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DELIVERABLE

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D2.1 Zero-point report on data of Supplying REScoops (Public Summary)

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REVISION HISTORY AND STATEMENT OF ORIGINALITY

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1. Introduction

Recent research on sustainable energy and development plans, indicate that a turn to renewable energy resources and adoption of energy conservation techniques are required, so that energy poverty is tackled and large-scale energy efficiency (EE) is achieved [1]. However, for EE to be achieved, many market actors need to react, such as utility companies, network regulators, end-users, etc.

A very important part of the current energy actors are European renewable energy sources cooperatives (REScoops) [2]. REScoops have begun to form in the European Union and provide their members the opportunity to buy renewably generated electricity at fair prices, to democratically react with other members and decide the cooperative's future, and to be autonomous and independent with respect to energy. Given these features, REScoops organize events, such as meetings, conventions, community projects, etc. in order to raise their members' energy awareness. Thus, it is expected that when end-users join forces in an energy cooperative, they become more active regarding energy conservation and efficiency.

To this end, the REScoop Plus project [3] aims to gather available information and data from various European REScoops, and *prove that participation in such a cooperative indeed increases energy awareness* and *promotes energy efficiency*.

The steps for achieving these goals, from the point of view of WP2, are the following:

1. Share *information* and *knowledge* regarding *data storage and handling*, and also *EE and consumption reduction behaviour,* among REScoops.
2. Identify and record *existing datasets* and *their format.*
3. Conclude on *a common data format* for all cooperatives. This includes the definition of a data structure, as well as the fields that will contain the various measurements.
4. Gather available datasets of the supplying REScoops
5. *Initial statistical analysis.* Analyze the historical data before the REScoop Plus project was initiated. This step will give us a first glimpse of what happens in general to the consumption of the cooperative members, and of how existing EE interventions are being applied. *The results will help identify:*
    a. Whether reduction is indeed taking place in REScoops.
    b. Potential key factors for consumption reduction.
        i. These factors can then be taken into consideration by WP3 and WP4 to help identify good behavioural practices and EE interventions.
6. Application of specific EE interventions to certain members and member groups.
    a. These interventions will have to be pin-pointed by WP3, after also observation of the initial statistical analysis results
7. Gather available datasets after the application of the EE interventions.
8. *Final statistical analysis.* Analyze the impact of each EE measure to the consumption of the end-users.
    a. This will help characterize the efficiency of each proposed EE intervention, and will enrich the recommendations toolkit offered to REScoops.

In this deliverable, we give descriptions of the WP2 workflow and efforts to cover steps 1 and 2 above. All these were crucial steps towards the definition of *a common data format*, which is key for making realistic comparisons among REScoops efforts and practices.

2. Existing information gathering practices

Initial discussions with our REScoop partners confirmed that REScoops vary greatly from one another with respect to commercial activity, internal structure, and data storage methods. Also, although REScoops are located in the European Union, they are registered in different countries, with significantly different energy regulations. This heterogeneity makes the use of appropriate information collection practices imperative, and necessitates the adoption of a common data format. This is crucial for setting up and applying a coherent statistical data analysis methodology.

Now, the collection and analysis of data are often categorized as being performed via *qualitative* and *quantitative* methods [4]. The first category focuses on interacting with stakeholders, and analyzing the population or data samples under study. The second includes the *experimental and statistical analysis of data* at *a larger scale*. For our purposes, we will adopt a *mixed* approach, encompassing a mainly qualitative approach for collecting the current state of data, and a quantitative approach on the supplied data (to statistically identify savings in energy consumption).

3. Methodology for acquisition of the current state of data

In the framework of REScoop Plus project, preparatory activities that include discussions in group meetings, online interviews, and questionnaire investigations to assess the size, state, contents of the various datasets etc., were performed. Specifically, suitably designed questionnaires were given to the REScoop experts (in two separate phases), and related feedbacks were further analyzed. The initial questionnaire contained 13 questions, and it was given to the experts in a paper form. In particular, its questions were:

1. What is the name of your cooperative?
2. How many are your members in number?
3. How many are your constituent coops/organizations in number?
4. How many are the actual people in your cooperative?
5. What is the estimated portion of which that could engage in demand-reduction actions?
6. Do you have energy production activities?
7. If yes, by what means?
8. Do you sell energy?
9. Do you provide district heating?
10. Do you apply Demand-side Management (DSM) [5] schemes?
11. Other?
12. Are measurements available?
13. If yes, since when?

The experts' responses provided us a first view of the current situation regarding each REScoop's size and activities, which was a necessary step for moving forward with the WP's tasks.

Then, a detailed questionnaire (on-line) was given to REScoop experts, in order to clarify the current state of the data, as well as potential difficulties that could be faced; and to create a basis for a common data format. This questionnaire divided into four parts:

A. General Information (6 questions)
B. Measurements Details (13 questions)
C. Demand-Side Management-related Information (7 questions)
D. Final Questions (5 questions)

Part A asked for general REScoop info such as the name, location, the "age" of stored data, etc; and the answers were provided in the form of text.

Part B asked for specific details regarding the data, that is which measurements are available relating to energy production and consumption, pricing and billing, indoors measurements, climatic conditions, and the possibility of dividing the population into control and testing groups [6]. The experts were asked to pick the granularity of each available measurement from a total of 10 different options, ranging from a second to a year. Additionally, text box responses were in place to allow experts to communicate additional information and provide clarifications to their answers.

Part C aimed to extract information related to additional demand reduction measures; Detailed feedback was requested, in the form of lists with checkboxes, and additional text fields in case further explanations were needed.

Part D requested additional information on available data for demographics, past participation in EE actions, and the existence of past surveys. Finally, they were allowed to provide further comments and remarks regarding their participation in WP2, via a textbox field.

The identification of the current state of the data also enabled us to conclude on a common data format that can be adopted by all partners in order to ease the data collection and analysis activities, and to render comparisons among the various REScoops information and practices realistic and meaningful.

4. Conclusions

This deliverable presented a zero-point report on the data of the supplying REScoops. Our WP discussed the matter in internal and project meetings, conducted a number of online interviews, and designed a specialized questionnaire to assess the size, state, and contents of the various datasets. Results showed that REScoops collect and store data in a heterogeneous way, each storing different data entries, and with different temporal granularity. Also, responses indicated that REScoops are not adequately informed or organized regarding certain data and activities - such as for DSM operations, sharing of personal data, and collection of meteorological data.

The identification of the current stat of the data, also enabled us to conclude on a common data format that can be adopted by all partners in order to ease the data collection and analysis activities, and to render comparisons among the various REScoops information and practices realistic and meaningful. The proposed common data format is given in the D2.2 deliverable of our WP [7].

Data Privacy and Data Protection issues

During our communication iterations, it became clear that at least some of the partners are very reluctant to share their data, due to confidentiality concerns. To address these concerns, we state that all data requested for this project should be strictly anonymized. Also, to render data submissions secure and private, the TUC *virtual private network (VPN)* will be utilized, which allows for specified connections only, using accounts and credentials that will be created specifically for the project's needs, and will be deleted afterwards. In particular, the VPN will allow connectivity to protected servers on which submitted data will be stored and kept during the project's time horizon. Afterwards, both the purpose-built submitters' accounts and the data stored on the servers will be permanently destroyed. Deliverable D2.2 also describes explicitly how these privacy issues are going to be addressed.

A Common Data Format

After discussions with the experts, we decided that measurements should be given in specific file formats, i.e. *comma separated values (.csv)* or *excel (.xls/.xlsx)* file formats. The common structure that is presented in [7] will allow us to import the datasets to the same statistical analysis program, making this way biases disappear. REScoops will have the ability to choose which specific measurements will be submitted, that is certain columns can be left blank. This fact might make the datasets become sparse, however, we would like to incorporate all available information, despite the fact that some datasets might miss specific parts; for those submitting all the requested measurements, the statistical analysis will be more sound and realistic.

References

[1] Energy Efficiency Watch Project, *Evaluation of National Energy Efficiency Action Plans*, 2009

[2] European Energy Mediators Group, *Working Group Consumers as Energy Market Actors*, 2015

[3] RESCOOP *Plus Project Proposal*, H2020-EE-2015-3-MarketUptake, 2015

[4] John W. Creswell, *Research design: qualitative, quantitative, and mixed methods approaches*, SAGE Publications, 2013.

[5] Gellings, C. W., and Chamberlin, J.H., *Demand-Side Management*, 1988.

[6] Lohmann, G., et al. *THE ICT PSP METHODOLOGY FOR ENERGY SAVING MEASUREMENT-A common deliverable from projects of ICT for sustainable growth in the residential sector*. Bonn: eSESH consortium (2011).

[7] REScoop Plus Project, *Deliverable D2.2-Methodology for Research*, 2016.

Appendix: Experts questionnaire

REScoop+ Experts Questionnaire for the Statistical Data Analysis

General Information

1. Please specify your name, e-mail, and Skype id (if you have one)

2. Which cooperative do you represent?

3. Specify the regions that your members are located.

4. Specify the regions for which you keep consumption/production data and other measurements

5. What is the earliest date for which you have stored data?

6. Which software suite or advanced metering infrastructure (AMI) do you use (e.g. BeeData, EnergyHub, etc.)?

Please provide the name, and a url link to a page with an adequate explanation of the software/AMI capabilities and technical specifications.

Measurements details

*7. Please check the highest resolution of the measurements that you store regarding energy *production* (check for every type of stored data in your possession). Please scroll to the right to see resolution options up to the "year".*

	Second	Minute	Quarter Hour	Half-hour	Hour	Day	Month	Quarter	Semester	Year
Electricity production from renewable sources (kWh)										
Heat generation from renewable sources (kWh)										
Electricity production from conventional sources (kWh)										
Heat generation from conventional sources (kWh)										
Electricity production (only aggregate measurements available) (kWh)										
Heat generation (only aggregate measurements available) (kWh)										
Other, please specify in your answer to the next question.										

8. Comments regarding energy production data (e.g. different data/resolution per region, additional measurements etc.)

*9. Please check the highest resolution of the measurements that you store regarding energy *consumption* (check for every type of stored data in your possession). Please scroll to the right to see resolution options up to the "year".*

	Second	Minute	Quarter Hour	Half-hour	Hour	Day	Month	Quarter	Semester	Year
Electricity consumption aggregate values for all cooperative members (kWh)										
Heating consumption aggregate values (kWh)										
Electricity consumption disaggregated per residential /industrial customer (member) (kWh)										
Heating consumption disaggregated per residential/industrial customer (member)(kWh)										
Electricity consumption disaggregated per building power line (kWh)										
Electricity consumption disaggregated per plug (kWh)										
Other, please specify in your answer to the next question.										

10. Comments regarding energy consumption data (e.g. different data/resolution per region, additional measurements etc.)

11. Please check the highest resolution of the measurements that you store regarding energy prices and bills (check for every category of stored data in your possession). Note you can use the "Other" field to already specify exact energy rates for rows 2 and 3, if these have remained unaltered over time. Please scroll to the right to see resolution options up to the "year".

	Second	Minute	Quarter Hour	Half-hour	Hour	Day	Month	Quarter	Semester	Year
Consumer energy acquisition prices in effect at your region (€/kWh)										
Special energy acquisition rates for the cooperative (€/kWh) [(historical) data on the rates coop pay for buying energy]										
Energy rates for cooperative members (€/kWh) [(historical) data on the average rates your members pay to you for buying energy]										

Bills the cooperative pays for acquiring energy (€)										
Average energy bill amounts paid by consumers to the coop, per consumer type (€)										
Energy bills paid to the coop by each individual consumer (€)										
Other, please specify in your answer to question 13.										

12. Do you have different rates per consumer type (i.e. household, commercial, industrial, other)? If yes how many and which?

13. Comments regarding energy prices/cost data (e.g. different data/resolution per region, additional measurements etc.)

14. Do you have data measurements for the member-specific energy consumption? If yes, please check the measurements that you have regarding indoor ambience. Please scroll to the right to see resolution options up to the "year".

	Second	Minute	Quarter Hour	Half-hour	Hour	Day	Month	Quarter	Semester	Year
Building/room thermostat setting preference (°C)										
Room Temperature (°C)										
Occupancy (True - False)										
Luminosity (lux)										
Air quality (CO_2 and CO levels)										
Other, please specify in your answer to the next question.										

15. Comments regarding energy consumption habits (e.g. different data/resolution per region, additional measurements etc.)

16. Meteorological data: Do you have stored historical meteorological data for your regions of interest? If yes, please check all meteorological measurements that you store. Please scroll to the right to see resolution options up to the "year". If no, is there an official source when appropriate data might be found? Please add a link, and mark which data may be found.

	Second	Minute	Quarter Hour	Half-hour	Hour	Day	Month	Quarter	Semester	Year
Air temperature (Â°C)										
Atmospheric pressure (mbars)										
Air humidity (%)										
Cloud coverage (%)										

Wind speed (km/h)										
Wind direction (N, E, W, S, NE, etc.)										
Rainfall (mm/3h)										
Solar irradiance (kWh/m^2)										
Snowfall (mm/3h)										
Other, please specify in your answer to the next question.										

17. Comments regarding meteorological data (e.g. different data/resolution per region, additional measurements etc.)

18. Please bear in mind that we will most likely request you to perform data pre-processing (e.g. modify excel/csv files) in order to bring the data to a format requested by TUC before submitting your data (we will be providing guidelines and assistance). How comfortable will you be in undertaking this task?

Quite comfortable

Not entirely comfortable

Other :

*19. Is it easy to divide your REScoop consumers into several groups for data analysis? E.g., one "control" (not implementing reduction actions) and one "testing" (implementing reduction actions). *We will discuss this possibility with you further.**

Yes

No

Demand-Side Management-related information

20. Does your cooperative as a whole participate in demand-side management schemes?

Yes

No, and is not going to be participating.

Not yet, but we plan to (when? please provide details in the "other" field)

Other :

21. Please describe the demand-side management schemes that the REScoop employs, or will be employing during the project.

22. Do your individual members participate in demand-side management / reduction schemes? If yes, please provide any existing info at the "other" field.

Yes

Not yet

Not sure

No, and are not going to be participating.

Other:

23. Does your cooperative as a whole, or your individual members participate in electricity load shifting schemes? If yes, please provide any existing info at the "other" field.

Yes

Not yet

Not sure

No, and are not going to be participating.

Other:

24. Do you keep records of any demand-side-management related data?

Reducible/shiftable capacities per end-user (kWh)

Shifting costs/effective monetary incentives for shifting (â‚¬/kWh)

Electric Vehicles driving and charging profiles (Battery state of charge levels per half-hour)

Other:

25. Has your cooperative participated in or organized any actions promoting energy awareness to its members?

Yes

No

26. If yes, please describe them in some length

Final questions

27. Other data regarding the cooperative as a whole and its individual members

Demographics (age, income, profession, education, m^2 of buildings)

Participations in energy efficiency actions (buildings renovations and upgrades, equipment replacements, energy awareness actions, conferences or other briefing events

Spendings by the cooperative in EE actions

Demand reduction incentives that the cooperative or the members have already identified as essential

Existing processed surveys on electricity consumption behaviours

Other:

28. If you do not have data at this point, will you be able to submit data to us in:

Three months from now

Six months from now

Nine months from now

Other :

29. Please state any additionally available data sources for your region (meteorological stations, utility companies, grid regulators, etc.)

30. Do you comply with the national / EU legislation as concerns to the personal data privacy and management? How can we overcome any existing legal/privacy issues? e.g. Is anonymization enough? Would you necessitate that all data is averaged out across the members ---please provide intuitions in the "other" field.

No

Yes

Other:

31. Please provide additional comments regarding your participation in the data analysis Work Package.