

Cynulliad Cenedlaethol Cymru Pwyllgor Amgylchedd a Chynaliadwyedd	National Assembly for Wales Environment and Sustainability Committee
Dyfodol Ynni Craffach i Gymru?	A Smarter Energy Future for Wales?
Ymateb gan Yr Athro Ian Knight Prifysgol Caerdyd (Saesneg yn unig)	Response from Professor Ian Knight Cardiff University
SEFW 04	SEFW 04



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National  
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Wales

## Support for a Smarter Energy Future for Wales

Evidence provided by Professor Ian Knight, Cardiff University. Writing in an individual capacity

The evidence provided in this submission relates to the questions on 'Storage', 'Energy efficiency and demand reduction' as well as 'Communities – making the case for change' but to include Non-Domestic Buildings as well as Domestic.

The correspondent has been involved in research and practice into energy management and energy efficiency in buildings since 1981, and his more recent European Union funded research has been examining the practice of achieving **operationally** low energy buildings through data collection, collation and reporting. The findings and publications from this research can be found at [www.harmonac.info](http://www.harmonac.info) and [www.iservcmb.info](http://www.iservcmb.info).

The findings from the HARMONAC project led to the European Commission's recast Energy Performance in Buildings Directive (2010/31/EU) being amended to 'encourage the introduction of intelligent metering systems' and 'encourage, where appropriate, the installation of active control systems such as automation, control and monitoring systems that aim to save energy'. The reasons for these amendments were the significant operational energy savings being shown in HARMONAC that arose from providing detailed operational data reports back to the system operators and end users.

The iSERVcmb project built on this finding to design and implement a procedure and system for collecting, collating, analysing and reporting on the operational energy use of Estates, Buildings, Systems and Components across EU Member States. The project achieved average total electrical energy savings of 9% in the participating Buildings and Systems from across the EU.

The project recruited 330 buildings, comprising 2,831 HVAC systems, 7,685 HVAC components, 2,230 Meters, 11,173 Spaces, 72 Activity types and 1,551,638 m<sup>2</sup> of floor area, from 20 EU Member States during the 2011 to 2014 project period. This can be seen to be a suitably large sample to provide confidence that the findings could be scaled up to National level.

A further project proposal to Horizon 2020 which will do exactly this is awaiting a decision. If successful the iSERVcmb procedure will be refined and implemented in 5 EU MS in conjunction with National Legislators, to enable them to take advantage of the exceptional returns on investment being generated by this approach.

Assuming that an annual building electricity use within Wales of around 8TWh (about £800M) can be addressed by the use of such an approach, then total annual electrical energy savings for Wales of around 0.7TWh (£70M) appear achievable for a total investment cost which is unlikely to exceed around £14M (based on the minimum 500% RoI found in iSERVcmb)

The reduction of unnecessary energy consumption is a pre-requisite for maximising the % of total energy use that can be met by renewable energy sources, and is a key component of the European Union's ambitions for increasing the % of all energy use that can be met from renewable energy.

A key element to implementing an iSERVcmb-type approach within Wales is the use of a common means of describing buildings and their physical assets which does not require the use of BIM or other software which are daunting to the average user.

The iSERVcmb project has already produced this common template which is freely available to download and use from the project website. A later version is also available.

Common adoption of this approach within Wales would assist Wales in meeting the aims for a Smarter Energy Future for Wales, as well as position it at the forefront of the use of operational data to inform and implement energy efficiency and energy investment at a National level.

The data obtainable from a full-scale implementation of the approach in Wales would enable Wales to meet many of its obligations under the EU's Energy Efficiency Directive and would provide a continuous audit and feedback on the energy use in Wales as a whole.

This, in turn, would help the WG clarify locations and capacities of new energy sources needed across Wales, as well as provide confidence in the Return on Investment that would be obtained from WG investment in new Technologies, by being able to monitor the operational impact achieved from pilot studies against existing methods and techniques.

The approach would also help inform Communities about the size and form of investments they may need to make into Renewable Energy projects by providing unique insights into energy profiles and demands from their existing communities and any proposed expansions.

The data will also provide quantified evidence about which Technologies work best in practice, not just in testing, enabling Wales to put its efforts behind those Technologies most likely to succeed in both the home and global markets. This would make Wales a very attractive place for entrepreneurial SME's and larger companies looking to quickly prove their products in practice.

An example of the real energy savings achieved by this approach can be seen in the figure below taken from the main incomer electricity use in Cardiff University's McKenzie House. The current reduction of the total electricity use of this building from its peak is over 43% - saving nearly 700MWh of electricity (>£75,000) per year.

The figure also shows the iSERVcmb benchmark range of annual electrical energy use that this building is expected to use based on the activities it houses and the way it is serviced, compared to the measured ranges of energy use of other operational buildings. It can be seen to have moved from the 'average' performance range into the 'good' range over the period.

Further reports and data are available if more detail is needed.

On the 'Storage' front, I have been involved with a colleague in assessing the role that Solar Thermal technologies combined with Storage

could have on reducing the annual heating for existing Welsh Domestic property types as originally built i.e. without major changes to their structure, based on the roof areas commonly available to these property types. This study indicates that Solar Thermal plus Storage could have an important role to play in giving existing 'hard-to-heat' and 'hard-to-treat' properties an extended lease of life. This is particularly important in historic buildings and areas where visual and structural changes to existing buildings are undesirable for various reasons.

For the purposes of economies of scale it is likely that solar thermal will, from a practical perspective, be better provided at a larger scale, enabling possibilities for Inter-seasonal Thermal Storage to work alongside district heating in helping address the heating demand in these and other properties.

I am happy to provide evidence orally if required.

