Transport and Infrastructure Net Zero Consultation Roadmap

Take the survey

Department of Climate Change, Energy, Environment and Water

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Yes

2 Please indicate how and if you want your submission published.
Public

3 Published name
Steve M

4 Confirm that you have read and understand this declaration.
Yes

5 First name
Steve

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9 Who are you answering on behalf of?

Individual or individuals

10 Organisation name

Not answered

11 What best describes you or your organisation?

Not answered

12 What sector do you represent?

Not answered

13 What state or territory do you live in?

New South Wales

14 Postcode

2287

15 What area best describes where you live?

City

16 1. Do you support the proposed guiding principles?

Yes

17 1.1 Please add details to your response.

Not answered

18 2. Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?

Yes

19 2.1 Please add details to your response.

Not answered

20 3. Do you agree the development of a national policy framework for active and public transport will support emissions reduction?

Yes

21 3.1 Please add details to your response.

Government grants and subsidies can accelerate the adoption of low/zero emission technologies into the transportation sector.

22 4. What should be included in a national policy framework for active and public transport and how should it be developed?

Electric high speed rail should be considered between major population centres.

23 5. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the movement of people contributes to transport emissions reduction?

The use of large vehicles, such as SUVs, in urban areas that are not for commercial activities should be heavily regulated to make their uptake less attractive. The general increase in vehicle size in Australia is negating the emission reduction benefits associated with increased electric vehicles (noting the Ford Ranger is currently the number one best selling vehicle in Australia). They also increase the risk of death or serious injury to other motorists, cyclists and pedestrians.

24 6.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure that the movement of goods contributes to transport emissions reduction?

Freight rail should be emphasised with increased application of electric only locomotives that are flexible enough to use either overhead catenary or battery only options. Strong government incentives should also be given to fast track the uptake of battery powered trucks such as the Tesla Semi. Furthermore, harbour, river and coastal shipping vessels should all be battery or hybrid propulsion based systems.

25 6.2. How would these actions address the identified challenges and opportunities for emissions reduction in the movement of goods?

These actions would significantly mitigate emissions by eliminating diesel combustion and the subsequent release of greenhouse gases from the transportation sector.

26 7. Do you agree with the proposed net zero pathway for light road vehicles?

Yes

27 7.1 Please add details to your response.

Non-commercial use of large SUVs should be heavily regulated to reduce their uptake.

28 8. The Australian Government is currently developing an Australian New Vehicle Efficiency Standard and has already begun to implement actions in the National Electric Vehicle Strategy.8.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce light vehicle emissions?

Strong regulation of large SUV vehicles for non-commercial activities should be applied. I also suggest maintaining significant tax incentives for EVs until they dominate Australian vehicle sales figures.

29 8.2 How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?

Smaller combustion engine based vehicles have reduced emissions and the accelerated uptake of EVs will further reduce emissions across the sector.

30 9. Do you agree with the proposed net zero pathway for heavy road vehicles?

Yes

31 9.1 Please add details to your response

Hydrogen based systems for the transportation sector should not be encouraged. The efficiency of a green hydrogen fuel cell based vehicle when considered from generation to

propulsion is approximately 40% (ref "The Big Switch" - Saul Griffith). When this is compared to the efficiency of a battery EV at 88% , the renewable generation infrastructure requirements for fuel cell based vehicles is double that of battery EVs. In addition, the fundamentals of the electricity grid are already in place for battery systems whereas the infrastructure requirements for hydrogen refueling are basically non-existent. Vehicles should be either battery, battery swap or hybrid diesel-electric (for extreme range). In the case of hybrid diesel-electric, HVO (renewable diesel) should be utilised. To address the HVO requirement, government should actively support efforts to increase availability of this renewable fuel alternative.

32 10. The proposed pathway for heavy road vehicles relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

1: Battery electric
2: Low carbon liquid fuels
3: Hydrogen fuel cell

33 10.1 Please add details to your response. Why did you rank them in that order?

Hydrogen for transportation is a very poor choice. When the full round trip efficiency is considered, the delivered energy efficiency for a fuel cell propulsion system is approximately 40%, less than half the round trip efficiency associated with a battery propulsion system. Battery technology is also advancing rapidly with 1000km plus ranges in sight. Internationally, hydrogen fuel cell based projects require heavy government subsidies to be viable and many projects are failing. For example, the German state of Lower Saxony recently cancelled its hydrogen fuel cell trains and are now adopting battery powered technology.

34 11. What role should low carbon liquid fuels play in the heavy vehicle decarbonisation?

Hybrid HVO based diesel - electric vehicles should be considered only when the feasibility of battery systems (including battery swap options) can be discounted.

35 12. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to

reduce heavy vehicle emissions?

Strong government incentives for battery vehicle uptake and fast charge deployment.

36 13. Do you agree with the proposed net zero pathway for rail?

Yes

37 13.1 Please add details to your response.

Hydrogen fuel cell based technology is not a commercially viable option and should be discarded for overhead electric catenary/battery, battery only, battery swap or hybrid HVO diesel/battery alternatives.

38 14. The proposed pathway for rail relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

1: Battery electric
2: Low carbon liquid fuels
3: Hydrogen fuel cell

39 14.1 Please add details to your response. Why did you rank them in that order?

Hydrogen fuel cell based transportation has less than half of the round trip efficiency of a battery system when considered from generation to propulsion. Battery, electric-catenary/battery or hybrid HVO-Diesel battery should be the options considered.

40 15. What role should low carbon liquid fuels play in rail decarbonisation?

HVO diesel should be prioritised for hard to abate scenarios. It should also only be used in conjunction with a battery hybrid system.

41 16. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce rail emissions?

Not answered

42 16.1 How would these actions address the identified challenges and opportunities to reduce rail emissions?

Not answered

43 17. Do you agree with the proposed net zero pathway for maritime?

No

44 17.1 Please add details to your response.

Hydrogen based systems should not be considered. For short distance operation, battery vessels should be prioritised. For medium to long trips, Hybrid HVO Diesel/Battery systems should be leveraged for these harder to abate areas.

45 18. The Australian Government is engaging in consultation as part of the development of the Maritime Emissions Reduction National Action Plan and those consultations will also inform the final Roadmap and Action Plan. 18.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce maritime emissions?

Grants and subsidies should be provided to stakeholders to accelerate the uptake of these technologies.

46 18.2 How would these actions address the identified challenges and opportunities to reduce maritime emissions?

Increased adoption of these technologies will lead to reduced diesel use and subsequently reduce emissions.

47 19. Do you agree with the proposed net zero pathway for aviation?

Not answered

48 19.1 Please add details to your response.

Not answered

49 20. The Australian Government has already engaged in consultation on

aviation decarbonisation through the development of the Aviation White Paper and those consultations will also inform final Roadmap and Action Plan.

Not answered

50 20.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce aviation emissions?

Not answered

51 21. Do you agree with the proposed net zero pathway for transport infrastructure?

Yes

52 21.1 Please add details to your response.

Rather than focus on hydrogen as a fuel for transportation, one area of focus should be on the application of hydrogen for green steel production that can be used for the construction of transport infrastructure. As an aside, another area for the application of hydrogen is for ammonia/fertiliser production which facilitates increase crop yields. Increased crop yields can assist in bio-fuel production for hard to abate sectors such as long distance shipping.

53 22. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce transport infrastructure emissions and ensure that transport infrastructure is ready for and enables low-emission transport modes?

Not answered

54 22.1 How would these actions address the identified challenges and opportunities to reduce transport infrastructure emissions?

Green steel production will significantly reduce emissions associated with the material requirements for transport infrastructure.

55 23. What additional actions by governments, communities, industry

and other stakeholders need to be taken now and in the future to ensure the energy mix is ready to support transport emissions reduction?

The government should avoid the use of green hydrogen for transportation. Given the international experience of many projects, heavy subsidies are required and all projects will eventually end up being replaced with battery alternatives. The focus on green hydrogen should be in areas such as green steel and green fertiliser.

Additional focus should be given to HVO (renewable) diesel. There needs to be increased availability of HVO diesel for sectors such as long distance shipping whose emissions will be difficult to abate for the foreseeable future.

56 24. How should the use of low carbon liquid fuels (LCLFs) be prioritised across different transport modes over time to achieve maximum abatement?

Priority should be given to HVO (renewable) diesel.

57 25. What are the best ways for the Australian Government to work collaboratively with industry, business, governments and communities to implement the proposed pathways?

Attractive grants should be made available to support local innovation and the infrastructure deployment of low emission technology in the transportation sector.

58 25.1 What are good domestic or international examples of partnership and collaboration on transport and transport infrastructure emissions reduction that could inform the final Roadmap and Action Plan?

Steber International Hybrid Boat
https://www.nbnnews.com.au/2024/03/21/hybrid-43-foot-workboat/

59 25.2 What opportunities can Government leverage to show leadership in Australia and internationally?

Given the bespoke nature of the maritime sector relative to other transport modes (larger vessels are not mass produced and generally application specific), Australian industry can be competitive in transforming our own maritime sector and potentially creating export opportunities.

60 26. What measures and metrics should be used to evaluate the final Transport and Infrastructure Net Zero Roadmap and Action Plan?

- Total emissions per sector per year (Road, rail, maritime, air)
- Emissions per tonne of steel (and cement) produced per year
- Local production of green steel tonnage per year
- New versus recycled battery percentage per year

61 26.1 What other data and evidence could governments use and how could this offer further insights on the pace, scale and location of transport emissions reduction pathways?

Not answered

62 27. Do you have any feedback on the proposed review process?

Not answered

63 28. Do you have any further feedback on the Consultation Roadmap and proposed pathways?

Not answered

64 28.1 Is there anything missing? Are the sections appropriately integrated? Is the Roadmap appropriately ambitious?

Not answered

65 29. Is there any further information or documentation that you wish to be considered with your submission?

Not answered

66 Would you like to upload a document?

Yes

67 Have you removed any identifying information from your submission?

Yes

68 Upload a submission

Club Marine 39.3_Steber Hybrid.pdf

69 Upload a submission

Not answered

70 Upload supporting file

Not answered

71 Upload supporting file

Not answered

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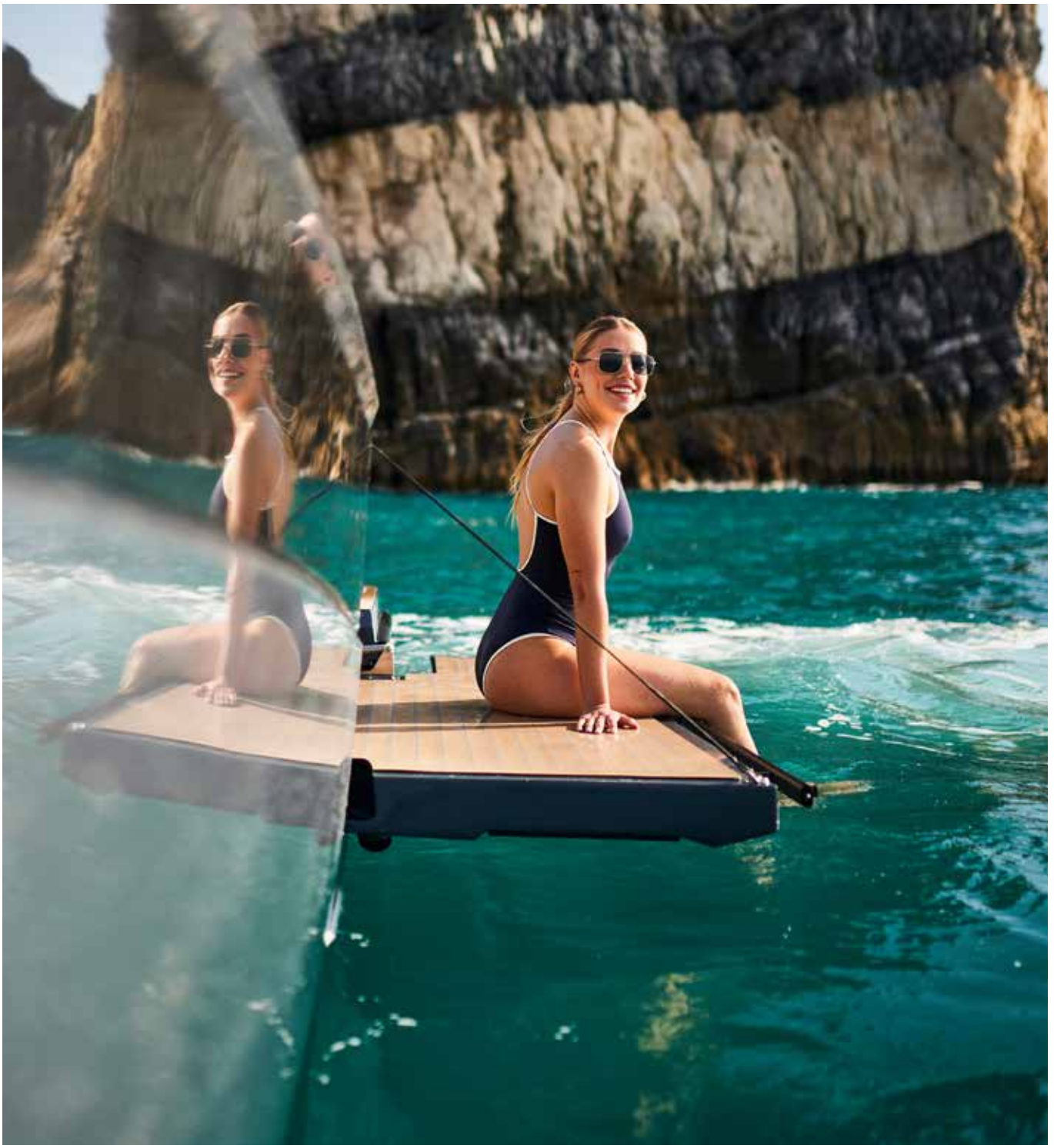

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SILENT **KNIGHT**

Driven to reduce the running costs and emissions of motor cruisers, Aussie engineers have pioneered a hybrid propulsion system for an evergreen Steber.

By Mark Rothfield

you can indeed teach an older hull new tricks

Ask boatbuilder Alan Steber whether his 4380 hull runs trim tabs and there's a good chance you'll score a backhanded slap on the bicep, as I did. It speaks volumes for the pride that Alan holds in the design efficiency of this evergreen, bluewater workhorse.

No, it doesn't need assistance to perform. Yet nowadays you can't really say the same for the combustion engines propelling it, which is an increasing concern as folk pay more heed to environmental vulnerabilities and future responsibilities.

Fortunately, an engineering team from NSW's Hunter Region has shown that you can indeed teach an older hull new tricks. Together with Alan Steber, they've spent six years researching, developing and perfecting a hybrid electric drive system that could revolutionise new installations and repowers in the future.

Above: The recreational flybridge version of the Steber 4380 hull shows its efficiency on glassy waters.

Below: Twin 640hp Caterpillar diesels filled the engineroom prior to making way for modern electric plants and battery sytems.

Like many grand design projects, this one began with very different intentions. Steber simply wanted to build a commercial vessel that could operate in stealth mode, allowing police to sneak up on crooks at night – and allow maritime inspectors or marine parks service vessels to conduct operations too – and for marine rescue crews to better hear cries and whistles for help. That's difficult to do with two thumping diesels, which meant exploring electric options.

TAKING CONTROL

First stop was Ampcontrol, an engineering firm based near Newcastle. They, in turn, contacted the University of Newcastle, and a triumvirate was formed.

"We took Alan up on the challenge," explains Ampcontrol Engineering Manager Steve Mitchell. "We secured a couple of small government grants, then initially conducted modelling to look at return-on-investment based on different battery sizes, different engines and different operating conditions.

"On the basis of those findings, Alan built a very rudimentary 22ft (6.7m) hull and we fitted

go from dawn till dusk purely with whisper-quiet, effective, emission-free operation

a Cummins diesel generator and some clever power electronics that we developed with the University of Newcastle. It ran an 80kW electric motor, plus we had 38kWh of lithium ion phosphate battery power.

"When we demonstrated it on the river at Taree, it went wonderfully; attracted quite a bit of media and political interest."

Using a modified 4380 hull, the new 40 Hybrid is conceptually similar to the 22 but has twin electric motors spinning shafts, with up to 600kW at its disposal. Its 150kWh battery bank has three times the capacity of a Tesla Model 3.

The hybrid's system then allows for three performance modes – full electric (up to 300kW), full diesel generator (up to 300kW), and combined generator/electric (up to 600kW).

Above: One of two electric motors in the Hybrid, with associated wiring and cooling. The adjacent black boxes contain the battery bank, keeping weight central.

Below: Located aft and on the centreline, the 300kW diesel generator feeds power directly to the motors, not the shafts.

Under electric-only drive, the system provides speeds of four knots (7.4km/h) for around 12 hours, eight knots (14.8km/h) for three hours, or 30-minute sprints at about 20 knots (37km/h). Having the 300kW generator overcomes any range anxiety as it can power the electric motors and/or recharge the battery.

That's not to suggest the genset is connected to the shafts. Rather, it is a series hybrid configuration, allowing the generator to supply electrical power straight to the battery's DC bus.

The gen-electric mode affords the benefit of instant torque from take-off, no gearbox crunch or turbo lag, and greatly reduced vibration. We saw top speeds of around 26 knots (48km/h) on Newcastle Harbour.

"If you're out wining and dining with friends, you could go from dawn till dusk purely with whisper-quiet, effective, emission-free operation as an electric vessel running on battery," adds Mitchell. "But if you need to go faster or further, you're only limited by the size of the fuel tank, the same as with conventional diesel-driven configurations."

Afterwards, the 40-footer can be plugged in and recharged at a dock using standard three-phase power outlets via a 60kW onboard charger; there's no requirement for marinas to install dedicated charging infrastructure. Alternatively, the boat can be recharged by its own generator.

KEEPING COOL

Electric motors have relatively few moving parts but operate at high rpm, making cooling imperative. In this case, Ampcontrol's team has tapped into the infinite supply of cold seawater surrounding the hull, sending the water through a glycol-filled heat exchanger.

But not only are the electric motors water-cooled, the batteries and charging system are too. Lithium-ion phosphate batteries are employed for added safety, which Mitchell explained were drop-tested, overcharged, over-discharged, compressed and short-circuit tested to ensure robustness.

Lead-acid batteries are used for starting the diesel and running the control gear, but otherwise the 40 is powered from its lithium bank. An inverter provides 240V as required.

Underway, proprietary software determines how the generator's power output is apportioned between the motors and batteries. As an example, while we were running at eight knots, the gauges showed 50kW to the shafts and 35kW to battery charging. If the batteries are fully charged, then the electrical power is utilised more by the motors.

On a delivery trip from Pittwater to Sydney, the Steber left with 40 per cent battery level and arrived with 80 per cent. Ideally, though, it is more cost effective to plug in and leverage the land-based electricity grid.

COST FACTORS

According to Mitchell, the hybrid system commands a price premium of around 25 to 30

OLD WAYS AND THE NEW WISE

It might surprise some to see 78-year-old Stebercraft International at the vanguard of hybrid technology, given the popular perception (or misconception) that elderly people and venerable companies are wont to lag behind the times.

That's until you realise that wizened boatbuilders like Alan and his dad Bruce have pioneered new technologies continually since day dot. In the marine industry, you either pivot or perish.

A tour of Stebercraft's factory on the NSW Mid-North Coast reveals a mix of time-honoured business practices and cutting-edge innovation. One room houses clip folders containing a paper trail of every commercial vessel ever built there. Another has blueprints for unmanned defence craft and concepts too confidential to mention here.

At the same time, the in-house R&D team is busily experimenting with carbonfibre foils to generate lift, improve planing efficiency and reduce power demands.

"It's not just keeping up with the Joneses, we're getting ahead of the game," says Alan Steber, the general manager. "We're thinking outside the square, because electric boating and sustainable boating are the future."

While the company's commercial vessels are in high demand, Stebercraft continues to offer eight recreational models ranging from 28ft (8.5m) to 65ft (19.8m). The flagship utilises Precision Marine moulds that Steber bought and trucked over from WA. The yard also has ex-Westcoaster moulds that extend to 72ft.

As testament to the construction quality, a 4380 was recently built for a Perth buyer. It was launched, sea trialled then delivered by sea, via the Great Australian Bight, without a hitch.

Displacing 16t with an enclosed flybridge and full fitout, the 4380 runs twin 640hp Caterpillar diesels, although Alan says anything above twin 500hp engines will suffice. As mentioned, the same hull is utilised by the 40 Hybrid, where the 300kW motors equate to approximately 400hp apiece.

The hybrid technology can be applied to all models within Steber's range, and many others.

"Why are we doing all this?" Alan concludes: "Because we love it."

Above: Alan Steber, left, and his father Bruce have adopted countless new technologies in the boating market. They now see a bright future for electric-diesel hybrid propulsion.

Where the concept has huge potential is with repowers

Above: Dashboard screen presents a wealth of information.

Below: Hybrid power helps the environment and running costs.

per cent above a diesel installation. Commercial operators could typically recoup that in three or four years.

A pleasurecraft may take longer but resale values would be substantially enhanced by the silent operation, lack of fumes and reduced engine maintenance – or what Mitchell calls the 'pleasure return on investment'.

Where the concept has huge potential is with repowers. As Alan Steber says, a fibreglass hull can have a 50-year working life, but not so its diesel engines.

"If you've got a vessel that's coming in for a major refit, we like to say that we won't only give it a second life, we could make it better than when it was first born," Mitchell adds. "We could also utilise one of the old diesel engines as the generator and cannibalise the other one for parts."

For weight balance, the batteries are generally housed where diesels would normally go, and the generator where a fuel tank would go. Even the propellers can potentially be salvaged.

After six years, Ampcontrol believes the concept is now market-ready. The 40 Hybrid was revealed at the recent Sanctuary Cove International Boat Show and henceforth it will be available to paying customers.

"I'd suggest that the modest premium is worth it, because it is so much nicer to have this vessel," concludes Steve Mitchell. "It really does tick a lot of boxes for both the pleasurecraft owner and the commercial operator. If I could afford a leisure craft, a decent leisure craft, there's absolutely no way I wouldn't go hybrid." CM