Flexibility makes the difference to residential solar

More and more home owners are installing PV systems. How efficient are these systems? What does the industry need to do to support this growth area? PES takes a look at Huawei's new, flexible solution.

Across solar markets globally, we are continuing to witness the maturation of utility scale solar, with subsidy-free commercial projects increasing in frequency. As solar's share in global energy generation continues to rise exponentially, the industry's ability to innovate expands too. The rapid technological developments and cost reductions that have been driven by investment in utility scale are also having a positive influence on the growth of the residential sector.

From an industry perspective, this growth has been accompanied by a proliferation of residential PV systems and technologies now available to installers and homeowners. So with residential solar now set for another significant period of expansion, it is essential that PV technology developers are able to offer systems that can handle the huge variety of customer demands across what is an increasingly competitive and crowded marketplace.

The growth of residential

Previously, residential solar was supported by necessary financial incentives in order to prove attractive to homeowners. As we look at the costs of a typical residential PV system in some of the most developed solar markets, many are now at the level that already makes economic sense on their own. Consequently, market analysts are predicting that following the rapid expansion of commercial projects, residential photovoltaic applications will be a key growth engine for the industry in the coming years. Industry experts at IHS Markit forecast that 48 GW of residential PV systems will be installed globally within the next five years, almost doubling the global installed base for residential solar to 90 GW by the end of 2021.

The growth of residential solar is just one example of how the global energy system is becoming increasingly decentralised. The use of renewable technologies and other forms of decentralised energy continue to expand, with countries moving away from traditional models of generation from conventional sources. As this system develops across markets, flexibility will be the defining characteristic of the new era of energy generation, in terms of distribution, storage and consumption.

Typically, when discussing the subject of flexibility with respect to solar, it's in relation to how the application of digital technology and smart management have transformed an intermittent form of generation into one of the most responsive forms of electricity supply. When it comes to residential PV systems, however, it is the flexibility of system design that will be a priority for both installers and for homeowners who are looking to invest in home energy solutions.

Flexible by design

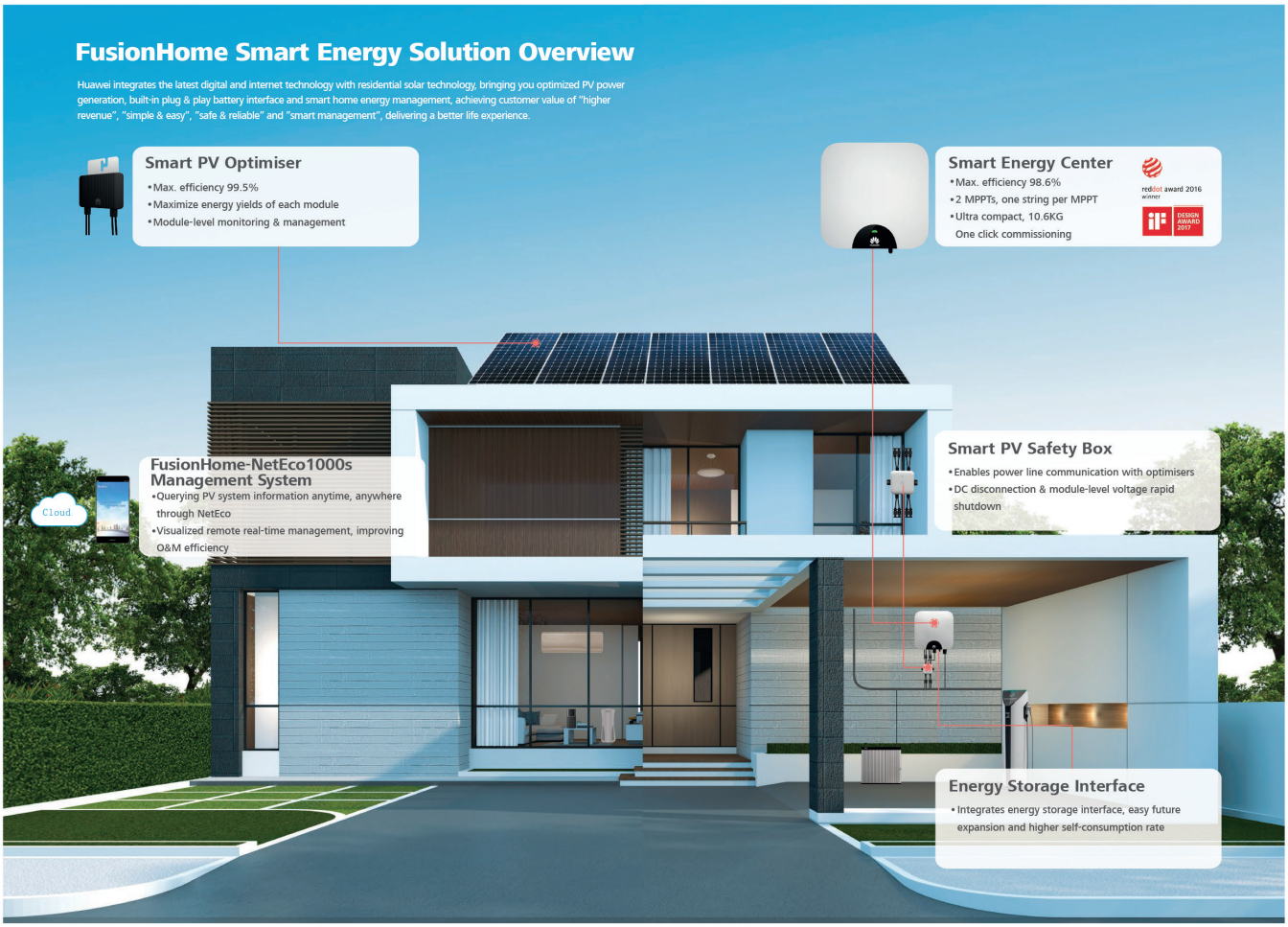
Although innovation by industry and economies of scale are contributing to cost reductions across solar, for homeowners, a home energy system can still represent a significant upfront financial expense. It is therefore imperative that any residential solar solution is able to account for different residential layouts and unique circumstances of the homeowner.

Although residential PV systems are much smaller in scale and capacity than their utility scale counterparts, they still present their own set of particular challenges. Taking the variability of rooftops, for example, there are several characteristics of a rooftop which need to be considered, including the complexity of the layout, shading and the most efficient string configuration.

These factors can be compounded further by limitations with respect to PV system design, which result in a sub-optimal use of roof space. Previously, PV systems would require that all PV modules in one string had to face the same direction and could not be located in shade-prone areas.

Similarly, individual strings would require identical module type while parallel strings had to be identical in length. Without the appropriate PV system design these factors can have a significant impact on both the upfront cost and energy yields over the lifetime of the system, having a direct effect on a customer's return on investment.

To avoid these issues, Huawei has designed its FusionHome Smart Energy Solution from the bottom up to be a one-fits-all solution, which has the flexibility to meet the range of customer requirements across the residential market. By helping to



simplify these design issues, it enables customers to maximise rooftop kWh yields in all scenarios. The system is built around an inverter with European-weighted efficiency of 98%, which also accommodates the use of PV optimisers on selected modules that may have shading or different roof orientation.

The smart optimiser effectively avoids module mismatch caused by dust, shadows, PV module attenuation, and hot spots and maximises the energy yield from each PV module. Taking a rooftop that may have a chimney-shaded area equivalent to the size of four modules, for example, FusionHome allows homeowners to install modules with optimisers in the shaded area enabling them to fully utilise their rooftop. Over 25 years these four modules can generate around 22,400 – 33,600 kWh in additional yields, comfortably covering the upfront cost of the modules.

Importantly, FusionHome has the functionality to enable customers to only add optimsers where needed. This helps customers keep costs down when compared with other systems, which require that optimisers be installed across an entire array even though they may only be needed on one module. For those customers who require a more comprehensive set-up, the system can be scaled up and optimisers can be combined with safety and module management to offer a fully functional solution.

For installers and distributors, the benefits of flexible residential systems are obvious. Being able to offer a solution that they know can cope with the full range of requirements across the market means that they no longer need to purchase multiple solutions from different suppliers, which helps to significantly reduce operation costs. In addition, installers only need to contact one supplier, helping to deliver savings across marketing, logistics, warehouse, team management and communication.

Future-proofing for storage

Another way in which it is essential that the industry is able to offer flexibility to customers is energy storage. The advent of reliable storage technology will be a central aspect of the new global energy system. Storage will help facilitate new ways for consumers and businesses to manage their energy while enabling industry and governments to reimagine how we can utilise the grid.

Consequently, batteries are set to be one of the fastest growing segments of the solar industry. An ever-increasing proportion of solar and wind on the grid, combined with the continued expansion of battery electric vehicles is helping to drive down battery costs, with the price of lithium-ion battery packs having fallen 79 per cent since 2010, according to Bloomberg New Energy Finance data.

Despite the positive trajectory that the storage market is on, it currently remains the case that storage still represents a sizeable financial undertaking for customers. As such many homeowners will understandably be looking to defer this cost until the price of batteries further decreases. While this is an attractive option, adding batteries later may result in customers encountering additional costs, or complications depending on the capabilities of their PV systems.

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Hybrid inverters, which are capable of storing energy directly into batteries, are prohibitively expensive, while other systems require system retrofit and the purchasing of additional AC/DC conversion modules before batteries can be added.

To provide homeowners with greater choice over when to invest in storage, Huawei's FusionHome features an integrated DC-coupling storage interface. This offers plug and play functionality, enabling customers to conveniently add batteries at any time. This eliminates the need for retrofitting and the costly purchasing of additional equipment.

In order to ensure optimum efficiency the interface is DC-coupling, meaning that power is stored directly in the battery in its DC form. As the process of converting AC to DC incurs some proportion of energy loss, DC-coupling ensures that this is kept to a minimum as there is only one total conversion required.

Maximising yields, minimising costs

As the residential market continues to expand apace, it will be flexibility that will be the deciding factor for both homeowners and installers alike when it comes to their PV system. In a highly competitive marketplace, the task at hand for PV technology manufacturers is to continue innovating and investing to ensure that they can offer a solution that is suitable for all customer scenarios that maximises yields while minimising costs.

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