

# Train of Trainers Workshop UCY

08.07.2019 – 12.07.2019

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WP Number	WP3		
Task Number			
WP Leader			
Due date of delivery		Project month	
Submission date		Project month	
Total number of pages			

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## Review Table

Version	Date of Submission	Quality check		Technical check	
		Reviewer	Date	Reviewer	Date
V01	07.08.2019				



Co-funded by the  
Erasmus+ Programme  
of the European Union

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ERASMUS PLUS Programme–HEBA Project Number: 585740-EPP-1-2017-1-AT-EPPKA2-CBHE-JP

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## 1 Overview about Participants and Lecturers

In Table 1, the participants of all different Jordanian, Egyptian and Lebanon Partner Universities are listed.

**Table 1: Participants from Jordanian, Egyptian, Lebanon and Cyprus Partner Universities**

No.	Participant Name
1	Dr. Said EL Masry
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15	Dr. Osama Ayadi
16	Dimitris Englezos
17	Filippos Perdikos
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19	Dr. Ahmed Al-Salaymeh
20	Dr. Rana Ahmed
21	Dr. Yasser Dessouky

## 2 Summary of the Workshop Days

### 2.1 Monday, 08<sup>th</sup> of July, 2019

On Monday, 08<sup>th</sup> of July, 2019, the Train-of-Trainers Workshop started at University of Cyprus at 9.00 am.



Figure 1: First day welcoming speech at the new Library building of the University of Cyprus

The first day included an introductory lesson to PV technology, along with the basics of solar energy, how PV cells produce electricity, and why semiconducting materials are important to achieve this photoelectric conversion. Some additional introductory modules like the PV potential in Cyprus and national legislations around PV technologies were briefly mentioned as well. A PV Laboratory tour has taken place early morning (in order to avoid the intense Cyprus sun in July), where the participants had the chance to meet the advanced in-door equipment we currently have at the laboratory, like the PASAN solar flasher, the electroluminescence technique, the environmental

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chamber (thermal cycling; Potential-Induced Degradation –PID- stressing), the UV chamber, and the out-door facilities as well like the PID stand, CPVs, CPTs, the inverters, fault detection etc.

## 2.2 Tuesday, 09<sup>th</sup> of July, 2019

On the second day, the participants attended a theoretical training on PV Technical characteristics, (number of cells in a module, open circuit voltage, short circuit current, IV diagram, Standard Test Conditions –STC-), different PV system types, Building – Integrated and Building – Applied Photovoltaic, and the correct system installation. Participants had the chance to learn about modern architecture techniques specialized on PV integration in buildings, and how to utilize them to produce green energy without altering the outer shell aesthetics. In addition, installation principles, involving high voltage protection, the necessary machinery and equipment, were properly introduced. Dr. George Konstantinou, a post doctoral researcher at the PV laboratory of the University of Cyprus explained the importance of good designing skills and safety measurements during PV installations.

## 2.3 Wednesday, 10<sup>th</sup> of July, 2019

Wednesday was a seminar day! Two Ph.D. students, Spyros Theocharides and Chrysanthos Charalambous, with a post-doctoral researcher, Dr. Konstantina Panayiotou presented their doctoral work to the participants, covering three main topics:

1. Spyros discussed about PV forecasting methodologies, which included all the necessary techniques to correctly forecasting the PV power production a priori, with numerous technological applications to date. Correct PV forecast is extremely useful when the future loads are defined and must be provided with the necessary power. In addition, forecast tools help PV holders to save money by properly varying their load requirements, to meet the forecasted power.
2. Chrysanthos talked about DC and hybrid DC-AC distribution systems. These systems utilize both DC and AC currents and voltages, since the modern trends in Smart Grid Designs show the importance of DC machinery (eliminating the problem of harmonics injected in the grid) as an alternative power source to classical AC systems.
3. Konstantina presented a PV energy storage scenario (currently running in remote homes in Cyprus island), where PV systems installed on rooftops, with proper energy storage are monitored through an Energy Management System (EMS) which was installed last year in our facilities. Konstantina explained the underlying problems with batteries, the different kind of batteries, pros and cons, and a real-time charging scenario, for an economical and profitable use of PV energy.



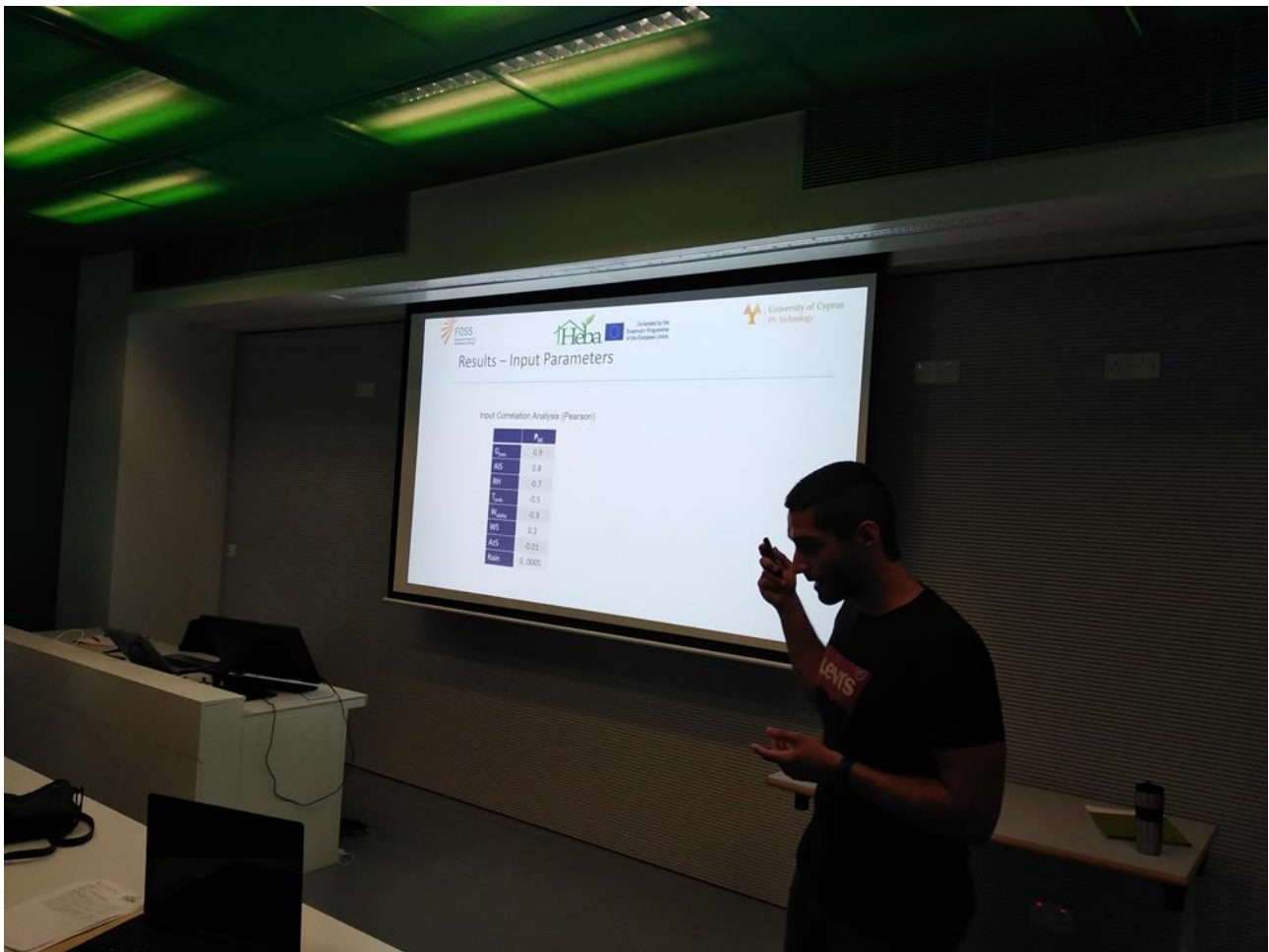


Figure 2: "Forecasting methodologies", by Spyros Theocharides





Figure 3: “DC and hybrid AC-DC systems” by Chrysanthos Charalambous

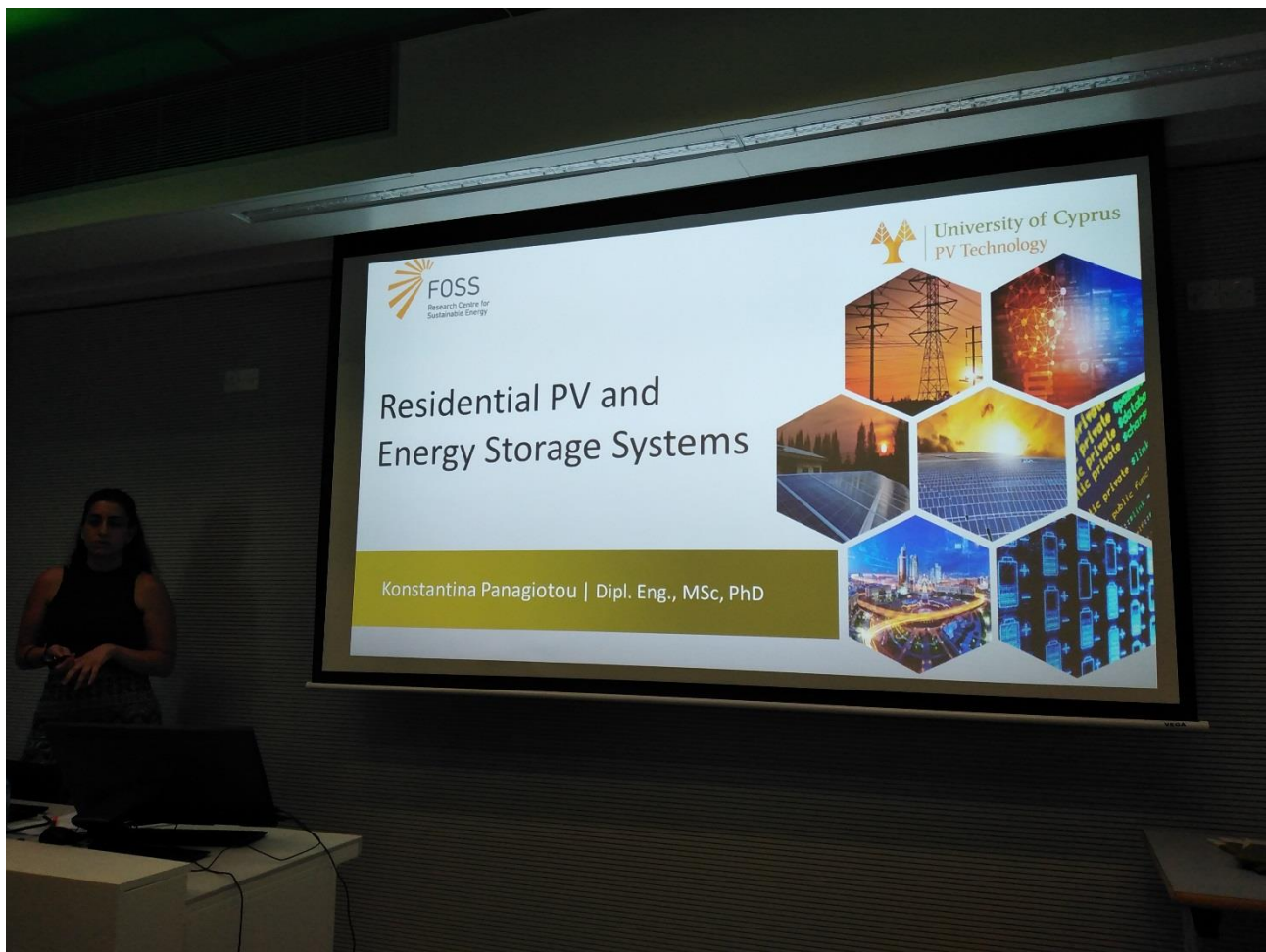


Figure 4: “PV Energy storage” by Konstantina Panayiotou

## 2.4 Thursday, 11<sup>th</sup> of July, 2019

Thursday was devoted to practical and experimental realizations of what the participants had learned so far. The training included a hands-on experiments series (Indoor PV characterization: Solar PV flasher, the environmental chamber, electroluminescence imaging, UltraViolet Chamber for stressing PV cell under deleterious solar irradiation). In addition, outdoor activities such as PV fault detecting, site survey, Potential Induced Degradation investigations, installing PV panels on an experimental roof, and interconnections, Thermal Camera imaging technique took place during the day. When the training at the PV laboratory finished, participants went to the computer room in the new Library building, where they had the chance to simulate a PV installation using the RETScreen software and PVSYST.

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Figure 5: Participants detecting faults on 11 y.o. solar panels at the PV laboratory

## 2.5 Friday, 12<sup>th</sup> of July, 2019

On Friday, 15<sup>th</sup> of July, 2019, participants went for a tour in the old Nicosia city, where they learned about the Cyprus problem, and enjoyed Cypriot delicacies at local stores. The day ended with an optional final exam, covering every aspect of the theoretical modules taught during the training session.

## 3 Training Material


























All presentations delivered and discussed during the workshop week have been shared through the Google Drive folder.

































## 4 Participants List

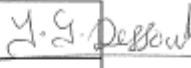
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All participants had to fill a participants list in order to prove their attendance. The signed list is shown below.

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