Energy Storage – The Vital Missing Link in UK Energy Policy

Posted on Wednesday 24th October 2012

The recently reported Coalition cabinet dialogues on future energy policy, ahead of the long awaited Energy bill due to be published in November, have highlighted the many choices that need to be made if the UK is to enjoy affordable and resilient energy systems. Much of the discussion may have focused on getting a better deal for consumers, but the nub of the problem lies in the significant technology and policy gaps that need closing if the UK is to deliver on the legislated 80% carbon reduction by 2050. Aside from the public facing debates around gas, nuclear, shale gas, coal and renewables is the little heard issue of Energy Storage – the missing link in national energy policy. The demand for energy is increasing and the shape of both the demand and supply of energy is changing.

The ability to store energy is a key component to ensure national security of energy supply and allow credible implementation of renewable energy. Unlike coal, gas and petroleum – which are available in a physical form – renewable supplies of energy such as solar, wind, and wave are 'virtual' and often only available at a specific location and moment in time. 'Wrong time wrong place' energy generation systems can only be utilised in combination with storage. This is a core requirement for our national resilience to an increasing reliance on such variable energy sources. Recently we have become all too familiar with the dire consequences of the gap in our storage capacity – most notably through the example of wind power suppliers being paid not to generate and supply into the grid even when the wind is active! Storage is one of the key likely solutions to this mismatch between generation (supply) and demand.

Key challenges for the UK are to understand what types of storage are needed, who should own storage capacity, how much and where it should be deployed in the energy system? There is a need to develop a coherent policy approach to energy storage and to stimulate governance and business models to enable rapid implementation.

Technologically speaking, energy can be stored in mechanical, electrical, or chemical devices and in the form of heat. All are probably needed, but in the UK – other than hydro-storage dams – there have been few examples at a significant scale. The need for flexibility in supply means that it is likely that several different types of storage may be needed – since some can be switched on quickly (batteries) whereas others require some time before providing an energy supply (heat, hydroelectric). The place of deployment of different technologies is likely to be at city, region, home and personal/domestic device level. Very large scale storage capacity is likely to be associated with industrial operations or at points of generation and distribution. The role of the electricity distribution network and its flexibility is an essential component in the delivery, and overall cost and viability of any storage scheme. Clearly the point of deployment affects the grid demand and methods through which it may be controlled. The capital costs of national grid infrastructure to accommodate moving to an electrification driven economy and transport will be unaffordable without storage.

Of course all this is a great opportunity for the UK to be innovative and create new businesses to stimulate the economy. These needs are driving new innovation. For example, look at China. There are some radical solutions that have been seen in some of the eco-cities with the emergence of large scale battery parks. Austere landscapes featuring hundreds of soldiers-like batteries standing in military assemblies. These systems help smooth transmission to ensure users receive supply in peak demand periods. But such systems have massive demand on metal and rare earth resources and are barely sustainable.

In the UK we have breakthrough technologies to compete to batteries using cold storage (cryogenic liquids). Merely by compressing air (using power from solar sources) to cause it to form a very cold liquid can provide a command able form of electricity – since when the liquid is allowed to vaporise, the gas can be used to drive a turbine or piston. We have recently seen the worldwide media coverage of two UK innovations;. A car that runs on air – using just air with a cold engine and no combustion, and the first on-grid storage systems using liquid air in Swindon – that can smooth supply at peak demand times. Since the liquid is very cold, the same process technology can be used to recover waste heat.

Storage is not an option but a necessity. The dangers of not understanding storage is that this situation may result in the risk of uneconomic and inappropriate supply and management systems being created. Government and politicians needs to grasp the opportunity.

Professor Richard A Williams
Pro Vice Chancellor and Head of College of Engineering and Physical Sciences