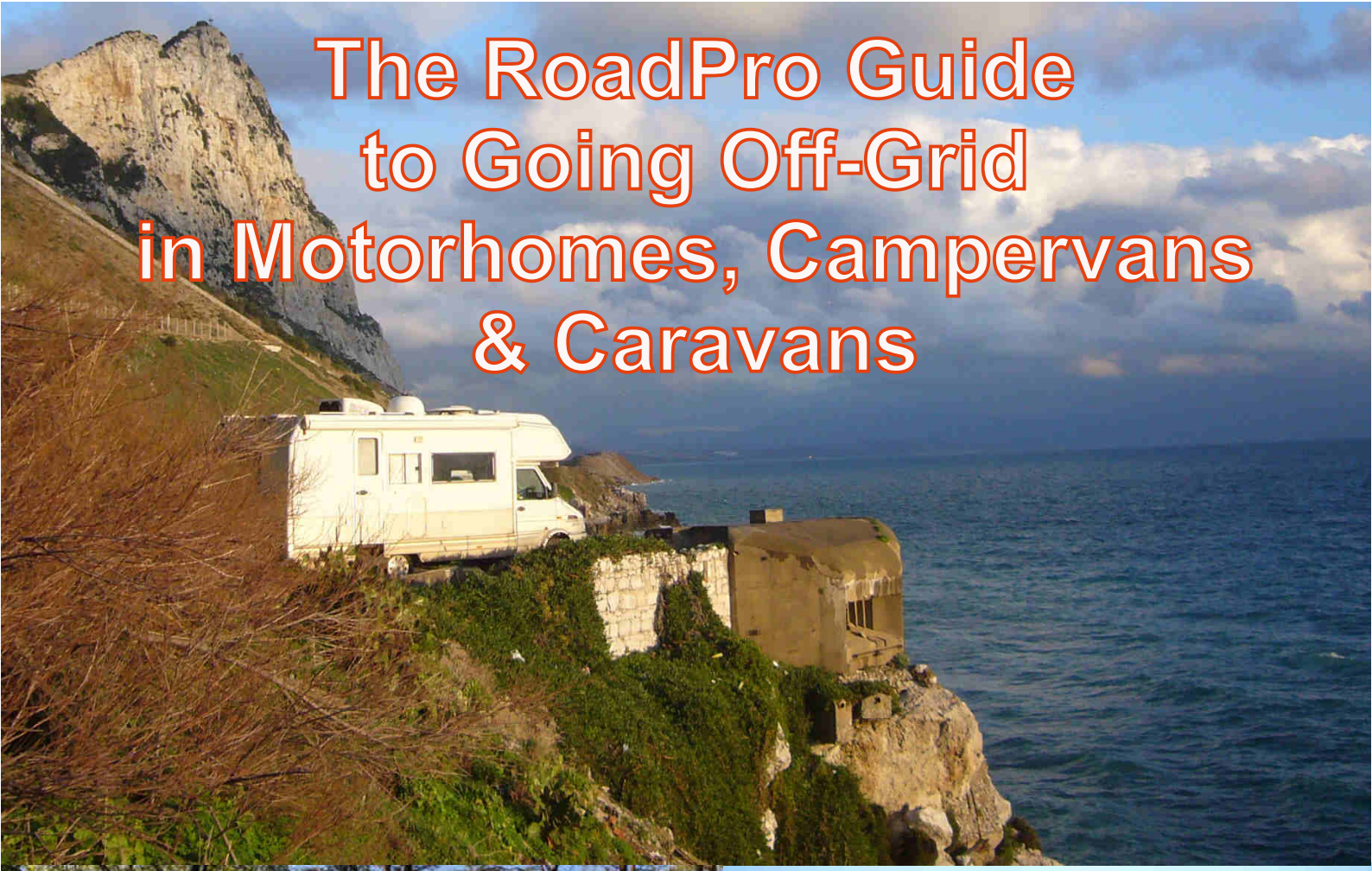
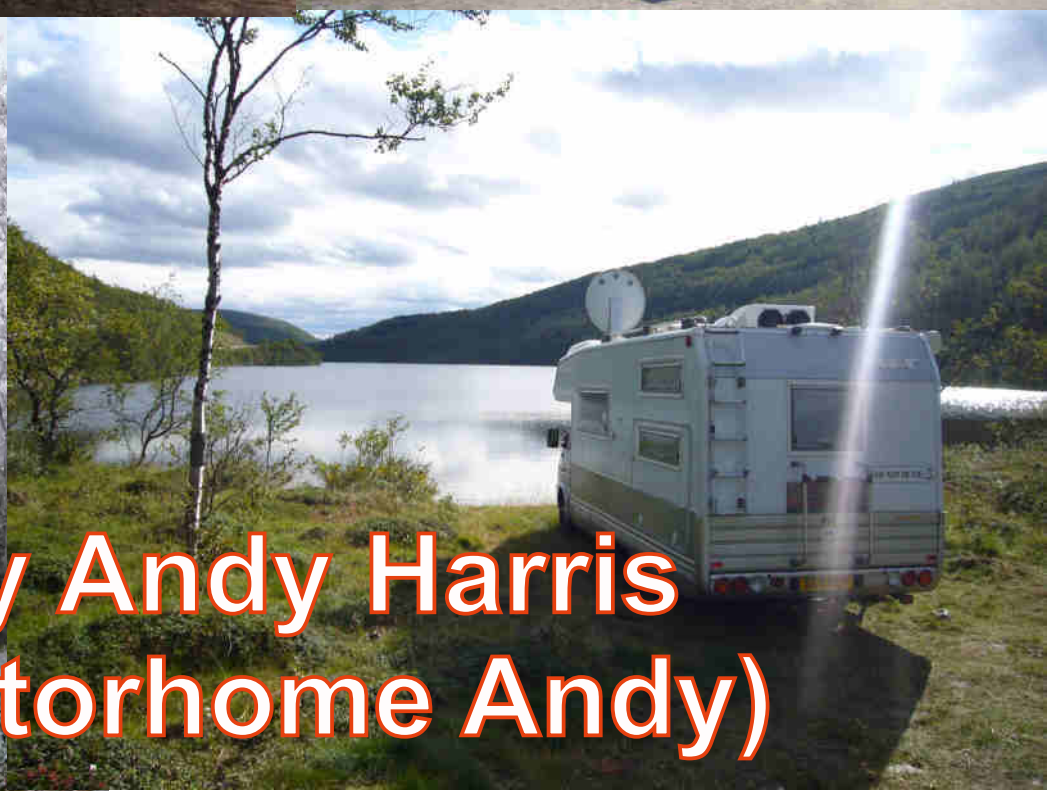
The RoadPro Guide to Going Off-Grid in Motorhomes, Campervans & Caravans





By Andy Harris
(Motorhome Andy)

Why Go Off-grid?

If you're lucky enough to have a motorhome, a campervan or a caravan, you can clamber aboard and, in theory, go absolutely anyway where there are roads to drive down. If you've got the right sort of vehicle, you don't even need a road. That's the theory. In reality, the majority of people seem happy to head straight for a campsite with all mod-cons and line up in neat rows with hundreds of other like-minded campers. If that's what you like, great! Enjoy.

Looking for the simple life?

Many people enjoy the security that campsites offer, the facilities and the way you can get your awning out and just relax for a few days or weeks. But maybe the regimentation, the rules and the holiday camp atmosphere don't appeal. To cater for people like this - you, maybe - there are thousands of campsites all across the UK that offer space to park up, peace and quiet and...that's about it. Some have basic facilities such as a tap and waste-tank emptying. Some have mains hook-up - EHU - but many don't and these include some of the quietest, most attractive sites in the UK.

Another appealing feature of these "nothing fancy" campsites is the price: from as little as £2.50 a night. The campsites with the lowest prices tend to be the ones with the fewest facilities. This used to mean that, if you depend on mains electricity to run your domestic appliances or you want to be certain that the TV doesn't drain the leisure battery just as Coronation Street gets to an exciting bit, you would be missing out on some very nice campsites.

An off-grid campsite somewhere in Wales

However, thanks to the technology that's now available to anyone in a motorhome, campervan or caravan - *shall we just say LV (Leisure Vehicle)? It makes sense and it'll save so much time* - it's quite possible to stay out in your LV with no mains hook-up for days at a time and still enjoy using your hair-dryer, toaster, microwave oven, coffee maker, etc. The best thing about being able to do this is the freedom it gives you. Even if you're quite happy with few or no mains-power appliances, the right equipment helps. Imagine not even having to think about EHU (mains hook-up) when you plan your trips: with modern technology, you can be self-sufficient and free to go anywhere your LV will take you.

Why be a "Campsite Captive"?

But if you don't fancy being a "Campsite Captive", even if the campsite is miles away from anywhere, with no shower block and just half-a-dozen LVs scattered around, there's always "wild camping". This means different things to different people. It can involve belonging to an organisation like BritStops and staying in pub car parks or, if you're on the continent, taking advantage of the aires that can be found in just about every European country - except the UK!

For some people though, wild camping means having no plans at all about where to spend the night and taking life as it comes. That can mean parking in the street, in car parks or any place where there's no one around to object or there is someone to ask for permission. Wherever you choose to lay your head, the rules are simple: leave no trace behind and take away nothing but memories. This kind of wild camping can result in experiences that will stay with you forever.

All set for a quiet night on top of a gun emplacement on Gibraltar

What do I know about off-grid camping?

During the past 20 years, I've travelled getting on for 250,000 miles in leisure vehicles of one sort or another: all over Europe, in Africa, America and Australia. During that time, I'm pretty sure that I've spent less than 30 nights on campsites of any kind and of those campsites, I remember using the EHU once.

In Albania, I saw a large service station forecourt and handed over a 5 Euro note in appreciation when I was given the OK to park in a quiet corner for the night. I didn't expect one of the attendants to grab a chair and a Kalashnikov AK47 and spend the night on guard next to the motorhome.

Then there was the time when we camped in a car park next to the Bosphorous in Istanbul and shared a barbecue with the Chief of Police who had parked his car next to us. And we once spent a memorable night on top of a disused gun emplacement in Gibraltar: the view was sensational. In Norway, we were the northernmost motorhomers in Europe: it was bitterly cold but we were comfortable enough, watching reindeer wander past while we were parked in a rest area. This kind of camping isn't for everyone but I reckon it's a lot more fun than joining a queue to empty your toilet cassette first thing in the morning.

I've been told that there are some people who never actually use the shower, toilet or kitchen in their leisure vehicles. For all I know, they don't use the beds either. If you're one of these people, a full-service campsite is just what you need, possibly with a Premier Inn next door. If, on the other hand, you can hear the great outdoors beckoning and you're feeling just a little adventurous, read on.

Andy Harris, July 2020. @MotorhomeAndy
Enthusiastic motorhomer, off-gridder and owner/founder of RoadPro.

If you're planning to travel abroad, going off-grid is perhaps even easier and often more attractive as well. This is because of the availability of aires and other parking places and also the conditions found in some continental campsites. But off-grid camping is not for everyone and I've devised a simple test to help you decide if you'll enjoy going off-grid or whether you'll be better off sticking to full-service campsites.

Look at the two photographs below. Where would you rather wake up? If you answer Photo 1, carry on reading. If your answer is Photo 2, start making those campsite bookings now!

Photo 1

Photo 2

Can *you* go off-grid in *your* vehicle?

The "Beast"

You may have thought that going off-grid needs a specially modified vehicle with 4-wheel drive, extra fuel tanks and maybe a winch to drag yourself out of trouble. If you're going to be trekking across Africa, all those things are a good idea and you should think of getting hold of a specially built expedition vehicle like the gigantic one from Australia, seen here parked on our forecourt. But, if you simply want to get away from the crowds and not go too far off-road, you can do it in any kind of LV: caravan, motorhome or campervan.

All you need is the right equipment.

"Going off-grid simply means not having to be hooked up on a campsite in order to enjoy your LV. Whatever your vehicle, it means freedom, independence and, if you're open to them, unforgettable experiences."

Chill out in the mountains.

Wake up to breathtaking views.

Go wild in the country.

Make friends with the locals.

Social distancing? Not a problem.

It's all About the Equipment.

When you stay on a full-service campsite, you need hardly any equipment in your LV other than what the manufacturer put into it on the production line. In fact, most caravans and motorhomes are designed with campsites in mind. Why would you want to stay anywhere else? Are you crazy?! That's why, if you're lucky enough to pick up a new LV from a dealer, there might be a single, 100 Watt (if you're lucky) solar panel, just the one leisure battery and often, as a special gift, a long orange cable so that you can connect your new motorhome, campervan or caravan to mains electricity.

To serious off-gridders, that orange cable is a symbol of failure, a statement that you won't be going off the beaten track and that you will almost always be tethered to a pole on a campsite. I haven't carried a hook-up cable in my motorhome for more than 20 years and, honestly, I've never needed one and never wished I had one. I do have one back at base so that I can run the fridge without using gas but it never, ever, travels with me.

Of course, you'll still need to fill up with water every now and again and to empty your toilet cassette or grey tank. You may need to fill up with LPG - although it's now feasible to do away with gas as well. With sensible planning though, you can easily go for several days or even weeks, without having to worry about any of these things. It's electricity that we're looking at here, 12V from the battery and, if you want it, 240V from an inverter.

So, what do you need to do to liberate yourself and your LV from the full-service campsites?

It's a simple question to answer: "Get the right equipment." But what is the right equipment? That's the tricky bit and the answer depends on two things: what sort of LV do you have and what do you want to be able to do in it when you're off-grid?

There's a third point to bear in mind. Deciding on the right equipment is one thing but it's essential that it's installed correctly if it's going to work efficiently and reliably. Get it wrong and you're wasting both your time and your money.

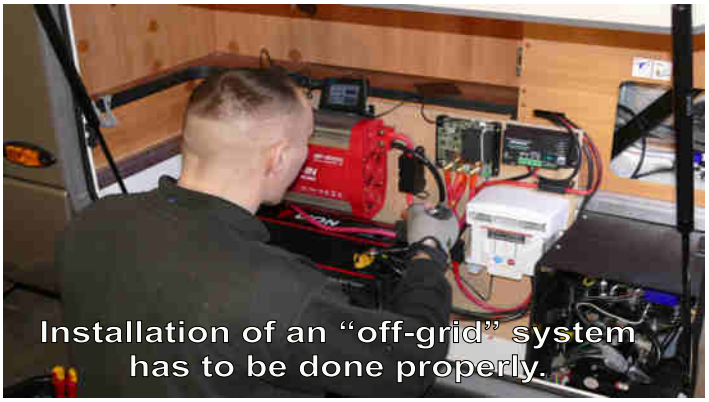
The Leisure Battery:

The leisure battery is the single most important component in your LV. Think about it: without the leisure battery you'd have no lights, no water, no fridge and definitely no fun. It's absolutely critical and yet, when they're buying a new one, many people still look for the cheapest. If you're planning to go off-grid and you don't get your leisure batteries right, you may as well stop even thinking about it. So, first off, a few words of warning.

There's no such thing as a "leisure battery". When we say leisure battery, we're just referring to the battery that's used in the living area of an LV, as opposed to the starter battery. It's not a special kind of battery, even though people who sell them may tell you it is.
A better way of describing it is "house battery" which is the term usually used in America. But, let's stick with "leisure battery" because that's the phrase that everyone in the UK recognises.

It's easy to get fooled by the way batteries are marketed. Many have fancy labels with images of yachts and motorhomes and are labelled as marine, dual-purpose, heavy-duty, deep-cycle, extreme leisure, maintenance-free, light-weight, factory-charged, etc. These descriptions and labels are almost always misleading and usually downright false. The situation is so bad that, at the time of writing, the Office for Product Safety and Standards, part of the Department of Business, Energy & Industrial Strategy is conducting an on-going investigation into batteries in general and this kind in particular.

When it comes to leisure batteries, cheap is just another way of saying not suitable for off-grid use. If your battery is not up to the job, your best bet is to find a mains hook-up point and plug in.


Installation of an "off-grid" system has to be done properly.

If you're seriousabout going off-grid, you'll need a battery - or batteries - that will be capable of powering the appliances you'll be using for however long you need them to run for. For example, if you only want to stay away for weekends and your LV is equipped with LED lights, LPG to run the fridge, heating and to use for cooking and you only watch TV for a couple of hours a night, you could probably manage with a single 100Ah wet lead-acid battery. (Ah stands for Amp hours, the capacity of the battery or the number of Amps that the battery can, in theory, supply for one hour.)

If, on the other hand, you're planning to go on expeditions lasting weeks or months at a time and you want to be able to take - and use - all the comforts of home with you, you need to be thinking about batteries with a capacity of 300- 400Ah or even more.

There are dozens of different "leisure batteries" available and, if you're only ever off mains hook-up for a day or two, just a few times a year, one of the many cheap batteries may work for you. For serious off-gridders though, paying extra for a battery that's actually designed for the task is the most important first step you can take on the road to freedom in your leisure vehicle.

Lead-acid Batteries.

So, how do you choose the right battery or batteries for your RV? If you've read the **RoadPro Guide to Lead-Acid Batteries**, you'll know that there are several different sorts of lead-acid battery, each with plus and minus points when used as leisure batteries. Here are the three main types and, like all lead-acid batteries, they have the big disadvantage of not responding well to being discharged quickly or heavily - which is what can happen when you're off-grid.

When a lead-acid battery gets to around 50% of its amp/hour capacity, (this will vary according to the type and quality of the battery) the voltage will drop and the battery will not be able to function as it would if it was fully charged. Lead-acid batteries are also not very good at taking a charge and can take many hours to charge fully even when using a high-powered charger.

Wet / flooded batteries are the most susceptible to this reduction in performance but some are designed specifically to deal with it. Banner "Energy Bull" batteries, for example, have thicker plates in their cells which reduces the harmful effects of discharging them below 50%. In fact "Energy Bull" batteries are specifically made to be used as traction batteries, operating machinery and powering motors: this makes them especially suitable for use as leisure batteries. The downside of batteries like this is that the harder they work, the more electrolyte they use and they need to be carefully maintained to avoid damaging them.

Looked after properly though, a traction battery such as the "Energy Bull" is a good first step towards serious off-gridding at a price not much higher than that of a cheap, low-quality, battery.

Gel batteries used to be popular with continental motorhome manufacturers - especially in Germany - who liked them for two main reasons: 1) They were maintenance-free. 2) They were less likely than wet batteries to cause problems in case of the vehicle turning over. Good quality gel batteries can perform well when heavily discharged and aren't so likely to be damaged. But, there's a third type of battery which has the advantages of gel but better performance when charging and, usually, a lower cost price.

AGM (Absorbed Glass Mat) batteries are becoming more and more popular and are an excellent choice for off-grid use. Like gel batteries, they are more resilient when heavily discharged and they're completely maintenance-free. They can also be placed in any position, except upside-down. Another important advantage of some AGM batteries is that their construction makes them less vulnerable to vibration; important if you're going off-road.

As with other types of battery, there are different qualities. At RoadPro, we only supply Green Power batteries from Italian manufacturer NDS. Their construction and the chemistry used - lead/calcium alloy - ensures excellent performance and high reliability. The highly respected manufacturer Adria now puts Green Power batteries in all their motorhomes and campervans.

We recommend Green Power AGM batteries to off-grid campers who don't need to run a lot of 240V appliances but want high reliability and good performance even when off-grid for weeks at a time.

We equipped this stunning VW Crafter with 4 x 110Ah Green Power batteries for total off-grid freedom.

Lithium Leisure Batteries - The Game Changer.

When lithium batteries suitable for use in LVs became available, several years ago, not many people noticed. Now, with prices having fallen and the technology improving all the time, lithium batteries enable anyone with a motorhome, campervan or caravan to free themselves from their orange hook-up leads and make the most of their LV, wherever they happen to be.

What makes lithium batteries so special? The problems associated with lead-acid batteries don't apply to lithium batteries. They can be charged quickly, they can be heavily discharged while still holding a usable voltage, they aren't as easily damaged by rapid or deep discharging and the cycle life - the number of times the battery can be discharged and charged - is many times higher than that of most lead-acid batteries.

The actual cycle life of a lithium battery depends on the quality of the cells and the way it's used. A good lithium battery, properly installed and used moderately - without excessive discharging - can last for 3-4,000 cycles or even more. That's more than 20 years for a typical motorhomer.

Lithium batteries can be placed in any position except upside-down, are maintenance-free and completely safe when installed correctly. Crucially, they also have almost twice the energy density of lead-acid batteries, so that a 100Ah lithium battery can provide almost the same amount of usable energy as two 100Ah lead-acid batteries.

As is the case with lead-acid batteries, not all lithium batteries are what they appear to be. The quality of the cells varies and - something you don't need to worry about with lead-acid batteries - the BMS (Battery Management System) will vary between different makes and models. The BMS controls the way the battery's cells are charged, how they discharge and how they react to unexpected voltage spikes, low temperature and other external influences. A good BMS makes a huge difference to the way a lithium battery performs and also to its life expectancy.

Beware of cheap lithium batteries. They may be OK for running lights, chargers, pumps and TVs but lack the power to do more demanding work such as powering 240V appliances through an inverter.

Do you need a battery or several batteries?

If your off-grid plans involve staying away from mains hook-up for as long as you want and you need to run 240V appliances, lithium batteries are a must. The only decisions you need to make now are: what sort, what Ah capacity and how many?

The NDS 3Lion range includes lithium batteries from 30Ah - 150Ah as well as the special equipment for charging them.

Lithium batteries come in various shapes, sizes and types and with different specifications. At RoadPro we specialise in the 3Lion range from NDS. Since 2015, we've sold and installed hundreds of lithium battery systems in all sorts of RV and these NDS batteries have proved to be very efficient and totally reliable.

Importantly, NDS 3Lion batteries can all be connected, both in series (to give 24V) and also in parallel, with up to 4 batteries working together. Four x 150Ah batteries will provide 600Ah which is roughly equivalent to the capacity of 10 x 110Ah lead acid batteries but weighing 50% less.
With this in your RV, you'll never need hook-up again.

NDS 3Lion lithium batteries are available with capacities ranging from 20Ah - 150Ah. The smaller batteries, 20Ah & 30Ah are designed for special applications such as powering caravan motor-movers but even a 60Ah lithium battery can be used as a replacement for a 110Ah lead-acid leisure battery if the demand for 12V energy is low. For most people though, the 100Ah and 150Ah batteries are what's required. But, as everyone's electrical demands are different, how do you decide which batteries you should get and how many?

Here's how to work out (roughly) what you need.

To get an idea of the battery capacity that you'll need to be able to go off-grid, you need to know how much energy you'll be using. You may not want to run an air-conditioner and, if you don't have a campervan, you probably don't have a 12V fridge but this chart will give you an idea of what you need to be aware of when going off-grid. To start off, take a look at the list below and make some calculations.

And, bear in mind that how you charge the batteries is very important indeed, as explained below.
As you can see, a fridge is the heaviest 12V consumer but running 240V appliances through an inverter takes the most out of the battery. Bear in mind too, that an inverter will add 5%-10% to the total Amp/hour demand of a 240V appliance.

Appliance	Typical Watt rating	Amp rating *(Amps = Watts/12V)*	Minutes usage per day	Amps per minute *(Amp rating/60)*	Total Amp/hour demand *(minutes usage x Amps per minute)*
12V Phone charger	5	0.4	60	0.01	0.4
12V LED lights x 6	6	0.5	240	0.01	2.0
12V 21" TV	24	2.0	240	0.03	8.0
12V fridge	48	4.0	480	0.07	32.0
12V WiFi system	6	0.5	1440	0.01	12.0
Total for 12V appliances					**54.4**
240V Laptop power supply	50	4.2	60	0.07	4.2
240V Microwave oven - small	1,000	83.3	12	1.39	16.7
240V Coffee maker	1,500	125.0	10	2.08	20.8
240V Toaster	1,000	83.3	10	1.39	13.9
240V Hair dryer	1,800	150.0	5	2.50	12.5
240V Induction hob	1,800	150.0	10	2.50	25.0
240V Air conditioning	900	75.0	360	1.25	450.0
Total for 240V appliances					**543.1**
Daily energy requirement from the leisure battery					**597.5**

The most important thing to remember here is: Watts/Volts = Amps.

So, a 1,200 Watt hair dryer powered from a 12V battery via an inverter will take 100 Amps out of the battery. (1,200W/12V=100) Using the hair dryer for 5 minutes will use 8 Amp hours of battery capacity.
100 Amps/60 minutes = 1.66A per minute. 1.66A x 5 minutes = 8Ah.

A 1,500W coffee maker will take 125 Amps (1,500W/12V) from the battery so, if used for 5 minutes, it would reduce the battery's state of charge by 10 Amp hours.

Consumption figures are approximate.

You can see from the chart that the more power-hungry your appliances, the greater the battery capacity that you'll need: with air-conditioning, almost 600Ah a day! But, this doesn't necessarily mean that you need that amount of battery capacity: if you can charge your batteries up reliably and quickly, you can get away with fewer or smaller batteries.

Imagine you need your batteries to provide 100Ah every day. If you're in the south of Spain in the summer and have 240W of solar panels on your LV, you could expect the panels to charge the batteries at approx. 12 Amps, easily charging the batteries to capacity during the course of a day. (For an explanation of this, see FAQs on page 13)

In the UK, in the winter, those same panels might put hardly any charge into the batteries. But, with a 50 Amp battery-to-battery charging system in place, the batteries would be topped up in just 2 or 3 hours of driving.

What if you're parked up somewhere with not much sunlight and you don't want to drive or run the engine? It's in this situation that, if you want to run the same appliances and use the same amount of energy, you'll need to have additional battery capacity to ensure that you don't run out of electrical "juice".

The higher your on-board battery capacity, the more flexibility you will have when staying off-grid.

Some Examples of Off-Gridding with Lithium Batteries.

You might think that people with campervans wouldn't need many batteries to satisfy their electrical requirements. So, you may be surprised to hear that between them, the two campervans here have a leisure battery capacity of more than 1,000 Ah on board.
The owner of the Devon (top), particularly wanted to run his air-conditioner even when he was away from mains hook-up. Thanks to 450Ah of NDS 3Lion lithium battery and a 2kW inverter, he can do just that.
The lady owner of the black Wildax is a full-timer and the van is her "van for life". Her reason for having 600Ah of 3Lion batteries? "I just want to be able to do whatever I want, whenever I feel like it, wherever I am" No problem!!

This 4x4 Hymer came to the RoadPro workshop straight from the factory: it didn't even have licence plates. Its owner had plans to travel across Europe, into Asia, to Africa and even further afield. He wanted to do all this in comfort, using his air-conditioning, microwave oven, induction hob, George Foreman grill, 1kW heater, Internet satellite system, etc.
450Ah of 3Lion lithium batteries make this possible and, since we installed the system in June, 2018 the Hymer has been away for most of the time, travelling as far south as Mauritania. During his travels, the owner has only stopped at campsites "when I feel like a bit of R&R."

We installed 2 x 100Ah 3Lion batteries in Brian Williams' Dethleffs motorhome in August 2017. Since then, Brian has spent more than 700 days in his motorhome without once hooking up to the mains. The motorhome spends much of the time in southern Europe with plenty of sun for the solar panels to work efficiently.
Brian says "We obviously need to be sensible about how much power we use but in practice we never need to think about our lighting, use of the TV, coffee machine, hair dryer or food processor."
That's something we hear a lot: "We just never worry about the batteries any more, it's amazing!"

Merve Gaskin won't mind if I say that he's been raving about the joys of going off-grid for years. A keen caravanner, Merve never goes to full-service campsites, preferring the peace and quiet of smaller CLs (certified location) and CSs (certificated sites). He used to rely on lead-acid batteries but, since we installed a 3Lion lithium system in his caravan, Merve has discovered that he no longer has to keep a close eye on the battery's voltage. "It's like having EHU in a box!"
I said Merve was a keen off-gridder: he's so keen that he helped set up the Caravan & Motorhome Off-Grid Facebook group - **CAMOGG**. He'd love you to join.

But do you really need lithium batteries to stay off-grid?

Yes, it's absolutely possible to stay off-grid in your LV without lithium batteries. But why would you? OK, there's the price: good lithium batteries are a lot more expensive than good lead-acid batteries. But talk to people who've made the leap - including the people above - and they'll tell you that not only do lithium batteries enable them to stay off-grid as long as they want to, they also save them money: enough, in some cases, to cover the cost of having the batteries installed. They save on campsite fees and also on the cost of replacing batteries every few years. Used sensibly and moderately, 3Lion batteries can be good for up to 20 years of regular usage.
So, in the long term, they can actually save you money as well as setting you and your LV free.

Charging Your Leisure Batteries (1).

Whatever type of batteries you have in your RV, you'll need to make sure that they are charged correctly. If you don't, the time you can spend off-grid, or what you're able to do, will be much reduced. If you bought your RV ready-to-roll, it will almost certainly be equipped so that it charges from the engine, from mains hook-up and,
if you're lucky, from a solar panel. Even so, these will probably have been installed by the manufacturer with full-service campsites in mind and they may be not much better than useless for serious off-gridding, especially if you're using lithium batteries.

Charging from the engine:

Charging your leisure batteries when the engine is running makes perfect sense. The alternator charges the vehicle's starter battery and, also, the leisure battery. The simplest way of doing this is with a voltage-sensitive relay. When the relay is closed, the alternator sends a charge to the starter battery and, when the relay detects that that battery is fully charged, it charges the leisure battery instead.

This way of doing things is OK if you don't really mind whether or not your leisure battery is being charged efficiently. In reality, the way that many manufacturers of motorhomes, campervans and caravans build their vehicles means that the charge going to the leisure battery is not sufficient. Even after a long drive with a 3-way fridge running, the leisure battery can actually be at a lower state of charge than when you set off.

Of course, if you were driving to a full-service campsite, that wouldn't matter: as soon as you arrive, you're going to get out the orange cable and plug in. That's what the manufacturer expects you to do and why the original equipment supplied by many RV manufacturers just isn't going to work if you're planning to go off-grid.

If you want to make sure that your leisure battery is charged efficiently and quickly, you need to get a battery-to-battery (B2B) charger of some sort installed*.

A B2B charger does what a 240V battery charger does but, instead of getting its energy from the mains, it takes it from the vehicle's starter battery.

A good one will not only ensure that your battery is charged more quickly but, also, much more efficiently so that the battery will also last longer.

There are many different models & types of battery-to-battery charger, with different features and power outputs.

Choosing the right B2B charging equipment for your vehicle.

Get the right battery-to-battery charger for your vehicle and you'll be amazed at the difference it makes. Get it wrong and you may as well have not bothered.

The most suitable charging system depends on what leisure battery you have, what engine and alternator and what you want to achieve - how fast you want the battery to charge, for example.

If you have a lead-acid leisure battery and your vehicle isn't equipped with a "smart" alternator, a straightforward B2B charger will do the job. You could get a charger that also acts as a solar regulator and others can take their power from the mains as well. Find out more on our website.

If you have a caravan, things aren't quite so simple but B2B chargers are available which work with caravans too. They won't charge the caravan's battery as fast as in a motorhome, but they do make a big difference.

*If you have a lithium leisure battery and a motorhome or campervan based on a Fiat Ducato (without a smart alternator), NDS have a simple but very effective device called a 3Link. This will charge the battery at up to 75 Amps without any additional equipment.

If your vehicle has a smart alternator, a B2B charger is essential if you want to charge the leisure battery efficiently. A few manufacturers now fit them as standard, most don't.

Whatever vehicle you have and whatever battery and charging equipment you decide to use, correct installation is critical. As I never get tired of saying, if you don't get it done properly, not only will things not work as they should but the installation could be dangerous as well. If in doubt about the equipment that you need and how it should be installed, ask someone you can trust and who really knows what they're talking about.

Charging Your Leisure Batteries (2).

Charging from solar panels:

Solar panels are often the first thing that people think of when they consider taking their motorhome, campervan or caravan off-grid. And it's true: solar panels can be great at keeping your leisure batteries charged.

But it's easy to get the wrong idea of what solar panels do. I often get asked how many panels someone will need if they want to run a fridge or a TV or some other appliance. It's possible to run appliances directly from solar panels but you could find them switching off as soon as the sun goes behind a cloud. You could have as many solar panels as you like but, if there's not enough sunlight, they won't produce electricity.

The best way to think of solar panels is as battery chargers that work when the sun's out. The higher the Watt rating of your panels, the more energy they'll put into your battery, but remember: no sun = no (or very little) charge.

Most solar panels are made from silicon and almost all are now made using monocrystalline cells. Different makes of cell have different levels of performance but what's equally important, in terms of how well a panel will work on an LV, is the construction.

A panel made with this application in mind, should be capable of dealing with the stresses of being installed on a roof where vibration and slight bending are going to occur.

One that's intended to be used on the roof of a building may be less resilient.

This semi-flexible panel from NDS is ideal for pop-top roofs on campervans where there's a slight curve.

There are rigid panels and semi-flexible panels. Rigid panels tend to be cheaper than semi-flexible ones and, in the past, have been more robust. New manufacturing techniques have made semi-flexible panels much more reliable though, and they have the added advantage of being less than 1/3 the weight of rigid panels: ideal where weight is an issue.

Solar panels & regulators come in many different types and sizes. Be sure to get what is most suitable for your vehicle & requirements.

Semi-flexible panels are also great for use on pop-tops or other roofs where there's curvature.

Solar panels are available in a wide range of Watt ratings. The higher the Watt rating, the greater the output.

Panels designed for use on LVs are usually rated from around 50W up to 180W and they can be joined together so that the combined output is several hundred Watts.

This type of panel usually operates at between 17V & 25V or thereabouts. This is too high a voltage to connect directly to a 12V battery and so you need a regulator to bring the voltage down to a suitable charging voltage.

There are two main types of regulator: PWM and MPPT. PWM are cheap and adequate when the sun's shining. MPPT regulators can put up to 30% more energy into the battery and are especially effective when conditions are less than ideal: when it's cloudy for example.

Many people like to be able to check the performance of their solar panels. To do this, you need a display which connects to the regulator.

Choosing the right solar power equipment for your vehicle.

You can't have too many solar panels! The more you have, the more self-sufficient you'll be. When the sun isn't shining, a single 120W panel may still put out some energy - just not very much. 2 or 3 panels, will put in 2 or 3 times as much. So, if you're planning to spend time off-grid in places where weather conditions may not be ideal, you should consider having more panel-power than if you're going somewhere where the sun always shines.

Some panels work better than others: good ones should reach efficiency levels of at least 18% - 20%. Then, consider how you want the panels mounted and how you'd like them to look. There are several mounting methods: some look smart, some don't. Appearance isn't everything but would you want an ugly-looking panel stuck on the roof of your LV?

Rigid panels or semi-flexible? Consider the points above. If you need light weight or your roof isn't flat, semi-flexible may be best.

As for regulators, the only reason not to use an MPPT model is the price. They really do work much better.

NOTE: As with most things in this guide, correct installation is essential if your solar panels are going to work to maximum efficiency. Get them fitted by someone who really knows what they're doing. It may cost a bit more but you'll never regret it.

240V From Your 12V Leisure Batteries.

Using an inverter in your LV:

An inverter is a device which converts the 12V DC supply from your battery to 240V AC, enabling you to run domestic appliances in your leisure vehicle, even when you're off-grid.

It used to be that inverters were expensive, big and not very efficient. Good inverters are still not cheap but they are compact and efficient enough to be a sensible option in any LV. When choosing one for yours, there are two main factors to consider:

1) The input power rating of the appliances you want to run.

If all you want to run on 240V is a laptop computer or an electric toothbrush, an inverter rated at 100W should be sufficient. But, if you want to run a coffee maker, a hair dryer or even an air-conditoning unit, you'll need to consider a 1,500W or even 2,000W model. If you want to run a coffee maker and a hair dryer together, a 3,000W inverter will be required - and big battery capacity!

2) The type of inverter needed to run those appliances: pure sine-wave or modified sine-wave.

Some appliances that have a simple function, such as a kettle, a light or a fan will operate perfectly well with a modified sine-wave inverter. The electricity coming out of one of these isn't smooth but square, as in the diagram.

An inverter allows you to use many of the appliances that you use at home, in your LV, including a coffee machine.

Modified sine wave inverters are low-priced but they're not suitable for coffee makers, microwave ovens, laptop power supplies or electric toothbrushes! In fact, I have known these to catch fire when plugged into one.

I always recommend using a pure sine-wave inverter. The electricity coming from the sockets is smooth and almost the same as you would get from a mains socket at home or work. You'll be sure that (with rare exceptions), any appliance will run smoothly and safely.

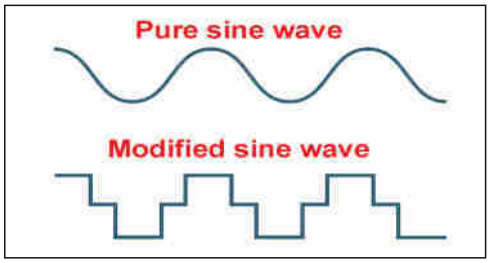
Inverters come in two types: modified and pure sine-wave. NDS & Votronic make models with power ratings suitable for most home appliances.

Modern inverters don't use much energy when they're switched on but, even so, it's worth turning them off when they're not actually being used. Remote controls are available for NDS and Votronic inverters.

When having an inverter installed, most people like to have all the 13A sockets in the vehicle connected to it. This way, even when you're off-grid, you can use your 240V appliances as you would with EHU.

To achieve this safely, you'll need a priority switch. This can either be a separate unit or built into the inverter. When EHU is available, the inverter is bypassed. Off-grid, the priority switch detects the absence of 240V and the inverter takes over, so that the vehicle's 240V sockets are live.

Installing a priority switch safely can be a tricky and time-consuming job, but it will make life in your LV so much easier and more convenient.



Choosing the right inverter for your vehicle.

Unless you want an inverter for a single, simple task such as boiling a kettle or running a fan, a pure sine-wave inverter is well worth the extra cost. Even if a modified sine-wave model does run an appliance such as a microwave oven (and you can never be sure it will or not), the oven will run roughly and will probably be damaged. Pure-sine wins every time.

If you want to use a hair dryer rated at 1,600 Watts, it's tempting to think that a 1,500W inverter would do. A good quality one would but you'd be straining it. It's always best to get an inverter that's rated higher than you may need so, in this case, a 2,000W inverter would probably be best. It's always better to have an inverter that's more powerful than you need than one that's only just up to the job.

The other thing to consider is whether or not you want the inverter to power all the 13A sockets in the vehicle, whenever you are off-grid. If you do, you'll need a priority switch as described above.

For efficient operation and safety, correct installation of an inverter is critical - we're dealing with 240V. Get it fitted by someone who really knows what they're doing and has installed them before. Don't take chances.

Let's work out what you need, to go off-grid.

The key to going off-grid in your motorhome, campervan or caravan is working out what you want to do and then making sure you have the right equipment to enable you to do it, wherever you are. To help you make up your mind, answer these questions and then have a really good think about what you want to be able to do in your motorhome, caravan or motorhome. When you've done that – or even before – **fill in this online form** and we'll get back to you with some suggestions on what your vehicle needs, to be "off-grid ready".

Point	Questions to consider	Your answers
	Your Vehicle	
1	What vehicle do you have? We'll need the following information: **Type of vehicle**: campervan, motorhome, caravan. **Base vehicle type**: Ducato, Sprinter, Transit, etc. **Manufacturer:** Bailey, Hymer, Rapido, etc. **Model:** Unicorn, Matrix, Exsis, etc. **Year of manufacture:**	
2	What's on your vehicle's roof? Is there space for more solar panels than you have already?	
	What are your electrical energy needs?	
3	First off, do you want to be able to use 240V appliances when off-grid? If you do (and you don't want to use a generator), you'll need an inverter.	
4	Use the table on page 5 to calculate your daily electrical consumption in Amp/hours, both 12V & 240V. **Watts divided by Volts = Amps.** 12V consumers: lights, TV, chargers, etc 240V appliances: coffee maker, hair dryer, etc.	
5	What are the Watt ratings of the appliances that you want to use and, will you want to use more than one at the same time? Your answers will give you an idea of the inverter output you'll need. Always go for a higher (at least 20%) output than you will actually need. It's always better not to run inverters flat out – leave some spare capacity. You also need to consider the energy taken by the inverter itself.	
6	Inverters always have one, two or more built-in sockets. You can plug appliances into them but, would you prefer to have the inverter installed so that all the 13 Amp sockets in your LV, are live, even when you're off-grid? If you'd like to have this feature, you'll need a separate priority switch or an inverter with a priority switch built in. It's a time-consuming job for the installer but may be well worth it for you.	

The Leisure Batteries		
7	What's your daily demand in Amp/hours from the leisure batteries going to be, based on all the electrical – 12V & 240V - appliances you're going to use. See the chart on page 5.	
8	How many days will you want to use your LV for without worrying about charging the batteries?	
9	How many batteries do you have space for and how much weight can you afford to carry?	
10	Do you have a preference for lead-acid, AGM or lithium batteries.	
11	Some 2020 motorhomes are described by their manufacturers as "lithium-ready". If you have a new motorhome, do you know if this applies?	

Charging the batteries		
12	Is your LV equipped with solar panels? If so, what's the total Watt rating? Solar panels are a great way to charge batteries and you can't have too many!	
13	Work out the maximum current that your solar panels will be able to put into the battery. Roughly, it's the Watt rating, divided by 19V. For example: 100W / 19V = 5.26 Amps. So, in ideal conditions, a 100W panel will put approximately 5 Amps per hour into the battery. Is the total Watt rating enough to put a reasonable charge into the batteries in the weather conditions that you expect to encounter? If not, is there space on the roof to add more panels? If so, how much space?	
14	Is there usually direct sunlight where you're going or are conditions often cloudy and overcast?	
15	Do you have a preference for rigid or semi-flexible panels? Both have pros and cons.	
16	Is your solar regulator an MPPT model?	
17	If you have lithium or AGM batteries, is the solar regulator compatible with them?	
18	Would you like to be able to see exactly how your solar panels are performing?	
19	If you intend to use EHU from time to time, and you have lithium or AGM batteries, is the vehicle's mains charger compatible with them? Does it have a setting for gel batteries?	
20	If your vehicle has a smart alternator (we can tell you) a battery-to-battery charger is essential. The higher the charger's output, the faster and more efficiently the batteries will charge.	
21	If your vehicle doesn't have a smart alternator and you want lithium batteries, do you want them to charge at a high rate of 50 Amps+?	

Once you've answered the questions above, we – and you - will have a good idea of what's needed to get your leisure vehicle off-grid fit. Everyone's requirements are different and that's why we are so thorough about asking you about exactly what you want to do, once you set off on your travels. If you'd like us to help you work out what equipment you need and roughly how much it will cost, **fill in this online form** and we'll get back to you with some suggestions on what your vehicle needs, to be "off-grid ready".

Of course, if you want 240V in your leisure vehicle, you could always carry a generator around with you. But, do you really want one? For almost everyone, good batteries are going to be preferable to a generator.

You'll notice that I've hardly mentioned LPG (gas), fresh water, waste water or the contents of the onboard toilet. How do you deal with these things when you're off-grid? I'll tell you what I do.

1) **LPG:** I have refillable cylinders with adaptors for different countries and can fill up anywhere I can find an LPG pump. However, I always try to use as little gas as possible. For cooking – even boiling water – I usually use an induction hob or the microwave oven: an induction hob can boil a cup of water in 2/3 the time that a kettle on the gas hob takes. Most motorhomes and caravans use LPG for heating, hot water and running the fridge. If I'm concerned about running short, I turn down the thermostat on the heater and the fridge and heat water using the induction hob. In this way, two full tanks of LPG can last me for months, depending on the time of year. In winter, the fridge uses less LPG and the heating more. In summer, the opposite applies.
2) **Fresh water:** I can't do without water but I can minimize its use so that I can go for many weeks without having to fill my tank. I often clean the dishes using just a damp paper towel. Showers are short and sweet. It's harder than it was to find service stations with a tap so, when I do need to fill up, I sometimes find a convenient campsite and ask if I may use their facilities. Another source of water is hand car washes. They're always (in my experience) happy to fill the tank for a fiver. I've done this in America, the UK and in European countries. I sometimes get the van washed at the same time.
3) **Waste (grey) water:** This is a tricky one. In theory, you shouldn't put it down a roadside drain hole as it could contain stuff that this kind of drain isn't designed to carry. I avoid putting food particles down the drain of the motorhome's sink, to avoid blockages and so that the waste in the grey tank is only soapy water. This is not a hazardous substance and can be safely disposed of in all sorts of places where doing so will not be anti-social.
4) **The toilet:** Like many people, I have a cassette toilet which needs emptying every now and again. To reduce the need for this, whenever the opportunity arises, I use public facilities. When the cassette has reached maximum capacity (max-cap), I always find a campsite, marina or other facility where they have proper disposal facilities. Ask politely, offer to pay and you'll (almost) never be refused.

On the following pages you'll find a number of Frequently Asked Questions. But, however hard I try, it's impossible to cover all the questions that people ask about what they need, why they need it, what it does, etc. For that reason, if after you've read them, you've still got questions, send us an email. **But, please don't ask questions like these:**

- "Can you give me a rough price to supply and install a leisure battery and 100W solar panel?"
- "Can you tell me what I need to be able to stay off-grid for six weeks?"
- "We have a 2011 Autocruise Startrail…. Could you please recommend & quote us for a Battery?"

With every single question concerning what equipment is needed for going off-grid, our answer always starts with the words: "It all depends what you want to do in your vehicle." You tell us what you want to do and where you want to go and we'll help you get there. It's that simple.

Off grid guide FAQs

We get asked a lot of questions by people who are considering taking their LVs off-grid. Not surprisingly: it's a big step and, if you're used to staying on full-service campsites, it can be a daunting prospect. All the questions below have been asked – often many times – by our customers. Not all of them are about being off-grid but might be useful anyway. If you have a question that's not answered here, we look forward to hearing it! Email us at: off-grid@roadpro.co.uk.

FAQs about base vehicles:

Q) "The Schaudt EBL99 (or Sargent controller) in my motorhome does not have a lithium setting so will the batteries still charge OK from the engine?"
A) Yes. Whatever the vehicle is, suitable equipment and correct installation will make sure that everything works properly, including charging from the engine.

Q) "Will the control panel in my caravan show the condition of the battery if I change to lithium?"
A) Almost certainly it won't, although everything else will work normally and nothing will be damaged. This is why, when people have lithium batteries installed, they usually have a dedicated battery monitor as well.

Q) "The starter battery in my van is lead-acid. Is that a problem if I want a lithium leisure battery?"
A) No. Every single vehicle in which we've installed a lithium battery has had a lead-acid starter battery.

Q) "Is it possible to spend a week off-grid in a caravan and still use my toaster and coffee maker?"
A) Yes. As long as you have the right batteries and the means to charge them using solar power or your towing vehicle's engine. And, as long you're not spending your entire time eating toast and drinking coffee!

Q) "Will getting lithium batteries in my motorhome invalidate the warranty?"
A) There's no reason why it should. The batteries won't adversely affect any of the components. More and more manufacturers are producing motorhomes that are "lithium ready" but they don't usually supply the batteries.

FAQs about batteries:

Q) Is it OK to leave my batteries in the motorhome, unattended for 3 months?
A) All batteries self-discharge from the moment they're left standing. A lead-acid battery could completely self-discharge within a few weeks and be damaged, as a result of sulphation. If you can leave the vehicle on EHU, the on-board charger will prevent the battery from discharging but, if you really want to look after your batteries, get a "smart" charger like any CTEK model. This will make sure that the battery is kept in as good condition as possible, all ready to set off when the time comes.
Lithium batteries lose charge more slowly, around 5% per month. Recommendations vary between manufacturers but NDS say that, if they start from a fully-charged state, 3Lion batteries can be left unattended for many months without damaging them. If the batteries are being charged from solar panels or from EHU, it's essential that the solar regulator and the mains-powered charger are compatible with lithium batteries.

Q) "Is it true that lithium batteries shouldn't be charged when the temperature is below zero?"
A) To be accurate, the cells in lithium batteries will not accept a charge at temperatures below zero. And, if they are subjected to a high charging current, they can be damaged. But, good-quality batteries such as the 3Lion range all have temperature protection built in. This protection will automatically reduce the charge current at low temperatures to avoid harming the cells.
In addition, almost all the charging products that we sell have lithium settings and temperature sensors. We have never heard of an NDS 3Lion battery being damaged.

Q) "Can I use my existing lead-acid battery with a new lithium battery?"
A) No. lead-acid and lithium batteries are completely different and not compatible. Why would you want to?

Q) "Can I run a 3-way (absorption) fridge on 12V when I'm off-grid?"
A) It's possible, but a very bad idea. 3-way fridges use a lot of energy – up to 15 Amps or more – and so will rapidly discharge your batteries. When you're off-grid, always use gas to run a 3-way fridge. People sometimes think that a 12V fridge will take a lot out of the battery. How much depends on the model of fridge, the ambient temperature, the temperature you set, the size of the fridge and the contents. A 12V fridge is very usable off-grid as long as – as usual – you have suitable batteries and charging capability.

Q) "Why do lithium batteries vary so much in price?"
A) There's a wide range of pricing for lead-acid batteries too and the reason is the same: different qualities, designs, materials and construction. Cheap batteries of both types are usually fine for light-duty use such as running lights
and TVs for example. For heavier-duty use, including powering an inverter, a better, more expensive battery will be a lot more capable and will last longer, in some cases a lot longer.

Q) "How can I run a Truma Aventa Comfort Air Condition Unit without 240V hookup? We have the usual appliances on board, including: hot water heater, pump, heating, oven, microwave, hair dryer, kettle, toaster and TV. We have 1 solar panel fitted with no extra space for anymore due to satellite dish and air-con unit."
A) Good question. When you're off-grid, whenever possible, use LPG to operate those appliances that can run on gas: fridge, water heater and space heater: they use a lot of electricity. You can run all the electrical appliances
from the battery using an inverter: 400-600Ah of lithium battery and a 2kW or 3kW inverter.
Running all those appliances is quite feasible with the right equipment and you can read about someone whose motorhome had similar requirements on page 6. Because you don't have space for many solar panels, you may need to run your engine to charge your batteries: for rapid charging, we'd recommend a 90 Amp B2B charger.

Q) "How many lithium batteries can be connected together in parallel?"
A) It depends on the battery: some are strictly stand-alone and can't be connected to even one more. Up to four NDS 3Lion batteries can be connected together to give up to 600Ah capacity, roughly equivalent to 1,200Ah of lead-acid battery in terms of the amount of energy stored.

Q) "Can you connect 12V lithium batteries in series to give 24V?"
A) Again, it depends on the battery. Most cannot but all NDS 3Lion batteries manufactured from June, 2020 onwards can be connected in series, giving 24V.

Q) "Where can I find out more about lithium batteries?"
A) Read the RoadPro Guide to Lithium Batteries which you can find on our website.

FAQs about solar panels:

Q) "Can I use panels designed for buildings on my campervan?"
A) Panels intended for use on buildings tend to have outputs of around 250 Watts. That sounds good but these are big panels that may not fit on the roof. They usually operate at between 24V & 48V so you'd need a special regulator. Both these factors can make domestic panels difficult to use on vehicles and boats.

Q) "I was told that a 100W, 12V solar panel will charge the battery at only 5 or 6 Amps. Is that right?"
A) It is right and here's why. There's no such thing as a 12V solar panel: most panels designed for vehicles work at a voltage in the range of 17V–21V. So, to work out the Amps that a 100 Watt panel might produce, you need to divide 100W by the panel's voltage – 19V for example - which gives you just over 5 Amps on a very sunny day: perhaps 50 Amps during the course of a day if the sun stays out.

Q) "What about portable panels?"

A) Portable panels can work very well because any solar panel will work best when it's pointing directly at the sun. To get the most out of a portable panel, you'd have to move it every few minutes. That's after you've taken it out, set it up and connected it to the battery: it's a lot of faffing about. Because, most of the time, they're not pointing directly at the sun, roof-mounted panels are less efficient but, because they're always working, they'll usually put more energy into the batteries in the long run.
A word of warning: If you enjoy spending your days keeping an eye on the position of the sun and adjusting your portable panel accordingly, get a good security system for it, just in case you look away: thieves love them!

Q) "Which solar panels are better: rigid or semi-flexible?"

A) It all depends what you want to get from your solar panels and both types have advantages. If you want the very highest efficiency, NDS SolarFlexEvo fit the bill. But the difference in a real-life situation will hardly be noticeable. If you want to save weight, semi-flexible panels are a lot lighter than rigid panels and they come in smaller sizes. If you have a campervan with a pop-top, a semi-flexible panel is a must and we have special ones with the junction box on the back of the panel. The look great, as you can see in the photo on page 9.
Rigid panels are cheaper and almost as efficient. They are available in higher power ratings – up to 180 Watts and in different finishes: the NDS "BLACKSolar" panels look amazing!

Q) "In bright sun, my semi-flexible panels get so hot that I can't touch them. Doesn't that damage them or stop them working properly? Are semi-flexible panels reliable"

A) A good-quality semi-flexible panel, such as those from NDS, is designed to operate between -40°C and +95°C. NDS SolarFlexEvo panels are fitted as standard equipment by Adria, who conducted extensive testing before choosing to use them on their motorhomes. Beware of cheap, poor-quality panels: if they've been stuck down and they stop working, they can be very difficult to remove from a roof.

Q) "My van conversion has got a ribbed roof, can you still install a solar panel?"

A) It can be tricky, but it can always be done, even if we have to fill the gaps between the ribs.

Q) "Can my solar panels charge the starter battery as well as the leisure batteries?"

A) Yes. NDS and Votronic solar regulators can be installed so that they charge both batteries.

Q) "Is it best to connect multiple panels in series or in parallel?"

A) There might be some advantages in connecting panels in series in certain situations. For 99% of installations on leisure vehicles though, connecting in parallel makes much more sense and is what we always do.

Q) "What size solar panel do I need to run my fridge?"

A) If you were in a place where bright sunlight was guaranteed 12/7, you could indeed run a 12V fridge directly from solar panels – through a regulator, obviously. But, the chances are that you're not going to be and, for this reason, it's better to think of a solar panel as a battery charger and not as a way to power appliances directly.

Q) "Why do I need a regulator and why should I get an MPPT version?"

A) The voltage coming from a "12V" solar panel is usually between 17V – 21V and can't be connected directly to a 12V battery. Maximum Power Point Tracking can increase the current going into the battery by up to 30% and this type of regulator is especially effective when the sky is cloudy or overcast.

Q) "Are your panels mono-crystalline or poly-crystalline?"

A) Mono-crystalline since you ask but, to be honest, you wouldn't notice much difference in the performance of the two types unless you were using scientific instruments. It used to be that poly-crystalline panels were significantly less efficient than mono-crystalline ones but, these days, that's not the case.

Q) "I saw a video on YouTube where an installer says that the panel he's fitted "is effective without sun light". Is he right – can you get solar panels that don't need sunlight?"

A) I've seen that video too and I asked the installer why he was saying this. He hasn't replied and my comment was removed! The fact is that, at the moment, you cannot get solar panels designed for use on vehicles that generate electricity without direct sunlight. A good-quality panel will produce some energy even in cloudy, overcast conditions and some are more efficient than others. But, if the panel is indoors, something is blocking the sun or the sun is below the horizon, it will not work, no matter what anyone on YouTube says.

Q) "In that same video, the installer has placed the panel very close to a TV aerial. In certain positions, the aerial will throw a shadow on the solar panel. What effect would this have?"

A) Anything that blocks direct sunlight from hitting a solar panel will create shade. In silicon panels (almost all those used on leisure vehicles), even if only a few of the panel's cells are shaded, the energy sent to the battery can drop by 50% or more. This is because of the way solar panels are constructed, with the cells connected in strings. For maximum performance, no shade should fall on a solar panel, even one from a TV aerial.

Q) "Not a question about solar power but, can I use my fuel-cell to charge lithium batteries?"

A) Unfortunately not and, even if you could, it probably wouldn't be worth it because of the low charging current.

FAQs about battery-to-battery (B2B) charging:

Q) "What does a battery-to-battery charger actually do and should I get one fitted to my vehicle?"

A) A B2B charger performs the same function as a 240V battery charger but gets its power from the vehicle's alternator, via the starter battery. They're useful to have if you want to charge your leisure batteries more efficiently and faster whenever the engine is running.
If your LV (towing vehicle if you have a caravan) has a smart alternator, you definitely need one. Some manufacturers fit them at the factory but most don't, opting for a special relay instead. This will charge the battery but not nearly as well as a B2B charger.

Q) "Will a B2B charger damage my alternator?"

A) Not if you have a suitable charger, it's been installed correctly and the alternator is in good condition.

Q) "How do I know which B2B charger will be best for my LV?"

A) Chargers come with different output ratings. A 90 Amp B2B charger will charge 3 times faster than a 30 Amp one. Some B2B chargers, such as the CTEK D250SE have a built-in solar regulator and some Votronic and NDS models charge not only from the alternator and the solar panels, but from 240V EHU up as well. These are ideal for use if you're building a campervan from scratch.

Q) "Can a B2B charger charge the starter battery as well?"

A) All Votronic B2B chargers will send a charge to the starter battery when the leisure battery is fully charged.

Q) "I keep hearing about D+. What is it?"

A) The D+ connection is an electrical terminal which is always live when the vehicle's engine is running. It's used by battery-to-battery chargers to tell them what they need to do. In older vehicles, the D+ signal wasn't so important because the charger could be controlled by the change in voltage at the starter battery, when the engine was running. With the introduction of "smart" alternators, this is no longer the case.

FAQs about inverters:

Q) "Modified sine-wave inverters are cheaper than pure-sine models. Can I use one to run my microwave?"

A) You can try but there's no knowing if it will work until you switch it on. Even if it does work, you will almost certainly notice that the microwave runs roughly. This means that it is not working efficiently, and this can result in the oven being damaged and having to be replaced.
The only way to be certain (well, almost certain) that your appliances will work as they should, is by using a pure-sine wave inverter. We have seen – just once – a microwave oven in a motorhome that would not run with a pure sine-wave inverter. We checked an identical oven in another motorhome and it worked perfectly. That's electronics for you.

Q) "If possible, I would like a system that automatically knows if the motorhome is hooked up to power or if it needs to use the inverter. The less we need to press buttons and switches, the better."

A) That's easy! All you need is a priority switch which sends power to the vehicle's sockets from EHU when it's available and from the inverter when it's not. There are no switches or buttons involved. We have separate priority switches as well as inverters with priority switches built in. The only tricky bit is actually connecting it all up. It's time consuming and it has to be done correctly. Leave it to a competent installer.

Q) "How efficient are inverters? How much electricity do they use when they're in use?

A) All inverters use consume electricity when they're powering an appliance. A good quality inverter will be around 90% efficient. So, if an appliance uses 1,200W the total Watt rating, including the inverter, would be 1,320W, taking 10% more out of the battery than you might think.
As a general rule, the more expensive the inverter, the better the design and the components. A good inverter will be more efficient than a cheap one, which could have an efficiency of less than 70%.

Q) "Do inverters take anything out of the battery when they're on but not in use?"

A) Yes, they do and it's called the quiescent current. It can be significant, so always keep an inverter switched off if it's not being used. Most inverters can be connected to a remote switch for convenience.

Q) "Which inverters are better: low frequency or high frequency?

A) They're designed for different uses and neither is better than the other. Most inverters designed for use in vehicles are high frequency. This type of inverter is compact, lightweight and efficient, making them ideal for use where size and weight are important. They work well with small appliances such as coffee makers, hair dryers, microwave ovens, etc.
Low-frequency inverters tend to be used for industrial and domestic off-grid installations and to power devices such as heavy-duty pumps and motors. They have certain advantages in these situations but are bulky and heavy, making them unsuitable for use in vehicles.

Q) "What size inverter do I need to power the charger for my electric bike/hair dryer/etc?"

A) Every appliance comes with a label on it that gives its Watt rating. That figure tells you the power output that your inverter will need. If in doubt, get an inverter with a higher rated output than you actually need – at least 25% higher. This will ensure that the inverter runs comfortably and is well within its operating capacity. Don't try to save money by getting one that is just about good enough, especially if you're going to be using it often.
One more thing, if you only need to run an appliance rated at 400W, there's no point getting a 1,500W inverter. A large inverter takes a lot of energy just to work and will take a lot more out of the battery than a 600W model.

Q) "Can I run my CPAP machine from an inverter and, if so, what size and type will I need?"

A) We have supplied a lot of inverters to people to do exactly this. Some CPAP machines use as little as 100W or less, others use more. Check yours to be sure and get a pure sine-wave inverter that can give the power the machine requires. Obviously, get a good-quality inverter: your life could depend on it!

Q) "Can I connect the inverter to my motorhome's battery charger, so that the inverter charges the battery?" (We have actually been asked this question.)

A) No! Think about it. If you could do this, you would have solved the world's energy problems and defied the laws of physics in the process. This doesn't stop one company we know of from installing inverters in exactly this way.

Q) "Is it possible to run air-conditioning from an inverter?"

A) Yes, it is and we have installed several systems to do just that. But, as well as a 2,000W inverter, you will need a lot of high-quality batteries, preferably lithium.

FAQs about installation:

Q) "Sorry to have so many questions but just want to ensure that everything will work properly and be installed correctly to justify the investment."

A) Ask away. We understand that spending thousands of pounds on transforming your motorhome is a serious commitment and we want you to understand exactly what you'll get for your money. You tell us what you want and we'll make sure you get it. You can rest assured that we have been installing lithium batteries, inverters, solar panels, chargers and much more in motorhomes and other leisure vehicles for almost 5 years and I haven't heard of a single customer who has regretted asking us to do the job for them.

Q) "Can you do the fitting?"

A) Yes we can. Anything that we sell, we can install and we have one of the finest installation engineers in the country working with us. Damian specialises in electrics and has installed hundreds of lithium battery systems, solar panels, chargers and inverters in all kinds of motorhomes, campervans, caravans and other vehicles. If you look at our Guide to Lithium Batteries you can read some testimonials and you can see customers' comments here.
We also work with several installers around the UK who can fit the equipment we supply.

Q) "I bought a cheap lithium battery and some solar panels on eBay. Can you fit them for me?"

A) No, we only install products that we have supplied. That way we can be 100% certain that everything will work as it should and that all the equipment is of the best quality.

Q) "I can get things installed for much less money by another company. Can you match the price?

A) Installing equipment so that it's efficient, safe and neat takes time and can't be done on the cheap: at least, not by us. If low price is more important to you than a first-class job where no cables are visible, the roof doesn't leak, the installation is safe and bits don't fall off, you'll have to look elsewhere. We can give you some names.

Q) "Can you come to my house to do the installation?"

A) No, we only work on vehicles at our premises in Daventry. Why? Because the work we do can be very complex indeed and every vehicle is different. In our workshop we have everything we need to cope with (almost) any situation. If a customer suddenly changes their mind and wants 3 batteries instead of two, or a 175W solar panel instead of a 100W model, we can accommodate them. And, you wouldn't want us making holes in your roof while it was raining, would you?!

Q) "I want a solar panel but I don't want you to make any holes in my caravan's roof. Is that possible?"

A) No, it's not possible. Even if we glue the panel to the roof, we still need to make a hole for the cable. Honestly, there's nothing to worry about. Since we started doing installations, we must have drilled well over 12,000 holes in people's treasured motorhomes, caravans and campervans. So far, we've not had a single complaint or report of water ingress! As long as the work is done properly, there's nothing to worry about!

Find out more about our products and our installation service at https://www.roadpro.co.uk

ROADPRO

Practical Products on the Move

There's never been a better time to go off-grid.

It's true, there's never been a better time to go off-grid. You don't need to rough it and, as Merve Gaskin from the Caravan & Motorhome Off-Grid Group (CAMOGG) on Facebook says, you certainly don't need to rough it or go back to basics. Going off-grid these days is all about freeing yourself from that orange hook-up lead and not having to rely on EHU to enjoy yourself in your motorhome, campervan or caravan.

At RoadPro, we've been helping people to get off-grid for years and we've never heard a single customer say that they wish they hadn't done it. If you'd like to find out how we can help you prepare your vehicle so that it's off-grid ready, get in touch: either email us at off-grid@roadpro.co.uk or complete the online form here.

I am not an expert when it comes to how things work. (Fortunately, I know people who are.) But, I've spent a lot of time and put in a lot of effort finding out what works best when I'm off-grid in my motorhome and I'm happy to share that information with you. Thinking about it, that's just what I've done in this guide!

@MotorhomeAndy

Follow RoadPro on Social Media

You won't see us at many shows this year. So that we can keep in touch, we're making sure that our customers and friends can see what we're doing by using social media. Just search for RoadPro and start clicking. See you there!

Find us on Facebook

Facebook is a great way to keep in touch and to share information about what's going on. We add regular posts to let you know about shows, new products, technical tips and more. So, take a look at our page now and, if you like it, "Like" it!

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YouTube

If a picture is worth a thousand words, a video is worth a thousand pictures. That's why we're making informative videos of as many of our products as we can.
To keep informed when we post new videos, remember to subscribe.

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Instagram

If you use Instagram, search for @roadprouk and keep an eye on what we're up to. We like to post pics of what we're doing, what we've done, customers' vehicles and more. Don't miss out on the fun..follow us!!

@roadprouk

Meet Damian, our chief engineer.

That's Damian in the photo. We think he's one of the best installers in the business and our customers agree. If you've spent thousands of ££s on your motorhome, you don't want it to be spoiled by a clumsy or incompetent installer.
With all the products we sell, getting the installation right is critical. If it's not done properly, the equipment won't work correctly. When we fit something, Damian makes sure that it's done properly: every time.
As you can see in the photo below, we don't have a huge workshop: we work on one vehicle at a time, giving it our full attention. When you leave, we guarantee your complete satisfaction. Take a look at the Customer Comments on our website to see what we mean.

Just a couple of comments.

"RoadPro's service is second to none."
Rodney Lambert, Vice Chairman, Caravan & Motorhome Club.

"I can't thank RoadPro enough for having done such a fantastic job. I would recommend them to anyone contemplating ways to improve their motorhome. 5 star rating."
John Lawrence Bsc MPhil CChem MRSC CSci FCMI FISBL

To place an order, find a dealer near you or arrange installation, phone or visit our website.

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We're not just a website. You can see our range of accessories in action in Daventry. Please phone us first to arrange a visit.