

Final report

1. Project details

Project title	International Smart Grid Technology Collaboration
File no.	64018-0625
Name of the funding scheme	EUDP
Project managing company / institution	Center for Electric Power and Energy, DTU Elektro
CVR number (central business register)	30 06 09 46
Project partners	Climate KIC, Intelligent Energi
Submission date	23 December 2021

2. Summary

Dansk version

Dette projekt har støttet dansk deltagelse i Mission Innovation Smart Grid Innovation Challenge også kaldet MI IC#1 eller blot IC#1, hvor Danmark var co-lead på den task, der omhandlede Demand Response. Formålet var at styrke den danske deltagelse i IC#1 og formidle resultater fra arbejdsgruppen til danske aktører og netværk gennem projektets partnere CEE, iEnergi, Climate KIC.

Uden projektet havde det ikke været muligt for Center for el og energi (CEE), at deltage på samme niveau i den såkaldte Smart Grid Challenge. CEE har deltaget i diverse arbejdsgruppemøder afholdt i forbindelse med de halvårslige Clean Energy Ministerial (CEM) og Mission Innovation konferencer, samt diverse bilaterale møder i de forskellige tasks. Ligeledes havde det ikke været muligt uden partnerne Climate KIC og iEnergi, at få delt viden om aktiviteterne i MI IC#1 til relevant interessenter.

Deltagelsen i MI IC#1 har bidraget til et godt netværk til internationale forskningsinstitutioner og givet mulighed for at give dansk indspark til den internationale energiforskning ift. smart grids. Ligeledes har projektet bidraget til at organisationer som Climate KIC og Intelligent Energi (iEnergi) har formidlet resultater og viden fra IC#1 til deltagere fra de to netværk.

English version

This project has supported Danish participation in the Mission Innovation Smart Grid Innovation Challenge also called MI IC#1 or just IC#1, where Denmark has co-lead the Demand Response task. The objective of the project was to strengthen the Danish participation in the MI IC#1 and to disseminate results from the

working group to Danish networks via project partners CEE, Climate KIC and Danish Intelligent Energy Alliance (iEnergi).

Without the project, it would not have been possible for Center for Electric Power and Energy to participate at this level in the Smart Grid Challenge. CEE has participated in various working group meetings in connection with the biannual Clean Energy Ministerial (CEM) and Mission Innovation conferences as well as various bilateral meetings in the various tasks. Furthermore, without the partners Climate KIC and iEnergi it had not been possible to reach the relevant stakeholders.

The participation in MI IC#1 has contributed to an outstanding network to international research institutions and provided an opportunity to give Danish input to the international energy research in relation to smart grids. In addition, the project has facilitated sharing and dissemination of results and knowledge between IC#1 participants and the members of Climate KIC and iEnergi.

3. Project objectives

The objective of the project was to strengthen the Danish participation in the MI IC#1 and to disseminate results from IC#1 to Danish networks via ClimateKIC and iEnergi who played a crucial role in dissemination activities. The projects partners, contributed to the IC#1 with insights in energy technology and in particular smart grids and integration and flexibility across power, heat, gas and water utilities This insight is one of the Danish strongholds and by offering Danish competencies and solutions to the working group our aim was to secure a solid Danish footprint in the future international energy policy.

4. Project implementation

The project started in January 2019 where CEE were very active in terms of contribution to the Demand Response task in MI IC#1. The project also delivered input on Danish grid data to country reports as well as input to an industry survey where we used iEnergi as source. Jacob Østergaard joined MI IC#1 workshops in connection with CEM10 and MI-4 in Vancouver in May 2019.

Our partner iEnergi hosted the first of two industry workshops, "Flexibility is the cornerstone of the future energy system with participation from the Finnish co-lead on the Demand Response task, VTT. More than 60 participants joined the workshop here among relevant EU representatives USEF, NODES, EPEX Spot, RAP og ENTSO-E / Energinet.

In connection with the C40 Mayors Summit, in Copenhagen in 2019, Climate KIC organized and hosted the Mission Innovation Energy Hack concerning smart grid solutions. The Energy Hack was organized together with DTU SkyLab and Next Generations Cities Challenge and took place over several days ending at a VIP event during the C40 Mayors Summit in October. Three researchers from CEE participated as jury members.

In the end of 2019 Henrik Bindner from CEE joined the sixth MI IC#1 meeting in Paris. The meeting consisted of an internal closed workshop as well as a public workshop. At the meeting results from the Danish project ECOGRID were presented.

In the beginning of 2020 the external related project activities were put on hold due to the COVID-19 pandemic that didn't allow for meeting up in larger groups or travel abroad. Internal workshops took place online as well

the ongoing work in the Demand Response task. As part of the task a survey regarding use of demand response and the potential and barriers in member countries were distributed.

Due to COVID-19 the project was first prolonged for half a year until June 2021 hoping that CEE would be able to invite for a physical workshop in the spring 2021. This was not possible due to the pandemic and the project was prolonged for six additional months until end of December 2021.

iEnergi managed to host their second workshop: 'Stock-taking on how demand response is progressing in the EU', with particular focus on Citizen Energy Communities. The workshop was carried out as an online event with close to 50 participants. From the MI IC#1 working group participated Luciano Martine from Ricerca sul Sistema Energetico - RSE S.p.A, and IC#1 co-lead as well as Kari Maki from VTT Technical Research Centre of Finland and co-lead on Demand Response task together with CEE. Among key stakeholders from both Denmark and Europe were the European Commission, DG ENER; Energistyrelsen and IEA.

During 2021 time have been spend on collecting various reports and recommendations from the Danish energy sector which are now part of the platform – <https://www.mi-sgiaplatform.net/private/home>. The platform collects input from IC#1 countries with the purpose of sharing knowledge of smart grids.

During 2021 Henrik Bindner joined various internal online meetings in the Demand Response task. Based on the survey carried out among member countries an overview of the flexibility in the participating countries have been produced. The survey have provided and overview of both unexploited and utilized flexibility in the demand. The results were presented at a CIRED conference in the fall 2021 which was also carried out online due to COVID-19.

In connection with the Digital Tech Summit end of November 2021 with more than 4000 participants, the project contributed with dissemination of MI IC#1 related activities at the session 'AI for a sustainable World – Tools for climate and energy'. Professor Jacob Østergaard participated in the session, which took place at the main stage. As a result of the event follow-up dialogues have been organized to discuss development of new digital solutions for optimizing operation of power transmission and distribution.

The workshop that CEE should have hosted in December 2021 focusing on research was cancelled due to a still ongoing COVID-19 pandemic.

COVID-19 have had an impact on the last part of the project and it have not been possible to carry out the last workshop hosted by CEE. The purpose of this workshop was to bring researchers from the IC#1 working group together with representatives from Danish companies and organizations.

Results from Energy Hack and the public workshops hosted by iEnergi has been presented to IC#1 working group and iEnergi stakeholders have engaged with IC#1 stakeholders thereby reaching all three key milestones. However, the presence of COVID-19 have limited the international network opportunities that were also part of the project.

5. Project results

The main objective of the project: 'To further strengthen the Danish participation in the MI IC#1' have been obtained. However, the COVID-19 pandemic have made it difficult to accomplish the final part of the network and dissemination activities. As a consequence of the pandemic iEnergi chose to do their second workshop as an online activity which worked very well.

Stakeholders from both iEnergi and Climate KIC have gained information on Mission Innovation activities and have contributed to the overall IC#1 activities in terms of knowledge sharing. The students from the Energy Hack got the chance to meet and pitch solutions to key international energy stakeholders who also gained new knowledge.

Results from the project are defined as the activities part of the project.

Results from the project have been disseminated at the website: www.mission-innovation.dk and at the conference hosted both by Climate KIC and iEnergi as well at meetings and workshops in the IC#1 working group.

The conferences are:

CEM 10 / MI4 together with IC#1 working group meeting, Vancouver, May 2019

iEnergi workshop, Flexibility is the cornerstone of the future energy system, June 2019

Mission Innovation Energy Hack, C40 Mayors Summit, Copenhagen, October 2019

Sixth MI IC#1 internal working meeting, Paris, November 2019

iEnergi Workshop: Stock-taking on how demand response is progressing in the EU, with particular focus on Citizen Energy Communities, April 2021

CIREN, online, September, 2021

Digital Tech Summit, Copenhagen, November 2021

6. Utilisation of project results

No technical results have been part of the project.

The activities in the project concern smart grid and intelligent use of energy in terms of utilization of flexibility. These are all important factors for reaching the 2030 energy targets. Supporting development of green energy technology contributes to some of the key Danish strongholds. The knowledge and network obtained in the project will contribute to future collaborations and development of new energy technology which will add to the growing portfolio of Danish energy strongholds which in the future will include PtX, Energy Islands and sector coupling.

7. Project conclusion and perspective

The objective of the project was not to develop new solutions but to strengthen the Danish participation in the MI IC#1 and to disseminate results from IC#1 to Danish networks via collaborating partners.

An international survey was carried out on the state of demand response and its application. The conclusion of the survey is that internationally there are relatively well developed schemes for utilisation of demand response from industry, but other applications are lacking due lack of regulation and business models. Smart meters are seen as key enablers, however, they are currently not used. One of the items that was identified

as main barrier that could also benefit from international collaboration is estimation and forecasting methods of flexibility. This could be a major driver for further utilisation of the demand response potential.

The project has also provided a frame for discussions of solutions for local markets for flexibility via the workshop that was organised. This activity has been continued by iEnergi in a series of workshops and has had an impact on the Markeds Model 3.0.

The MI IC#1 collaboration has provided new international perspectives as well as a research network that will be useful going forward. Future technology areas supplementing smart grid research will include PtX, sector coupling and energy islands.

The project have contributed with knowledge of international energy sector and provided a network that can be used in future collaborations.

8. Appendices

Annual reports

[2019](#)

[2020](#)

[2021](#)

[Project website](#)

[SGIA platform](#)

[Smart Grids Innovation Challenge Country Report 2019](#)

[Report from Energy Hack](#)

Survey presented at CIRED 21 Conference. 'Global analysis on demand response status and further needs for joint research', Kari Maki¹, Matti Aro¹, Henrik Bindner², ¹ VTT Technical Research Centre of Finland Ltd, Finland. ² DTU Elektro, Denmark