



## Cost-effective rehabilitation of public buildings into smart and resilient nano-grids using storage

**Thematic Objectives:** B.4 - Environmental protection, climate change adaptation and mitigation (Address common challenges in environment)

**Priority:** B.4.3 - Support cost-effective and innovative energy rehabilitations relevant to building types and climatic zones, with a focus on public buildings

**Countries:** Cyprus, Greece, Israel, Italy

**Output n°:** 3.1

**Output Title:** Pilot actions in buildings in 4 countries

**Activity n°:** 3.1.5

**Activity title:** Preparation of server and database hosting data

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### 3 Copyright

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|                     |  |        |
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## 1 Project summary

The objective of BERLIN is to address high-energy consumption in the building sector that is mainly fossil – fuelled, support rural areas and areas powered by weak grids, which are common in the MENA region, and achieve higher grid penetration of renewable energy sources (RES) while maintaining grid stability and power quality. For this reason, this project aims at the implementation of cross border pilots that will support innovative and cost – effective energy rehabilitation in public buildings based on the nanogrid concept. Thus, BERLIN project focuses on the increase of photovoltaics (PV) penetration, which coupled with energy storage and demand – side management (DSM) will increase the energy efficiency (EE) of the buildings. The implementation of these technologies in a cost – effective way will result in high level of self – resilient public buildings that are green, smart, innovative and sustainable. Six pilot buildings will be implemented: 1 in Cyprus, 2 in Greece, 2 in Israel and 1 in Italy.

The project has started in September 2019 and is expected to be completed within 36 months.

## 2 Introduction

The preparation of the server-hosting infrastructure and the central database, where the data of each pilot building from all the participating countries are stored, is presented in this report. In addition, the monitored parameters are illustrated, classified as mandatory and optional for each pilot building. The data collection process by each partner is followed by the storage of all the data in a central database hosted by the University of Cyprus (UCY). Finally, this report provides the procedure for transferring the data to the central database.

## 3 Data collection procedure

### 3.1 Data monitoring

The monitored parameters and their acquisition format have been agreed between the project partners at an early stage, before the infrastructure installation and commissioning, in order to ensure compatibility between the collected data for the whole monitoring period of the project. Thus, through this report, a description for each monitored parameter is provided. The parameters have been classified as mandatory or optional for each partner, depending on their choice based on their capability and research interest and activities, however, some of them are mandatory for all the pilots, as they are crucial for the purpose of the project.

The acquisition of the data is followed by the post-processing stage, which is required for the calculation of some of the parameters, or in some cases, for the conversion of the data into the agreed format and/or units. The next step involves the storage of the data by each partner into their regional database, which is followed by the insertion of the data into the central database of UCY in the common format that was agreed.

### 3.2 Monitored parameters

The monitored parameters are split in two categories, the mandatory and optional, with the former being required by each pilot building, whereas the acquisition of the latter will be optionally performed depending on the choice of each partner. Table I lists the monitored parameters. All parameters are measured between intervals of duration that could vary between each partner and averaged every 15 minutes. The averaged values are acquired and stored in the database. The averaged value of 15 minutes was selected, as it can be achieved by a wide range of equipment, thus it does not limit the partners with respect to the data acquisition equipment, and it was mutually agreed that a 15-minute resolution is adequate for the research activities of BERLIN project.

Table I: List of monitored parameters, split in mandatory and optional.

| No | Parameter     | Type       | Mandatory | Optional |
|----|---------------|------------|-----------|----------|
| 1  | Timestamp     | -          | ✓         |          |
| 2  | PV generation | Electrical | ✓         |          |

| No | Parameter                      | Type          | Mandatory | Optional |
|----|--------------------------------|---------------|-----------|----------|
| 3  | Grid import power              | Electrical    | ✓         |          |
| 4  | Grid export power              | Electrical    | ✓         |          |
| 5  | Consumption power              | Electrical    | ✓         |          |
| 6  | Direct PV consumption          | Electrical    | ✓         |          |
| 7  | Grid voltage                   | Electrical    | ✓         |          |
| 8  | Battery SoC                    | Electrical    | ✓         |          |
| 9  | Storage charge power           | Electrical    | ✓         |          |
| 10 | Storage discharge power        | Electrical    | ✓         |          |
| 11 | Ambient temperature            | Environmental | ✓         |          |
| 12 | Ambient humidity               | Environmental | ✓         |          |
| 13 | Irradiation                    | Environmental | ✓         |          |
| 14 | Wind velocity                  | Environmental | ✓         |          |
| 15 | Module temperature             | Environmental | ✓         |          |
| 16 | Indoor temperature             | Environmental | ✓         |          |
| 17 | Indoor humidity                | Environmental | ✓         |          |
| 18 | PV reactive power              | Electrical    |           | ✓        |
| 19 | Grid reactive power            | Electrical    |           | ✓        |
| 20 | Battery voltage                | Electrical    |           | ✓        |
| 21 | Battery current                | Electrical    |           | ✓        |
| 22 | Storage reactive power         | Electrical    |           | ✓        |
| 23 | Module voltage                 | Electrical    |           | ✓        |
| 24 | Module power                   | Electrical    |           | ✓        |
| 25 | Air quality (PM2.5, PM10, VOC) | Environmental |           | ✓        |
| 26 | CO <sub>2</sub>                | Environmental |           | ✓        |

### 3.3 Data collection and storage to the central database

A local database will be established by each partner and will be used for data storage. Figure 1 illustrates the data collection process for each partner. A local database can be utilised by partners for the implementation of their research activities, as well as a backup method of the central database for protecting the obtained data.

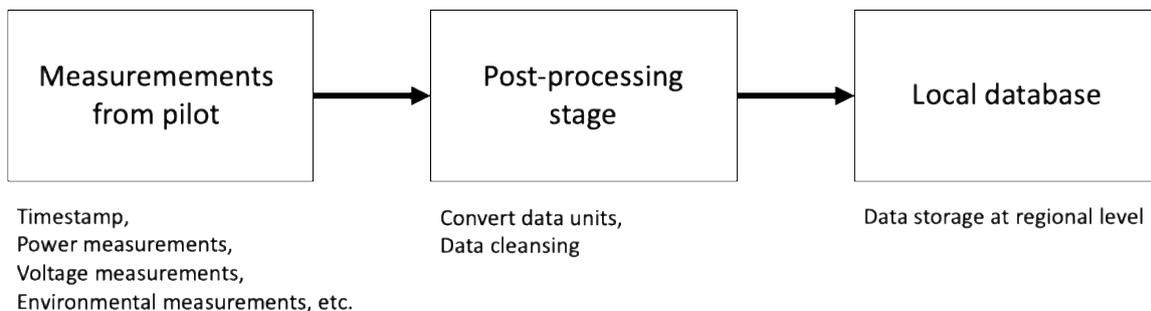


Figure 1: Data collection process.

The data collection and storage to the regional databases is followed by the data storage to the central database that is managed by UCY. An overview of the data monitoring, storage to a regional database and finally, submission to the central database, is illustrated in Figure 2.

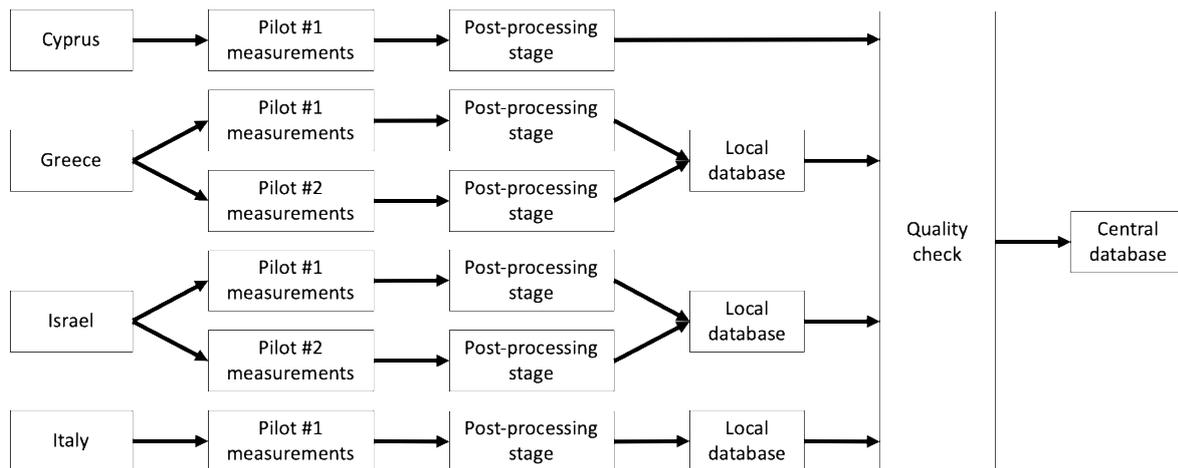


Figure 2: Overview of BERLIN data collection process.

## 4 Conclusions

In this report, the preparation of the server-hosting database and the central database have been presented. Moreover, the mandatory parameters for all the pilots as well as optional parameters based on the capabilities and research interests of each partner have been outlined. Based on the agreement between the project partners, data transfer to the UCY central database will occur on a monthly basis, whereas each partner remains responsible for collecting the data from their pilots, storing them in a local database that acts as a backup, and providing them to UCY in the agreed format within the agreed timeframe.