties
GET: /rest/secure/configurationProperties/{key}
GET: /rest/secure/features
```

```
GET: /rest/secure/consumptionCheck
GET, PUT, DELETE: /rest/secure/consumptionLimit
GET: /rest/secure/measurements
GET: /rest/secure/export/excel
GET, PUT: /rest/secure/meters
GET: /rest/secure/meters/consumptionDataDelivered
GET: /rest/secure/costCheck
GET, PUT, DELETE: /rest/secure/partialPayments
GET, POST: /rest/secure/rate
GET, PUT: /rest/secure/rates
DELETE: /rest/secure/rates/{id}
PUT: /rest/secure/changeInitialPassword
GET, PUT: /rest/secure/messaging
PUT: /rest/secure/changePassword
GET: /rest/secure/blockingInfo
POST: /rest/secure/confirm/{documentType}
GET: /rest/secure/userproperty/{key}
POST: /rest/secure/userproperty
POST: /rest/secure/pushNotificationToken
GET: /rest/secure/userdata
GET: /rest/secure/notifications/discountSavings
GET, PUT, DELETE: /rest/secure/pushMessage
GET: /rest/secure/authorized
POST: /rest/login/game
GET: /rest/measurements/measurementsComplete
```

Figure 6: REST endpoints available for the app

At the moment two possibilities exist to run the software. On the one hand, a commercial solution from Oracle is supported and on the other hand a free and Open-Source alternative, Maria DB 10.2. In section 2.2.1 the requirements for the hard drive capacity are provided. The database is initially installed and set up. The schema is generated and basic master data is imported, such as SMTP-settings, feature configuration and system users.

2.3.2 The Game Server

The game server architecture is basically the same architecture as described above, expanded by game components. The game is part of the app and embedded in an iframe located on a separate route and displayed in full screen. The app hosting the game communicates with the iframe via the `window.postMessage()` method, which safely enables cross-origin communication.

All requests are handled by a web server which functions as a Reverse Proxy and decides where to route the requests. All game requests are accordingly prefixed and directed to the game server. The game server itself needs further user specific information which can be fetched from the application server and its REST interface. The following endpoints are accessible by the game.

- Authenticated: An endpoint which simply returns true or a status code of 401 (unauthorized) otherwise
- Consumptions: Returns the consumptions of a specific meter
- Notifications: Endpoint to advise the application server to send messages to the user
- Measurements Complete: Returns true if there is consumption data for a specified time interval

The game itself also offers a REST interface with one endpoint. The endpoint is used on the dashboard of the app to display the current state of the game. The app game stores its data in a separate database. Currently MySQL and Oracle are supported. The database can be setup easily and updated by calling a npm command: `npm run deploy-db –production`. The database schema currently consists of three tables:

- bet_tweaks: Links bets and the user's tweaks
- bets: Holds information about the user's bets

- measurements: Some of the measurements are stored redundantly to perform nightly calculations

2.3.3 Security aspects

Regarding the data security of the app, two main aspects are of importance. Firstly, a user needs to authenticate in the front-end against the back-end to gain access to the content of the application. Therefore, a login name and a user defined password are required. The password will be securely transported to the back-end via HTTPS and compared to a salted one-way hash representation of the password stored in the data base. If the hashes equal, the user will be forwarded to the secured part of the application or stays on the login page otherwise.

Secondly, after the access has been granted every request will be secured with a token. The token consists of metadata, such as the period of validity, but also an encrypted part which can only be decrypted with a private key only known by the security framework in the back-end. The encrypted part of the token holds information about the user and connects the user in the front-end to its back-end representation, including any personal data, contracts, meters and viewing rights on the consumptions measured by the meters. Whenever a user or an attacker tries to access the secured part of the application without having a valid token, the security framework handles these unauthorized requests and forwards the application and therefore the user to the login screen. All REST endpoints dealing with personal data are secured with a token.

2.4 Installing the system

At this point there is no installation manual available. If any difficulties arise, GreenPocket directly consults the LC partners. They will guide them through the installation process and answer upcoming questions related to the system.

2.5 Testing the system

The following example (from project partner SWH) illustrates how to successfully test the system and which steps are necessary. In order to test the system, transferring test files via SFTP is required. This includes both master data and consumption data. SWH has successfully transferred master data in the XML-format as suggested in section 2.2.2.1. These files were picked up and imported by GreenPocket. Amongst successful file imports there were some that led to error messages as the format was incorrect. This demonstrated that the importer picked up and communicated mistakes within the files successfully.

Along with the front-end for users, GreenPocket provides an interface for administrators, which allows them to view such error messages and successful imports. An example of both can be seen in the below screen.

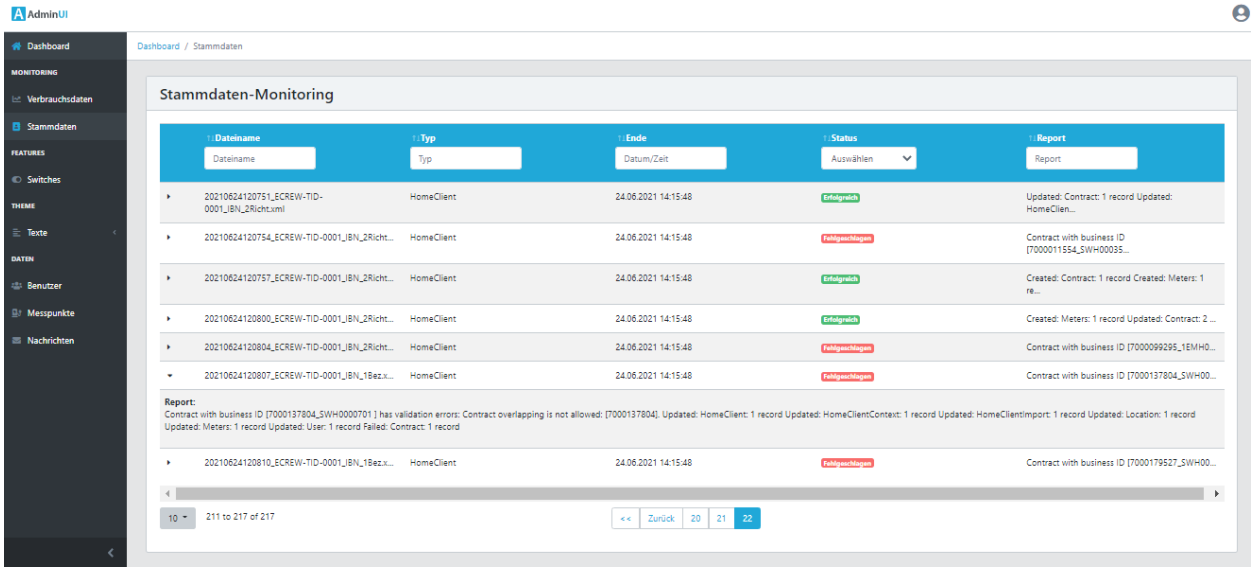

Figure 7: GreenPocket's Admin-UI for administrators from SWH

2.6 The split-incentive approach

In eCREW, most members of a CREW are prosumers who produce excess electricity, households capable of storing electricity, or households that consume but do not produce electricity. A "CREW contract" is developed together with an energy retailing company that holds the right to establish supply contracts with consumers. This contract includes electricity supply and generation surplus trade tariffs with the ability to provide benefits to both producers and consumers of PV electricity. The initiation of promoting energy sharing among CREW members is thus referred to as the split-incentives approach (SIA), as described in Deliverable 2.2: Definition of the split-incentives approach in LCs.

The concept of eCREW's business and governance model evolves around this notion of a SIA. The specific layout and implementation of the SIA depends on the prevailing market conditions: the SIA in an open market system versus a subsidised integration of renewable electricity surpluses. In the following, both concepts are briefly discussed.

In the open market system, excess electricity is sold at market costs and every citizen is allowed to sell surpluses to an energy provider at tariff models offered by the provider. Excess electricity is thus generally sold to a retailer/grid for a fixed low feed-in tariff (e.g. 3c€/kWh), while the energy costs of each kWh purchased are higher (e.g. 6c€/kWh). The SIA would offer the following benefits for CREW participants.

Regarding consumers, CREW members can buy excess electricity from other members at a lower price than that offered by the energy provider (e.g. 5c€/kWh). These price differences (e.g. 1c€/kWh) are refunded as bonus payments by the Community Administering Entity (CAE). Grid electricity is only necessary when total CREW demand exceeds total CREW supply. Regarding producers, CREW members can sell their excess electricity to other members at higher prices than if they were to sell it to the grid (e.g. 4c€/kWh). The differences are again paid as bonus payments by the CAE. Selling surpluses for the common feed-in tariff is only necessary when total CREW supply exceeds total CREW demand. Regarding CAEs, the difference between the price the producer receives and consumer pays is the revenue of the CAE (in this example 1 c€/kWh).

Many national regulations offer a subsidised integration of renewable electricity surpluses with fixed feed-in tariffs. Thus, the pure energy price when purchasing electricity from the energy provider is often lower than feed-in tariffs. While the incentives were found in-between provider-defined supply and feed-in tariffs in the open market system,

subsidised integration calls for a different SIA concept. One possibility are bonus payments for energy exchanged within the CREW. Since both consumers and producers would benefit monetarily from such payments at the expense of the CAE, such a bonus system is a solution only for the transitional period from subsidised feed-in tariffs to the open market system. The SIA would offer the following benefits for CREW participants.

Regarding consumers, the consumption of excess CREW electricity is incentivised as a bonus (e.g. 1 c€/kWh) credited against the standard energy supply tariff. These incentives are refunded as bonus payments by the CAE. Regarding producers, excess electricity is sold to the provider at standard feed-in tariffs. Surpluses that could be utilized within the CREW are remunerated by the CAE as bonus payments (e.g. 1 c€/kWh) to the producer. Regarding CAEs, their revenue and costs are dependent on national regulations and involve allocations of subsidies. As of now, the CAE has to cover the bonus payments for the CREW members. The benefits for CAEs within this concept are thus mainly based on attracting new clients, until the feasibility of profitable business models under appropriate adaptations of regulations and the implementation of a proper SIA.

2.6.1 Conclusion

The split-incentives approach is economically viable in the open market perspective, if none of the three market players (consumers, producers, CAE) is made worse off. In the perspective of subsided feed-in tariffs, where the CAE provides financial incentives for consumers and producers, it will be important to assess the costs for the CAE along with the benefits for consumers and prosumers to derive a balance between incentives for participation to a CREW and costs for the CAE. Thus, each Lighthouse city has to decide on a specific configuration of the split-incentives parameters under the prevailing market conditions and determine the financial incentives provided to the CREW participants. Our results of the simulations of the German and Spanish LCs in Deliverable 2.2: 'Definition of the split-incentives approach in LCs' show that within the perspective of subsided feed-in tariffs and the proposed bonus system the additional earnings per producer are significantly higher than the individual savings for the consumers (incl. prosumers) according to the proportion of these member types. Thus, the incentives for production could be lower than those for consuming energy within the community without creating disadvantages for individual members, while decreasing compensation costs for the CAE.

3 Launch phase: Initial recruitment and launch the app in the field

In this phase the initial crew participants are recruited by the Lighthouse city partners, the app is rolled-out in the field and compliance with relevant legal and regulatory prerequisites is ensured. This chapter thus outlines the necessary legal and regulatory aspects and steps that need to be followed in the data collection, protection and management processes, presents the consultations with National Data Protection Authorities as well as recruiting materials to guide LCs in the process of recruiting eCREW participants (specific engagement strategies are presented in section 4.2). Lastly the current status regarding collective action initiatives and the relevant EU directives and related topics within the three Lighthouse communities are highlighted.

3.1 General Information

In eCREW data from several categories is collected automatically via a specified software interface when users are participating in the field tests. This includes app usage data, client data, contract data, meter data and survey data. However, data collections in eCREW are limited to the data requirements to facilitate the eCREW concept. This means that electricity load profiles and limited demographic information is collected for those customers of the Lighthouse Communities that provided their informed consent to do so. The software system requires data of the customers as input. Data of the customers is transmitted from the respective metering service providers to the CAEs. Each CAE either hosts the smart phone application (and hence stores the data) on its own servers, or delegates these tasks to GreenPocket, in order to finally display them in the eCREW app. This makes it necessary to define procedures for how data access rights for researchers are achieved and how that data is used without any conflict of national or EU-level data protection regulations.

To enable a user-friendly and personalized interface, personal usage data, like the number of log-ins, the average usage duration of the application is needed. The Google Analytics™ interface provides these data in anonymized form. The data will be gathered in the Microsoft Excel™ Add-in Analytics Edge™ from Analyticsedge.com via Oauth2 authentication. Google classifies the locational data as the corresponding NUTS 1 region[1]. Therefore, there is no data on the customer's exact location available to the consortium. The data will be collected on a monthly basis and for the number of accesses to the app per timestamp. The data also includes the number of postings on social media platforms, but without any reference to content.

3.2 Data Management

This chapter describes the procedures applied in eCREW for the different steps of data collection, management, storage, and publication.

3.2.1 Formal ethics approval

eCREW involves human participants, data collection and processing, and involvement of a non-EU country (Turkey, see also section 3.2.1.4), which raises ethical issues. The eCREW consortium will comply with all relevant national, European and international ethical regulations and professional codes of conduct. All partners will also conform to Horizon 2020 ethical guidelines, including General Data Protection Regulation, "Data protection and privacy ethics guidelines", the "Guidance for Applicants on Informed Consent", and national regulations. Before the data collection activity is launched, the competent national data protection authorities were notified and asked for their opinion on data protection law (see section 3.3).

[1] See https://ec.europa.eu/eurostat/web/nuts/background.

3.2.1.1 Involvement of human participants

The possible participants are determined from the existing customers of the participating energy retailers. For this purpose, attention is paid to the technical requirements of the households; i.e. a smart meter is already in place. An offer to participate in the eCREW research program will be sent to these households by means of the respective legally and contractually permissible contact options. This offer includes a presentation of the project and informs about the course of the research program. Additional recruitment is expected to happen via other channels, i.e. companies' websites or newspaper articles. Recruitment will be done by the Lighthouse community partners, SWH, ADEE and UEAS, so that no information about the participants will have to be shared or used before they give their informed consent. When registering, it is necessary to provide information about the equipment of the household. Participants will never be asked for sensitive data.

All interested participants will be asked to expressly agree to the detailed informed consent (including information on revocation, which is possible at any time). Since the participants are existing customers of the respective energy retailer, the eCREW contract is concluded with them. The contract data remain with the energy retailer. Any information about the households and respective information (e.g. annual electricity consumption or hourly load-profiles, information on PV/storage ownership available yes/no, etc.) utilizable for the provision of targeted communication and accompanying actions that enable consumers to take part in CREWs will be collected on a need-to-know basis and no additional unrelated information will be collected. Participants are 18 years or older and must be able to give informed consent. They will be informed about the aim of the study, the collected data, data handling, storage and anonymization procedures as well as publication of the anonymized data and its inclusion in the Open Data Pilot. This will be done – in accordance to GDPR – in simple terms and in the respective national language, easy to understand for the participants. From the point of anonymizing the data is no longer personal information.

3.2.1.2 Informed consent procedures

The introduction of the project by the LC will provide potential participants with comprehensive information about eCREW. Project participants can register to participate in the project. During the registration, participants will agree to the informed consent by signing the checkpoint (opting-in principle). The informed consent contains the objectives and methods of the research. It is pointed out that the anonymity of the participants is guaranteed when publishing research data, as well as during data collection and data storage.

Participants may give notice of their withdrawal from research activities at any time. They are also informed that they can retract their consent until the data is anonymized without any disadvantages and without having to give a reason. The information sheets and consent forms as used by SWH in the recruitment for the field test can be found in the appendix in section A.1 (this document was translated from German to English) and may serve as guideline in the recruitment process, but should be adapted to the respective LC (see section 4.2 for engagement strategies). As described in this document, potential participants also have the opportunity to register online. Therefore, the questionnaire and informed consent was recreated within a Typeform[2] form and customers of SWH were offered to register online.

3.2.1.3 Data collection and Processing

eCREW uses two different databases. First, the historical energy consumption data (only energy data) of the respective LC is used to for the simulation of possible split incentives.

[2] https://typeform.com/

The other database contains energy data plus contact details of the households, but they never leave the entity where it was generated. Only the energy retailer has this data, which he uses even without their participation in eCREW (e.g. for billing). The upstream processing and storage of energy consumption data with contact details is carried out by the LCs. The further processing and storage take place on the GreenPocket data server, which prepares the data for the use of the app. GreenPocket uses servers from European server providers that comply with the GDPR. The aggregated data of the respective eCREW is presented anonymously in the app. Only the respective user can see his or her own energy production, consumption and storage data.

When processing the data, care is taken to ensure that personal data is made anonymous as soon as possible. Non-anonymized data is only necessary for the quality control of the dataset. As soon as this quality check is done, the data set will be anonymized, i.e. any personal information (gender, name, address) will be deleted. Additionally, the dataset will be scrutinized in order to detect additional variables that may allow de-anonymization. We expect this to be a factor in smaller CREWs of households in close proximity, where e.g. the existence of a swimming pool or an e-car clearly identifies a household. In such cases, additional data deletion will be done to ensure the privacy of the households. Furthermore, during the field test the participants are asked to answer surveys via app. The survey results will be communicated on an anonymous basis to the project partners and to the public.

Data transfers are carried out exclusively in encrypted form. All anonymized data will be stored and protected on EI-JKU encrypted servers. Passwords will not be exchanged via e-mail but in personal communication between the partners. The encryption solutions will be chosen in accordance with the eCREW partners' IT supports.

3.2.1.4 Involvement of non-EU countries

eCREW´s Turkish partners UEAS and IUE fully commit to the Horizon 2020 ethical guidelines and will comply with European ethics and data protection related regulation. A signed letter confirming this compliance was sent to EASME during the Grant Preparation phase. Activities carried out outside the EU will be executed in compliance with the legal obligations in the country where they are carried out, with an extra condition that the activities must also be allowed in at least one EU Member State. In eCREW data will be transferred between the Turkish institutions UEAS and IUE and countries in the European Union to allow for joined analyses and storage of all data in the common database.

Only for those participants to CREWs who gave consent to the utilization of their data for scientific purpose, anonymized energy consumption data and descriptive data of households (number of residents, equipment owned, etc.) will be transferred from the Lighthouse Community in Turkey to EI-JKU (Austria) and CIRCE (Spain) only be made in encrypted form via secured channels.

3.2.2 Data collection criteria

In order to achieve quality assurance, quality control and consistency throughout the project, specific data collection procedures are to meet general scientific quality criteria for data collections[3] as indicated in the following:

- Accuracy (the data is collected correctly and complete and the data entry procedures are reliable)
- Efficiency (the least amount of resources are used to collect the necessary data)
- Effectiveness (the collected serves to achieve the objectives set and results planned)
- Feasibility and timeliness (the data can be collected and analysed cost effectively and can provide current information in a timely manner)

[3] These standards and explanations are developed by *European quality assurance in vocational education and training* (EQAVET)

- Relevance (the data is relevant and important for primary stakeholders and complements rather than duplicates existing information)
- Security (the confidentiality of the data is ensured)
- Utility (the data provides the right answers to the questions posed)

3.2.3 Data documentation

This section contains the documentation that will accompany the data to help secondary users to understand the data. The term FAIR defines the guiding principles that the eCREW project follows in all data collection and processing activities. FAIR stands for findable, accessible, interoperable and re-usable[4]. All data used or produced are processed in such a way that they are easily findable. The access to the data is prepared in such a way that the data is accessible according to the general standard. Furthermore, eCREW ensures that the data are interoperable so that scientific use between researchers, institutions, organizers and countries is possible. The resulting data is also made available for re-use.

An open access database will be used to grant access to anonymized quantitative and qualitative data after the project has ended, eventually aggregated to protect the LCs' commercial interests. This is in line with the H2020 open data pilot (see https://www.openaire.eu/opendatapilot). Personal data remains exclusively with the LCs. The researchers have a duty of transparency to fully inform how the data will be used and to what purpose the data is for. The data provided in eCREW will be of interest for policy makers, businesses in the energy sector, stakeholder groups and researchers. They will be documented and presented in a way that makes them accessible for non-scientists. All data files provided by eCREW include a documentation of the content of the data file and the context the data was collected in. Quantitative data will be made available in standard data formats for popular statistical program packages to make reuse as easy as possible (e.g. CSV, SAV, or R with popular character encoding such as ASCII or UTF-8 without BOM).

3.3 Consultations with National Data Protection Agencies

Before the roll-out of the smartphone app, consultations with the National Data Protection Authorities of Germany, Turkey and Spain were carried out. Thereby, it can be ensured that no information/data is displayed in the app that might be in conflict with EU/national legislation or ethical standards (see D1.4: Consultations with National Data Protection Agencies). The process of consultation with the National Data Protection Agencies was coordinated by the Project Coordinator and the partners' Data Protection Officers.

Contacting was already started in December 2020. First, information was sent to the data protection authorities of Germany. The nationwide data protection authority (namely "Der Bundesbeauftragte für den Datenschutz und die Informationsfreiheit") responded immediately and referred to the responsibility of the Bavarian data protection authority (namely "Bayerisches Landesamt für Datenschutzaufsicht"). Following this, an information was also sent to the Bavarian data protection authority. The information was transmitted by e-mail and coordinated by the EI-JKU. We have delivery confirmation of the e-mail to the Bavarian data protection authority. However, to date, there has been no response from the Bavarian data protection authority.

The Spanish data protection authority ("Agencia Española de Protección de Datos") was also informed by letter about the data collection and data processing in the context of the eCREW research project. EI-JKU and the data protection officer of project partner ADEE worked together to contact the authority. The Spanish data protection authority has

[4] See https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/data-management_en.htm.

reviewed the letter and concluded that they have no objection, provided that the necessary measures already implemented and those specified in the letter are applied.

A letter with information about the eCREW project was sent to the Turkish data protection authority (namly "Kişisel Verileri Koruma Kurumu") in January 2021. The tracking number allowed us to follow the route, but there is no confirmation whether the letter actually arrived. An inquiry was also ordered on the location of the letter. To make sure that the Turkish data protection authority received the information about the eCREW project, another letter with the information was sent in May 2021. In June, EI-JKU received a response from the Turkish Data Protection Authority that did not contain any negative or positive comments about our project. Rather, it was stated that the authority does not express any opinion and/or advice on this topic. Furthermore, the reply letter referred to the relevant articles of the Turkish Act on the Protection of Personal Data.

All full inquiry letters and responses can be found in D1.4: Consultations with National Data Protection Agencies.

3.4 Interim conclusion

All partners will conform to Horizon 2020 ethical guidelines, including General Data Protection Regulation, "Data protection and privacy ethics guidelines", the "Guidance for Applicants on Informed Consent", and national regulations. The national data protection authorities were contacted and the Spanish authority had no objections regarding our requests, the Turkish did not give any positive or negative feedback and the German has not responded yet. However, any future responses of these authorities will be evaluated and implemented accordingly. Data collections in eCREW are limited to the data requirements to facilitate the eCREW concept and data guidelines and procedures presented above have to be strictly followed by all participating parties.

3.5 Current situation in Lighthouse communities

The following demonstrates a comparison of the current situation related with RECs and CECs, the legislative framework regarding community based collective energy generation, smart meter rollout and data flow in the countries of the LCs (Germany, Spain and Turkey). The countries are in different levels of progress regarding these issues. The Renewable Energy Directive (RED II) was introduced in 2018 and the Internal Electricity Market Directive in 2019. As of 2021, it is obvious that the countries have not fully harmonize their legislation with the concept of renewable energy communities (REC) and citizens energy communities (CEC) yet.

However, the countries have already transposed some parts of the regulation into their own legislation. Spain updated its legislation after the EU Directives. There exists a definition of REC in accordance with the Directive 2018/2001/EU. CEC, on the other hand, has no legal foundations yet. Since the concept of REC is not introduced in the main law on Electricity Sector (Law 24/2013), there exists a conflict of laws that limits the implementation of RECs in Spain. Germany introduced a draft law which explains that there exists no need of defining CEC in Germany since the current collective based electricity generation systems already allows the citizens to join in the electricity market. Germany allows the citizens to generate electricity by forming or joining a cooperative or a "citizen energy corporation", a regular company with special provision. Turkey has not taken any steps so far towards introduction of REC/CEC in their legislation.

The citizens of the countries studied have the right to self-generate electricity for their own consumption needs. Community based collective generation, however, differs from country to country. In Germany, the residents of a building, with several apartments or business premises are allowed to generate electricity for the use of it in the building. They are also free to sell the surplus in the market. This system is called the tenant electricity model ("Mieterstrom"). In Turkey, only those who are in the same tariff group and connected to the same connection point, or those whose

electrical energy consumption can be measured with a single common meter are allowed collective generation. Very limited numbers of households, commercial / industrial entities, etc. meet these criteria. The legal developments that occurred since 2018 in Spain allowed collective generation activities for those who belong to the same mode of self-consumption. This allows a group of apartment owners or administrators of industrial estates to engage in collective self-consumption.

Apart from that, though the concept of REC/CEC is not introduced, the cooperatives, the most common form of a legal body that can operate as REC/CEC in Europe, are allowed to generate electricity in some countries. In Germany, cooperatives have the right to operate in the electricity market as any other commercial companies. Spain also lets cooperatives operate in the electricity market, but for limited activities (the limitation of financial incentives negatively affected their establishment as well). In Turkey, where the cooperatives were allowed to generate electricity between 2016 – 2019, the government restricted its activities to prevent malicious acts on financial support schemes. Currently, no new cooperative can be established to generate electricity.

The regulations on smart meters, data flow and data sharing exist and are similar in all countries and this is in favour of the eCREW approach.

Though REC / CEC is not fully transposed to countries' legislations and further legal actions are needed, the existing schemes allow the implementation of eCREW approach on national levels. The full analysis of the legal and administrative frameworks as well as demographic descriptions and insights into the perceptions of individuals regarding energy-related issues in the three countries can be found in D.5.1 'Draft report on the legal and administrative framework'.

4 Monitoring phase: Continuous engagement and data collection

This phase focuses on monitoring the progress of the app usage as well as continuous engagement activities with the field trial participants. Thus, this section first describes the Key Performance Indicators that monitor the progress and success of the eCREW approach and describes the data required to quantify them. Further, engagement strategies are proposed to ensure successful and ongoing contacting, communicating and enrolling of enough potential CREW members. In addition, a Collective Action Plan is briefly outlined aiming at stimulating collective actions in the CREWs during the project. Lastly, a schedule accompanied by a template is presented to ensure regular reporting of planned activities and success stories.

4.1 Monitoring

The key objective of the eCREW project is to ensure that many households enrol in the LCs and that those who register actively participate in actions at the community level. The success of the activities done by the CREWs is measured by a set of Key Performance Indicators that monitors the progress and the effectiveness of the eCREW community roll out. These indicators are designed to reflect the effectiveness of the different activities and strategies deployed by the CREWs at individual and at community level and encompass impacts in different domains like social, environmental, economic and project related topics.

With this set of KPIs in mind, the three LC communities and app developers will work to create the necessary procedures and structures to be able to properly collect, store, calculate and show the results of the KPI measurement according to the suggested reporting frequency. The following is a summary of all KPIs, displaying where the data will come from (Input source), which variables and data will be required to collect in order to quantify the indicator (Data

required) and the reporting frequency of the indicator (Frequency). D2.5 'List of Quantitative Indicators' describes all indicators in more detail and offers further information.

Firstly, Table 1 shows the set of KPIs that intends to measure the social impact of the CREW-type communities. It encompasses those metrics related to membership and app usage metrics. Measuring the size of CREWs and respective growth rates gives insight into the enrolment success. Monitoring activity levels and time usages of the app helps to understand the perceived usefulness of the app or of certain functionalities and potential (technical) issues that need to be addressed. Support service inquiries describe how members interact with the respective CAE and may point towards specific issues or topics. Lastly, the satisfaction rates measure a subjective usefulness of the app and its functionalities and offer highly important and necessary feedback, overall as well as of specific aspects of the app.

Table 1: Social KPIs

KPI	***Number of CREW households and members***	***App usage rate***	***App time of usage***	***Support service inquiries***	***App overall satisfaction rate***	***eCREW service satisfaction rate***
Input source	CAE	Matomo	Matomo	CAE	User survey	User survey
Data required	N. of households, N. of members	% of households that use the app	Average hours of app usage per user	Total number of inquiries, average per CREW	Average rating from a 1-5 satisfaction scale	Average rating from a 1-5 satisfaction scale
Frequency	At least twice, after initial enrollment and at the end of the project	Monthly	Monthly	Monthly	Once at middle of end of the project	Once at middle of end of the project

Secondly, Table 2 shows the set of indicators that measure the CREW impact regarding energy and carbon footprint. A main reason for consumers to engage is to increase their energy performance and enjoy energy savings jointly. Thus, these metrics offer highly relevant information for all participants. Energy consumption of CREWs and the average CREW members track the performance and are compared to a threshold (national consumption average, etc.) to offer a benchmark and dynamic and realistic targets that can be reached cooperatively and help boost further savings. CREW autarky levels are another metric that can be targeted within a CREW to enhance performance. Lastly, measuring the total energy generation of each CREW helps to monitor the aggregated energy self-consumption potential as well as the environmental impact of the CREW RES generation in terms of emissions avoided in kg CO_2.

Table 2: Environmental KPIs

KPI	*Energy consumption at CREW level*	*Average energy consumption benchmark gap*	*CREW self-consumption coverage rate*	*CREW renewable energy generation*	*CREW emissions avoided*
Input source	Metering info	Metering info	Metering info; CAE	Metering info	Calculated from RES generation
Data required	kWh consumption, average kWh per user	average kWh per user and a predefined threshold	kWh consumption, kWh surplus available to CREW and grid	kWh generation, average per user	RES generation times an emission factor of the energy mix
Frequency	Monthly	Monthly	Monthly	Monthly	Monthly/ yearly

Thirdly, Table 3 shows the set of indicators that convert energy consumption and savings into monetary values using the energy tariff rates as conversion factors. It is to note that changes to more economic tariffs or shift loads from peak to valley periods can derive into economic impacts with no variation in environmental and energy figures. The total energy consumption costs track overall economic performance. Importantly, calculating monetary savings from self-consumption as well as from consuming excess energy from CREW members displays the economic benefits of joining a CREW and tracks the evolution of savings over time. Lastly, a special app functionality (see D3.2 for details) calculates the individual payback time of a potential PV facility of a member for a given PV size and historic consumption profile. This metric is not reported in the KPI dashboard since it is a personal and individual metric calculated on demand through the app.

Table 3: Economic KPIs

KPI	*CREW energy costs*	*CREW economic savings from self-consumption*	*Payback time of potential PV facilities of CREW members*
Input source	Metering info, tariffs	Metering info, tariffs; CAE	Historic metering, individual PV info
Data required	kWh consumption, energy price	kWh self-consumption, external supply price, kWh excess energy, compensation prices	Historic consumption, PV info, location and installation yield
Frequency	Monthly	Monthly	On demand

Finally, Table 4 shows the set of indicators that aim at quantifying the internal eCREW targets in terms of engagement, participation, replication and RES uptake that are described in the Description of Action (DoA) in an objective way. Participation rates in different activities led by the CAEs as well the number of initiatives deployed from private sources or a CREW are measured. Tracking the number of recruited members in relation to the total number of contacted people measures the effectiveness of the enrolment messages and the suitability of the communication channels. By reporting the number of follower communities that replicate the LC models and the resulting potential number of members, the eCREW success on dissemination and replication is quantified. Lastly, once an initial baseline has been set, measuring total CREW renewable power available gives insights to the RES uptake and how the CREW model boosts the installing of new plants of the enrolment of prosumers with generation capacity.

Table 4: Project specific KPIs

KPI	*Participation in CREW collective actions*	*CREW projects and initiatives employed*	*CREW engagement rate*	*Number of follower communities and members*	*CREW RES uptake*
Input source	CAE	CAE	CAE	CAE, eCREW project partners	CAE
Data required	N. of participants in collective actions, % of participants	N. of initiatives deployed	N. of enrolled members, N. of contacted people	N. of follower communities, estimation of potential members	kW of installed power, baseline at beginning
Frequency	Per activity, on demand	Once at end of the project	Twice, after the enrolment campaign and at the end of the project	Once at the end of the project	Once at the end, potentially interim checks

The indicators presented above are crucial to monitor and evaluate the progress, effectiveness and success of the eCREW approach and offer valuable and necessary knowledge to all participating parties. It is thus of utmost importance to properly collect all necessary data in a comprehensive and timely manner. Missing or poorly documented data could impose serious implications and threaten the motivation of participants and hinder the progress and successful completion of the project.

4.2 Engagement strategies and collective actions

The following presents engagement strategies that should guide the three LCs to successfully contact, communicate and enrol a large enough number of potential CREW members, initially and ongoing. These engagement strategies are complemented with a Collective Action Plan aiming at stimulating collective actions at community level. The objective of the engagement strategies is to turn passive consumers into active prosumers and players in the energy supply and generation value chain. After the identification of potential CREW members, the strategies are defined by three items: the communications channels to reach the potential targeted citizens, the message with the benefits for potential consumers that are attractive for a large number of citizens and the deployment action plan recommendations for a successful implementation of the strategies at every LC.

In general, the success of engagement strategies is linked to several key points:

- Shared information must be clear and concise, using language adapted to the respective type of audience. Transmitting attractive, realistic and transparent information that does not generate expectations that cannot be fulfilled.
- Participants should feel welcome and part of the community, which is why it is necessary to establish a bond of trust with the CAE.
- Participant interest is achieved through activities that lead to constant interaction, such as games or periodic news feeds, and even suggestions from participants can be used to provide more content.

In eCREW the definition of the engagement strategy is developed in different phases. In the planning phase possible participation and communication frameworks were designed in collaboration with the CAEs, who know the preferences of their partners. Actions planned in the strategy are executed in the implementation phase. Next, an evaluation of the participation process measures the impact of the mechanisms adopted. In the feedback phase, the mechanisms are discussed with participants in order to stimulate a continuous participation of partners. Lastly, in the results monitoring phase, corrective actions are taken to react to any deviation from the plan. Accordingly, several KPIs (see section 4.1) will provide information regarding engagement and participation.

The definition of the final enrolment strategies for each LC implies the following steps that should be taken separately at each country, these are summarised below:

Initially, the target group of new CREW members is to be defined at each LC. Members will have some characteristics in common to create homogeneous energy communities. The majority of members will be domestic households. Members will be geographically close, i.e., in the same cities: Bursa, Alginet or Haßfurt. Hence, they are subject to the same climatic conditions and regulatory framework. Lastly, members will be customers of the same utility and will benefit from the same tariffs and energy supply conditions. The first item of the engagement strategies is the communication campaign. This includes the definition of the communication channels to reach a large number of users and enable them to reply back showing interest. The second main item is the message with key benefits for CREWs to engage new members. Benefits could be economic, social or also environmental. The messages were categorized

in high, medium and low relevancy for each LC. Finally, the Action Plan recommendations include the key factors for a successful engagement strategy rollout in the LCs.

These steps were iteratively taken with every LC and jointly with the participatory strategies that are presented in D2.4 "Collective Action Plan". The purpose of these collective actions is to identify concepts, strategies and tools that foster cooperation and motivate energy consumers to join a CREW and build their own community in order for them to evolve from an individual action perspective towards a collective one, by interacting and building relations within the group. The most relevant key messages identified in the engagement strategies were further revised and classified into four collective action categories. **Stakeholder engagement actions** refer to activities meant to identify and attract new members. **P2P activities** enable the different types of stakeholders to create synergies and to constantly share their ideas, difficulties, suggestions and to involve new members. **External activities** are deployed by external actors and may act as facilitator of further collective actions. Finally, **monitoring activities** led by the CAE provide individual and collective information for a proper energy management at both levels. Achieving a good balance of activities in the four categories is the basis for a success of the collective actions.

In the following, for each LC the engagement strategies based on the three main items communication channels, the key messages, and action plan recommendations are outlined, followed by a short plan for collective actions. It is highly important that each LC closely follows and implements the strategies and plans presented, as they have been designed in collaboration with the respective CAE as local experts to guarantee successful recruitment, engagement and collective development of the CREWs.

4.2.1.1 LC Germany

The German LC is situated in Haßfurt, Germany. The city has 13,500 inhabitants. The CAE is the company SWH, a local gas, electricity and water utility that also holds the local DSO position. The number of customers currently is 13,572, of which 30 % to 50 % are easily accessible.

Regarding **communication channels**, SWH issues quarterly publications in a local newspaper to share local news that are also published in the corporate web site. They are active on Facebook (455 followers) and Instagram (425 followers). E-mail is also a common communication channel used to communicate with customers, along with ordinary post, mainly for billing purposes. All the above channels can be used to disseminate the eCREW project at all levels of the city population. An eCREW membership invitation with the benefits of joining a CREW was sent in the regular billing emails to check for the response rate in February 2021. About 150 users expressed their interest by replying to the email. A more formal e-mail with more information and the membership form, along with a short survey was sent by August 2021. All the information is also being made available on the SWH website and in the social media channels, to reinforce the messages, ensure the proper and smooth distribution of the invitation in a non-discriminatory manner.

Regarding the **key message** in order to attract a large number of citizens, the following points were proposed in collaboration with SWH. Five highly relevant messages were identified that are key attracting factors for potential new members. The free rights to use the eCREW app are considered very important. The PV economic assessment functionality could be interesting for consumers who are considering the possibility to become prosumers. SWH has a service to give personalised advice for design and installation of PV facilities that could be offered through the app. Another key message in Haßfurt is the best use of exceeding RES generation. Since the CAE is directly managing this excess of energy within the community in administrative terms and the benefits in terms of bonus are extended to all community members, it is deemed key for the positive answer given by respondents. The economic savings expected have been indirectly mentioned as it is likely important for the majority of the CREW members. Lastly, the possibilities of energy consumption monitoring and benchmarking through the app is almost taken for granted as a minimum

functionality of the app. A set of further key messages has been considered to be of medium and lower importance. A list of all key messages can be found in A.2 Key messages

The table below shows all messages with the benefits for potential consumers that are attractive for a large number of citizens and their priority for each LC. These messages and their relevancy were developed in collaboration with the respective CAE of each LC.

Table 5.

Regarding **action plan recommendations**, the member sample can be enlarged with interested parties of the company's work force, as they are contactable, they live in the locality and are customers of the utility. It is advised to publicly advertise using social media and the company website. A reminder can be sent again via email to give a second chance to hesitant users and those who just missed the first early communication. Use the word-of-mouth to extend the invitations through the already engaged active members of the community. Use low-cost prices and awards to promote further communication campaigns through current active members. React fast to complaints and issues related to CREW administrative issues. Lastly, measure the user satisfaction and preferences of the members from time to time to adapt the participatory activities to the choices of the enrolled users, to increase their satisfaction and boost their further active participation.

The **collective actions** proposed to achieve the **engagement** of stakeholders consist of the advertising of the key benefit messages that are the free rights to use the eCREW app, making the best use of excess RES avoiding wastes and the economic savings expected. Personal energy performance advising and having energy related questions answered by experts seem important for some, but not for the majority of members. The most relevant **P2P activity** seems to be the possibility of benchmarking energy consumption within the app to foster energy savings. The main **external activity** is the calculation of the payback of a PV installation as it is highly relevant for consumers who are considering to become prosumers. Regarding **monitoring actions**, monitoring of energy consumptions will provide relevant insights on the individual and the community level and the comparison with other communities might stimulate participation. Also, surveys are an important monitoring method to evaluate evolving preferences of existing and new members.

4.2.1.2 LC Spain

Alginet is a medium-size town of 13,100 inhabitants located south of Valencia. ADEE is made up of an energy cooperative and an energy retail company. ADEE is represented in the project by the energy cooperative, ALGINET. The cooperative owns, maintains, and exploits the distribution grid in the city of Alginet. The retail trading company sells the electricity purchased in the wholesale spot Spanish market to their customers. The cooperative is a small organization with 13 employees and 5,800 associates, from which about 1,000 are easily accessible. They belong to the greater Valencian Federation of Energy Cooperatives where they play an active role. They would be the target group for the enrolment efforts.

Regarding **communication channels**, the cooperative regularly publishes a newsletter in a local newspaper. They also use snail mail, and e-mail for their communications. They are active in Facebook, with 600-1,000 active followers, and 1,500 individuals are reachable by email. An email campaign is considered the best and most efficient way to reach a large number of people, enabling a response channel for those interested by replying to the same message. While bills are sent via email, a separate dedicated email to all customers seems more suitable. The same information is also posted on the corporate website and on Facebook, and published in a specifically dedicated newsletter. In addition, some direct contacts to key participants are expected. A workshop to explain the project and the CREW idea

will be organised. The expected communication time will be September 2021 due to the inactive long holiday period in Spain that may hamper the response rate.

Regarding the **key message** in order to attract a large number of citizens, the following points were proposed in collaboration with ADEE. Three highly relevant messages were identified that are key attracting factors for potential new members. The free use of the app functionalities is key to trigger user's behavioural changes for a more efficient use of electricity. The energy consumption monitoring features are highly relevant since also new ToU tariffs with three consumption periods per day are in force since June 2021 in Spain. Grasping the benefits associated to individual and collective energy savings, especially individual, is considered highly important and it is linked to the monitoring features of the app. A user manual with visual attractive material to show new users what it looks like would be highly recommendable. Benchmarking is also relevant for some users as a reference of energy performance. A set of further key messages has been considered to be of medium and lower importance. A list of all key messages can be found in A.2 Key messages

The table below shows all messages with the benefits for potential consumers that are attractive for a large number of citizens and their priority for each LC. These messages and their relevancy were developed in collaboration with the respective CAE of each LC.

Table 5.

Regarding **action plan recommendations**, sending the enrolment message in waves to control the size of the initial community is proposed. A reminder should be sent again via email to give a second chance to hesitant users and those who just missed the first early communication. Involve key cooperative members with RES facilities or with special interest in the community that could push forward some interesting individual or collective propositions of general interest to the CREW. Democratise the process by moving it public. Public and official communication channels accessible by anybody could be used, such as social media and company website. Use the word-of-mouth to extend the invitations through the already engaged active members of the community. Use low-cost prices and awards to promote further communication campaigns through current active members. React fast to complaints and issues related to CREW administrative issues. Lastly, measure the user satisfaction and preferences of the members from time to time to adapt the participatory activities to the choices of the enrolled users.

The **collective actions** proposed to achieve the **engagement** of stakeholders consist of advertising the key messages that are the free use of the app's functionalities and the benefits of individual and collective energy savings and the resulting economic savings. Regarding **P2P activities** benchmarking may be relevant for some users as a reference of energy performance, so gamification and competitions are an attractive tool to drive energy efficiency and get people involved. Concern for the environment and participation in collective activities is increasingly important for many people, but not for all, and is therefore seen as a complementary method. **External activities** proposed are energy performance personal advising and general hints of best practices for optimal energy usage at home. Providing expert advice to get your energy related questions solved, is out of the scope of the cooperative but the service could be provided by external technical partners (CIRCE). The simulation tool of PV self-consumption facility payback calculation is also considered a good option for users who wish to generate their own PV energy. This information aims at attracting the users' interest towards the future installation of a PV facility but the final assessment and subcontracting should be done to an external ESCO or installer. Lastly, **monitoring actions** are based on the monitoring of individual and community energy consumption. Also, alarms and warnings within the app are considered relevant activities as well as monitoring members' satisfaction levels through surveys.

4.2.1.3 LC Turkey

The Turkish LC is located in several building complexes in the city of Bursa (3 million inhabitants), in the Marmara Region. ULUG energy is part of the UEAS group and acts as a retailer and distribution company that operates in the Marmara region in Turkey, employing around 2,300 people. The total number of customers is 3.2 million over the region of whom around 22,500 are reachable and easily contactable by the company.

The company has already identified the target consumers group, five building complexes with around 1,000 – 1,500 potential users. The buildings have smart meters installed, but none of them have PVs. This is an issue for a self-consumption split-incentive programme rollout centralised by the CAE, but on the other hand, it represents an opportunity for community members to join efforts for new PV asset investments. A workaround is to use an existing PV from nearby public buildings. Another option is installing a virtual demonstrative facility to make people visualise the potential of self-consumption within the community by means of simulated generation. A third option is a physical installation project lead by the facility manager and financed by the residents. These options are still to be explored further.

Regarding **communication channels,** the company uses cell phone messaging commercial apps (WhatsApp) and social media posts to communicate informally with customers. They are active on Twitter with 1,600 followers, and on Instagram with 6,000 followers. A department of the company is already working with users to advise on efficient appliances and energy efficiency measures. Other commonly used communication channels for consumer billing information are email or ordinary mail, and the corporate website. The buildings involved are currently maintained and operated by a company under UEAS's supervision. They have direct contact with the residents and permanent staff onsite. Thus, much of the communication can be done physically. Contacts are made through the company or through the elected representative who is present in premises. For future community growth new districts and buildings operated under the same basis can be included. Although UEAS will make the eCREW project information available to all their customers and stakeholders, personalised invitations will only be handed out to the target community building residents, either to their physical mailboxes, through email, or in dedicated physical neighbourhood meetings in the common areas of the condominiums.

Regarding the **key message** in order to attract a large number of citizens, the following points were proposed in collaboration with UEAS. Three highly relevant messages were identified that are key attracting factors for potential new members. The use of the app for free is a key message that shall be highlighted in the enrolment messages. Monitoring and benchmarking features are taken for granted by the users. Participatory activities may be welcome. The activities should look fancy, entertaining and make sure the participants understand the benefits. Raising consciousness of environmental issues might be positive to keep people engaged. A set of further key messages has been considered to be of medium and lower importance. A list of all key messages can be found in A.2 Key messages

The table below shows all messages with the benefits for potential consumers that are attractive for a large number of citizens and their priority for each LC. These messages and their relevancy were developed in collaboration with the respective CAE of each LC.

Table 5.

Regarding **action plan recommendations**, it is advised to go for a decentralised management level of the CREW to adapt it to the preferences at building or condominium level and increase communication efficiency in smaller groups. Name a focal point per building or condominium that is well known by the neighbourhood and that can address questions, motivate participation and that knows the issues regarding energy of the building and the community. Deploy informal communication channels like WhatsApp groups or Facebook groups. Call for meetings with specific topics to

foster discussion or spread knowledge. Use these meetings to listen to the members and the issues they worry most about. Let the focal point persons be present and active to align actions, share best practices and dynamic participation activities and share relevant information at full CREW level. Use the word-of-mouth to extend the invitations through the already engaged active members of the community. Use low-cost prices and awards to promote further communication campaigns through current active members. React fast to complaints and issues related to CREW administrative issues. Lastly, measure the user satisfaction and preferences of the members from time to time to adapt the participatory activities to the choices of the enrolled users, to increase their satisfaction and boost their further active participation.

The **collective actions** proposed to achieve the **engagement** of stakeholders consist of advertising the key messages of the free access to the different app features that also provide the information for users to benefit of individual and collective energy savings, since economic benefits is a key engagement factor in all communities. In this sense, the possibility of seeking energy performance personal advising could be relevant to some users. Regarding **P2P activities** it is to note that this community is culturally more open to participatory events and community meetings, whether formal or informal, as all members are in the neighborhood. Among the most preferred activities involving CREW members we find the benchmarking of energy performance, the meetings with other community members to discuss about environmental and energy issues affecting the neighborhood, and the participation in community events such as workshops, debates and for a most promising. **External subject activities** proposed include technical advice from experts (IUE experts) and recommendations for the optimal energy usage at home. Although deemed relevant, these activities do not seem crucial for the success of the community. However, it may be for some users that face specific energy performance problems in their dwellings. Lastly, for **monitoring activities** the energy consumption monitoring through the app is the most important. In Turkey, there is initially no RES distributed generation sources to share among the community members, but it might be the case in a close future. The rollout of regular surveys is also very important for members to have their voices heard.

4.2.2 Template for regular reporting

It is important for each CAE to report the progress of the project on a regular basis to foster a productive communication between the project partners in order to evaluate the steps taken and collect necessary feedback. Information on planned and finished activities, success stories or difficulties encountered are valuable and urgently asked for. Thus, a template for regular reporting was designed. Each CAE is asked to report to WP4 at least every 6 months using the template below as minimum information required, additional information is highly welcome. The template should be adjusted in case more space is required.

Template For Regular Reporting

Entity: **Date of this report:**
Name: **Date of next report:**

General info (current number of crews and members, changes of numbers since last report,…)

Activities with and for CREWs (description, participants, timeframe, outcomes, feedback, difficulties, success…)
• Planned: • Finished:

Feedback and communication (Responses of customers and members, positive and negative feedback, discussions, exchanges,..)

Lessons learned (what went wrong, success stories, recommendations,...)

Additional information (requests, open questions, complaints,…)

A. Appendix

A.1 Informed consent

Address: XXX

Phone: XXX
Fax: XXX
Internet: XXX
Email: XXX

Serial letter to all interested parties

Date: XXX
Clerk: XXX
Phone: XXX

eCREW Research Project

Dear Mr./Mrs...,

With this letter we are once again sending you detailed information about the eCREW project you selected in the first step. At the end of this letter, you find attached the eCREW contract with which you agree to participate in the project. The eCREW Contract contains the declaration of consent for the final participation in the project, including the use of your personal data within the scope of the information provided. You can also give your consent online at https://energieinstitut-linz.typeform.com/ecrew-teilnahme

As you have already been informed in the first information letter dated XXX, Stadtwerk Hassfurt GmbH and the project partners of the consortium are developing an approach for the implementation and application of Energy Communities in selected energy supply areas. Within the scope of the project, a web application as well as an app will be developed, which visualizes the data of electricity generation and consumption of the own household as well as cumulatively of the entire community. For the participants themselves, however, only their own energy data as well as that of the entire group is visible.

It is planned to carry out the field test with a total of XXX individual community groups (so-called CREWs) of 10 - 15 participants each until around the end of the project in 2023.

What is the goal of the project?

The aim of the project is to provide participating households, whether they are self-consumers, full feed-in households, households with battery storage capacities or even simple consumer households, with a user-friendly tool for optimizing power generation and consumption in their own households, which also rewards the use of savings potential financially! The aim is to exchange (virtually) as much energy as possible within one's own CREW. The higher the value of energy exchanged at the end of the year, the higher the bonus of the individual CREWs, which is paid to you as a participant in the course of the year-end electricity bill.

Accordingly, the eCREW project also aims to test the approach of collaborative use of electricity generation under real conditions in order to obtain meaningful results for a later implementation of this technology in the supply area of Stadtwerk Haßfurt GmbH.

What does your participation include?

Your participation includes using the information provided in the app or via the web application. At best, you should try to retrieve and check meter readings, weather forecasts, and load profiles once a day so that the full potential of your own household, and thus the positive impact on your CREW's results, can be fully realized. If necessary, adjust your electricity consumption or even your energy consumption behavior in such a way that you give priority to using the energy provided **virtually** by your CREW partners and thus achieve a maximum of exchanged energy as a CREW. This, in turn, will have a positive impact on your overall results and thus on the bonus of each CREW participant. During your participation in the project, you will occasionally be asked to participate in anonymous surveys to provide additional social and objective information to the research project.

Who is conducting the study?

The study is carried out by the project team, led by the research institute Energieinstitut at Johannes Kepler University Linz[5] and the project manager Dr. Johannes Reichl. The project involves national and international research partners, as well as energy suppliers, such as Stadtwerk Hassfurt GmbH, in order to implement the eCREW project under real conditions. The eCREW project is funded by the European Commission.[6] The project was launched in June 2020 and will end in May 2023.

How are the results used?

The anonymized data from this study will be analyzed and used for project reports, presentations and possibly scientific publications. Neither your name nor any personal information that could be associated with you will appear in these reports. Your data will not be shared with unauthorized third parties.

What happens to the information you provide?

All data collected and processed in this study will be handled in compliance with the European General Data Protection Regulation.[7] All information will be anonymized and stored in a secure location. You may also decide to withdraw your participation in this study at any time (should you decide to do so, any material relating to your participation will be deleted or destroyed). We may ask you for clarification in this case, but you would not be required to explain or continue to participate.

If you still have questions about this study or would like more information, please contact the following person: **XXX**

Further procedure

After completion of the internal test phases, we will inform you separately around XXX about the start of your participation in the field test. With the next following letter, you will receive your access data for the

[5] The website of the Energy Institute can be found at: https://energieinstitut-linz.at/portfolio-item/ecrew/.
[6] For more information, visit: https://ecrew-project.eu/ and https://cordis.europa.eu/project/id/890362/de.
[7] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data, on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation) OJ 2016 L119/1.

app application, which will be available in all app stores. In addition, we will have grouped you into your CREWs by then. If you have already deposited related, friendly or known interested parties with whom you would like to act in a group, we have already noted them internally. Nevertheless, you have the possibility to inform us about your preferences regarding group partners within the scope of the data query within the declaration of consent. Following the next letter on the start of the field test phase, you can easily and quickly register in the app and from this point onwards enjoy the benefits of the project through regular use.

If we have gained your interest and you agree to participate in the project, please fill out the eCREW-Contract (incl. form) and sign it. Afterwards, please send us the completed and signed eCREW-Contract by mail to XXX or send it scanned to XXX@XXX.XX.

You can also submit your consent to participate in the project online at XXX. When doing so, please fill out the eCREW contract provided online. After your consent, a confirmation email will be sent to you. If you want to participate with two residences/buildings (for example, residential and commercial) in Hassfurt, please use the online registration.

If you have any further questions, please feel free to contact the person listed above.

Stadtwerk Haßfurt GmbH and the entire eCREW project team would like to thank you in advance for your support in this research project. By participating, each and every one of you is making a contribution to the path to climate neutrality in our region and especially in the city of Hassfurt.

With kind regards
STADTWERK HASSFURT GmbH

eCREW Contract
Informed consent for voluntary study participation

Description and purpose of the study

eCREW[8] coordinates and supports the deployment of an innovative system of household cooperation in energy management. These are "Community Renewable Energy Webs" (CREWs) in which households share electricity generation and battery storage capacity at the household level and optimize energy efficiency and expenditure. The main goal of CREWs is to support the transition from passive consumers to active participants in the local energy system through informed decision-making and collective action. In eCREW, three energy companies from Germany, Turkey and Spain (Lighthouse Communities) will introduce the eCREW approach to their customers. To this end, Stadtwerk Haßfurt GmbH (hereafter SWH) is implementing the eCREW approach with its residential customers in a field test (Lighthouse). The field test will run until approximately the end of the project in 2023. Collaboration within a CREW is facilitated by the provision of a smartphone app and a web application that analyzes smart meter data to promote an increase in energy efficiency and the use of local renewable electricity generation. The management of CREWs, including the reading of metering data and billing for consumption and generation, is handled by retail electricity companies (SWH), which thus become holistic service providers; as so-called Community Administering Entities (CAEs). In our approach, households are relieved of administrative tasks and can focus on getting the most out of their participation in a CREW.

As the contact person, you have already communicated with the project manager XXX in person or by e-mail and expressed your interest in participating in the field test. This document serves for the concrete and final registration for the field test and for the legal consent to use the personal data for the specified purposes.

Contact: XXX

[8] The European funded research project "eCREW" (Grant Agreement Number: 890362) started in June 2020 and ends in May 2023.

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 890362.

1. Details of the volunteer

First and last name	
Address	
Contact details (phone and e-mail)	
Participant ID (assigned by SWH)	
If you wish to participate with a second household, please use the online consent form at: XXX	

2. Data on building, budget and invoice

What is the best way to describe your electricity household?	Consumer ☐; Self-consumer ☐; Full feed-in ☐ (Explanation: *Consumers do* not produce any electricity themselves. *Self-consumers* only feed surplus electricity into the public grid, while *full feed-in households* feed all the electricity generated by a PV system into the public grid).
Address of the registered household If the address of the registered household is different, enter the street, house number, postal code, city.	
Contract account number(s) (VK) Explanation: Two contract account numbers when operating a generation plant on full feed-in or own consumption.	E.g.: Purchase: 2005000*****; Feed-in: 2003000***** (The last 5 digits are individual)
Billing address of the contract account number(s) If the address of the registered household is different, enter the street, house number, postal code, city.	
Please mark with a cross if you own a generation plant. If yes, what is the nominal power- in kilowatt peak (kWp) - of your generation system?	Generation plant ☐ Power: _____ Please enter the power of the generation plant in kWp here.
Please tick if you have a facility to store electricity. If yes, what is the capacity (in kWh) of your storage?	Power storage system ☐ Capacity: _____ Please enter the storage capacity of your electricity storage system in kWh here.
How many people - including yourself - currently live in your household?	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ more than 5 ☐
If you would like to exchange electricity with someone special, you can enter that person(s) here. Otherwise, we are looking for your perfect electricity partner. In this project you have the opportunity to exchange electricity with other households, where **all households** can **exclusively benefit** and no one has disadvantages by participating in the project.	(First and last name, address)

3. Questions about the building, equipment and attitudes of the registered household

How would you describe the building you live/work in?	A detached single-family house ☐ A detached two-family house ☐ Row house ☐ Buildings with more than two apartments ☐ How many apartments/businesses are in your building? (Please estimate if applicable): _____ Other building ☐
How many m² of living space/business space are available to your household/business? If you do not know how much living space/business exactly, please provide an estimate.	
Which **heating system** do you primarily use to heat your living spaces? If you have several heating systems, please indicate your main heating system.	Heat pump ☐ Electric heating (no heat pump) ☐ Biomass boilers (pellets, wood chips, etc.) ☐ Log wood heating (tiled stove, fireplace) ☐ Natural gas heating ☐ District or local heating ☐ Fuel oil boiler ☐ Other/do not know ☐
What system do you use for **hot water**? If you have multiple hot water systems, please specify your main system.	Heat pump ☐ Electric water heater ☐ Electric instantaneous water heater ☐ Solar thermal system ☐ Biomass boilers (pellets, wood chips, etc.) ☐ Log wood heating (tiled stove, fireplace stove) ☐ Natural gas heating ☐ District or local heating ☐ Fuel oil boiler ☐ Other/do not know ☐
The following appliances require a comparatively large amount of electricity and therefore have a significant impact on your electricity bill. Please tick if appliances are in your household at least once.	Tumble dryer ☐ Swimming pool ☐ Aquarium ☐ Waterbed ☐ Sauna/infrared cabin ☐ Air conditioner ☐ Electric vehicle (car, bicycle, motorcycle, moped) ☐ None ☐
How many of the following devices are in your household?	Refrigerators (with or without freezer compartment): _____ Freestanding freezers: _____ Washing machine: _____

	Dishwasher: _____ TV: _____ Computer, laptop, tablet PC, game consoles: _____
Please check off which goal is most important to you in your household.	Energy efficiency for cost reduction ☐ Energy efficiency for emission reduction ☐ Both are equally important ☐
Please tick how often you disconnect devices that you are not currently using from the mains (especially TV, PC, notebook, etc.).	Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never ☐
Which of the following statements applies to you? Select as many statements as you like.	I alone can contribute a lot to the energy transition ☐ Together we create the energy transition ☐ Being environmentally conscious is important to me ☐ I behave more environmentally friendly when others do the same ☐ None of the statements apply to me ☐

Explicit consent to participate in the eCREW project.

1. By agreeing to participate in the project, I confirm that I have read and taken note of the eCREW information sheet (dated XX.XX.XX, which contains further details about the project [purpose, expected duration and procedure of the study]) and the above description and purpose of the study (the description and eCREW information sheet can also be found on our homepage at *https://www.stwhas.de/portfolio-item/ecrew/*).
2. By participating in the project, I agree that my data on electricity generation and consumption of my household(s) and personal data, such as name, billing address, meter number and load profile in hourly values, will be collected, stored and processed by Stadtwerk Haßfurt GmbH.
3. I agree that my electricity consumption data and generation data may be used within the framework of the eCREW project by Stadtwerk Haßfurt GmbH by means of an electricity meter that can measure hourly values and allows these to be read remotely, in order to be able to display this information in the app or via the web application. The display is done individually for each CREW partner and in the form of an overall display of CREW per se. In order to enable this representation, I agree that Stadtwerk Haßfurt GmbH as the responsible party uses the project partner GreenPocket GmbH for data processing, which has developed and continues to support the app and web application.
4. Furthermore, I acknowledge that my personal data will be processed in accordance with the European General Data Protection Regulation.[9] Data collected and processed during the project will be provided to the project partners only in anonymized form for the purpose of this research project. At no time will personal data be published or passed on to third parties. The anonymous data will only be transmitted within the scope of this research project and during its project duration.
5. I agree to voluntary participation in the eCREW project and acknowledge that I may revoke my participation in this study at any time and request the deletion of my personal data. Revocation as well as deletion can be done by an informal letter to Stadtwerk Haßfurt GmbH or by e-mail to XXX.

With my signature I give my consent about my voluntary participation in the research project "eCREW" and accept the above-mentioned points.

Date: _____ Signature: _____

[9] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data, on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation) OJ 2016 L119/1.

A.2 Key messages

The table below shows all messages with the benefits for potential consumers that are attractive for a large number of citizens and their priority for each LC. These messages and their relevancy were developed in collaboration with the respective CAE of each LC.

Table 5: Comparison of CREW service preferences in the three eCREW LCs

CREW benefits to join a CREW.	Spain	Germany	Turkey
Free download rights of the e-CREW app	High	High	High
Easy monitoring of your energy consumptions with your app	High	High	High
Benefit of individual and collective energy savings	High	High	Medium
Benchmarking of your energy performance with your app	Medium/high	Medium	High
Energy performance personal advising	Medium/High	Medium	Medium
Get your energy related questions solved by professionals and experts.	Medium	Medium/High	Medium
PV self-consumption facility payback calculation in your app	Medium	High	Low/medium
Hints of best practices for optimal energy usage at home.	Medium/high	Low/medium	Medium
Meet up with other people sharing your concerns about environment and energy	Medium	Low/medium	Medium/High
Make the best use of exceeding RES avoiding wastes	Low/medium	High	Low
Energy consumption alarms and warnings with your app	Medium	Low	Medium
Take part in community events, debates and coaching about energy best practices	Low	Low	Medium/High
Take part in a community concerned with environmental sustainability	Low	Low/medium	Medium
Be up-to-date with periodic newsletters and communications from your Energy CREW	Low/medium	Low/medium	Low
Take part in online fora, debates and groups.	Low	Low	Medium
Shared investments in collective RES for self-consumption.	Low	medium	Low
Participation in community projects and investments in EE at collective level	Low	Low/medium	Low