

# NEWCASTLE 2017 **Symposium on Microgrids**

Symposium Program  
29-30 November





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Towards a campus microgrid at the University of Melbourne





# 1 Welcome

On behalf of the International Microgrid Symposium Steering Committee and the Newcastle Local Organising Committee, we are pleased to welcome you to Newcastle and the thirteenth in our series of microgrid symposiums. As a microgrid expert, we value your participation in discussions on microgrid and smart grid research, development and demonstration activities.

The purpose of these international events is to exchange information, in an informal setting, on the current state of research, and to identify key technical, economic and policy issues that should be addressed by future work. All previous symposiums have proven to be highly productive and enjoyable. Our goal for the Newcastle 2017 Symposium on Microgrids is to continue our exchange of results from microgrid research, demonstration and deployment worldwide, with an emphasis on recent results and areas of potential international cooperation.

**The previous twelve symposiums have been held in the following locations:**

Berkeley, USA – June 2005

Jeju Island, South Korea – May 2011

Montreal, Canada – June 2006

Evora, Portugal – September 2012

Nagoya, Japan – April 2007

Santiago, Chile – September 2013

Kythnos Island, Greece – June 2008

Tianjin, China – November 2014

San Diego, USA – September 2009

Aalborg, Denmark – August 2015

Vancouver, Canada – July 2010

Niagara-on-the-Lake, Canada – October 2016

To see presentations and other material from these past events, please go to <http://microgrid-symposiums.org/>

We would like to make special mention of our sponsors for this year's Symposium on Microgrids in Newcastle – without them this event would not have been possible.

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|   | <b>OPAL-RT Technologies</b><br><a href="http://www.opal-rt.com/microgrid">www.opal-rt.com/microgrid</a> | <b>Siemens</b><br><a href="http://www.siemens.com">www.siemens.com</a>   |





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## Newcastle, Australia

Newcastle is a cosmopolitan coastal city in the state of New South Wales with an estimated residential population of 162,766. It is quietly reinventing itself from a steel and coal port to a vibrant, creative and thriving industrial city. It is bordered by a stunning coastline with beautiful beaches and is located at the heart of the Hunter Region.

Newcastle's attractions include historic sites, amazing beaches, and the surrounding regions of Lake Macquarie, Port Stephens and the world-class Hunter Valley wine region. Newcastle is Australia's eighth largest city and is located 160km north of Sydney.



In the month of November, Newcastle is characterised by gradually rising temperatures, with daily highs of around 23-25°C (75-78°F), but rarely exceeding 31°C (89°F) or dropping below 18°C (66°F).

## Transport

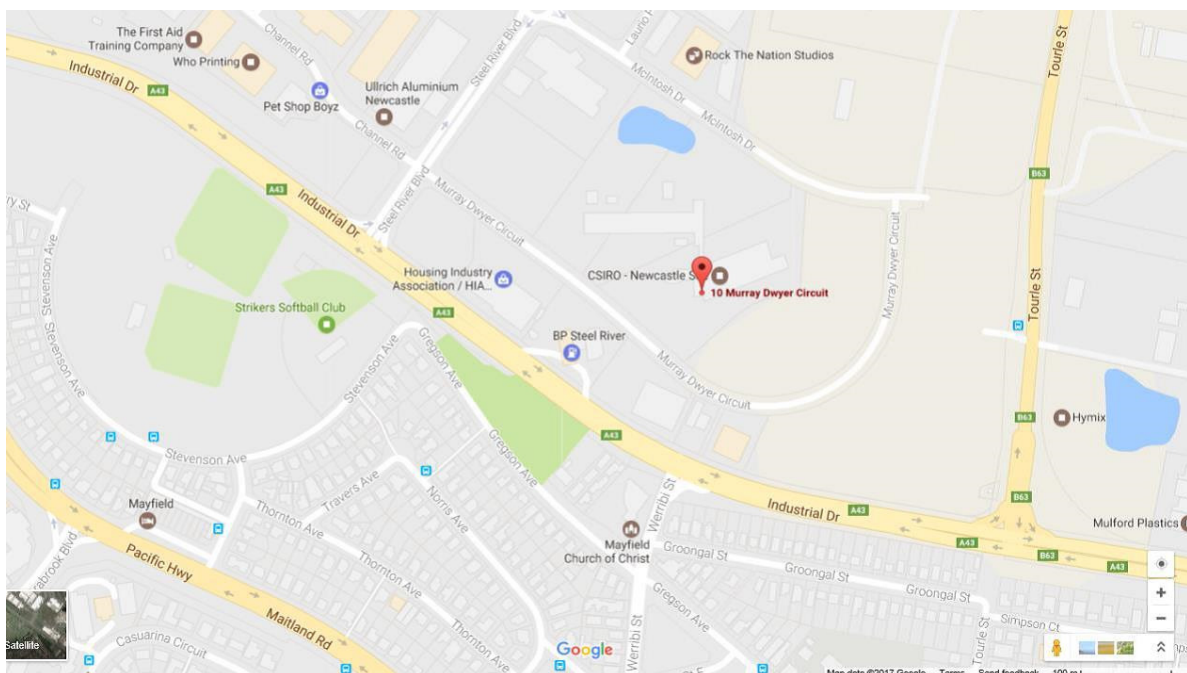
The nearest airport is Newcastle Airport – a regional airport located 30km north of the Newcastle city centre. Shuttle services can be booked in advance with Hunter Connections (<https://hunterconnectionshuttle.com.au/index.php>) and Newcastle Limousines (<http://www.newcastlelimo.com.au/airport-transfrers.html>). Public buses (Port Stephens Coaches) also operate from the airport up to 11 times a day. Alternatively, transport from the airport and around Newcastle can be organised via rental car (Avis, Budget, Europcar, Hertz, Redspot and Thrifty), Taxi (Newcastle Taxis – 133 300) or Uber.

Sydney Airport is an international airport located approximately 170km south of Newcastle. Shuttle services can be booked with Hunter Connections, Newcastle Limousines or Redy2Go (<https://www.redy2go.com.au/>). Airport Link rail services depart international and domestic terminals every 10 minutes – leave the train at Central station and join the Central Coast and Newcastle Line service to Wickham where a dedicated shuttle bus operates (bus service 110) to the former Newcastle station. Rental car services are also available from Sydney airport.

In Australia, driving is on the left side of the road – if you are an international visitor you are able to drive in Australia with your foreign licence so long as that licence is valid and in English. If your licence is not in English, you will need to attain an International Drivers Permit. Ensure you carry formal photo identification (such as your passport) if your licence does not have a photo.

## **The venue**

The symposium and welcome reception will be held at the CSIRO Energy Centre, which hosts CSIRO's solar field and energy research hub. For attendees staying at Noah's on the Beach or the Crowne Plaza Newcastle, we have arranged transportation to and from the Energy Centre (located at 10 Murray Dwyer Circuit, Mayfield West). The symposium dinner will be held on Wednesday evening at the Merewether Surfhouse.



For further detail on transportation, accommodation locations and the venue, please consult the electronic Registration and Information packs provided at your registration, or visit the event page from the email links provided when you registered for this event.

# NEWCASTLE 2017 SYMPOSIUM ON MICROGRIDS



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## 2 Welcome reception and site tour

In addition to the symposium presentations on Wednesday 29 and Thursday 30 November, there will be a welcome reception and site tour of CSIRO's Energy Centre on Tuesday 28 November. The site tours will be held between 3.00 and 5.00pm, with the welcome reception commencing at 5.00pm.

Registration will be open from 2.30pm on Tuesday 28 November, and during the site tour and welcome reception. Registration will open again on Wednesday 29 November from 8.30am. Once you have registered you will be provided with a name tag and registration pack. Please ensure you keep your nametag and accompanying lanyard with you for the duration of the event.

### Agenda for the Newcastle 2017 Symposium on Microgrids Welcome reception & tour – CSIRO Energy Centre, Newcastle

| TUESDAY 28 NOVEMBER – PRE-SYMPOSIUM ACTIVITIES |   |
|--|---|
| 14:00  | <i>Shuttle pick-up from Crowne Plaza &amp; Noah's on the Beach hotels</i> |
| 14:30-19:00                                    | Registration open   |
| 15:00-17:00                                    | CSIRO Energy Centre site tour   |
| 17:00-19:00                                    | Cocktail welcome reception  |
| 19:00  | <i>Shuttle departure from CSIRO Energy Centre</i>                         |



### 3 Symposium program

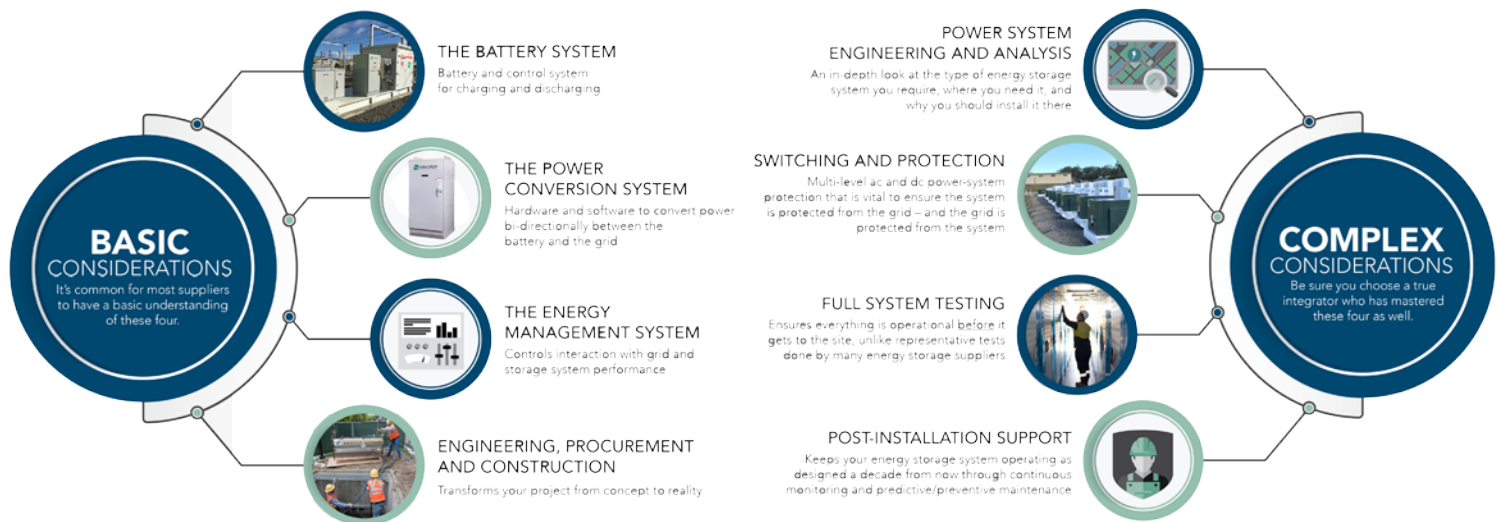
The program for the Newcastle 2017 Microgrid Symposium emphasises the global reach of this area of research by dedicating sessions to particular regions: Asia, Europe and the Americas. In line with previous symposiums, short summaries of the region's research program will be followed by invited speakers who will present their current work on microgrids. In addition to these prepared presentations, group discussion will be encouraged.



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**Agenda for the Newcastle 2017 Symposium on Microgrids**  
**CSIRO Energy Centre, Newcastle**  
**Wednesday and Thursday, 29-30 November, 2017**

| <b>WEDNESDAY 29 NOVEMBER – MORNING SESSION</b> |   |
|--|---|
| <b>08:00</b>                                   | <i>Shuttle pick-up from Crowne Plaza &amp; Noah's on the Beach hotels</i>   |
| <b>08:30</b>                                   | Registration open   |
| <b>09:00-09:05</b>                             | Saad Sayeef, CSIRO & Symposium Chair<br><b><i>Welcome</i></b>   |
| <b>09:05-09:20</b>                             | Lord Mayor of Newcastle, Cr Nuatali Nemes<br><b><i>Official Opening of the Newcastle 2017 Symposium on Microgrids</i></b>               |
| <b>09:20-09:30</b>                             | Ryoichi Hara, Hokkaido University & International Symposium Steering Committee Chair<br><b><i>The Microgrid Symposium Tradition</i></b> |
| <b>09:30-11:00</b>                             | <b>ASIA SESSION 1</b>   |
|  | <b>Chairs: Dong-Jun Won (Inha University) &amp; Jaeho Choi (Chungbuk National University)</b>   |
| <b>09:30-09:50</b>                             | Toshifumi Ise, Osaka University & Alex Chong, A*STAR<br><b><i>Overview of Microgrids in Asia</i></b>                                    |
| <b>09:50-10:00</b>                             | Discussion  |
| <b>10:00-10:20</b>                             | Xiaofeng Sun, Yanshan University<br><b><i>New Direction of Microgrids in China</i></b>  |
| <b>10:20-10:30</b>                             | Discussion  |
| <b>10:30-10:50</b>                             | Samson Shih, A*STAR<br><b><i>Achieving High Reliability: Design Considerations for Microgrids</i></b>                                   |
| <b>10:50-11:00</b>                             | Discussion  |
| <b>11:00-11:30</b>                             | <i>Coffee Break</i>   |
| <b>11:30-12:30</b>                             | <b>ASIA SESSION 2</b>   |
|  | <b>Chairs: Jianhua Zhang (North China Electric Power University) &amp; Hak-Man Kim (Incheon National University)</b>                    |
| <b>11:30-11:50</b>                             | Dong-Jun Won, Inha University<br><b><i>Construction of IoT-Based Campus Microgrid in Seoul National University</i></b>                  |
| <b>11:50-12:00</b>                             | Discussion  |
| <b>12:00-12:20</b>                             | David Stephens, Horizon Power<br><b><i>DER Control &amp; Optimisation on Horizon Power's Microgrids</i></b>                             |
| <b>12:20-12:30</b>                             | Discussion  |
| <b>12:30-13:30</b>                             | <i>Lunch</i>  |



## Agenda for the Newcastle 2017 Symposium on Microgrids

| WEDNESDAY 29 NOVEMBER – AFTERNOON SESSION |  |
|---|--|
| <b>13:30-14:00</b>                        | <b>PLENARY SESSION</b>   |
|   | <b>Chairs: Ron Brandl (Fraunhofer IWES) &amp; Ali Mehrizi-Sani (Washington State University)</b>   |
| <b>13:30-14:00</b>                        | Peter Asmus, Navigant<br><i>Overview of the World Microgrid Market</i>   |
| <b>14:00-15:30</b>                        | <b>PANEL SESSION: State-of-the-Art in Microgrid Hardware</b>   |
|   | <b>Chairs: Ron Brandl (Fraunhofer IWES) &amp; Ali Mehrizi-Sani (Washington State University)</b>   |
| <b>14:00-15:30</b>                        | <ul style="list-style-type: none"> <li>- Cyprian Peters (RTDS Technologies, Canada)</li> <li>- Craig Blizzard (ABB, Australia)</li> <li>- Pierre-Francois Allaire (OPAL-RT, Canada)</li> <li>- Owen Lock (S&amp;C Electric Company, Australia)</li> <li>- Frankie Lu (Siemens, Australia)</li> <li>- Ron Hall (EPSA-CAT, Australia)</li> </ul> |
| <b>15:30-15:45</b>                        | <b>GROUP PHOTO SESSION</b>   |
| <b>15:45-16:00</b>                        | <i>Short break</i>   |
| <b>16:00-17:00</b>                        | <b>POSTER INTRODUCTION</b>   |
|   | <b>Chairs: Miky Albu (Politechnica University of Bucharest) &amp; Shigeru Bando (CRIEPI)</b>   |
| <b>16:00-17:00</b>                        | Each poster presenter gives a 3 minute teaser (Posters 1-20)   |
| <b>17:00-17:30</b>                        | <i>Move to hotels (shuttle departure from CSIRO Energy Centre at 17:00)</i>  |
| <b>18:15</b>                              | <i>Shuttle pick-up from Crowne Plaza &amp; Noah's on the Beach hotels to Merewether Surfhouse</i>  |
| <b>18:30-22:00</b>                        | <b>Symposium dinner</b>  |
| <b>22:00</b>                              | <i>Shuttle departure from Merewether Surfhouse</i>   |



## Agenda for the Newcastle 2017 Symposium on Microgrids

### THURSDAY 30 NOVEMBER – MORNING SESSION

|             |  |
|-------------|--|
| 09:00       | <i>Shuttle pick-up from Crowne Plaza &amp; Noah's on the Beach hotels</i>  |
| 09:30-11:30 | <b>EUROPE SESSION</b>  |
|             | <b>Chairs: Goncalo Mendes (Lappeenranta University of Technology) &amp; Mar Martinez-Diaz (KU Leuven)</b>  |
| 09:30-09:50 | Britta Buchholz (ABB) & Maria Brucoli (EDF)<br><b><i>Overview of Microgrids in Europe</i></b>  |
| 09:50-10:00 | Discussion   |
| 10:00-10:20 | Samuli Honkapuro (Lappeenranta University of Technology)<br><b><i>Microgrid Opportunities in Finland</i></b>   |
| 10:20-10:30 | Discussion   |
| 10:30-10:50 | Mar Martinez-Diaz, KU Leuven<br><b><i>ElectrifyMe.org: Research Studies, Trends &amp; Opportunities for Researcher's Community Integrating Renewables Off-Grid</i></b> |
| 10:50-11:00 | Discussion   |
| 11:00-11:20 | Axel Seibel, Fraunhofer IWES<br><b><i>Grid-Forming Inverters in Microgrids</i></b>   |
| 11:20-11:30 | Discussion   |
| 11:30-12:30 | <i>Lunch</i>   |



## Agenda for the Newcastle 2017 Symposium on Microgrids

| THURSDAY 30 NOVEMBER – AFTERNOON SESSION |   |
|--|---|
| 12:30-14:30                              | <b>THE AMERICAS SESSION</b>   |
|  | <b>Chairs: Jim Cale (Colorado State University) &amp; Guillermo Jimenez (University of Chile)</b>   |
| 12:30-12:50                              | Brian Miller, NREL; Alexandre Prieur, NRCAN; & Guillermo Jimenez, University of Chile<br><b><i>Overview of Microgrids in the Americas</i></b> |
| 12:50-13:00                              | Discussion  |
| 13:00-13:20                              | Fereidoon Sioshansi, Menlo Energy Economics<br><b><i>Innovation &amp; Disruption at the Grid's Edge</i></b>                                   |
| 13:20-13:30                              | Discussion  |
| 13:30-13:50                              | Brian Miller, NREL<br><b><i>NREL Microgrid Controller Innovation Challenge Event</i></b>  |
| 13:50-14:00                              | Discussion  |
| 14:00-14:20                              | Ali Mehrizi-Sani, University of Washington<br><b><i>Stability Considerations in Microgrids</i></b>  |
| 14:20-14:30                              | Discussion  |
| 14:30-15:00                              | <i>Break</i>  |
| 15:00-17:30                              | <b>REMOTE SESSION</b>   |
|  | <b>Chairs: Xavier Vallvé (TTA) &amp; Alexandre Prieur (NRCAN/RNCAN)</b>   |
| 15:00-15:20                              | Choo Fook Hoong, Nanyang Technological University, Singapore<br><b><i>REIDS Project at Semakau Landfill, Singapore</i></b>                    |
| 15:20-15:30                              | Discussion  |
| 15:30-15:50                              | Kamlesh Khelawan, The World Bank<br><b><i>Microgrids – A Solution for Electricity Access in the Pacific Island Countries?</i></b>             |
| 15:50-16:00                              | Discussion  |
| 16:00-16:20                              | Dow Airen, NT Power & Water Corporation<br><b><i>Daly River High Penetration Diesel-Solar-Battery System</i></b>                              |
| 16:20-16:30                              | Discussion  |
| 16:30-16:50                              | Junpei Baba, University of Tokyo<br><b><i>R&amp;D Project on Grid Integration of Variable Renewable Energy</i></b>                            |
| 16:50-17:00                              | Discussion  |
| 17:00-17:20                              | Pekik Dahono, Bandung Institute of Technology<br><b><i>Applications of Microgrids for Remote Areas in Indonesia</i></b>                       |
| 17:20-17:30                              | Discussion  |
| 17:30-18:15                              | <b>CLOSING SESSION</b>  |
| 18:30                                    | <i>Shuttle departure from CSIRO Energy Centre</i>   |



#### RESERVED SPEAKERS AND PRESENTATION TITLES

David Edwards, Horizon Power

***Microgrid Automation Tool Using an IoT Backbone***

Ryoichi Hara, Hokkaido University

***Energy Storage Applications in Microgrids***

Maria Nuschke & Ron Brandl, Fraunhofer IWES

***Towards Holistic Testing: Development of a Microgrid Controller***

Chris Marnay, MgDoM LLC

***AC vs DC Building Electricity Distribution***

Yasuhiro Kojima, Mitsubishi

***Microgrid Systems for Remote Islands***

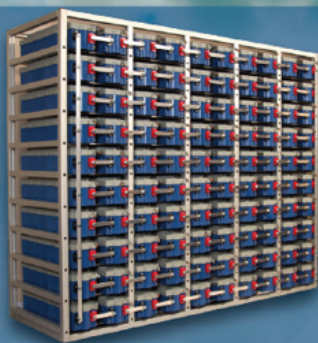
Guillermo Jimenez, University of Chile

***Co-Construction Methodologies & EMS Applications in Microgrids***

Jim Cale, Colorado State University

***Smart Village Microgrids***

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## 4 Posters

### POSTER AUTHORS AND TITLES

Goncalo Mendes, Salla Annala, Samuli Honkapuro & Jarmo Partanen (*LUT School of Energy Systems, Finland*)  
***Microgrid Prospects in Finland: LUT's Contribution***

Samuli Honkapuro, Ville Tikka, Nadezda Belonogova; Jukka Lassila & Gonçalo Mendes (*LUT School of Energy Systems, Finland*)  
***Optimization of Battery Energy Storage Systems for Multi-Market Participation***

Paul E. Roege & Ivan Celanovic (*Typhoon-HIL*)  
***Integrated Microgrid Development Using Real-Time Controller Hardware-in-the-Loop Capability***

Jong-Nam Weon (*KEPCO*)  
***Development of Energy Management System for Island Considering Renewable Energy & Diesel Generators***

Jong-Nam Weon (*KEPCO*)  
***A Sensitivity Analysis of Economics of Remote Microgrid System***

Irina Ciornei, Mihai Sanduleac, Lucian Toma & Mihaela Albu (*UPB*)  
***Optimal Capacity Planning & Scheduling of BESS Serving Communities Resilient to Regulatory Changes***

Gilsung Byeon, JinHong Jeon, ChulSang Hwang & GyeongHun Kim (*KERI*)  
***Real-Time Testing Platform for Load Management Strategies of DC Microgrid System***

Parisa M. Shabestari & Ali Mehrizi-Sani (*WSU*)  
***Reachability Analysis for a Voltage-Sourced Converter in a Microgrid***

Han Wang, Eduardo Martínez Ceseña, Nicholas Good, Angeliki Syri & Pierluigi Mancarella (*University of Melbourne*)  
***Techno-Economic & Business Case Assessment of Multi-Energy Microgrids with Co-Optimization of Energy, Reserve & Reliability Services***

Marc Pelletier (*Smart Storage Pty Ltd T/A Ecoult*)  
***Lead Acid Batteries in MW Scale Multi-Purpose Applications***

Byung-Chul Kim & Hye-Yoon Jeong (*KDNERI*)  
***MicroGrid Agent System using ESS***

Soumya Thomas, Shyam A. B., Soumya Ranjan Sahoo & Sandeep Anand (*IIT Kanpur*)  
***Cooperative Control of DC Microgrid Using Average P.U. Current Estimator***

Shigeru Bando & Takayuki Higo (*CRIEPI*)  
***Development of Web-Based Scheduling Tool of Facility Operation for Energy System of a Microgrid by Using Open-Source Software***

Xavier Vallvé & Prosper Magali (*Trama TecnoAmbiental/ENSOL*)  
***PV Rural Microgrid in Tanzania***

Brian Miller (*NREL*)  
***NREL – Autonomous Energy Grids***

Ron Brandl, Juan Montoya, Maria Nuschke & Diana Strauss-Mincu (*Fraunhofer IWES*)  
***Towards Holistic Testing: Development of a Microgrid Controller***





#### POSTER AUTHORS AND TITLES

Daniel Gerber, Vagelis Vossos, Wei Feng, Richard Brown, Aditya Khandekar, Bruce Nordman & Chris Marnay  
(Lawrence Berkeley National Laboratory)

***A Comparison of AC versus DC Distribution in Commercial Building Nanogrids***

E. A. Martinez Cesena & Pierluigi Mancarella (University of Melbourne)

***Optimal Placement & Design of Low-Carbon Microgrids for Electrification Planning Based on Satellite & Mobile Phone Data***

Giel Van den Broeck, Jeroen Zwysen, Raf Ponnette & Johan Driesen (KU Leuven)

***Bipolar LVDC Test Lab***



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## 5 Post-symposium tour

For those who have registered to attend the post-symposium technical tour on Friday 1 December, we will be visiting Narara Ecovillage located south of Newcastle on the Central Coast of New South Wales.

Narara Ecovillage is an intentional community being built with the aim to achieve economic, environmental and social sustainability. The village utilises smart grid technology to monitor loads and determine usage patterns, particularly peak load periods. It also utilises the forecasting of weather events, especially those affecting renewable energy generation. Sixty new homes will soon be connected to the community's microgrid, which will include 471kW of solar PV, 460kWh of energy storage, integrated demand side management and control systems.

For more information please visit <http://nararaecovillage.com/news/>. Following a tour and presentation, a networking lunch will be held at the village before returning to Newcastle.



### Agenda

#### Newcastle 2017 Symposium on Microgrids Post-symposium tour

##### FRIDAY 1 DECEMBER – POST-SYMPOSIUM TOUR

|              |   |
|--------------|---|
| <b>08:30</b> | <i>Shuttle pick-up from Crowne Plaza &amp; Noah's on the Beach hotels</i>                             |
| <b>09:00</b> | <i>Shuttle pick-up from CSIRO Energy Centre</i>   |
| <b>10:15</b> | Arrival at Narara Ecovillage  |
| <b>10:30</b> | <b>Tour of Narara Ecovillage</b>  |
| <b>12:30</b> | Lunch   |
| <b>13:30</b> | <i>Shuttle departure from Narara Ecovillage</i>   |
| <b>13:45</b> | Drop off at Gosford train station   |
| <b>15:30</b> | Arrive at Newcastle<br>(Drop off at CSIRO Energy Centre, & Crowne Plaza & Noah's on the Beach hotels) |



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## 7 Symposium committees

### International Symposium Steering Committee

| Name   | Organisation                     | Contact  |
|--|----------------------------------|--|
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## Local Organising Committee

The Newcastle 2017 Symposium on Microgrids has been organised by CSIRO and the University of Melbourne. We would like to thank this year's Local Organising Committee for their efforts in bringing this symposium to Newcastle. We hope you enjoy the 2017 symposium, and your time in Newcastle, Australia.

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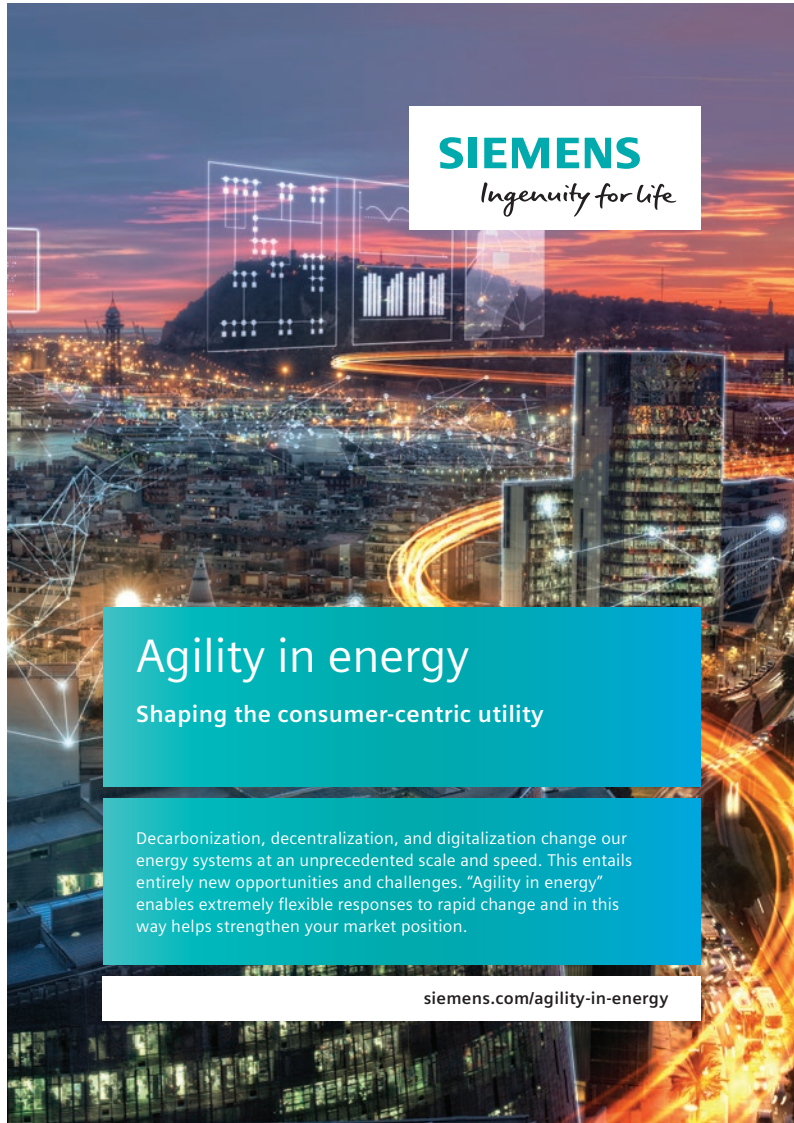


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