



REDEC 2018

4th International Conference on Renewable Energy for Developing Countries

November 1-2, 2018

Radisson Blu Martinez Hotel
Ain Al Mraish, Beirut, LEBANON



A Welcome Message from the Conference General Chair

Dear Participants,

The fourth edition of the International Conference on Renewable Energies for Developing Countries will be held this year in the city of Beirut.

Beirut is the capital and largest city of Lebanon and one of the oldest cities in the world. It plays a central role in the Lebanese economy. Beirut's popularity as a tourist destination has grown in recent years as the access from different countries is very convenient. Some of the important places to visit are National Museum of Beirut, Martyrs' Square, St. George Maronite Cathedral, Mohammad Al-Amin Mosque etc.

The conference is well known for hosting researchers, keynote speakers with proven experience and authors from all over the world to discuss and present latest research topics on Renewable energies conversion and resources, energy storage, policies and legislations.

Most developing countries have abundant renewable energy resources, including solar energy, wind power, geothermal energy, and biomass, as well as the ability to manufacture some low cost production equipment. Although some of these countries especially in the MENA region are involved in very important renewable energy projects, most of them suffer from the weakness of scientific and economic planning, the lack of financial means and technical knowhow. The conference is a place for international scientific researchers and consultants to discuss scientific issues that help in improving the renewable energy production in developing countries. It will be a platform to encourage investors to support the implementation of the suggested solutions and strategies that will be presented.

Finally, I would like to express my gratitude to all contributors, institutions, universities and organizations for their financial and logistic support. However, I would like to thank in particular the Association of French Speaking Universities (AUF) for providing the necessary financial support thus enabling the organizing committee to invite French speaking keynotes and to organize French sessions to enrich the discussion and contribute greatly to the success of the conference. Also, I would like to acknowledge the sponsorship of well-known international and local institutions and NGOs (IEEE, ALMEE, OEA, IRI and BRIC) for their technical and financial support.



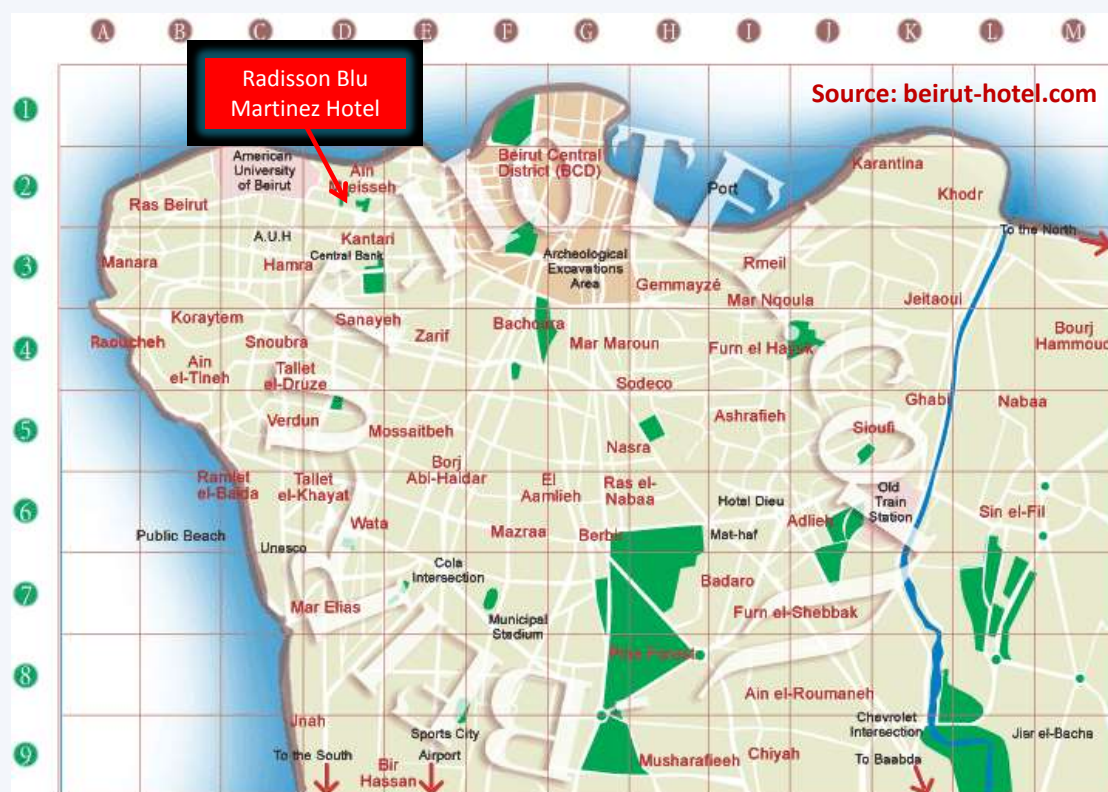
REDEC 2018 Conference Chair
Prof. Imad MOUGHARBEL

General Information

Conference Venue:

Science, art, culture and entertainment give an insight into the social life of the capital of Lebanon, Beirut. This wonderful city is a melting pot of several cultures. Arabic traditions, oriental and western influences offer a perfect blend of a specific society in the world. Art has formed an integral part of Beirut's history. The oldest universities in the Middle East region were established in this city.

The Radisson Blu Martinez Hotel, located in Ain Al Mraiseh, Beirut, will host the conference on November 1-2, 2018. The hotel is situated next to one of the world's most beautiful bodies of water. Corporate travelers love the proximity to the banking and business district and the Seaside Arena (previously BIEL). The city's main international airport is only 7 kilometers away, while the city is serviced by taxis. An array of city center attractions are less than 5 kilometers away. For more information on the venue, please visit the website: www.radissonblu.com/en/hotel-beirut.



Map of the city of Beirut

Conference Objectives:

Some developing countries are actually active in the domain of exploiting renewable energies. They are doing efforts in order to progress towards a green future. They tend

to be in conformity with international requirements to protect the environment. Also, some projects are implemented in these countries in order to reduce their external energy dependence. Although the willingness for introducing renewable energies is apparent, there are still important economic constraints preventing them from investing in this hot area.

National strategies in these countries need to be enforced with more appropriate technical solutions and more accurate data acquisition of resources. A common vision among national stakeholders in the domain of renewable energies should be considered. Laws and regulatory issues need to be more adapted. The conference aim is to benefit from international experience and discuss innovative scientific solutions adapted to the developing countries situations. Researchers from local and foreign universities will suggest during this conference solutions for specific problems. Professionals will find the opportunity to know about the most efficient way for investing in renewable energies in these countries. Case Studies on successful solutions and on supporting programs will be presented. The adaptation of laws and regulations will be discussed for an easy penetration of renewable energies in developing countries.

Conference Topics:

1. Renewable Energy Resources: wind, solar, biomass, hydraulic, geothermal, waves, tidal, etc.
2. Renewable Energy Conversion: Electrical power converters, fuel cells, photovoltaic panels, heating and cooling.
3. Energy Storage: Electrical storage, hydraulic storage, thermal storage.
4. Energy Management, Saving and Efficiency: Optimal management process, control algorithms, smart grids, grid connectivity and control, DC micro-grids, green and zero consumption buildings, energy recovery, energy harvesting, standards.
5. Policies and legislation related to renewable energy: Capacity building for the needs of developing countries, mechanisms for providing energy services in rural areas.
6. Implementation of educational and research programs in the fields of renewable energy, supporting programs for renewable energy projects.
7. Hardware, software, material and physics related to Renewable Energy.

Oral Presentations:

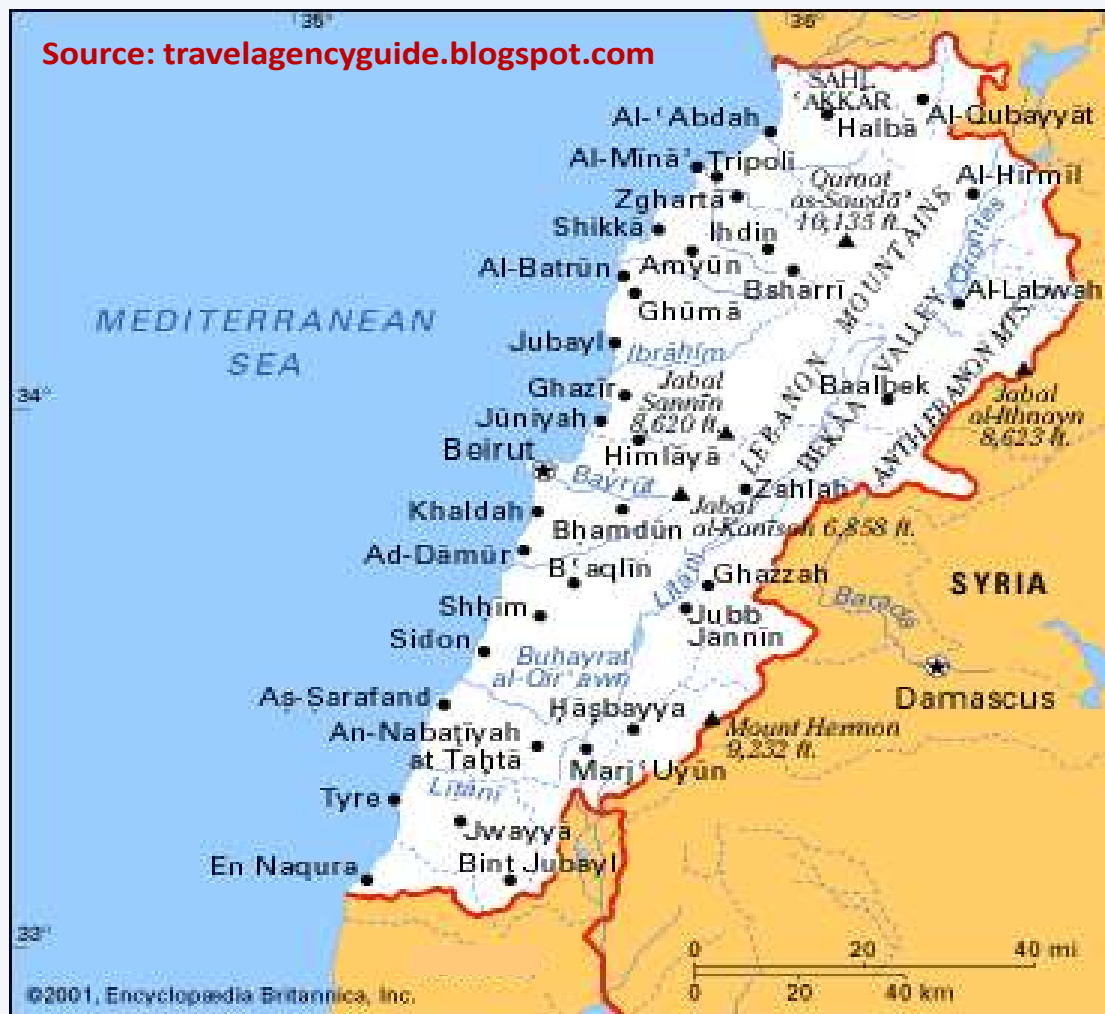
Follow please the following instructions:

- Each author/presenter is allowed for 20 minutes maximum for each paper. The length of the presentation is restricted to 15 minutes, plus 5 minutes for questions.
- REDEC 2018 presenters are required to meet their session chair in the session room, 15 minutes before starting the session in order to download from a USB memory their power point or PDF presentation to the computer.
- Each author/presenter has to make sure that the session chairman is provided with a very short biography on the presenter if not it will be hand written on the spot.

- Each author/presenter must assure that all fonts needed for his presentation are compatible with Microsoft Office 2007 (it is not recommended to use its own computer in order to save time).

Registration:

Authors of accepted papers should register and present their work in the conference in order to be included in the IEEEExplore database. The registration can be made online through the conference website or at the registration desk during the conference. All authors who have paid full registration fees are asked to pick up their conference set at the registration desk.



Map of Lebanon

REDEC 2018 Organizing Committees

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REDEC 2018 Conference at a Glance

Thursday, November 1st, 2018

Time	ROOM A	ROOM B
08:00 – 09:00	Registration	
09:00 – 09:30	Opening Ceremony	
09:30 – 10:30	Keynote Lecture 1 Dr. Adrian ILINCA	
10:30 – 11:00	Coffee Break	
11:00 – 12:40	Technical Session 1 French Session I	
12:40 – 14:00	Lunch	
14:00 – 15:00	Keynote Lecture 2 Dr. Dario CHELLO	
15:00 – 16:40	Technical Session 2 Energy Storage	Technical Session 3 Energy Management, Saving & Efficiency I
16:40 – 17:00	Coffee Break	
17:00 – 18:20	Technical Session 4 Wind Energy & Hydropower	Technical Session 5 Energy Management, Saving & Efficiency II
19:30 – 23:00	Gala Dinner	

Friday, November 2nd, 2018

Time	ROOM A	ROOM B
08:00 – 08:30	Registration	
08:30 – 09:30	Keynote Lecture 3 Prof. Amrish CHANDRA	
09:30 – 09:50	Coffee Break	
09:50 – 10:50	Keynote Lecture 4 Dr. Mohamed EL MANKIBI	
10:50 – 12:30	Technical session 6 Power Systems & Smart Grids	Technical session 7 Biomass, Thermal & Heating Energy
12:30 – 14:00	Lunch	
14:00 – 15:10	Technical Session 8 French Session II	
15:10 – 16:30	Technical session 9 Photovoltaic Systems	Technical session 10 Capacity Building for the Needs of Developing Countries
16:30 – 16:45	Closing Ceremony	

REDEC 2018 Conference Program

Thursday November 1st, 2018

- 08:00 – 09:00 Registration
- 09:00 – 09:30 Opening session – Room A
Imad MOUGHARBEL, *Conference Chair*
Said CHEHAB, *President of ALMEE*
Hervé SABOURIN, *Director of AUF Middle-East*
Jad TABET, *President of OEA Beirut*
- 09:30 – 10:30 Keynote Lecture 1 – Room A
Dr. Adrian ILINCA
Université du Québec à Rimouski, Canada
Hybrid Systems and Storage Technologies: New Solutions for the Development of Wind and Solar Energy
- 10:30 – 11:00 Coffee Break
- 11:00 – 12:40 Technical Session 1 – French Session I – Room A
Session Chair: Ménouèr Boughedaoui, *Université de Blida, Algérie*
- 11:00 – 11:30 **Le marché international et européen du solaire photovoltaïque et le rôle des ONG pour le développement de l'accès à l'électricité (Off-Grid)**
Bassam Ouaida, *Ex-directeur Trans-énergie*
- 11:30 – 12:00 **L'Electrification Solaire Photovoltaïque : Systèmes Autonomes, Hybrides et Miniréseaux – Qualité et Sécurité des Installations Photovoltaïques**
Gérard Moine, *GM Consultant, France*
- 12:00 – 12:20 **Approche multicritère de la qualité d'intégration de l'énergie solaire dans les refuges de montagne**
Letizia Roccamena, *ENTPE, Université de Lyon, France*
- 12:20 – 12:40 **Etude comparative des caractéristiques mécaniques et thermophysiques des matériaux locaux de construction**
Abdallah Dadi, *INSTA d'Abéché, Tchad*
- 12:40 – 14:00 Lunch

- 14:00 – 15:00 Keynote Lecture 2 – Room A
Dr. Dario CHELLO
European Union & Int. Organizations Unit of ENEA in Brussels
 MEETMED: Mitigation Enabling Energy Transition in the Mediterranean Region
- 15:00 – 16:40 Technical Sessions
- Session 2: Energy Storage
- Room: A
- Session Chairs: Hadi Kanaan, *Saint-Joseph University of Beirut, Lebanon*
 Imad Mougharbel, *Ecole de Technologie Supérieure, Canada*
- 15:00 – 15:20 **Modeling, P&O MPPT and PI controls and performance analysis of PV/Energy storage hybrid power system**
 Mohamad Saad, *UQAT, Canada*
 Albert Ayang, *University of Quebec in Chicoutimi & UQAT, Canada*
 Mohand Ouhrouche, *University of Quebec at Chicoutimi, Canada*
 René Wamkeue, *UQAT, Canada*
- 15:20 – 15:40 **Improvement of quasi Z-source inverter PV pumping system by battery-supercapacitor energy storage**
 Seifeddine Boukebbous, *University Constantine 1, Algeria*
 Djallel Kerdoun, *LGEC – Research Laboratory, Algeria*
 Noureddine Benbaha, *Unit of Applied Research in RE, Algeria*
 Hachemi Ammar, *Unit of Applied Research in RE, Algeria*
 Abdelhak Bouchakour, *URAER-CDER, Algeria*
- 15:40 – 16:00 **Impact of Considering Variable Battery Profile of Electric Vehicles on the Distribution Network**
 Claude Ziad El-Bayeh, *Ecole de Technologie Supérieure, Canada*
 Ambrish Chandra, *Ecole de Technologie Supérieure, Canada*
 Dalal Asber, *IREQ, Canada*
 Imad Mougharbel, *Ecole de Technologie Supérieure, Canada*
 Serge Lefebvre, *IREQ, Canada*
 Maarouf Saad, *Ecole de Technologie Supérieure, Canada*
- 16:00 – 16:20 **Phase Change Materials in a Domestic Solar Hot Water Storage Tank of the Lebanese Market**
 Omar Beih, *Saint-Joseph University / Lebanese University, Lebanon*
 Sara Abou Chakra, *Lebanese University, Lebanon*
- 16:20 – 16:40 **Integrating a High Solar Combi-Plus System using PCM Storage in a Smart Network: KSA Case Study**
 Mohamed Hmadi, *Saint-Joseph University of Beirut, Lebanon*

Adel Mourtada, *Lebanese University / ALMEE, Lebanon*

Session 3: Energy Management, Saving & Efficiency I

Room: B

Session Chairs: Adel Mourtada, *ALMEE, Lebanon*
Chantal Maatouk, *Saint-Joseph University of Beirut, Lebanon*

15:00 – 15:20 Energy efficiency in dairy production: Elaboration of energy consumption rating – Lebanese case study

George El-Jamal, *Saint-Joseph University of Beirut, Lebanon*

Chantal Maatouk, *Saint-Joseph University of Beirut, Lebanon*

Adel Mourtada, *Lebanese University / ALMEE, Lebanon*

Mazen Ghandour, *Lebanese University, Lebanon*

Fouad Kaddah, *Saint-Joseph University of Beirut, Lebanon*

15:20 – 15:40 Infrared Thermography for Assessing Thermal Bridges and Humidity in Lebanese Building Components

Bechara Nehme, *Holy-Spirit University of Kaslik, Lebanon*

Jad Antonios Jelwan, *Holy-Spirit University of Kaslik, Lebanon*

Roy Youssef, *Holy-Spirit University of Kaslik, Lebanon*

Barbar Zeghondy, *Holy-Spirit University of Kaslik, Lebanon*

15:40 – 16:00 Technical and Economical Photovoltaic Potential Assessment on Flat Roofs in urban area

Rhinane Hassan, *University Hassan II of Casablanca, Morocco*

Reda Drissi El-Bouzaidi, *University Hassan II of Casablanca, Morocco*

Maanan Mehdi, *University Hassan II of Casablanca, Morocco*

Saddiqi Omar, *University Hassan II of Casablanca, Morocco*

Hilali Atika, *University Hassan II of Casablanca, Morocco*

El Arabi El Hassan, *University Hassan II of Casablanca, Morocco*

16:00 – 16:20 Energy-Saving Solution for Future Cellular Systems

Ayman Khalil, *IETR & INSA, France*

16:20 – 16:40 Improved control method of HVAC system for Demand Response

Nivine Abou Daher, *Ecole de Technologie Supérieure, Canada*

Mary-Jo Lattouf, *Saint-Joseph University of Beirut, Lebanon*

Imad Mougharbel, *Ecole de Technologie Supérieure, Canada*

Maarouf Saad, *Ecole de Technologie Supérieure, Canada*

Hadi Y. Kanaan, *Saint-Joseph University of Beirut, Lebanon*

Mahdi Raoofat, *Shiraz University, Iran*

Dalal Asber, *IREQ, Canada*

Javier Beltran-Galindo, *Ecole de Technologie Supérieure, Canada*

16:40 – 17:00 Coffee Break

17:00 – 18:20 Technical Sessions

Session 4: Wind Energy & Hydropower

Room: A

Session Chairs: Tilda Akiki, *Holy Spirit University of Kaslik, Lebanon*
Rita Najjar, *ALMEE, Lebanon*

17:00 – 17:20 **In-flight estimation of the aerodynamic characteristics of a Magnus effect-based AWE system**

Ahmad Hably, *Grenoble, France*

17:20 – 17:40 **A Point-Absorber-Based Wave Energy Converter for Power Production in Lebanon**

Guys Salame, *Notre-Dame University, Lebanon*

Elio Frem, *Notre-Dame University, Lebanon*

Elias Albona, *Notre-Dame University, Lebanon*

Charbel Bou-Mosleh, *Notre-Dame University, Lebanon*

Pierre Rahme, *Lebanese University, Lebanon*

17:40 – 18:00 **Modeling and Fixed Step Analysis of a DFIG-Based Wind Farm**

Marc Anthony Mannah, *Lebanese International University, Lebanon*

Loren Makki, *Lebanese International University, Lebanon*

Ali Koubayssi, *Lebanese International University, Lebanon*

Mohamad Arnaout, *Lebanese International University, Lebanon*

Milad Ghantous, *International University of Beirut, Lebanon*

18:00 – 18:20 **Finite Element Comparative Study Between PMSG and PMAG Generators Used in Wind Turbines**

Ziad Noun, *Lebanese International University, Lebanon*

Mohamad Arnaout, *Lebanese International University, Lebanon*

Andre Mrad, *Lebanese International University, Lebanon*

Session 5: Energy Management, Saving & Efficiency II

Room: B

Session Chairs: Adnan Jouni, *ALMEE, Lebanon*
Talal Salem, *Notre-Dame University, Lebanon*

17:00 – 17:20 **Novel Multilevel Soft Constraints at Homes For Improving the Integration of Electric Vehicles**

Claude Ziad El-Bayeh, *Ecole de Technologie Supérieure, Canada*

Ambrish Chandra, *Ecole de Technologie Supérieure, Canada*

Imad Mougharbel, *Ecole de Technologie Supérieure, Canada*

Dalal Asber, *IREQ, Canada*

Maarouf Saad, *Ecole de Technologie Supérieure, Canada*

Serge Lefebvre, *IREQ, Canada*

17:20 – 17:40 **Green Residential Village in Bekaa - Lebanon: Design and Certification Processes**

Rayan Mourtada, *Expert EE & RE, Lebanon*

Adnan Jouni, *Lebanese University / ALMEE, Lebanon*

Doha Assaf, *Lebanese University, Lebanon*

Fatima Al-Hajj, *Lebanese University, Lebanon*

Sarah Shalhoub, *Lebanese University, Lebanon*

17:40 – 18:00 **Optimization of the design of hydrogen production based on system cost**

Abdelhamid Mraoui, *Centre de Développement des ER, Algeria*

Abdallah Khellaf, *Centre de Développement des ER, Algeria*

18:00 – 18:20 **Optimization of renewable energy systems for NZEB in hot climate**

Fatima Harkouss, *Lebanese University, Lebanon*

Farouk Fardoun, *Lebanese University, Lebanon*

Pascal-Henry Biwole, *University of Nice-Sophia Antipolis, France*

19:30 – 23:00 Gala Dinner

Friday November 2nd, 2018

08:00 – 08:30 Registration

08:30 – 09:30 Keynote Lecture 3 – Room A
Dr. Ambrish CHANDRA
Ecole de Technologie Supérieure, Canada
Hybrid Renewable Energy Standalone Systems

09:30 – 09:50 Coffee Break

09:50 – 10:50 Keynote Lecture 4 – Room A
Dr. Mohamed EL MANKIBI
ENTPE – University of Lyon, France
Latent Energy Storage Integration in Building

10:50 – 12:30 Technical Sessions

Session 6: Power Systems and Smart Grids

Room: A

Session Chairs: Semaan Georges, *Notre-Dame University, Lebanon*
Imad Mougharbel, *Ecole de Technologie Supérieure, Canada*

10:50 – 11:10 **Hybrid Power System Optimized Design for Remote Base Stations**
Marc Anthony Mannah, *Lebanese International University, Lebanon*
Ali Waffic Koubayssi, *Lebanese International University, Lebanon*
Loren Makki, *Lebanese International University, Lebanon*
Rabih Rammal, *International University of Beirut, Lebanon*
Rodrigue Elias, *Lebanese International University, Lebanon*

11:10 – 11:30 **Review of Indirect Matrix Converter Topologies with Uniform Inputs versus Multi-Variou Outputs**
Amira Ammar, *Lebanese Univ. & Saint-Joseph Univ. of Beirut, Lebanon*
Hadi Y. Kanaan, *Saint-Joseph University of Beirut, Lebanon*
Mahmoud Hamouda, *SICISI – ESSTT of Tunis, Tunisia*
Kamal Al-Haddad, *Ecole de Technologie Supérieure, Canada*

11:30 – 11:50 **An economic study of control strategies for microgrids**
Khaled Hajar, *Université Libano-Française, Lebanon*
Ahmad Hably, *Grenoble, France*
Ahmad Rafhi, *Université Libano-Française, Lebanon*

11:50 – 12:10 **Optimal PMU placement for reverse power flow detection**
Zeina Al Rammal, *Lebanese Univ. & Saint-Joseph Univ., Lebanon*

Nivine Abou Daher, *Ecole de Technologie Supérieure, Canada*

Hadi Y. Kanaan, *Saint-Joseph University of Beirut, Lebanon*

Imad Mougharbel, *Ecole de Technologie Supérieure, Canada*

Maarouf Saad, *Ecole de Technologie Supérieure, Canada*

12:10 – 12:30 **Mixed-Integer Optimization for Volt/VAr Control in Radial Networks**

Rabih Jabr, *American University of Beirut, Lebanon*

Mohammed Knaiber, *American University of Beirut, Lebanon*

Session 7: Biomass, Thermal and Heating Energy

Room: B

Session Chairs: Talal Salem, *Notre-Dame University, Lebanon*

Elias Kinab, *Lebanese University, Lebanon*

10:50 – 11:10 **Parametric Analysis of Solar Water Heating Systems for Buildings in Lebanon**

Rayan Mourtada, *Expert EE & RE, Lebanon*

Zeinab Nakad, *Lebanese University, Lebanon*

Alaa Hmadi, *Lebanese University, Lebanon*

Khaled Al Hussein, *Lebanese University, Lebanon*

Houssam Ajouz, *Lebanese University, Lebanon*

11:10 – 11:30 **Numerical and experimental investigations of a PCM integrated solar chimney**

José Carlos Frutos Dordelly, *ENTPE - Université de Lyon, France*

Mohamed El Mankibi, *ENTPE, France*

Mike Coillot, *ENTPE - Université de Lyon, France*

11:30 – 11:50 **Olive pomace, a source of green energy using anaerobic digestion**

Jean H. El Achkar, *Saint Joseph University of Beirut, Lebanon*

Clara Rohayem, *Saint Joseph University of Beirut, Lebanon*

Dominique Salameh, *Saint Joseph University of Beirut, Lebanon*

Nicolas Louka, *Saint Joseph University of Beirut, Lebanon*

Richard G. Maroun, *Saint Joseph University of Beirut, Lebanon*

Zeina Hobaika, *Saint Joseph University of Beirut, Lebanon*

11:50 – 12:10 **Experimental analysis and model verification of a new earth-to-air heat exchanger system**

Zhengxuan Liu, *ENTPE-Hunan University, France*

Zhun Yu, *Hunan University, P.R. China*

12:10 – 12:30 **Can coffee grounds be considered as a potential for green energy production?**

Jean H. El Achkar, *Saint Joseph University of Beirut, Lebanon*

Ali Baydoun, *Saint Joseph University of Beirut, Lebanon*

Dominique Salameh, *Saint Joseph University of Beirut, Lebanon*

Nicolas Louka, *Saint Joseph University of Beirut, Lebanon*

Zeina Hobaika, *Saint Joseph University of Beirut, Lebanon*

Richard G. Maroun, *Saint Joseph University of Beirut, Lebanon*

12:30 – 14:00 Lunch

14:00 – 15:10 Technical Session 8 – French Session II – Room A

Session Chair: Bassam Ouaida, *Ex-directeur Trans-énergie*

14:00 – 14:30 **Elaboration des plans d’actions climat des communes en Algérie :
Expériences et méthodologies de mise en œuvre**

Ménouèr Boughedaoui, *Université de Blida, Algérie*

14:30 – 14:50 **Energie durable au Cameroun : Proposition de solutions pour une
production et une gestion efficaces des microcentrales
hydroélectriques dans les hautes terres de l’Ouest**

Léonnie Deseu Tchinda, *Université de Maroua, Cameroun*

14:50 – 15:10 **L’interrelation entre l’approche Genre et les politiques et
programmes des énergies renouvelables en vue de l’atteinte des
ODD Cas de la Tunisie**

Zohra Bouguerra, *Tunisie*

15:10 – 16:30 Technical sessions

Session 9: Photovoltaic Systems

Room: A

Session Chairs: Ali Assi, *Lebanese International University, Lebanon*
Elias Kinab, *Lebanese University, Lebanon*

15:10 – 15:30 **dSPACE Validation of Improved Backstepping Optimal Energy
Control for Photovoltaic Systems**

Noureddine Benbaha, *Unit of Applied Research in RE, Algeria*

Fatiha Zidani, *Chahid Mostefa Ben Boulaid, Algeria*

Mohamed-Said Kamel Nait-Said, *University of Batna, Algeria*

Salah Eddine Zouzou, *LGEB Laboratory, Algeria*

Sief Eddine Boukebbous, *Unit of Applied Research in RE, Algeria*

Hachemi Ammar, *Unit of Applied Research in RE, Algeria*

15:30 – 15:50 **The first BIPV plant in Lebanon: performance analysis of hybrid
configuration with diesel generator**

Elias Kinab, *Lebanese University, Lebanon*

Talal Salem, *Notre Dame University, Lebanon*

Naji Abi Zeid, *Industrial Research Institute, Lebanon*

15:50 – 16:10 **Optimization of a Solar Photovoltaic Micro Grid for Electricity and Desalinated Water Production**

Sami Karaki, *American University of Beirut, Lebanon*

Adnan Zein, *American University of Beirut, Lebanon*

Chaybane Ghabech, *American University of Beirut, Lebanon*

16:10 – 16:30 **Photovoltaic Water Pumping System Site Suitability Analysis Using AHP GIS method In Southern Algeria**

Hachemi Ammar, *Unit of Applied Research in RE, Algeria*

Seifeddine Boukebbous, *University Constantine 1, Algeria*

Noureddine Benbaha, *Unit of Applied Research in RE, Algeria*

Session 10: Capacity Building for the Needs of Developing Countries

Room: B

Session Chairs: Tilda Akiki, *Holy Spirit University of Kaslik, Lebanon*

Adnan Jouni, *ALMEE, Lebanon*

15:10 – 15:30 **Parametric analysis for the Development of an Energy Building Code for Lebanon: HVAC Chapter**

Adel Mourtada, *Lebanese University / ALMEE, Lebanon*

Khaled Al Hussein, *Lebanese University, Lebanon*

Alaa Hmadi, *Lebanese University, Lebanon*

Zeinab Nakad, *Lebanese University, Lebanon*

Houssam Ajouz, *Lebanese University, Lebanon*

15:30 – 15:50 **Comparative study of mechanical and thermo-physical characteristics of local building materials**

Abdallah Dadi, *Université de Thiès & INSTA, Chad*

Malloum Soultan, *INSTA, Chad*

Brahim Tchou, *INSTA, Chad*

Abakar Ali, *ENSTP, Chad*

15:50 – 16:10 **Beirut Solar Map**

Sara Najem, *CNRS & BRIC, Lebanon*

16:10 – 16:30 **Development of Practical Guidelines and Tools for GRASS green buildings rating system**

Adel Mourtada, *Lebanese University / ALMEE, Lebanon*

Salam Eid, *Lebanese University, Lebanon*

Rayan Mourtada, *ALMEE, Lebanon*

16:30 – 16:45 Closing Ceremony

List of Reviewers

Nivine Abou Daher	Abdallah Kassem
Omar Al Kaaki	Piotr Klosowski
Ali Assi	Raed Kouta
Anissia Beainy	Chantal Maatouk
Charbel Bou Mosleh	Marc Anthony Mannah
Concettina Buccella	Nassar Mendalek
A. Darcherif	Najib Metni
Georges El Jamal	Imad Mougharbel
Youssef Errami	Catherine Nasr El Khoury
Maurice Fadel	Arshad Nawaz
Usamah Farrukh	Bechara Nehme
Michel Fick	Michel Owayjan
Semaan Georges	Eleftheria Pyrgioti
Mazen Ghandour	Muhsin Rahhal
Imad Hage Chehade	Talal Salem
Hadi Kanaan	Hani Vahedi



Institute of Electrical and Electronics Engineers (IEEE)

About IEEE

IEEE, an association dedicated to advancing innovation and technological excellence for the benefit of humanity, is the world's largest technical professional society. It is designed to serve professionals involved in all aspects of the electrical, electronic and computing fields and related areas of science and technology that underlie modern civilization.

IEEE's roots, however, go back to 1884 when electricity was just beginning to become a major force in society. There was one major established electrical industry, the telegraph, which—beginning in the 1840s—had come to connect the world with a communications system faster than the speed of transportation. A second major area had only barely gotten underway—electric power and light, originating in Thomas Edison's inventions and his pioneering Pearl Street Station in New York.

IEEE, pronounced "Eye-triple-E", stands for the Institute of Electrical and Electronics Engineers. The association is chartered under this name and it is the full legal name.

However, as the world's largest technical professional association, IEEE's membership has long been composed of engineers, scientists, and allied professionals. These include computer scientists, software developers, information technology professionals, physicists, medical doctors, and many others in addition to our electrical and electronics engineering core. For this reason the organization no longer goes by the full name, except on legal business documents, and is referred to simply as IEEE.

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IEEE creates an environment where members collaborate on world-changing technologies – from computing and sustainable energy systems, to aerospace, communications, robotics, healthcare, and more. The strategic plan of IEEE is driven by an envisioned future that realizes the full potential of the role IEEE plays in advancing technology for humanity.

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The key values of IEEE membership are technical innovation, access to cutting-edge information, networking opportunities, and exclusive member benefits.

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IEEE offers a wide range of learning, career enhancement, and employment opportunities within the engineering sciences, research, and other technology areas.

The goal of these programs is to ensure the growth of skill and knowledge among professionals and to foster individual commitment to continuing education among IEEE members, the engineering and scientific community, and the general public.

Association Libanaise pour la Maîtrise de l’Energie et pour l’Environnement (ALMEE)

The Lebanese Association for Energy Saving and for Environment is involved in a wide range of activities related to sustainable practices and other “green” issues. Known by its French-language acronym, ALMEE (Association Libanaise pour la Maitrise de l’Energie et pour l’Environnement), the group describes itself as “a non-political & non-profit association” committed to better handling of multiple issues and technologies associated with **Energy and Environment**, not just in Lebanon but also across the Mediterranean Basin and worldwide.

Specifically, ALMEE’s overriding goal is to develop, increase and promote scientific methods and means contributing to better management of energy and related economic policies, including the following:

- Renewable energy sources like solar, wind, biomass, hydraulic, wood, etc.;
- Technical issues designed to improve energy efficiency, such as insulation, glazing, and the latest heating and air-conditioning technologies;
- Techniques like cogeneration that lessen the waste associated with power generation and industrial processes.

For more than 2 decades, ALMEE has pursued a philosophy of sustainable and harmonious development for Lebanon and the region, gaining a wealth of experience from cooperation with some of the world’s leading organizations.

In short, ALMEE has worked with local, regional and international partners – from governments and multilateral institutions of civil society and the private sector – to buttress calls for more sustainable policies and practices related to energy and environment. ALMEE’s main goal is building awareness and support for better management – and to keep the business community apprised of the tremendous growth potential exhibited by this new and exciting sector.

As the public becomes more and more concerned about environmental issues, the marketplace continues to reflect changing attitudes, opening up significant opportunities for forward-thinking companies to increase sales and revenues and be good corporate citizens at the same time. ALMEE constitutes an excellent venue to communicate these and other possibilities tied to the use of renewable energy and other means of better and more sustainable environmental practices.

ALMEE worked on developing proposed mechanisms for greenhouse gases emissions in several projects.

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