

The IEM & IET Electrical Conference (IIEC 2013) on Sustainable Development Through Innovations in Energy Management and Technology



by Dr. Nedra Tan Mei Lin, Dr. Agileswari Ramasamy and Dr. Ng Kok Chiang



Conference participants paying attention to a presentation

OVER 150 international and local speakers (experts in their respective fields) as well as participants of the IIEC 2013, convened at the Palace of The Golden Horses Hotel in Selangor, Malaysia. This is the second IIEC jointly organised by the Electrical Engineering Technical Division (EETD) of Institution of Engineers Malaysia (IEM) and the Institution of Engineering and Technology (IET), Malaysia Network. The inaugural IIEC was held in October 2011.

The conference theme, "Sustainable Development Through Innovations in Energy Management and Technology", is timely and essential as we all face depleting primary energy sources and the need to preserve much of what we have today for the future generations. The conference was a great platform for industries, academicians and other stakeholders to share and discuss topics that include green building, energy efficiency, energy management and smart grid and renewable energy.

Apart from the two-day conference held from 20-21 November, 2013, a one-day tutorial session was held on 19 November, 2013. In addition, 11 companies showcased their green technology innovations and products in an exhibition held in conjunction with the conference. These were ADC Power Concept Sdn. Bhd., Gruppe Lightings Sdn. Bhd., JJ-Lap Cable (M) Sdn. Bhd., Johnson Controls (M) Sdn. Bhd., Malaysia Solar Resources (MSR), Mun Hean (Malaysia) Sdn. Bhd., QAV Technologies Sdn. Bhd., Siemens Malaysia Sdn. Bhd., Simhan (M) Sdn. Bhd., Terasaki Electric (M) Sdn. Bhd., and Useins Infotech Sdn. Bhd. ■

19 NOVEMBER 2013 – TUTORIAL SESSION

Session 1

On the first day, the IIEC 2013 tutorial covered two main topics, namely, Green Building Innovations and Smart Grid Technologies. The tutorial session in the morning started with the theme Green Building, which is increasing becoming a subject of great concern as the US department of Energy's Center for Sustainable Development has reported that buildings consume a whopping 40% of the world's total energy.

Ar. Michael Ching, a distinguished figure in Green Building who has won awards from PAM, was the first speaker to talk about "Innovations In Green Architecture". Ar. Ching covered a few major areas in the innovations of green buildings. He started by painting a real world scenario on what were the greatest contributors to global warming and how Malaysia was among the bottom 10 listed in the climate index. He went on to talk about green developments and how innovations can make a difference, through six very interesting case studies on different types of buildings, namely bungalow (single residential), school (commercial low-rise), resort (commercial low-rise), office (commercial high-rise), and institute (commercial high-rise).



Ar. Michael Ching

In all the case studies, it was evident that through better location, design, construction, operation, maintenance and removal as well as reducing the overall impact of the built environment on its surroundings, sustainable development could be achieved in all types of buildings through innovations. The case studies also showed how focus could be shifted towards increasing the efficiency of resource use (such as energy, water and materials) while reducing building impact on human health and the environment during the building lifecycle. These case studies were buildings certified green under the Green Building Index, the pioneer green tool used to verify the sustainability of buildings in the country.

Ar. Alice Leong Pek Lian was the second speaker for the tutorial. She went on to elaborate further where Ar. Ching had left off. Armed with more than 10 years

of experience and her active involvement in green and sustainability in living spaces. Ar. Leong talked about how the GBI green tools evolved through time to respond to the industry's needs, to cater for different building types, to meet UBBL's amendments, and to introduce new criteria in evaluating the sustainability of a building.

She focused on the RNC (Residential New Construction), a category under the GBI tools. She spoke about the four main ratings in RNC, i.e. Platinum being the highest, followed by Gold, Silver, and last but not least, Certified. She then went on to explain the tool upgrade which was created and improved, based on the current data of projects submitted and compiled. The RNC can be differentiated by types namely, highrise, landed and lowrise. The main changes to the RNC tools include points redistributions, rebalancing and new points among the six main criteria being evaluated, namely EE, EQ, SM, MR, WE, and IN. Passive design has been given more emphasis in the new RNC tool. This was in the hope that it would encourage more innovations in design to achieve the desirable energy efficiency without incurring added costs in the mechanical systems.

Other changes include more total points for Advanced EE with the introduction of new sliding scale for single landed, strata lowrise, and strata highrise, new points for QLASSIC, dedicated cycle paths, increased landscaped area, recycling of landscape waste and MSMA under the SM category, additional points for natural ventilation and daylight under the IEQ category, additional points for the use of regional materials, recycled content materials and sustainable timber under the MR category and, lastly, more points given for the IN (Innovation) category to encourage performance "over and above" stated criteria.

Ms. Tan Hwee Yinn, a GBI facilitator and a LEED Accredited Professional whose expertise is in energy simulations and sustainable design concepts for building, was the third speaker. She spoke about affordable Green Building and presented that Green Buildings may not necessarily be more expensive. In fact, in her presentation, she showed evidence that green buildings were not expensive at all. She quoted a BOOT builder at a Dubai conference (2009) who had said, "I want a building that is better than LEED Platinum, not only because it is green, but because it is the cheapest option".

The main areas covered in Ms. Tan's tutorial section were the CO₂ saving potential in the building sector, the barriers, incentives, carrots and sticks and the various pioneering green building case studies in Malaysia, namely the Low Energy building, Suruhanjaya Tenaga Diamond building and KKR2 building. All the case studies showed huge savings with very minimal increase in costs and a low payback period for the investments to achieve the desired energy efficiency. It was shown that energy savings could be as high as 66% and that the payback period could be as low as 3 years. It was also revealed that Green Platinum project could, in fact, be 2% cheaper, according to Bill Odel, HOK Group during the World Green Building conference in 2010.

The rationale behind this claim was that there was an initial cost shifting for green buildings because when more was spent on the façade to ensure the green buildings repelled heat, savings would come in the mechanical system that would not need to be sized up to cool the building. Denmark had shown good experience with investment in energy efficiency where the payback for the investment was about 10-fold. Ms. Tan concluded the tutorial with thoughts on Earthship case studies, where the structures cost as much as a conventional home except that the latter did not come with the electricity and water that one required for use. She also stressed that a conventional home was bad for the planet, was not strong and used materials that required a lot of fossil fuels to manufacture and get to the building site.

Ms. Adrienne Heaney was the last speaker for the green building section and having joined the Green Building Council of Australia since 2008 as a Green Star Case Manager, she gave a very different perspective on the innovations in green buildings from the Australian view point. She spoke about the innovations and the values that come with these advancements. She said that in certification models in Australia, buildings were rated from a low of one star to a high of six stars.



Ms. Adrienne Heaney



Ms. Adrienne Heaney answering questions from the audience

The environmental impact categories used to assess the Green Star ratings of buildings in Australia are the Management, Indoor Environmental Quality, Energy, Transport, Water, Materials, Land Use and Ecology, Emissions and Innovations. It was also explained that since Green Star's introduction to the market in 2003, more than 7 million square metres of certified green building space had been achieved. In 2013, there were more than 623 Green Star projects, 481 registered, and 87 green buildings rated six stars in Australia. She pointed out that innovations in green buildings produced up to 62% fewer greenhouse gas emissions, used 66% less electricity, consumed 45% less energy, used 51% less potable water, achieved up to 96% recycling rate, reduced up to 42% absenteeism, increased workplace productivity by 15%, fetched up to a 12%

premium in asset value and a return of 10.8% and increased the visitor traffic to green shopping malls by up to 20% in the various case studies of Green Star rated buildings in Australia. Ms. Heaney concluded her tutorial with a peek into the future where perhaps innovations would, one day, present zero net energy designs with the advancement in building information modeling, pioneer the rehabilitation of existing buildings, build larger green community, cities and infrastructure, and encourage a closer adaptation of living space to the nature.

Session 2

The second tutorial of the day was "Smart Grid Technologies", presented by Dr Mike Lees, Group Technical Director of EA Technologies. He discussed the challenges for smart grid technologies in the US, Europe, UK and Australia where there is a need for more efficient transmission of electricity, decarbonising the energy sector and maintaining the security as well as quality of supply. Future networks will see the load flexing to meet the available generation that is feeding in all network voltages, the smart grids are actively operating, and an increasing pool of active industrial, commercial, SME and domestic customers.



Dr Mike Lees

Dr Lees also presented various low carbon technologies such as wind, PV, heat pumps, electric vehicles, combined heat and power and their impact on the network. In Europe, dynamic grid parity has been reached in some segments of some countries and the deployment driver has changed from policy to market driven. PV generation can impact the network due to solar ramps, season, mismatch in demand, harmonic currents injection and increased power requirements. He is of the view that feed-in tariffs can distort the PV market.



Dr Mike Lees delivering his presentation on Recent Smart Grid Project Experience in the UK

Ideally, distributed generations (DG) in a smart grid should use minimum interventions to deliver maximum benefits. The DGs can cause a voltage rise effect on rural or urban low-voltage (LV) networks and their output need to be monitored and controlled to prevent network voltage from exceeding the statutory limits.

Electric vehicles that are connected to the LV networks can increase thermal issues with the transformer capacity constraint likely to be reached first. DGs also make the fault level assessment more complex, reduce network security and power quality. These issues need to be addressed. There are various solutions which include the use of voltage control devices, upgrading of cables, transformers and substations, curtailment of large generators to meet voltage statutory limits, connection of energy storage at the DNO or customer side and sequential switching that have been presented in length and breadth during the tutorial.

20 NOVEMBER 2013 – CONFERENCE DAY 1

The opening ceremony began with the welcoming address by Dato' Ir. Lim Chow Hock, Deputy President of IEM. Dato' Ir. Lim said he hoped presenters and participants would use IIEC 2013 as a platform to discuss sustainable development through innovations and to network with various stakeholders. He stressed that engineers should not only use technology but should also enhance its capacity as tools for sustainable development.

Next, the guest-of-honour, Y.B. Datuk Seri DiRaja Mahadzir Khalid, Deputy Minister of Energy, Green Technology and Water, delivered the opening address. He said human attitude is important for the responsible and efficient management of energy. He proposed for proper documentation, improvement in control automation and a cleaner production process to minimise waste. He felt strongly that the trend for the construction of future buildings would be to achieve zero energy buildings and that smart grids were the future for generating power to consumers.



Y.B. Datuk Seri DiRaja Mahadzir Khalid delivering his opening address at IIEC 2013

He praised IEM and IET for organising the conference and selecting such an appropriate theme. Then he announced the IIEC 2013 officially opened.

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Datuk Seri Diraja Mahadzir Khalid was then invited to witness the exchange of a recently-signed Memorandum of Understanding (MoU) between the IEM and IET (Malaysia Network). The MoU is aimed at promoting more collaboration and improving the existing relationship between the two professional engineering bodies in Malaysia.

The opening ceremony proceeded with the presentation of tokens of appreciation to the main sponsors of IIEC 2013 by Datuk Seri Diraja Mahadzir Khalid. The sponsors were Tenaga Nasional Berhad, Malaysia Solar Resources Sdn. Bhd. and Cypark Resources Bhd. Thank you once again to all the sponsors for their support!

Accompanied by Ir. Lim Chow Hock, Ir. Chris Chew, and the organising Chairs of the IIEC 2013, Ir. Lam Sing Yew and Assoc. Prof. Ir. Dr Vigna Kumaran, Datuk Seri Diraja Mahadzir Khalid visited the technical exhibition after the opening ceremony. He was very interested in the exhibition and visited all the 11 booths.



Y.B. Datuk Seri Diraja Mahadzir Khalid visiting the technical exhibition booths. He is accompanied by Dato' Ir. Lim Chow Hock (front left), Ir. Dr Ali Askar (back row left) and Ir. Lam Sing Yew (back row right)

The conference continued after the morning break with Ir. Mah Soo as the chairperson for the session themed "Energy Efficiency".

The first keynote speaker, Ir. Prof. Dr K.S. Kannan (National Project Manager of Industrial Energy Efficiency for Malaysian Manufacturing Sector) delivered his address on United Nations Industrial Development Organisation (UNIDO) and Industrial Energy Efficiency. There are short and medium term challenges in mitigating climate change including a stronger presence of standards and regulations for energy management, doubling the role of renewable energy and accelerating the development of low carbon technologies and energy efficiency improvements in reducing industrial carbon dioxide emissions. Prof. Kannan stressed that improvements in energy efficiency in industrial sectors can be achieved if the top management is committed to changing how energy is managed on a daily



Ir. Prof. Dr K.S. Kannan

basis. Energy savings from optimising industrial systems such as steam, pump, fan systems and etc. are also essential. UNIDO has developed many energy efficiency and climate change programmes (in 52 countries) in the areas of energy efficiency, renewable energy and advance energy and carbon technology to train users, vendors and experts in energy management and system optimisation.

The second speaker was Ir. Francis Xavier Jacob, a Senior Analyst with the Energy Commission of Malaysia. His presentation was "Public Sector Policy Initiatives Towards Promoting Energy Efficiency". Energy efficiency (EE) is an important issue in climate change debates. He explained that EE is required because of the growing energy demand, depleting supply of fossil fuel, investment needed for energy infrastructure and renewable energy, increasing fuel subsidies, and environmental considerations. Even though EE benefits firms in saving money, increasing reliability of operations, and has a positive effect on competitiveness and productivity, there are still barriers to achieving EE. These barriers include lack of management focus on EE and more focus on production, lack of knowledge and awareness on the need for EE, subsidized fossil fuel, and etc. He also explained that the public sector has to play a role in determining causes and initiating measures to remove such barriers through EE policies for the building and transport sectors, industries, and energy utilities. Malaysia is committed towards combatting climate change and its EE policies and strategies focus on the "carrot and stick" approach via five-fuel policy, fiscal incentives, regulations, demonstration projects, and integrated townships, and demand side management, to name a few.



Ir. Francis Xavier Jacob

The third speaker of the session was Dr Brahmanand Mohanty, Regional Adviser for Asia-French Environment and Energy Management Agency (ADEME). In his presentation on "An Integrated Approach To Reducing Carbon Footprint Of The Industry," he warned that present global consumption was unsustainable as we were using the equivalent of 1.5 earths currently to support human activities. Industrial processes have great energy saving potential. However, there is a urgent need to look into how we can optimise and integrate processes to help reduce the overall industrial energy demand and to avoid over-sizing energy supply. Energy saving potential is also available in conventional energy generation and distribution, renewable energy and end-user side.



Dr Brahmanand Mohanty

The final two presentations were on energy management. Mr. Zaini Abdul Wahab, Director of Operation, CNS Group Malaysia, gave a very passionate talk on "Sustainable Approach To Energy Management". The take-home message from his talk was that



Mr. Zaini Abdul Wahab

Malaysia should set high EE standards, learn from the successes of other countries and that there was no need to reinvent the wheel in improving energy performance and reducing energy consumption. As a result, new sources of economic growth would be created and more experts in EE would be produced.

Last but not least, Mr. Anand C. Pande, the Executive Director and Founder of Infolliance Sdn. Bhd., talked about energy management as the key to increased productivity.



*Mr. Anand
C. Pande*

The second session continued with 'Green Building' as the theme. This session was chaired by Ir. Francis Xavier Jacob. The second keynote address was delivered by Ir. Loo Hip Peu, President of Malaysian Green Building Confederation, titled 'Leveraging Sustainability – The Next Wave (for the Built Environment)'. He said sustainability has been a worldwide agenda and is currently seriously impacting the building industry. He explained that the first wave of the green movement largely saw the deployment of multi-criteria, environmental rating tools for buildings. He added that the need to reduce carbon emission had resulted in the mushrooming of Green Buildings worldwide, especially in Malaysia. Ir. Loo also stressed that the next wave in the green building industry would, principally, be driven by the following:



*Ir. Loo
Hip Peu*

largely saw the deployment of multi-criteria, environmental rating tools for buildings. He added that the need to reduce carbon emission had resulted in the mushrooming of Green Buildings worldwide, especially in Malaysia. Ir. Loo also stressed that the next wave in the green building industry would, principally, be driven by the following:

- a) a deepening of the green building market which will increasingly devolve down to products and system
- b) a move to look at communities and cities on a global basis.

His keynote address focused on the second trend which was 'benchmarking' cities and communities. He started with a review of current initiatives and works on 'green', 'liveability' and urban-ecology in context of cities and communities by European researchers. He then briefly explained the internationally available (or used) 'Community-Environmental Rating Tool' (BREEAM, Green Star, LEED Communities, GBIT etc). He indicated that there were five key principles for sustainable communities:

- a) Liveability
- b) Economic Prosperity
- c) Environmental Quality
- d) Place Making
- e) Urban Governance.

The second speaker for the session was Ar. Michael Ching. His topic was on 'Affordable Green Building: Fact Or Fallacy?' He talked about how medium cost residential projects can still obtain the desired Green Building Index (GBI) and be considered as w'green buildings'. First, he drew out the GBI Assessment Criteria, which was divided into six sections:

- a) Energy efficiency (EE)
- b) Indoor Environment Quality (EQ)
- c) Sustainable Site Planning and Management (SM)

- d) Material and Resources (MR)
- e) Water Efficiency (WE)
- f) Innovation (IN).

Each section had different maximum points and was based on the total points the green building rating varied from normal certification to Platinum rating. He then demonstrated how medium cost (slightly above low cost) residential units would be able to obtain good GBI rating without incurring too much expenditure. He concluded by stressing that affordable green building is a fact.

The third speaker was Mr. Bikash Kumar Sinha (Director, C2C Project Management), who spoke on "Carbon Benchmarking". His presentation was based on a multi-million ringgit project entitled, "Environmental Declaration Scheme For Construction And Building Materials". This was a collaboration project between SIRIM, The Carbon Trust, Federation of Malaysian Manufactures (FMM), Malaysian Green Building Confederation and Building Materials Distributors Association of Malaysia (BMDAM).



Mr. Bikash Kumar Sinha

Its main objective was to drive for continuous improvements in the sustainable production, manufacturing and use of materials for the construction and building sector in the country and its export markets. It also aims to produce guideline tools and the supporting mechanism for product footprinting and labelling (meeting the needs of the local and international market). He later briefed the audience on Environmental Management System ISO (14001/4) and the concept of Life Cycle Assessment (LCA) in determining carbon footprint. He concluded by displaying the labels of carbon footprint used by various countries and emphasised that carbon footprint for a product or service was determined by the greenhouse emission produced directly or indirectly during the lifecycle of a product, material or service i.e. from cradle to grave, including use phase in association with human activities.

The final speaker for the session was Ms. Adrienne Heaney who spoke about "The Transformation of Green Construction in Australia". She said the green construction transformation in Australia was carried out through Rating (Green Star Rating), Educating (by educating the public; 60,000 people in Australia are trained in green building and sustainable communities) and finally Advocating. She said these methods have successfully improved energy efficiency as well as reduced water consumption and greenhouse emission. She then elaborated on current green building designs in Australia which ranged from school buildings to commercial office buildings. She concluded by saying that in Australia, "green star" buildings were able to command a better rental yield which was a motivating factor for building owners to obtain such a rating.



Ms. Adrienne Heaney

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21 NOVEMBER 2013 – CONFERENCE DAY 2

The second day of IIEC 2013 started with the session themed 'Energy Management And Smart Grid', chaired by Prof. Dr Ir. Hew Wooi Ping.

Mr. Matthias Gerber was the third keynote speaker for the conference. His presentation was spot-on in encouraging thoughts on innovations in energy and sustainability. He reminded us that Malaysia was committed to reducing carbon intensity by 40% by year 2020. He strongly believed that energy efficiency should start earlier than renewable energy generation and that the solution to the challenges of global warming was through changing energy-inefficiency human habits and that should start from home.



Mr. Matthias Gerber

Mr. Christian Jean Chevalier, Vice President of Schneider Electric Malaysia, then spoke about 'What's New In The Smart Grid?'



Mr. Christian Jean Chevalier

Smart grid is said to be able to reduce power losses and is more efficient. According to Mr. Chevalier, Asia is believed to be where changes/transformation on smart grid will happen. However, smart grid needs to be integrated with the existing conventional generation systems. A smart energy management system that focuses on energy control center is needed to manage smart grid, smart cities, services, etc. The challenges lie in the ability to have all stakeholders talk to each other and in the complexity of database migration.

The fourth speaker was Ir. Loo Kok Seng, Senior General Manager (Corporate Planning and Sustainability, Planning Division) of Tenaga Nasional Berhad. His talk on 'TNB's Initiatives In Smart Grid' was most informative. TNB divided its Smart Grid initiatives into three phases. Phase 1 (2010-2011) focused on distribution automation to improve operational efficiency. Phase 2 (2011-2013) was aimed at empowering customers with the installation of 1,000 advanced metering infrastructure (AMI), and improving energy and network efficiency. Phase 3 (2011-2015) will see online condition monitoring and increment in renewable energy capacity.



Ir. Loo Kok Seng

The session continued after a short tea break with the first speaker, Mr. Lim Kok See from Usains Info Tech Sdn Bhd who spoke on 'An Understanding Of Maximum Demand Billing And How To Manage It'. He explained about maximum demand in terms of electricity usage for customers using a supply of 6.6 kV and above. He clarified that for billing, maximum demand was calculated at twice the highest amount of electricity used (in kilowatts) within any consecutive period of 30 minutes in a month. The billed charges then depend on the customer's tariff category. Therefore, he said, it was vital to reduce the maximum demand in order to reduce the electricity bill.



Mr. Lim Kok See

He then illustrated methods that could be used to reduce the maximum demand and the available equipment in the market that could do this.

Dr Mithulan Nadarajah from University of Queensland, Australia, presented a very informative session on the 'Impacts And Opportunities Of Electric Vehicles (EV) On Power Grid'. He said there were plenty of favorable policies around the globe to promote EVs, considering their environmental and economic benefit. Research and development in this area is also fast progressing. Impact of EV on the electrical grid has to be considered as with EV, household energy demand will increase and there will be unpredictable dynamic behaviour when EVs are plugged for charging and an increase in peak demand when EVs are charged at the end of the work day. The impact of EV on the electrical grid includes:



Dr Mithulan Nadarajah

- a) Possible overloading of distribution transformers, distribution lines and cables.
- b) Injection of harmonic currents to the grid.
- c) Violation in limits of voltage regulation.
- d) Increased network power losses and
- e) Potential instability.

Some initiatives taken to reduce the above impacts are:

- a) Valley filling approach of the system load curve
- b) Smart metering system based on multi agent system
- c) Demand management approach based on nonlinear pricing and
- d) Use of energy storage to compensate for sudden demand peak during fast charging.

He concluded by stating that the success of vehicle to grid concept not only depends on technical feasibilities but also on user behaviour and intention.

The next presenter was Dr Mike Lees with 'Recent Smart Grid Project Experience In The UK – The Low Carbon Network Fund (LCNF)'. He said that in UK, the Office Of Gas And Electricity Markets (OFGEM) started the LCNF fund in 2010 to kickstart innovative changes to make the electricity network a low-carbon energy sector. One method used was to accelerate the use of low carbon technologies such as electric vehicles, heat pumps and micro-generation. He then elaborated on Customer Led Network Revolution (CLNR), UK's biggest smart grid project and a project under LCNF. This project involved the implementation of smart grid technology on the Northern power grid electricity network and as well as created thousands of smart enabled homes in North East and Yorkshire. Dr Lees was all praises for this project which focused mainly on consumers and where consumers had more choices and flexibility over the way they used and generated electricity. In conclusion, he said that the knowledge gained from CLNR would be shared with other distribution networks and it would be used as a



Dr Mike Lees

guide on addressing key energy issues related to smart grid technologies and consumer inventions.

The conference continued in the afternoon with Assoc. Prof. Ir. Dr Vigna Kumaran as chairperson. It started with Keynote 4 by Ir. Dr Ali Askar Sher Mohamad, Chief Operating Officer, SEDA Malaysia, titled "RE Development In Malaysia – What's After The Feed In Tariff?" Ir. Dr Ali talked about National RE policy and Action Plan. He said Malaysia was targeting power generation via RE of 985 MW (6%) by year 2015, whereas the target for year 2030 is 4,000 MW or 17%. In line with this, SEDA Malaysia was established on 1 September 2011. Its main function was to advise the Minister and relevant government authorities on all matters relating to sustainable energy, including recommendation on policies as well as law and action to be applied to promote sustainable energy. SEDA also plays an important role in implementing, managing, monitoring and reviewing the feed in tariff (FIT) system.



*Ir. Dr Ali
Askar Sher
Mohamad*

The implementation of (FIT) boosted the RE industry in Malaysia with quota allocation for PV taken almost immediately after the launching of the allocation. The current FIT is being funded by the 1% of electricity tariffs, which is only able to fund about the 50% of the RE target of 2015. If an additional 1% is approved by the government then it will be sufficient to fund almost 50% of the RE target for year 2020.

Ir. Dr Ali stressed that FIT could not continue indefinitely and that an alternative mechanism to boost RE has to be implemented. In his concluding remarks, he presented the possible alternative mechanism which included net metering for residential and small commercial building, utility scale PV through competitive bidding similar to conventional generation and displaced cost for small hydro, biomass, biogas, geothermal, and etc.

The second speaker was En. Saharauddin Sulaiman from the Distribution Division of Tenaga Nasional Berhad. His topic was Renewable Energy (RE) Connection to TNB Distribution Network. En. Saha briefed the audience on the major sources of renewable energy in Malaysia such as solar power, mini hydro, biogas and biomass. He said the connection guidelines for renewable energy could be obtained from:

- a) Renewable Energy Act, 2011 (SEDA Malaysia)
- b) Distribution Code (Energy Commission Malaysia)
- c) Connection of PV Generation (TNB)
- d) DG Generation Guidebook (TNB).

He later illustrated the connection process of RE to the TNB Distribution grid which included the connection process and the types of available connections in Malaysia. He then talked about the technical impacts of RE connection on the TNB grid. The technical impacts considered by TNB are voltage rise, voltage fluctuations, reverse power flow, protection issues, power quality, safety, fault current contribution, overloading and hidden load.

Any connection of RE will be evaluated based on the technical impacts above and must comply with the technical impact guidelines available. He also said there was a penetration limit which was allowed for connection to TNB grid. For connection at PPU (33/11kV) the maximum allowable capacity of DG is 85% of day time/daily PMU trough load (base load). Whereas for connection at PE, SSU (11kV & 33kV), maximum allowable capacity of DG is 50% of cable capacity from connection point to the source and maximum allowable capacity is 2MW. The maximum allowable PV capacity connected to LV feeder pillars is 90% of transformer capacity and each solar connection capacity must be < 250A (180kW). He concluded by saying that TNB supported RE as long as the guidelines were complied with and the penetration limit was not exceeded.

The third speaker Dr Wuthipong Suponthana from Thailand shared his experience of connection of PV to Thailand's grid system. Thailand started using Solar PV 35 years ago. Since then, there were 3 major events and policies to boost solar PV in the country. The initiatives were the accumulated installation of Solar PV energy systems which were 240,000 Solar Home Projects in 2004, Adder scheme incentives in 2006 and the FIT scheme in 2013. The Adder scheme is similar to FIT scheme, where the Thai government supported the investment cost of small power producers to generate electricity using RE for selling back to the three utility companies. He emphasised that Thailand aimed to use RE at 25% of total energy consumption by year 2021. Thailand has drafted Alternative Energy Development (AEDP 2012-2021) plan to achieve this target.



*Dr Wuthipong
Suponthana*

Dr Wuthipong said the major technical issues experienced in Thailand with connection of RE to the grid were voltage fluctuations and other power quality issues. In conclusion, he said Thailand had identified the following provisions to prevent and solve these problems:

- a) To implement PV Power penetration limit
- b) To implement New Inverter requirements
- c) To install remote access PQ meter for PV power plant with install capacity \geq 250 kWp
- d) Remote accessibility by utility company (PEA) to control active and reactive power limit of the plant.

Next, Dr Mithulan started his talk on "Smart Integration Of Renewable Energy" by saying that concerns about global warming and climate change had led to the push for renewable energy around the world. Wind and PV are the forefront RE in the world currently. He briefly presented the different types of PV and Wind technologies available.



*Dr Mithulan
Nadarajah*

He then moved on to smart integration where the main idea behind smart integration was to compensate or to overcome the challenges faced in integration of REs to the grid. Smart integration is aimed at improving losses, voltage profile and enhancing stability and reliability. He further

emphasised that smart grid technologies i.e. incorporation of communication and control can be deployed to increase the penetration of RE. In conclusion, Dr Mithulan pointed out that large scale energy storage was unavoidable if the penetration of PV and wind increased.

The last speaker shared his company's success story on transforming Pajam Landfill into an integrated Renewable Energy Park. He said landfill areas were unsanitary and caused both environment and health hazards to those living nearby. Landfills also caused leachate contamination of rivers and seafront and were potential fire hazards.

Through research and development, Cypark Company developed methods to restore and transform the landfill into a Renewable Energy Park. He explained that the transformation happened through several processes which included having a leachate treatment plant, drilling landfill gas wells and using engineered soil capping method. Today, Pajam RE Park which involved the integration of three resources available at the landfill – solar, landfill gas (biogas), and waste (biocell) – was capable of generating 10 megawatts of power.

CONCLUDING REMARKS

Then the MC invited Ir. Lam Sing Yew to officially declare the IIEC 2013 closed. Besides thanking all the speakers for sharing their expertise and knowledge, Ir. Lam also expressed his gratitude towards members of the

Organising Committee, the Conference Secretariat staff and participants for contributing to the success of the event. He then declared the IIEC 2013 officially closed and said he looked forward to meeting all the delegates again at the next biennial IEM-IET Electrical Conference. ■