

# Newsletter

on the new developments in the project

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



Source: THI

### Memorandum of Agreement signed between STEG, LaRINa and ENSTAB

*Prof Ikbal Chammakhi Msadaa (ENSTAB SP3 Coordinator)*  
Within the framework of cooperation between the Tunisian Company for Electricity and Gas (STEG), the European Bank for Reconstruction and Development (BERD) and the European Union (EU), and under the supervision of the Tunisian Ministry of Industry, Mines and Energy, STEG signed Memorandums of Agreements (MoA) with three higher education institutions and one research laboratory on March 16th, 2022. ENSTAB and LaRINa were among the signatories in addition to the two Tunisian engineering schools ENIT and SupCOM.

According to these agreements, the general framework for cooperation and partnership between the signatories is set with the aim of:

- Providing academic training in the field of energy transition in Tunisia
- Developing new curricula and academic frameworks  
Adapting the proposed programmes of these higher education institutions to the labour market demands in Tunisia and worldwide

These agreements fall within the framework of the BERD financing programme aiming at restructuring STEG. Moreover the collaborations will support STEG in the implementation of reforms improving the overall performance of the energy sector in Tunisia.

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The restructuring project includes efforts to invest in human resources at STEG and identifying its “STEG Talents 2030”. Employers' skills shall be further developed through continuous training mechanisms to keep pace with updates in the field of ICT and to engage in digitization within the new projects related to the production of electricity from renewable energies, smart grid systems. At research and development level, the MoA offer the opportunity for pooling expertise and resources to carry out research activities and develop innovative research projects in the energy sector.

The higher education institutions and LaRINA research lab will have access to an appropriate training space for their students within STEG.

The company also pledges to support students wishing to specialize in the energy field during the doctoral programme and sponsors them through dual academic and professional supervision.

The various agreements will also contribute to match the university majors and the local requirements of the labour market in the energy field.

The new formally affirmed collaborations support Tunisia in its energy, environmental and digital transition targeted within the National Energy Control Strategy 2030.



Prof K. Grayaa (Director of LaRINA), Prof K. Ben Saad (Director of ENIT), Mr H. Anene (Director of STEG), Mr. H. Khechini (Director of ENSTAB) and Prof S. Cherif (Director of SupCOM)



left: Prof K. Grayaa (Director of LaRINA), Mr H. Anene (Director of STEG), Mr H. Khechini (Director of ENSTAB)  
below: Group picture of ceremony participants



## Excursion to IRESEN Green Park and iSmart

*Prof Ahmed Khallaayoun (Country Coordinator AUI)*

Al Akhawayn University REMO Researchers and Master's students conducted a field trip to the Green Energy Park located near Marrakech. The Green Energy Park is a research facility for the development of sustainable cities in Morocco and is part of Mohammed VI Polytechnic University. This includes energy generation plants, as well as a variety of laboratories for research in the field of solar energy and other renewable energies. The excursion's participants also visited the Moroccan company iSmart, producer of electric charging stations. The company is highly interested in cooperating with AUI by participating in workshops and offering internships for students.



above: Group picture of excursion's participants in front of the Green Energy Park near Marrakech

left: Visit at PV panel production

## Publication: Potential impact of large-scale integration of electric vehicle charging stations into the grid

*Ameur Arechkik (AUI researcher)*

*Contributors: Prof Khalid Loudiyi, Dr Rachid Lghoul, Prof Ahmed Khallaayoun*

With the popularity of e-vehicles, connection of e-vehicle charging stations (EVCS) to the power system will often create more technical challenges, mainly due to their irregular use during different periods of the day. To define the potential impact of large-scale integration of EVCS into the grid, a steady state analysis is performed at AUI on an existing electric network of the region Fès-Meknès in Morocco.

PSS@E software simulation tool is used to conduct power flow analysis on the grid substations, transmission lines and transmission transformers to investigate the voltage stability as well as power losses of the electric network. In addition, a N-1 contingency analysis is realized to identify the impact on reliability and security of supply and to determine the transmission grid reinforcement options.

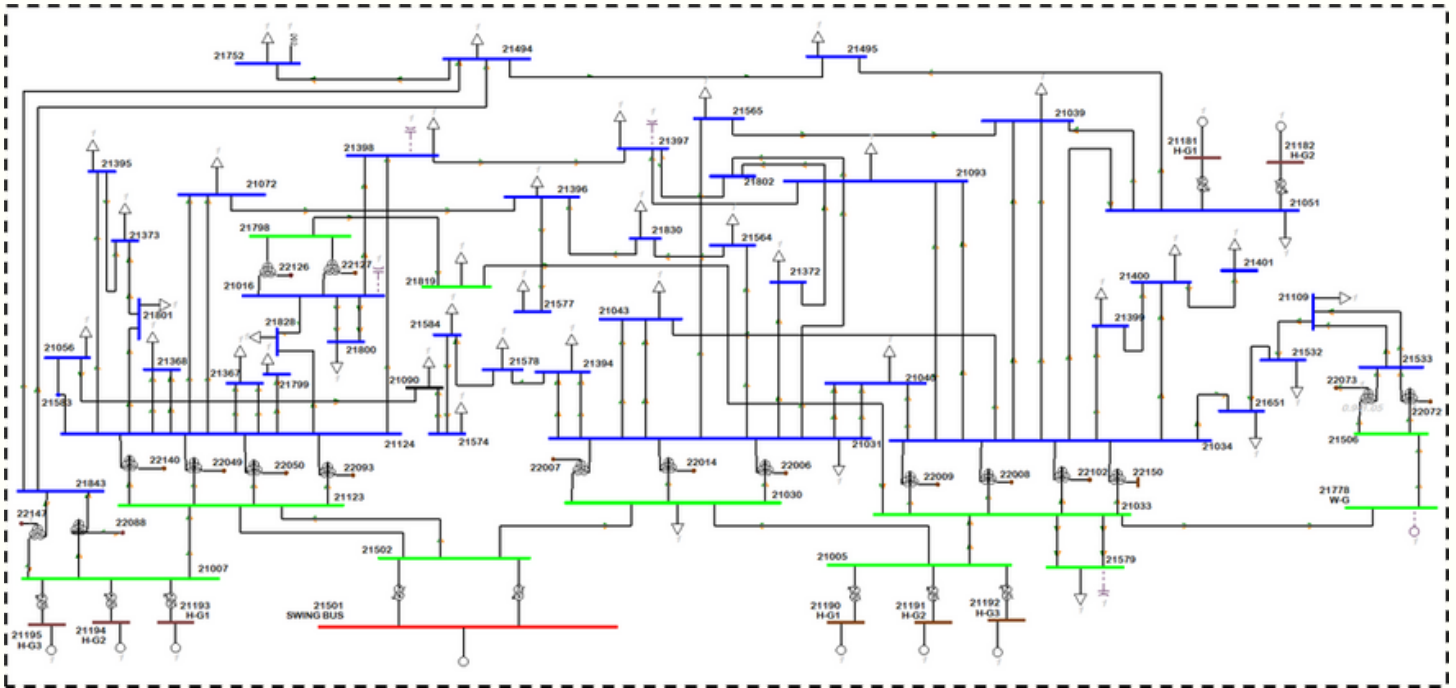


Figure 1 Single diagramme of investigated power system

Figure 1 presents the single diagramme of investigated electrical grid with a maximum penetration rate of EVCS loads. This grid consists of 81 substations of extra-high voltage (400kV in red and 225 kV in green) and high voltage systems (60 kV in blue), three existing hydro power plants and one wind farm in development, branches, transformers, capacitors and reactors bank, and loads. The red bus (number 21501) of 400 kV is considered as swing bus, also known as reference bus or slack bus. Its role is to keep the power balance in the power system so that generation can meet demand even when there are some losses. If there is a loss of the reference bus or the most powerful generator, the simulation will be ruled unsuitable. The slight increase in the number of charging stations for e-vehicles will increase the load on the grid. The analysis and examination of the grid stability is performed using the PSS/E software.

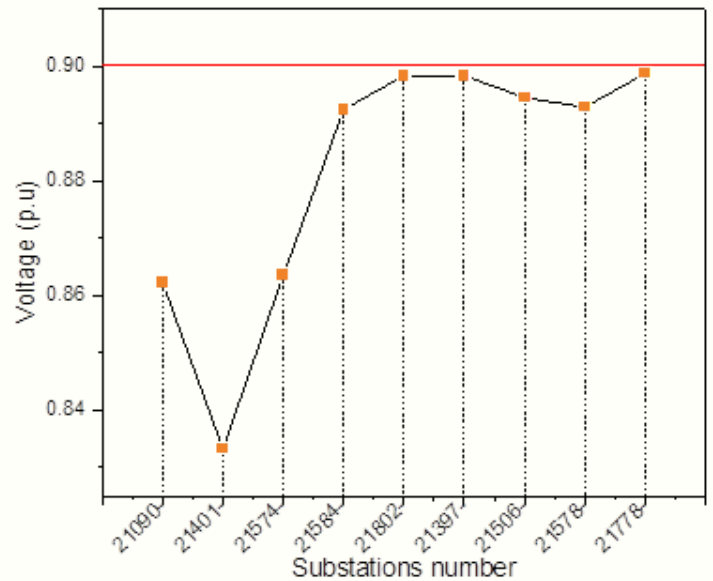


Figure 2 Substation voltage profile after adding more than 25% of EVCS loads

The simulations are carried out under the steady state case for different penetration rates. The obtained results demonstrated that by adding more than 25% of EVCS loads distributed between weak and strong buses affect the grid stability (voltage profile, branches loading, and increase power losses). The transmission grid high voltage profile must be within  $\pm 10\%$  of the nominal voltage value to be considered acceptable (0.90-1.1pu). There are different buses in the current study that are below these limitations after integrating more than 25% of EVCS loads, indicating a considerable voltage drop of around 19%, as illustrated in Figure 2.

## ENSTAB Research Stay at InES: Experience report

*Dimeth Nouicer and Fedi Abdellaoui (PhD and Master's student at ENSTAB)*

Dimeth Nouicer and Fedi Abdellaoui, two Tunisian students are currently at InES for a 5-month research stay. During their stay, they are working on their respective research projects in the frame of the REMO project focusing on e-mobility:

Dimeth Nouicer, PhD student in her second year, works on the development of a reinforcement learning algorithm for EV routing.

Fedi Abdellaoui is a senior year Master's student researching on the simulation of a fleet transitioning to e-vehicles and the costs attributed to this transition.

About their first weeks at the institute, the students said: "Our stay started with a visit to the THI campus and learning about the different laboratories and the materials they use. During our stay, we have the opportunity to exchange with different colleagues and attend several meetings to understand their projects and offer our knowledge and help whenever possible.

Currently, we are collaborating with some employees in their research projects where they are thinking of adding machine learning and artificial intelligence logic into the system. This provides an opportunity for cultural and scientific exchange, since we are not experts on energy systems and this is helping us understand more the problems that InES is working on. Additionally, we already participated in a few lab courses such as "Energy Storage Systems" and "Off-Grid photovoltaic" and a THI lecture course "Energy Policies and Economics" which is a class offered within the Master programme *Renewable Energy Systems* and taught by Prof Wilfried Zörner.

Apart from the work activities, there is also social activities where we had team building session together outside of the institute like having picnics, bike riding and going to dinner together with colleagues."



*Mrs D. Nouicer (left) and Mr F. Abdellaoui (right) in front of the institute offices.*



Mrs D. Nouicer, Mr Fedi Abdellaoui and Dr M. Ehrenwirth on the rooftop of THI, where, among other things, a solar thermal tracker (right) and steel structures (right) for flexible PV and solar thermal modules are installed.



## Student of the REMO newsletter - Reda El Makroum

*Reda El Makroum (Master's student at AUI)*

I am Reda El Makroum, a graduate student at AUI studying the Master programme *Sustainable Energy Management*.

For the past three years, I have been working as a research assistant mainly on a national research project dealing with smart home energy management systems. Now, I am part of the REMO research team at AUI focusing on developing optimization algorithms within households including EVs. As an undergraduate student, I have published two conference proceedings. Currently, I am working on a journal paper.

Regarding my stay at THI this summer as part of the research mobilities funded by the REMO project, I have no doubt that I will greatly benefit from my interactions with my peers and professors at THI as well as from the significant research taking place at THI.

Very nice to meet everyone and looking forward to meeting you in person soon.



Mr Reda El Makroum - Master's student at 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:



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