

Final report

1.1 Project details

Project title	Participation in ISGAN Annex 5 (SIRFN)
Project identification (program abbrev. and file)	64015-0569
Name of the programme which has funded the project	EUDP
Project managing company/institution (name and address)	CEE, DTU Elektro Frederiksborgvej 399, 4000 Roskilde
Project partners	AAU IET TI
CVR (central business register)	30060946
Date for submission	2019-05-14

1.2 Short description of project objective and results

The project objective was to support the Danish representation in International Smart Grid Action Network (ISGAN) which is both a part of the Clean Energy Ministerial (CEM) and the IEA activities. In particular, Annex 5 Smart Grid International Research Facility Network (SIRFN) which is concerned with development of experimental research facilities and development of test methods. The project has contributed to the development of test methods for intelligent systems such as virtual power plants or microgrids. Due to the links with CEM the activities are closely linked with Mission Innovation Innovation Challenge #1 (MI IC#1) and the work in SIRFN has contributed to the development of the work program for MI and the Danish participation in MI IC#1.

Projektet har til formål at understøtte dansk repræsentation i International Smart Grid Action Network ISGAN som er en del af både Clean Energy Ministerial og IEA aktiviteter. Specifikt er deltagelse i Annex 5 Smart Grid International Research Facility Network SIRFN som omfatter samarbejdet vedrørende smart grid eksperimentelle forskningsfaciliteter og udvikling af test metoder for intelligente enheder og systemer. Projektet har bidraget til udvikling af testmetoder for intelligente systemer såsom virtuelle kraftværker og microgrids. Med baggrund i det tætte bånd til CEM har arbejdet i SIRFN bidraget til udviklingen af Mission Innovations IC#1 arbejdsprogram og til at Danmark er deltager i dette med en task lederrolle.

1.3 Executive summary

The project objective was to support the Danish representation in ISGAN Annex 5 (SIRFN) which is concerned with development of experimental research facilities and development of test methods for individual components and combined systems such as virtual power plants, aggregators or microgrids. The Danish participation has been in physical meetings and web conferences. There has also been organised a number of workshops where there have been contributions. The main Danish contribution has been to the activities of power system testing methods in particular for aggregators and combine it with methods for pre-qualification of the aggregators by the system operators before deployment. The participation has been in

the form of presentations at meetings and workshops. Denmark/CEE is now leading this activity (the change in leadership of the activity was after the project period). Another significant outcome of the project is access to the results of activities in automatic testing of intelligent inverters. The results themselves are interesting in identifying the challenges of achieving coherence in implementation of specific behaviour of the inverters in relation to the international standards. Additionally, the work has revealed the complexity in describing the required behaviour in a testable way for pre-deployment performance verification as part of a pre-qualification process. The activities in the working group has also contributed to identify relevant improvements of the experimental facilities to enable system level tests.

ISGAN/SIRFN has also been a very good forum for exchange of experience with relevant laboratories outside Europe. Combined with the link to CEM the SIRFN activities has contributed to the development of the work programme for Mission Innovation Challenge #1. Denmark has a task leader role in that MI IC#1.

1.4 Project objectives

The project objective to interact with other international laboratories in the field of smart grids research has been achieved. The project has enabled Danish researchers to bring results to the working group to further discuss and elaborate them as well as take experience from other labs with similar capabilities and bring it to Denmark for the improvement the functionality of the research facilities.

The concrete production of reports and other documents has been slow. During the project period the specific activities in system testing, microgrids and to quite some extent power system testing were very slow as previously reported. The main activity with significant progress was inverter testing.

1.5 Project results and dissemination of results

SIRFN is an internationally collaboration effort to exchange experience and results in smart grid testing as well as to support and facilitate development of new testing methods and new lab capabilities.

The work within SIRFN consists of different activities. One important activity is exchange of experience within the field of smart grid labs and testing through labs visits. Another important group of activities is development of testing methods and comparing test results across labs. Further, there are activities to communicate and interact with other projects and initiatives.

During the project period there has been several physical meetings at different labs. This has formed a good background for discussing present capabilities of the different labs that are participating. This has led to improving the foundation for development of lab automation and lab support for controller testing e.g. in the form of supporting the development chain of controller from concepts in Matlab to capability for distributed controller deployment and testing in the labs.

As mentioned above the activities for development of testing methods has been slower than anticipated and only very limited results have been produced for other than inverter testing. The battery testing has had no progress and is now closed. The other activities did not produce deliverables during the project period. They mainly presented the issues and background to be covered for discussions at the workshops which has contributed to the development.

Currently, there are three active topics additionally to inverter testing. These are power system testing, advanced testing methods and microgrids. These groups have been reactivated recently (after the project).

SIRFN has acted as a vehicle for information exchange between European projects and between European and extra-European projects. This has worked very well and is now continuing both in the frame of SIRFN but also carried over in MI IC#1.

1.6 Utilization of project results

The work on power system has continued. It is now being coordinated by CEE (currently without external funding). This will lead to initial results on use of labs for smart grids system testing.

The inverter testing activities is continued in two directions. One is so-called advanced testing methods that include hardware in the loop (HIL) testing. It has a strong focus on the product development cycle by integrating the functional development with prototyping and lab testing to reduce the time to market at the same time as ensuring desired system functionality. The other direction is requirements for inverter-based power systems. This will be extremely relevant as more generation and consumption will be inverter connected and conventional power plants are out-phased.

1.7 Project conclusion and perspective

The progress of the work during the project period was slow. The outcome in terms of deliverables during the project period was lower than expected.

However, the project was a very good vehicle for becoming a part of the international network of smart grid lab facilities and it has provided valuable input for the development of the smart grid labs. Additionally, during the project period the topics of power system testing and advanced testing methods have matured and the effort in those activities are now at a higher level and with good prospects of producing relevant output.

The links between SIRFN and MI IC#1 are still strong and it also contributes to the progress of the work as well as to ensuring the relevance of the activities.