Energy Systems Integration in smart buildings, communities and microgrids

The University of Melbourne, Melbourne, Australia, 21st-22nd March 2017

Room **TBD**

*Organised by **The University of Melbourne** and the*
International Institute for Energy Systems Integration (iiESI)

Workshop background

Decrease in cost of distributed renewable energy sources (e.g., PV) and energy storage and the ubiquitous penetration of ICT technologies are rapidly changing the power and energy system landscape. Furthermore, the rise of the smart grid control-oriented philosophy as opposed to the "conventional" asset-based one to facilitate development of a low carbon energy system is creating new opportunities for end-users to play a more active role in system and market operations. In this context, concepts such as smart buildings, smart districts, community based energy systems, and microgrids are rapidly developing throughout the world and represent a perfect example of Energy Systems Integration (ESI) as an evolving paradigm for future energy systems and exciting emerging research area. More specifically, ESI can be appreciated here from manifold perspectives, for example integration of multiple energy vectors in a multi-energy system context (e.g., electricity, heat, cooling, gas, etc.), integration of energy and ICT technologies, integration of "distributed" and "centralised" power and energy systems, integration of consumers and producers, and so forth. In the light of the above, the aim of this workshop is to present and discuss some of latest developments, challenges and opportunities in the ESI area with focus on applications in buildings, districts communities, and microgrids.

Day 1

The first day will involve presentations and discussions, also based on briefing papers previously circulated, on technical (morning) and socio-economic and business case (afternoon) aspects of smart buildings, districts, communities and microgrids.

8.30 – 9.00 Registration, Tea & Coffee

9.00 – 9.15 Welcome and opening – Pierluigi Mancarella, The University of Melbourne

9.15 – 9.30 Workshop objectives - Mark O'Malley, University College Dublin, Ireland

AM Session: Technical aspects - presentations and discussion
Chair: Mark O'Malley, University College Dublin, Ireland
The first morning session will cover technical aspects associated to energy systems integration at the level of smart buildings, districts, communities and microgrids.

9.30 – 10.00 Integrating PV and storage in communities and microgrids: distribution network challenges and smart grid solutions – Nando Ochoa, The University of Melbourne

10.00 – 10.30 Hybrid solar PV-diesel Microgrids – Prof Michael Brear, The University of Melbourne

10.30 – 11.00 Data analytics in smart buildings and community energy systems – Prof Rob Hyndman, Monash University, Australia **TBC**

11.00 – 11.30 Coffee Break

11.30 – 12.30 Discussion: "What are the technical gaps and challenges in understanding and modelling for ESI in districts, communities and microgrids? What are the key technologies to be considered? What are the potential benefits? What's the role of data (for instance from smart meters)?"
Based on briefing paper previously circulated, and involving all attendees

12.30 – 14.00 Lunch Break

PM Session: Business cases and socio-economic aspects
Chair: William D'haesleer, KU Leuven, Belgium
The afternoon session will cover techno-economic and social aspects associated to energy systems integration at the level of smart buildings, districts, communities and microgrids.

14.00 – 14.30 Business cases for smart districts, community energy systems and microgrids – Pierluigi Mancarella, The University of Melbourne

14.30 - 15.00 Socio-economic aspects of community energy systems – Reihanna Mohideen, The University of Melbourne

15.00 - 15.30 Speaker from industry, **TBC**

15.30 - 15.45 – Coffee break

15.45 – 16.45 Discussion: "What are the socio-economic, commercial and regulatory barriers to develop ESI-based districts, communities and microgrids? What is the role of consumers? What is the role of energy policy?"
Based on briefing paper previously circulated, and involving all attendees

16.45 – 17.15 Summary and lessons learned from day 1 – Pierluigi Mancarella, The University of Melbourne

19.00 Dinner

Day 2

The second day will provide further insights into energy systems integration in distributed energy systems but from the perspective of the whole system (AM). Then, three key topics will be discussed in break-out sessions (PM) before summarizing the workshop achievements and next steps.

Whole System-level aspects
Chair: Pierluigi Mancarella, The University of Melbourne
The morning session will cover whole system-level aspects associated to energy systems integration at the level of smart buildings, districts, communities and microgrids.

9.00 – 9.30 Integrated modeling of active demand response with electro-thermal systems – William D'haeseleer, KU Leuven, Belgium

9.30 – 10.00 – Planning and operating integrated energy systems
Mark O'Malley, University College Dublin, Ireland

10.00 – 10.30 Speaker from industry, **TBC**

10.30 – 11.00 Coffee break

11.00 – 12.00 Discussion: "What are the whole system level benefits from integrating distributed and centralised energy systems? How about integrating different energy vectors? What are the challenges? Are they technical, economic or what?"
Based on briefing paper previously circulated, and involving all attendees

12.00 – 13.30 Lunch

PM session: breakout sessions and wrap-up
The afternoon sessions will comprise of cross-cutting multidisciplinary discussions on application domains of ESI. Workshop attendees will opt to take part in one discussion with the aim of having a balance of expertise within each session. Each breakout session will have a designated chairperson.

13.30 – 15.00 Breakout sessions

#1: "What flexibility is possible to obtain, technically and practically, from distributed energy systems?" - Chair: William D'haeseleer, KU Leuven, Belgium
#2: "How can we deliver integrated energy systems for smart cities?" –**TBC**
#3: "What role is energy systems integration playing in the interaction between distribution and transmission?" – Chair: Luis Ochoa, University of Melbourne, Australia

15.00 – 15.30 Read-out from breakout sessions (from the Chairs)

15.30 – 15.45 Coffee Break

15.45 – 16.30 Final discussion and next steps - Chair: Mark O'Malley, UCD, Ireland
The final group discussion will involve all attendees and will be centred on the written output of the workshop. Tangible to address the identified research and practical challenges and opportunities will be discussed. The discussion will also focus on next steps and how to engage interested parties who could not attend.

16.30 – 16.45 Workshop closing remarks – Pierluigi Mancarella