

Interim report – WP6

Electricity Infrastructure

Reporting months: July 2018 – June 2019



Photo: By & Havn / Ole Malling

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May 2019

Work package aims and objectives

Development of methods for grid design for a forthcoming future load scenario with low energy buildings, widespread DER, stochastic consumer loads and actively managed distribution grid according to various market optimum.

Overall progress of the work towards WP Objectives

Radius is satisfied with the overall results of the project. The learning curve has been steep and today we would have approached the task in another way.

The largest investment in time and money has been the battery. A new EU directive has prevented the DSOs to own or operate batteries in connection to the grid. For that reason, the results are less valuable for Radius but the achieved knowledge and experiences can be used for specifying storage services from an external supplier.

In particular one of the Ph.D. studies have been valuable and the results will be integrated in the control center routines. In addition, we have plans of further development of the methods in grid planning.

We have conducted quality-based interviews regarding new tariff design to learn how this will be understood and accepted among customers. The results are in demand in the committees in the electricity sector organized by the Danish Energy Association.

WP6 is close to ending. All demonstrations have been conducted and all possible learning obtained. Reports related to the various tasks is under final preparation and review.

The project has moved Radius a significant step towards coping with the expected future stochastic load profile. Some of the results require further development and the knowledge of the future challenges has also developed during the project period.

Part of the learnings obtained is further integrated in practice.

Status and activities in the WP tasks

Task 6.1.

All analyses conducted and reports under preparation except concerning benchmarking of current load prediction method with the new clustering method. This is not part of the planned deliveries but a natural consequence of introducing a new method. The clustering method is planned to be implemented in the grid operation practice.

Disaggregation has been less successful. The disaggregation method has been tested on Radius grid data (the method was originally developed on basis of data from Bornholm) but the variation of types of heat pumps is considerable, and the disaggregation method was unable to detect them with neither 1 hour sampling nor 15 min sampling. Radius will develop further on the method in another innovation project.

Task 6.2

All analyses conducted and reports are under review. The results inform Radius design method, but further innovation work needs to be undertaken (and are considered) for implementation of the suggestions in practical grid design methods.

Task 6.3

All experiments conducted and reports are under preparation.

During the project period, the EU parliament has adopted a directive that prohibit DSO to own or operate batteries except under very special circumstances. The learnings obtained have therefore limited use for Radius.

The battery is currently offering capacity to the ancillary market and is also used in experiments in WP8.

Task 6.4

All interviews conducted and reports are under review. The results are used in the tariff engineering work organized by the Danish Energy Association.

Deliverable status

D #	Deliverable title	Planned completion month	Status 1 = on schedule 2 = completed 3 = delayed
D6.1.2b	Confirmation of model against data obtained	June 2019	3
D6.1.3	Development of an advanced model and a report describing how to give prediction of peak load in a stochastic load scenarios. The report includes practical directions of how to use as basis for grid design. Slide set for presentation of the new method.	June 2019	3
D6.1.4	Disaggregation. Demonstration of application of appliances detection and load disaggregation	June 2019	3
D6.2.2	Report with technical and financial assessment of at least 5 new add-ons to the existing grid in Nordhavn.	May 2019	1
D6.2.3	Report on financial assessment of step wise roll out of distribution grid in Nordhavn	May 2019	1
D6.2.4	Comparison between current grid design for Phase 1 and greenfield design with add-ons.	May 2019	1
D6.3.4	Report with analysis of battery operation results.	May 2019	3
D6.3.5	Joint Delivery with CC. Battery as flex assets for DSO etc. Battery effect on grid performance due to operation by commercial agent.	July 2019	Deleted

D6.3.7	Battery incorporation in regulatory economy	May 2019	3 Merged with 6.3.4
D6.4.1	B2B research on new tariff design	May 2019	1
D6.4.2	Customer research on new tariff design	May 2019	1
D6.4.3	Stakeholder research		1
D6.4.4	Overall report with recommendations to new tariff design	May 2019	1

Dissemination

The amount of presentations to external groups has been considerable and we still receive a stream of applications to learn about Radius experiences with use of a battery in grid operation.

Next steps

The tasks in WP6 are coming to an end.

The battery is integrated in ongoing experiments in WP8 concerning fuel shift and flexibility mobilization.

We continue to develop the results achieved in the Ph.D. studies (task 6.1-2) regarding clustering, disaggregation and grid design.

The knowledge obtained concerning tariff engineering is already integrated in Radius current work.

Quality Assurance

Status of deliverable		
Action	By	Date
Sent for review	Poul Brath	22.05.2019
Reviewed	Palle Holdt	27.05.2019
Approved	WPL	01.07.2019

Author	Reviewer	Approver
Poul Brath	Palle Holdt	WPL

The project "EnergyLab Nordhavn – new urban energy infrastructures" will develop and demonstrate 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, CleanCharge, METRO THERM, Glen Dimplex and the PowerLab facilities. The project is supported by EUDP (Energy Technology Development and Demonstration Programme), grant 64014-0555 and runs from 2015-2019.



Version Control

Version	Date	Author	Description of Changes
1.0	2-5-2019	pouL Brath	Preparation
2.0	14-6-2019	pouL Brath	Comm. included. Final