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REI – the leading magazine for the renewables sector since 2008

Universities' research shows quantum mechanics could slash cost of solar energy

New research is offering the prospect of cheap and efficient solar cells of a conformable type that could be worn on the body or even painted onto windows. Sunlight is the most abundant source of renewable energy, and learning how best to harvest this radiation holds the key to meeting the world's future power needs. For solar energy to become a viable alternative to fossil fuels, solar cells need to be both inexpensive to manufacture and efficient in terms of energy they collect. Now a Scottish-led team has taken a major step towards this goal by using quantum mechanics to design molecular solar cells to be more efficient.

The researchers from Heriot-Watt, Oxford, Harvard and St Andrews universities have been looking at organic solar cells, which use organic polymers which are less expensive to produce. However, they are normally relatively inefficient, throwing away around 90 per cent of the power they absorb. The team has found a way to use interference between the excited states of molecules to stop them re-emitting sunlight, thereby wasting already absorbed energy. This disproves the assumption that absorption and emission of light by molecules must always go hand-in-hand, limiting how efficient solar cells can be. The breakthrough, published in *Physical Review Letters*, centres on the discovery

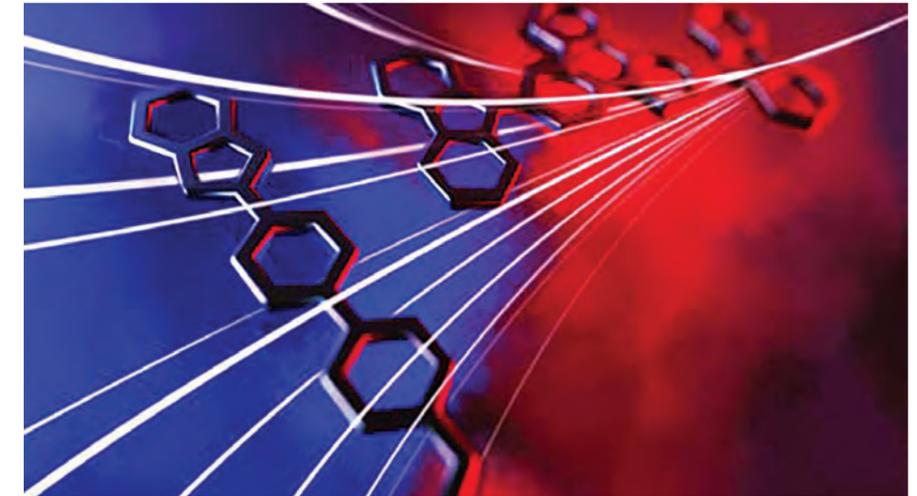


Image: Heriot-Watt University

that asymmetric structures can outperform identical molecules ensuring more sunlight is converted into electrical energy. This has allowed the team to identify literally thousands of possible pairs of coupled molecules that could be used to improve solar cell operation. Dr Brendon Lovett, of the School of Physics and Astronomy of the University of St Andrews, explains, "Quantum mechanics can be used to help improve the performance of solar cells, and we have shown that the effect could be harnessed in many different device designs. We are not limited to very specialised choices of material. This really simplifies how to

build a quantum-enhanced solar cell, and hopefully we will see one being made in the next few years." Lead-author Dr Erik Gauger, of the Institute of Photonics and Quantum Sciences at Heriot-Watt University, added, "What really surprised us is that embracing the imperfections that distinguish realistic molecules from theoretical toy models, can lead to better-performing designs. Whilst we understand the physics behind that now, at the outset of the study we expected exactly the opposite." The team hopes to see a quantum-enhanced solar cell being made in the next few years.

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Government policy forces rethink for leading onshore wind engineering firm

One of the UK's leading onshore wind turbine experts has announced ambitious plans to take its engineering business in a new direction after the Government's decision to halt support for the renewable energy source.

Windcare, which successfully installed more than 300 wind turbines across the UK, has created Sancus Utilities and is now actively seeking to win work across a broad range of sectors.

The new multi-disciplined construction, civil engineering and M&E infrastructure provider will specialise in the energy, telecoms and marine sectors. Windcare will remain as a sister company to Sancus and will continue carrying out servicing and maintenance work on existing onshore turbines as well as launching a range of offshore services next year.

Sancus Utilities' managing director Alex Thornton said the new company was in active and positive discussions with Tier One and Tier Two contractors in a bid to win work on infrastructure projects across the UK. It is also looking to increase its £4million annual turnover as part of its expansion plans.

He explained: "The decision to take the business in a new direction was forced upon us after the Government effectively killed the onshore wind sector overnight by withdrawing support for it.

"That political intervention, which was unnecessary in my opinion, has not only cost jobs, it has stopped the onshore wind sector in its tracks.

"It has brought everything to a halt just as the industry was beginning to make great strides in playing its part in the renewables mix needed to help give the UK the energy security it urgently needs.

"It's not great news for the UK renewables sector. But there is no point dwelling on what has been done, we have to look ahead and we do so with confidence. We have a great team of 20-plus engineering experts in the business and I'm determined to move it forward and harness all that experience and know-how to win work in



Plumb and Parts Center invests further £2.5m into parts availability

Plumb and Parts Center is ensuring that installers have immediate access to the parts they need thanks to an additional £2.5m investment into branch stock. The investment means unbeatable availability of 200 of the fastest moving parts in every branch with a further 65,000 products available for next day delivery.

It is expected that 20 per cent of all UK household boilers fail during the colder months so Plumb and Parts Center has carried out detailed analysis into the most frequently ordered and required parts across the UK. The 200 includes

parts from all leading brands including Baxi, Honeywell, Ideal, Potterton, Alpha, Ravenheat, Vaillant, and Worcester Bosch.

Simon Allan, Category Director for parts at Plumb and Parts Center explains: "Clearly installers are rushed off their feet at this time of year and it's made worse by the fact that we, as consumers, are becoming unrealistically impatient – it's all driven by smart phones and brands like ASOS and Amazon who've made waiting an alien concept. It's imperative to our business that our stock is readily available for customers so that they can get the job done quickly."

a wider area of infrastructure projects.

"The Government has indicated that it is now looking to loosen the purse strings and bring some major projects forward and we are well placed to play our part in helping to deliver them.

"We're seeing encouraging signs about HS2 and, as a business based in the North, we're excited by the prospect of the Northern Powerhouse initiative leading to other much-needed infrastructure projects.

"It is also encouraging to see that large amounts of private sector money are being spent on important development.

From its base in Pickering, North Yorkshire, the Sancus team provides civil, mechanical and electrical contracting services into high compliance sectors using its in-house teams of highly trained and experienced engineers.

The company has a strong management team with more than three decades of operational experience in the UK construction and engineering sectors.

It has extensive experience working on a wide range of projects, including installing and maintaining multiple energy-from-waste biomass power plants.

Relief as Government plans to axe solar thermal from RHI are scrapped

The Government has dropped plans to remove solar thermal from the Renewable Heat Incentive (RHI) and at the same time has increased the level of support the scheme provides to heat pumps, biomass and green gas technology.

In the Government's official response to its reform consultation, Energy Minister Baroness Neville-Rolfe confirmed the RHI will continue for the four technologies currently supported by the scheme.

The 116-page statement included details of a fresh financing model and a number of tariff increases, including:

- * The tariffs for new ASHPs and GSHPs to be increased to 10.02 pence per kilowatt-hour (p/kWh) and 19.55p/kWh respectively.

- * All new ASHPs and GSHPs applying for support will be required to have electricity metering to monitor their heating system.

- * GSHPs making use of a shared ground loop will continue to be eligible for the non-domestic scheme and will not be eligible on the domestic scheme.

- * The tariff for new biomass installations will be increased to 6.44p/kWh, the level available between October and December 2015, adjusted for inflation.

- * Heat demand limits will be introduced, to limit the level of annual heat demand in respect of which any household can receive support. The heat demand limits will be set at 20,000kWh for ASHPs, 25,000kWh for biomass boilers and stoves and 30,000kWh for GSHPs. However, this will not disqualify properties with higher heat demands from applying to the scheme. There will be no heat demand limit for solar thermal.

The tariffs stated in the response document are in 2016/17 prices and do not take account of any inflationary adjustments which will be made to tariffs on 1 April 2017.

The Government also intend to introduce the option for households to assign their rights to payments through the scheme to a third party. However, this will not be delivered alongside the spring 2017 reforms. The Government now intends that

this will be implemented at a later date, to provide extra time to implement adequate consumer protection.

This reform will make way for new financing models to develop – for example, where a household receives a free or substantially reduced-cost heating system from a third party in return for assigning their rights to RHI payments to this third party.

The reforms also introduce a cap to the annual payments for new domestic biomass systems to make sure owners of larger properties are not overcompensated – there will be similar caps in place for new heat pumps. Alongside this, there will be a slight increase to the tariff for new domestic biomass systems.

The Solar Trade Association (STA), which had mounted a concerted effort to oppose the initial proposals published last March welcomed the announcement.

Paul Barwell, STA Chief Executive commented: "Solar thermal is back, which is great news for businesses and families

who want to bring down their energy bills and do their bit to mitigate climate change.

It is to the new Energy Department's credit that they listened to the very strong arguments we made for retaining solar thermal within the RHI."

The move reflects the robust case the STA put forward on the importance of solar thermal technology, which boasts even greater installed capacity globally than solar PV.

Retaining solar thermal will also help to alleviate fuel poverty as well as efforts to reach the Government's own target of 12 per cent renewable heat by 2020.

Solar thermal's reinstatement in the RHI means there is a great opportunity for growth in a sector that already boasts some of the most advanced manufacturing in the world. With the RHI a typical business user will be able to earn back the cost of their installation within seven years; without the RHI it would have been 21 years, which would have prevented investment.

Endurance Wind Power goes into administration



The UK subsidiaries of Endurance Wind have been placed into administration following the collapse of its Canadian parent company.

Sarah O'Toole and Eddie Williams of Grant Thornton UK have been appointed administrators of Endurance Wind Power (UK) Ltd and Endurance Mftg (UK) Limited.

The companies are wholly owned subsidiaries of Endurance Inc which is located in Vancouver, Canada.

The companies, which employ 45 people, install and maintain wind turbines in a number of locations across the country with a manufacturing facility in Hartlebury, Worcestershire.

There are about 900 Endurance turbines in operation in the United Kingdom (pictured left), mostly the 50 kW E-series model, in addition to several of the 225 kW X-series



New standard for hot water storage with solid fuel

In a joint initiative, HETAS has worked with the Hot Water Association to develop a new standard for hot water storage designed for use with solid fuel appliances.

The first HETAS listing has been awarded to Advance Appliances for their SFUTS multi fuel thermal store (pictured left). With all the plumbing, controls and wiring pre-installed the unit is easy to install in any multi-fuel system.

Using the SFUTS (Solid Fuel Universal Thermal Store) makes it easy to incorporate a wood burner with other appliances such as gas or oil boilers, solar thermal or PV roof panels, off-peak electricity and other inputs for heating and hot water.

Each input has a thermostat control pre-wired to a junction box to control all inputs. Solar thermal is not pre-figured as panel suppliers usually supply a control package.

The SFUTS unit can be specified in three domestic sizes – 210, 250 and 300 litres capacity – and can be supplied as suitable for sealed heating systems so underfloor heating and modern sealed system boilers can be incorporated. The sealed system unit meets G3 safety requirements with three levels of safety so wood burners can be safely installed on a pumped circuit. The unit is CE marked in addition to the HETAS listing.

The store's solid fuel pump also acts as a re-circulator to ensure that cold return temperatures to the appliance are avoided. This prevents condensation, helps the heat up profile and aids efficiencies. It also helps with maintaining even store temperatures. A flue stat is wired into the system to detect when the wood-burner is lit.

Hot water is always mains fed in these systems for power showers and fast bath filling, using an internal high output coil as a heat exchanger through a thermal mixing valve. A small expansion vessel is used as a shock arrestor and a service valve is fitted.

Switch2 and Newport City Homes win award for combating fuel poverty

Switch2 Energy and Newport City Homes (NCH) have won a national award for their joint success in tackling fuel poverty.

More than 750 homes connected to NCH's Duffryn district heating scheme have halved their energy consumption by using Switch2 Energy's G6 smart energy pay-as-you-go meters.

Previously, residents paid a fixed weekly charge for their heating and hot water, but now they have control over their usage and costs, which allows them to budget better and save money.

The joint project was voted 'Best Initiative to Combat Fuel Poverty' in the Association of Gas Safety Managers (AGSM) Supplier Excellence Awards.

Since implementing Switch2's smart pay-as-you-go meters, annual gas consumption at the Duffryn biomass boiler plant has reduced by around 50 per cent, with a saving of around 2032 tonnes of carbon dioxide per year.

The G6 meter makes pay-as-you-go energy more customer friendly. It uses smart wireless technology to replace the traditional corner shop/token-based system. Residents can instead 'top-up' online, by a smart phone app, by phone, or any PayPoint location. The technology includes a graphical display to show residents how much energy they are using - helping them to reduce consumption and save money.

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Here comes the sun! Reasons to be cheerful

Despite the pressures and challenges facing the solar industry, Howard Johns argues that the future is bright

When I built my first solar energy system in 1999 I had no idea what a dramatic transformation and scaling up the solar sector would undergo. My first grid-connected PV system was delivered for something like £20k in about 2003 and to get the customer the grant that was available at the time was a virtually impossible process. At the time it felt like a very big deal. Over the next 10 years there were various different grant schemes and, of course, the Feed-in Tariff, which launched the solar market in the UK onto a new scale.

The system we built for £20k is now available for £2-3k and we have gone from basically no solar anywhere in the UK to probably close to 12GW deployed across some 900,000 installations. That's a pretty spectacular shift if ever there was one. Most of the other technologies – heat pumps, biomass and solar thermal – have grown apace but none like the growth of solar PV, which is now the clear winning technology.



Howard Johns—a revolution is afoot

Consistent

The one consistent thing in the whole journey has been repeated and sudden shifts in the market, which led to massive downturns or huge growth. Unfortunately, working in a market where politics has been such a driving force meant that we had moments where we had to completely rethink our strategy and redirect our business to survive. I guess that probably happened at least once a year.

I remember well the days when the grant scheme that was meant to support our month's work closed after 40 minutes in the first day of the month, and we only got a quarter of our clients through the process. We sat there scratching our heads

as to what we could do next – that was our business shut down for a large part of the month. Many of you out there will have experienced similar things in the past few years – extremely busy periods followed by big gaps and head scratching. Not fun when you are trying to run a business and put food on the table.

Sadly, the market is once more in one of those doldrums. Monthly installation figures for solar PV have hit a new low for many months, and the same is happening for solar thermal. Pretty challenging for anyone running an installation business in the space. Add to that Brexit and the

currency impact, Donald Trump and the general anti-green feeling in the media, and it would be easy to be depressed about things.

Whilst there are no quick fixes to this situation, the STA does have some great advice for Government that could help; like requesting that it reviews the FiT caps and does not change business rates for solar. These are simple things that Government could surely do with no extra funds?

For me, though, the big news and what gives me hope for the future is the trends. We are in such a different place to where we were even a few years ago.

Fastest growing

Globally solar is the fastest growing energy technology – 500,000 solar panels were installed EVERY DAY last year. You, of course, had a hand in that – but it's a staggering number and shows that we are part of something much bigger than the current industry, affected as it is by small-minded politics protecting vested interest.

Economics will trump politics. Solar has been reducing in cost so dramatically in the last few years, it is amazing to me that we can now buy a quality module for less than 40p/watt.

The pace of price reduction is not linear, but it is continuing, and this is going to be the thing that makes the politicians increasingly insignificant.

Already in many parts of the world solar has reached the magic 'grid parity' moment where it is providing energy cheaper than the grid. In fact, in some of the large-scale system tenders solar is providing energy at a rate cheaper than any other source of electricity generation ever! So people are starting to build subsidy-free projects in Italy and Spain, and phase two of the

Who are the RE100 companies?

RE100 is a collaborative, global initiative of influential businesses committed to 100% renewable electricity, working to massively increase demand for - and delivery of - renewable energy.

The private sector accounts for around half of the world's electricity consumption. Switching this demand to renewables will accelerate the transformation of the global energy market and aid the transition to a low carbon economy.

RE100 shares the compelling business case for renewables and showcases business action, while working with others to address barriers and develop transparent reporting mechanisms.

RE100 is delivered by The Climate Group in partnership with CDP, as part of the We Mean Business coalition.

Companies joining RE100 are encouraged to set a public goal to procure 100 per cent of their electricity from renewable sources of energy by a specified year.

Since RE100 was launched at Climate Week NYC 2014, the campaign has continued to gather momentum and is now being rolled out in India and China in addition to Europe and the US.

Companies have joined from all over the world and from a wide range of industrial sectors - from telecommunications and IT to retail and food.

market will open up. It is only a matter of time before that happens here.

There is a commitment to this agenda that we have never seen before. Whilst it may seem irrelevant to you right now, the Paris Agreement is a huge marker in the sand for change. It is basically the world

committing to a total transformation in how it generates and uses energy. It may not feel like it will have an impact, but already it is. Just check out the RE100 group of 100 major companies committed to going 100 per cent renewable. These guys are not doing this for fun – they are

doing it because it makes business sense and, of course, because it is the right thing to do, given what we know. These will surely be our customers moving forwards?

Above all this is the people. All the polling shows that the people want solar above any other form of energy generation. It's a consistent finding. Whilst the market feels challenging, that is the backdrop. The people want this and, let's face it, if people bought systems when I was selling them for £20k, then there must still be a market out there.

Sometimes when things feel the most broken, that is the moment when we find we have actually broken through and what we are doing just became the new normal. I think we are not far from that spot, so keep on keeping on! There is a revolution afoot – a solar revolution!

Howard Johns is MD of ENcome Energy Performance UK, Chairman of the climate change campaign 10:10 and author of Energy Revolution: Your Guide to Rebuilding the Energy System; www.howardjohns.net

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THE POWER BEHIND YOUR BUSINESS



Renewables can get new lease of life from storage



**Bill Wright, ECA
Head of Energy
Solutions**

The electrical energy generated by solar started to move ahead of coal during 2016, a highly symbolic but also practical development. A series of milestones were reached, including the first-ever day, month, quarter and half year, where solar electricity output exceeded that from coal. However, at present most renewable energy generators, such as solar PV and wind, are very variable and any potentially useful energy is lost if it cannot be usefully stored or distributed. There have been far too many occasions when wind power has had to be turned off, as the distribution system has not been able to cope with huge amounts of clean energy.

Fortunately, there is now an increasing awareness of energy storage systems, both at large grid scale and lower commercial scale, which will give renewable energy the capability of supplying a greater proportion of our overall power. Electrical energy storage allows for the smoothing of output, providing clean energy when the peaks of renewable energy supply have passed. As the cost of energy storage falls, the options and finances for 'renewables plus storage' will increase significantly.

From being a small sector, storage is now set to be a bigger contributor to grid supply as financiers discover that there is money to be made. This can be achieved by installing large scale energy storage and 'selling' these services to the National Grid and other distributors in the form of grid balancing and demand reduction. Once this gains momentum we should see an increase in installed systems, giving the grid added stability when its supply from generators is becoming increasingly variable. Even smaller consumers should soon start to see the financial benefits of installing storage systems in domestic and commercial premises by storing low cost energy and using this at high cost times. Once this takes place, we may see a revolution away from large-scale generating units to more distributed generators, feeding through a decentralised network. Should the cost of storage fall sufficiently, the generation and use of electrical energy will never be the same again.

The implications of this shift appear to be truly remarkable, and the ECA will be looking to lead the way in 2017 by developing a programme on the opportunities and challenges of the UK's growing energy infrastructure.

Advertising isn't just for Christmas



**Bruce Allen
CEO
HETAS**

This year, the Christmas adverts from leading high street retailers were as hotly anticipated as Christmas day itself. Whether your favourite was Buster the Boxer (John Lewis), rainbow coloured yetis (Argos) or a talking carrot called Kevin (Aldi), the battle of the ads demonstrated an outstanding quality and standard of advertising in 2016.

Here, Bruce Allen from HETAS, the body recognised by Government to approve biomass and solid fuel heating appliances, comments on advertising in the biomass and wood-burning sector and how it helps HETAS promote their training courses.

"We don't have a Buster or a carrot called Kevin. We do have a very close relationship with the industry and understand what it needs as technology and safe working practice changes.

During 2016 HETAS attended numerous industry events including Ecobuild, Hearth & Home, Installer and Energy Now as well as hosting #HETASLive events nationwide and supporting our sister company Woodsure at the APF Exhibition for the fuel sector

Throughout the events a wide variety of topics were discussed with stakeholders from all areas of the industry. One of the most popular topics discussed is training for the installation of biomass and wood burning appliances. We received lots of enquiries about installation training and upskilling, which we found reassuring given the concerns about the skills shortage within the industry, demonstrating to us a general willingness by installers to upskill.

So the demand to attend training courses is there. Who to train with? At HETAS, we developed the basic courses prescribed by the out of date 'minimum technical requirements' document used by training organisations as a guide to minimum course content a long time ago.

It no longer reflects the current industry needs or modern competence requirements for installers. We seek to attract installers onto our training courses who want to do the best and the most up to date job possible. In this respect we are the industry

specialists and our courses are the most up to date. Our training centres advertise regularly throughout the year with a number of different publications

Increasingly, we are seeing adverts from other training organisations advertising what appear to be the base courses modelled on the outdated minimum requirements, referencing our HETAS training and claiming their courses are cheaper. Whilst this can prove frustrating, we are confident in our product and in having added additional learning criteria which is, in our view, essential to the modern competent installer.

We have a national network of training centres designed to help retailers, sweeps and installers, whether undertaking a refresher to brush up on knowledge and skills, or an entirely new course which allows them to enhance their business' offering.

The adverts we place are available for all to see, HETAS adopts the nationally recognised framework of pre-requisites as a guide to a candidate's suitability for attendance of core training. The pre-requisites are there because the courses are not for those without previous experience. The theoretical and practical principles of installation practice are taught to candidates who have relevant previous involvement in this type of work. They can then go on to seek HETAS registration for the installation, servicing and maintenance of wood burning and biomass appliances and systems.

We are conscious there are instances however whereby certain areas of the pre-requisites do not align with an installers experience to date. In identifying such scenarios, HETAS accredited training centres have responded; each offering their own individual learning pathway. Some focus on the practical elements only, whilst others also offer distance or online learning as an adjunct providing the opportunity for installers to undertake learning as a way of enriching and evidencing their existing experience as a pathway to attending HETAS training courses.

It is important also to note, Government require all registered installers to have a refresher training session every five years to ensure that they are abreast of the latest regulations and practices so that they can in turn maintain high standards of service for their customers.

To conclude, it is wonderful to see and hear the demand for training. We will continue to advertise our courses and promote the offering from HETAS. We might not be able to include Buster the Boxer in our advertising campaigns, but we can be confident we are delivering a quality assured product."



Solar roofing tiles – a new energy revolution?

Elon Musk recently unveiled a new product from his company Tesla, solar pv panels that are also roofing tiles. The announcement was greeted with great fanfare but does the new product really represent a ground-breaking new technology?

Musk's main achievement with regards to solar power has been to develop a sophisticated battery management system that improves the efficiency of solar cells. However, electricity generating solar roof tiles are not a new concept. The idea has been researched extensively and some similar products are already available on the market. Tesla's tile panels come in a number of different types so that they can be integrated into a range of existing roofing designs. They are claimed to be as strong as traditional tiling materials and to have a long design life, though their glass construction slightly reduces their efficiency compared to conventional solar PV panels and are currently expensive.

The technology of solar pv roof tiles offers promise to further expand the amount of electricity generated from solar by integrating the technology into existing structures and maximising the use of space. The most important thing Musk may achieve is the popularising of the technology with his extremely effective branding, which in conjunction with his battery storage technology encourages low carbon distributed energy generation on and off grid.

Tesla's product is being promoted primarily in the US at present but if it successful in promoting solar tiles generally with greater economies of scale production costs may fall substantially. Whether or not it becomes more popular in other markets will also depend on local building regulations and government support mechanisms for their installation but the ease with which they can be retrofitted into existing structures and the large scale they could be installed on makes it a technology to watch for future market opportunities.

To learn more about Renewable Energy and Energy Efficiency through training courses see our website at www.EUenergycentre.org

Installers urged to adapt for a bright future in the commercial sector

In an interview with REI, Trina Solar's Sales Manager for Northern Europe Richard Rushin describes his bright outlook for the UK solar market

The UK sales chief of leading panel manufacturer Trina Solar has called on installers to re-examine their business models in preparation for an opportunity-packed shift in the PV sector.

In an interview with Renewable Energy Installer, Trina's UK Sales Manager Richard Rushin described the current market as the "last hurrah" for the residential market but highlighted how the commercial sector could be as lucrative, with fresh opportunity and rich rewards.

Delivering an upbeat message, Richard Rushin explained: "These are changing times, when you walk around the recent trade shows there are a lot less module manufacturers exhibiting but lots of storage companies, it's a sign of the times.

"We are in an odd time between the end of substantial subsidy support and grid parity – these are tough times but they are also times of huge opportunity.

"We have to look at where the installers have come from and understand that storage is a different beast to solar PV, but installers should understand the massive opportunities that are still out there to be gained in the market."

Opportunities for businesses

Speaking at Trina Solar's UK HQ in Nottingham, Rushin explained his belief that rooftop solar PV will lead the way in the large-scale solar market, as it poses an effective and efficient opportunity for all types of businesses and sizes to achieve maximum energy efficiency, support Corporate Social Responsibility (CSR) goals and reduce dependency on traditional forms of power generation.

"As a manufacturer, Trina is always looking to share its experience and expertise from its different operations around the world," he explained. "We are



Above: Trina Solar's UK Sales Manager Richard Rushin says there are many positive indicators

currently trying to pass on the importance of recognising the commercial market as a sleeping giant.

"Large-scale solar and residential were the low-hanging fruit that got the solar PV market in the UK to the fantastic position it is in today.

"But the feedback we're hearing is that business model is withering away, the order books are drying up and there is a growing appetite to serve the commercial sector and move away from the one-size-fits-all model.

"The biggest opportunity in the solar PV sector for 2017 is definitely in the

commercial area, there are literally millions of rooftops around the country on office blocks and business premises that are perfect for solar panels.

"But there are obstacles and problems with commercial, and just like any other sector these can be resolved and are certainly not insurmountable.

"For example with commercial clients, the actual ownership of the building is often complicated and there can be potential conflicts of ownership. But despite the prospect of property deeds and covenant complexities, the rewards are there to be had.



Above: The Trina Solar showroom

"There are also technical challenges to consider when targeting the commercial properties, many of these roofs are simply there to keep the rain out and not suitable for weight bearing, but that said the size of the prize is colossal."

Rushin suggested that if they hadn't already started, installers should look to adopt their revenue models to continue to grow and develop.

"There are so many different business and serving the commercial market is more nuanced than most with the different considerations and reasons for the client to invest," he added. "But installers shouldn't be frightened by the complexities, they can be resolved and the market is such a sleeping giant."

Excellent return on investment

Rushin explained that while the residential market continues to suffer with lower than expected forecasts, the key to success will now be in mass deployment.

He said: "The days of signing up individual homeowners is over, while it still provides an excellent return on investment installers should be looking at how they install in five, 10 and 20,000 properties at a time.

"There is a lot of targeting on who to approach and how they should be approached. Some of the small and medium-sized installation companies may not be able to compete for the orders of the global corporate giants like a PepsiCo

holistic approach including LED lighting, voltage optimisation, insulation and of course energy storage.

"Installers should be looking at the whole building instead of just generation, energy efficiency followed by generation. It's a natural conclusion of the energy argument.

"We are still here, we've been through the boom and bust of the low-hanging fruit in the residential market. The future for solar is still extremely bright but the shape of the market is changing considerably.

"The companies that depend on three or four orders a week will see their order books dry up. Installers should look at bringing in outside help and developing a portfolio of products.

Rushin described how Trina Solar has supplied 120MW of installations in the UK and is now eyeing up the energy storage market.

"We are aware that storage can stand-alone and complements well the commercial market's idea of solar – it will play a crucial role in the overall mix of microgeneration.

"Solar remains the most popular form of energy for practical and technical reasons. It is easy and cheap to deploy, there are no moving parts and it goes down well with the planners.

"Our message to the installer community would be don't be despondent, solar has a massive future in the UK. It is important to understand what the new audience is and adjust the message accordingly, it is equally as important to understand the market and where you can fit in."



Above: Trina Solar's large-scale Wymeswold installation

A growing company with a focus on excellent service and happy customers

GoEcoRenewables is a young business built on impressive credentials in the sustainable heating industry. Co-owners John Gilham and Chris Delaney may be celebrating their company's first Christmas but between them they have 16 years' experience in the renewable energy market, and York-based GoEcoRenewables has already established a reputation for delivering challenging installations and happy customers.



Company background

Chris Delaney started out in 2008 working for City of York Council, looking after the energy efficiency of eight local authorities across North Yorkshire, before moving on to Vaillant as Renewables Development Manager in the North of England. With three young children, he made the decision to base himself closer to home and took on a development role with a York-based installer, tasked with expanding its renewables business. After a period on the front line with GoGeothermal, he found his ideal business partner in John Gilham and the pair entered into a 50/50 partnership to create GoEcoRenewables.



While Chris manages the commercial aspects of the company, including sales, purchasing and compliance, John looks after the operations side. Also a family man, and a keen sports fan, he has been involved in energy efficiency his entire working life, first in the insulation market and then, for the past eight years, in renewables. After making that move, he initially specialised in solar PV, then made what he describes as the natural progression into heat pump installations. "This is where my real passion is," John says, "I've been installing and commissioning systems for six years and there is no better feeling than seeing your service customers every year and being told their savings and comfort with renewable products."

The first year

Chris and John made the brave decision to 'go it alone' during uncertain times for the industry that have seen many companies close their doors or move away from renewables. However, they strongly believed – and continue to believe – that there is a market for renewables and,

in particular, growth for heat pumps as people look to take control of their energy bills and move away from fossil fuels. That faith looks as though it has paid off with GoEcoRenewables on target to install 30 heat pumps in the first year of trading.

With a further five people who work with them when needed, Chris and John have created a company based on in-depth knowledge and a genuine passion for the products, and a determination to offer honest, practical solutions.

GoEcoRenewables' primary areas of focus are air and ground source heat pumps in domestic new-build and retrofit markets. The business offers additional technologies to complement this core service, such as solar PV, solar thermal, heat recovery and underfloor heating, and does also operate in the commercial arena, having recently installed a heat pump for Whitby Marina.

The company is currently working with or has recently carried out renewables

work for East Riding Council, Scarborough Borough Council and City of York Council. Chris and John typically work within a two-hour radius of York, but will travel further if required. Looking ahead, Chris explains: "I have extensive background working with and for Local Authorities so I would want to build on that knowledge and experience and forge links with social housing providers across Yorkshire and the North East. That is in addition to targeting specifiers and a range of small and medium-sized developers."

The products

Currently, the company mainly installs Vaillant heat pumps, crediting the brand for fantastic back-up and support from its onsite group service engineers to the sales team out on the road. "It also helps that having worked for Vaillant I know the product inside out," Chris points out. "And I've seen the quality and attention to detail that goes into the design and manufacture first hand, having visited the factories in Germany several times."

Materials are purchased from GoGeotherm, with whom Chris has again enjoyed a long working relationship. "They provide excellent service and knowledge when it comes to heat pumps and their range of ground source collector kits held in stock allow us to work very effectively on site if the situation changes," he explains.

Finding solutions

GoEcoRenewables' stated aim is to deliver projects that save customers money and reduce their carbon footprint, in whatever way this is best achieved in each situation. "It depends on the customer and there isn't a one-size-fits-all solution," Chris says. "We offer a bespoke, tailored approach and

GoEcoRenewables Case Study 1: Ground Source Heating added to solar-powered North Yorkshire home

In the picturesque North Yorkshire village of Aldwark one of GoEcoRenewables' customers increased his green credentials. So pleased with the performance of the solar panels installed in December 2015 the homeowner felt that his heating system should also make use of the renewable technology available so he contacted the company again to provide a solution.

GoEcoRenewables carried out a full detailed survey and calculated the property's heat loss requirement, took measurements of the surrounding garden and made its recommendations. While the property is enormously well insulated and has top of the range A rated windows, the house is large enough that the 18.8kW heating demand was too much for a single ground source heat pump.

The company have dealt with a situation like this many times in the past and were able to design a highly efficient solution using two heat pumps in a cascade system. This means that one of the heat pumps is programmed to be the primary source of heating for the property. If and when the outside temperature becomes too low for that heat pump to cope by itself the other unit fires up to give the heating system



the boost it needs. This is a highly efficient way of running a heat pump system for a high demand property as it means that the system is always only using as much energy as it really needs.

The System

Heating: 1 x 11kW & 1 x 8kW Vaillant GeoTherm Ground Source Heat Pump with 500 litre buffer cylinder.

Hot Water: 300 Litre Joule heat pump compatible cylinder

The property is a village which is not connected to the gas grid so our customer was switching from an oil

central heating system to a system which does not require fuel level monitoring, is no longer subject to the vast, unpredictable fluctuations in price or the potential pitfalls of fuel delivery.

The Project

The homeowner was lucky enough to have vast open space behind his home which meant installing the ground loops was very straight forward. The ground source heat pump system required 5 x 250m lopped trenches to be dug and with the help of colleague Will

Continued overleaf

work together with the customer to find out what it is they want to achieve."

When asked to describe the company's most challenging installation to date, he replies: "Hall House was an 11kw and 8kw Vaillant FlexoTHERM GSHP install in a cascade system with 400m of bore holes, accompanied by Nu-Heat underfloor heating. This was a renovation, which presented challenges bringing new technology into an old house. Access for the drillers to install the bores was challenging, as was retrofitting two heat pumps, a hot water cylinder and buffer into a utility room.

"The underfloor heating was a challenge to ensure the floor was properly prepared for the Nu-Heat liquid screed system. It all worked out in the end."

Future vision

Looking forward to 2017, Chris describes the company focus: "We still see us working in the retrofit market but we are establishing good links with developers and architects to install renewable technology to new-build properties.

"These properties are ideal for renewable technology, especially heat pumps with the good insulation levels and underfloor heating. 2017 will also see us develop more of our light commercial projects, such as office blocks, schools and public buildings."

The future aim is to grow the business to install 60-plus installations – double this year's tally – while maintaining a constant emphasis on quality and the customer.

Chris also speaks of the ambition to keep working with likeminded architects

and developers who place renewable technology at the heart of their ethos.

The energy storage answer

Both Chris and John remain unsure about the advantages of providing energy storage systems because they don't yet believe they represent value for money.

Chris explains: "We prefer to direct customers towards something called a solar I-boost, which in essence is an immersion diverter. It directs any excess solar PV gain through the immersion in the hot water cylinder and provides free hot water. It depends on the usage of hot water and on spare PV gain, but typically it can do your hot water from April through to September and saves between £100- and £150 per annum for a cost of £450."

Continued from previous page

McDermott of WM Rural Contractors made a very tidy job of it.

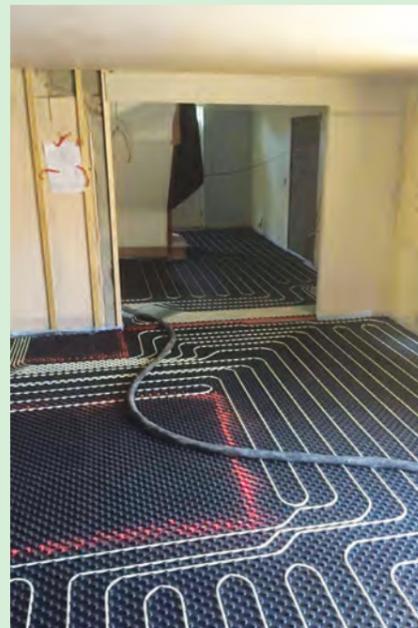
Ground loops in and the ground back filled the company set about installing the heat pumps in the garage, where they would be out of everyday sight but easily accessible for maintenance and their annual service.

Then the company moved on to the underfloor heating. The homeowner was keen to make the heating system as efficient as possible and the inclusion of underfloor heating does just that. Underfloor heating works by radiating a lower temperature of heated water than traditional radiators which means that the heat pump does not have to work as hard to heat the water flowing around the system, making it more cost effective to run the heat pump and more comfortable for the homeowner.

Financial Benefits

Ground source Heat Pump
Installation cost (excluding UFH)
£28600
Fuel Savings against Oil (@45p per litre)
£1315
Renewable Heat Incentive £4987.52
Return on Investment 22%

RHI Payments are made for 7 years for domestic customers. Payments are index linked and tax free in domestic dwellings.
Solar PV - installed in 2015
Installation cost £6293
Feed-In Tariff (@12.47ppkW as at Dec 15) £445.18
Export Tariff (@4.84ppkW) £86.57
Electricity Savings (@14ppkW) £299.98
Fuel Savings for hot water production
£150
Return on Investment 16%.



Above: Preparing the underfloor heating

GoEcoRenewables Case Study 2: Installing an Air Source Heat Pump for Whitby Marina's amenity block

Forward thinking Scarborough Borough Council had already installed an Air Source Heat Pump for Whitby Marina's amenity block however the original installation needed to be updated after many years service. Scarborough Borough Council were keen to ensure that a replacement was installed before winter and contacted GoEcoRenewables to carry out the work.

The company's first task was to survey the building and carry out full heat calculations to ensure that the new heat pump would meet the heating demand of the building. Having calculated that a 14kW heat pump was required the company recommended the Mitsubishi system due to its incredible ability to maintain a 14kW heat output. This means that the marina users will be able to enjoy the refurbished amenity block very comfortably.

The installation was fairly straightforward even though the position of new unit was changed to a more suitable location to improve airflow. However, there was just a small amount of pipework to be redirected



but the heat pump was up and running in less than two days. In order to protect their investment, Scarborough Borough Council opted to include a protective 'cage' around the heat pump. Not only will this casing

protect the unit from damage it will also prevent falling leaves and other debris entering the fans which will make sure that it functions without problems for years to come.

Trailblazing storage project leads the way to low-carbon future

A trial of the largest grid-scale battery in Britain has proved it can potentially transform the energy grid and play a major role in the transition towards a low-carbon economy. The 'big battery', designed and run by UK Power Networks and based in Leighton Buzzard, Bedfordshire, stores energy when demand is low and releases it at peak times.

The Smarter Network Storage (SNS) facility is the first grid-scale battery storage project in the UK and the only one of its kind currently operating on the energy network. It has proved for the first time that energy storage has the potential to be both technically and commercially viable.

The two-year trial of the 6MW/10MWh "big battery" – which is the size of three tennis courts and can store enough electricity to power 6,000 homes for 1.5 hours at peak times.

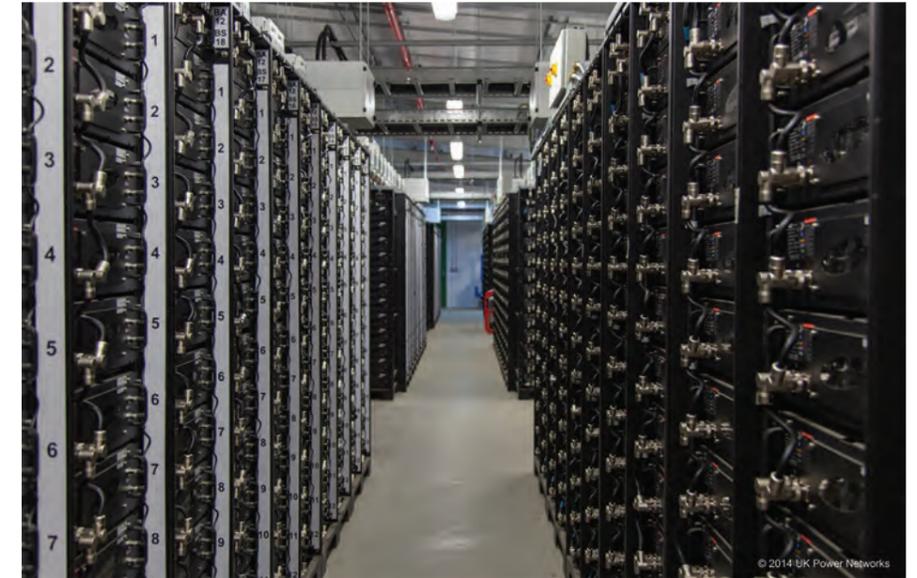
Grid-scale energy storage has a key role to play in a rapidly-changing energy landscape. It can support low-carbon generation by storing energy generated from renewable sources such as wind and solar and releasing it onto the grid when it is needed by consumers.

Suleman Alli, Director of Safety, Strategy and Support Services at UK Power Networks, said the project has delivered insight for the whole industry at a crucial moment in its evolution.

Mr Alli said: "As we move towards a low carbon, decentralized, digital energy system, all eyes are on the role of storage – especially batteries – in Britain's electricity network. We believe that grid-scale storage has a huge role to play in addressing the challenges the industry faces.

"The trial has drawn attention to the fact that the UK's regulatory framework needs to evolve to help exploit its full potential. For example, energy storage currently incurs a double carbon levy – both when it stores energy and when it releases it."

The project concluded grid-scale energy storage could be commercially viable as battery costs continue to fall and revenue streams become accessible.



Top: The 'big battery' trial at UK Power Networks. Below: The company's test facility at Leighton Buzzard, Bedfordshire

The recently published Government Smart Flexible Energy System consultation recognises that storage has a key role to play in the country's future energy supply and makes reference to the issues the trial highlighted.

The Smarter Network Storage project was funded by £13.2million from the Low

Carbon Networks Fund, administered by Ofgem, £4million from UK Power Networks and £1.2million from other businesses partners and academic institutions.

UK Power Networks will continue to operate the battery in Leighton Buzzard, helping to meet the continuing demands for electricity in the Bedfordshire town.

How to grasp the opportunities that beckon in residential-scale energy storage

In December 2007 a friend and I created a solar PV installation business. I think we were about the 12th company in the UK to become MCS registered. Pretty much everyone thought we were insane. “Solar won’t work in the UK”... “Solar panels are way too expensive”... “The payback is over 20 years, who is going to buy them?”... These were just some of the comments. This was, of course, over two years before Feed-in Tariffs came along. I bet those of you that have been in the industry as long have heard similar comments. Now replace the word solar with ‘energy storage’ in those comments. Probably echoes what you’ve heard, and maybe what you actually think to yourself?

The thing is, less than nine years later, for all the trials and tribulations we’ve suffered in the industry, we’re not far off having a million domestic PV installations in the country. Although energy storage is more complex than solar, and not a direct analogy, there are sufficient similarities to learn from. When we started, it was a nightmare to buy product at all, and when we did, solar panels were still nearly £3 per watt. And no FiT. The bottom line is that energy storage is a huge opportunity for solar installers. Is it an instant fix? No. Is it going to be a mass market in the next 18 months? No, probably not. It is, though, a market, and a growing market, and one that in two years will be becoming a mass market. You could, of course, wait until then, or you can get in the game now, and put yourself ahead of the pack.

I work with or speak to nearly every storage manufacturer with product available in the UK: Sonnen, Tesla, LG Chem, SOLARWATT, Powervault, Growatt and Moixa, among others. They are all keen



David Hunt—getting involved is the key

to build a network of qualified, committed, professional and ethical installers, and are already doing so.

Early adopters

Perhaps surprisingly, given the hype, it is Sonnen that has the largest market share globally, ahead of Tesla, and the German company is very active in the UK. I discussed the stand-out statistics from the EuPD report with Sonnen UK Country Director Martin Allman.

“No one is really tapping into the market for retrofitting storage on existing PV systems. This should be the lowest hanging fruit, particularly with the early PV adopters (pre March 2012) on the highest FiT rates,” he said. Martin is another with early UK solar experience. Selling energy storage solutions in the present market is very much like those early PV days, and not very much at all like selling PV in the Feed-in Tariff years, and that is where most installers need to adapt their thinking in order to succeed in the present market.

Martin continued: “We are in an early adopter market and installers need to tap into the buying motivations of these early adopters. It is difficult to try to quickly convince the majority of consumers of a new and innovative idea; it is better to start first with convincing the innovators and the early adopters. Who are the energy storage early adopters? These are popular, educated people – with money to invest. Often they are opinion leaders in their communities; they are more risk-oriented than most, and want to try new ideas and do things differently – but in a careful way.”

The problem is that installers have all become used to selling on return in investment, and right now in energy storage that’s a difficult proposition. With battery prices plummeting that won’t always be the case, but for now buyers have different motivations, and that’s what installers need to think about. It also leaves room for installers to make some margin, which is essential when volumes are low.

Manufacturer support

The EuPD survey results do suggest that people either aren’t engaged with the concept of energy storage, or just haven’t found a brand or product they are comfortable with yet. As I know manufacturers and distributors that run energy storage seminars are oversubscribed, the latter must be true. Before engaging with manufacturers though, it is important to accept that this is not at present a mass market. No manufacturer, even Tesla, can promise or offer an instant deluge of customers with cheque books open. They can, and do, like most installers, offer a package of support, both commercial and technical, to help you enter and succeed in the business.

One company quietly enjoying much success and growing its UK energy storage team is Growatt. I spoke with UK General Manager Scott Feng. Growatt are developing animations and marketing tools to help installers, but are very much focused on providing advanced training and instant, local technical support. Scott

German market researcher EuPD interviewed 1,000 British homeowners about energy consumption and photovoltaics. Respondents who were interested in PV or even PV owners—who make up over a third of the sample—were asked if they knew that PV storage solutions are being offered. Seventy per cent of them answered “no”. The research also suggested that only 50 per cent of homeowners who already had solar PV installed were aware of energy storage solutions.

Top tips

- 1 Don't try to sell storage like you sell solar PV. Don't focus on ROI, but on energy independence, self-consumption, energy security. Early adopters tend to be 'green', savvy and like the idea of being an innovator. Don't forget they also tend to love technology. Know your product offering and have apps to show off and demonstrate if you can.
- 2 Don't try to offer every product on the market. You are better off working with one manufacturer at this stage. A couple at most. Know the offering inside out.
- 3 Seek help from your chosen manufacturer to prepare marketing mailshots to existing and previous customers. Perhaps an 'offer' or add-on for those that bought PV from you in the past.
- 4 Don't expect huge volumes of sales yet. See this as positioning and experience gathering. Of course, you want and need to sell a product, and there is a big market there, even at an early adopter stage, but the flood will come later.
- 5 Be informed. Read the trade publications, attend seminars and events, join a trade association. The Renewable Energy Association (REA) has a dedicated Energy Storage and Decentralised Energy sector group. Others are also active.

explained: “We have been running regular accredited installer training courses and help installers gather deeper knowledge of our battery storage solutions. We believe a qualified installer will provide better service to customers and build up confidence to sell more of our product. “We will have two UK offices, one in the South and one in the North to provide

prompt technical support when an installer needs help on site. We will also have a testing facility and demonstrator systems in our office to test and repair storage units and this and this will help us quickly close up new potential technical issues.”

Other manufacturers, such as Powervault, offer strong technical support but try to design a product that is simple and

elegant, and easy to install, getting as close to ‘plug and play’ as possible and designing their solution to look like (and be) a household appliance, fitting in with dishwashers and washing machines.

In short, all manufacturers are keen to speak to installers, those committed to the long term and prepared to work hard now, to build their profile, reference sites, expertise and experience. In return they are committed to providing technical and marketing support, and hand-holding while you find your feet, and I’m sure some price support too. Do research, reach out to them, engage them. We know that energy storage is going to be a significant market, at all scales. Get informed and get involved.

David Hunt was a director for eight years in a multi-technology renewable energy installer. Currently he is Managing Partner of one of the leading global executive search firms in the clean energy sector. He is also Chair of the Decentralised Energy Forum and a policy board member of the UK Renewable Energy Association (REA) and the Energy Storage Alliance

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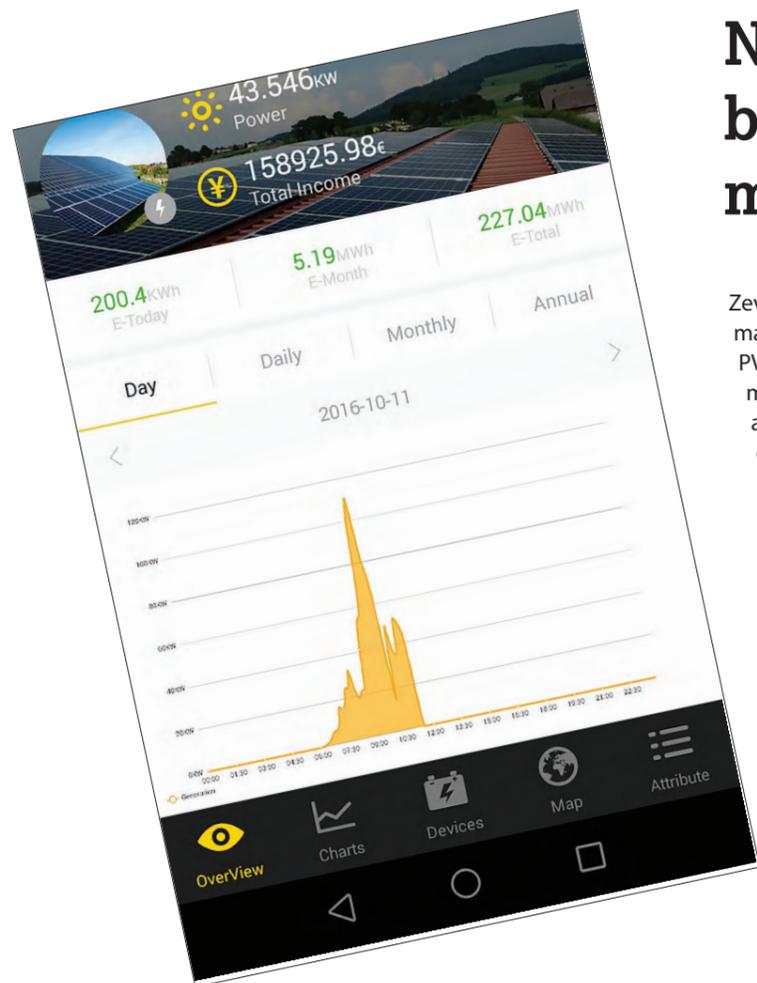
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New app for cloud-based PV system monitoring

Zeversolar, a subsidiary company of leading inverter manufacturer SMA, has launched a new app for monitoring PV systems via smartphone. The app accesses cloud-based monitoring portal ZeverCloud, and versions for both Android and iOS are available. No matter where they are, PV system operators can use it to access current and historical yield data for their PV system, as well as information on the CO2 emissions that they have avoided. The location of the systems is automatically shown on a map on the cell phone.

The app is suitable for private and commercial users and, like the monitoring system via ZeverCloud, free of charge. It shows daily, monthly, and annual yields clearly in compact diagrams and also provides information about feed-in tariffs generated.

New systems are registered quickly and easily when users scan a QR code on their Zeversolar inverter with a smartphone. The inverter is subsequently connected to the internet router via WLAN or a LAN cable.

With ZeverCloud, yield losses can be identified partly by the comparison of current and previous yield data. In addition, the software sends error messages by e-mail.

World's first gas heat pump for domestic use available in UK

ESS (Environmental Site Supplies) has launched the world's first gas heat pump for domestic and small commercial use. The Robur K18 is an 18kW mini gas-powered heat pump that offers temperatures up to 65°C for heating and up to 70 °C for domestic hot water.

The K18 is aimed at larger or period domestic properties, and is also ideal for small commercial installations, such as schools, church halls and care homes. A hybrid version, with an integrated boiler, offers a 37kW output and is available early in 2017.

The Robur K18 is a high efficiency boiler replacement that provides energy and carbon savings of 38 per cent against a modern condensing boiler. It is a monobloc heat pump that requires no costly fridge work and simply connects to an existing heating main.

The K18 has fewer mechanical parts than electric heat pumps and so benefits from exceptionally low noise levels and low maintenance costs. It satisfies demand in properties that are too large for electric heat pumps, or where higher water temperatures are required.

Kevin Pacey, Managing Director of ESS, commented: "It makes complete sense to use our established gas transmission network to deliver the energy we need for heating until such time that adequate renewable power becomes available. Gas heat pumps are straightforward for a gas-qualified plumber to fit and plumb and are similarly priced to an electric heat pump."



Jaguar claims to have torn up rule book for new EV concept

Jaguar says it has torn up the rule book by creating an EV concept with super car looks, sports car performance and SUV space, in one electric package. The Coventry-based company has developed a long distance sprinter that accelerates to 60 mph in around 4 seconds, with a range of more than 500km (NEDC cycle) and rapid charging of 90kWh battery. The driver-focused all-wheel-drive performance comes from two in-electric motors generating 700Nm of torque and 400PS.

Jaguar's engineering and design teams have created a bespoke electric architecture, matched with a dramatic design. The result is a smart, five seat sports car and a performance SUV in one.

Dr Wolfgang Ziebart, Jaguar Land Rover, said: "This is an uncompromised electric vehicle designed from a clean sheet of paper: we've developed a new architecture and selected only the best technology available. The I-PACE Concept fully exploits the potential EVs can offer in space utilisation, driving pleasure and performance."

The state-of-the-art electric motors and 90kWh lithium-ion battery pack were designed in-house by Jaguar Land Rover to give the best possible performance and range for most daily journeys.

The driver can simply plug the car into a wall socket overnight, and have more than enough range to complete the average daily commute of around 50 km.

For rapid charging, using a typical public 50 kW DC charging network, a full charge will take just over 2 hours. Enough to deliver more than 220 miles range (measured on the US EPA test cycle) or more than 500 km range (measured on the European NEDC test cycle).

Jaguar says the I-PACE Concept transforms the electric driving experience and offers the driver-focused performance and response Jaguar is renowned for. To help deliver this, the I-PACE has electric motors on the front and rear axles. Their combined output is 400PS and 700Nm of torque – the same torque rating as the petrol F-TYPE SVR.



Above: The Jaguar I-PACE

EVs at the heart of Government's post-Brexit industrial strategy

Business, energy and industrial strategy secretary Greg Clark has announced his goal of making Britain a world-leading hub for next-generation electric vehicles as the Government develops its plans for a post-Brexit economy.

Delivering a speech at Warwick University last month, Clark said electric vehicles, driverless cars and battery storage, will be "one of the big features of the world and Britain's industrial policy during the weeks, months and years ahead".

In addition, the Department of Transport pledged £80million to improve the charging infrastructure for EV owners as part of a wider £290million investment to support low emission vehicles.

Transport Secretary Chris Grayling said the move reiterates the Government's commitment to reduce carbon emissions from transport and is a major step towards its aim for nearly all cars and vans to be zero emission by 2050.

A further £150million will be invested in cleaner buses and taxis, which will include putting new, less polluting buses on the road as well as retrofitting engines to reduce nitrogen oxide emissions.

The government has also pledged £80million to improve charging infrastructure for electric vehicle owners.

The Workplace Charging Scheme (WCS) is now open for applications.

The £290million funding will be invested in a number of projects, including:

- * £150million for cleaner buses and taxis will provide better journeys and help tackle air quality challenges in our towns and cities

- * £80million to improve electric vehicle charging infrastructure

- * £20million for an Advanced Renewable Fuel Demonstration Competition to build demonstration-scale advanced renewable fuel plants in the UK this will target the decarbonisation of lorries and planes

A further £100million will support our plans to develop and test connected and driverless vehicle technology.

Mr Grayling said: "We are absolutely determined to reduce carbon emissions from transport as part of our ongoing commitment to tackle climate change."

Poppy Welch, Head of Go Ultra Low, said: "This is fantastic news and the continuation of incentives for plug-in vehicles through company tax and salary sacrifice schemes will give thousands more people the option of choosing the very lowest emitting cars and allow more businesses to benefit from adding electric vehicles to their fleets."

Counting the benefits of net metering, grid parity and electric vehicles



Ayrshire based Beyond Innovation Ltd have been at the heart of designing renewable energy products for over 16 years now, and Director Dougie Blair (left) takes a fresh look at what's holding back the Solar PV markets in the UK. Since the virtual demise of FITs in January this year, the PV industry seems to have fallen asleep at the wheel. It's widely recognised, through bitter experience in many cases, that PV offers one of the most stable and predictable sources of power generation in the UK. Despite this, it's now widely assumed by

the public that PV has "had its day" and is no longer a good investment, since the returns are not as good as they once were. The reality is PV could be re-invigorated by the introduction of what is known as Net Metering. The UK Government has yet to make Net Metering commonplace, by legislating that energy companies must offer it to those customers who would benefit, as is the case in the United States and many EU Countries, where PV has created a wealth of opportunities for both installers and consumers alike, as a direct result of its introduction.

Net Metering involves the counting of any exported units (or kWh) of unused power from a PV system (or other forms of renewable power generation), allowing that power to be "banked" on the grid for later use, either at night or in the winter. In practical terms, a 4kWp PV system that operates in a domestic setting, where the owner leaves for work each day, would see the bulk of the power generated during the day from his/her PV system being spilled onto the national grid. In the evening, as the household's demand increases, and the production from the PV system ceases, the homeowner currently needs to buy back the power which spilled onto the grid earlier in the day, and pay the full retail price for it, despite the fact that it was their own power which spilled onto the grid earlier in the day. With Net Metering, the spilled units of power can be effectively "bought back" free of charge in the evening, or at a later date, thus levelling out the use of the PV power, irrespective of when it was generated. PV power is typically spilled onto the grid during the day when big business and industry requires it most, and is bought back in the evening when the grid is "backed off" through lack of demand. PV is unique in its power generation in this respect, in that it produces excess power when it's required most by the

grid. Allowing domestic customers to buy back their spilled power in the evening is an ideal use for that banked power. Net Metering would achieve this. Currently, most domestic PV installations provide as little as 15 per cent direct use of the power generated by the system, while with Net Metering, that figure would rise to 100 per cent. The importance of being able to use 100 per cent of the power

generated by investing in PV couldn't be more critical at this time. The reasons for this are not complex, but a UK Government which doesn't recognise and implement the introduction of Net Metering is spoiling a glaringly obvious opportunity. In the absence of Net Metering, the solar PV industry is now looking at "self consumption" battery storage systems, which create a virtual Net Metering system



Left: With Net Metering the spilled units of power can be effectively "bought back" free of charge in the evening, or at a later date, thus levelling out the use of the PV power, irrespective of when it was generated.

Real life testing of PV, Battery Storage and Electric Car

At our base in SW Scotland, Beyond Innovation have, over the past two years, operated several electric and hybrid vehicles in conjunction with solar PV and battery storage, in order to gain real-life data of how easy or difficult it is to combine renewable energy with electric transport.

A BMW i3 (right) was tested for 26 weeks, using 4kWp solar PV power, stored in a 10kWh battery backup system on a virtual grid, powered by an SMA Sunny Island 6kW inverter and ABB Aurora PVI 3.6kW Grid Inverter. Power was stored in the battery bank during the day and "dumped" into the BMW i3 each evening to replenish what had been used for driving in that day. Over a period of 6 months, it became clear that, in order to use as much of the solar PV output as possible, the electric car had to be parked on site, where the power was being generated. This allowed the car to utilise any excess electricity that couldn't be stored on-site as and when the solar PV output dictated. By using battery storage, the fluctuations in PV power could be "ironed out" to allow continuous recharging of the 21kWh Lithium battery in the i3. If the car was off site, unused power from the PV system which couldn't be stored would be exported onto the grid, and effectively lost. The results of testing showed that the practicalities of using PV power to recharge an electric car currently relies on the car being present during the main production part of the day, in order to charge the car



real-time from the PV output. Clearly this isn't practical in most cases, and a battery storage system of similar capacity to the car's own battery size is required in order to retain as much PV power as possible during each day, to be available in the evening to recharge the car overnight. With Net Metering, the entire process becomes simple, with all daily PV production being available at any time to recharge the car's battery, with no other battery storage required. In essence, the use of PV to recharge electric cars would become very straightforward, with Net Metering being present. Without it, extensive battery storage

is required to make use of the free power from the PV system while the electric car is not present at the charging location. Tests were also carried out with other vehicles including a Renault Twizy, which could average over six miles per kWh of power used, compared with the 4 miles/kWh of the BMW i3. In total, over 6,000 miles of driving was provided from PV alone, in only six months of testing. Other vehicles tested included BMW's i8 hybrid and 330E hybrid. These vehicles contain a smaller battery capacity, so can be more easily recharged from a battery backed up PV system. Net Metering holds the key to a properly integrated PV/EV charging culture.

for the owner. Battery technology stores power which would otherwise spill onto the national grid, making it available for use in the evenings or when demand is otherwise high. This approach, on a domestic scale, simply bridges the Net Metering gap until its introduction, at which point it would become less useful. Investing in battery storage is of course widely recognised as essential for proper grid power management in the future, but from a domestic perspective, Net Metering is by far the most preferred power and bill management solution, hence its widespread use around the world. Net Metering requires the installation of digital metering, to allow both imported and exported power data to be counted.

By subtracting the exported power from that imported, a net bill could be created, reflecting the actual net amount of power being consumed from the grid. In most countries where Net Metering has been adopted, power companies allow the "banking" of up to 3000kWh or more of unused power, over a 12 month period, thus allowing summer production of PV electricity to be used in the winter months when days are shorter and PV production decreases. The introduction of a system like this in the UK would seriously re-ignite the PV industry, and for more reasons that you might expect. The roll-out of Smart Metering is unwittingly creating the metering network required to introduce Net Metering, since many Smart Meters

have the ability to register both imported and exported power. Grid Parity is another term which seems to confuse many within the renewables sector. This term is used to describe the point at which power can be generated from renewable sources for the same levelised cost as from conventional power generation. Unfortunately, the figures used by industry relate to the wholesale cost of generation and not the retail value of it. Solar PV currently offers power generation costs for domestic customers at around 7p/kWh based on a 4kWp PV system operating over 25 years. In retail terms, this power clearly costs around half of what domestic customers typically pay for their electricity. *Continued overleaf*

Solar potential would ‘explode’ with net metering

Continued from previous page

If Solar PV was being launched in the UK today, in today's energy markets, and was being shown to offer domestic customers the chance to purchase a significant amount of their own power at 50 per cent of the cost of what they currently pay, the market would explode. The main barrier preventing such mass roll-out of PV is Net Metering. Without Net Metering, the domestic customer, investing £5k-£6k for a 4kWp PV system, would still only use as little as 15 per cent of their hard earned PV electricity on site, thus taking the Grid Parity calculation to a figure of around 50p/kWh or more, thus clearly not a good deal. Net Metering therefore holds the key to allowing 100 per cent use of the power generated by such a PV system, thus making full use of the 7p/kWh power generation. Investment in PV at this stage in the UK's renewable energy market relies heavily on the introduction of Net

Metering, even if it was initially only offered to domestic customers, and with annual “power banking” restrictions imposed on it.

Finally, and most importantly, the synergy between what happens in the PV markets and what's rapidly emerging in the Electric Vehicle and PHEV Car markets, is what makes Solar PV possibly the most suitable source of free power combining these two sectors. By sheer coincidence, and not though deliberate planning on the part of the car and PV manufacturers, electric cars consume around 1kWh of electricity for every three to four miles of driving. A typical 4kWp PV installation, generating 3,000+kWh annually, would provide enough power for 9,000 to 12,000 miles of driving. That means, a G83/2 installation of 4kWp PV system with a 3.6kW Grid Inverter operating with Net Metering, would produce enough power to cover the average annual mileage driven each year by car owners. What's more, the physical

size of a 4kWp PV system just happens to be around the size of a Car Port, thus Beyond Innovation's move to design Solar Carports for both domestic and industrial installations.

The UK Government should be taking advice from both the Solar PV and Car Manufacturing sectors to have Net Metering introduced in the UK sooner rather than later, otherwise the natural synergy between Solar PV and Electric Vehicles will not be fully exploited. The Scottish Government has been approached on this subject but they currently don't have the devolved powers to implement Net Metering in Scotland, and are in discussions with their UK counterparts. Lobbying from within the PV industry is therefore essential if we're not going to sit around and watch one of the most obvious opportunities for this industry pass us by. Further information at beyondinnovation.co.uk and solarcarports.co.uk.

UK's largest companies call on Government to “Stop the Solar Tax Hike”

Some of the largest companies, including Sainsbury's, IKEA, and Kingfisher PLC - have joined over 160 diverse groups calling on the Chancellor to drop the solar tax hike.

The UK group, which includes two former directors of Big Six energy companies, as well as senior politicians, the Federation of Small Businesses, campaigning groups like Greenpeace and Friends of the Earth and senior academics have signed the letter asking the Chancellor to stop the forthcoming rise in business rates for self-consumption solar power.

Changes to business rates paid on solar power could see many systems become uneconomic. The changes will see rates rise up to eight fold for organisations that own solar panels and use the power themselves. This would see the most efficient use of solar, consumption at point of generation, bizarrely penalised by the tax system.

The change will only affect systems where the energy is for self-consumption; companies who export their power to the

grid or a third party are rated on a different calculation. This means that the tax rise is most likely to hit smaller companies, as well as public sector organisations such as state schools and hospitals.

Paul Barwell, STA CEO, commented: “The sheer diversity of groups willing to sign this letter demonstrates the breadth of feeling on this issue. Now that the UK has signed the Paris Agreement it goes without saying that the Government should support organisations seeking to reduce their carbon footprints, not penalise them. It is essential that solar energy is treated sensibly within the tax system.”

In a speech to Energy UK Greg Clark MP, the Secretary of State for Business, Energy, and Industrial Strategy, said he wanted decentralised energy to compete with large-scale new generation because “competitive tension is best for consumers.” However solar power is being increasingly disadvantaged in the tax regime; for example gas combined heat

and power devices have been exempted from business rates since 2001, but not zero carbon solar. This is in addition to tax breaks for fossil fuel extraction such as 100% capital allowances for oil and gas production in the first year, which are not available to solar energy.

The letter says it is “disappointing that over the past year major policy changes have led to rooftop solar deployment falling by over 80% in the UK. Instead of stabilising the industry, it has been further jeopardised by surprise business rate rises for organisations that own and supply themselves with solar power.”

Sir Tim Smit, Co-founder of Eden Project, said: “The folly of this measure will be seen unkindly by history.”

“I urge the Chancellor to ensure common sense prevails and creates a business climate that promotes a sustainable, independent, future, demonstrating that Britain remains serious in its ambition to play a part as a global citizen.”

Flaws in Clark's energy strategy criticised

Greg Clark's first major energy speech as the new Secretary of State for Business, Energy and Industrial Strategy, has received a mixed reception from the renewables sector. The address, delivered at the Energy UK Conference, outlined the Government's energy priorities, which include wind, solar energy, tidal power and nuclear.

However, the absence of a strategy for gas and heat from the Minister's words has sparked concern that the potential for gas technologies to reduce domestic carbon emissions are being overlooked.

Neil Schofield, Head of External Affairs at Worcester, Bosch Group, attacked the speech for its ‘electricity fixation’.

And Paul Barwell, Solar Trade Association CEO, believed that Mr Clark's focus on reducing costs for the consumer was inconsistent because he kept the cheapest forms of renewable energy out of the CfDs.

Mr Clark said it was a time of dramatic

change in the energy industry on a scale not seen since the roll-out of electricity grids across the country decades ago.

The current energy system of rules and regulations was set up to move power from big power stations, down long wires, to people's homes and businesses. But new technology such as solar panels, electric vehicles, storage and smart metering are challenging that model. Mr Clark said the aim is to harness the potential of storage, demand side response and other technologies to create the most efficient, most productive electricity system.

Neil Schofield said: “In nearly 2,500 words the Secretary of State used the word gas once and didn't even mention heat at all. The entire speech is based on the argument that electricity is the magic bullet that can deliver the Government's climate change commitments, a position that is fundamentally flawed. The electricity

solution being promoted in the Secretary of State's speech is simply unrealistic and a return to old-style thinking which we thought had reached its sell-by-date.”

Paul Barwell added: The STA welcomes the recognition by the Secretary of State that the cost of intermittency for variable technologies is ‘overblown’. Indeed our recent analysis by Aurora shows that at current levels of solar, the cost is only £1.3/MWh and at 40GW rises to £6.8/MWh.

“However, with Mr Clark's focus on reducing costs, it seems inconsistent that he has kept the cheapest forms of renewable energy out of the CfDs. A new ‘pot 1’ round would deliver the best value, but we also need BEIS to focus on expanding the capacity for growth by increasing the caps under FITs. We have 380GW of south facing potential under commercial rooftop solar but tiny caps of 60-70MW per year.”

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Sustainable homes feature REHAU heating and cooling



A whole raft of REHAU low energy heating and cooling solutions have been chosen for an innovative development of sustainable homes in Lighthorne, Warwickshire.

Specialist designers and contractors Be Green Systems, working in partnership with Housestyle Countrywide, are fitting the contemporary family homes with ground source energy and REHAU underfloor heating systems as standard, and then showcasing additional options such as REHAU chilled ceilings and MVHR to buyers in the on-site show home. The intention is that, once buyers on the development see how easily and cost effectively these can be integrated into a new property and experience for themselves the gentle heating, cooling and ventilation which they generate, they will specify them for themselves.

Be Green Systems has been a long term customer of REHAU, routinely choosing the RAUVITHERM pre-insulated pipework for district heating projects and the REHAU floor systems and PE-Xa pipework for underfloor heating installations.

At Lighthorne, RAUVITHERM pipework is connecting all of the nine properties to a ground-source energy collector installed under the road. A heat pump in each property is generating the low flow and return temperatures required for the REHAU underfloor heating systems. REHAU's flexible heating and plumbing pipework is also supplying the hot and cold running water.

University of Liverpool invests in Sustainable Energy Centre



Installation works have commenced on site, as Vital Energi begin the installation of a new £1.5m Energy Centre, for the new Greenbank halls of residence at the University of Liverpool. Vital Energi have a long-standing relationship with the University of Liverpool and have previously installed the University's district heating network and converted their Grade II former mortuary building into a CHP-powered energy centre.

The finished Energy Centre will contain two 1MW boilers, four 250kW boilers, one 230kW CHP, one 150kW CHP and eight thermal stores, each with a storage volume of 8m³ and should be completed in February.

Due to the proximity of the student accommodation, the project requires strict acoustic performance of the plant and equipment to ensure there will be no disruption to the residents. The project team will begin work on site by first putting up an acoustic ceiling in the Energy Centre to prevent noise pollution.

Mike Worrall, Contracts Manager for Vital Energi, commented, "The University have a clear commitment to ensuring noise from the energy centre doesn't disturb the students as they live, sleep and study at Greenbank Residences. Our designers were able to create a solution which, not only ensures all plant related noise will be mitigated, but will also see low-carbon energy generated for decades to come."

Greenbank Student Village, which is approximately three miles away from the main university campus, will be home to around 1,361 students and is currently undergoing a major redevelopment. Once complete, it will include facilities such as social spaces, library, entertainment spaces and a fitness room.

Scottish energy park plans take major step forward



A plan to create an innovative energy park at the former Glenmuckloch open cast coal mine in Dumfries and Galloway took a significant step forward last month when the Scottish Government gave consent for a pumped storage hydro scheme of up to 400MW on the site. The project would make a major contribution to energy provision and breathe life into the former opencast site, which has ceased commercial coaling and is now undergoing restoration works. It would also create over 250 jobs during a five-year construction programme and more than 15 long term local jobs when complete.

The proposed scheme, a joint venture between Buccleuch and 2020 Renewables, has the potential to become a catalyst for industrial regeneration in the region; however any proposal will require major financial investment from other partners to proceed. Meetings have taken place with the UK Government – which sets energy policy – to discuss the need for a stable revenue mechanism that will encourage investment. Pumped storage hydro stores electricity in times of low demand and releases it on to the National Grid in peak demand periods, providing energy when required and also balancing local constraints on the electricity grid.

Six new innovation projects get funding to pave the way for smarter energy grids



Ofgem is driving innovation improvements across the electricity and gas sector by funding six new projects through its Network Innovation Competition (NIC). The projects include testing how 'greener' gas can be used on a university's gas grid in Staffordshire, and examining how advanced software can help make more efficient use of locally-connected solar power.

Britain needs gas and electricity networks to become smarter to manage the transition to a low carbon economy at the lowest possible cost for consumers. Each year Ofgem calls on network companies to compete for funding where they trial new approaches and technology which will pave the way for smarter grids.

In this year's competition Ofgem has agreed funding of £44.6 million for six of the eight projects that entered (four for electricity and two for gas).

Jonathan Brearley, Senior Partner, Networks, Ofgem, said: "Britain's networks will play a crucial role as we head towards a smarter energy system. This year's trials will test a variety of new technologies and arrangements. If they are successful they will provide networks with valuable learning that may be incorporated into their everyday working practices, providing financial and environmental benefits to consumers.

"We want network companies to work closely with non-network organisations so that more ideas can be developed through collaboration. I'm pleased that some of this year's projects are doing that and look forward to seeing more collaborative projects coming forward next year."

Installers need to see the benefits of solar thermal and act on them

Paul Hind, Technical Manager, Secon Solar Ltd explains the reasons for the early decline in PV installations and how the industry can stimulate consumer demand

Why isn't solar thermal selling as well as it used to? Simple, the launch of the Feed in Tariff (FIT) in April 2010 saw an explosion of PV installs from about mid 2011 – installers suddenly realised that selling a PV system was easy because they could convince home-owners that these expensive PV systems would pay for themselves quickly and continue to pay a premium for the next 20 to 25 years. The much cheaper and more efficient solar thermal market slipped into decline because the once popular renewable energy system couldn't compete with such a generous tariff.

The government promised an incentive to get solar thermal moving again but the domestic RHI (Renewable Heat Incentive) was so held up by delays that the public and installers lost faith that it was ever going to happen. When it did eventually arrive in 2014 it was a huge disappointment to the industry – very complex to explain to homeowners and not generous enough to compete with PV.

However, now that the PV tariff has dropped to a much more manageable level we are seeing installers coming back into the market – at its peak in 2010 the Solar Trade Association estimate that there were 30,000 installs in that one year. Now that we have a level playing field again we could potentially get back to that figure creating a great opportunity for installers prepared to take it on.

What is the payback for solar thermal?

The Energy Saving Trust estimate that the average system costs between £3,000 and £5,000 to install.

The RHI is still currently available for solar thermal and is linked to the number of occupants – according to the Energy Saving Trust the RHI would give a return of between £195 per year (for two occupants) and £475 per year (for six occupants) over seven years. It would also save between



£60 and £300 per year on hot water costs obviously dependent upon number of occupants and energy source.

Payback on a fully accredited install, claiming RHI, varies between six years for properties with high occupancy and possibly over 20 years with only two occupants. This doesn't take account of any costs of servicing or repairs or potential rises in fuel costs.

For a home-owner to be eligible to receive the payment an installer must be a member of the Microgeneration Certification Scheme (MCS) and the home-owner must have an EPC assessment carried out.

Due to the lack of volume over the last few years a number of smaller companies have let their MCS lapse and ignored the MCS scheme completely. This is not entirely a desirable state of affairs but largely a result of the RHI not being attractive enough to kick-start the scheme.

By being outside the scheme installers save thousands of pounds on MCS fees

that they can pass on. The home-owner is happy to get a cheaper install rather than claiming £50 a quarter for the next seven years! A well installed system will last many years giving free hot water every year. The equipment installed is still accredited and high quality so it is a win-win.

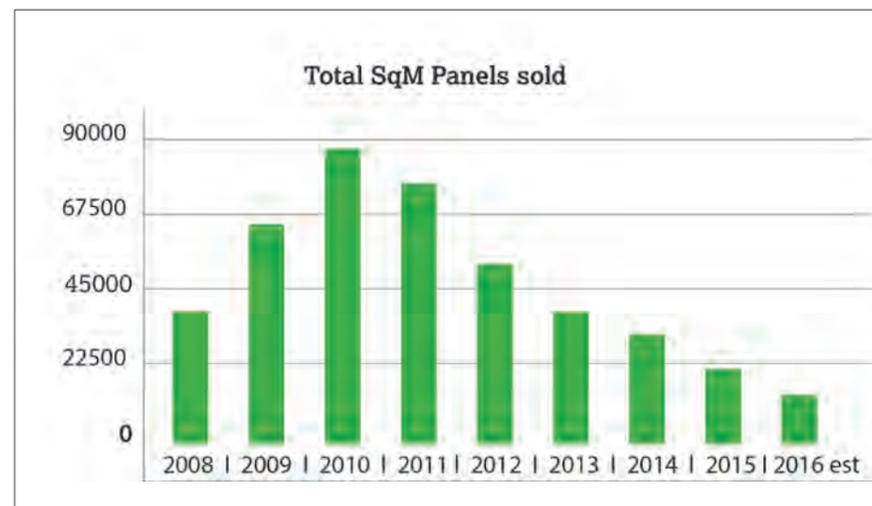
If the installer is fitting a new boiler or a heat pump with a new cylinder, the extra cost of adding a solar system is more affordable, improving payback.

What do installers need to know to be able to sell solar thermal?

Selling solar thermal to householders is quite easy especially if other maintenance work is being carried out that necessitates a new cylinder.

Solar thermal is loved by every householder who's ever had it installed, we don't know the exact numbers but it is over the 100,000 mark

There are a few basic questions to ask. Is there room to fit panels on the roof? At most six square metres will be needed.



Does the roof of the property face south? If not, east/west is an option but is a lot more expensive than a standard system. If the roof isn't south facing we normally recommend installing a west facing system as it will only slightly underperform a south facing system.

Don't get hung up on the types of

collectors. The main options are either on-roof or in-roof flat plates or evacuated tubes but it's mainly down to homeowner preference. All systems are capable of giving the same result.

The main requirement is to ensure that the roof array is matched to the cylinder and hot water usage. The biggest single

cause of system problems is mismatch so if in doubt consult your merchant or the manufacturer. Most have simple tables for guidance.

Most merchants can offer solar thermal kits with all components included and with instructions to guide you. Installers with experience of installing cylinders and some practical knowledge of roof work should be able to safely install a system.

There are currently over 1.5m boiler swaps every year – add thermal to just two per cent of these jobs and we're back up to the heady days of 2010 – 30,000 installs per year. All we need are the installers to see the opportunities and act on them – installers shouldn't be scared to offer a customer an upgrade – if they're unsure what to do – ask a specialised merchant – their tech advice and support will guide them through everything they need to know. The opportunities exist – the rewards will be great. Many home-owners don't even know this simple technology exists – they're not going to ask for it – they need to be offered it!!

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BIOMASS

What: Welsh holiday park makes the switch from LPG to sustainable biomass

How: Purpose-built plant room with Hertz Firematic boiler

Result: Efficiency measures save about £18,000 per year

South Wales holiday park goes green with sustainable biomass

A holiday park in South Wales is set to deliver energy savings of around £18,000 per year thanks to the installation of a new sustainable biomass heating system.

Gateway Resort is one of the largest camping and touring sites in South West Wales, it occupies over 35 acres of land and has a capacity for over 300 tents and caravans. The new system was fitted as part of a scheme of major improvement works at the park that includes two bars, two restaurants, a heated indoor pool and an indoor play area.

Previously heated by LPG, the owners were quick to spot the opportunity to install a biomass heating system at the site as part of their £1.5 million improvement and expansion works. Local biomass specialists Igen Renewables were appointed back in October 2015 to manage the design and installation of the heating system and the project was finally completed in January this year.

The renewable heating system includes a leading brand Herz, Firematic 499kw boiler,



housed in its own purpose-built plant room. The system provides heat for the entire resort building including the pool, function areas, kitchens and showers, as well as three residential homes on the site. The boiler, supplied by Leicestershire based distributor Myriad Heat & Power Products is fuelled by wood pellets, stored in a cleverly designed adjacent fuel store. With a capacity of up to 18 tonnes, the store can take a full load of wood pellets to minimise deliveries and reduce costs further.

FAN CONVECTORS

What: Perfect heating solution for a newly refurbished school library.

How: Caspian Low Level units used with existing system

Result: Tamper proof controls and 'pencil-proof' grilles

Energy efficient radiators for school library

Smith's Caspian Low Level fan convectors have provided the perfect heating solution for a newly refurbished school library. Established in 1935, Ashlyns School is a mixed secondary school and sixth form located in Berkhamsted, Hertfordshire.

The installer replaced three old dysfunctional fan heaters and a radiator with four Caspian Low Level units as part of the library's refurbishment. Four of



Smith's Caspian High Level fan convectors were originally chosen however, because the existing pipework was unable to be changed, four of Smith's Caspian Low Level units were installed instead because of their ability to heat large spaces quickly and effectively, their compatibility with the existing heating system and low noise.

When choosing a replacement heating system, as it is a school, safety was of paramount concern. They had to ensure that the units they chose were safe to be exposed to students. All Caspian Low Level models are fitted with tamper proof controls and 'pencil-proof' grilles and their low surface temperature means that they are entirely safe.

Fan convectors are ideal for schools because they are compatible with all types of wet central heating systems and they function equally efficiently connected to a conventional boiler or to renewable technology, such as biomass boilers or ground or air source heat pumps.

WSHP

What: Kensa extracts heat from nearby stream for cost-effective system

How: Use of the lesser known open loop system

Result: Sustainable heating using a nearby stream

Water source heat pump warms 18th century home using nearby stream

Water source heat pump systems are becoming increasingly popular, but one lesser known water source application is open loop systems. Open loop collectors take the form of two separate straight pipe collectors. These designs abstract and filter the water through the heat pump. This water is then discharged either back to the water source or another discharge area.

Installer Ecodragon South West helped a homeowner find a cost-effective heating solution which would have otherwise flowed right past the back door, thanks to an open loop system and a stream at the bottom of the property's garden.

The company utilised Kensa's MCS Umbrella service to deliver an RHI eligible scheme that makes use of the stream water as the primary source of heat for his Kensa ground source heat pump. Using an open loop design the stream is partially diverted into a well, where the liquid is then passed through a plate heat exchanger, which extracts the heat from the water and feeds this heat into the ground source heat



pump, with the cold stream water then discharged back into the stream.

As the build progressed, the Kensa 6kW Single Compact ground source heat pump arrived on site. In the garage a plate heat exchanger was fitted to the two pipes in from the well and the two back out to the heat pump. A small submersible pump was fitted in the well and located approximately one foot from the bottom to make sure no sand or silt would be sucked into the heat exchanger.

GSHP/BIOMASS

What: Greenio and Finn Geotherm team up to make Lincs. school truly green

How: Unique funding with biomass and ground source tech

Result: Annual £120,000 RHI savings for 14 years

Unique funding plan helps green school

Renewable heating expert Finn Geotherm is collaborating with Lincolnshire-based renewable energy hub Greenio to make William Farr School become truly green.

The Lincolnshire school is investing £900,000 in biomass and ground source heat pump technology which will replace its existing gas boiler system. The 16 week project is being led by Greenio, who are installing five biomass boilers. The ground



source system is being sub-contracted to experts Finn Geotherm to install two Lampoassa Eli 90 ground source heat pumps, linked to 10,000 metres of ground loop underneath an adjacent football pitch. The 180kW ground source system will run alongside Greenio's biomass boilers to generate all the heating and hot water required by the 1500 pupil school.

The School has already installed solar panels, LED lighting and intelligent energy control systems. Once this latest project is complete, the school will save 300 tonnes of CO² and generate income and savings of £185,000 per year after the investments are paid back. The latest eco-technology has been funded by a tailored operating lease which allows the school to stay cost neutral during the repayment period. The biomass and heat pump installation will pay for itself in six years, but generate grants and cost savings through the Renewable Heat Incentive (RHI) scheme, worth £120,000 annually for a further 14 years.

Ecotricity unveils plan for Britain to make its own gas – from grass

Photograph: Ecotricity



Ecotricity has unveiled a plan to heat almost every home in Britain using green gas made from grass.

Ecotricity outlines the potential in a new report – Green Gas Mills: The Opportunity for Britain – which shows that by 2035, green gas made from grass could provide all of the gas needs for 97 per cent of Britain’s homes, pump £7.5billion annually into the economy, and create a new industry that supports up to 150,000 jobs.

Additionally, green gas made this way is virtually carbon neutral, so could play a significant role in Britain meeting its climate targets, and creates new habitats for wildlife on an unprecedented scale.

Ecotricity has just received planning permission to build a prototype ‘Green Gas Mill’ at Sparsholt College in Hampshire, the first of its kind in Britain.

Dale Vince, Ecotricity founder, said: “As North Sea reserves run out, the big question is where we’re going to get our gas from next. The government thinks fracking is the answer, but this new report shows there is a better option.

“Recently, it’s become possible to make green gas and put it into the grid, in the same way we’ve been doing with green electricity for the last two decades. The current way of doing that is through energy crops and food waste – but both have their drawbacks.

“Through our research, we’ve found that using grass is a better alternative, and has none of the drawbacks of energy crops, food waste or fracking – in fact, it has no drawbacks at all.

“Our first Green Gas Mill has just been given the go-ahead, and we hope to build it soon – though that does depend on whether government energy policy will support this simple, benign and abundant energy source.

“As our report shows, the benefits of Britain making its gas this way are astounding. And in the light of this new option available to us, I call on Teresa May to review the government’s plan for where Britain gets its gas – post-North Sea.

“We now have a more than viable alternative to fracking, which people have been fighting tooth and nail up and down the country to prevent. It’s not too late, because fracking hasn’t started yet. We need a proper review of where Britain gets its gas from – we can either frack the countryside or we can grow the grass. It’s that simple.”

Making green gas from gas will cut carbon emissions, help Britain become energy independent, support food production by improving soils, create wildlife habitats, and allow farmers to financially diversify in the face of lost EU subsidies following Brexit.

Renewables adviser focuses on Ireland

Dulas, a leading independent renewable energy advisor, has announced it is currently engaged in providing detailed design services to several major ground mount solar developers in Ireland. The current work brings its total design portfolio in the market to 125 MW for the second half of 2016, with the firm expecting to undertake a minimum of a further 150 MW in 2017.

While Ireland currently sits behind other European nations in terms of installed solar capacity, the pipeline of Irish solar projects continues to grow, as the country aims to meet one of the most ambitious renewable energy targets in Europe and source 16 per cent of its total energy from renewables by 2020 and 27 per cent by 2030. Currently, just over nine per cent of Ireland’s energy is sourced from renewables, with less than one per cent (10 MW) coming from solar.

Despite this growth in the pipeline, however, several factors have led to a bottleneck in the application system. Multiple grid applications by developers for new connection offers have overstretched the resource available to process them, while the delay on an announcement regarding a new solar subsidy system has further caused the rate of development to slow.

Additional factors, such as the lack of national planning guidance on ground-mount solar and the excessive planning requirements from some regulators, are creating further uncertainty in the market.

With this in mind, Dulas has drawn on its extensive experience of solar PV design and installation in the UK and further afield to advise Irish developers on drawing up design and layout plans..

Dulas’ design services ensure that solar PV projects are as near to ‘shovel-ready’ for construction as possible, improving developers’ chances of securing planning approval and allowing them to more easily proceed to this next phase once planning permission has been secured.

In addition to this high level of detail, Dulas’ design services are sufficiently adaptable to allow clients a number of procurement options on panels, mounting systems, inverters, and other equipment.

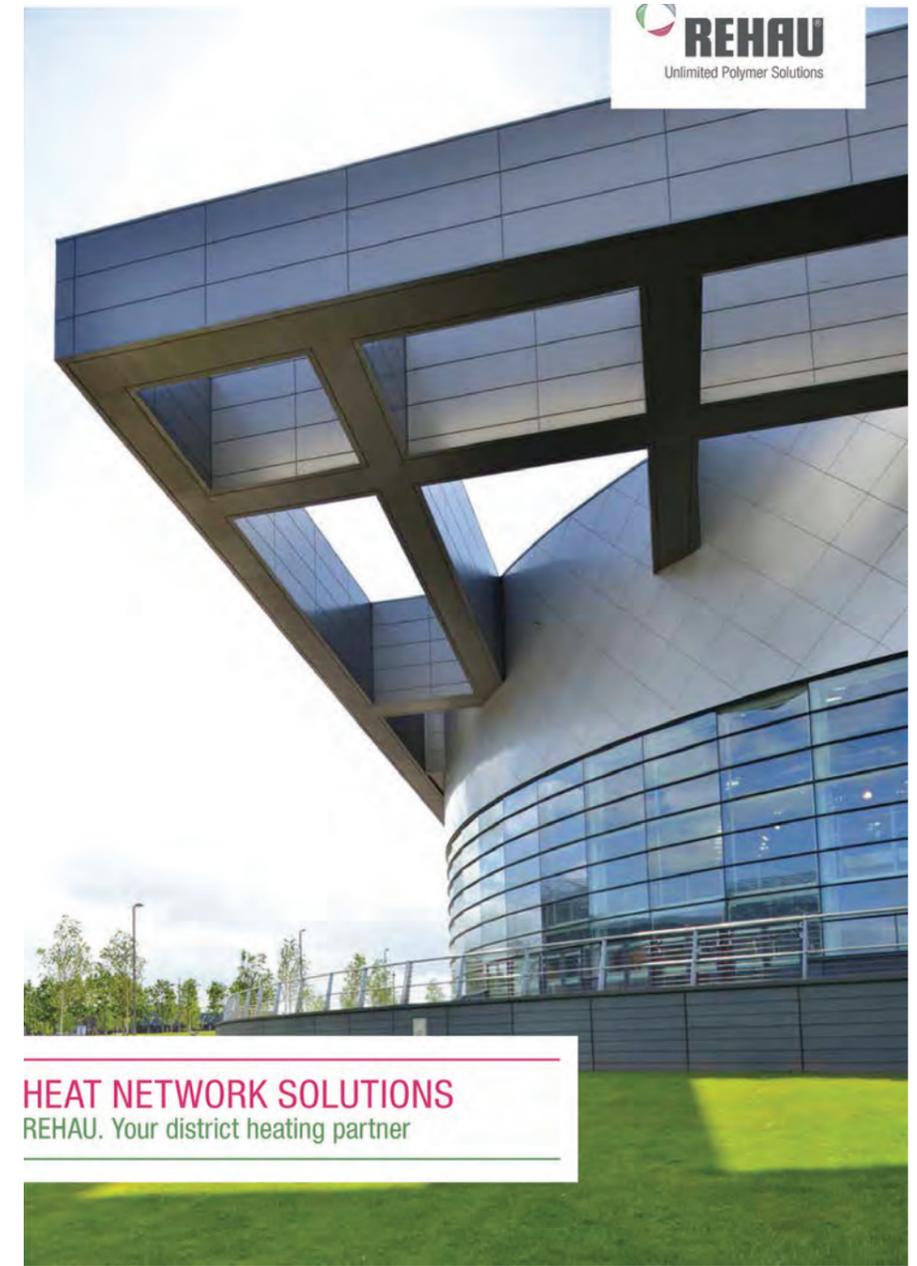
12 reasons to install Rehau district heating pipework

There are twelve compelling reasons to install REHAU’s range of district heating pipework – according to the brand new 12 page brochure just published by the company behind the market leading RAUVITHERM and RAUTHERMEX brands.

Amongst them is the fact that REHAU’s pipework uses 10 per cent less material than steel and has fittings which are up to 50 per cent quicker to fit with no hot works. Also, the DUO form of the pipework is available in 400m lengths so needs fewer joints and, in the RAUTHERMEX version, has the best lambda value (0.0216 W/mk lamda) of any pre-insulated pipe available in the UK. Alongside the overall benefits of choosing district heating, the brochure sets out all of the specific benefits to consultants and contractors of working with REHAU including its UK based sales and technical support team, BIM modelling capability and UK manufacturing.

There is also guidance for specifiers on choosing between RAUVITHERM and RAUTHERMEX depending on the thermal performance and flexibility requirements of the project, and a focus on some of REHAU’s highest profile recent installations including at the award winning Soho Farmhouse in Oxfordshire and at the iconic Portmeirion village made famous as the setting for 1960s TV series The Prisoner.

The brochure can be downloaded from the REHAU website at www.rehau.co.uk/districtheating and is available for mobile or tablet via the REHAU Docs app.



HEAT NETWORK SOLUTIONS
REHAU. Your district heating partner

Energy efficiency investment could create 9,000 Scottish jobs say business leaders

A group of Scottish business leaders claim a boost in energy efficiency investment could lead to 9,000 jobs a year being created in Scotland.

The business leaders have written a joint letter to the Scottish Government’s Economy Secretary Keith Brown urging him to “set out a clear direction of travel” for what they say is a “growing industry”.

The group said a “long-term,

infrastructure approach to tackling poor housing as a cause of fuel poverty” could create between 8,000 and 9,000 jobs a year.

They have called on ministers to increase spending on energy efficiency in next year’s budget to £190million, which would allow for existing schemes and provide confidence to the sector at the start of the new Scotland’s Energy Efficiency Programme (SEEP).

Kensa unveils new heat pump for 2017



Kensa Heat Pumps, the UK's confirmed leading supplier of ground source heat pumps, has released details of a brand-new 'Evo' series, which claims to deliver significantly improved efficiencies.

Manufactured in Cornwall, the new Evo ground source heat pump series builds upon Kensa's eighteen years of experience designing heat pumps specifically for British properties.

Simon Lomax, Managing Director commented: "The Kensa Evo represents a significant step forward and is a testimony to the ingenuity of an engineering team which focuses exclusively on ground source heat pumps."

The Evo series is more efficient and we have also worked hard to reduce noise levels to industry-leading levels. And we have not forgotten that the Evo must be simple-to-install and maintain."

Offering a 15 per cent gain in efficiency in order to minimise running costs and maximise income via the Government's Renewable Heat Incentive, the Kensa Evo is available to pre-order in January 2017 for delivery from Spring in 7kW, 9kW, 13kW and 15kW single phase models.

The ERP A++ rated Evo delivers heating and hot water efficiencies of SCOPs to 4.2 at 35°C along with reduced noise outputs, packaged in a contemporary contoured gunmetal and gloss-white finish, punctuated by a custom built control panel unique to the Kensa series.

Designed for larger new builds and renovation projects, the Evo will supplement Kensa's market-leading Shoebox 3kW and 6kW models which are ideally suited for smaller new builds.

Each model in the Kensa Evo series has optimised sized stainless steel heat exchangers, which allows the compressor to respond more efficiently, increasing SCOP performance and delivering 60°C domestic hot water.

The Evo has been designed to be easy to handle and install. With just one single cross head screw in its unique bevelled front panel, the Evo's electrical component and wiring terminals are easily accessible with the removal of just one panel.

The heat pump has four rear water connections, two for the ground collectors and two for the property's heating distribution system. The connections consist of four 28mm straight brass fittings designed with minimal tolerances, ensuring compatibility with easy to install push fittings. The external side panels feature a curved cut-out offering the installer an extra level of flexibility to install the Evo according to the demands of the site, with vertical and horizontal pipework exit points from the sides and top.

Kensa has developed its own control board which is the brain of the new Evo heat pump. The customer interface is an intuitive touch screen that facilitates commissioning and parameter settings.



Saving thousands of pounds with a Warmflow ground source heat pump

In the current climate, everyone is looking to save money where possible and when it comes to heat pumps, the brand you chose can have a major bearing, not just on price, but on performance. Choosing the right brand can mean that you and your customers can save even more!

Not all heat pumps are the same, as demonstrated by Warmflow's range of revolutionary ground source heat pumps, which feature variable outputs of up to 10kW and 18kW. Warmflow GS08 & GS16 ground source heat pumps are the highest

efficiency units in their class thanks to our intelligent software control, waste heat recycling and the latest inverter driven Copeland compressor together with Grundfos's new high efficiency modulating brine and heating pumps.

The units are designed with variable speed, inverter driven compressor units, which draw on the latest technology to achieve market leading efficiency of 508% at B0W35, the most efficient in Europe! With the new energy efficiency labelling in place, the Warmflow Ground source

heat pump has a Seasonal Coefficient of Performance (SCoP) of 5.00 giving it the highest band of A+++.

In basic terms, this means customers can increase savings via the RHI payment scheme by thousands of pounds. In addition to market leading efficiency, customers no longer need to be restricted by fixed speed units with all their limitations. The variable speed compressor gives the Warmflow heat pump a wide output range, automatically modulating within this range depending on your heat demands. Working off a single phase power supply, this means you don't have to install a 3 phase electricity supply as the Warmflow heat pump will ramp up slowly avoiding large starting currents associated with fixed speed units. In addition, this eliminates the need for a buffer tank in almost all installations saving both time and money for you and your client. It also offers a flow temperature of 65°C whilst still achieving ground breaking efficiency and allowing domestic hot water to be heated to 60°C.

For the specifier and installer, the variable heat output also means that the sizing and specifying of a heat pump is made easier. The heat output has a large range, which automatically adjusts to meet the demand and therefore does not need to be matched exactly to the peak heat load; something that is essential to the overall efficiency of fixed speed units.



Sharp introduces most efficient 48-cell PV module on UK market

Sharp has launched the industry's most efficient 48 cell module for the European market, following its best-selling success in Japan. With an award-winning design, the NQ-R256A (256W) monocrystalline photovoltaic (PV) module incorporates Sharp's back contact technology for unparalleled efficiency of 19.8 per cent; increasing the amount of sunlight that can be used and returning maximum power output for minimum roof space.

With conventional technology the solar cells have the electrical contact wires on the front side, blocking the sunlight that enters into the cell, and approximately six per cent of received light remains unused. With back contact cells all connectivity is removed from the front to the backside. Sharp's back contact technology reduces the losses from 6 per cent to three per cent, an improvement of 50 per cent. In addition to increased module efficiency the cell design also has a stylish black front.

The back contact modules are ideal for all family houses, whether small or large because any available roof space can be used more efficiently. On the same surface, the 48 cell modules can generate more power than with conventional 60-cell modules. The compact and lightweight 48 cell module is easy to handle, and can be installed either in portrait or landscape orientation. The safety, quality and durability of the module has been recognised with IEC seals (IEC/EN 61215 and IEC/EN 61730).



The year for energy storage

The industry is braced for the influx of new energy storage technology that will make the installation of renewable energy more compelling to the homeowner. One such company with its eyes on the UK market is SOLARWATT, which has established a strong reputation for quality and innovation with its glass-glass solar PV panels, MyReserve storage and intelligent management system Energy Manager.

The German company's PV panels were certified last month under the Microgeneration Certification Scheme after receiving recognition from Which! and the top rating from the EU's CLEAR Project. The panels come with an industry-leading 30-year warranty, including transport and reinstallation.

MyReserve storage systems bring households energy independence, with daytime generation for night-time consumption. It is the most advanced home battery DC storage system, with 2.2KW to 11KW capacity and an unmatched charging management algorithm, securing the longest-lifetime and stability for Li-ion cells. *Top 10 Products continued on Page 37*

A 360° View Of Cylinder Efficiency

Jason Hobson, Chief Commercial Officer at Gledhill, discusses the role of cylinder specification in delivering energy efficiency

According to the Energy Saving Trust, more than half of the money that the average UK home spends on fuel is spent on heating and hot water. Ensuring that the system installed in domestic dwellings is efficient in terms of both design and specification is vital to keeping bills and carbon emissions down. Consequently, selecting the right size and model of cylinder for a property is vital to its energy efficiency.

Hot Water Demand

As Part L building regulations become more stringent and new build residential properties get smaller in line with PPG3 planning requirements, UK homes are actually becoming easier and cheaper to heat because of the compact room sizes and increased levels of insulation. Meanwhile, however, the amount of hot water the average household uses has increased over the years, with multiple bathrooms, power showers and more frequent washing all putting increased demand on hot water supply.

With energy prices set to rise this year, the need to build energy efficiency into hot water systems is both environmental and economical. While some of the energy efficiency of a property depends on the energy saving behaviours of the occupiers, the installer has an important role to play in selecting a hot water system that maximises the energy efficiency potential of the dwelling. This means choosing a cylinder that is correctly sized to meet the spatial demands of the property and the likely demographic of its residents.

Size Matters

The size of a cylinder should be based on the number of bathrooms and shower rooms in a property along with the number



Jason Hobson: Selecting the right size and model of cylinder for a property is vital to its energy efficiency

of bedrooms, as this will determine average and maximum occupancy levels, which determines average hot water demand.

While cylinder manufacturers, including Gledhill, provide general specification guidance on selecting a cylinder size in line with the number of bathrooms in a property, this should never be seen as a definitive guide as there are other factors that will also influence the level of hot water demand. For example, in a home designed for young families, demand is likely to be much higher as children will take baths rather than showers. A cylinder that is too small for the property will have insufficient capacity to meet the occupier's needs whereas one that's too large will be inefficient as heated water will cool before it is used.

Installers will determine the best size and model of cylinder for a property, based on the accommodation and occupants and the available location for the unit. For some properties, a slimline model may be necessary to fit into an existing restricted cupboard space, and where there is an

opportunity to save space by locating the cylinder in the loft, a horizontal model may be ideal. Gledhill's StainlessLite range of unvented cylinders includes both slimline and horizontal options for conventional and renewable heat sources.

Unvented Innovation

For both conventional and renewable systems, unvented cylinders provide the ideal solution for maximising energy efficiency. Providing mains pressure hot water, even for rapid fill baths and power showers, unvented cylinders offer a space-saving solution that requires no cold water tank.

Selecting a high quality unvented model is critical to maximising energy efficiency. Installers should look for a product with a credible guarantee and robust construction, along with excellent technical and after sales support, as well as supply chain continuity.

The calibre of insulation to prevent heat loss is also critical to efficiency and tests show that the 50mm insulation injected into the case achieves extremely low levels of heat loss.

When it comes to renewable installations, selecting a model designed specifically for the renewable energy sources is also critical to energy efficiency and the heat exchanger should be designed to meet the requirements of the system. For example, Gledhill's StainlessLite HP has a double and triple pass corrugated coil heat exchanger designed specifically for use with heat pump installations, to maximise the flow rate and heat transfer from the heat pump. In addition, the coil has been increased up to four metres in the largest units to maximise heat exchange.

Greener Future

Energy efficiency is being driven by legislation and regulations but, if we are to reduce bills and consumption for homeowners, it must also be front of mind with installers and suppliers. If manufacturers work with installers to ensure best fit solutions, householders can look forward to a greener and more cost-effective future.



Above: ZEDpod; innovative housing for young people

ZEDpod - the future of sustainable living is right here

The innovative ZEDpods provide first homes for young people and key workers - that can be erected in a few days above existing parking lots close to amenities and jobs. The idea enables responsible local car park owners to provide affordable homes for key workers without using land already allocated for affordable homes.

Each ZEDpod installed at scale costs around £ 65,000,00 to purchase dependant on spec and site specific requirements. Orders for smaller numbers are likely to cost approximately 10 per cent more. The pods can either be purchased from the ZEDpod co or leased. The longer the lease over parking spaces - the lower the rental cost. Private car park owners can purchase the same offer and rent the pods out at market rent - creating a valuable extra income stream.

A young couple sharing a ZEDpod could pay £325,00 a month each and enjoy privacy, their own balcony and front door, a micro kitchen and dining table, their own bathroom, a TV sofa, and a stair leading to a mezzanine floor with home office desk and double bed and wardrobe. It is possible to live in a ZEDpod with potentially zero net annual energy bills.

The ZEDpods are net zero carbon, and use integrated roof mounted solar panels to charge a LIPO4 battery store that often means they only need to connect to the grid for 30 % of the year - mostly in midwinter when offshore wind powered electricity is often available.

The Pods are built to higher standards than conventional homes with superinsulation, vapour permeable draught proofed construction, heat recovery ventilation, aluminium clad triple glazing, hot dip galvanised structural frame with timber infill panels and external insulation. The external envelope is designed to be around 20 years to first maintenance, and is constructed from fireproof, durable and robust materials.



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Consumer support for home energy efficiency is on the up

New research from BRE shows that people are increasingly focusing on energy-efficiency and sustainability when it comes to improving their home or choosing a new build property.

The motivators for home improvements and new home purchase decisions are the subject of 'Home Improvements: Who, What and Why?' - a new report from BRE. Comprising the findings of the organisation's nationwide survey of over 2000 households, it includes details of the types and sizes of properties being improved, drivers for improvement, where people go for information and what they are looking for in their next home.

According to the report, four of the top ten most commonly completed home improvements were concerned with energy efficiency. Replacing light bulbs with energy efficient versions featured strongly (75 per cent), followed by boiler replacement (50 per cent), installing loft

insulation (40 per cent) and replacing windows or doors (39 per cent).

The survey also addressed installation of renewable energy technologies, with 46 per cent of those who had completed renewable energy works installing solar PV, followed by a solar hot water system at 26 per cent and air source heat pumps at 20 per cent. These were also the top three technologies for those planning installations, at 54 per cent, 39 per cent and 38 per cent respectively.

The research found that 73 per cent of people surveyed would consider moving into a newly built home, with 84 per cent of these putting energy costs at the top of their list of priorities. Maintenance costs and ease of maintenance were the next highest, at 78 and 77 per cent respectively, with high levels of natural light (62 per cent), good air quality (42 per cent) and use of sustainable materials in the build (33 per cent) also featuring prominently.

Government cuts estimated forecast for smart meter savings for consumers

The estimated savings that each household could make once smart meters have been installed across the UK is less than half of what was previously predicted, according to a recently released Government report.

The annual dual-fuel energy bill for each home is said to drop by an average of £11 by 2020, less than half of the previous estimate of £26.

The decrease in potential savings is partly down to an increase in the cost of setting up the smart meter network. It's also down to the estimated cost of a dual fuel bill being revised - the new report estimates it will be £200 less on average per year.

The smart meter roll-out is now estimated to cost £54million more than the



£10.98billion previous official forecast, and benefits to consumers have dropped by £415m overall.

The BEIS report was written in August 2016, but was only published last month.

BRE studies prototype for improving solid wall heat loss measurement

BRE has carried out first stage tests on a prototype device for rapid and accurate measurement of heat losses (U-values) from solid wall homes.

Created by Finnish University Arcada with input from Salford University, the device was entered in to a BRE competition aimed at developing viable assessment tools to help improve the thermal performance of homes of this kind.

The UK has over seven million solid wall homes and insulating them is a major challenge. Understanding heat losses from solid walls is vital to determining the likely energy, cost and carbon savings associated with solid wall insulation, however to date, solution policies have been based on modelled estimates of these savings.

The Arcada-Salford device moves the process forward considerably by focusing on robust, up to date and accurate real world data collected in situ by energy assessors.

Supported by funding from the Department for Business, Energy and Industrial Strategy (formerly the DECC), the tool underwent a laboratory and field-based test programme focused on measurement accuracy and speed, ease of use and financial viability.

With refinements identified for incorporation into the second phase model, the tests will help drive further innovation, ultimately making significant improvements to the measurements that are critical for effective retrofit programmes in the future.

Commenting on the outcomes, Matthew Custard, Principal Consultant at BRE said: "The tests were very encouraging and we're keen to see next stage development. These devices have the potential to differentiate wall performance and with investment could enable a more informed and effective approach to the development of thermal improvement strategies."

Government support for smart energy could save the economy billions

The Department for Business, Energy, and Industrial Strategy has released its long-awaited proposals on smart, flexible energy systems which outlines a future where the energy system is cheaper and where homes, power stations, businesses, vehicles, and other facilities actively balance their energy needs.

The Government has identified a number of policy barriers that currently exist to the establishment of this smart system, including how storage systems connect to the grid, the need for a definition of energy storage in legislation, the double counting of storage, and the role of the capacity market in helping drive deployment.

It also requesting evidence on the future role of Electric Vehicles (EVs) in this smart system. The mass roll-out of EVs could shift

peaks in electricity demand and function as a substantial energy storage system.

A report released in July 2016 by the Carbon Trust and Imperial College London, commissioned by the Government and released in association with the Call for Evidence last month, argues that between now and 2050 the UK could save £17-40billion across the electricity system by supporting the deployment of technologies such as batteries.

Dr Nina Skorupska, Chief Executive at the Renewable Energy Association, said: "The Government's call for evidence could be the foundation of the flexible, decentralised energy system that reduces energy bills for every one of us.

"This document clearly shows that the Government is aware of the revolution

taking place in the energy sector right now, and sees that the shift to a more decentralised, flexible system could feel as radical as the emergence of mobile phones. The right questions are being asked but it's now about the speed in which policy change can take place.

"Storage and DSR technologies are evolving very rapidly and the Government risks being in a position where it is not leading but playing catch up or worse, by standing in the way.

"Moving quickly by addressing policy barriers and prioritising these technologies in the industrial strategy would also help position the UK as an international leader. This translates to more jobs for UK firms as these technologies will also be deployed on a massive scale internationally."



Above: Preparing the roof of Danby Castle with the Actis Hybrid insulation system.

Yorkshire castle wedding venue chooses Actis Hybrid insulation

A Grade 1 listed ancient barn at a hunting lodge on the edge of the North York Moors has been restored for use as a wedding venue – with help from the Actis Hybrid insulation system.

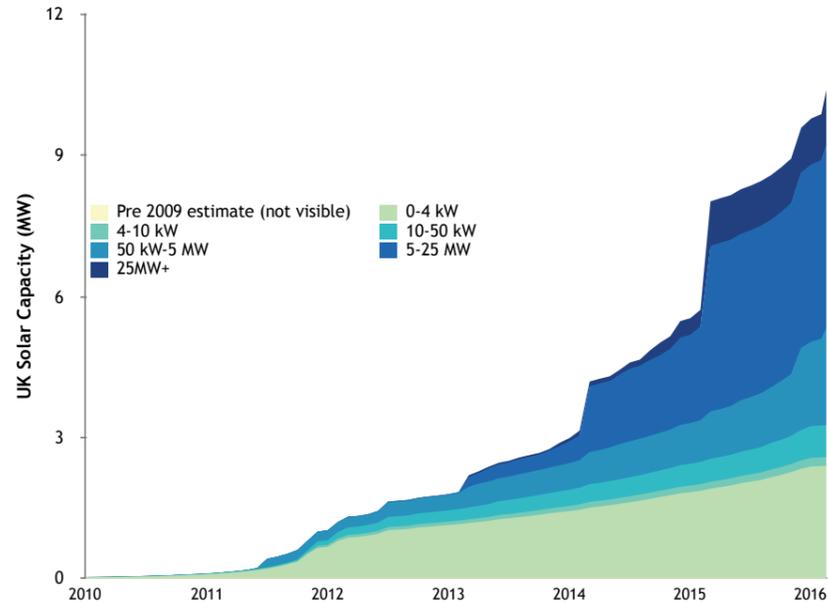
Danby Castle, a 13th century hunting lodge, has been operated as a successful wedding venue by Esk Valley Weddings for the past seven years, with the indoor element of the functions taking place in a marquee in the castle grounds.

Booming business inspired organisers to relocate the main event area into a barn on the site – a particular challenge, as not only did it require extensive renovation but it was also a grade 1 listed building.

Owners, Dawnay Estates, appointed Ivy Construction of Whitby, who in turn brought in AS Roofing of Scarborough to carry out the work. Burton Roofing Merchants of York were then selected to supply the materials. The project was particularly sensitive as in addition to its Grade 1 listed status it was also within the grounds of an ancient monument.

Solar deployment

UK Solar Deployment: By Capacity (updated monthly)



FiT deployment caps that have been reached in tariff period 01 (01 April-30 June 2016)

Accurate as at 00.01 on 15 March 2016

Deployment Band	Cap limit (MW)	Cap reached	Date & time of final installation to qualify	Capacity deployed (MW)
PV <10kW	76.96	No	N/A	2.56
PV 10-50kW	25.72	No	N/A	0.859
PV >50kW	14.5	No	N/A	6.79
PV standalone	5	Yes	08/02/2016 01:15	12.79
Wind <50kW	11.17	No	N/A	-
Wind 50-100kW	0.3	Yes	08/02/2016 00:15	0.542
Wind 100-1500kW	6.8	Yes	08/02/2016 00:18	21.730
Wind 1500kW-5000kW	10	No	N/A	-
Hydro <100kW	1.1	No	N/A	0.135
Hydro 100-5000kW	9.5	No	N/A	-
AD (All)	5	Yes	08/02/2016 00:15	15.67

Generation tariffs for solar PV

Tariff band	Higher rate	Middle rate	Lower rate
<10kW	4.18	3.76	0.57
10-50kW	4.39	3.95	0.57
50-250kW	2.03	1.83	0.57
250-1000kW	1.69		
>1000kW	0.57		
Standalone	0.51		

* Currently subject to consultation

Generation tariffs for non PV technologies

Technology	Band (kW)	Tariffs (p/kWh)
Hydro	<100kW	7.65
	100-500kW	6.13
	500-2000kW	6.13
Wind	<2000kW	4.43
	<50kW	8.33
	50-100kW	6.08
	100-1500kW	3.92
>1500kW	0.83	

Source: OFGEM

Cost comparison of heating fuels (not including RHI payments)

Fuel source	kWh provided per unit of fuel	Efficiency of system (%)	Units consumed by house (kWh)	Price per unit of fuel (£)	Units consumed per annum	Cost per annum
Heating oil (kerosene)	10 per litre	90	25300	0.3 per litre	2530 litre	£784
Wood pellets	4800 per tonne	94	24300	256 per tonne	5 tonnes	£1280
Natural gas	1 per kWh	90	25300	0.04 per kWh	25300 kWh	£1,012
LPG	6.6 per litre	90	25300	0.38 per litre	3833 litres	£1,457
Electricity	1 per kWh	100	2300	0.14 per kWh	23000 kWh	£3,220
*Air source heat pump	1 per kWh	290	7931	0.14 per kWh	7931 kWh	£1,110
*Ground source heat pump	1 per kWh	360	6389	0.14 per kWh	6389 kWh	£894
Dual mode system 1						
Oil boiler (30% of heat mode)	10 per litre	90	7590	0.31 per litre	759 litres	£235
*Air source heat pump (70% of heat mode)	1 per kWh	290	5552	0.14 per kWh	5552 kWh	£777
Dual mode system 2						
Gas boiler (30% of heat mode)	1 per kWh	90	7590	0.04 per kWh	7590 kWh	£304
*Air source heat pump (70% of heat mode)	1 per kWh	290	5552	0.14 per kWh	5552 kWh	£777

Based on 23,000kWh needed to meet typical household's heating and hot water needs per annum. Prices and costs are indicative only and may vary. *Calculations based on continuous operation at maximum efficiency. Fuel costs taken from Nottingham Energy Partnership and other sources.

RHI non-domestic rates

Tariff name	Eligible technology	Eligible sizes	Tariff rate Pence /kWh	Tariff duration
Small biomass	Solid biomass, municipal solid waste (inc CHP)	<200 kWth	Tier 1: 3.10	20
			Tier 2: 0.86	
Medium biomass	Solid biomass, municipal solid waste (inc CHP)	200 kWth and above	Tier 1: 5.24	20
			Tier 2: 2.27	
Large biomass	Solid biomass, municipal solid waste (inc CHP)	100 kWth and above	2.05	20
Small ground source	Ground source heat pumps, water source heat pumps, deep geothermal	<100 kWth	Tier 1: 8.95 Tier 2: 2.67	20
Deep geothermal			5.14	20
Solar collectors	Solar collectors	<200 kWth	10.28	20
Air source heat pumps	ASHPs (Source: OFGEM)	All	2.57	20

According to the latest figures published by the Department for Business, Energy & Industrial Strategy, as of the end of September 2016, overall UK solar PV capacity stood at 11,152 MW across 891,409 installations. This is an increase of 30% (2,572 MW) compared to September 2015. Provisionally, September 2016 saw 21 MW (4,461 installations) of solar PV capacity being deployed throughout the month, with the main drivers (46% of capacity) being small scale 0 to ≤ 4 kW schemes in Great Britain and Northern Ireland. To date, 49% (5,462 MW) of total installed solar PV capacity comes from large scale installations greater than 5 MW, with 22% (2,441 MW) coming from small scale 0 to 4 kW installations. At the end of June 2016 (end Quarter 2), 53% of capacity (5,669 MW) came from ground-mounted or standalone solar installations.

Domestic RHI deployment

Technology	Accreditations (Apr14-Sep 16)	% of total
ASHP	24,024	47
GSHP	7,489	15
Biomass	11,998	23
Solar Thermal	7,908	15
Total	51,419	100

Number of MCS registered installers per technology

Technology	Cumulative	Registered Sep 16
Solar PV	1,838	13
Biomass	547	0
Air source HP	979	7
Ground source HP	683	2
Solar thermal	755	1
Small wind	54	0
Total	2,519	23

(Figures supplied by Gemserv)

Number of MCS registered installations per technology

Technology	Cumulative	Installed Sept 16
Solar PV	883,581	4,461
Biomass	17,065	51
Air source HP	49,539	466
Ground source HP	13,594	92
Solar thermal	8,683	64
Small wind	5,061	2
Total	955,615	4778

Domestic RHI tariffs

Technology	RHI rate (from April 1 (p/kWh))
ASHP	7.51
Biomass boilers	4.68
GSHP	19.33
Solar thermal	19.74

Renewable energy supplies – a brand new paradigm?

In May 2016, Portugal ditched fossil fuels and ran solely on renewable energy for four consecutive days. Solar, wind and hydroelectric power exclusively covered the electricity consumption of the entire country for a whopping 107 hours in total. The feat is the latest of many renewable energy success stories and highlights the growing role renewables play in modern energy generation.

Here, Nick Boughton, sales manager of industrial systems integrator Boulting Technology, discusses how emerging technologies can provide a new answer to an old question: renewables are great, but what happens if it's not sunny or windy?



Above: Europe's biggest ever floating solar panel array on London's Queen Elizabeth II reservoir as part of Thames Water's ambitious bid to self-generate a third of its own energy by 2020.

Microgeneration

The role of the National Grid is changing. Traditionally, it relied on a few very large fossil fuel and nuclear power stations to supply electricity. Put simply, the grid received large input from a few sources dotted around the country. Today, as these larger power stations are being closed down, due to age or inability to meet forthcoming emission regulations, the supply mix is changing.

The grid still gets electricity from traditional power plants, but it increasingly receives power from many smaller-scale wind, solar and anaerobic digestion plants as well.

Earlier this year, as part of its target to self generate one third of its electricity requirements by 2020, Thames Water unveiled Europe's largest floating solar farm on the Queen Elizabeth II reservoir at Walton-on-Thames. With more than 23,000 solar panels covering an area equivalent to eight football pitches, its peak output is 6.3MW and its projected annual output of 5.8 million kilowatt hours is enough to power 1,800 average homes (see picture above). While this is a significant contribution, it would take more than 600 similar sized solar farms to match Drax. With an output of 4,000MW, the UK's largest coal and biomass fuelled power station takes some beating. Drax does have the advantage of running day and night, seven days a week though.

Demand-side response

The main role of the National Grid is to ensure electricity supply meets the demand, known as balancing the grid. This brings us on to demand-side response.

Once upon a time, the National Grid had to rely mainly on supply side response – getting power generators to match demand.

Demand-side response is a technology where customers are incentivised financially by the Government to lower or shift their electricity use at peak hours.

In a sign of the times, the biggest electricity user in London — or the Tube to you and I — recently announced it is signing up to a demand-side response network. This means when demand on the grid is at its peak, London Underground will use its back-up power supplies to ease strain on the grid.

There is still huge potential for demand-side response. Instead of merely sending signals to customers when they need to take action, automated processes could be put in place, by the grid or more locally, to trigger back-up power or turn off non-critical applications automatically.

In industrial power management environments, the same principle can be applied by using smart low voltage switchgear, such as the Boulting Power Centre. This means any building —

industrial or commercial — can prioritise the order in which the switchgear turns off connections, if at all, and for how long.

Batteries

One of the concerns with solar and wind energy is that production is often at its highest, when demand is lowest. Therefore, storage is a key priority for eliminating waste and harnessing production potential. Battery storage isn't new, but until fairly recently, batteries were big, heavy, expensive and had a limited lifespan.

Leveraging car and mobile phone developments, modern battery storage systems offer a much more attractive proposition. Looking only a few years ahead, battery storage will be commonplace not just at grid level, but on industrial sites, office blocks and domestically. The Tesla Powerwall is an example of an innovative solution applicable to most homes.

With viable and scalable battery storage options and demand side response, renewables and microgeneration can join the top table of electricity generation, previously dominated by nuclear and fossil fuels sources.

With this kind of progress, it's not too hard to imagine Portugal's 107 hours being beaten quite soon.

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