

# Newsletter

on the new developments in the project

## Renewable Energy-based E-Mobility in Higher Education



Source: THI

### REMO Industrial Workshop in Tunis - great opportunity to exchange and receive valuable feedback on the project activities

*Dr Ikbal Msadaa (ENSTAB SP3 Coordinator)*

Held in Tunis on December 9th 2021, the REMO Industrial Workshop was attended by more than 60 participants from about 20 academic and industrial institutions representing the key stakeholders of RE and e-mobility in the country.

The main aim of the workshop was to engage with the partners on how the transition to RE and e-mobility can be accelerated. The REMO project focuses on the further development of higher education so that the expertise required is gradually built up to meet the specific labour market needs in the partner countries.

The opening speech of the workshop was given by Ms Nadia Mzoughi, Dean of the University of Carthage in Tunisia, followed by Professor Khaled Grayaa, Country Coordinator of the REMO project and Director of LaRINA, introducing the LaRINA lab and its main activities.

Ms Philine Ginsberg, project manager of the REMO project from InES-THI in Germany subsequently presented the REMO project, its main objectives and involved partners.



REMO team from ENSTAB

Source: ENSTAB

### IN THIS EDITION

REMO INDUSTRIAL WORKSHOP  
IN TUNIS - P. 1 & 2

REMO PROJECT PRESENTATION  
AND NETWORKING AT THE  
OFF-GRID CONFERENCE IN  
AUGSBURG - P. 3

REMO TEAM MEMBERS' VISIT  
AT IBC SOLAR AG - P. 3

AI-EMPOWERED E-MOBILITY  
BASED ON RENEWABLE  
ENERGY - P. 4 & 5

SUMMARY ON THE DAAD  
LAUNCH CONFERENCE IN  
NOVEMBER 2021 - P. 5

AUI TEAM MEMBERS CON-  
DUCTED A VISIT TO FÈS-  
MEKNÈS DISPATCHING  
CENTER IN MOROCCO - P. 6

INVOLVED PARTNERS &  
CONTACTS - P. 7



From top to bottom: (1) Ms Mzoughi, Dean of the University of Carthage opening speech (2) Speakers during the plenary session; from left to right: Mr Gannouni, Mr Marzouki, Dr Msadaa (moderator of the session), Professor Grayaa. (3) Team from THI and Asantys Systems participating online (4) Ms El Khazen from ANME (5) Ms Trojette facilitating the 2nd session and explaining the proposed brainstorming activity.

Source: ENSTAB

Dr Faten Kardous, Coordinator of the project's second sub-project dealing with the development of an international Master's programme on RET and e-mobility then reported on the main results of the survey aiming at the collection of recommendations and insights for the Master's programme. This survey was circulated in 2021 among industry and academic representatives.

Mr Hassen Marzouki, from STEG (Tunisian Company for Electricity and Gas), focal point of the *Electric Vehicles STEG-Program (VES)* has then presented the three goals of VES:

- Electrification of STEG fleet
- Study of the impact of EVs on the grid
- Study of the compliance between the EV programme and the smart grid project

Mr Abdelhamid Gannouni, Lead of the Department of Energy Efficiency for Transport at ANME (National Agency for Energy Management) talked about the current situation and the perspectives of e-mobility both at national and international level. Highlighting the main challenges in this transition in Tunisia, he also presented the proposed tax incentives to promote e-vehicles, granting financing facilities for private investments in the e-mobility sector, and bringing together industry and reserach structures to encourage mass EV adoption.

In the context of Tunisia, an energy deficit of 55 % in 2019 (vs. 20 % in 2010) was reported which might aggravate with increasing numbers of EV. Ms Lamia El Khazen, Helpdesk at the Renewable Energies Dept. of ANME presented the main goals of the Tunisian Solar Plan. This national plan targets to produce 22 % of the electricity from RE sources in 2023 (and 30 % in 2030). Therefore, a production of 1860 MW from PV and wind energy is aimed at within the 2017-2022 programme.

The plenary session of the workshop was wrapped up with a debate on the future of RE and e-mobility in Tunisia. The closing discussion was followed by two seperate sessions: one on the Master's programme and the second was dedicated to research and partnerships between academia and industry. Brainstorming activities and fruitful discussions shed light on the priorities to be tackled in the e-mobility sector based on RE.

If you are interested to receive further information on the results of the workshop, please do not hesitate to contact Professor Khaled Grayaa (see contact details on the last page).



Session 1 led by Ms Saffar and Dr Kardous  
Source: ENSTAB



Session 2 - Team work  
Source: ENSTAB

## REMO project presentation and networking with potential partners at the off-grid conference in Augsburg

*Philine Ginsberg (InES Project Manager)*

On December 2nd and 3rd, the Institute of new Energy Systems (InES) presented both the Technische Hochschule Ingolstadt and its international project activities at its booth at the OFF-GRID Expo & Conference in Augsburg. More than 50 exhibitors from the off-grid community had the opportunity to demonstrate their off-grid solutions and products. Exhibitors included other universities as well as (international) companies specialised in the off-grid sector.

The REMO project was also presented at the booth and attracted the visitors' attention. It became clear that especially in rural areas innovative concepts for mobility are of utmost importance and needed also in order to contribute to the SDG goals.

Particularly appreciated was the support at the booth by the guests Professor Samir Jomaa and Mr Lazher Mejdi from ENSTAB who were also sharing their comprehensive experience.



The THI-InES team members as well as some guests from African partner universities were in Augsburg presenting the international activities to the audience. The following REMO project members were present: Professor Samir Jomaa (second from left), Mr Lazher Mejdi (second from right) and the REMO project coordinator Ms Philine Ginsberg (forth from left).

Source: THI

## REMO team members' visit at IBC SOLAR AG

*Karoline Kaiser (InES researcher)*

On November 29th, the ENSTAB researchers Professor Samir Jomaa, Mr Lazher Mejdi and Mr Karem Chatti as well as InES researcher Ms Karoline Kaiser and project manager Ms Philine Ginsberg visited the REMO industry partner IBC SOLAR AG (IBC) in Bad Staffelstein.

The discussion with Mr Dieter Miener from IBC was inspired by the question about challenges due to the increasing number of EVs and how this will affect the national electricity infrastructure. In the discussion, it became clear that regardless of the location, deficient infrastructure hinders the expansion of e-mobility. In this context, intelligent charging, energy management as well as the potential of smart solutions based on artificial intelligence were discussed. Regarding this, Mr Dieter Miener outlined that a common energy management system is sufficient to meet the requirements at the moment. But within the next years and an increasing number of EVs as well as an associated higher charging demand, smart charging will be essential. Additionally, Mr Dieter Miener introduced the REMO researchers to the past and ongoing incentive system for the promotion of renewable energies in Germany, as the availability of green electricity is indispensable for the planned expansion of sector coupling and e-mobility in Germany.



ENSTAB and THI researchers in front of the IBC premises (from left: Mr Lazher Mejdi, Ms Karoline Kaiser, Professor Samir Jomaa, Mr Karem Chatti)

Picture below: During the workshop in the IBC Competence Center

Source: THI



Together, the researchers discussed how this can also be transferred to developments in Tunisia and what has already been implemented or planned.

Mr Dieter Miener also presented IBC's history and working fields at the IBC SOLAR Competence Center and showed the company's own charging infrastructure and its electricity supply. In the Competence Center, Mr Dieter Miener also explained the local training set-ups to the REMO team.

This exciting excursion and especially the exchange with IBC as an industrial partner was very insightful for the researchers as they learned more about the practical challenges that businesses are faced with today. Therefore, we would like to thank Mr Dieter Miener and IBC again for the invitation.

## AI-empowered E-Mobility based on Renewable Energy - Why does data matter for any office EV charging station? Findings of an ENSTAB end-of-studies-project

*Karem Chatti (ENSTAB graduate)*

The number of EVs globally, and specifically in Germany is rocketing and growing exponentially thanks to the technological breakthroughs in battery technology and charging infrastructures. The following question arises when observing this growth: How can we satisfy this new kind of energy demand?

Some may say that putting chargers everywhere will solve the problem, but the answer is unfortunately not that intuitive.

One of the key charging scenarios identified in the literature is the "charge at work" use case, as providing an EV charging service at a workplace parking lot has proven to be profitable for companies and convenient for employees who benefit from a relatively cheap and sometimes free energy access and get a fully charged battery by the end of the day. In contrast, this charging scenario shares some challenges with other EV charging use cases:

- Having many vehicles charging simultaneously causes network congestion and dangerous load variations
- Limiting access to chargers is unfair from a user point-of-view

To be able to solve this dilemma, we need to understand how things actually work. During my research stay at THI in summer 2021, we had the chance to get in touch with Eichenseher Ingenieure GmbH, a Bavarian company providing their employees with charging infrastructure. The aim of this exchange was to better understand the charging behaviour and how it impacts the building's electrical infrastructure.

Moreover, we aimed at the development of solutions for the jointly identified challenges. Using power consumption time series from the chargers in the building, we were then able to calculate some key parameters, namely the charging duration, the energy consumed during each charging session and most importantly the drivers' arrival and departure time at the charging station. This helped us to understand the growth of energy demands over the years. Moreover, we noticed a typical charging behaviour: Employees start charging together, and also leave together! This causes a sudden increase in the building's load every day at around 8 a.m. while the infrastructure is underused in the afternoon (Figure 1).

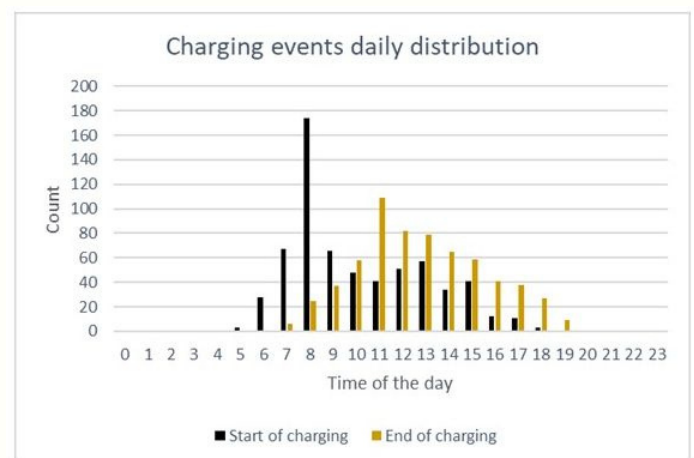


Figure 1: Daily charging events distribution in the building

Having this in mind, *Reinforcement Learning Control* algorithms were an attractive alternative to reach the following objectives:

1. Maximize the infrastructure's usage without the need of expensive upgrades
2. Flatten the building's load profile
3. Satisfy the vehicles' demand given their stochastic behaviour and changing needs

To reach these goals, many other challenges were faced mainly due to limitations of data and computation, but with the help of other data sources and statistical modeling, we were able to develop a control algorithm that can charge three times more vehicles, flatten the load curve and most importantly satisfy the charging needs.

The algorithm (Figure 2) was a result of few iterations, and we then concluded that data is not only crucial for having tailor-made solutions, but also needed for having cost-saving planning decisions.

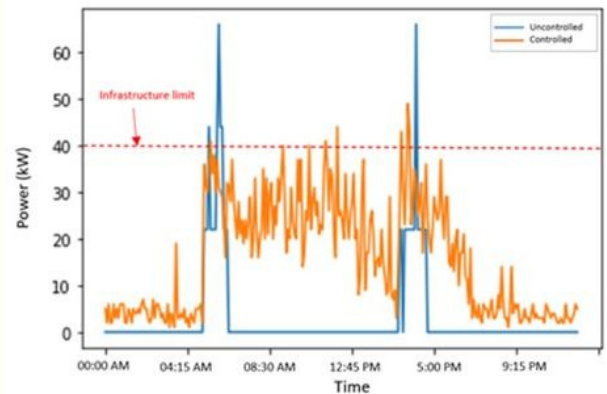


Figure 2: A comparison between a controlled and an uncontrolled charging scenario

## Summary on the DAAD LAUNCH Conference in November 2021

*Philine Ginsberg (InES Project Manager)*

The DAAD conference at the end of November focused on the exchange between the various project partners in the respective funding programme University-Business-Partnerships between Higher Education Institutions and Business Partners in Germany and in Developing Countries. The funding agency DAAD also invited the involved industry partners as they play a vital role in the programme.

During the 3-day conference, presentations from various stakeholders such as Federal Ministry for Economic Cooperation and Development or the German-African Business Association and representatives from DRÄXLMAIER Group Tunisia were held highlighting current and future challenges with respect to the economies on the African continent and thereby emphasised the great importance of the projects. It became clear that Europe and also Germany is well advised in investing in African countries both monetarily but also ideologically and thereby also limiting China's growing influence. Interestingly, Professor Stefan Liebing, Chairman of the German-Africa Business Association, mentioned that German industry also diversifies its supply chain searching for suitable partner in African countries as the relationship with China has been tensed. This chance should be used positively.

To do so, the employability of graduates ought to be increased and the participants discussed potential methods to achieve that. Practice-oriented education was claimed to be key and could be realized through integrated internships in businesses, the organisation of hackathons to work on real use cases or long-term co-creating projects with companies and students. Moreover, it was also pointed out that lectures could also be held by industry partners to bridge the gap between the rather theoretical education and the business world.

During the conference, the REMO project's goals and progress was presented by Ms Philine Ginsberg. The thematic areas of the other 16 projects currently funded by the programme are manifold reaching from agriculture, circular economy, automotive and also RE. The LAUNCH Conference is organized once a year and we will thus be happy to see you there in 2022.

## **AUI REMO team members conducted a visit to Fès-Meknès Regional Dispatching Center in Morocco**

*Professor Rachid Lghoul (AUI Lecturer)*

On April 17th, 2021, AUI researchers Professor Khalid Loudiyi, Professor Ahmed Khallayoun, Professor Rachid Lghoul and Dr Ameer Arechkik accompanied students enrolled in the *Sustainable Energy Management* Master's programme (SEM) and further students involved in the REMO project to the grid owner's regional headquarter of ONEE (Office National Electricity et Eau Potable) and the regional dispatch center.

A round table took place, where a discussion on the challenges related to the impact of integrating e-vehicles into the grid along with current and future planning practices took place.

A technical introduction by the regional dispatch center followed by a Q&A session was also included in the visit.

The visit was very instructive and fruitful as it opened the door to future collaboration between the REMO team in Morocco and ONEE in the field of e-mobility and its impact on the regional grid.



AUI team inside the Monitoring & Control unit during the visit at the regional dispatching center.

Source: AUI

## REMO Consortium

### University partners

In Morocco:



In Tunisia:



In Germany:



### Industry partners



If you have any inquiries regarding the content of the newsletter or the overall REMO project, please get in touch with the following persons:



**Project leader:**  
**Professor Wilfried Zörner (THI - InES)**

Wilfried.Zoerner@thi.de  
+49 841 - 9348 2270



**Overall project management:**  
**Philine Ginsberg (THI - InES)**

Philine.Ginsberg@thi.de  
+49 841 9348 6845



**Country coordinator Morocco:**  
**Professor Ahmed Khallaayoun (AUI)**

A.Khallaayoun@aui.ma  
+212 535 86 2196



**Country coordinator Tunisia:**  
**Professor Khaled Grayaa (ENSTAB-LaRiNa)**

Khaled.Grayaa@ensta.u-carthage.tn  
+216 530 90377

The REMO project is funded by the DAAD with funds of the German Federal Ministry for Economic Cooperation and Development (BMZ).