אוניברסיטת בן-גוריון בנגב
Ben-Gurion University
of the Negev

Program
19th Sede Boqer Symposium
on Solar Electricity Production
February 23-25, 2015

George Evens Family Auditorium
Jacob Blaustein Institutes for Desert Research
Sede Boqer Campus

Sponsored by:

First Solar

The Jacob Blaustein Center for Scientific Cooperation
The Jacob Blaustein Institutes for Desert Research
Ben-Gurion University of the Negev

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Program

Monday, February 23, 2015

9:00 – 10:30 Arrival at the George Evens Family Auditorium, Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev (Midreshet Ben-Gurion), **Registration and Reception**

10:30-11:00 **Opening Greetings**

(Chair: Prof. **David Faiman**, BGU Blaustein Institutes, Sede Boqer)
Prof. **David Saltz**, Chair, The Swiss Institute for Dryland Environmental and Energy Research, BGU Blaustein Institutes for Desert Research

Dr. **Rona Sarfaty**, Ministry of National Infrastructures, Energy and Water Resources

11:00-12:00 **Session 1: Invited Keynote Lecture and Discussion**

Chair: Prof. Daniel Feuermann

300 MW of Solar Power at Ashalim

Chemi Sugarmen, CTO, Negev Energy - Shikun Binui, Tel Aviv, Israel

12:00-13:30 **Lunch –** High School Dining Room

13:30-15:00 **Session 2: Solar power production**

Chair: Dr. Sonia Leva, Politechnico di Milano, Milan, Italy

1. *Annual analysis of solar hybrid steam injection gas turbine (STIG) cycle with PCM thermal storage*
   G. Polonsky and **A. Kribus,** Tel Aviv University, Tel Aviv, Israel.

2. *The Role of Solar Energy towards 100% Renewable Power Supply for Israel: Integrating Solar PV, Wind Energy, CSP and Storages*
   C. Breyer and **D. Bogdanov,** Lappeenranta Univ. of Technology, Lappeenranta, Finland

3. *Validation of Energy Prediction Technology Against Utility-Scale PV Power Plant Performance*
   B. Littmann. First Solar Inc., San Francisco CA, U.S.A.

4. *PV plant power: 24-48 hours forecasting by an hybrid method based on artificial neural networks*
   A. Dolara, F. Grimaccia, S. Leva, M. Mussetta and **E. Ogliari**, Dept. of Energy, Politecnico di Milano, Milan, Italy

5. *Managing the grid while optimizing revenue from small PV systems*
   M. Green[1] and **E. Brill**[2], [1]Lightning Electrical Engineering, [2]Holon Inst. of Technology, Holon, Israel

15:00-15:30 **Coffee break**

15:30-17:00   Session 3: Increasing Efficiency: Theoretical ideas

Chair: Prof. Avi Kribus, School of Mechanical Engineering, Tel Aviv University, Israel

1. *Thermally enhanced photoluminescence for efficient photovoltaics*
   A. Manor[1], L.L. Martin[2] and C. Rotschild[1,2], [1]Russell Berrie Nanotechnology Inst., [2]Dept. of Mechanical Engineering, Technion, Haifa, Israel.

2. *Near-field electromagnetic theory for thin solar cells*
   A. Niv, Blaustein Institutes, Ben-Gurion University, Sede Boqer, Israel

3. *Optical designs for angular confinement in solar cells*
   J. M. Gordon, D. Feuermann and H. Mashaal, Blaustein Institutes, Ben-Gurion University, Sede Boqer, Israel.

4. *Thermodynamic limit for coherence-limited solar power conversion*
   H. Mashaal and J.M. Gordon, Blaustein Institutes, Ben-Gurion University, Sede Boqer, Israel.

5. *General assessment of the main limiting mechanisms in single and multi-junction solar cells*
   A. Vossier[1] and A. Dollet[2], [1]CNRS, PROMES Laboratory, Odeillo, France, [2] CNRS, PROMES Laboratory, Perpignan France

17:00-18:30   Free time (final registration, room check-in)

18:30-20:00   Dinner - High School Dining Room

20:30

   Festive Concert: "Viva Sevillia" (The George Evens Family Auditorium, Midreshet Ben-Gurion)

   Sivan Rotem – Soprano

   Oded Shoub –Guitar

   Songs and solo guitar pieces, including works by:

   I. Albeniz, A. Barrios, G. Bizet, M. de Falla, E. Granados and *F.G. Lorca.*

Tuesday, February 24, 2015

9:00-10:30   Session 4: Photovoltaics I

Chair: Dr. Alexis Vossier, PROMES, CNRS, France

1. *Carbon nanotubes coated with fullerene nanocrystals*
   E.A. Katz[1], C. Bounioux[2], E. Shahnazaryan[1], A.E. Goryachev[1], C. Itzhak[2], and R. Yerushalmi-Rozen[2]**,** [1]Blaustein Institutes, Sede Boqer Campus, [2]Dept. of Materials Engineering, Beersheva Campus, Ben-Gurion University, Israel.

2. *An Application of luminescent down-shifting to improve the performances and stability of organic photovoltaic cells*
   J. Kettle, School of Electronic Engineering, Bangor University, Wales, UK

3. *Oxide absorber materials for all-oxide photovoltaics*
   K. Majhi, A. Anderson, H.-N. Barad, Y. Bouhadana, A. Ginsberg, D. Keller, E. Rosh-Hodesh, K. Shimanovich and A. Zaban, Dept. of Chemistry, Bar-Ilan University, Ramat Gan, Israel.

4. *Semiconductor nanostructures for IR photovoltaics*
   A. Harush[1], R. Gertman[1,2] and **I. Visoly-Fisher**[2,3], [1]Dept. of Chemistry, Beersheva, [2]Ilse Katz Inst. For Nanoscience and Technology, Beersheva, [3]Blaustein Institutes, Sede Boqer, Ben-Gurion University, Israel

5. *Advancements in First Solar thin-film technology*
   B. Littman, First Solar GmbH, Belgium

10:30-11:00   Coffee Break

11:00-12:00   Session 5: Invited Keynote Lecture and Discussion

Chair: Dr. Iris Visoly-Fisher, Blaustein Institutes, Ben-Gurion University, Israel

Perovskites for photovoltaics: Why?
Prof. Jonathan Spanier, Drexel University, Philadelphia, USA.

12:00-13:30   Lunch – High School Dining Room

13:30-15:00   Session 6: Photovoltaics II

Chair: Prof. Eugene Katz, [1]Blaustein Institutes, Ben-Gurion University, Israel

1. *Highly efficient hole conductor free perovskite based solar cells*
   L. Etgar, Hebrew University, Jerusalem, Israel

2. *Extremely slow photoconductivity response of $CH_3NH_3PbI_3$ perovskites suggesting structural changes under working conditions.*
   R. Gottesman[1], E. Haltzi[1], L. Gouda[1], S. Tirosh[1], Y. Bouhadana[1], A. Zaban[1], E. Mosconi[2] and F. De Angelis[2]**,** [1]Dept. Of Chemistry, Center For Nanotechnology & Advanced Materials, Bar-Ilan Univ., Ramat Gan, Israel. [2]Computational Laboratory for Hybrid/Organic Photovoltaics, CNR-ISTM, Perugia, Italy.

3. *Accelerated stability study of methylammonium lead trihalide perovskite photovoltaic materials*
   R. K. Misra[1]**,** S. Elboher[2], B. Li[1], I. Visoly-Fisher[1,3], L. Etgar[2] and E.A. Katz[1,3], [1]Blaustein Institutes for Desert Research, BGU(Sede Boqer), [2]Inst. of Chemistry, Hebrew University, Jerusalem, [3]Ilse Katz Inst. for Nanoscale Science & Technology, BGU (Beersheva), Israel.

4. *Observation of Morphological Changes in PbI$_2$ Single Crystals Upon Transformation to the Perovskite CH$_3$NH$_3$PbI$_3$*
   T. M. Brenner, Yevgeny Rakita, Gary Hodes, David Cahen**.** Dept. of Materials and Interfaces, Weizmann Institute of Science

5. *PV module soiling: quantifying energy losses and protection against dust*
   S. Biryukov and P. Pokrass, Blaustein Institutes, Ben-Gurion University, Sede Boqer, Israel

15:00-15:30   Coffee break

15:30-17:00   **Session 7: Miscellaneous**

Chair: Prof. David Faiman, Blaustein Institutes, Ben-Gurion University, Sede Boqer Israel

1. *Solid/liquid interfaces in ionic liquids: From scientific debates to electrochemical energy based applications*
   A. Yochelis, Blaustein Institutes, Ben-Gurion University, Sede Boqer, Israel.

2. *Separation of light confinement and absorption sites for enhancing solar driven water splitting*
   A. Niv, Blaustein Institutes, Ben-Gurion University, Sede Boqer, Israel

3. *Analytical approximation of external characteristic of manufactured solar cells*
   M. A. Slonim[1], G. Vitner[2], A. Lidogoster[3] and V. Stefin[3]. [1]Electrical and Computer Engineering Dept., Ben-Gurion University, Israel; [2]School of Engineering, Ruppin Academic Center, Israel; [3]Electrical and Electronic Engineering Dept., Sami Shamoon College of Engineering, Beersheva, Israel

4. *Finding the global maximum among all of the local maxima in the I-V curve of a partially shaded PV array*
   M. Averbukh, Blaustein Institutes, Ben-Gurion University, Sede Boqer, Israel

5. *Solar Fields Radiation Power Prediction Models*
   O. Pitussi and R. Rabinovici, Dept. of Electrical and Computer Engineering, Ben-Gurion University, Beersheva, Israel

18:30-20:30   **Dinner and after dinner talk** – Vickar Information Center

North-East Asian Super-Grid: Renewable Energy Mix and Economics
Prof. Christian Breyer
Lappeenranta Univ. of Technology, Lappeenranta, Finland

19th SEDE BOQER SYMPOSIUM ON
SOLAR ELECTRICITY PRODUCTION

DAY 3: GRID INTEGRATION TECHNICAL WORKSHOP

Wednesday, February 25, 2015

Evens Auditorium, Midreshet Ben-Gurion

(Sede Boqer Campus of Ben-Gurion University of the Negev)

Utility-scale photovoltaic (PV) power plants that support grid stability and reliability are becoming available as PV generation grows to the point of making a significant contribution to the grid, and "grid-friendly" features are clearly needed. Examples are voltage regulation, active power control, ramp-rate control, fault ride-through, frequency control and others. First Solar *has over 3 GW of utility scale PV systems completed and in development globally ranging between 10 MW (AC) and 550 MW (AC). Recently the Aqua Caliente (in Arizona, USA) PV power plant was completed as one of the largest utility-scale PV plants in the world with 290 MW (AC) connected to the grid.*

This track record and the experiences on designing, installing and operating these plants provided extremely important information concerning all aspects of interfacing very large PV systems with the electricity grid and operating them to the best advantage of both.

This workshop is aimed at participants from the Israel Electric Corporation, the Israel Electricity Authority, interested parties from government ministries and local authorities, PV system designers, and in general, everyone who is interested in the feasibility of substantial amounts of the country's electricity coming from the sun.

8.30 – 9:00	**Registration & Welcome Coffee**
9:00 – 9.30	*Vision and Challenges for Israel's First 1 GWp* **Prof. David Faiman**, Ben-Gurion University of the Negev
9:30 – 9:45	*Introduction to First Solar Corporation* **Pascal Tirtiaux,** Head of Business Development Southern Europe & Israel
9:45 – 10:45	*Overview on variable generation integration topics* **Bodo Littmann,** Senior Expert Plant Prediction Technology, Plant Performance • *Grid Stability & Reliability* • *Load Balancing* • *Power Systems Planning and Design*
10:45 – 11:00	Q&A

11:00 – 11:30   Coffee break

11:30 – 12.45   *"Grid friendly" utility scale PV power plants*
         Vladimir Chadliev, VP Product Management First Solar
- *Power Plant Controller Architecture*
- *Dynamic Voltage Regulation Modes*
- *Active Power Management*
- *Frequency Droop Control*
- *Fault Ride-Through Capability*

12:45 – 13.00   Q&A

13.00 – 14.30   Lunch

14:30 - 15:00   **Yuval Zohar,** Head of Renewable Energies, Israel Ministry of National Infrastructures, Energy and Water Resources. *The Israeli Renewable Energy market - Status and Integration of Solar Power into the Grid*

15.00 – 15.30   **David Elmakis,** Israel Electricity Company**.** *Effect of solar generation systems on the power system*

15.30 – 16.00   **Honi Kabalo**, Alternative Energies Branch, Israel Public Utilities Authority**.** *Optimal Integration of RES Into the Electric Grid: Economic, Environmental, and Regulatory Considerations*

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16:00 – 16:30   Coffee Break

16:30 – 17:30   **Israeli Developers and EPCs of Large PV Plants** – **achievements and plans**
- **Navot Bar**, VP Business Development, Shikun Binui
- **Guy Shahar,** CEO, Belectric Israel
- **Yanir Allouche**, COO, Aravapower

17:30 – 18:30   **Open panel discussion** – with full audience participation