





ESI 2014 Conference Summary Report







INTRODUCTION

INDIA Energy Storage alliance (IESA) hosted India's 1st Energy Storage conference in December 2013, which was attended by over 300 participants from 12 countries and has generated lots of interest on energy storage and micro-grid opportunities in India. The first staging of Energy Storage India Exhibition had 14 exhibitors showcasing innovative technologies and applications in the energy storage sector. Most of the companies who participated in the event have provided very strong positive feedback, and are looking forward to continuing the discussion for implementation projects. We also saw a very strong interest in developing long term strategic partnership, which is essential in developing this sector.

The India Energy Storage Alliance (IESA) witnessed a stronger participation of various industry stake holders, right from the policy makers to the end users at the recently concluded 2nd international conference & expo, Energy Storage India 2014, at New Delhi. The key industry participants appreciated the reinforced will of MNRE and other policy makers to introduce energy storage at a large scale in India. With more than 500 delegates from 15+ counties participated in this year conference at New Delhi.

The 3 day event kicked off with 3 workshops (Energy Storage 101, Power Quality, Micro-grids workshops) providing delegates with an excellent overview of various energy storage technologies, with parallel session on IRENA International Energy Storage Policy and Regulators workshop. The technologies covered in the workshop and conference spanned complete range including electrochemical batteries such as Advanced Lead Acid, Li–Ion, Flow batteries, Ultra Capacitors, Sodium Nickel Chloride, Sodium Sulphur, as well as other forms of energy storage technologies including pumped hydro, compressed air energy storage and thermal storage.

The conference covered the complete range of opportunities for advanced storage technologies in India including renewable integration, rural electrification, microgrids, smart cities, utility and industrial applications as well as electric transportation. Special sessions on 'Make in India' and 'International Prospective on Energy Storage' created higher interest among all delates in the conference.







IRENA International Energy Storage Policy & Regulations Workshop

The International Renewable Energy Agency (IRENA) partnered with the India Energy Storage Alliance (IESA) (<u>http://indiaesa.info/</u>) to convene top international policy makers for the International Energy Storage Policy and Regulations Workshop during the Energy Storage India international conference (http://esiexpo.in/), organized by IESA in New Delhi, December 3rd – 5th, 2014. IRENA convenes these workshops to help define how energy storage technologies can assist the increasing deployment of renewable energy generation. Mr. Gurbuz Gonul,



acting director, IRENA provided an overview of IRENA's Electricity storage roadmap at ESI2014.The workshop was chaired by Mr. Upendra Tripathy, Secretary, Ministry of New & Renewable Energy (MNRE), India. Other prominent attendees were Ms. Varsha Joshi, Joint Secretary MNRE India, Dr. Rahul Walawalkar, international energy expert and Executive Director IESA, policy makers from Germany, Bangladesh, Nepal, Egypt, etc. The panel discussion was moderated by Mr. Vinod Kala from Emergent Ventures. Highlights from the panel discussion are:

- Due to the planned huge capacity addition to renewable energy installations in the next 5 years, there is a need for energy storage to manage the variations in renewable energy to maintain grid stability.
- Regulatory framework to address both grid connected and off-grid systems, integrated with energy storage.



- Development of regulatory framework which can support multiple revenue streams for energy storage.
- Energy storage integrated with local renewable energy source could be an attractive alternative in places depending on diesel for power generation.
- Example: Andaman & Nicobar Islands where diesel is used for power generation has a cost of generation approximately INR 30/ kWh. Lakshadweep Islands has a diesel based cost of generation ~ INR 40 / kWh. In these places, solar with energy storage would be economically attractive and less polluting as well.
- Innovations in energy storage technologies leading to reduction in cost in the next 5-10 years.
- Financing of energy storage could be based on life -cycle cost. There is a need for innovative ways of financing, such as lease based financing for energy storage.
- The social impact of large scale integration of energy storage with renewable energy could result in the creation of green energy jobs and less









pollution.

- Mr. Shirish Garud from The Earth Resources Institute (TERI) discussed applications of energy storage to develop microgrids, solar street lighting and other off-grid applications. Mr. Garud shared the plan to open the Center of Excellence at TERI University to study energy storage technology, initially focussing on thermal storage.
- The workshop concluded with the goal to promote large scale adoption of renewable energy with energy storage, leading to decarbonized grids.







Energy Storage India 2014: Day 1, 4th of Dec, 2014

India ESS market likely to be over 15 GW through 2020

Optimism is the word which describes the mood of participants on day one of the second Energy Storage India conference in New Delhi. On the morning of the 4th of December, 2014, the global energy storage industry converged once again in South Asia. One of the most prominent countries, India, shared its experience on 'Energy Storage' on the national and global level to understand the stand of policy makers in the country on storage of energy for various applications. Day one of the conference was attended by several energy storage OEM's, solution providers, utilities, Government of India's ministries, regulatory bodies, commercial and industrial end users, students and industry enthusiasts.

The day kicked off with welcome remarks from Mr. Udo Schurtzmann, MD, Messe Dusseldorf and Mr. Stephen Fernands, President of Customized Energy Solutions. Then Dr. Rahul Walawalkar took over the stage and expressed his views about the energy storage market in India over the next five years. Dr. Walawalkar forecasted that with the help of aspirational renewable energy plans by MNRE and encouragement on the storage front, the energy storage market in India through 2020 can touch a mark anywhere between 15 GW to 20 GW.



Before inviting the keynote speaker, Mr. Tarun Kapoor, Joint Secretary Ministry of New and Renewable Energy, Dr. Walawalkar optimistically stated that the next decade can be the decade of transformation of the power sector in India, and energy storage will play a key role in this journey of revolution.

Mr. Kapoor, in his keynote speech, mentioned that the role of energy storage is very crucial for the growth of renewable energy and off-grid supply in India. He provoked a poignant thought in the minds of the audience by stating that over 75 million households in the country burn kerosene to meet their energy needs. He said that energy storage can be an answer to this challenge. However,

to reach out to the all the rural and remote locations in the country, standardized storage solutions will be required with long lasting batteries at competitive pricing. He further mentioned that the industry should work to bring high battery replacement cost, to make inroads in micro grid markets in the country, which has huge potential. As per Mr. Kapoor, in the solar PV and storage hybrid model, the cost of storage should not be more than the 20% of CAPEX of the solar PV plant for the model to be financially viable.









The keynote speech was followed by the session on 'Regulatory & Policy Framework to adopt Energy Storage in India', moderated by Dr. Pramod Deo, Ex-Chairman, CERC, where a lot of interesting views were shared.

At the beginning of this session, Mr. Kapoor, Mr. Soonee and Dr. Deo released a report prepared by IESA and Shakti Foundation titled 'Role of Energy Storage Technologies in Providing Ancillary Services, Improving Power Quality and Reliability of the Indian Grid'.

Mr. Sushil Kumar Soonee, CEO, POSOCO, said that the regulatory and the planning team have to consider the value of the lost load to the consumer. If we consider that value, some of the expensive technologies will start looking attractive. The tool of load shedding will always be a cheaper option than the tool of ancillary service market. But if we consider the cost which the end consumer pays for the load shedding, energy storage solutions will definitely make a better business case. The regulatory panel in the conference also commented that the Indian grid operators are everyday handling ramp rates of over 40 MW per minute, which is an incredible effort. Energy storage can help the operators in smoothing this steep rate and can make the grid more secure. Mr. Soonee further stated that the time and the location have always mattered to a grid operator and energy storage can disrupt this mind-set.

Later in the session, Dr. Chawla, Head of Joint Regulatory Electric Commission, spoke about challenges of supplying power to islands like Andaman & Nicobar and Lakshadweep. He mentioned that diesel is transported to these islands in cans that are floated in the sea and are often collected by men and children who have to jump into the water. Can this situation be improved by renewable energy powered remote grids which will be backed by energy storage systems?

As informed by Dr. Chawla, in the Andaman & Nicobar Islands about 5 MW of solar PV is installed. The installations in Lakshadweep is however comparatively small and much less than 1 MW.

After this session, the conference witnessed international perspectives on energy storage from speakers, namely Mr. Chris Edgette, Senior Director, California Energy Storage Alliance, Mr. Brian Caffey, Industry Research Manager, China Energy Storage Alliance, Mr. Jens Burgtorf, Director, Indo-

German Energy Programme and Mr. Junill Yoon, ESS Business Group Leader, Hyosung. During this session, facts like ESS' need for EV (Electric Vehicle) in Germany is expected to be around 19 TWh, over 2 GW of ESS is coming up in Korea, KEPCO has integrated 9 MW of wind energy with ESS and 450 kW of diesel genset at Gapado Island in Korea was done away with 500 kW of wind turbine with ESS, were discussed.



In the case studies session, Mr. John Wood, CEO, Ecoult, shared exciting case studies for smoothing wind and solar ramp rates with Ultra batteries which were developed in Australia. Mr. Wood stressed on combining the benefits of energy storage systems to make the whole project profitable. During this session, David Myers from S&C Electric spoke about increasing the utilization of wind farms with application of ESS. Duke Rankin's solar integration is one of the most prestigious and







successful projects carried out by S&C Electric. In a UK based community, peak shaving and smoothing of solar PV were achieved by a single ESS provided by S&C. More interesting case studies were discussed by Mr. Ravi Bantu from RESAmericas about the application of ESS in RE integration and ancillary service markets in North America.

ESS solution providers in the conference were all ears to the challenge provided by Mr. Bansal from BSES Rajdhani Power Limited. Mr. Bansal mentioned that the peak load in their territory is increasing by over 6.0% every year and the load growth witnessed is almost less than 2.3% per year. In such a situation, the increase in the capital expenditure for grid expansion is not in proportion with the increase in revenue from overall rise in power consumption and hence, the profit margins are reducing drastically. Mr. Bansal openly invited all the solution providers to take up this challenge and provide his company with the best storage option for this case. The next session, the Role of ESS in RE integration, was moderated by Mr. Pankaj Batra from CEA. Mr. Manu from SunEdison mentioned that better demand charge reduction and demand response can make economics of ESS viable. Here Dr. Nayagam from CWET and Mr. Khemka from Re Gen provided their perspective on integration RE to the grid. Dr. Nayagam emphasized that the establishment of REMC's will be required to handle issues around the growth of RE in several states of India. Here Prof. Osman advocated for the zero carbon world and the role ESS can play to achieve this goal. He also promoted the idea of helping the needy people across the globe without electricity by connecting them to the micro grids powered by RE and ESS.

The day was concluded by Mr. Somers, Former Chairman US India Business Council, as the moderator for Make in India session. Mr Somers was all praise for India's Prime Minister Mr Narendra Modi and his initiative of 'Make In India'. Many of the participants in the conference were not aware of the 20% capital subsidy provided to electronics manufacturer in the country under Electronic Manufacturers Cluster scheme. Information on this scheme was shared by Mr Rajeev Jain, VP, India Electronic & Semiconductor Association.

Mr. Shah from Panasonic urged government to reconsider the case of Li-ion battery market in India. He stated that Li-ion batteries need relaxation in import duty to compete on fair grounds with Lead Acid in India. Panasonic India is coming up with new manufacturing set-up in India which will produce VRLA batteries for automotive and industrial storage solutions.

The day was concluded by an interesting presentation by Mr. Saha from Siemens, showcasing the company's capabilities in the field of energy storage and energy in India. Mrs. Varsha Joshi, Jt. Secretary MNRE, who is leading the efforts on drafting national energy storage roadmap, joined the delegates for networking dinner. She had a roundtable meeting with industry leaders from the US, Germany, Japan, Australia and India to discuss inputs for the national storage policy. She invited these companies to expand their manufacturing operations in India by assuring that energy storage is a top priority for the Indian government considering initiatives on renewables, energy access, smart cities as well as electric mobility.







Energy Storage India 2014: Day 2, 5th of Dec, 2014

Energy Storage: Many Applications; One Solution

After a successful completion of Day1 of the conference, all attendees had an optimistic view about the Indian ESS market. Day 2 was primarily focused on various possible applications of ESS in the Indian electricity market ranging from: Smart Grids, Smart Townships, Off Grid, Microgrid, Commercial & Industrial applications to Electric Mobility. At the beginning of Day 2, there was a unique session to address financing issues of energy storage and hybrid solutions. The 'Product Watch' session in the day created a lot of interest among all the delegates. The second day of the conference was attended by several energy storage solutions providers, manufacturers, large scale consumers, utilities, government officials, regulators, policy makers and other stake holders from the energy industry.

The key note speaker for the day was Mr. Reji Pillai, President of the India Smart Grid Forum. He emphasized the need of modern grids to address the ambition of 100 smart cities for India. He also highlighted grid extension and grid corridor plans by MNRE with recent energy programs by the Government of India, such as the Integrated Power Development Scheme (IPDS), Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and North Eastern Region Power System Improvement Project (NERPSIP).



The keynote speech was followed by the session on 'Smart Grid/Smart Townships" where discussions were held about providing of reliable and uninterrupted power to existing townships and new smart cities announced by the new government. The panel discussion credited the role of energy storage in smart cities and townships to realise this ambition.

The session was moderated by Dr. Rahul Tongia, Advisor ISGF and ISGT, Fellow, Brookings Institution. Dr. Rahul Tongia initiated the discussion clarifying the buzz words clean, green and smart used in this industry. He stated that rapid urbanisation and energy requirement in urban India, which is the new bottleneck for Indian cities. Other panellists in this session were Brigit Hartland Johnson, General Manager, and Sales development, Siemens, Dr. Chandan Chowdhury, Managing Director, Dassault Systems and Shigekazu Hayashi, Director, Smart Community Department, NEDO, Japan.

As the first speaker of the panel, Mr. Hayashi, Director, NEDO, exemplified some lessons from Japan's experience. He explained the way in which initiatives to connect the grid to the clustered PV resulted in significant electricity reform in Japan. With examples of four smart community projects (Yokohama city, Kanagawa, Toyota City, Aichi, Kansai Science City in Kyoto, Kitakyushu City, Fukuoka), he argued that this









should be the way ahead for India. In the same session Brigit Hartland Johnson mentioned the role of energy storage in smart cities. She also discussed that energy storage can be used as a flexible asset to make cities green, sustainable and self-sufficient.

Later in the session Dr. Chanadan Chowdhury, MD, Dassault, talked about new city development and the importance of renewable energy for the new cities. He spoke about 3D Experiencity software and green field city & brown field city development for India. In his concluding remark for the session he said to "make citizens as a part to design smart cities".

The second session of Day 2 focused on Off-Grid and Micro-grid. The session was moderated by Mr. Shirish Garud, Senior Fellow and Associate Director, The Energy and Research Institute (TERI), with panellists in the session such as Col. C. P. S. Pasricha, Indian Army, Jon Bassett, Electrical engineer, SELCO Foundation and Dr. Abhishek Somani, Scientist, Advanced Power and Energy Systems, Pacific Northwest National Laboratory. Mr. Shirish Garud mentioned various initiatives taken by TERI for energy access and energy security in India. In his speech he talked about a need of micro-grid and off grid applications like lighting in rural India that are possible only through integration of renewable energy and advanced technologies like energy storage.

Following Mr. Garud, Col. C. P. S. Pasricha said that there is a crisis of electricity in deserts, mountains and isolated areas in the Himalayas. He gave several examples form the defence sector that energy/electricity is inaccessible to many army camp areas. In his concluding remark, he told that off-grid electricity access can be a better solution for these un-electrified areas. Mr. Jon Bassett narrated the journey of the SELCO foundation in this area of micro-grids and also briefed about the SELCO micro-grid project established at the village "NeelKantarayana Gaddi". Dr. Abhishek Somani also provided a few examples of the US microgrid projects. In this context, he mentioned the SAGE (US Army Smart and Green Energy, forward operating Base Project) micro-grid and facility system in which 200kWh storage is integrated to provide reliable power to the community. In the concluding statement, panellists agreed that the business model for micro-grids in India needs to be sustainable and innovative concepts like mobile micro-grids need to be introduced.

The third session was an eagerly awaited session of the day by both project developers and storage manufacturers. This session on "Financing Storage and Hybrid" was moderated by Vinayak Walimbe, Director, Financial Services, of Customized Energy Solutions. He discussed the industry perspective and the current ways of storage financing at the global level. He also mentioned about the need of lease financing and evolving financing models for project financing for large scale energy storage projects. Other panellists in this session were Mr. Sanjay Mathur, Manager, Solar Energy Corporation of India, Mr. Pramod Kulkarni, Senior Consultant, Customized Energy Solutions, USA, Mr. Ashish Kulkarni, India Business Head, Ricardo-AEA and Mr. Rajshekhar B., Associate Director, ILFS.

Mr. Sanjay Mathur spoke about the government's initiative for different subsidies and incentives for renewable energy and the government's program for advanced technologies like energy storage. Informally, he mentioned about SECI's planned 2.5 MW grid connected energy storage project expected to be announced next year. Mr. Pramod Kulkarni mentioned DOE and the US government's support for early stage and growing companies from his vast experience of California Energy Commission. Mr. Ashish Kulkarni talked about equity funding for early stage companies in energy storage by citing recent examples of STEM, Solar Grid Storage and Green Network. He also







mentioned venture capital's role for corporate finance and the lease model & service model for storage projects adopted in developed countries. Mr. Rajshekhar B said that there is a high technology risk involved in energy storage projects and asset life mismatch and asset ownership are major concerns for these projects across the industry. In his concluding remark, Mr. Vinayak discussed storage IPP set up and a need for a shift of CAPEX to OPEX business models due to high initial investment. The panel urged government bodies to initiate financial support for the energy storage industry to boost quality and reliability of power in India.

The post lunch session "Product Watch", was moderated by Mr. Heiko Stutzinger, Head of Renewable Energy Fairs, German Energy Storage Association (BVES), with other panellists Mr. Krishna, Regen PowerTech, Philippe Forestier, Executive Vice President, Global Affairs & Communities, Dessault Systems, Mr. Sorin Grama, Director, Promethem Power Systems and Mr. Chinmay Pandit, Director-Hybrid Solutions, KPIT Technologies.

Mr. Krishna highlighted the journey of Regen PowerTech and its entry into the hybrid system (solar+wind) and solar inverter through the government's MAKE IN INDIA initiative. Mr. Chinmay Pandit talked about the plug-in hybrid electric vehicle and India's concern for importing fossil fuel for transportation. 21% of the total fossil fuel consumption is for transportation, which consists of 38% of import bill. Mr. Sarin Grama mentioned Prometheann's roller-coaster journey and it's entry in thermal storage, which is used across India presence in milk cooling systems by dairy firms such as Nestle, Amul, Mother Dairy etc.

To make India as a suitable manufacturing hub, reliable and uninterrupted power supply to industrial corridor is an essential requirement. The next session on "Commercial and Industrial Application" witnessed maximum involvement from the audience, to make energy storage implementation as a viable solution for India. Dr. Rahul Walawalkar moderated the session with other panellists, Mr. Manoharan Rajbushan, Vice President, Reliance Jio, Takaya Watanabe, General Manager, Mitsubishi Heavy Industries, Dr. Senchoudhury, Executive Vice President, R&D, Exide Industries and Mr. Archan Padmanabhan, Stationery Energy Storage, Tesla Motors.

Mr. Manoharan Rajbushan spoke about the Reliance deal for Li-ion Battery for the telecom tower and mentioned that through replacing diesel generators with a Li-ion battery, they could save INR 20,000 to 40,000 per year per tower to the company. He also told that the Lithium Ion battery has low TCO (total cost of ownership) over other technologies. Mr. Takaya Watanabe told his experience over the last 2 years to initiate large scale energy storage integration project in India. He shared his mixed reaction about hurdles and opportunities for the Indian market for energy storage project development. Dr. Senchoudhury emphasized the maturity level of the lead acid battery industry in India and EXIDES's Ultra battery for commercial applications. Mr. Archan Padmanabhan shared TESLA's stationary energy storage manufacturing for electric vehicles and TESLA Giga Factory for battery manufacturing.

The last session of the day was on "Electric Mobility" with moderator Mr. Deepanshgshu Dev Sharma, Editor in Chief, Auto Tech Review and panellists Mr. Sujit Mishra, IRSEE, Sr. Divisional Electrical Engineer, Lucknow Devision, North Eastern Railway, Ministry of Railways, Mr. Sajid Mubashir, Member R&D, National Automotive Board, Department of Heavy Industries, Government of India and Mr. John Wood, CEO, Ecoult.







Mr. Sujit Mishra mentioned various storage/ battery applications for Indian railways such as signalling, locomotive application and new metro trains in tier 1 and 2 cities. He also mentioned the Indian Railway's new initiative to manage energy to start a new public sector company as Rail Energy Management Company (REMC). Mr. Sajid Mubashir mentioned the need of charging infrastructure and fast charging systems. In his concluding remark, Mr. Deepanshgshu Dev Sharma mentioned two important points for electric vehicle industry as (1) standardisation of charging infrastructure and (2) standardising battery module.

The 2nd day of the conference was concluded by Dr. Rahul Walawalkar, Executive Director India Energy Storage Alliance (IESA). His concluding remarks are to team up all industry stakeholders to a common platform. The industry is optimistic about steps taken by the Modi government, which will provide the stimulus for the growth of energy storage industry.



As mentioned by some of the conference participants, the first day of ESI 2014 had a lot to offer in terms of knowledge and ideas. One of the delegates at the conference mentioned that it is the sharing of knowledge that will eventually bring down the cost of energy storage in the market. IESA was created with this goal and active participation from policy makers and industry leaders around the globe will help us accelerate this transition.

We are thankful to all supporters, sponsors, exhibitors and partners for their support and active participation in the conference. Ministry of New and Renewable Energy (MNRE) as Principal Supporter, Siemns as Gold Sponsors, AMCO SAFT, Dessault Systems, Ecoult, Exide, Sun Edition and S&C as Silver sponsors, and Aquion Energy, Hitachi Chemical, Hosen Corp and Regen Powertech as exhibitors. We are also thankful to our 30+ key partners and 27 media partners for this year event.

Looking forward to seeing you at ESI'15, Please share your feedback at contact@indiaesa.info

