



Mission Report
Ghislain REMY, Jean DEPREZ
Palestine Technical University Kadoorie – Tulkarm
Palestine Polytechnic University - Hebron
October 23rd – 29th, 2011

1- Context

In November 2009, the Palestine Technical University Kadoorie – Tulkarm and the Palestine Polytechnic University Hebron for the Palestinian side, the Laboratory of Electrical Engineering and the IUT Cachan of Paris-Sud 11 University for the French side, have submitted a proposal to the Palestinian- French Research Program AL-MAQDISI. The project “Design and Control of Photovoltaic Systems” has been elected in September 2010.

Since the first meeting of the project teams (November 2010), the following points have been treated:

- Functional analyses of the energy conversion: mathematical modeling of photovoltaic (PV) and power converter systems: simulation on Matlab/Simulink software.
- Elementary Maximum Power Point Tracking (MPPT) Algorithms : simulation on Matlab/Simulink software
- Seminary on microcontroller PSoC
- MPPT algorithms implementation
- Analyses of collected data (sun irradiance, temperature, electric load) in Palestine
- Specification and ordering of the hardware (PV panels , Batteries , Controller , and power converter).
- 6 PV panels and 3 batteries have been delivered in PTU just before these mission. .

2- Objectives of the mission

The main objectives of the mission were:

- To validate models and simulations
- To help the installation of the PV systems in PTU and PPU.
- To prepare a test bench for HIL validation of MPPT program implemented in a PSoC
- To adopt a policy concerning the publication's authors
- To make the planning for the further actions

3- Financial aspect

- The Travel ticket of Jean DEPREZ (1124 €) is covered by MedLink
- The Travel ticket of Ghislain REMY (1124 €) is covered by the Al Maqdisi budget of the French side.



- The indemnity (per-diem) of Ghislain REMY (180 €) is advanced by MedLink and will be covered by the Al Maqdisi budget of the Palestinian side.
- The local transportation (Airport – Tulkarm, Hebron – Jerusalem, Jerusalem - Airport) of Ghislain REMY and Jean DEPRez (160 €) is advanced by MedLink and will be covered by the Al Maqdisi budget of the Palestinian side.
- The transportation Tulkarm – Hebron and food and accommodation of the participants to the meeting in PTU is partially covered by the Al Maqdisi budget of the Palestinian side.
- Food and accommodation of the participants to the meeting in PPU is partially covered by the Al Maqdisi budget of the Palestinian side.

4- Participants to the working meetings

Palestine Team:

Sessions in PTU

PTU: Basim ALSAYID, Mohammad DRAHI, Khalid SHADEED, Anees ABU SNEINEH, Jaffar JALLAD, Samer ALSADI, Abdel Karim DAOUD

PPU: Nassim Ahmed Hamdan IGTEIT, Khaled TAMIZI, Mekawi IHRAIZ

Sessions in PPU

PTU: Mohammad DRAHI, Jaffar JALLAD

PPU: Nassim Ahmed Hamdan IGTEIT, Khaled TAMIZI, Mekawi IHRAIZ

French Team:

IUT CACHAN, LGEP (Paris-Sud 11 University) :Ghislain REMY

MedLink NGO : Jean DEPRez

5- Agenda of the mission and program of the working sessions

Agenda of the mission

Sunday October 23rd

- Flight Paris CDG – Tel-Aviv Ben-Gurion (Air France AF 2220)
- Taxi Tel-Aviv Ben-Gurion – Tulkarm
- Night in Sultan YASEEN's home

Monday October 24th

- Working session 1 in PTU
- Diner in Tulkarm and night in the Campus House

Tuesday October 25th

- Working session 2 in PTU
- Diner in Tulkarm and night in the Campus House

Wednesday October 26th

- Transfer Tulkarm – Hebron with the PTU bus
- Working session 3 in PPU
- Diner in Mekawi IHRAIZ home and night in Hotel Al Khalil

Thursday October 27th

- Working session 4 in PTU
- Finalization of posters



- Diner and night in Khaled TAMIZI's home.

Friday October 28th

- Taxi Hebron – Jerusalem
- Meeting with Philippe CAPPELAERE and Julie BELMONT in the French Consulate
- Ghislain REMY : Taxi Jerusalem -Tel-Aviv Ben-Gurion and Flight Tel-Aviv Ben-Gurion - Paris CDG (AF 1621)
- Jean DEPRESZ : Rest in Jerusalem and night in Jerusalem Hostel

Program of the working sessions

- Session 1: Monday October 24th PTU Kadoorie Tulkarm

- Installation of the test bench for identification of a PV panel.
- Determination of I-V and P-V characteristics for various irradiation intensities
- Characterization of temperature dependence of the PV open circuit voltage
- Reminder on Buck-Boost DC/DC converter: general structure, equations
- Structure proposed for the Buck-Boost converter of the PV system

- Session 2: Thursday October 25th PTU Kadoorie Tulkarm.

- Determination of I-V and P-V characteristics for various irradiation intensities
- Installation of 2 panels on the roof, I-V and P-V characteristics
- Preliminary tests of the Buck-Boost DC/DC converter
- Programming of the PSoC microcontroller
- Association PSoC - Buck-Boost DC/DC converter

- Session 3: Wednesday October 26th PPU Hebron

- Installation of the test bench for identification of a PV panel.
- Determination of I-V and P-V characteristics for various irradiation intensities
- Cartography of the spotlight irradiation
- Installation and test of the system: PV panel/ Buck-Boost /Load controlled by PSoC

- Session 4: Thursday October 27th PPU Hebron

- Test of 2 panels outside, I-V and P-V characteristics under sun irradiation
- Connecting a battery to the system controlled by PSoC

6- Scientific report – Poster

A detailed scientific report has been elaborated during the sessions. It is available as attached document to this report.

3 presentation posters has been design, summarizing the progress of the project, to be install for valorisation of the project, either in PTU, PPU and LGEP. They are also available as attached documents to this report.

7- Conclusion

First of all, some **positive points** have to be mentioned:

- The Palestinian team actively dealt with the ordering of equipment. The components (panels and batteries) were present at PTU a few days before the mission
- PTU dedicates to the project a large laboratory



- PTU and PPU have very well organize all the logistic allowing the execution of the working sessions and the welcoming of the participants.
- Mekawi (PPU) has demonstrated real interest in this session regarding the previous one, especially because he has been able to provide experimental equipments at PPU.
- Jafar (PTU) and Khaled (PPU) have been working together very efficiently on the PSoC programming.

Some **negative points** have to be underlined:

- Some preparatory works asked by Ghislain were not done:
 - Improvement of the Simulation Model of PV in SimPowerSystems in order to avoid negative voltage and negative current during simulation, which are not physically possible.
 - Design of the Buck-Boost Power converter regarding the specifications provided in the previous report
- The PV panels specifications sent to Ghislain were not the actual specifications of the bought PV panels.
- One time again, new participants were involved in the Palestinian team and previous participants were not presents. Some of the participants were obviously not competent on the subject and, generally speaking, even for a research programme...
- The Palestinian laboratories lack of the basic equipment for measurements: current probes, differential voltage probes, temperature probes, reliable connectics, power resistance load. Some of this equipment was carried from France.
- The Palestinian team is may be not enough involved in the methodology of collecting data during and after experiments (day by day systematic writing of the scientific report).

All theses positive and negative points have been discussed with Philippe CAPELLAERE and Julie BELMONT (Service de Cooperation et d'Action Culturelle, French Consulate) at the end of the mission.

After the 4 working sessions, the **following results have been obtained:**

- The current-voltage and power-voltage characteristics of the PV panels, under artificial and sun irradiances have been determined. The needed equipment is installed in PTU and PPU.
- The structure of the Buck-Boost power converter has been validated, using an experimental mounting gathering on the table separated components. The optimisation of the components and the realization of a printed circuit board will be the following steps.
- The global system [PV panel/ Buck-Boost / load] has been tested, controlled by PSoC
- A first algorithm allowing the transfer of power from the PV panel to a battery has been qualitatively experimented, under artificial irradiance.

All theses points are detailed in the scientific report.



8- Next activities

Palestinian team:

- Specification of the components (L, Ce, Cs, transistor and diode constrains) of the buck boost converter (100 KHz PWM), according to the characteristics of the PV panel under sun irradiance. Simulation. (this work as to be completed before the next workshop in France)
- Sending, as soon as possible, on the FTP of the project the data collected in Palestine about irradiance, temperature and consumer report (these data are needed for one of the publication)

French team:

- Preparation of the next mission
- Submission of papers for the IEEE REVET 2012 conference

Next mission:

The next mission could be held in LGEP/IUT Cachan on the PCB design of the Power Converter and the PSoC Board.

This mission should be organized before the end of year 2011. The design and the simulations of the buck-boost converter have to be finished previously by the Palestinian team.

This mission concerns 1 Palestinian researcher. He has to be strongly involved in the design of the power converter and the control of the converter using PSoC. He will have to repeat in Palestine the PCB design (for duplication in PTU and PPU, modification and improvements after tests...) so it is suitable that he is used to manage with a PCB machine in Palestine.

Publications:

It has been decided that only 2 names by Laboratory can be mentioned for each publication. Example: X and Y from PPU, Z and T from PTU, and U and V from LGEP/IUT Cachan. However, others names could be added in the acknowledgements in the papers,

Two papers have to be submitted in the IEEE REVET 2012 conference. Deadline is the 26th of November.

- One paper could focus on the reviewing the existing renewable power sources that are available in Palestine and the electricity use of Palestinian. (PTU and PPU have to put the collected data (Irradiance, temperature, consumer report) on the FTP of the project)
- The other paper will focus on the Hardware In Loop test, that have been performed in dSPACE environment, during Khaled's visit in Cachan, to validate the PSoC programming using a MPPT algorithm.

The Palestinian team has in charge to get info concerning the opportunity to make publications in Palestine (e.g. "Palestinian Conference on Modern Trends in Mathematics and Physics", July 16-18, 2012, Palestine Polytechnic University or conferences in Palestine dealing with Renewable Energies...)



Ghislain REMY and Jean DEPREZ thank their Palestinian colleagues for the organization of the meetings and for their warm welcome. They also thank Sultan YASEEN and Khaled TAMIZI for their hospitality in the beginning and the end of the mission.

Cachan, the 9th of November 2011




Jean DEPREZ
 MedLink



Ghislain REMY
 LGEP / IUT Cachan

Joint Documents (4):

- Scientific Report

Programme_Al-Maqdisi_10_2011_v4.pdf
 Type : Adobe Acrobat Document
 Auteur : Jean DEPREZ
 Titre : Al Maqdisi October 2011
 Objet : Scientific Report
 Date de modification : 11/11/2011 16:02
 Taille : 3,40 Mo

- Posters (3)

2011-10-24_Poster_1_Al-Maqdisi_v2.pdf
 Type : Adobe Acrobat Document
 Auteur : Ghislain REMY
 Titre : Poster_PV_identification
 Date de modification : 11/11/2011 09:05
 Taille : 1,41 Mo

2011-10-26_Poster_2_Al-Maqdisi_v3.pdf
 Type : Adobe Acrobat Document
 Auteur : Ghislain REMY
 Titre : Poster_power_converter
 Date de modification : 11/11/2011 09:07
 Taille : 1,23 Mo

2011-10-27_Poster_3_Al-Maqdisi_v3.pdf
 Type : Adobe Acrobat Document
 Auteur : Ghislain REMY
 Titre : Poster_PSoC
 Date de modification : 11/11/2011 09:09
 Taille : 1,36 Mo

Notes:

- We would like to underline the difficulties encountered to access the town of Tulkarm, due to the closure of Enab Check Point. Without help from Sultan YASEEN who coordinated with our taxi driver after Tayibe Check Point, it would not be possible for us to reach Tulkarm.

- Once again, the security checks were particularly long (more than 2 hours at Ben-Gurion Airport) and painful for Ghislain REMY, in spite of the order of mission of the French Consulate. A part of the equipment that he carried in his suitcase was not admitted in the plane and was delivered in Paris after two days of delay...