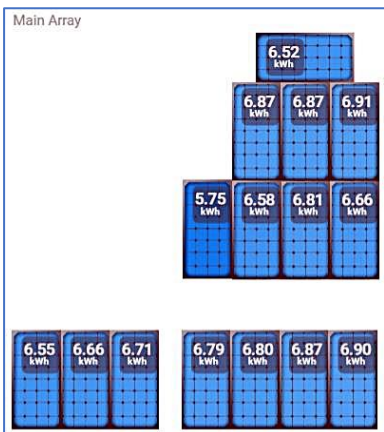


Experience with Solar PVs and Electric Car at our 1930s Semi in the Hurst Park Estate

SOLAR PV PANELS

In 2013, driven by enticing national advertising and the enthusiasm of some early adopter friends, we decided to investigate the feasibility of harvesting some 'free' energy from the sun. We obtained quotations from three companies (two local and one national) and eventually settled on [Cambridge Solar Ltd](#) who are still in business and doing quite well I believe. The panels were installed over a period of about three days and became operational about a week later in mid-April, after a new consumer unit was fitted. A full technical survey, appraisal of the options and pre-planning was important to ensure a smooth installation, and Owen Morgan, the MD of Cambridge Solar, was very helpful in this regard.

We have an array of 15 panels facing south-west at the rear of the house. Each panel is capable of generating 250 watts under optimum conditions – so a theoretical maximum of 3.75kWp. There are [many factors](#) which affect the actual power achieved – in our case the best we have seen is 3.4kW – but this is all factored in when you receive a quotation and an estimate of generation capacity from the supplier. Owen told us that he prefers to give a conservative calculation of annual generation output and we have found that his estimates have been exceeded in practice every year.



We also invested in a device which diverts any excess power that is generated to an immersion heater so that it augments our hot water supply, thus reducing gas consumption. Any remaining excess energy is exported to the National Grid.

Back in 2013 the feed-in tariffs were guaranteed by the government for 20 years with annual RPI increases:

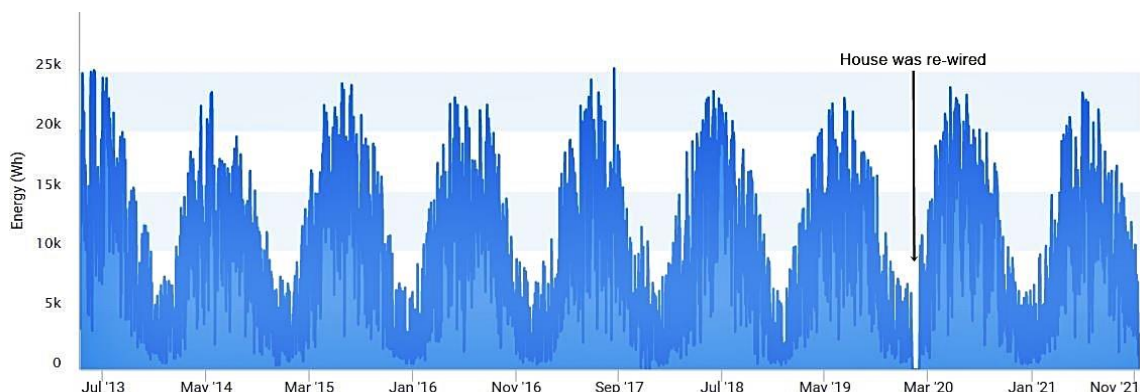
	2013	2021
Generation	15.44p/kWh	18.48p/kWh
Export	4.64p/kWh	5.57p/kWh

This resulted in a payback estimate of 9 years at 2013 prices.

Taking into account the extra savings on gas usage for water heating and rising tariff rates this improved to about 8 years.

Over the last 8½ years we have generated 29.8 megawatt hours of electricity – a carbon offset of 21 tons or saving 538 trees (according to the monitoring software).

Since 2013 the cost of panels has reduced considerably but the generation tariff is no longer available and the export tariff varies according to the energy supplier you choose to contract with. This has resulted in longer [payback periods](#), but with the ever increasing cost of energy it could still make sense to make the investment particularly if space can be found to include [solar battery storage](#) or if a charger is planned for a battery powered car which is compatible with [vehicle-to-grid](#) charging.



Solar panels produce a DC output which needs to be converted to 240v AC for household use and export to the grid. The conventional installation method used to be for all panels to be wired together to a single inverter, but we were advised that a fault occurring in any of the panels, or in the inverter itself, could cause the whole system to fail. We therefore opted to have panels installed each with its own integrated micro-inverter producing 240vAC. This means that total system output is maintained, albeit at a reduced level, if there is a panel failure, and integrated software allows the performance of each panel to be monitored via a cloud-connected computer or smartphone app. Touch-wood we have not yet encountered any problems, although the system has often reported when the national grid voltage or frequency has drifted out of spec!

ELECTRIC CAR

As a working couple with children we had always had a car each, one diesel and one petrol, as well as bicycles. When the children grew up and left home the habit and convenience of having two cars continued on for many years and into retirement, until the end of March this year. It was then that we eventually overcame our inertia and decided to invest in an all-electric car. The Passat diesel was traded in and the Honda Jazz sold to a dealer via an auction website.

We made the new purchase with EMG at Thetford for a Kia E-Niro 4 that had been a demonstrator model with just 900 miles on the clock. We were attracted to this car because of its claimed range of 282 miles, seven year warranty on all parts including battery, and good press reviews. Also there is an EMG dealership on Milton Road for service support.

I have to say that we have no regrets. The car is comfortable and a delight to drive and so far it is living up to its claimed maximum range. In fact, so long as we drive in Eco mode we often get an indicated 300 miles or more – although we haven't been brave enough put this to the ultimate test of driving until 'empty'.

Charging – we looked into getting a wall-charger installed using a subsidy from the Government's OZEV scheme but we gave up! The paperwork and procedures required of the installer are so onerous that I couldn't find any who were interested in doing the job on this basis. In the end we paid the full cost to a local electrician who did an excellent job using a [small, neat unit](#). I see that this manufacturer is now offering to arrange quotations including the OZEV grant so that might be a better way to go in future. The number of charger units on the market continues to grow so it will pay to shop around.

We were advised that it would be best to get the main fuse for the electrical supply to the house upgraded from 60amp to 100amp because of the extra load requirement (7.3kW). UK Power Networks has a [good website](#) explaining how to check your existing fuse rating, and there is an online form to apply for the work to be done. We found them to be very helpful and efficient, and they upgraded the fuse at no cost!

The App – yes the car has its own smartphone app. You can use it to monitor the charging status and available range, to check whether doors and windows are locked, to view the power consumption of recent journeys (kW/mile), to warm up the car before you go out of the house, etc. One of the most useful features for me has been to set destinations on the app and send them remotely to the car's navigation system. Oh, and if you've forgotten where you parked the car the app will show you its location on a map.

Range anxiety – yes, we still get this but we're more confident now that we've had some experience of planning trips and how to use charging stations and their apps. Fortunately

there is a strong trend now towards converting to contactless pay stations rather than having to rely on using suppliers' different apps.

Regenerative braking – one of the criticisms levelled at electric cars is that, although there are no harmful exhaust emissions, they still generate particulates from brakes and tyres. There is some speculation that because they tend to be heavier than conventional cars then there will be more wear on brake pads, but the research on this is sparse and rather inconclusive. In order to minimise brake wear and maximise driving range it's possible to adjust the amount of regenerative braking that occurs by operating paddle controls on the steering wheel. When your foot comes off the accelerator, power from the battery to the motor is cut and the drive rotor experiences a negative torque from the magnetic field in the motor which slows the vehicle down. The electric motor effectively becomes a generator feeding electric current back to recharge the battery, thus helping to extend the driving range. A certain amount of mechanical braking is also applied automatically if you want to bring the car to a complete standstill, but much less is needed than in a conventional car.

This feature really comes into its own when using the intelligent cruise control which not only maintains a constant speed but also a constant distance from the car in front. This means that when the system needs to slow the vehicle to keep a safe distance it automatically uses regenerative braking rather than the disc brakes.

Performance – the car has four driving modes: Eco+, Eco, Normal, and Sport. We find that the Eco mode is fine for all our needs, whether it's suburban or motorway driving. The electric motor has a lot of torque and feels quite lively over the whole speed range without any gear changes required.

Top speed is 108mph with 0-60mph time of 7.5 secs (6.5 in Sport mode). We would only use Eco+ if desperate to find a charging station – it turns off all unnecessary electrics including heating, air-conditioning, radio, satnav, etc.

Fuel costs – the cost of electricity for charging varies according to whether the sun is shining and we are getting the full benefit of the solar panels or whether we have to get the majority of power from the grid, or use a commercial charging station.

This means that home charging can vary from about £6 to £10.30 for a full charge giving a mileage cost of between 2.13p/mile and 3.65p/mile. For commercial charging stations this rises to about 7.1p/mile. This rate is likely to increase soon with mounting costs being passed on by the electricity generating companies.

Battery charging – approximate recharge times from 20% capacity:

2.5kW AC charger/cable for 13amp socket	22.3 hrs	(cable supplied with car)
7.3kW AC home charger	7.2 hrs	(cable supplied with car)
22kW AC charger	2.5 hrs	
50kW DC charger	1.1 hrs	
100kW DC charger	0.5hrs	

Ageing – to optimise battery life over the long term it is preferable not to allow the charge remaining to fall much below 20% on a regular basis and not to top it up by more than about 80% if possible. Repeated use of high power DC chargers can also put stress on the battery cells leading to some degradation of capacity over time.

New Models – new cars and variants are being launched all the time – either to stay within the price cap of £35k for the government's (£2.5k) subsidy scheme, or to introduce up-market performance improvements.