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Description of publishable data sets from experiments and field trials, V1

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Abstract
This deliverable describes the current plans of the edgeFLEX project on what data sets are planned to be collected in trial sites as well as laboratory experiments, simulations and calculations in the Work Packages (WPs) and then be published and with that be made available for the general public. This report has been written based on the expected data drawn from project work that is planned to be completed in the first phase of the project (M1-12). The description will be evaluated every 12 months based on new findings made during the project year and will be updated in M15 and M27 of the project.

edgeFLEX will conduct field trials of fast and slow dynamics distribution management control services and energy flexibility trading with prosumers in Germany and Italy. Furthermore, the project plans to conduct laboratory trials and simulations based on electricity grid simulated data in Dublin, Bologna and in Aachen.

Keyword list
Research participants, consent, incidental findings, privacy, ethics, publishable, data, renewable energy, electricity grid, VPP, Energy Community

Executive Summary

Reproducibility of results is the goal of research and development. The transparency of the input data used is essential to generate results under the same conditions and with that make them comparable. This transparency is ensured by publishing not only results but also all input data and methodologies included in the investigations. On the other hand, this data is often the core of existing or future business models. With these points in mind, the edgeFLEX project carefully weighs what data sets can be published in which form in the course of the project.

The development and simulation of new technical solutions is set in Work Packages 1 to 4 (WP1-4) of the project. These solutions will then be implemented in the project's lab experiments and field trials. The edgeFLEX field trials and investigations are managed by Work Package 5 (WP5) of the project. WP 5 will organise live field trials in Germany and Italy and laboratory-based experiments and trials in Aachen, Dublin and Bologna using simulations and hardware in the loop.

At the date of preparation of this report, work packages 1 to 4 are in the process of analysing existing structures, defining scenarios and gathering requirements, not least given in the lab and field trial sites. Work package 5 is in the process of defining the scope of their trial sites.

Therefore, data sets which are planned to be published in the first project year will have an emphasis on preparation for realisation at the trial sites. This report will be updated at the beginning of the second and third project year.

Executive Summary

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1. Introduction

The edgeFLEX projects participates in the Open Research Data Pilot (ORD Pilot or ORDP) and therefore fully supports the publishing of research data and findings in an open access manner.

This means, the consortium aims to fulfil the following two requirements regarding their data gathered in trials and lab experiments:

- Publish the data in a research data repository.

- Attach appropriate licenses for further use of the published data.

In partial fulfilment of ORDP, this report gives a description of the data expected to be gathered in lab and field trials and published during months 4 to 14 of project work.

2. edgeFLEX field trial plans

edgeFLEX is planning to organise a range of field trials and lab experiments during the project. The field trials are planned to be located in Germany, Italy and Switzerland, the lab experiments in Germany, Ireland and Italy.

It is anticipated that only for the field trial organised by SWW in Germany the participation of field trial participants is required. Hence, it is possible that personal data needs to be collected, which will be done strictly in accordance with the following deliverables:

- D8.2 – D8.2 Data management plan [M4],

- D9.1 – POPD – Requirement No.1 [M3],

- D9.1 – H – Requirement No.2 [M3].

Consequently, personal data and any data including meta data which makes it possible to trace back to e.g. a single person or household from the trial sites are considered as not publishable data.

In the following, the expected sets of publishable data per trial site and lab experiment will be described.

2.1 Field trials organized by Alpiq

The field trial under the responsibility of Alpiq, consists in testing the algorithms developed in WP3 – "Optimisation of 5G dynamically controlled VPP solutions" on an ad hoc VPP.

A subset of Alpiq's assets operated in Germany will be used for the field trials, as Germany's market is permitting to distributed assets to participate in the market directly, which is not the case in other jurisdictions that were initially envisioned (especially Switzerland).

This trial is about testing if, and ideally proving that, the usage of the newly developed algorithms results in a better economic outcome for the VPP owner with respect to the use of the operating tools in the status quo. In order to do this, we chose to adopt the following approach:

We will receive the data of the historical operations of the assets and ascertain how the asset would have operated according to the new algorithms and compare the simulated outcome with the real one. Considering the reasonable assumption that the market action change would have a negligible impact on the German market, we shall be able to conclude the testing of the algorithms on the trial.

2.2 Field trials in Italy organized by Universita di Bologna (UniBo)

At the trial sites in Italy organized by UniBo, especially fast dynamics, are planned to be tested.

The first months of the project are dedicated to gain an overview of DSOs/utilities that may be interested to test the edgeFLEX services. To this purpose, UniBo is in discussion with Enel and A2A, two of the major Italian DSOs.

Potentially, they may agree on having a laboratory and/or a field trial. However, even in the case of a laboratory trial, the simulation would be on real data of DSOs' electricity networks. Publishable data from simulations for the trial sites will be included within the more detailed descriptions of the WPs in the following chapter.

As for the data from the trial sites to be published, considering that this is just a preliminary consideration from past experience:

- The DSOs will not provide access to any sensitive data of customers/prosumers. Access might be granted to aggregated and anonymized data.

- Possibilities to publish electricity network data of DSOs – potentially in a masked way – is aspired and will be evaluated individually in all cases with the respective DSO.

- They are typically inclined to share their feedback after the service implementation.

2.3 Field trials in Germany organized by SWW

At the trial site in Wunsiedel, Germany organized by SWW, both slow and fast dynamics will be tested.

Some of the new technologies will be implemented at prosumer premises or even need consumer support. Therefore, the consortium will continue its running user involvement process. It has started in GOFLEX with various design thinking activities and the development of new, user centric products and services. In these co-creation activities, many citizens have expressed their wish for the utility to get more control over the local energy generation and supply system. They have shown interest in operating storage in a grid supportive way or have their photovoltaic inverters provide ancillary services.

Data planned to be published will only relate to types of stakeholder or participants on average level. Data on individual level of participants will not be made available. This data can contain information on what type of technology is being used, possibly what tariff is defined, and other framework conditions are in place. Connected to these configurations, it is possible to give data on what flexibility can be provided in different quantities and resolutions. Since this data is real data from end-users, it is sensitive and must be clustered or aggregated accordingly so that it can no longer be traced back to individuals.

Data on network topology from this trial site is not planned to be made publicly available in more detail than already available due to transparency regulations in Germany.

3. edgeFLEX simulation and calculation plans

edgeFLEX is planning to perform simulations and experiments in laboratory environment. In the following the publishable data per WP will be described.

3.1 WP1 – Dynamic-phasor driven voltage control concepts for dynamically controlled VPP solutions (UniBo)

WP1 will develop voltage control concepts/algorithms to be integrated as services into the edgeFLEX platform.

To perform the simulation and test the control algorithm applied to Distributed Generators (DGs) installed in the electrical grid, realistic power profiles will be produced. These profiles can be assigned to single units or to aggregated nodes, when considering LV feeders connected to an MV node. These profiles can be made available for replicability of the tests.

The results of the simulations, in terms of voltage profiles, power profiles of the controllable resources (reactive power injection of the PVs, active power of the energy storage systems) can be published to prove the benefits of the applied control strategy. Then, possible comparison with the results of the simulations where voltage control is not performed can be provided. This data will have the form of percentage of voltage violations, amount of active power curtailment, percentage of energy storage system employment.

3.2 WP2 – Frequency and inertial response control concepts for dynamically controlled VPP solutions

WP2 will develop frequency control and inertia estimation algorithms to be integrated as services into the edgeFLEX platform.

For such developments, WP2 will validate and run the algorithms through simulation tests on reference grids, such as the IEEE 9-bus system, which is commonly used as a benchmark system for stability studies, and its data is publicly available for the scientific community.

Similar to WP1, to perform the simulation tests, realistic power profiles for the loads and the distributed generation installed in the electric grid will be produced. These power profiles together with the resulting frequency profiles of the simulation tests can be made available for replicability of the results.

3.3 WP3 – Optimisation of 5G dynamically controlled VPP solutions

ALPIQ will publish a research paper to explain the VPP optimization developed in the frame of edgeFLEX. This paper will include a description of the algorithms developed for the enhanced management of the VPP tested in the trial, and will as well include the data expressing the results of the field trial performed (the production output data used for the simulation remains Alpiq's proprietary and as such will not be published).

In Deliverable 3.1, EDD will describe the results of its planned investigations of the edgeFLEX energy use cases as large-scale deployments in commercial electricity networks enabled with 5G technology and define the resulting potential 5G ICT requirements and solutions.

Furthermore, 5G proof of concept implementations utilised in carefully selected edgeFLEX energy use cases will be carried out. General proof of concept implementations solution architectures and interfaces will be described and published in Deliverable 3.1.

3.4 WP4 – Platform and services for dynamically controlled VPP solutions

WP4 will over the whole course of the project define, implement and assess a set of platforms, tools and services that will enable the deployment of the control algorithms developed in WP1 and WP2.

The activities for WP4 in the first project year will consist of compiling a full set of requirements for both the services and the trial sites so that we can efficiently and accurately develop the software supports and platforms required to implement the services. These requirements will describe each service in terms of, among others:

- the optimal latency and data volume required for the service to operate;

- the measurements needed to execute the service;

- the preferred communications and security mechanisms and protocols and;

- the base operating systems and software modules needed to instantiate the services.

The requirements in the initial stages of the project would provide pointers of the basic software and ICT requirements needed to run each service as a minimum viable product (MVP) and may be broad with a view to updating them with more precise requirements as the services are researched further, tested and assessed in both the laboratory and field trials.

The end goal is to derive and publish a summarised set of requirements for the edgeFLEX platform in deliverable D4.1 due in Month 18. It is also planned to correlate the set of requirements gathered for the services and tools and publish them as a dataset on a public GitLab wiki page that will contain a representation of the requirements in tabular form.

3.5 WP5 – Field trials of dynamically controlled VPP solutions

It is not expected to gather or publish additional data which was not already mentioned in the trial site chapter and the above description of WP1-4.

The 5G performance in enabling the proof of concept implementations of services developed in WP3 for the edgeFLEX energy use cases will be evaluated in the 5G lab trial in WP 5. As part of the published results of this set of tests to be reported and published in Deliverable 5.5, the general test lab infrastructure configuration, the general test methodologies, the general descriptions of the test cases investigated and the general latency performance results will be described.

3.6 WP6-9

Address lists, mailing lists and other data and meta data collected for administrative reasons within the project are not considered publishable data (sets) in the sense of the Open Research Data Pilot. In WP7 – "Dissemination and communication" information and data fulfilling these tasks will naturally be published on appropriate channels. These are also not considered data sets for the purpose of the Open Research Data Pilot.

4. Conclusion

The simulations planned at the current stage of the project are based on a lot on synthetic and open access data which can be made publicly available or is already. Requirements for the edgeFLEX platform to be found at the trials is planned to be made publicly available.

The publication of specific data from the trial sites will need to be carefully considered as this concerns both privacy and system security issues in the end. As the project evolves further, the data set description will be revised carefully at the beginning of the second and third year.