

Interim report – WP2

Data and measurements

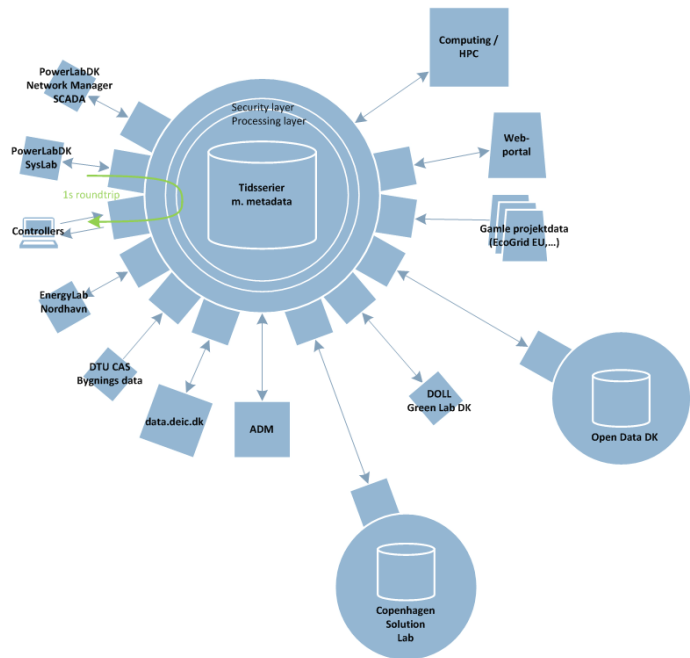
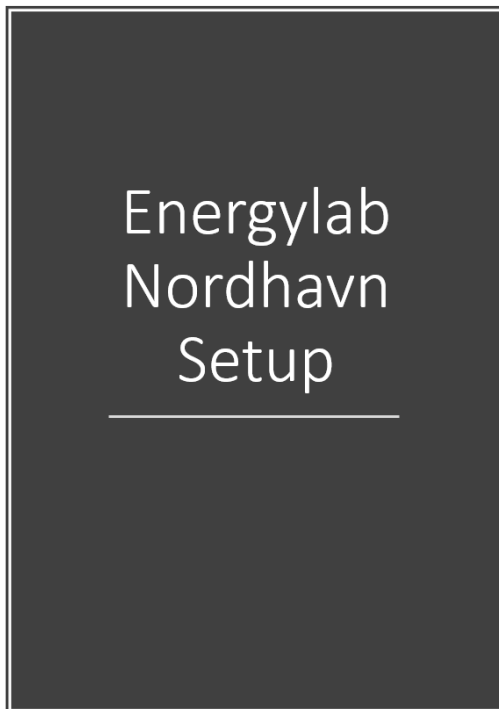
Reporting months: July 2018 – June 2019



Photo: By & Havn / Ole Malling

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ABB A/S
June 2019

Work package aims and objectives



'DOW ver2.0'

The objective is to establish and operate a data collection and management system for EnergyLab Nordhavn integrated in PowerLabDK and to provide real-time and historic data to other WP's and public visualizations. The data collection and management system will integrate measurements from district heating system, electricity system, electric vehicle system and smart buildings. A real-time Nordhavn energy system status visualization will be developed and provided.

Overall progress of the work towards WP Objectives

The DMS system has been running for a full year in operation. DMS is receiving data from 13 different data sources and more than 10.000 data flows are updated daily.

The remaining interfaces are waiting for installation to be finalized.

The data from meters, both in district heat and in electricity networks, are not possible to get in real-time. These data are delivered automatically once a day via a sFTP service and contains 24 hour-values.

All agreed deliverables have been delivered and approved by WPL except D2.3; this delivery will be finished end of June 2019.

The last two reports are D.2.2c and D2.2d. Radius has called off these reports, however, this has not been accepted by the ELN Project Leader. Therefore, these deliveries are now managed by the Project Leader.

With this, WP2 has now fulfilled the agreed tasks described in DoW.

Self-evaluation

- Early in the project it was agreed that the database system already at DTU PowerLab was not good enough for the new tasks that EnergyLab Nordhavn project planned to solve, test and demonstrate. It was decided to build a new Data Management System (DMS) from scratch. This took longer time than expected and resulted in all the WP2 tasks being delayed.
- When the DMS was ready, a new legal set of data rules, GDPR, was added to the ELN project. Getting our knowledge updated to be able to handle the type of data that was needed in this project also took a long time.
- Interface and infrastructure to connect all the devices in Nordhavn back to the DMS system were not considered in the project and it took a long time to agree on the process regarding installation and support. There is still a support issue with the installation inside private homes.
- Agreement with our different partners regarding real-time data from grids, electric and heat meters has also been a huge and time-consuming task and we are still not receiving real-time values from the meters.
- Transport data is not considered in this interim report as there has not been much EV connection to DMS. After Nerve Smart Systems took over from CleanCharge, the DMS receive limited EV charging data. Unfortunately, it is too late in the project to do something about this. No other electric transport options have been looked into either; this could have been electric busses, metro, cruise ships and more.

Status and activities in the WP tasks

Task 2.1: Measurement specifications

All data streams, GIS data and other information exchanged in the project are covered by the grant agreement and the collaboration agreement. In the following table each of the other types of agreements are mapped to data sources established:

Description	No. Of Interfaces	DTU - Consent with data subject (physical person)	Radius, Exchange of RPM meter data	HOFOR - Consent with customer (physical or legal person)	HOFOR/DTU NDA	Data processing agreement - subcontractor	Data processing agreement - student
Danfoss living.	15	x				x	X
Danfoss Heat Booster Station (HBS)	1						
Danfoss Supermarked	1						
Terra Nova Concrete temp. Meas.	4	x				x	x
Frihavnstårnet apartment meas, KNX	13	x				x	x
Sundmolen apartments KNX measurements	19	x				x	x
Tetris rowhouses fuelshift	13	x				x	x
Casa Rowhouses fuelshift	11	x				x	x
PowerLabDK Syslab Fuelshift	1						
Weather station at CIS	1						
Heat Storage Radiators	1						
Power grid meas (SGU)	1						

EV Charging data	1					x	x
Copenhagen international School (CIS) building meas.	1						
District heating meters	45			X	x		
Remote Power meter readings	1400+		x			x	x
Tomorrow, CO2 forecast	1						
MeteoBlue, weather forecast	1						
Battery	1						
Nordpool, power spot prices	1						

- For a full overview of signals please refer to the report D2.1b

Task 2.2: Electricity grids measurements

- Apart from a measurement point established in one substation in Q3 2017 by DTU electrical engineering, it has not yet been possible to establish the transfer of grid data to the DMS.

Task 2.3: Individual meters

- Balslev has taken the lead on this task. Approximately 33% of the KNX energy meters in ELN have been selected and SAT tested with a wide range of measurement points.
- The data from Radius' MDM are proven to follow the same trend as data from DTU's DMS. Most values from the MDM are with very little deviation from the DMS. The values of the data from Radius' power meters are validated.

Task 2.4: Thermal grids measurements

- HOFOR has provided a list of installations and meter numbers for heat meters in the EnergyLab Nordhavn area - there is a supply address attached to them in DMS for mapping reasons.
- HOFOR has sent files in csv format for more than a year and the data delivery has been stable. Just a short period with a fault on the server made a "natural test". The

missing data during the fault have subsequently been delivered and received in the DMS system without any problems.

- The data have been uploaded every day for almost a year and, thus, the functionality has been approved. A SAT test was made in February 2019 and there is a full link between the HOFOR system, Energykey, and DTU DMS system.

Task 2.5: Building measurements

- Two-way communication has been developed for real-time control of the apartments in Sundmøllehusene using the MQTT interface. These systems have been used for extensive demonstrations to use the thermal inertia of the apartments to provide energy flexibility to the district heating system.
- The http API has also been used for scientific investigation since this interface allows for automatic extraction of large data volumes, which was unfeasible using manual data handling.
- The data from CIS have been used for several investigations into optimized operation of large non-residential buildings. The data from CIS is collected directly from CIS BMS system.

Task 2.6: PowerLabDK SCADA extension

- MicroSCADA is connected to DMS and the use-case UC#1 is demonstrated receiving data from HOFOR and BESS battery. MicroSCADA and the developed algorithms are used to send back control signals to the equipment in ELN installations within UC#1.

Task 2.7: Data collection and measurement system operation

- Data Management System has now been running for a full year and is very stable.
- New users are added to the system; approx. one new user a week and the approval process for access to data is working as planned.
- The DMS is able to control devices. This is, for instance, used to test the temperature regulations in some of the apartments to find the thermal capacity within the concrete structures.
- It is possible to search for data in DMS via API.
- It is possible to add new data sources to DMS via API.
- Backup of all meta data is running.

Deliverable status

D #	Deliverable title	Planned completion month	Status 1 = on schedule 2 = completed 3 = delayed
D2.3	SAT test report. Automated meter readings are validated, according to specification from T2.1 and reach the data collection system as specified in T2.1.	June 2019	3
D2.4	SAT test report. Automated meter readings are validated, according to specification from T2.1 and reach the data collection system as specified in T2.1.	April 2019	2
D2.5	Design specifications, commissioning / implementation reports, operation reports, functional building measurement systems	May 2019	2
D2.6a	Specification of data collection system (SCADA extension, data warehouse, software, hardware etc.).	February 2019	2
D2.6b	SAT test report data collection system.	January 2019	2
D2.7a	MTBF or similar system stability analysis report.	April 2019	2
D2.7b	System and data validation and warning tool manual	March 2019	2
D2.7d	Report on system stability issues, solutions and future recommendations.	March 2019	2

D2.7c: Specification of channels for data and signal distribution to work packages has been cancelled as it is no more relevant. The new DMS system is much more flexible. Channel need between WP and demonstrations will mainly come via WP8.

Dissemination

No PhD in WP2.

Next steps

Final reporting is the only outstanding task in WP2.

Quality Assurance

Status of deliverable		
Action	By	Date
Sent for review	Benny Stougaard Hansen	12/6-2019
Reviewed	Magnus Klintström, DTU	12/6-2019
Approved	WPL approved	21/6-2019

Author	Reviewer	Approver
Benny Stougaard Hansen	Magnus Klintström, DTU	WPL

The project "EnergyLab Nordhavn – new urban energy infrastructures" develops and demonstrates future energy solutions. The project utilizes Copenhagen's Nordhavn as a full-scale smart city energy lab and demonstrates how electricity and heating, energy-efficient buildings and electric transport can be integrated into an intelligent, flexible and optimized energy system. The project participants are: DTU, City of Copenhagen, CPH City & Port Development, HOFOR, Radius, ABB, Balslev, Danfoss, Nerve Smart Systems, METRO THERM, Glen Dimplex and the PowerLab facilities. The project is supported by EUDP (Energy Technology Development and Demonstration Programme), grants 64014-0555 and 64015-0055 and runs from 2015-2019.



Version Control

Version	Date	Author	Description of Changes
1.0	12-06-2019	Benny S. Hansen	
1.1	12-06-2019	Magnus Klintström	Review
1.2	13-06-2019	Benny Stougaard Hansen	Minor changes to the text
1.3	21-06-2019	Benny Stougaard Hansen	Approved document