



Living on an Electric Narrowboat

A talk by Paul Sumpner



Goals of the presentation

- Give a flavour of what life onboard an electric narrowboat is like
- Highlight some of the challenges
- Outline the solutions we have found and used on “Old Nick”
- Dispel some of the “Urban Myths” around electric boating
- Show the technology is available now and everyone can “go electric”



“Old Nick”

- 58.5ft Tyler Wilson hull, with Vetus Serial Hybrid, 48v 800Ah Lead Carbons and 1.92KW of solar
- Launched Dec 2020
- Cruised over 2000 Miles and 1500 Locks





BOOM – Myth#1 Busted!

- Comments we have heard...

“You can’t go very far on that!”

“That’s not very practical!”

“Bet you need a long extension lead!”





Meeting Our Physiological Needs

- At the lowest level of Maslow's "[Hierarchy of Needs](#)" are our physiological needs; Heat, Water, Food, etc.
- To this I would also add "Internet Connectivity" and Netflix!
- How are these basic needs met on a modern Electric Narrowboat?
- We will take a look at each one, please note "Old Nick" is a Gas free boat and has no dual fuel stove, the two traditional sources of heating and cooking on a narrowboat



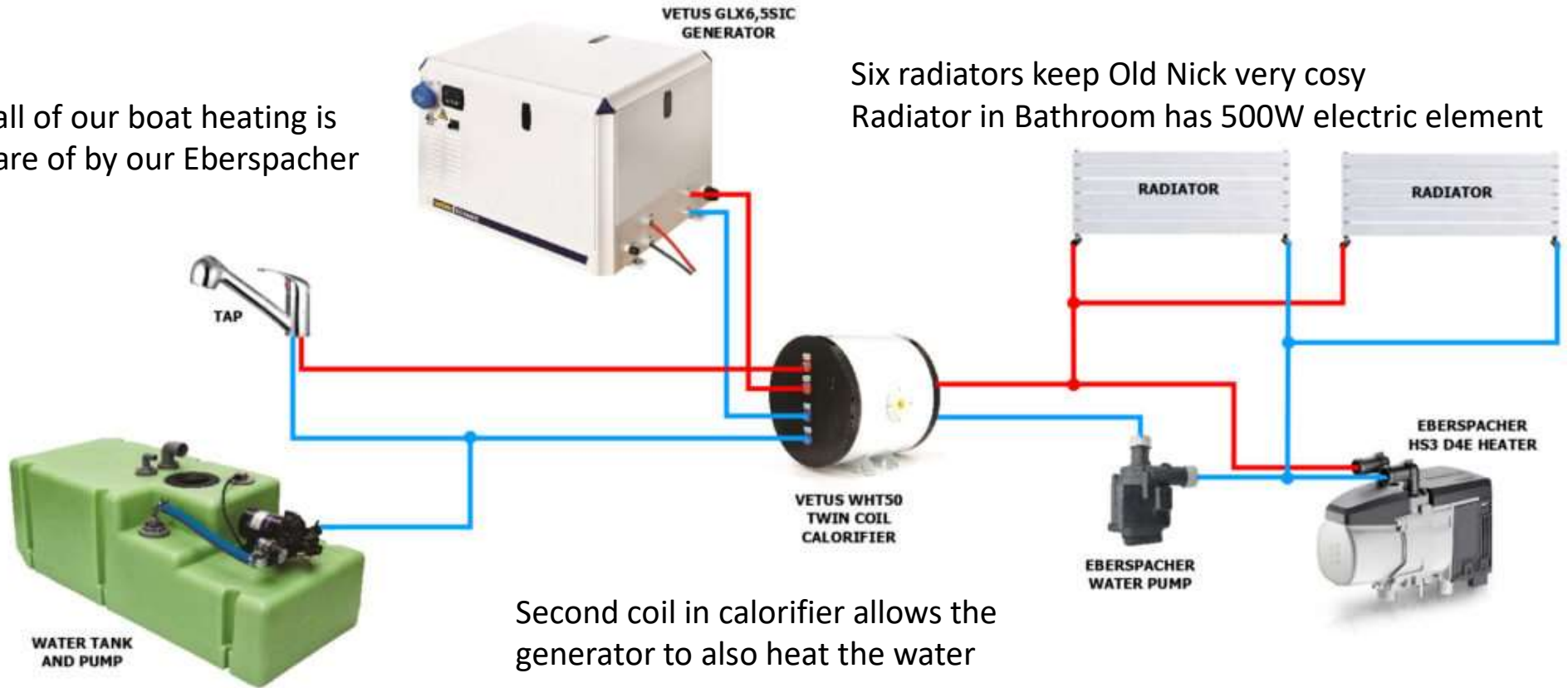
Water – Hot and Cold

- Old Nick has a 500L water tank, and originally a DC pump and accumulator, which was OK but noisy – now we have a “silent” AC pump
- After propulsion, water heating is the next biggest consumer of electric power on board
- Our 1500W AC immersion heater, will heat our Vetus 50L calorifier in around 1 hour (depending on air temperature)
- We are considering a “Quooker” type instant boiling water tap – which should be more economical
- When cruising, we tend to time showers around us running the generator for an hour and use the generator to heat the water (see next slide)

Heating

Nearly all of our boat heating is taken care of by our Eberspacher

Six radiators keep Old Nick very cosy
Radiator in Bathroom has 500W electric element



Second coil in calorifier allows the generator to also heat the water



Cooking – Just like at Home

Kay loves to cook and bake and was not going to compromise in the galley, which is number 3 in the electric power consumption chart

- Full size AC fridge
- 4 ring induction hob
- Neff “Hide & Slide” fan oven
- Microwave
- 12v Freezer in Dinette
- 3KW fast boil kettle
- Electric Toaster
- Air fryer (more efficient)
- Bread Maker





One thing in common - Electricity

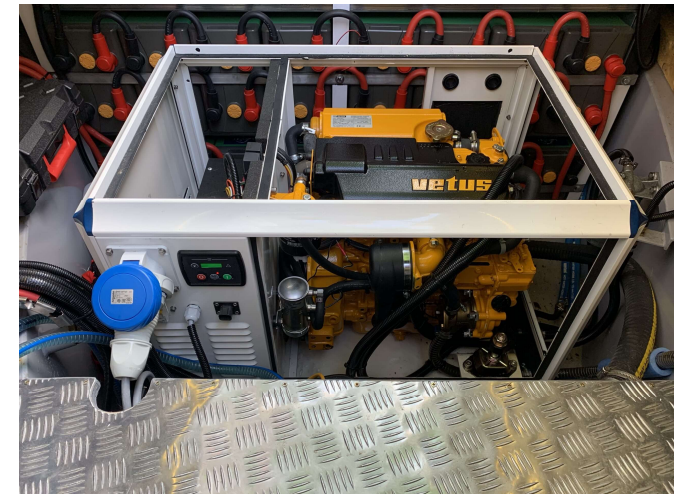
- Good electricians are important on any boat, but when you are reliant on electricity for propulsion and living, this certainly “ups the ante”



24 x 2V 800Ah Lead Carbon Batteries



12 x 160W (1920W) Solar Panels



6KVA Vetus AC Generator



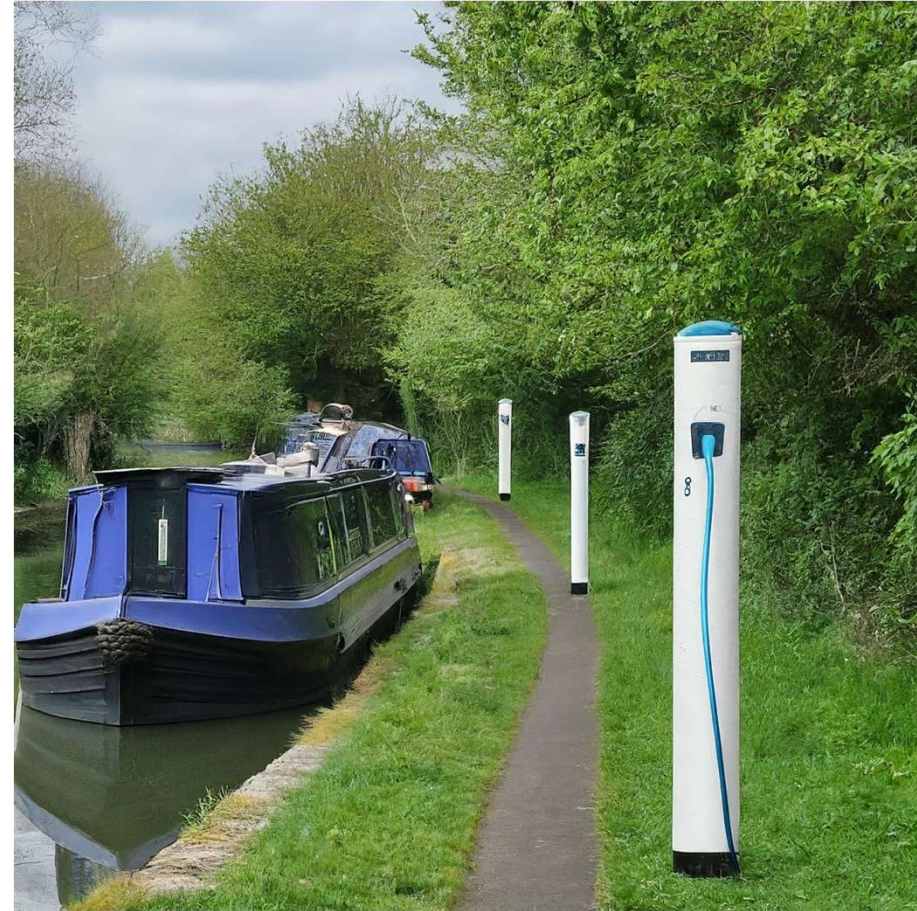
BOOM – Myth#2 Busted!

- Comments we have heard...

“CRT will need to install thousands of charging points all around the system!”

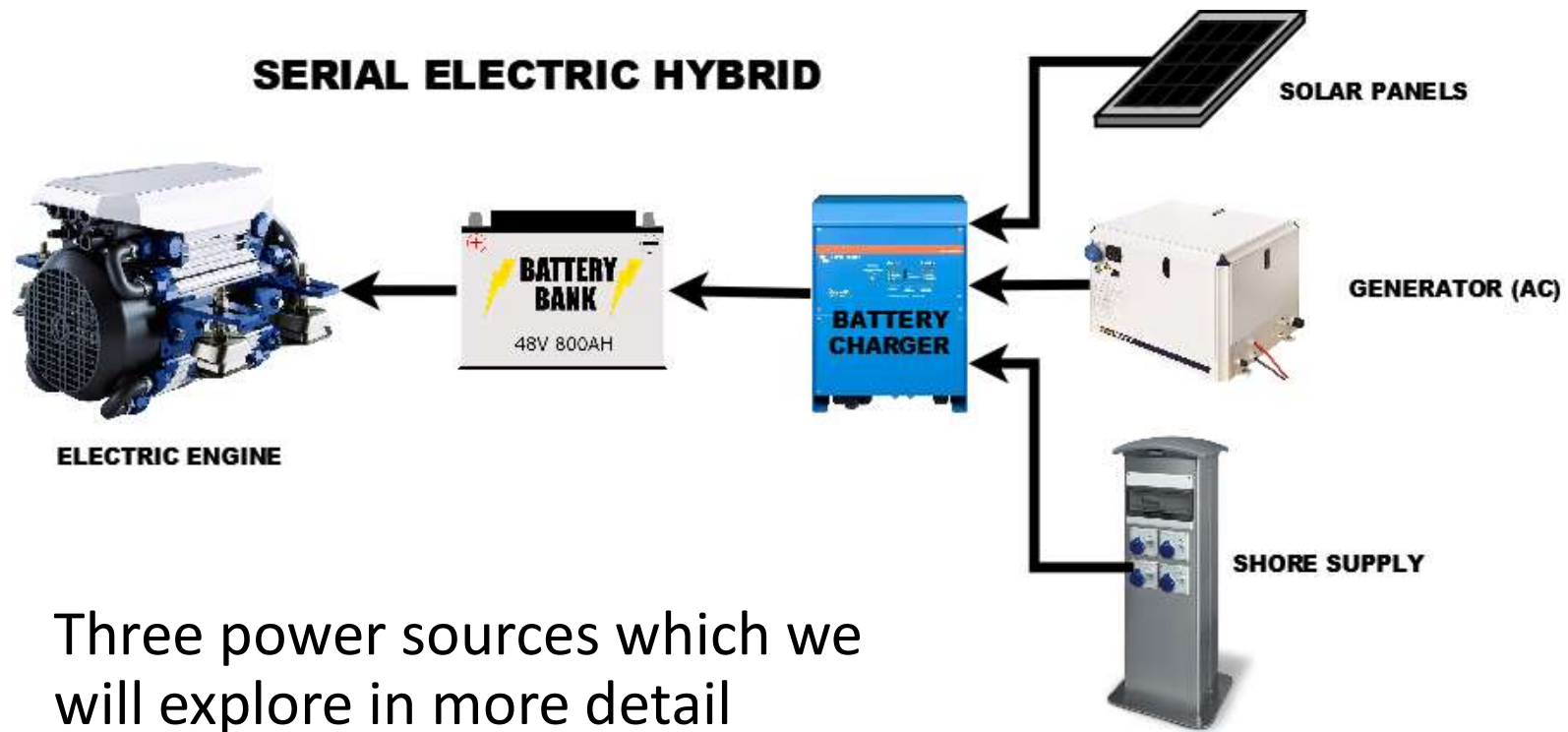
“Back to the marina tonight for a charge?”

“How many hours can you cruise for?”





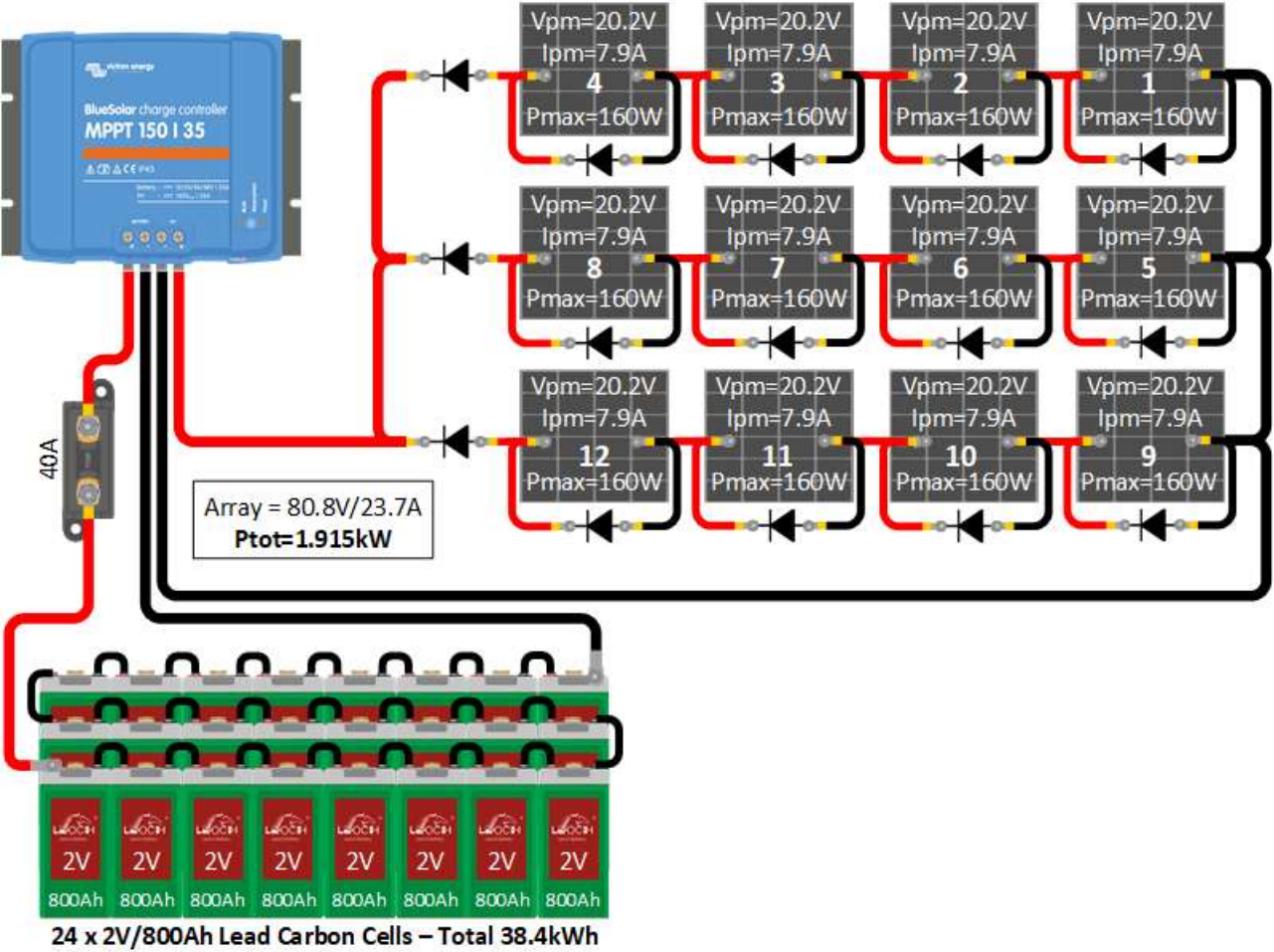
Old Nick's Design



Three power sources which we will explore in more detail



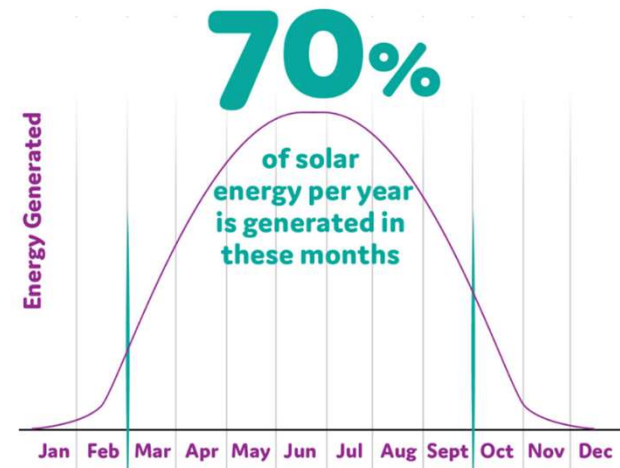
Solar System





Solar Power

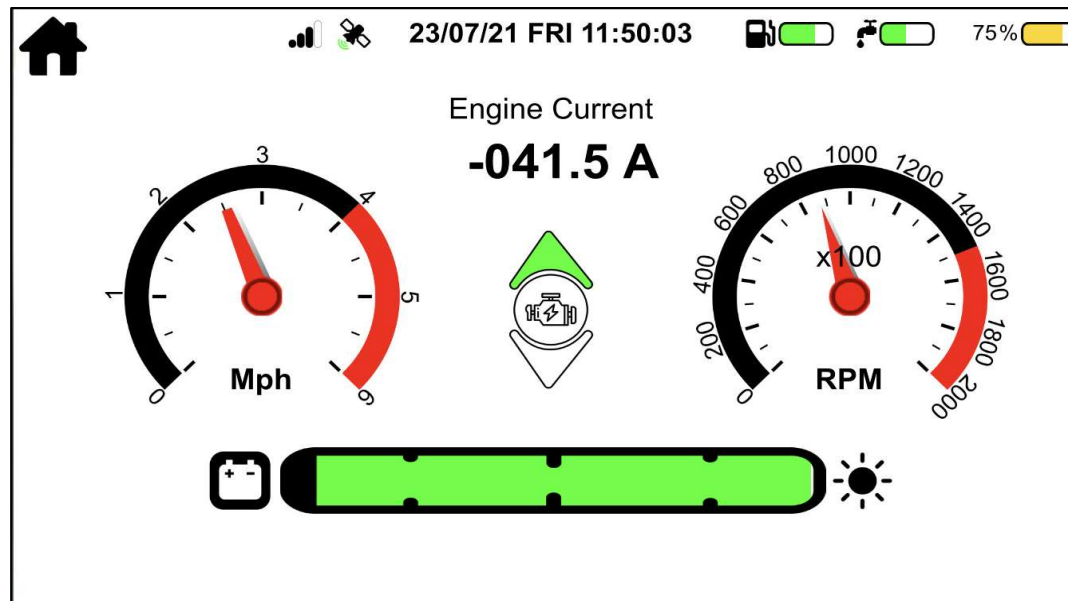
- Since launch (Dec 2020) Old Nick has generated 4 MWh of solar from our 12 x 160W semi-flexible panels (1920W)
- Optimising solar has become a constant challenge
 - Panels only generate power if there is space to store it
 - Obstructions; ropes, poles, trees, etc. reduce output
 - In the Winter solar panel output is <10%
 - Keep them clean
 - Summer output can be reduced due to panel heat
- With solar panels it is definitely a case of *“the more the merrier”*





“Nirvana”

- On bright sunny days, we can achieve “Nirvana”
- Where the solar power > electric engine power consumption
- Free boating!





The Diesel Generator

- Currently there is no way to continuously cruise without a generator
- We manually manage where and when we run the generator and our goal is to minimise usage as much as possible
- When we do run the generator it operates at 1500 RPM and has a 57dB noise level – less than most narrowboat engines
- It is a Vetus GLX6,5SIC and can generate 6KVA of power (25A)
- In 1hr we can bring the SOC up by 10% which in the summer is enough for a day of cruising and living
- We schedule running the generator with hot water for showers, oven cooking or doing the laundry



Diesel Generator Efficiency

- A diesel engine is most efficient when under load - about 30%
- Most traditional diesel engined boats have to run their engines after being moored for more than 24hrs
- Stationary running of the engine for charging is < 10% efficient as the only load is the 12v alternator
- A typical 12v boat running the engine for 1hr at 1500RPM would generate $12v \times 60A = 720W$ of power to charge the batteries
- Old Nick running our AC generator for 1hr at 1500RPM would generate $240v \times 23A = 5500W$ of power to charge the batteries (or 4000W of power and a tank of hot water for showers)



BOOM – Myth#3 Busted!

- Comments we have heard...

“Oh well - its not an electric boat if it has a great big diesel engine”

“That’s not very green then”

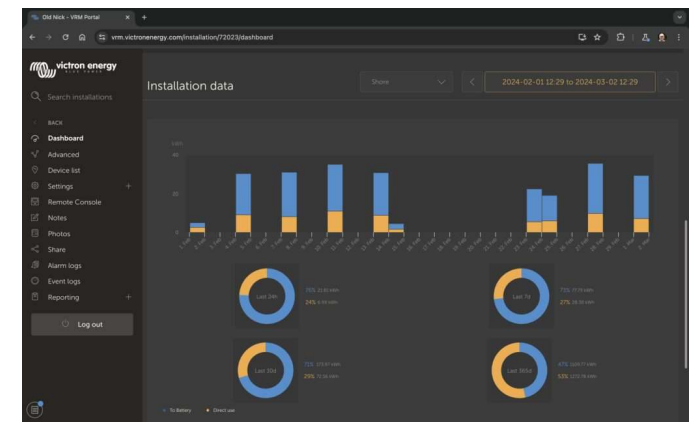
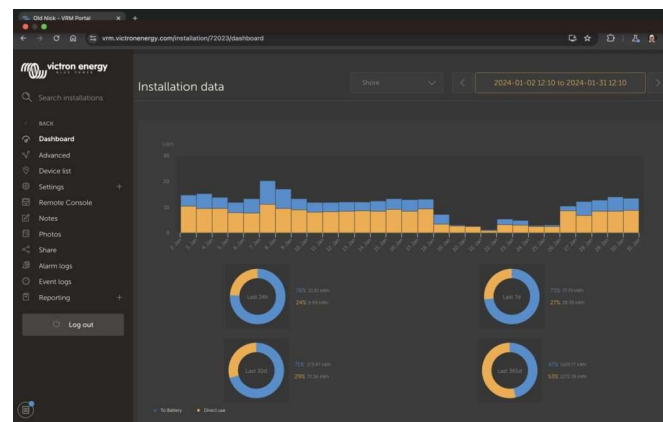
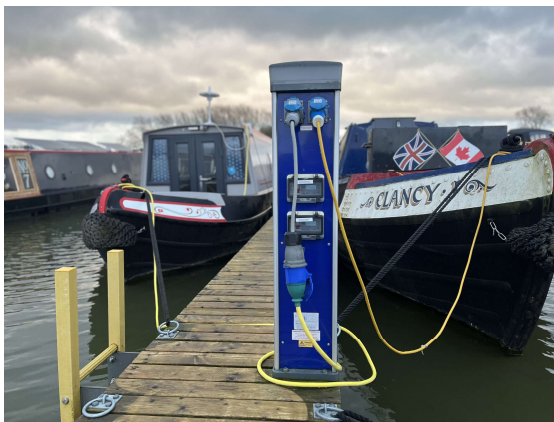
“So you cruise all day and then run the generator all night!””





Shore Hook Up - Winter

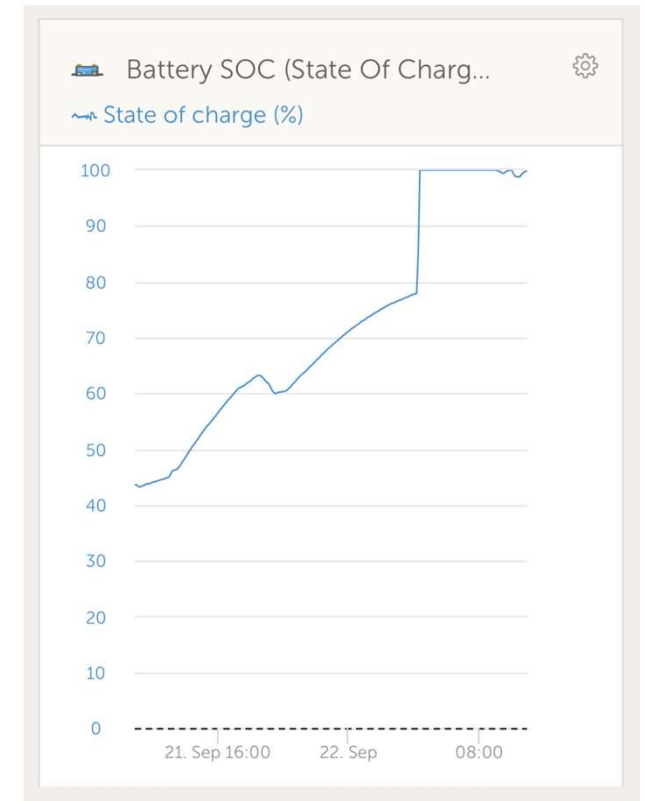
- We over winter in Brinklow marina and to minimise our hook up consumption we let our system cycle down to 60% SOC
- This maximises the available solar and reduces the number of Bulk and Absorption cycles





Shore Hook Up - Summer

- Although we can cruise indefinitely with the setup we have, we have discovered that over time our SOC reading wanders
- After a couple of weeks our SOC reads lower than it actually is
- A night on hook up allows us to get a full charge and for the Victron system to re-sync to 100%
- Combined with a shopping delivery, marina visits have become part of our cruising routine





Power Storage – the battery bank

- So we have covered the three power sources on a Serial Hybrid, but how is it stored?





Choice of battery technology

- The batteries are a key and expensive part of a Serial Hybrid
- How much power you can store, decides the distance between charges and just like solar panels “*you can never have too many*”
- On “Old Nick” we have 24 x 2V LC800 Lead Carbon batteries – “*a wall of power*”, that provide 38400Wh of storage (48v x 800Ah)
- Back in 2020 when Old Nick was built, a 48v Lithium Battery bank was >£10,000 so our £6,000 Lead Carbon bank seemed like great value!!



Choice of battery technology

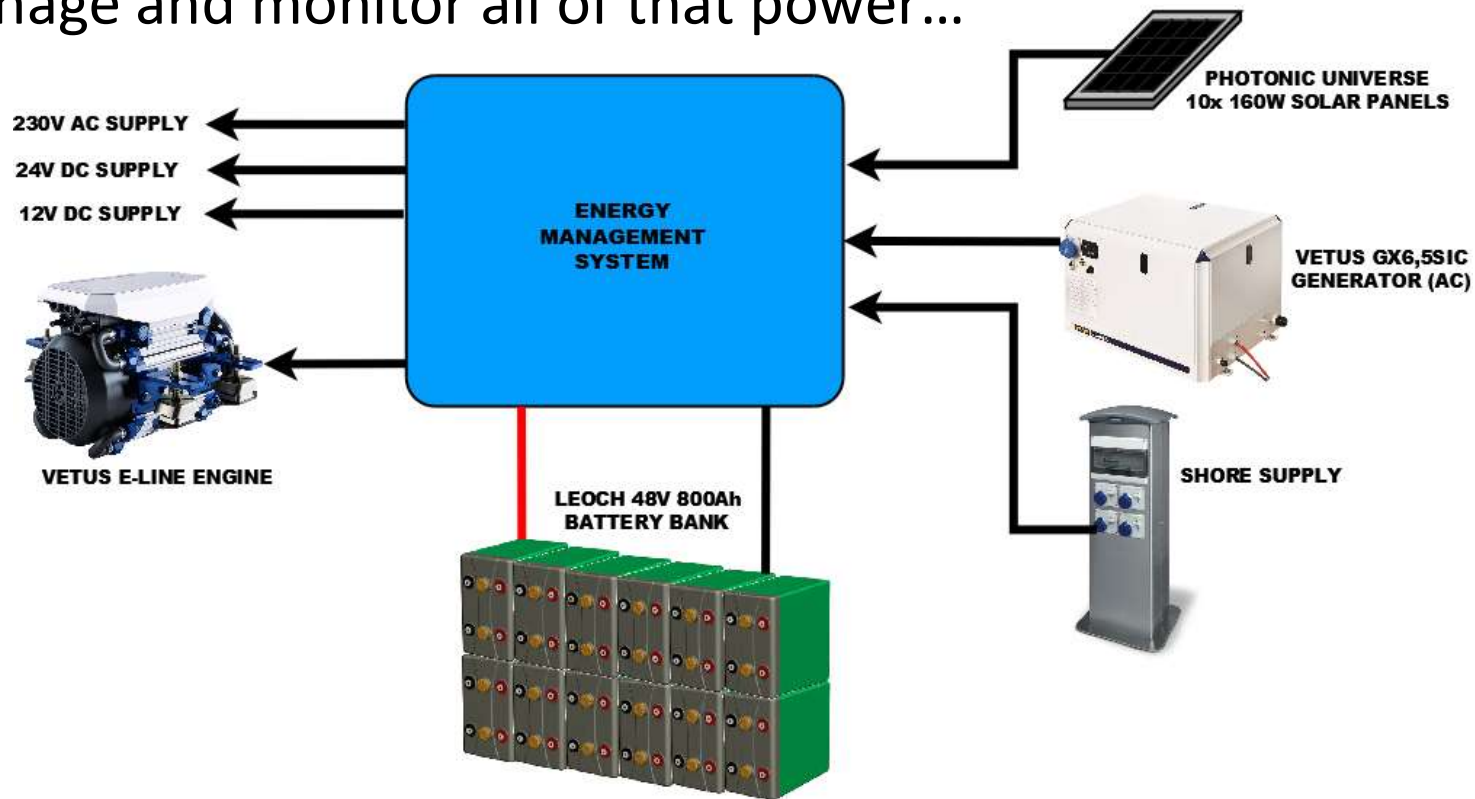
- For a serial hybrid, there are only two suitable battery chemistries
 - Lead Carbons and Lithium (LiFePo4)

Battery Technology	Average Cost	Zero Maintenance	Quoted DOD	Number of Cycles	Non-Vertical Mounting	PSOC Resistant	< 0° C Operation
Sealed Lead Acid	£	✗	50%	200	✗	✗	✓
Flooded Flat Plate (6v)	££	✗	60%	700	✗	✗	✓
Flooded Tubular Plate (2v)	££	✗	80%	1500	✗	✗	✓
Gel Cell	£££	✓	60%	800	✓	✗	✓
AGM	£££	✓	60%	600	✓	✗	✓
Lead Carbon (2v)	£££	✓	60%	3000	✓	✓	✓
Lithium	£££££	✓	80%	4000	✓	✓	✗



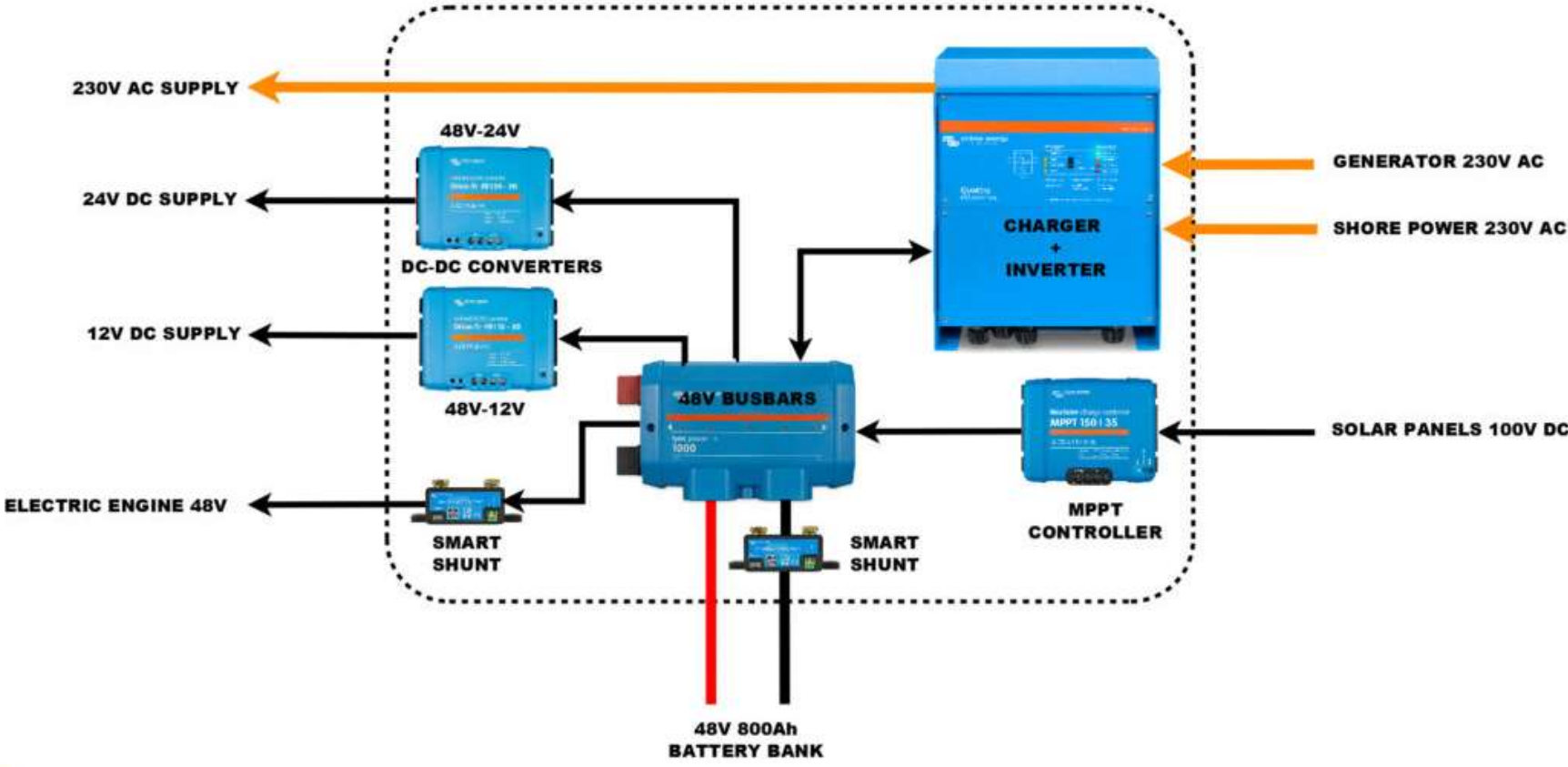
Managing the electrical power

- So we have three power sources and a large battery bank but how do we manage and monitor all of that power...





Victron Energy Management System



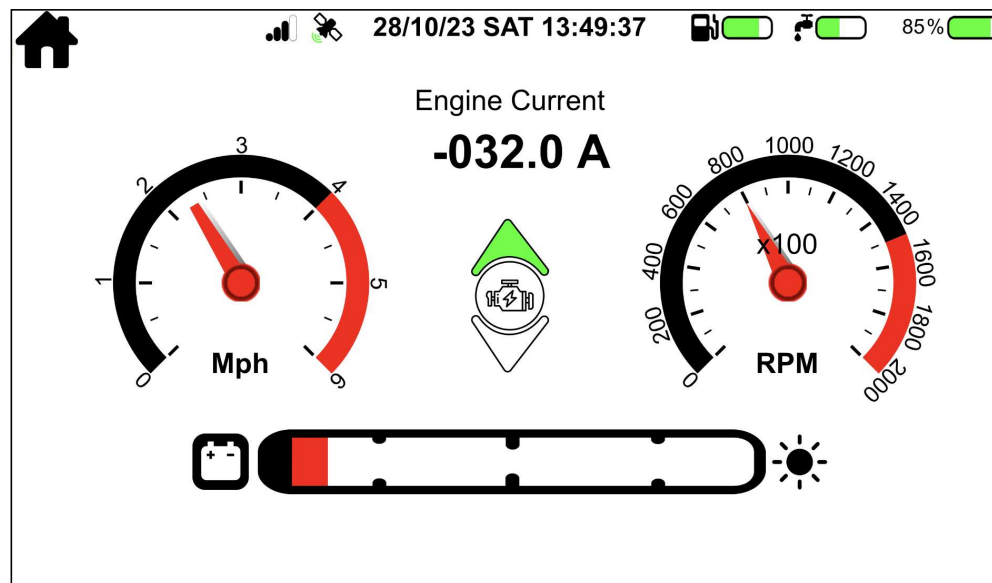
NOTE - Old Nick's 8KVA Quattro Charger/Inverter provides a good match to the battery bank





Electric Narrowboating

- Cruising with electric is different to diesel
- You are more in-tune with your power usage
- Your focus shifts from Speed and RPM to Current and RPM





Electric Narrowboating

- You soon get to know your boat's characteristics
- Changes in depth, weed and even leaves can have a noticeable difference on current consumption
- If the current is 5-10A more than normal for a given RPM, a quick blast of astern clears the prop and the current returns to normal
- We do find that our average cruising speed is less than a diesel as we try to optimise our consumption
- We are happy to take things slower and we always move over if a faster boat is behind us



Summary

- “Going Electric” is more than feasible with the current technology
- There is a lot of negativity and ignorance around Electric Propulsion
- Talk to the people who are doing it – learn from our experiences
- Select the right boat builder or engineering company
- Ensure you have a good match between your Generator, Solar Panels, Batteries, Inverter/Charger and Electric Engine
- Enjoy the rewards of greener boating