**TITLE:** Smart Grid Interoperability Use Cases for Extending Electricity Storage Modeling within the IEC Common Information Model

**PRESENTER:** Nigel Hargreaves

This presentation is based on a paper by the same title co-authored with Alex Carter of National Grid Electricity Operations, UK, and Gareth Taylor of Brunel University, UK. The paper has been accepted for publication on the IEEE eXplore database subsequent to the 47th Universities Power Engineering conference, which will be held in September 2012.

**CONTACT (presenter):**
Nigel Hargreaves is with Brunel University Institute of Power Systems, Brunel University London, Uxbridge, UB8 3PE. (e-mail: nigel.hargreaves@brunel.ac.uk)

The presentation to the CIMug will fall into four general parts:

1/ We argue for the IEC 61970 CIM architecture to extend and support more diverse forms of energy storage than it does currently. In view of the scaling-up of energy storage systems which are different to pumped hydro and CAES, and a number of emerging use cases for energy storage, we assume that grid-scale energy storage systems will be a reality in the near future and will require the CIM to model their information requirements. Some use cases will be reviewed.

2/ Current CIM model ((CIM15 v33) places energy storage within the generation package, but storage offers both demand and generation capabilities. Does this mean that to address future grid-connected energy storage technologies we should re-structure the CIM architecture? The proposed model for energy storage will be presented as a separate package of classes (Energy Storage Package), objects and interactions and its composition is revealed. It is designed to be a template for the 'connection' of different storage technology information models within IEC 61970 and follows the logic of the current pumped-hydro model. It therefore respects existing class re-use as far as possible.

3/ Energy storage within energy security is considered. A small extension to the existing fossil fuel class is proposed to enable planners to be more able to model stored energy capacity in depots and fuel stores, but this raises a wider question about the role of the CIM in future and whether it's scope needs to be widened to address the continual arrival of new use cases for energy information? In the early days, the CIM was considered an EMS-API. It has now outgrown that to become a domain ontology. What is it's identity for the future as the energy domain evolves?

4/ Future work includes the need to develop the proposed extension to include finer detail with respect to different energy storage technologies, in the form of necessary enumerations and characteristic attributes within class objects. Another strand of work would ideally quantify the use cases behind the ES model development into the form of IEC 62559.