EDISON

Global Energy Ventures

Emission-free green hydrogen and H_2 transport

Initiation of coverage

Industrial support services

Global Energy Ventures (GEV) is one of the first transport companies to offer the prospect of genuinely emission-free hydrogen production and inter-regional hydrogen transport solutions. Its innovative C-H2 Ship design has been approved and is in the early stages of development and construction prior to an expected launch in 2026, most likely serving markets in South-East Asia, but with exciting applications in offshore energy production in Europe too. Our scenario models suggest IRRs of between 10% and 19%.

Year end	Revenue (A$m)	PBT (A$m)	EPS (c)	DPS (c)	P/E (x)	Yield (%)
06/19	1.1	(8.9)	(2.6)	0.0	N/A	N/A
06/20	1.5	(2.9)	(0.8)	0.0	N/A	N/A
06/21e	0.1	(4.1)	(1.0)	0.0	N/A	N/A
06/22e	0.0	(6.4)	(1.3)	0.0	N/A	N/A

Note: PBT and EPS are on a reported basis.

Market opportunity: Renewable energy imbalance

Australia is blessed with plentiful renewable energy sources (wind and solar) and a relatively limited local demand given the population. By contrast, several countries in South-East Asia have pledged to decarbonise their economies but have challenges in achieving targets given the geographies. GEV is looking to address this imbalance by transporting surplus energy in the form of green hydrogen from northern and western Australia to areas of high demand in its novel compressed hydrogen vessels.

Timeline milestones to give investors comfort

GEV has already partnered with Ballard Power Systems for fuel cells and Wärtsilä for a propulsion system, and has an existing relationship with CIMC Raffles for ship building. Furthermore, it has already published its 'scoping study', which highlights the feasibility and cost advantages of transporting compressed hydrogen versus either liquified hydrogen or hydrogen in the form of ammonia. The next milestones will be to formally appoint its partners and to achieve approval in principle (AIP) for the 430t pilot vessel from the American Bureau of Shipping (expected in Q321), and Full Class Approvals (expected in late 2022). Finally, GEV will need to raise capital of at least c A$1.2bn, which is likely to be achieved largely through a special purpose vehicle (SPV) arrangement.

Valuation: NPV calculation implies attractive IRRs

Our modelling suggests potentially attractive IRRs from a range of scenarios. We have modelled a deflationary scenario and a flat pricing scenario for a fleet of 430t vessels and a fleet of more efficient 2,000t vessels. In the 430t fleet size, the IRR comes in at 9.7% in the deflationary scenario, rising to 14.2% in the flat pricing scenario. The larger vessel fleet benefits from scale and indicates IRRs of 13.8% and 18.7% in the respective scenarios. However, there are considerable risks to achieving these returns including funding, hydrogen availability, hydrogen pricing, the fact that the hydrogen market is at an early stage of development and that the vessel design is novel and therefore untested.

23 July 2021

Price	**A$0.06**
Market cap	**A$27m**
	A$1.3/US$
Estimated net cash (A$m) at 30 June 2021	6.5
Shares in issue	452.1m
Free float	100%
Code	GEV
Primary exchange	ASX
Secondary exchange	FRA

Share price performance

%	1m	3m	12m
Abs	(19.7)	(37.8)	(11.6)
Rel (local)	(20.4)	(40.6)	(28.5)
52-week high/low		A$0.14	A$0.04

Business description

Global Energy Ventures is focused on the delivery of integrated compressed gas shipping solutions for transporting energy to regional markets. Although the primary focus is on compressed natural gas, large-scale compressed hydrogen solutions are likely to become the dominant focus of the group.

Next events

Quarterly activities	22 July 2021

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Investment summary

Company description: Compressed hydrogen transportation

GEV is focused on the delivery of integrated compressed gas solutions for the production and transportation of energy within regional markets. Although its primary focus until now has been on compressed natural gas (CNG), large-scale compressed hydrogen solutions are likely to become the dominant focus of the group. To this end, GEV is currently developing a compressed hydrogen vessel, which is expected to begin operations in 2026. This is expected to be followed by the introduction of a fleet of more efficient 2,000t vessels to transport green hydrogen from northern and western Australia, to regional markets in the South-East Asia, specifically Japan and Korea, where the opportunity is huge, driven by net zero commitments. There are also numerous opportunities within the EU, within economic range.

The achieved hydrogen price spread will be crucial

The success of GEV fundamentally depends on the availability and price of green hydrogen in Australia, and the market price in South-East Asia, which we believe are currently c US$4/kg and US$9/kg respectively, although we believe the market is opaque and currently going through a price discovery phase. In the long term, the prices of new energy forms fall, and we have reflected this in our deflationary modelling.

In The hydrogen economy: Decarbonising the final 20%, we highlight the exciting opportunities offered by the compressed hydrogen market and some of the major challenges that it faces: green hydrogen is likely to require policy support, particularly in the near term, to stimulate end-demand and to bridge the cost gap with more traditional energy sources such as natural gas. Key policy tools are likely to include subsidies, deployment targets, carbon taxes and co-ordinated infrastructure development.

Estimated valuation of 18c/share implies c 160% upside

Our modelling suggests potentially attractive internal rates of return (IRRs) from a range of scenarios. We have modelled a deflationary hydrogen gas (H_2) price scenario and a flat pricing scenario for a fleet of six 430t H2 vessels and a fleet of five, more efficient, 2,000t H2 vessels. The smaller, 430t vessel fleet implies transporting 50,000t of H_2 pa in 116 voyages of 2,000 nautical miles (nm), a round trip of 4,000nm. The IRR comes in at 9.7% in the deflationary scenario, rising to 14.2% in the flat pricing scenario.

The larger 2,000t vessel fleet implies transporting 200,000t of H_2 pa over the same distance, but in 100 voyages. The IRRs in the two respective scenarios come in at 13.8% and 18.7%. This, we believe, highlights the benefits of scale of the larger, more efficient vessels.

We estimate that the smaller fleet in a deflationary scenario, that is the lowest IRR scenario, would have a diluted net present value (NPV) of 18c per share (at 6% WACC).

Risk: Multiple considerations

GEV is attempting to build a long-term business based on projections of the future availability, demand and the price of green H_2. There are of course multiple elements that influence the outcome of the plan. These include:

- **Development risks:** novel ship design, development and construction delays.
- **Market risks:** H_2 supply, end-market demand, competition.
- **Financial risks:** project funding availability, interest costs, H_2 costs and selling prices.

Shipping H_2 in a compressed form is one of three potential transportation alternatives, liquid hydrogen and ammonia being the others. Each one has its strengths and weaknesses, but GEV has been able to demonstrate that its compressed hydrogen model is the most efficient up to a range of c 4,500nm as evidenced in its March 2021 scoping study.

Strategy: To commercialise compressed gas solutions

GEV was set up in 2016 to develop and commercialise integrated compressed shipping solutions for energy (gas) transportation between regional markets. The business aims to design, build, own and operate integrated transport projects for either natural gas or hydrogen. GEV has clearly defined ideas and relationships, and a robust route to revenue and cash flows that fits very neatly with the global drive to a net-zero carbon emission future for energy production, transportation and usage. There are hurdles to overcome on this journey and GEV has the answers to some of the major issues that stand in the way of achieving this goal. We believe GEV has the management in place and access to the right technology to make a success of its future.

Lower, and zero, inter-regional gas transportation

GEV's current primary activity is focused on developing integrated CNG marine transport solutions. This has taken the form of devising the company's construction-ready 'CNG Optimum' ship. This vessel utilises a patented hexagonal, close-packed, high-strength pipe system that stretches the entire length of the cargo hold. This CNG transportation solution could have applications in situations where reinjection of natural gas into the seabed is too expensive or is not feasible, or in situations where no pipeline to shore is available. CNG is well understood as a transport solution, is safe and produces lower emissions than transporting gas in a liquified (LNG) form.

In addition, as the world aims to transition to net zero-carbon fuels, GEV is developing the world's first large-scale Compressed Hydrogen Ship (C-H2 Ship) design, which should support the transportation of 'green' (zero-emission) hydrogen, which could be used to decarbonise hard-to-reach heavy greenhouse gas-emitting industries. The vessel would have twin, 1,000 tonne capacity tanks in the hold that will be pressurised to 250 bar. The vessel will ultimately be powered by a fuel cell that will create energy from green hydrogen stored in the ship's hold, implying zero emission fuel for transportation. Therefore, the C-H2 Ship has 'green cargo', and the cargo itself offers zero-emission fuel for transportation. With the exception of the vessel construction, this solution could have zero carbon emissions and could be a vital differentiator for GEV as it helps corporates towards decarbonisation targets.

The 'CNG Optimum' solution could have applications off the coast of the United States, Mexico and Brazil for example. The C-H2 Ship is expected to have applications in northern and western Australia, exporting green hydrogen to South-East Asia, and in off-shore applications in Europe. We have attached zero valuation to the CNG Optimum solution as this project may ultimately be shelved in favour of the C-H2 Ship solution. However, it does lend credibility to the C-H2 Ship project.

Renewable green hydrogen projects and sources

With the anticipated investment, Australia is likely to become a net exporter of green (emission-free) hydrogen given the number and size of projects either under construction or planned versus the domestic demand level, with the first export volumes available from 2025. The largest of these projects is the Asian Renewable Energy Hub, which is planned to have 1,600 wind turbines and a 78 sq km array of solar panels producing 26,000MW of green renewable energy. Therefore, there will be significant volumes of green hydrogen available for export to regional markets, potentially carried in GEV's zero-emission C-H2 Ship. It is also anticipated that the vessel design will have applications for off-shore energy and hydrogen production in Europe's off-grid, off-shore windfarm industry.

In addition to the C-H2 Ship, GEV is also planning to develop its own renewable hydrogen production facilities in order for it to be able to provide a fully integrated supply chain. GEV is looking to construct a pilot project with 10,000–20,000tpa capacity. It is currently in discussions with technical partners to supply electrolysers, including Siemens and Nel. Once the hydrogen is produced, it will need to be compressed before loading. Siemens and others are already providing compressors suitable for hydrogen at the volumes and pressures required.

The potential markets for the excess hydrogen are likely to be South Korea, Japan and Singapore, which are within, or on the cusp, of the economic range of the C-H2 Ship being designed. Currently, GEV has no agreements in place for offtake for export, but it does have a relationship with Iwatani Corporation and others that may lead to agreements. Iwatani is Japan's only liquid hydrogen producer and distributor with an annual production capacity of 120m m^3 across six plants supplying 70% of the country's current hydrogen demand.

Offshore green hydrogen production transport solution

GEV's C-H2 Ship can also be utilised in offshore applications where a wind farm and an H_2 production facility are located 'off-grid'. This could easily be the case in Europe and especially in the North Sea where there is a significant build-out of offshore wind farms. The EU is also funding (€2bn, terms of reference to be announced after the summer) schemes to accelerate engineering studies of potentially viable offshore hydrogen production and GEV is looking at tapping into these schemes via a partnership with engineering firms already active in the space.

GEV is in discussion with a number of major engineering partners to advance the supply into key markets. Such relationships could be a beachhead into the EU as well. In Europe, it is envisaged that 430t vessels would be more suitable than the 2,000t capacity vessel for a number of reasons, including shorter distances to market and the lower cost of smaller vessels.

Exhibit 1: GEV's offshore green hydrogen C-H2 Ship solution

Source: GEV

In essence, the offshore model is very similar to the onshore model. The principal difference is that the C-H2 vessel is loaded via a submerged turret loading (STL) system in mid ocean, similar to those used in offshore loading of high-pressure oil and gas applications, rather than piped directly from the production facility at a port. Once loaded, the vessel would sail to the unloading terminal in the same way as is anticipated in the onshore model. These production facilities are likely to be closer to the shore (customer) than in Asia-Pacific, so a smaller fleet is likely. In some situations, there may be competition from existing pipelines, which would need to be considered.

Current and long-term green H_2 price expectations

The key to success for GEV will ultimately be the difference between the purchase price of green hydrogen and the price that it can sell it at, minus shipping costs. The Hydrogen Council estimates that the current average global production cost of green hydrogen is c US$5.3/kg, and expects it to fall to US$2.3/kg by 2030.

Declining costs and prices are a double-edged sword. Falling production costs imply a greater market opportunity for green hydrogen in general, but, more significantly, the lower absolute spread between supply and demand prices will also have an impact. Based on the Hydrogen Council estimates, in 2030 the spread between Australian H_2 production and domestic Japanese production could be less than US$1/kg (the spread between the landed price and domestic cost of c $1.5/kg), potentially undermining GEV's business case. There could be mitigating measures introduced such as carbon tax subsidies that would have the effect of reducing the purchase price of hydrogen and widening the spread to an acceptable magnitude. That said, Japan has recognised that it will require imports of 3mt of green hydrogen by 2030 and 20mt by 2050 given they will not have the available resources for renewable hydrogen production at scale. This important issue is discussed in more detail in our report Finding the sea of green.

Currently, the green hydrogen market in South-East Asia is very opaque with few, if any, participants making prices privately, and none publicly. It is, in effect, a new market where participants are at the price discovery stage. It would appear that c US$9/kg is the current price in Japan based on pilot production facilities, but there are no publicly quoted figures. Given the current lack of visibility and the early stage of market development, in our deflationary valuation scenario (see page 13), we start at the US$9/kg pricing level and assume price erosion over the forecast period to c US$4/kg by 2050. This 3% pa deflation is also reflected in the purchase price. We note that this is a preliminary scenario, and the future pricing and supply/demand situation will significantly depend on the overall energy market development.

A novel compressed hydrogen solution

GEV believes that the future of clean, zero-emission energy production lies in 'green' hydrogen, and that the location of energy production (Australia) will not always be close to consumption (South-East Asia) due to net zero commitments, particularly in Japan and South Korea. It has addressed this technical issue with the development of a compressed hydrogen shipping solution (the C-H2 Ship), which it expects to build and commercialise over the next four to five years, using its patented C-H2 Ship design. The feasibility and economics of this model were recently confirmed in the findings of GEV's scoping study. We believe this method of hydrogen transportation is not only cost-effective versus selected alternative methods but has by far the lowest carbon footprint. Credibility for this project can be evidenced by the progress made by GEV in developing its CNG vessel.

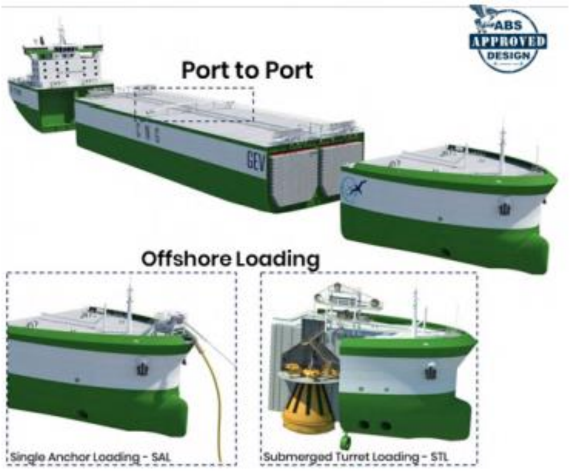
CNG programme offers credibility to the C-H2 project

GEV has a CNG vessel that has already been designed and approved for construction by the American Bureau of Shipping (ABS) and GEV has signed a letter of intent with shipyard CIMC Raffles for its construction. This previous process is clear evidence that GEV has the expertise and experience to bring the C-H2 project to fruition. However, it is unclear whether this project will ever be developed as GEV is likely to want to focus on the emission-free C-H2 vessel instead.

The CNG vessel, called CNG Optimum, is 190m long and has the capacity to carry 200mmscf at a pressure of 3,600psi, or 248 bar. The CNG Optimum has a patented, pressurised pipe storage system, and is capable of being loaded via a STL system implying it is suitable for offshore, as well as onshore, loading.

The vessel is designed to be powered by gas from the cargo as this is expected to be three to four times more efficient in terms of green house gas (GHG) emissions than for an LNG vessel because the liquefaction process, in particular, is so energy intensive.

Exhibit 2: CNG Optimum Ship



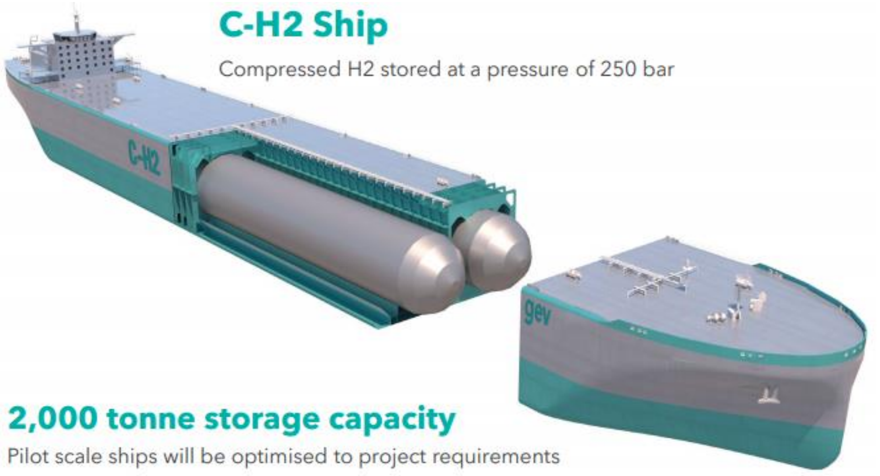
Source: GEV

Patented Compressed Hydrogen Ship (C-H2 Ship)

GEV's C-H2 Ship is designed to carry 2,000 tonnes of ambient temperature hydrogen in two large 20 metre diameter tanks at an operating pressure of 3,600 psi, or 250 bar (see Exhibit 3). The hold tanks will be fabricated in layers with an inner liner to prevent the tiny hydrogen molecules entering the steel and weakening it. This weakening process is called 'embrittlement'. The inner tank layer will be stainless steel, and the outer six layers of the tanks will be made of high-strength alloy steel to meet stress and fatigue requirements. The multi-layer design is a key safety feature as any crack that was to appear on the inner tank would not naturally proceed through the adjacent layer.

It is expected that the vessel will be powered by a Ballard fuel cell (described on page 10), which would run from hydrogen piped from the cargo hold. This implies a 'zero-carbon' shipping solution.

Exhibit 3: Illustration of C-H2 Ship design



Source: GEV

There have been several key milestones to date; in December 2020, GEV filed a US patent application for various parts of the design relating to the storage and transportation of hydrogen on the vessel. The inventor of the specialist design work is GEV Canada's Chief Technical Officer John Fitzpatrick. Detailed filing is likely within 12 months with a positive outcome expected, as GEV has already been granted two patents relating to its CNG Optimum vessel.

In January 2021 GEV signed a memorandum of understanding (MoU) with Ballard Power Systems to design and develop a hydrogen fuel cell to power the vessel using hydrogen from the cargo tanks, and in June it signed an MoU with Wärtsilä for its propulsion system.

The design and construction of the vessel is progressing, and certain approvals have already been achieved such as the AIP from the ABS received in March 2021. This approval confirms that there are no unresolvable or unmitigable risks that would prevent the successful development of the 2,000t C-H2 Ship.

Exhibit 4: Timeline of C-H2 Ship development

Source: GEV

The company is now in a position to commence discussions with suitable shipyards that should lead to external confirmation of the capital cost of the vessel and the schedule of construction. Ultimately, GEV is hoping to develop a five 2,000t vessel fleet, but will look to design a pilot vessel with 430 tonnes of capacity over the next 18 months. The pilot C-H2 ship should be operation around the end of 2025 or early 2026.

Partners: Ballard Power, Wärtsilä and CIMC Raffles

To initiate the project there are three key physical elements that need to be put in place: (1) an emission-free power system, (2) a C-H_2 propulsion system and (3) the C-H2 ship itself. GEV has already signed MOUs with Ballard Power Systems and Wärtsilä to develop a fuel cell solution for power and the propulsion systems respectively. Furthermore, it has signed a letter of intent with CIMC Raffles for the design, development and production of a CNG ship (CNG Optimum, discussed earlier). This establishes credibility for the construction on the C-H2 Ship.

GEV and Ballard signed MOU for a fuel cell system in February

GEV's ground-breaking C-H2 Ship is expected to be powered by a fuel cell system (FC System) designed by Ballard Power Systems after the two companies signed an MoU on 3 February to design and develop a hydrogen fuel cell system.

The FC System will be powered by compressed green hydrogen drawn directly from the storage/cargo tanks thus providing a truly zero-emission marine transport system. Ballard will design the FC System utilising its FC Wave Technology and will assist GEV with the integration of the FC System into the design of the C-H2 Ship.

It is expected that both companies will work to complete the design, and procure all necessary approvals and full costings over the next 12–18 months.

Exhibit 5: C-H2 Ship powered by hydrogen fuel cells

Source: GEV

Ballard's FCwave system is developing quickly

The C-H2 Ship with 2,000t capacity will require approximately 26MW of power. The smaller 430t pilot vessel will require c 10MW. Ballard's FCwave Marine Module technology is already proven in a number of applications, and there are now four train projects and five ships in development that will use the technology. Pressure for the shipping industry to migrate to zero-emission transport is growing and has been given a push, for example, by the Norwegian government's requirement that cruise ships and ferries operating in its heritage fjords need to be emission-free by 2026.

Ballard Power is working with a number of partners to develop these technologies. The partners include ABB (cruise ships), Kongsberg Maritime and CMAL (ferries), Norled and Westcon (ferries), ABB and LMG Marine (barge push boats), and BEHULA and TU Berlin (ELEKTRA push boats). Some of these projects are due to go into testing or operation as early as 2022.

The FCwave fuel cell module is tested and certified for marine environments. Each individual power unit generates 200kW, which can be 'banked' together to scale-up output to multiple megawatts to satisfy more power-hungry applications like coastal vessels and ferries. Ballard is developing the FCwave technology to produce a 1,000–1,500kW (1–1.5MW) module more suited to large applications like the C-H2 Ship.

GEV and Wärtsilä; MOU signed in June

The objectives of GEV's MoU with Wärtsilä are: (1) to review the various low emission propulsion solutions, including use of alternative fuels for the C-H2 vessel; (2) to advance GEV's AIP application with the ABS for the 430t C-H2 Ship; and (3) to demonstrate the availability and outlook for efficient, low-emission propulsion systems for the C-H2 Ships, including the integration of fuel cell applications to be provided by Ballard.

C-H_2 supply chain

GEV's green hydrogen production and supply chain is emission free and less complicated than the alternatives of using liquified hydrogen (LH_2) or ammonia. The renewable energy source and hydrogen production could be either onshore or offshore, making the supply chain model very flexible. The compression to 250 bars, and loading, is to be carried out simultaneously onto the C-H2 Ship, negating the need for expensive quayside storage. In the GEV model, there will always be a vessel moored on the quayside.

The hydrogen is stored on board in its gaseous form and transported at ambient temperature. The vessel is powered by electric drive engines and onboard fuels cells utilising hydrogen from the ship's own cargo. This is a closed system that does not result in any boil-off of cargo (in the case of LH_2), or emissions other than water vapour. 'Boil off' is where liquified gas warms up and evaporates.

Exhibit 6: C-H_2 production and supply chain developed by GEV

Source: GEV

When the vessel arrives at its destination, the C-H2 ship unloads pure gaseous hydrogen to a customer for fuel cell applications. The unload is unassisted due to the high pressure in the hold.

Cost efficiency of the various supply chains

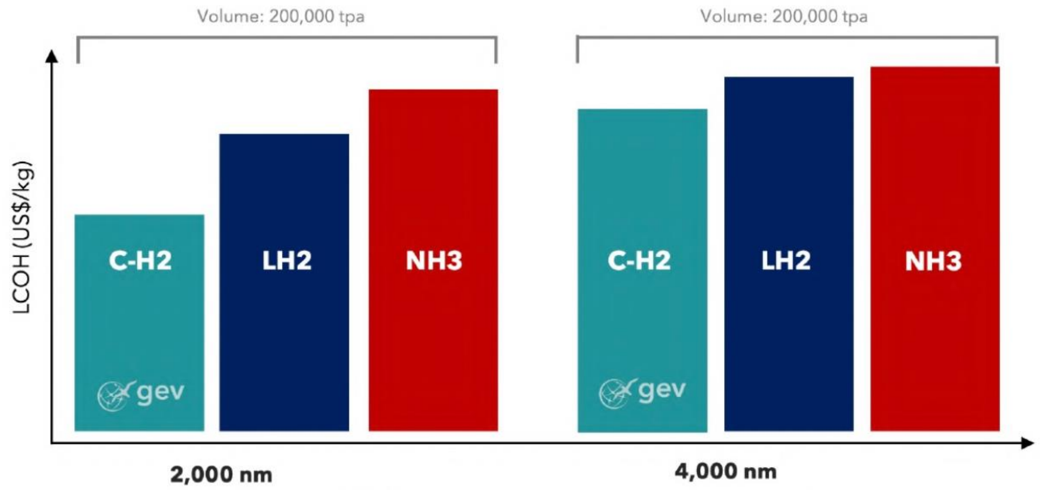
GEV believes a net-zero emission supply chain should be the 'holy grail' of its green hydrogen cargo, and zero-emission marine transportation. Therefore, GEV undertook a scoping study to assess the cost competitiveness and technical feasibility of its 2,000t C-H2 Ship using 100% green hydrogen. GEV's detailed scoping study looked closely at the cost efficiency of the three main supply chain alternatives: compressed hydrogen (C-H_2), LH_2 and ammonia (NH_3), comparing its 2,000t C-H2 Ship against other comparable vessels. The conclusion was that the C-H_2 supply chain was the most cost efficient for the transportation of 200,000tpa of hydrogen over distances of 2,000nm and 4,000nm.

The key assumptions in the study were:

1. A constant supply of green hydrogen was provided by a third party at a cost of US$2/kg and a pressure of 20bar (from the electrolyser). However, the cost of green hydrogen is expected to fall from c US$5/kg, to less than US$1.7/kg by 2030 thus further improving the attractiveness of a hydrogen powered solution (source: Hydrogen Council).
2. At the loading location, a green certified power grid was available at US$0.15/kWh, a significant premium to the local renewable energy price at the time of the scoping study due to the requirement for 100% reliable base load supply, essential for both LH_2 and NH_3 facilities.
3. Port facilities for all three supply chains were made available by third parties at zero cost.
4. On board power requirements were met via a fuel cell using the ship's cargo of hydrogen or ammonia. A 50% fuel cell efficiency higher heating value (HHV) was assumed at this scale. 50% HHV means for example that if 100kWh of energy is stored in the hydrogen, the fuel cell will be able to provide 50kWh of useful electricity to the customer.
5. At the unloading location, power for scavenging compression (C-H_2), regasification (LH_2) and cracking/purification (NH_3) was supplied via a fuel cell powered by the cargo.
6. The hydrogen delivered was at 70 bar and pure enough for fuel cell use.

The charts below describe the relative levelised cost of hydrogen (LCOH) of the three supply chains over 2,000nm and 4,000nm (Exhibit 7).

Exhibit 7: Levelised cost of hydrogen (LCOH)



Source: GEV

The key conclusions were:

1. For C-H_2, the LCOH was the most competitive marine transportation solution for green hydrogen of the three considered at a distance of 2,000nm, and remained cost effective up to c 4,500nm.
2. C-H_2 is viewed as the simplest and most energy efficient of the three supply chains (see discussion below).
3. C-H_2 has the least technical barriers to commercialisation over the next five years.
4. C-H_2 had the ability to 'load follow' green energy production, which can be a variable and volatile power source. LH_2 and NH_3 are not able to take advantage of this flexible, emission-free power supply because they both need a constant power source. This gives C-H_2 a significant advantage.

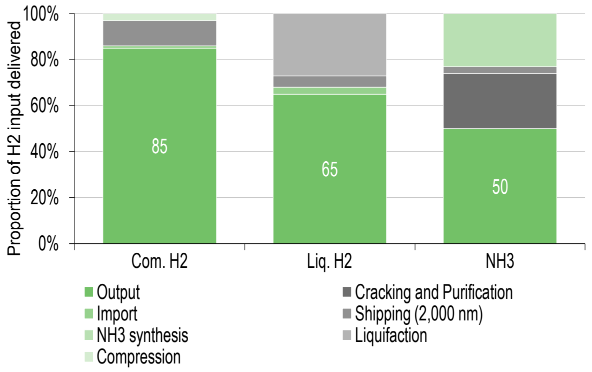
Energy efficiency of various supply chains

GEV's detailed scoping study also looked into the energy efficiency of the three main supply chains: C-H_2, LH_2 and NH_3. The conclusion was that the C-H2 ship supply chain was the most energy efficient principally because it involved fewer and far less complicated processes than either the LH_2 chain, or the NH_3 chain.

The study estimated that for a supply chain of between 2,000nm and 4,000nm, the C-H_2 chain delivered 75–85% of the initial energy, while LH_2 delivered 60–65% and NH_3 delivered less than half (47–50%).

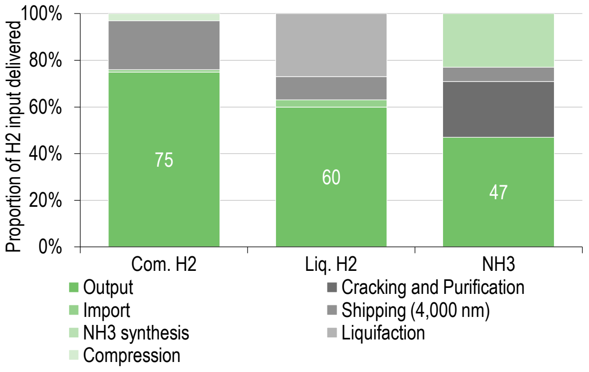
The principal energy loss for C-H_2 was in the shipping, so the longer the distance to the destination, the more of the hydrogen cargo was used; see Exhibits 8 and 9 below. Very little energy was expensed elsewhere in the whole energy production, transportation and usage process.

Exhibit 8: Breakdown of energy usage at 2,000nm



Source: GEV

Exhibit 9: Breakdown of energy usage at 4,000nm



Source: GEV

With LH_2, the main energy loss was the liquefaction process where the gas has to be chilled and kept below -253°C to avoid or minimise losses of 'boil-off'. Other problems also exist. The liquefaction process only exists in small-scale plants and therefore does not exist in suitable scale at any locations where it would be required physically. Furthermore, the shipping technology to transport high volumes of LH_2 is a new technology developed by NASA and, again, only exists in small scale.

The most readily available and well-understood supply chain is that of NH_3. However, this process has its own limitations. For example, the initial compression and synthesis process is highly energy consumptive, and the shipping and storage at -33°C also potentially requires energy and produces CO_2 emissions. Finally, if the hydrogen is to be used for fuel cell applications, the ammonia will need cracking and purifying, which is very energy intensive and currently only exists at micro-scale.

Exhibit 10: The advantages and disadvantages of different hydrogen transport options from Australia to Japan and South Korea

Method	Description	Advantages	Disadvantages	Status
Pipeline	Continuous volumes of hydrogen can be transported over short and medium distances using adapted existing gas pipelines or new pipelines	Capable of transporting high volumes cheaply over distances < 1,500km. Low operational costs	Existing gas infrastructure likely to require further investment to carry hydrogen. High capital costs of new pipeline particularly over long distances and undersea	Unsuitable given distance between Australia and South Korea and Japan
Shipping: ammonia	By combining hydrogen with nitrogen to create ammonia (NH_3) and then liquifying (-33°C) density can be significantly increased	High density means low cost to ship. If ammonia can be used directly, conversion losses are only 7–18%. Some transmission infrastructure is already established	Roundtrip conversion losses if a pure form of hydrogen is required (such as for fuel cell vehicles) are 14–36%. Toxic	Potentially suitable, particularly over longer distances and where re-conversion is not needed
Shipping: other LOHC (liquid organic hydrogen carrier)	Hydrogen density can be significantly increased by combining with a 'carrier' molecule such as toluene	Can be transported as liquids without any cooling and therefore very low shipping costs. Could use adapted existing oil tankers	High conversion losses currently (35–40%). Potentially toxic. Multiple solutions still being trialled	Potentially suitable but technology still in its early stages
Shipping: liquid hydrogen	Hydrogen liquifies at -253°C, increasing its density by 800 times	Liquefaction significantly reduces transport costs per unit. Could use a similar technology to existing LNG vessels. Delivers pure hydrogen	Liquefaction and maintaining a low temperature consume significant amounts of energy (25–35%) and a certain proportion is lost as boil-off	Potentially suitable but highly capital intensive. First LH ships expected in 2022
Shipping: compressed hydrogen	Compressing hydrogen to 250 bar significantly increases the volume of hydrogen that can be stored	No conversion losses and only modest technical challenges to store compressed hydrogen. Delivers pure hydrogen	Relatively high shipping costs per unit reduces cost efficiency with distance	Potentially suitable. Type approvals from the ABS expected in H1. Construction of pilot ship expected to begin shortly

Source: GEV, IEA and Hydrogen Insights Report, 2021 (Hydrogen Council and McKinsey)

Emission efficiency of the various supply chains

The C-H2 Ship solution is virtually emission free, whereas the other two transportation methods are far more energy hungry and could therefore produce far greater GHG emissions, especially where a certified green grid is not available for processes that require a base load power supply.

Management team has relevant experience

GEV's management team is crucial to the success of the company. We believe GEV has the required experience to make it a success. For example, the non-executive chairman, Maurice Brand, has been active at senior levels in international energy companies for over 30 years. Martin Carolan, the newly promoted CEO, has a financial market background that was preceded by roles at large corporates on behalf of international consultants.

In addition, Garry Triglavcanin, who is the chief development officer, has more than 25 years' experience of the commercial, technical and legal aspects of project developments and delivery in the international energy industry; and the chief technical officer is John Fitzpatrick, the inventor of the specialist design work for the C-H2 vessel.

They are supported by non-executive director Andrew Pickering, who has spent his entire career in shipping and logistics. Specifically, he was CEO of a company that developed a small-scale fleet of LNG vessels and an LNG terminal. His experience is extremely relevant to GEV.

Risks abound

We see a number of risks to the long-term success or failure of GEV, mainly because of the early stage of GEV's development, but also the embryonic stage of 'green' hydrogen production in Australia, and the potential demand for hydrogen in end-markets. Furthermore, the high level of upfront investment required is a further, and fundamental, risk. We see the principal risks as follows:

Development risks

- Although the design of the C-H2 vessel has AIP from the ABS, it has a novel design for the cargo hold. Hence there is an inherent risk for any shipyard working to an as yet untested design. This could lead to delays and potential cost overruns.
- Shipyard space may be unavailable, thus delaying construction.
- Steel prices may be volatile altering the cost of the vessels from current assumptions.

Market risks

- The green hydrogen that GEV intends to transport is not available yet as the projects to produce the gas are under development. It is possible, therefore, that the hydrogen that GEV wishes to transport may not be available in sufficient quantities to maximise the potential of the fleet and reduce available returns on the project. Currently, green hydrogen production volumes are expected to coincide with the 2026 timescale of the C-H2 Ship.
- The end-markets for green hydrogen in countries such as Japan and South Korea may not exist on the timescale assumed, despite net zero commitments.
- GEV may not be the only shipping company transporting hydrogen, which may affect hydrogen availability and/or prices. If this were the case, it may have an impact on available volumes and/or prices.

Financial risks

- GEV may not be able to secure funding for the vessels, thus delaying or curtailing the project. We estimate that GEV will need to secure funding of A$1,190m in order to go ahead with a 430t vessel fleet, which swamps its current market capitalisation.

- Finance costs/interest costs may be significantly different to either our assumptions or what might be available in the current markets.
- The cost of green hydrogen, and the anticipated selling price in 2026, may be very different to today's estimated prices. This point is most crucial as some of the current H_2 production cost forecasts do not fully support the business case (see our themes report Finding the sea of green).

Mitigating factors

Despite the long list of risks above, there are numerous mitigating issues to consider that would reduce the risk of failure.

For example, the C-H2 Ship is really a standard handy-max vessel. The two principal differences being the C-H2 hold tanks and the FC/propulsion system. Both of these can be tested on dry land and at an appropriate scale to improve design in the early stages and to minimise the risk of failure.

Hydrogen is rapidly becoming a key renewable energy in the fight for decarbonisation. Therefore, we believe hydrogen production, and demand, are likely to attract more, not less capital, accelerating the demand for product and its transportation.

The biggest risk we see for GEV is that of H_2 pricing. But here too we believe that GEV is likely to sign long-term purchase and supply contracts with common reference points/prices that would reduce its risks.

Financials and valuation

There are several key drivers that weigh very heavily on the financial viability of the project, including the size of vessel, distance to market and, most importantly, the cost and price of the hydrogen bought and sold. Our modelling concludes that a fleet of small (430t) vessels could generate an IRR of over 14% in a flat pricing scenario, falling to an acceptable c 10% in a deflationary H_2 price environment of 3% pa (see Exhibit 11). The economics improve dramatically with scale. Our 2,000t fleet model suggests IRRs move up to c 19% and c 14% in the flat pricing/deflationary scenarios, driving considerably higher profits from the enlarged capital base. In our valuation we modelled the smaller 430t vessels, in a deflationary environment.

Anecdotal evidence suggests green hydrogen can be purchased from producers for c US$3–4/kg and that the selling price is c US$9/kg currently as discussed earlier. We have adopted $4/kg and $9/kg as a starting point in our modelling, though pricing could prove to be more advantageous than these figures as the market matures and production prices in particular fall. Therefore, we have also modelled two scenarios for each fleet: one with flat pricing assumptions and a second scenario that assumes parallel price deflation of 3% pa on both the purchase and selling prices of hydrogen. This scenario implies that the purchase cost of hydrogen falls from $4/kg to $1.93/kg by 2050, and that the selling price falls from $9/kg to $4.33/kg at the same point in time, consistent with long-term market forecasts.

We believe that the six vessel, 430t fleet is therefore able to prove the concept of shipping compressed hydrogen and will be able to generate profits and positive cash flows even in a deflationary environment. However, given the demonstrably higher IRRs available on the larger-scale vessels, it is likely that GEV would want to leverage on this scale advantage sooner rather than later.

Exhibit 11: NPVs and IRRs of both fleets under flat, and deflationary scenarios

	430t fleet			2,000t fleet	
	NPV (US$m)	IRR (%)		NPV (US$m)	IRR (%)
Flat pricing	747.6	14.2%		2,892.2	18.7%
Deflationary (3% pa)	**199.6**	**9.7%**		**1275.9**	**13.8%**

Source: GEV and Edison Investment Research

Key assumptions

The cost and price assumptions for hydrogen are crucial to the economics of the models. As stated above, for each of the two fleets, we have modelled two scenarios: the first with flat pricing based on the hydrogen price assumptions above; and a second that assumes parallel price deflation of 3% pa over the life of the project. Many industry experts expect the cost and price of hydrogen to fall as production reaches scale, but there are also likely to be long-term supply contracts involved that would give investors in new hydrogen production plant the confidence to invest in the first place. These contracts could potentially hold purchase prices higher for longer and would potentially be matched by long-term selling price contracts that would protect GEV from unnecessary pricing risks.

Six-vessel, 430t fleet generates an IRR of c 10–14%

Our models for the 430t fleet involve shipping 50,000t of compressed hydrogen per annum. In this scenario we assume the full cost of initially running the vessel on marine fuel oil (MFO) rather than utilising the hydrogen cargo. There are two reasons for this. Firstly, GEV is keen to prove the concept of transporting compressed hydrogen with the vessel design, and secondly, by using MFO, it can deliver a higher volume of hydrogen per voyage as it will not have utilised part of the cargo to power the vessel. The 430t vessel will be designed such that the traditional engine can be replaced with a fuel cell at a later date.

Our 3% pa deflationary model gives revenue of US$450m and a profit of US$153.9m in year one, 2026. This implies a margin of 34.2% which declines c 100bp pa as we have assumed 3% cost inflation in operating expenditure and fuel. Based on our discussions with management, we have assumed the fleet of six vessels costs about $900m and are depreciated on a straight-line basis over 30 years. It produces an IRR of 9.7%.

Exhibit 12: 430t vessel fleet income statement – 3% deflationary scenario (US$m)

	2026e	2027e	2028e	2029e	2030e
Revenue	450.0	436.5	423.4	410.7	398.4
Implied wholesale price – Japan (US$/kg)	9.00	8.73	8.47	8.21	7.97
Costs					
H_2	(200.0)	(194.0)	(188.2)	(182.5)	(177.1)
Implied cost of H_2 (FAS) (US$/kg)	(4.00)	(3.88)	(3.76)	(3.65)	(3.54)
H_2 compression	(8.2)	(8.2)	(8.2)	(8.2)	(8.2)
Vessel - Opex (US$m. 3% pa inf)	(33.0)	(34.0)	(35.0)	(36.1)	(37.1)
MFO Fuel Cost (US$m. 3% pa inf)	(24.9)	(25.7)	(26.5)	(27.3)	(28.1)
Depreciation	(30.0)	(30.0)	(30.0)	(30.0)	(30.0)
Total costs	(296.1	(291.9)	(287.9)	(284.1)	(280.5)
Total cost of delivered H_2 (US$/kg)	(5.92)	(5.84)	(5.76)	(5.68)	(5.61)
Operating profit	**153.9**	**144.6**	**135.6**	**126.7**	**117.9**
Operating profit margin (%)	**34.2%**	**33.1%**	**32.0%**	**30.8%**	**29.6%**

Source: GEV and Edison Investment Research

There are clearly some potentially large sensitivities to these assumptions. In the table below, we have described the potential operating profit in 2026 given a range of hydrogen purchase and selling prices. It shows for example a profit of US$153.9m with a purchase cost of US$4/kg and selling price of US$9/kg. Profits would fall to US$103.9m if the purchase price fell to US$2/kg, and the selling price dropped to $6/kg.

Exhibit 13: Sensitivity of operating profit (US$m) to hydrogen purchase and selling prices in 2026e

		Selling price of delivered H_2 (US$/kg)						
		3	**4**	**5**	**6**	**7**	**8**	**9**
Purchase cost of H_2 (US$/kg)	**1**	3.9	53.9	103.9	153.9	203.9	253.9	303.9
	2	(46.1)	3.9	53.9	**103.9**	153.9	203.9	253.9
	3	(96.1)	(46.1)	3.9	53.9	103.9	153.9	203.9
	4	(146.1)	(96.1)	(46.1)	3.9	53.9	103.9	**153.9**

Source: Edison Investment Research

Our flat price scenario contains the same assumptions bar pricing. Profits decline more slowly because the selling price is much higher than the purchase price, and the IRR in this scenario rises materially from 9.7% to 14.2%, a level that is clearly more attractive, thus making the case for compressed hydrogen more compelling.

Five-vessel 2,000t fleet generates an IRR of c 14–19%

Our model for the 2,000t fleet involves shipping 200,000t of compressed hydrogen pa. In this scenario we assume the vessel is powered by a fuel cell that is fed from the hydrogen in the hold such that c 166,000t of the original 200,000t of hydrogen are delivered at the destination. We also assume the first voyage is four years after the first 430t vessel voyage, in 2030, by which time the concept should be proven, and many key lessons are likely to have been learned by GEV, and the shipyards building compressed hydrogen vessels in particular.

This 3% pa deflationary price model gives a revenue of US$1,325.9m and a profit of US$471.9m in year one. This implies a margin of 35.6% which declines slowly as we have assumed 3% pa cost inflation in operating expenditure only. Based on company guidance, we have assumed the fleet of five vessels costs US$2,400m and are depreciated on a straight-line basis over 30 years. It produces an IRR of 13.8%.

Exhibit 14: 2,000t vessel fleet income statement (US$m)

	2030e	2031e	2032e	2033e	2034e
Revenue	1,325.9	1,286.2	1,247.6	1,210.2	1,173.8
Implied whole price/Japan (US$/kg)	7.97	7.73	7.50	7.27	7.05
Costs					
H_2	(708.2)	(687.0)	(666.4)	(646.4)	(627.0)
Implied cost of H_2 (FAS) (US$/kg)	(3.54)	(3.43)	(3.33)	(3.23)	(3.13)
H_2 compression	(32.8)	(32.8)	(32.8)	(32.8)	(32.8)
Vessel - opex (US$ pa)	(33.0)	(34.0)	(35.0)	(36.1)	(37.1)
Depreciation	(80.0)	(80.0)	(80.0)	(80.0)	(80.0)
Total costs	(854.0)	(833.8)	(814.2)	(795.2)	(776.9)
Total cost of delivered H_2 (US$/kg)	(5.13)	(5.01)	(4.89)	(4.78)	(4.67)
Operating profit	**471.9**	**452.4**	**433.4**	**414.9**	**396.9**
Operating profit margin (%)	**35.6%**	**35.2%**	**34.7%**	**34.3%**	**33.8%**

Source: GEV and Edison Investment Research

There are clearly some potentially large sensitivities to these assumptions, similar to the smaller vessel fleet. In the table below we have described the potential operating profit in 2030 given a range of hydrogen purchase and selling prices. We forecast a profit of US$471.9m, with a purchase cost of $3.54/kg and selling price of $7.97/kg. Profits would fall to US$452.7m if the purchase price fell to $2/kg, and the selling price dropped to $6/kg.

Exhibit 15: Sensitivity of operating profit (US$m) to hydrogen purchase and selling prices

		Selling price of delivered H_2 (US$/kg)						
		3	4	5	6	7	8	9
Purchase cost of H_2 (US$/kg)	**1**	153.4	319.9	486.3	652.7	819.1	985.5	1151.9
	2	(46.6)	119.9	286.3	**452.7**	619.1	785.5	951.9
	3	(246.6)	(80.1)	86.3	252.7	419.1	**585.5**	751.9
	4	(446.6)	(280.1)	(113.7)	52.7	219.1	**385.5**	551.9

Source: GEV and Edison Investment Research

Our flat price scenario contains the same assumptions bar pricing. Profits decline slightly more slowly because the selling price is much higher than the purchase price, and the IRR in this scenario increases from 13.8% to 18.7%, a level somewhat more attractive than any of the other scenarios due to better pricing and the benefits of scale of the larger vessels.

NPV based valuation implies over 150% upside

As described above, we have modelled two scenarios for each of the 430t and 2,000t vessel fleets, one that assumes a deflationary pricing environment, and one that assumes flat pricing. Using the NPV of the smaller fleet in a deflationary environment and assuming some additional cash requirements to reach deployment, we value GEV at A$0.18/share, implying more than 150% upside. Our flat pricing model implies significantly greater upside. The 2,000t fleet model shows materially more uplift potential, highlighting the benefits of the larger-scale vessels.

Key assumptions

In arriving at a valuation for GEV, we started with the estimated net cash as at 30 June 2021 of A$6.5m and added A$119.0m, being an estimate of 10% of the total funding requirement, raised at the current share price, to take GEV to the point of beginning operations and to pay for the vessels. This gives a total cash value of A$125.5m. We then added the NPV of the 430t fleet (six vessels) of US$199.6m/A$259.5m, which gives a total value of A$385.0m. In our NPV model we used a weighted average cost of capital of 6%, which reflects a cost of debt of 4% and a cost of equity at 25%, 90%/10% weighted. A 4% cost of debt may seem low, but Australian government bonds currently yield c 2%, and we also think that ‘green’ finance initiatives may be happy to accept such a return. That said, the potential funding structure and the possible share of equity in the overall funding package remain to be seen.

In this scenario, we have assumed that 1.7bn new shares are issued, which dilutes the existing shareholders by a factor of nearly five. However, despite the dilution, we estimate that the shares would have a value of A$0.18, which implies 156% upside.

In a flat pricing scenario, the value rises considerably, to A$0.51/share, because both revenue and profits are higher. In reality, it could be possible that GEV may negotiate long-term contracts with hydrogen producers and customers that may in effect be a combination of the two scenarios modelled; that is, the first 10 years may be a flat pricing scenario, followed by some trajectory of price deflation/open market pricing for the last 20 years.

Exhibit 16: Summary valuation scenarios

Assumptions	
Price (Ac)	**7.0**
Current market cap (A$m)	31.5
Net cash at 30 June 2021e	6.5
A$/US$	*1.30*

Required capital and equity issuance	430t	2,000t
Capital required to fund fleet (US$m)	*900.0*	*2,400.0*
Capital required to fund fleet (A$m)	1,170.0	3,120.0
Capital required to reach 2026 (A$m)	20.0	40.0
Total capital required (A$m)	**1,190.0**	**3,160.0**
Assume 10% of total required capital equity funded, at current price (A$m)	119.0	316.0
Market cap post equity raise (A$m)	150.6	347.6
Post raise dilution (x)	4.8	11.0
NOSII - Today (m)	452.1	452.1
Shares issued to equity fund 10% (m)	1,700.0	4,514.3
Total shares in issue post equity fund raise (m)	**2,152.1**	**4,966.4**

Scenario	430t		2,000t	
	Deflationary	Flat price	Deflationary	Flat price
Net cash at 30 June 2021	6.5	6.5	6.5	6.5
Capital raised (A$m)	119.0	119.0	316.0	316.0
Implied net cash post raise (A$m)	125.5	125.5	322.5	322.5
NPV of fleet (US$m)	*199.6*	*747.6*	*1,275.9*	*2,892.2*
NPV of fleet (A$m)	259.5	971.9	1,658.7	3,759.9
Total value (A$m) (MC+NPV)	385.0	1,097.4	1,981.2	4,082.4
Total SII (m)	2,251.1	2,152.1	4,966.4	4,966.4
Value per share (Ac)	**0.18**	**0.51**	**0.40**	**0.82**
Uplift to shareholders	**156%**	**628%**	**470%**	**1,074%**

Source: GEV, Edison Investment Research

Of course, achieving any of this will require significant amounts of capital, which GEV does not have. In our deflationary scenario, we estimate GEV would need to raise A$1,190m, which would be 10% equity (A$119.0m), and the balance (A$1,071.0m) being debt. This is likely to be extremely challenging considering the current market capitalisation of GEV is only A$27m.

In reality, the funding model is likely to follow GEV's CNG funding structure. This is likely to involve placing the C-H2 project in an SPV, which in turn would raise both debt and equity. The pool of relevant capital could be deep given the interest in hydrogen from ESG investors and from infrastructure and pension funds. Government funding is also a potential source.

In our summary valuation scenario table above, we have assumed that GEV will require equity fund raises totalling c A$20m (ie A$5m pa) in order to fund the project through to 2026. We estimate that GEV ended the 2020/21 year to June with net cash of c A$6.5m following a A$6.3m equity raise in February.

Exhibit 17: Financial summary

A$m	2019	2020	2021e	2022e	2023e
Year end 30 June	**IFRS**	**IFRS**	**IFRS**	**IFRS**	**IFRS**
INCOME STATEMENT					
Revenue	1.1	1.5	0.1	0.0	0.0
Profit Before Tax (reported)	(8.9)	(2.9)	(4.1)	(6.4)	(7.4)
Reported tax	0.0	0.0	0.0	0.0	0.0
Profit After Tax (reported)	(8.9)	(2.9)	(4.1)	(6.4)	(7.4)
Net income (reported)	(8.9)	(2.9)	(4.1)	(6.4)	(7.4)
Basic average number of shares outstanding (m)	339	382	418	485	557
EPS – Reported (c)	(2.62)	(0.75)	(0.97)	(1.32)	(1.33)
BALANCE SHEET					
Fixed Assets	6.3	6.3	5.9	5.5	5.0
Intangible Assets	6.2	6.2	5.8	5.4	5.0
Tangible Assets	0.0	0.1	0.1	0.1	0.1
Investments & other	0.0	0.0	0.0	0.0	0.0
Current Assets	2.4	3.2	6.6	5.9	4.3
Stocks	0.0	0.0	0.0	0.0	0.0
Debtors	0.0	0.1	0.1	0.1	0.1
Cash & cash equivalents	2.4	3.1	6.5	5.9	4.2
Other	0.0	0.0	0.0	0.0	0.0
Current Liabilities	(0.1)	(0.3)	(0.3)	(0.3)	(0.3)
Creditors	(0.1)	(0.2)	(0.2)	(0.2)	(0.2)
Tax and social security	0.0	0.0	0.0	0.0	0.0
Short-term borrowings	0.0	0.0	0.0	0.0	0.0
Other	(0.0)	(0.1)	(0.1)	(0.1)	(0.1)
Long-term liabilities	0.0	0.0	0.0	0.0	0.0
Long-term borrowings	0.0	0.0	0.0	0.0	0.0
Other long-term liabilities	0.0	0.0	0.0	0.0	0.0
Net Assets	8.6	9.2	12.2	11.1	9.0
Minority interests	0.0	0.0	0.0	0.0	0.0
Shareholders' equity	8.6	9.2	12.2	11.1	9.0
CASH FLOW					
Op Cash Flow before WC and tax	0.0	0.0	0.0	0.0	0.0
Receipts from the ATO (Covid-19 cash boost)	-	0.1	0.1	0.0	0.0
Payments to suppliers and employees	(2.9)	(2.9)	(2.0)	(2.5)	(2.5)
Research and development	(3.2)	(0.1)	(0.1)	(2.0)	(3.0)
Project development	(2.3)	(1.0)	(1.0)	(1.0)	(1.0)
Interest received	0.0	0.0	0.0	0.0	0.0
Interest paid for lease liabilities	-	(0.0)	(0.0)	(0.0)	(0.0)
Research and development tax concession rebate	1.0	1.4	0.5	0.0	0.0
Working capital	0.0	0.0	0.0	0.0	0.0
Exceptional & other	0.0	0.0	0.0	0.0	0.0
Tax	0.0	0.0	0.0	0.0	0.0
Net operating cash flow	(7.4)	(2.5)	(2.6)	(5.5)	(6.5)
Capex	0.0	0.0	0.0	0.0	0.0
Acquisitions/disposals	0.0	0.0	0.0	0.0	0.0
Net interest	0.0	0.0	0.0	0.0	0.0
Equity financing	4.8	3.5	6.3	5.0	5.0
Dividends	0.0	0.0	0.0	0.0	0.0
Other	(0.4)	(0.3)	(0.4)	(0.2)	(0.2)
Net Cash Flow	(3.0)	0.7	2.9	(0.7)	(1.7)
Opening net debt/(cash)	(5.4)	(2.4)	(3.1)	(6.5)	(5.8)
FX	0.0	0.0	0.0	0.0	0.0
Other non-cash movements	0.0	0.0	0.0	0.0	0.0
Closing net debt/(cash)	(2.4)	(3.1)	(6.5)	(5.8)	(4.2)

Source: GEV accounts, Edison Investment Research

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Revenue by geography

N/A

Management team

Non-executive chairman: Maurice Brand

Maurice Brand is a fellow of the Australian Institute of Management and of the Australian Company Directors Association. He has over 30 years' experience in the international energy industry having founded ASX-listed Liquefied Natural Gas Limited in 2002 and Energy Equity Corporation in 1985 (now known as ASX-listed EWC). He was the driving force behind both companies as the MD and CEO, with LNG being admitted to the ASX 200 in September 2014 with a market cap of A$2.5bn.

Managing director and chief executive officer: Martin Carolan

Martin Carolan joined GEV after a 13-year career in the financial markets, with extensive experience in providing corporate advisory and capital raising services to a large number of small-cap ASX companies. He joined Foster Stockbroking in 2010, was made executive director and partner in 2014, and was primarily responsible for managing relationships with Foster's institutional and corporate clients. Mr Carolan's professional experience prior to his time in the financial markets also included management consulting roles to large corporates during his time with Accenture and Deloitte Consulting.

Executive director, chief development officer: Garry Triglavcanin

Garry Triglavcanin holds a bachelor of engineering (mechanical) and an MBA. He has over 25 years' experience in the international energy industry across commercial, technical and legal aspects of project development, negotiation and delivery. Garry spent the past 12 years with ASX-listed Liquefied Natural Gas as group commercial manager, developing a range of LNG projects. Garry joined Woodside Petroleum in 2001 as senior commercial advisor, working on a portfolio of renewable energy projects. As business development manager of Energy Equity Corporation from October 1992 to March 2001, Garry was responsible for the assessment and development of energy projects in Australia and Indonesia.

Non-executive director: Andrew Pickering

Andrew Pickering recently returned to Australia after retiring from a career of 40 years in shipping and logistics across the globe, which included responsibility for the largest global fleet of chemical tankers for Stolt-Nielsen. More recently, he led the development of an integrated global energy supply business as CEO of Avenir LNG located in London. Avenir LNG was established as a joint venture between Stolt-Nielsen, Golar LNG and Hoegh LNG, before becoming a publicly listed company on the OTC exchange in Norway. Avenir LNG provides LNG supply solutions for off-grid industry, power generation, marine bunkering and the transport industry, including the construction of six new small-scale LNG vessels and an LNG terminal.

Principal shareholders (as per 2020 report and accounts)	(%)
Sasigas Nominees Pty Limited (Fletcher M Brand Family A/C)	4.26
SPO Equities Pty Limited March Street Equity A/C	3.86
Prospect Custodian Limited	3.81
Merrill Lynch (Australia) Nominees Pty Limited	3.48
National Nominees Limited	3.00
Mr Robert Francis Davies + Mrs Yvonne Elizabeth Davies (he Davies, Minyama S/F A/C)	2.51
Marjack Holdings Pty Limited	2.32

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