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BULLETIN
DECENTRALISED ENERGY & SMARTER GRIDS

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Smart home technology provider Hive, known for its "smart" thermostat products offered in affiliation with British Gas, just announced the first products based on its ICT based Honeycomb development platform. The products are a door and window sensor and a smart plug. The technology offered as part of the new products is not in itself new, but once Honeycomb becomes publicly available, Hive will be able to 'talk' effectively to home hubs and third-party apps for the first time.

Other companies are sprinting further and further ahead with their own offerings as well and the much anticipated start of a new "smart era" now looks ready to materialise; finally allowing us all to leave behind a time when we ever worried about having left the lights on!

But this is not all, the technology has the potential to generate substantial savings for electricity consumers simply by changing the time at which appliances and gadgets consume electricity.

SO WHAT EXACTLY IS THIS TECHNOLOGY AND HOW IS IT GOING TO CHANGE THINGS FOR US?

The technology is typically referred to as "Smart Grid" technology and uses ICT based technology incorporating "intelligent" metering/management devices. These devices allow for an "intelligent" two-way communication between themselves and the cables carrying electric current to our homes and offices **("Smart Energy Devices")**. The electricity cables form part of a much larger cable network carrying electricity from the plants where it is generated to consumers **("Power Grid")**. The Power Grid also includes wires, substations, transformers, switches and other equipment necessary for the purpose of carrying electricity from the point of its generation to the point of its consumption.

SO WHY IS SMART GRID TECHNOLOGY NECESSARY?

Electricity cannot be stored easily. Although there is a lot of innovation being done in the area of energy storage, it is not yet at a point where it will allow electricity to be stored as cheaply as other sources of energy such as gas and oil. In simple terms, it means that all electricity generated must be consumed. This necessitates constant monitoring of the Power Grid to ensure that only as much is produced as is needed - generate too little and it will cause power outages; generate too much and it will blow the Power Grid.

This constant monitoring and balancing is conducted by the keepers of the Balancing and Settlement Code ("BSC") - Elexon. All licensed electricity suppliers and large scale electricity generators therefore have to sign up to the BSC and enter into contracts agreeing the volume of electricity to be generated and supplied on a speculative basis ("Supply Contracts"). Smaller generators wishing to sell their electricity to the Power Grid (as opposed to selling it over private wire) have to enter into power purchase agreements with the licensed electricity suppliers, to be able to do so. The Supply Contracts are entered into on a half hourly basis to allow for better monitoring of the Power Grid. The meter readings are then sent to Elexon who balance the Power Grid by comparing the contracted electricity generation/ consumption volumes with the actual volumes (based on 1.25 million meter readings taken every day). Elexon then work out a price for the difference and transfer funds accordingly from one to the other (approx £1.5 billion annually).

Electricity generation, transmission and supply is regulated by the Electricity Act 1989 and a license needs to be obtained from Ofgem for engaging in any of the activities mentioned (there are exceptions to this rule but they do not form the subject of this paper).

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SO WHAT IS THE PROBLEM?

Our current electric grid was built in the 1890s and consists of more than 9,200 electric generating units with more than 1 million megawatts of generating capacity connected to more than 300,000 miles of transmission lines. However, it has only been improved upon "in patches" as technology advanced through each decade and it is now stretched to its capacity.

Also, for a century, utility companies have had to send workers out to gather much of the data needed to provide electricity. The workers read meters, look for broken equipment and measure voltage, for example. Not only is this expensive, it is also inefficient as "demand" data from consumer meters is collected "after-the-event" and therefore electricity generators don't really get a sight of the real time demand. This results in them sticking to generating in accordance with "peak" and "non-peak" hours and consequently the grid supply is led by when the power stations are generating as opposed to when there is demand. This results in inefficient generation and supply leading to higher costs.

WHAT'S CHANGING THEN?

There is a great deal of focus now on changing the Power Grid response from generation to demand which has now become possible through the advent of Smart Energy Devices as they allow two way communication between the Smart Energy Devices and electricity suppliers. For the first time collection of real-time energy use data and its communication to electricity suppliers has become possible. But what is a real game changer is that data from the electricity supplier may now also be communicated via the technology to the Smart Energy Devices. This means that not only will electricity usage be captured by the electricity suppliers in real time, but they will also be able to communicate with the Smart Energy Devices potentially managing electricity consumption during peak usage. By way of illustration, the Smart Energy Device will relay the electricity consumption figure to the electricity supplier in real time and the supplier will send instructions back to the Smart Energy Device to turn appliances and gadgets 'off' or 'on' based on whether there is a supply shortage or excess on the Power Grid thereby allowing the Power Grid to be monitored and balanced in real time.

Electricity suppliers will therefore now be able to act on the real-time demand data collected by it by sending instructions to the Smart Energy Devices to turning on devices consuming electricity (if there is too much power in the system) or turn off devices consuming electricity (if there is too little power generated in the system). This "intelligent" Power Grid will therefore allow for a swift and accurate response referred to in industry terms as a "demand side response" creating not only an efficient Power Grid but also reducing costs which will in turn result in lower bills for consumers.

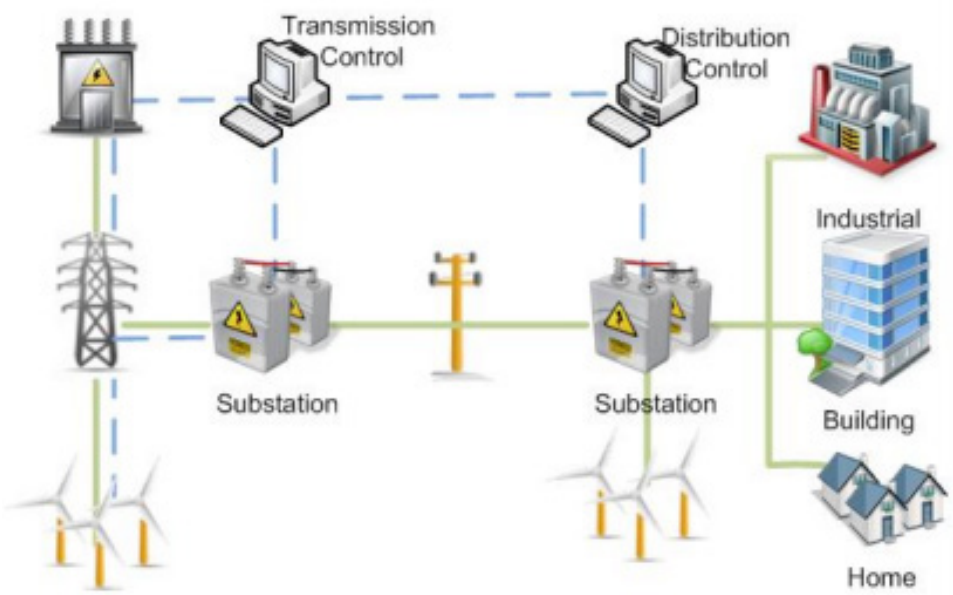
The number of applications that can be used on the Smart Grid once the data communications technology is deployed is growing as fast as inventive companies can create and produce them. The Hive/Honeycomb is just one such - there will no doubt be a "bee-line" of inventive products offered to the markets as we enter the Smart Grid era!

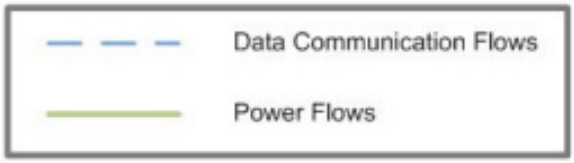
Ashfords is currently engaged in respect of a major Smart Grid project on the Isles of Scilly where the Islands along with key partners are seeking to implement the "Smart Islands Vision" constituting various projects, including the development and installation of an innovative cloud-based ICT platform and home energy management devices to implement a cutting-edge Smart Grid, with the aim of achieving a self-sufficient and low carbon island community. The Smart Islands Vision is expected to deliver a 20% reduction in average electricity bills across the Islands in the first 5 years and 40% reduction over the first 10 years, with over 40% of the Islands' energy generated from renewable resources.

A diagram demonstrating the current or "Conventional Grid" and another demonstrating a "Smart Grid" is set out below. Please note that the diagrams are purely provided for reference and reliance should not be placed on their accuracy:

CONVENTIONAL GRID

(One-way data communication)





SMART GRID

(Two-way data communication)