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TASMANIA'S RENEWABLE ENERGY FUTURE

Submission to the Draft Tasmanian Renewable Energy Action Plan

Prepared by the Tasmanian Policy Exchange

September 2020

Acknowledgements

This submission has been prepared by the Tasmanian Policy Exchange (TPE) at the University of Tasmania.

The TPE has been established to enable the University of Tasmania to make timely and informed contributions to key policy debates occurring in Tasmania thus making a positive contribution to the future of our state and its people. This submission provides an assessment of Tasmania's renewable energy future and the policies and strategies which should be considered in order to maximise the long-term benefits for the Tasmanian community.

The TPE is grateful to the many researchers and staff across the University who contributed their time and expertise to the preparation of this submission.

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Executive Summary

This submission has been prepared as a contribution to the development of the *Draft Tasmanian Renewable Energy Action Plan 2020* (*TREAP*). The analysis responds to the specific questions posed in the *TREAP* while also outlining a wider range of options which could be considered as part of a broader energy and emissions strategy. The overall aim of the *Action Plan* should be to develop an advanced and sustainable energy system which delivers long-term economic, social and environmental benefits to the Tasmanian community while making a significant contribution to reducing greenhouse gas emissions nationally. It is an opportunity for Tasmania to provide leadership in relation to one of the most significant global challenges of our age.

Given the need to decarbonise electricity generation and energy systems more broadly this submission supports the *TREAP* target of doubling renewable energy generation in Tasmania by 2040. Doubling Tasmania's renewable energy generation over the next 20 years is an important goal but more can be done to manage risks associated with the *TREAP* and maximise the long-term benefits for the Tasmanian community. Specifically, this submission identifies four key issues which require further consideration during the development of the *Action Plan*:

1. Identify and address the potential risks associated with the *TREAP*

Initiatives within the *TREAP* have the potential to unlock over $7 billion in investment and create up to 4,000 direct jobs at the peak of the construction phase. This represents a significant opportunity for Tasmania, but we must continue to analyse, acknowledge and address the financial, social and environmental risks associated with significantly increasing renewable electricity generation and interconnection with the National Energy Market (NEM).

2. Maximise and promote the long-term benefits of the *TREAP* for Tasmania

We must ensure that communities, both those directly involved in renewable energy projects and Tasmania as a whole, enjoy long-term benefits from increased investment in renewable energy projects. Providing training to maximise local employment in the industry will enable communities to work in and benefit from the expansion of the energy sector. Engaging with communities and responding to their needs and concerns in a consistent and coordinated manner will also be critically important for securing community support.

3. Use increased renewable energy generation to develop new low-carbon industries

The *TREAP* and the further development of Tasmania's renewable energy assets should be regarded as a foundation for Tasmania's transition to a sustainable low-carbon economy or 'climate positive' economy. Tasmania is already on the cusp of meeting its on-island needs from renewable sources and now should use this resource to phase out fossil fuel use in transport, heating and industrial applications. The *Action Plan* should be complemented by a comprehensive strategy to promote Tasmania's world leading emissions profile and increase investment and innovation in emerging low carbon industries to deliver long-term, state-wide benefits.

4. Develop Tasmania's 'brand' as a sustainable, innovative, low-carbon economy

Pursuing a world-leading target for renewable energy production and establishing an innovative and prosperous low-carbon economy will also deliver benefits beyond energy intensive industries. If we can build and promote a renewable energy and low carbon 'brand' it will benefit exporters and help attract visitors whether they be tourists, students or migrants wanting to make Tasmania their new home. Above all, a widely shared vision which delivers both environmental dividends and sustainable employment and economic growth will deliver long-term benefits to the Tasmanian community.

In addition to the four key issues outlined above, this submission makes 28 specific recommendations in response to discussion questions raised in the *TREAP*. These recommendations are provided in the relevant section of the submission and presented as a consolidated list at the end of the full submission.

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List of Acronyms

AEMO – Australian Energy Market Operator
BEV – Battery Electric Vehicle
BoN – Battery of the Nation
CER – Clean Energy Regulator
CEFC – Clean Energy Finance Corporation
CCS – Carbon Capture and Storage
DECC – Dept of Energy and Climate Change (UK)
DPIPWE – Dept of Primary Industries, Parks, Water and Environment
ESB – Energy Security Board
EV – Electric Vehicle
GHG – Greenhouse Gases*
GSP – Gross State Product
HVDC – High Voltage Direct Current
ISP – Integrated Systems Plan
LCoE – Levelized Cost of Energy
NEM – National Energy Market
OEM – Original Equipment Manufacturer
PEV – Personal Electric Vehicle
PV – Photovoltaics
REC – Renewable Energy Certificate
RET – Renewable Energy Target
REZ – Renewable Energy Zone
RIT-T – Regulated Investment Test for Transmission
TIA – Tasmanian Institute of Agriculture
TREAP – Tasmanian Renewable Energy Action Plan
TREC – Tasmanian Renewable Energy Certificates
TRET – Tasmanian Renewable Energy Target
UTAS – University of Tasmania
VRE – Variable Renewable Energy
VRET – Victorian Renewable Energy Target
ZEV – Zero Emission Vehicle

*The United Nations Framework Convention on Climate Change (UNFCCC) recognises seven greenhouse gases: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3).

Introduction: Issues and opportunities for Tasmania's renewable energy future

Tasmania is a pioneer in renewable energy generation with extensive clean energy expertise and assets. If developed strategically, Tasmania can establish a reputation as a global leader in flexible, storage-backed renewable energy systems capable of delivering reliable, cost-effective renewable electricity. More significantly, our clean energy resources can be used to establish Tasmania at the forefront of the broader transition to a sustainable low-carbon economy, perhaps the most significant transformation which will occur in the global economy in the coming decades.[1] If Tasmania can grasp this opportunity and provide an example to the world, it will not only contribute to the State's medium-term COVID-19 recovery but will underpin our future prosperity.

This submission endorses the central aims of the *TREAP* and acknowledges the importance of the proposed Marinus Link as a means of ensuring that electricity from new renewable projects can be exported making a significant contribution to national emissions reduction efforts. We also note that energy policy, markets and systems are changing rapidly creating the possibility of alternative or hybridised energy futures in which small-scale, decentralised generation and storage become more prominent. Tasmania should, therefore, also pursue these alternative technologies and approaches to both complement established, large-scale grid-based energy systems and in preparation for a future where more energy is generated, stored and consumed in localised micro-grids. What is clear is that our significant renewable energy resources are a valuable asset which provides a foundation for the broader transition to a sustainable low-carbon economy.

The *TREAP* outlines the key elements of an ambitious agenda which has the potential to shape Tasmania's future for the better. But as with all ambitious, future-shaping programs there are risks, uncertainty and a wide range of views about how the significant benefits and potential costs of the *TREAP* should be managed. This submission draws on the expertise of staff across the University of Tasmania (UTAS) and assesses the key actions outlined in the *TREAP* while also posing key questions and considering a range of policy options. Our aim is to make a constructive, evidence-based contribution to both the development of the *TREAP* and the wider debate about how best to ensure Tasmania develops an advanced and sustainable energy system to promote the broader transition to an innovative and prosperous low-carbon economy.

Structure of the submission

This submission follows the structure of the *TREAP* beginning with an analysis of Priority 1: 'Transforming Tasmania into a global renewable energy powerhouse'.

Section 1 considers the key issues arising from the doubling of the Tasmanian renewable energy target including the benefits and risks, ways in which to encourage and attain the target, likely future energy demand and alternative Tasmanian energy futures (sub-section 1.1). We then look in detail at specific elements of the *Action Plan* including:

- Marinus Link and Battery of the Nation, and the benefits and risks associated with these projects (sub-section 1.2)
- The development of a renewable hydrogen industry (sub-section 1.3) in Tasmania, including the need for a strong renewable hydrogen certification scheme
- The potential use of bioenergy in Tasmania (sub-section 1.4)
- The clean transport opportunity available to Tasmania, which would work to cut the State's emissions as well as providing other co-benefits (sub-section 1.5)
- The potential role of Renewables Tasmania to coordinate the implementation of the *TREAP* and the broader transition to a low-carbon economy is outlined in 1.6.
- Finally, in sub-section 1.7 we assess the case for a Renewable Energy Centre of Excellence and possible models for such a centre

Section 2 focuses on Priority 2: Making energy work for the Tasmanian economy. Specific elements include:

- Analysis of the implications of the *TREAP* for energy prices and security (sub-section 2.1)
- The benefits of the increasing role of digitalisation, smart-meters and micro-grids in Tasmania's future energy system (sub-section 2.2)
- The issues associated with the expansion of on-farm electricity generation and storage and the broader issue of agricultural emissions (sub-section 2.3)
- The section concludes with a discussion of the benefits of promoting energy efficiency measures in sub-section 2.4

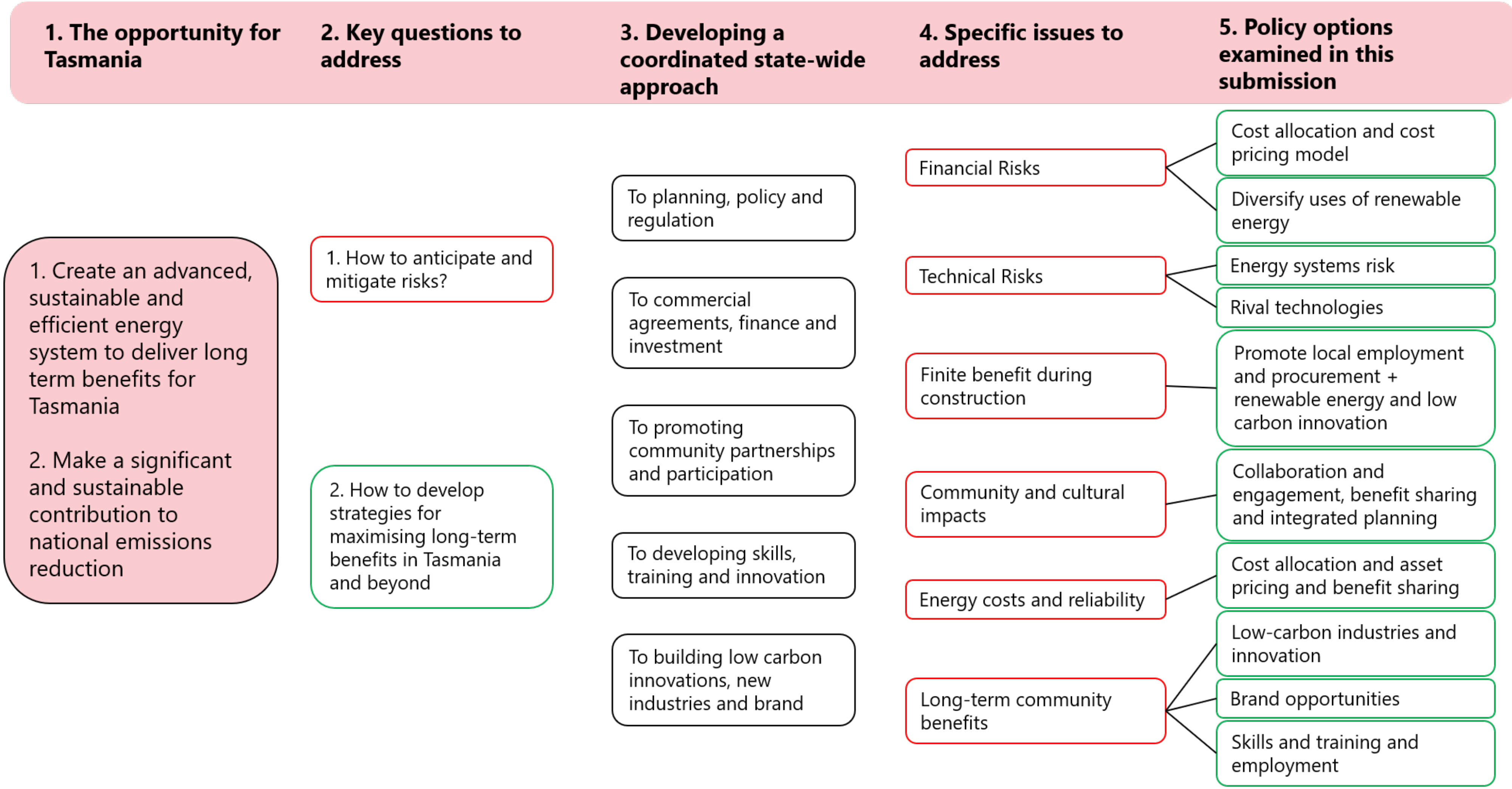
Section 3 focuses on Priority 3: Growing the economy, providing regional jobs and delivering long-term community benefits. Specific elements include:

- Models of community engagement and benefit-sharing necessary to achieve the *TREAP*'s vision (sub-section 3.1)
- Options for improving renewable infrastructure planning and coordination (sub-section 3.2)
- Strategies for maximising local employment from both the construction and operation of renewable energy projects and associated indirect employment in regional communities. A key element here is the identification of future workforce needs and continuing to develop appropriate training opportunities (sub-section 3.3)
- Sub-section 3.4 outlines the potential social and economic benefits to Tasmania

of developing and promoting our renewable, low-carbon brand

- This section concludes by considering how our clean energy resources can be used on-island to drive low-carbon innovation and investment. There are a wide range of applications including the production green ammonia and fertiliser in agriculture, establishing zero emissions data centres, developing low emission marine technologies as well as a role for Tasmania in undertaking internationally significant research and providing advisory services and expertise to the world.

The Tasmanian Renewable Energy Action Plan: A strategy for Tasmania's low carbon future



Priority 1: Transforming Tasmania into a global renewable energy powerhouse

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Priority 1 considers a range of specific issues associated with the *TREAP*'s ambitious 200% renewable energy target, its implications for Tasmania and the associated benefits and risks. We then examine the two key renewable energy projects on which the 200% target depends, Marinus Link and Battery of the Nation before assessing a wider range of complementary initiatives identified in the *TREAP* with a view to capitalising on Tasmania's clean energy assets.

1.1 Doubling renewable energy generation by 2040 - key issues

The *TREAP*'s commitment to double renewable energy generation by 2040 has the potential to establish Tasmania as a leader in clean energy systems while making a significant contribution to reducing carbon emissions both on-island and beyond our shores. Before assessing the wider implications of the Tasmanian Renewable Energy Target (TRET), it is important to clearly define the target, its implications and assess the best strategies for achieving this goal.

Defining the Tasmanian Renewable Energy Target

The *TREAP* establishes an ambitious TRET of generating an additional 10,500 GWh of renewable energy annually by 2040. The definition of 'new renewable generation' for the purposes of the TRET should incorporate the following elements:

1. Create a 2020 baseline, of total energy and power capacities of existing generators in the Tasmanian system with only energy produced from new renewable generators (or energy generation capacity expansions) counted as contributions to the TRET target. This baseline could provide a

Text box 1: Tasmania's target in a global context

The 200% renewable energy target proposed in the *TREAP* is ambitious and will enhance Tasmania's reputation as a leader in renewable energy and the broader transition to a low-carbon economy. What is distinctive about the *TREAP* is that it will result in a significant surplus of renewable energy which will have to be exported and/or used to replace fossil fuels or support new low-carbon industries in Tasmania.

Notable jurisdictions with energy-related targets include:

British Columbia – Legislation requires that 93% of all electricity comes from clean or renewable sources while B.C.'s GHG emissions must be reduced by at least 80 per cent by 2050 with intermediate targets of 40% by 2030 and 60% by 2040. All new cars and trucks must be zero-emission by 2050, with an interim target of 30% by 2030. Targets have also been set around emissions from buildings and public sector transportation fleets. BC established the first carbon tax in North America in 2008.

Iceland – Iceland has achieved 99% renewable electricity generation based on its geothermal assets. It is now turning its attention to becoming carbon neutral by 2040. The plan has two main planks: the phasing out of fossil fuels in transport and the increase of carbon sequestration in land use. Further, a general carbon tax, already in place, will be increased.

Denmark – Denmark has committed to 100% renewable power and heat by 2035, with 100% renewable energy in all sectors and becoming a 'climate-neutral society' by 2050. By 2020 half of the country's electricity consumption is to be covered by wind power, with coal to be phased out by 2030. From 2030 there will be a ban on sales of new petrol and diesel cars and increasing support for electric vehicles is in place.

foundation for a certification scheme for new renewable capacity.

2. Output from new energy sources should be based on sent-out energy, metered under National Energy Market (NEM) rules for large generators, over a 12 month period. Final energy output should be adjusted to net out any increase or decrease in the total stored energy over the period. Final energy output could also be adjusted to account for variations from the Typical Meteorological Year (TMY) for that period.

3. Small-scale, behind-the-meter renewable generation should be included in the TRET provided it is eligible for certification under the Clean Energy Regulator (CER) rules. If independent metering is not installed a fixed annual generation calculation should be applied, based on system size, location and orientation, similar to procedures used by the CER.[2]

Recommendation

1. 'New renewable energy generation' should be defined for the purposes of the Tasmanian Renewable Energy Target and include specific provisions relating to 'new' renewable generation, the methodology for measuring output and include behind-the-meter generation.

What type of generation? Promoting flexibility and diversity of supply

The diversity of supply (geographical and technological diversity) and dispatchability and flexibility of generation are critical in ensuring power system reliability and security given the variability of renewable generation. Diversity and flexibility are needed to mitigate the natural renewable resource variations (rainfall, wind, sun), which occur on multiple timescales. A TRET should not only target a quantity of energy (the 10,500 GWh new energy per annum) but should also support new generators capable of, either in their own right or in combination with others, providing a degree of flexibility so as to produce energy at times when it is needed most. Ideally a TRET should encourage diversity in new generation capacity: wind farms in a wide range of locations rather than concentrated in one; a portfolio of wind, solar, new hydro energy capacity and other cost-competitive technologies. A TRET should also ideally support generation which incorporates a degree of control and dispatchability: a solar farm operated in co-ordination with new storage capacity; a wind farm operating in curtailed mode and thus more readily able to respond to changing conditions; new generation technologies (tidal, for example) offering more predictable generation profiles.

Recommendation

2. The Tasmanian Renewable Energy Target should encourage diversity of supply, and support new energy generation capacity that can provide a degree of flexibility and dispatchability of energy produced.

Strategies for achieving the Tasmanian Renewable Energy Target

Legislating the 2040 TRET signals a clear intention to significantly expand renewable energy generation in Tasmania over the coming decades. The experience in other Australian jurisdictions demonstrates how developing appropriate instruments and strategies can help achieve desired outcomes.[2] Interim targets, periodic reviews and appropriate policy instruments to encourage investment in new renewable energy projects all need to be considered as part of developing the TRET.

Interim targets and periodic reviews

Developing renewable energy infrastructure and projects takes time and a 20 year *Action Plan* and associated targets is an appropriate time horizon. However, in order to enhance accountability and the credibility of the TRET it will be important to legislate an interim renewable energy target and to conduct a parliamentary or independent review every five years to assess progress against the TRET in the light of changing technology and market conditions.

Recommendation

3. Based on the proposed development of the first phase of the Marinus interconnector an interim Tasmanian Renewable Energy Target of 4850 GWh (46% of the 2040 target) of additional renewable energy generation by 2030 should be legislated. The *Tasmanian Renewable Energy Action Plan* should also be subject to an independent review every five years.

What is the appropriate generation target for Tasmania's electricity system?

The *TREAP* establishes a supply-side approach to renewable energy development in Tasmania. Prior to providing a more detailed assessment of the TRET it is first necessary to consider the implications of the target for the Tasmanian energy system and how the target aligns with future demand for renewable energy under different scenarios.

Key questions to consider are:

1. What is the capacity of the Tasmanian energy system and proposed interconnection infrastructure to host additional renewable generation on-island?

2. What are Tasmania's possible future energy demand scenarios and their implications for generation required on island?

Electricity system capacity to host additional renewable generation

We have prepared preliminary estimates of the levels of new renewable generation that the Tasmanian electricity system would likely support for different interconnection and storage scenarios (Table 1). These estimates consider both energy and power capacity constraints and typical generation and load conditions in the Tasmanian system; they are not based on detailed time-series modelling.

The assumptions are:

- New renewable generation is a mix of approximately 90% wind (could include offshore wind) and 10% solar (solar farms + roof-top)
- No change in Tasmanian demand profiles (alternative demand scenarios are presented below)
- An increased use of hydro generating units as flexible generators
- Interconnection is available for export at all times when required

Table 1: Assessment of Tasmania's energy system capacity

Scenario	Interconnection/storage capacity	Feasible additional generation (% renewables)
1. Basslink only	Basslink (480 MW)	~ 3600 GWh (~135% renewables)
2. Basslink + Marinus stage 1	Basslink + 750 MW	. ~ 6100 GWh (~165% renewables)
3. Basslink + Marinus stage 2	Basslink + 1500 MW	~ 8700 GWh (190% renewables)
4. Basslink + Marinus stage 2 + 500 MW of storage	Basslink + 1500 MW + 500MW of storage	~10500 GWh (200% renewables)
5. Marinus stage 2 (without Basslink)	1500 MW	~7400 GWh (170% renewables)
6. Marinus stage 2 (without Basslink) + 1000 MW of storage	1500 MW + 1000 MW of storage	~10500 GWh (200% renewables)

- A minimum synchronous generation requirement consistent with current operations; generator inter-trip protection (or similarly adequate scheme) in place while Marinus exporting
- A level of acceptable wind curtailment during periods of low demand and peak wind and solar generation (up to about 10% of installed capacity wind 'spill' at peak generation)
- Storage, if included, is reversible, flexible and has round-trip efficiency consistent with pumped hydro or Lithium-ion battery systems

These estimates suggest that, while the raw energy transfer capacity of Marinus Link alone is well above that required to export an additional 10,500 GWh per annum (the TRET target), there will be many occasions where it is power capacity constrained, thus limiting generation output at those times. Naturally a 200% target could still be achieved, either with new generators needing to frequently curtail output and operate at diminished capacity factor (which in turn reduces the investment attractiveness), or with the addition of significant amounts of energy

Table 2: Tasmania's current and future energy demand scenarios (sources: AEMO, Tas Economic Regulator, TPE)

Energy use (GWh)	2020 Actual demand scenario	2040 Low demand scenario	2040 Medium demand scenario	2040 High demand scenario
Other underlying total demand and losses	3800	3700	3800	3850
Industrial load	6640	3300	6610	6620
Hydrogen production	0	500	1000	2000
Electric transport	<1	90	200	410
New uses	0	0	500	1000
Approx. total annual on-island	10,440	7,580	12,110	13,880
'Surplus' renewable supply for export	-	12,420	7,890	6,120

storage or suitably flexible on-island demand.

This preliminary analysis suggests the TRET is viable if approximately 2000 MW of interconnection and 500 MW of storage is established by 2040 (Basslink + Marinus Link) or, if Basslink is retired (which is quite likely), through Marinus Link alone supplemented by 1000 MW of storage. Two conclusions can be drawn from this:

1. To maximise additional renewable generation in the Tasmanian energy system, new large-scale generation projects should be incentivised to operate with a degree of dispatchability, or be complemented by new storage capacity or flexible demand. For example, it could be a requirement that every 100 MW of new generation capacity proposed also supports (directly or indirectly) 15 MW of storage capacity.
2. If the TRET target is to be achieved it will be desirable, and perhaps necessary, to grow on-island demand for renewable energy through new industries and applications (sub-sections 1.3, 1.5 and 3.5).

Our analysis also provides guidance in terms of setting an interim target, or indeed multiple interim targets if desired. For a single interim target, the mid-point year of 2030 seems logical. At present, the most likely timeline for Marinus stage 1, identified in the AEMO 2020 ISP report, is for commissioning to occur in 2028. This would allow 12 months or longer for new renewable generation capacity to come online prior to a 2030 interim accounting period. Our estimates suggest that pre-Marinus stage 1 a target of 3600 GWh would be possible, and it seems feasible for projects amounting to at least half of the additional generation unlocked by Marinus stage 1 to be advanced enough to ensure connection during 2029. We thus recommend a target of 4850 MWh, utilising all of Basslink's capacity plus half of Marinus stage 1 (see Recommendation 3).

Future electricity demand scenarios for Tasmania

The analysis presented above suggests that between 1500 and 2000MW of interconnection supported by efficient storage will be required to support the TRET generation target of an additional 10,500 GWh of new renewable energy generation by 2040. The proposed Marinus Link and Battery of the Nation (BoN) projects would provide this interconnection and storage capacity highlighting that, from a system capacity perspective, the feasibly of the TRET depends on the Marinus Link proceeding. These estimates were based on no changes to Tasmania's energy demand in the period to 2040.

We now consider the demand for energy in Tasmania for three 2040 demand scenarios based on AEMO estimates (see Table 2 and Figure 2).[3] Key assumptions informing these scenarios are:

- Domestic, industrial and transport-based electricity demand estimates are based on AEMO estimates
- Electricity demand estimates for hydrogen production are based on the goals of *Tasmanian Renewable Hydrogen Action Plan*

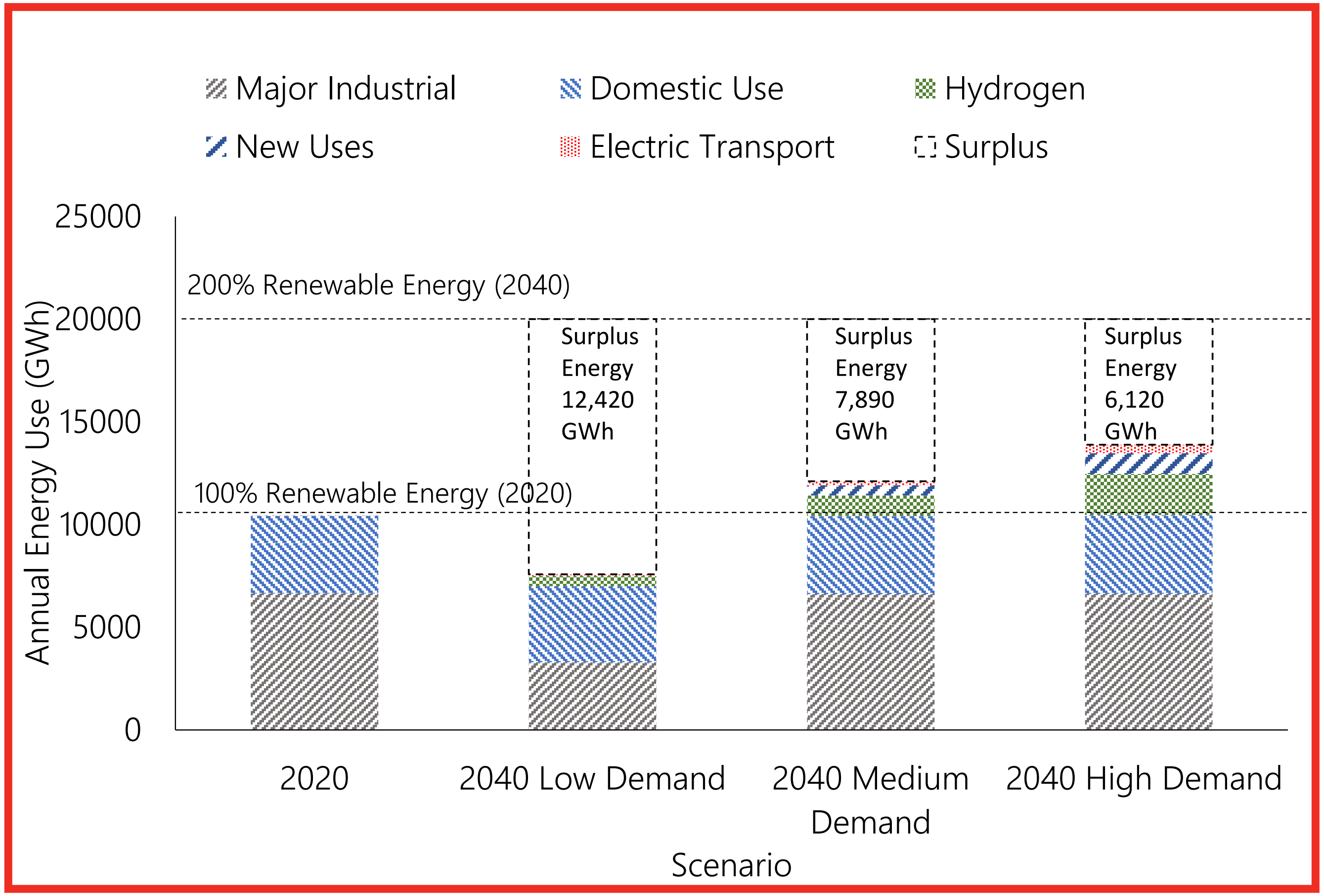


Figure 2: Future energy demand scenarios
(sources: AEMO, Tas Economic Regulator, TPE)

- All scenarios assume underlying demand remains relatively unchanged over the period 2020 to 2040, in line with AEMO's Central Forecast in their 2019 Statement of Opportunities, at approximately 10,000 GWh in 2040.
- The medium and high demand scenarios assume additional demand is created from by new industries attracted to Tasmania's low-emissions basis of energy supply (sub-sections 1.5 and 3.5).
- The low demand scenario assumes major industrial consumption will decline by 50%, due to industries down-sizing or leaving Tasmania, and new industries are not developed.

Medium Demand Scenario

Under the Medium Demand Scenario, the system contains some additional on-island demand (hydrogen and electric vehicles) which if sufficiently flexible, will not only use additional on-island generation, but also can facilitate increased utilisation of the export capacity. We estimate that under the expected demand scenario, close to 200% renewables could be achieved (with Basslink + Marinus) without storage, or that reduced storage (an estimated 250 MW storage capacity) would be needed to meet the target.

High Demand Scenario

We estimate that the increased load and flexibility afforded by our High Demand Scenario would allow the 200% target to be reached comfortably without the need for any on-island storage. The downside of such a scenario is that the export capacity of Marinus and Basslink, from an energy transfer capacity point of view, becomes somewhat under utilised. Under such a scenario, there could be a strong argument for increased renewable generation beyond 200%.

Low Demand Scenario

Under this challenging scenario on-island demand for electricity in 2040 is only 35% of the TRET. This is likely not a viable outcome from a financial or an energy system perspective, requiring significant additional investment in energy storage to facilitate export of the additional surplus generation. This scenario demonstrates that the viability of the TRET depends on establishing Marinus Link and a diverse range of new, on-island renewable energy industries and applications. If Marinus Link were not to proceed then Tasmania would have to contemplate an alternative energy future characterised by less integration with the NEM and a shift to smaller scale generation and storage projects (see Text box 3).

Instruments for promoting additional generation

Credible emissions reductions and renewable generation targets can be supported by various market and policy instruments and incentives to provide certainty and encourage investment in new generation projects. However, in many ways Tasmania's context and market structure is unique in that the TRET is designed to promote surplus renewable generation, rather than promoting the transition from carbon-based to renewable energy sources. Moreover, establishing the Marinus Link combined with a 'fair' pricing model may be sufficient to 'unlock' significant new renewable generation to achieve the TRET without the need for additional policy measures. The most common policy instruments to promote additional renewable generation capacity are described below.

1. *Reverse Auctions*

Reverse auctions are used to set the long-term purchase price for renewable energy and are designed to support (and subsidise/de-risk) investment in renewable energy generation and the achievement of renewable energy targets at the lowest marginal cost. They are the 'reverse' of a conventional auction in that generators bid the lowest price they are willing to sell energy into the market with the lowest bidder winning a supply agreement. Several Australian states and territories have conducted reverse auctions. The Victorian Government's Reverse Auction of 2017 was a competitive tender process which delivered 928 MW of new renewable energy generation capacity through 15-year Supply Agreements.[4] In September 2020 the Victorian Government announced a second

Text box 2: Victoria's renewable energy targets and reverse auction

Victoria's approach to renewable energy targets involves legislated interim targets and reverse auctions to achieve the targets. Victoria has legislated renewable energy targets of 25% by 2020 and 40% by 2025. In October 2019, the Victorians legislated a renewable energy target of 50% by 2030. The justification for legislating the target is worth consideration:

"Legislating the VRET 2030 target provides a clear signal to industry and the whole sector that Victoria is serious about its renewable energy transition....Meeting the VRET targets will bring forward significant investment in new renewable energy projects in Victoria, supporting the reliability of Victoria's electricity supply. This will generate billions of dollars of additional economic activity in Victoria, create thousands of jobs, put downward pressure on electricity prices and reduce emissions from electricity generation, contributing to Victoria's long-term target of net zero emissions by 2050....The Victorian Government established the Victorian Renewable Energy Auction Scheme to support the achievement of the Victorian Renewable Energy Targets (VRET)." [5]

auction. The Australian Capital Territory's (ACT) ambitious 100% renewable energy by 2020 target has been achieved largely due to reverse auctions which secures 40 megawatts of solar capacity and 600 megawatts of wind capacity whilst paying record low prices.[6]

As mentioned, the Tasmanian context is unusual, in that achieving a target of 200% renewable generation requires new supply to be sourced for energy consumers not covered directly by Tasmanian legislation or regulations. However, a reverse auction could still potentially be used to provide certainty (and potentially subsidies) for investors in new renewable generation. A reverse auction process should be configured to guarantee a long-term $/MWh price for a new generation project, but still require normal energy market exposure and interaction. This can be done by contracting to pay the difference between a contract price, as determined by the reverse auction, and the market wholesale price.
A competitive reverse auction would likely yield a contract price at or below recent year wholesale energy price averages, and so may represent a saving to purchasers/consumers

rather than a cost. But a reverse auction can work by successfully unlocking new generation through removal of risk (upside and downside risk) to investors, noting that the risk would instead be taken on by the Tasmanian Government or, via pass-through, by Tasmanian energy consumers.

The impact on wholesale energy prices would need to be analysed via rigorous market modelling, under scenarios where a target is introduced and where infrastructure such as Marinus Link is or is not constructed on a given timeline. A poorly timed or poorly sized reverse auction could result in excess generation capacity relative to export capacity and thus would likely result in lower wholesale prices, with potentially detrimental impact on incumbent generators at no penalty to new generators. One distinct advantage of a reverse auction process in this respect is that the Government or market regulator can influence the timing of bringing new generation to market, so as to coincide with infrastructure being available.

2. *Renewable energy certificates*

Renewable Energy Certificates (RECs) are a demand-side approach for meeting a target. Registered new renewable generators issue RECs for each unit of power they produce, and major power consumers (including retailers) are required to purchase a predetermined number of certificates corresponding to the renewable energy target for that period (typically a 12-month period with an associated target for that year). With an efficient market operating, the price of RECs moves up or down to provide incentives for investment in the required new generation. Many REC markets operate efficiently, but again, the Tasmanian market is unique in that all major on-island consumers are already purchasing close to 100% renewable energy, and the majority of any new renewable generation created under the TRET will, on a net basis, be used by energy consumers outside of Tasmania.

Unlike a reverse auction process, a mechanism based on RECs leaves much of the financial risk with the investor in new generation (they are exposed to both the uncertainty in the wholesale energy market and in the market for RECs). Under a closed system (all generation and consumption in one region/jurisdiction) a RECs based system could fairly apportion the requirement to purchase RECS among all energy users, but this does not apply in the Tasmanian case. Given the inter-jurisdictional nature of energy consumption required under a 200% TRET scenario (most new energy generated being consumed on the mainland), it would be very difficult to apportion the requirement among consumers users in a fair way. Furthermore, a RECs based system (regardless of how the target is apportioned to energy users), where the amount of generation that creates RECs is large compared to total generation, could easily distort the wholesale energy market, potentially disadvantaging the incumbent Tasmanian generators.

Given the above issues we do not see how, given the size of the TRET target and the nature of the Tasmanian energy system, that a REC regime could be implemented in a fair and equitable way to help achieve the TRET.

3. *Direct incentives and clean capital*

Direct incentives are not a preferred option from an efficiency and fairness perspective but can be effective in a small jurisdiction where markets are imperfect. In this respect, governments can provide capital for developments, especially in a low interest rate environment. The Queensland Government-owned clean energy company, "CleanCo" does just this. Its remit is to invest public capital in renewable projects – owning them directly or investing in private projects. In other words, the Government, through CleanCo, funds and builds its own renewable energy generation. The Queensland Government argues that CleanCo's investments will help the state reach its renewable energy target, create new investment and jobs, and reduce emissions from heavy industry - for example BHP recently signed a Power Purchasing Agreement with CleanCo that would see BHP purchase renewable energy to reduce its scope 2 emissions from electricity use. Similar outcomes could be expected in Tasmania.

At the national level, the Clean Energy Finance Corporation (CEFC) co-finances or co-invests with renewable energy companies in large and smaller low-emissions and energy efficient technologies and projects. Projects span low-emissions transport, agriculture, and urban environments, as well as stand-alone renewable energy enterprises. Since 2012, $6.03 billion in CEFC capital has been deployed. While the CEFC is a federal statutory authority, it includes state and territory representatives and could be used to finance new renewable generation and low-carbon industries.

This policy approach means renewable investment will be driven by government priorities rather than market forces, which potentially increases the financial risk to taxpayers and may crowd out private sector investment. To mitigate these risks any such enterprise would also need to consider governance arrangements including the composition of an Independent Board and its relationship to Renewable Tasmania (see sub-section 1.6)

4. *Price on carbon*

A price on carbon is perhaps the most effective instrument to promote Australia's renewable energy transition. Ideally a carbon price would be reintroduced at a national level (as was the case between 2012-14) although in the absence of a national approach a state-level scheme may be feasible. Such schemes work effectively in Canada and the United States and a framework for developing a state-level emissions trading scheme in Australian was developed in 2006.[7] The Tasmanian Government should advocate for the reintroduction of a national price on carbon to efficiently reduce emissions across the Australian economy, to support the *TREAP* and to maximise the long-run financial return from Tasmania's renewable energy assets.

Recommendation

4. The Tasmanian Government should outline how it intends to achieve the Tasmanian Renewable Energy Target in the event it does not implement an established approach for encouraging new renewable energy generation.

Table 3: Benefits and risks of doubling renewable energy

	Benefits	Risks	Mitigation
1.	Provide deep storage for the national grid and assist in the transition to reliable renewable power generation; potentially reduce national 10 million tonnes of CO_2 emissions per annum from NEM by 2040	The TRET without Marinus Link and other sources of energy demand leads to oversupply and increasing costs to Tasmanian consumers and/or declining profitability among state-owned energy businesses. Increasing integration to NEM may compromise Tasmania's low carbon credentials and energy independence	Regular independent review of TRET; adjustment of target depending on Marinus and other market developments Diversification of demand through broader emissions strategy. Develop robust renewable hydrogen certification regime and framework for Tasmanian renewable PPAs and carbon offsets
2.	Likely to deliver lower power prices relative to business as usual and higher return on Tasmanian energy assets	The costs and financial risks of Marinus could be detrimental to Tasmania .	Costs and financial risks of Marinus and other energy projects need to be carefully managed and disclosed. Viable, regulated cost allocation model, transparency and independent commercial oversight to prevent excessive risk for Tasmanian taxpayers
3.	Could establish Tasmania as a leader in advanced renewable energy systems and associated employment opportunities	Failure to gain broad-based community support for renewable energy projects resulting from the *TREAP*; failing to maximise Tasmanian employment both during construction and beyond	Government and industry need to work collaboratively with communities and develop (eg co-plan and co-design), maximise and communicate long term benefits to communities and Tasmania as a whole
4.	Could provide a foundation for innovation in low-carbon industries and in establishing Tasmania as an example of a prosperous and sustainable low-carbon economy	Failure to capitalise on our clean energy resource would be a lost opportunity. Ongoing employment in the renewable energy sector after the construction phase is limited	Actively identify and promote new low-carbon industries, innovation and research Develop, and promote Tasmania's renewable energy and low emissions brand to export opportunities, migration and build a sense of shared purpose

The implications of the 2040 renewable energy target

Doubling renewable electricity generation by 2040 would establish Tasmania as a significant renewable energy exporter and would reduce direct CO2 emissions across the NEM by an estimated 10 million tonnes by 2040. This would make a material contribution to meeting Australia's Paris Agreement target. As is outlined in greater detail below (sub-section 3.3), new generation and transmission projects required to deliver the TRET would also deliver significant economic and employment benefits for the Tasmanian community. However, as with any major development program and investment strategy, the *Action Plan* also poses risks.

The central risk associated with the TRET, in the absence of long term purchasing agreements which usually underpin large energy projects, is failing to secure sufficient demand and a sustainable market for the additional 10,500 GWh of renewable energy per annum to be generated by 2040. This could leave Tasmania with a significant over-supply of renewable generation energy which, in turn, would have negative energy system (see above) and financial consequences for Tasmania. This risk, as we have noted, can be mitigated by subjecting the TRET to an independent review every five years so it can be adjusted to reflect changing technologies and market conditions and by diversifying demand through the development on new, flexible on-island clean energy industries and applications.

In addition to ensuring there is adequate demand to support the TRET it is also important that the cost allocation and financing model for the Marinus Link does not pose an excessive risk for Tasmanian taxpayers. Basslink, for example, currently benefits mainland consumers and Victorian generators although they paid nothing towards it.

As with many large development projects, there is also a risk that new generation and transmission projects will fail to attract broad-based community support due to their impact on the environment, cultural values and local amenity. The best way to achieve broad-based community support for large-scale energy projects is to develop deep and enduring partnerships with communities while also developing strategies to maximise the long-term benefits to Tasmania and its people (sub-section 3.1). The most important strategies in this regard are the development and delivery of comprehensive skills and training programs to maximise local employment on proposed energy projects and to use our clean energy assets to promote innovation and investment in low-carbon industries and employment. Establishing an advanced energy system and low-carbon economy will also contribute to Tasmania's reputation as an example to the world in emissions reduction and sustainability which delivers economic, social and environmental benefits.

A further issue to be considered is the sustainability of the Tasmanian energy system in the event of declining on-island demand (low demand scenario) due to the departure of a major industrial customer and/or decreasing domestic demand. As we have noted, Tasmania's longer-term energy strategy must address this risk through a combination of increased interconnection, flexible storage and through the diversification of on-island applications.

University of Tasmania experts on renewable energy systems:

Associate Professor Evan Franklin (technical and policy issues)

Professor Healther Lovell (future energy systems)

Dr Vikram Garaniya (offshore renewable energy systems)

Text box 3: Alternative Tasmanian energy futures

The *TREAP* presents one Tasmanian energy future. This future focuses on the continuation and gradual adaptation of the existing national energy grid in which generation is delivered by large renewable projects and distributed to millions of customers via a large-scale transmission and networks. However, there are several other potential energy futures, which are not discussed in *TREAP* which could be considered either as alternatives to the export-focused *TREAP* model or as complementary strategies. A central element of alternative approaches is the development of small-scale and community-level energy systems which could be supported and integrated at the state level. Energy solutions developed at the local scale are more likely to achieve community acceptance. Elements of a more decentralised energy system include:

- Promoting further small-scale decentralised generation, battery storage and greater energy efficiency (sub-sections 2.2 and 2.4)
- Digitalisation of the energy sector (see sub-section 2.2) to improve operating efficiency and responsiveness of the electricity grid and using associated data for policy and commercial applications
- Supporting community energy hubs and initiatives (sub-section 2.2 including the Bruny Island Consort Trial – Text box 14)
- Becoming more self-sufficient and less integrated into the NEM in line with recent government proposals
- Scaling down aging hydro infrastructure and replacing it with next generation renewables
- Encouraging renewable energy innovation (sub-section 3.5)
- Rethinking how the energy sector is governed and operates in Tasmania. This could include considering community ownership, and less financial support (electricity subsidy) for the major industrial users
- Engaging communities in broad discussions about our future energy, which are not focused on pre-determined technical solutions (sub-section 3.5)

These alternative energy futures are still evolving and involve risks, but have the potential to deliver significant, enduring long-term benefits for Tasmania including: lower and more flexible investment costs for Tasmania relative to large scale projects, potentially enabling lower electricity prices; reducing the risk of community opposition to energy projects. The aim of Tasmania's future energy policy should be to promote the further development and deployment of decentralised generation and storage options alongside large-scale renewable energy and transmission projects as both 'visions' can contribute to Tasmania's renewable energy future.

1.2 Leveraging Tasmania's renewable energy assets

The *TREAP* sets a target of doubling renewable energy production in Tasmania through the generation of an additional 10,500 GWh of clean energy per annum by 2040. As already foreshadowed, this energy would be exported to the NEM via the existing Basslink interconnector and the proposed Marinus Link and used in the production of zero-emissions hydrogen or other uses across the Tasmanian economy. Having established additional demand for clean energy through the Marinus Link or other means, it is assumed that investment in approximately 2000MW of new, on-island, renewable generation including pumped and optimised hydro (Battery of the Nation), wind and solar generation will follow, especially if appropriate instruments to promote new on-island renewable generation are developed (recommendation 3).

Marinus Link

Marinus Link is a proposed $3.5 billion, 1500MW undersea interconnection project linking Tasmania and Victoria, as part of Australia's future electricity grid. It is to be delivered in two staged 750MW developments. Favoured technology is a High Voltage Direct Current (HVDC) interconnector supported by an upgraded High Voltage Alternating Current network in North West Tasmania.[8] This is a different and newer technology than that of Basslink. In terms of timing, the *AEMO 2020 Integrated System Plan*, (*ISP*) found that Marinus Link Phase 1 would be required by 2028 under all scenarios except the 'slow change' case where coal generation continues for longer than anticipated. To meet the 2028 completion deadline the project would have to be approved and construction commenced by 2024.

The project will deliver a broad range of economic, social and environmental benefits. It is estimated that Marinus would make an estimated $1.5 and $1.4 billion direct economic contribution to the Victorian and Tasmanian economies respectively, and create 1,400 direct and jobs in each state at the peak of construction (see sub-section 3.3). Moreover, the existing 500 MWh Basslink cable established 15 years ago is halfway through its operating life and has been subject to outages in recent years and will likely be decommissioned by 2040. Marinus would complement the existing 500 MWh Basslink cable enabling more Tasmanian hydro power to be dispatched into the national grid providing firming load to support and improve the reliability of increased wind and solar generation both on the mainland and in Tasmania. It is estimated that Marinus could directly reduce CO2 emissions by 10 million tonnes by 2040 and indirect emissions by 45 million tonnes of CO2 emissions from NEM by 2050. And it is considered essential in replacing the 63% (15GW) of coal fired generation set to retire by 2040.[9] Because firming load should attract a price premium, the Marinus Link should enable Hydro Tasmania to sell more electricity into the NEM at a price premium when wholesale prices are high while also allowing Tasmania consumers to access more low-cost wind and solar energy when this is available putting downward pressure on prices.

Cost-benefit analysis to determine whether

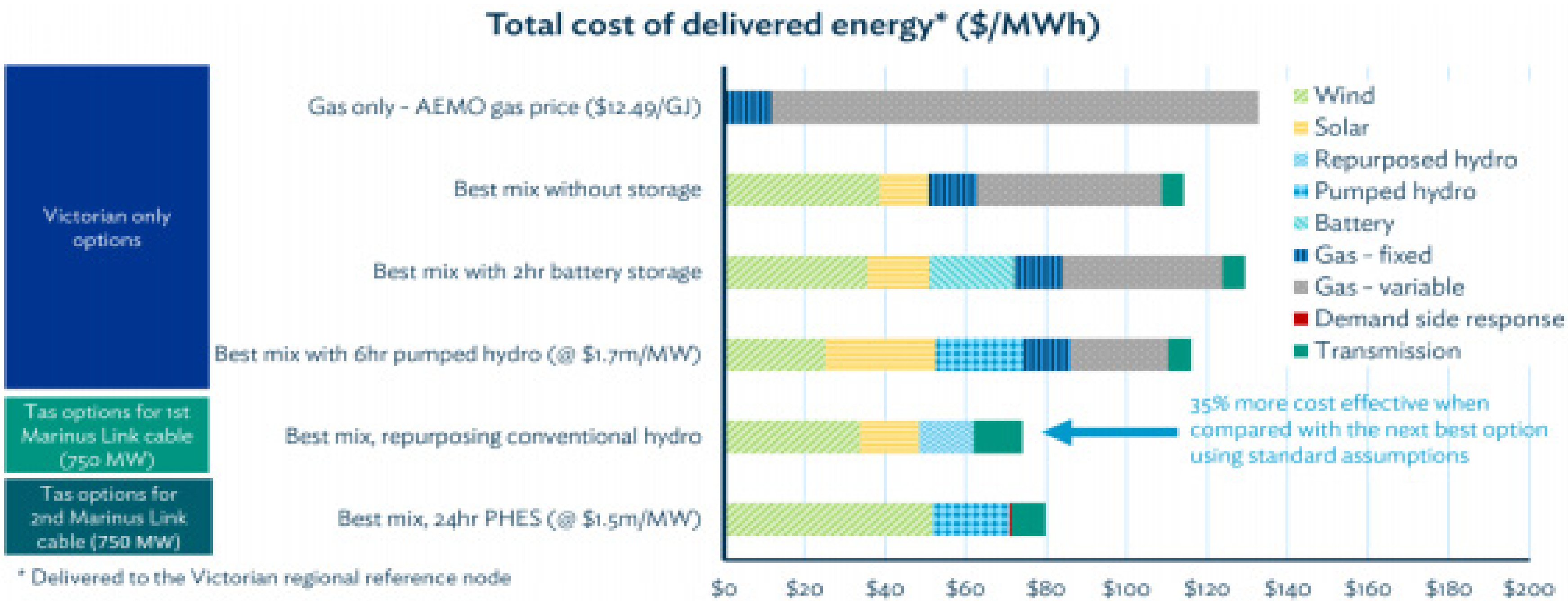


Figure 3: Analysis of relative costs of providing 750 MW of firming load on the NEM
(source: Hydro Tasmania, *Battery of the Nation*, November 2019)

the Marinus Link would result in a net benefit for consumers across the national grid has been published by the Australian Energy Regulator. The RIT-T test concluded that the proposed interconnectors would allow mainland consumers to firm capacity from renewable generation and displace higher cost gas-fired peaking generation (sub-section 2.2). Specifically, the preferred option of two 750 MW interconnectors completed in 2028 and 2032 would deliver net present value market benefits of $1.67 billion.[10]

The *2020 AEMO Integrated System Plan*, which assesses Australia's energy infrastructure needs over the next 20 years, finds that Marinus will be required under all scenarios except under the unlikely and undesirable 'Slow Change' scenario where coal fired generation is retired more slowly than AEMO projections.[11] Above all, many regard

Marinus as the 'key' piece of transmission infrastructure which will unlock the next wave of investment in renewable generation both in Tasmania and across the NEM. The importance and potential benefits of Marinus are highlighted by the Federal Government's decision to include it among key nation building projects to be streamlined under improved Commonwealth assessment and approval efficiency.[12]

Marinus Link cost allocation and financial risks

Analysis to date suggests that the Marinus Link is a cost-effective way to provide reliable, renewable hydroelectricity to provide firming capacity to support increased wind and solar generation across the NEM. Despite these benefits, there are a number of unresolved issues and risks associated with the Marinus Link. Central among these is the need to establish a new 'beneficiaries pays' cost allocation model for transmission infrastructure.[13] In the case of Marinus Link, mainland consumers should pay a share of the total cost, commensurate with the benefits they derive from the Link. If Tasmanian consumers have to pay more than their fair share of the Marinus Link then it is likely Tasmanian energy prices would rise as a result of the project.

The Energy Security Board (ESB) is currently developing cost allocation models for large-scale regulated transmission assets but the final decision for cost allocation for large-scale, cross-jurisdiction transmission projects will be resolved politically. Given this is a zero-sum-game there is a significant risk that, in the absence of a significant Commonwealth subsidy, energy Ministers will not be able to agree on an acceptable approach resulting

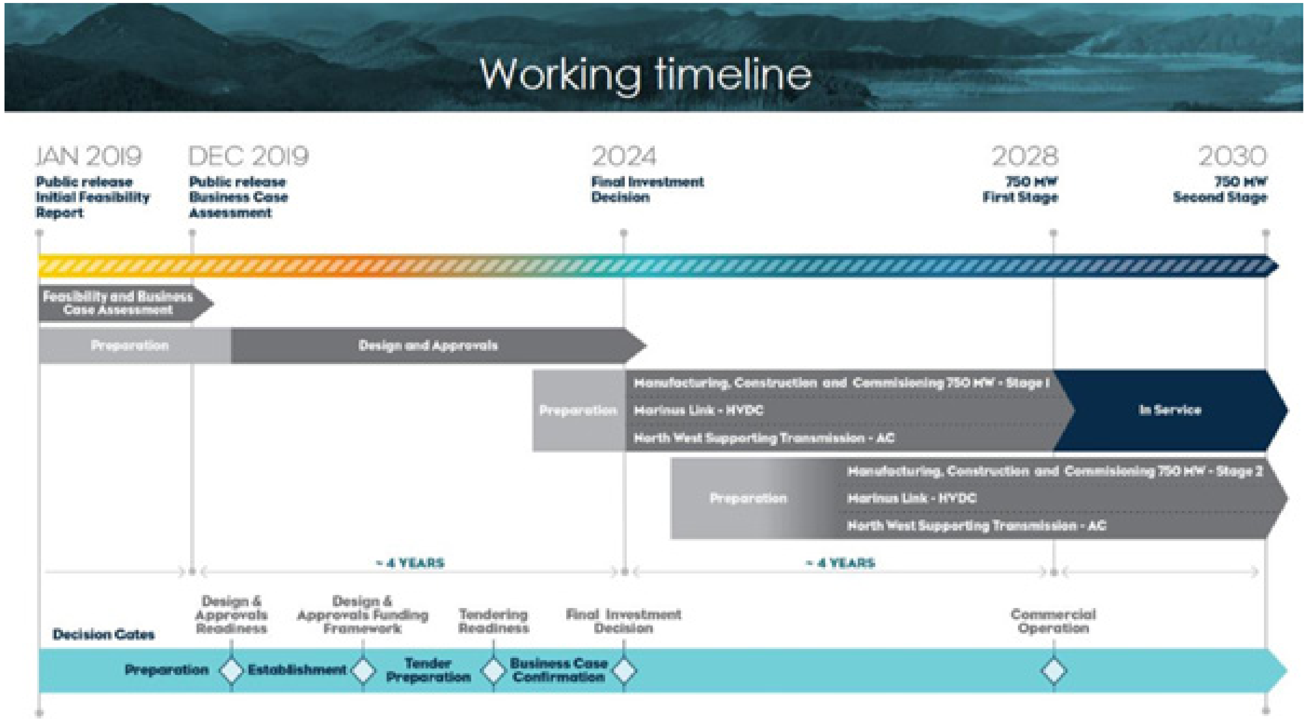


Figure 4: Marinus Link project timeline
(source: TasNetworks)

in a scenario where Marinus Link does not proceed or where Tasmanian consumers and taxpayers bear excessive risk. Therefore, it is of critical importance that Tasmanian politicians articulate Tasmania's case clearly and frequently lest our interests be sacrificed to the interests of others who are more significant electorally. Tasmanian politicians should also bear in mind that given 100% Federal ownership of Snowy 2.0 there is potential for it to be favoured over Marinus despite it being a more expensive option.

Recommendation

5. Marinus Link (and the Tasmanian Renewable Energy Target) should only proceed if a beneficiary pays cost allocation model is applied to the project. The Tasmanian Government should determine the cost-allocation threshold beyond which Project Marinus is no longer in the long-term financial interest of Tasmania.

Given the pace of technological and market change in energy systems Marinus Link should be established as a regulated asset with a regulated rate of return determined by the Australian Energy Regulator (AER) over the life of the project. This model would reduce the Tasmanian Government's financial risk if demand for Tasmanian hydro power and the Marinus Link declines over the expected operating life of the project. Perhaps

Text box 4: What if Marinus Link does not proceed?

The discussion about Tasmania's renewable energy and emissions future focuses on the likely benefits and risks associated with proceeding with Marinus Link, Battery of the Nation and up to 2,000 MW of associated wind energy projects. However, given the rapid change in energy markets and technologies it is also important to consider what the implications are if Project Marinus does not proceed.

In the absence of increased interconnection across Bass Strait, it is likely that Tasmania will have to embrace one of the 'alternative energy futures' (see Text box 4 above) and may experience a difficult transition as the costs of maintaining aging electricity generation infrastructure are met by a declining consumer base which may result in higher energy prices and/or declining profitability for state-owned energy businesses and dividends to government (see Figure 14). Whether such a scenario would result in a long run decline in energy-related employment in Tasmania is unclear given that designing and installing small scale energy systems is relatively labour intensive.

What is clear is that Tasmania's energy system will change profoundly in the coming decades and Tasmanian energy policy, consumers and businesses will need to adapt.

the greatest risk to the financial viability of Marinus Link is if the scale of battery storage increases (and battery storage costs decrease) across the NEM significantly more quickly than anticipated. However, AEMO analysis suggests Marinus will still be required if 45,000 MW of battery capacity ($39 billion in 2019 prices) is installed across the NEM by 2040.

Finally, on the question of finance and ownership, a range of business models could be considered from long term state-ownership and control, through to financing by issuing renewable energy bonds and various models of joint venture and private ownership. While all of these models have merit, historically low interest rates and capital costs mean there is strong investor appetite for clean energy projects offering a stable rate of return.

An alternative on 100% state ownership would be a hybrid model with the state ensuring 51% or more ownership and the rest privately owned. Since interest rates are also at record lows for private sector borrowers, including through the RBA's 0.25% term funding facility, and there is plenty of capital in super funds for whom an investment like Marinus would be ideal, this could well be a feasible option.

Recommendation

6. That Marinus Link be established as a regulated asset in order to minimise the long-term financial risk to the Tasmanian Government.

Battery of the Nation

Hydro Tasmania's Battery of the Nation (BoN) initiative consists of generation system enhancements to deliver up to an additional 400MW of latent generation capacity in Tasmania's existing hydroelectric system and, from 2028, the construction and operation of up to three pumped hydro storage facilities. Cethana, Lake Rowallan and the Tribute Power Station have been identified as possible sites. The Tasmanian Government, through Hydro Tasmania, has committed up to $30 million to this development.

As noted above, in conjunction with the Marinus interconnector, the BoN projects would provide 'firming' capacity and 'deep storage' for the NEM. 'Firming' capacity, or the ability to provide 12 hours or more dispatchable electricity, is vital for reliably increasing variable renewable energy (VRE) on the grid and to replace an estimated 12,000 MW of coal generation by 2035, and will thus help reduce emissions from the national electricity system.[14]

The BoN program is effectively contingent on the establishment of the Marinus Link and subject to similar risks in terms of declining demand and battery technology improving to the point where it could provide deep storage on a more cost-effective basis than BoN (see Figure 3). While this is a medium-term risk for all hydro and pumped storage options analysis indicates that BoN is the most cost-effective option for Australian consumers (see Figure 3) and some 30% cheaper than Snowy Hydro 2.0, making Marinus Link a much more responsible and viable option to be pursued than the federally owned Snowy Hydro 2.0.

1.3 Renewable hydrogen: Benefits and risks

Energy markets across the globe are undergoing substantial change, driven by the need to reduce carbon emissions while meeting growing demand for energy. Hydrogen is gaining a reputation as a flexible, safe, transportable and storable fuel. Hydrogen itself is a clean fuel but whether it is truly a renewable or low-emissions fuel depends on how it is produced (see Text box 5).

In November 2019, the Federal Government released Australia's *National Hydrogen Strategy*.[15] It argues that regional demand is increasing for cheap low-emission fuels. *The Strategy* envisages Australia exporting large quantities of hydrogen to meet this demand, even becoming a 'clean hydrogen' superpower. *The Strategy* defines 'clean hydrogen as being produced using renewable energy or using fossil fuels with carbon capture and storage.' As explained below, this broad definition of clean hydrogen may be contrary to Tasmania's interests as it will be difficult to differentiate Tasmanian renewable hydrogen from 'clean' hydrogen produced on the mainland from energy from a combination of renewable and carbon-based energy sources. While mainland hydrogen producers may use purchasing agreements to source 100% renewable energy to produce hydrogen, critics argue that such purchasing agreements simply allocate renewable electricity available in the NEM to a specific use (in this case hydrogen production) without reducing overall emissions.

In late 2019, the Tasmanian Government released a *Draft Renewable Hydrogen Action Plan*.[16] *The Plan* envisages hydrogen playing a strong role in Tasmania's industrial future as both an export commodity as well as an on-island fuel for heavy transport, industrial applications and in agriculture. Modelling presented in *the Plan* suggests that considerable employment and economic dividends exist should the Tasmanian Government proceed along this technological path.

The *TREAP* proposes that a significant proportion of the new renewable generation in Tasmania be devoted to renewable hydrogen production. The *TREAP* envisages this no-emissions hydrogen being exported to the mainland and across Asia as well as having on-island application such as in on-and-off-shore heavy-transport (ie trucks and shipping) and in agriculture.

Hydrogen production is in its infancy and a large-scale international market is yet to emerge which poses both opportunities and challenges for the development of a hydrogen industry in Tasmania. Perhaps the biggest risk is that if hydrogen becomes a bulk export commodity then Tasmania, as a small and geographically remote producer, will struggle to sustain a viable export industry. The best strategy for mitigating this risk is by developing a simple yet robust certification regime that establishes Tasmanian-produced hydrogen as genuinely renewable and sustainable and thus able to attract a price premium in the emerging hydrogen export market. Secondly, developing innovative on-island applications for renewable hydrogen will diversify demand and help reduce emissions in a range of industry sectors including industry, heavy transport, shipping and agriculture further reinforcing Tasmania's status and brand as an innovative low-carbon economy.

Tasmanian leadership on hydrogen certification

A robust national and international hydrogen certification scheme is necessary to ensure Tasmania can fully capitalise on the burgeoning hydrogen economy. A robust hydrogen certification scheme is also essential to ensure emissions reduction from emerging hydrogen systems.

But nothing is assured. A national and international battle over hydrogen certification is currently underway. The European Union is leading this debate, arguing for the traditional Green (renewable), Blue (gas), and Brown (coal) certification to continue.

By contrast, some fossil fuel importers and exporters, including the Commonwealth government, are pushing for a certification scheme that simply identifies the differences in carbon intensity; and/or establishes a series of national and regional schemes that will invariably lead to confusion and, as some argue, a race-to-the-bottom. This could see product being sold as low-emissions hydrogen despite significant emissions being produced in the production process. Tasmania should oppose hydrogen certification where gas-produced hydrogen is promoted as being 'green' or low-carbon hydrogen in key export markets. Such a scheme would limit Tasmania's ability to effectively market export hydrogen as 100% renewable with no emissions associated with the industrial production process (this would not be true of the whole process though).

Based on effective product certification schemes in other sectors, Tasmania's

Text box 5: Hydrogen production

Hydrogen can be produced from water in three main ways:

1. By electrolysis, which extracts hydrogen from water using electricity. If renewable electricity is used, this process produces no carbon emissions. This is 'renewable hydrogen'.
2. Through thermochemical reactions, using coal in a process known as 'gasification'; or
3. Through thermochemical reactions, using natural gas in a process known as 'steam methane reforming'. Using fossil fuels means there are associated carbon emissions.

Given the numerous steps in hydrogen production there are inherent inefficiencies with more than half of the input energy being lost during the process. For fuel cell cars, it is estimated that only 38% of the original energy that is used in production is available to power the vehicle after the energy vector transitions. By comparison a battery electric vehicle is approximately 80% efficient.

Text box 6: Bell Bay as a hydrogen hub

The Tasmanian Government has identified Bell Bay as an 'ideal hydrogen hub' to pilot this new technology. The Bell Bay has a number of advantages as a future energy hub.

1. The Bell Bay Advanced Manufacturing Zone is an existing heavy industry precinct and a node in the Tasmanian transmission grid
2. There is an existing deep water port for hydrogen export
3. There is an existing local workforce with expertise in manufacturing and heavy industry and good proximity to Launceston as a regional services and training hub.

An objective of Tasmania's Renewable Hydrogen Action Plan is to establish a renewable hydrogen production and export facility at Bell Bay by 2030. The industry is still in its infancy but a number of proponents are seeking to establish large scale hydrogen plants in Australia. If a 1000 MW facility was established at Bell Bay it could create up to 1000 direct or 4000 indirect jobs during construction. Establishing a cluster of local hydrogen-related industries would help ensure long-term benefits from the hydrogen sector (see sub-section 3.5)

renewable energy interests would be best served through the development of a comprehensive 'sustainable hydrogen' certification standard. Such a standard would build on the existing EU model and its assessment of embedded carbon emissions but also consider broader social and sustainability considerations and develop a collaborative governance framework for resolving emerging issues relating to hydrogen certification.

The four key elements of a robust sustainable hydrogen certification scheme are:

1. Contribute to the development of a multi-stakeholder process to negotiate the meaning of sustainable hydrogen that distinguishes it from Green, Renewable, Clean, Black, Brown and other terms. Where possible collaborate with other jurisdictions with shared interests.
2. Promote a Sustainable Hydrogen Standard that balances efficiency, fairness, resilience and sufficiency criteria to ensure that hydrogen production is environmentally appropriate, socially beneficial and economically viable for most stakeholders in the global system.
3. Contribute to the design of a Sustainable Hydrogen Certification and labelling scheme that ensures easy, low-cost access by producers irrespective of their size.
4. Sustainable hydrogen would have to be produced from new renewable energy projects and all associated renewable energy certificates would need to be retired to ensure that equivalent capacity is built somewhere else.

Tasmania is in an excellent position to take

Text box 7: Diverse and innovative on-island uses of renewable hydrogen

- *Green ammonia*. Renewable hydrogen can be used to produce 'green ammonia' and low carbon fertiliser, which would create a new industry while reducing emissions in our all-important and expanding agricultural sector (see sub-section 3.5).
- *Maritime applications*. Renewable hydrogen has many advantages in remote off-shore locations and in water-based transport such as Derwent-based ferries and short-distance shipping such as in Bass Strait. Opportunities may also exist for renewable hydrogen to be deployed for use in Antarctica (see sub-section 3.5).
- *Gas substitute*. Renewable hydrogen may well have an important role in heating applications, heavy industry production processes, and for consumers, including the University of Tasmania. ~7% of Tasmania's energy consumption comes from gas, with 11,765 retail gas consumers and >900 business consumers and unlike electricity, gas prices are not regulated (*Energy in Tasmania Report*, 2018/19).

a leadership role on this type of hydrogen certification given its clean energy credentials, emerging hydrogen sector and the University of Tasmania's expertise in product certification and labelling systems.

If Tasmania can shape this debate and contribute to the development of a robust and sustainable hydrogen standard backed by a stringent certification and labelling scheme it will make a significant contribution to protecting and advancing Tasmania's renewable energy interests. Tasmanian politicians will have to be strong advocates for Tasmania's stance as a developer and producer of truly clean hydrogen and stand up for a robust, ethical and emissions-lowering hydrogen certification scheme.

Recommendations

7. The Tasmanian Government should oppose hydrogen certification where gas-produced hydrogen is promoted as being 'green' or low carbon hydrogen in key export markets.
8. The Tasmanian Government should collaborate with other jurisdictions on the development of a comprehensive 'sustainable hydrogen' certification standard.

Researchers on hydrogen energy at UTAS include:

- Associate Professor Evan Franklin (technical)
- Professor Fred Gale (certification)
- Dr Ben Parr (certification)
- Associate Professor Matthew Harrison (agricultural)
- Professor Irene Penesis (marine transport applications)
- Associate Professor Francisco Ascui (carbon accounting)

1.4 Bioenergy in Tasmania

Using renewable biomass to produce energy is becoming an established method for generating low-emissions energy and, where organic waste is converted into energy, is a key element of the circular economy. Across the OECD bioenergy accounts for 2.4% total energy generation whereas in Australia it accounts for 0.9% of output.[17] Modern waste-to-energy systems have a particularly important role in reducing methane emissions (which are 30 times more potent than CO2) from waste sites. However, large-scale bioenergy generation can be controversial and is contested in many communities where forest residues and biomass farmed on what were previously food producing lands are used as feedstock. These issues, combined with Tasmania's abundant hydro and wind energy resources, suggest that large-scale bioenergy generation is unlikely to become a significant part of Tasmania's future energy mix.

There may be scope to develop small-scale bioenergy plants linked to industrial, processing and waste management facilities. If this type of small-scale waste-to-energy generation is developed in Tasmania feedstock from native forests should be excluded from the process. Failing to do so risks damaging 'Brand Tasmania' and may undermine community support for bioenergy. Opportunities exist for piloting small-scale household and neighbourhood systems for the conversion of organic waste (primarily sewage) into biogas for cooking and heating. These technologies are already widely used internationally and are being developed in Australia.

Recommendation

9. Bioenergy generation in Tasmania should focus on small-scale operations using existing waste materials for feed stock. Native forests products should be excluded from the process.

Figure 5: Logan City bio-waste plant (source: ARENA)

1.5 The clean transport opportunity

Tasmania's transport sector is almost completely dependent on imported fossil fuels, and accounts for approximately 19% of state emissions having declined only marginally since the 2011 peak (see Figure 6). The combination of Tasmania's expanded renewable energy production, the rapid development of battery and fuel-cell powered vehicles and the broader benefits of further reducing Tasmania's economy-wide emissions profile make a compelling case to aggressively promote a low- or zero-emissions transport system.

Tasmania's transport systems and associated energy needs are dominated by cars and light commercial vehicles which combined contribute 68% of Tasmania's total transport-related emissions (see Figure 7). The following analysis focuses on the electrification of personal and light vehicles while acknowledging that it will also be important to develop low-emissions heavy and public transport solutions using a combination of battery and hydrogen fuel cell technologies. Increasing the availability of low-emissions public transport options must also be a priority given the limited transport options available to many low-income Tasmanian households. Another important strategy which will yield environmental and health benefits is to promote active transport and design in our cities and towns so Tasmanians can become less vehicle dependent.

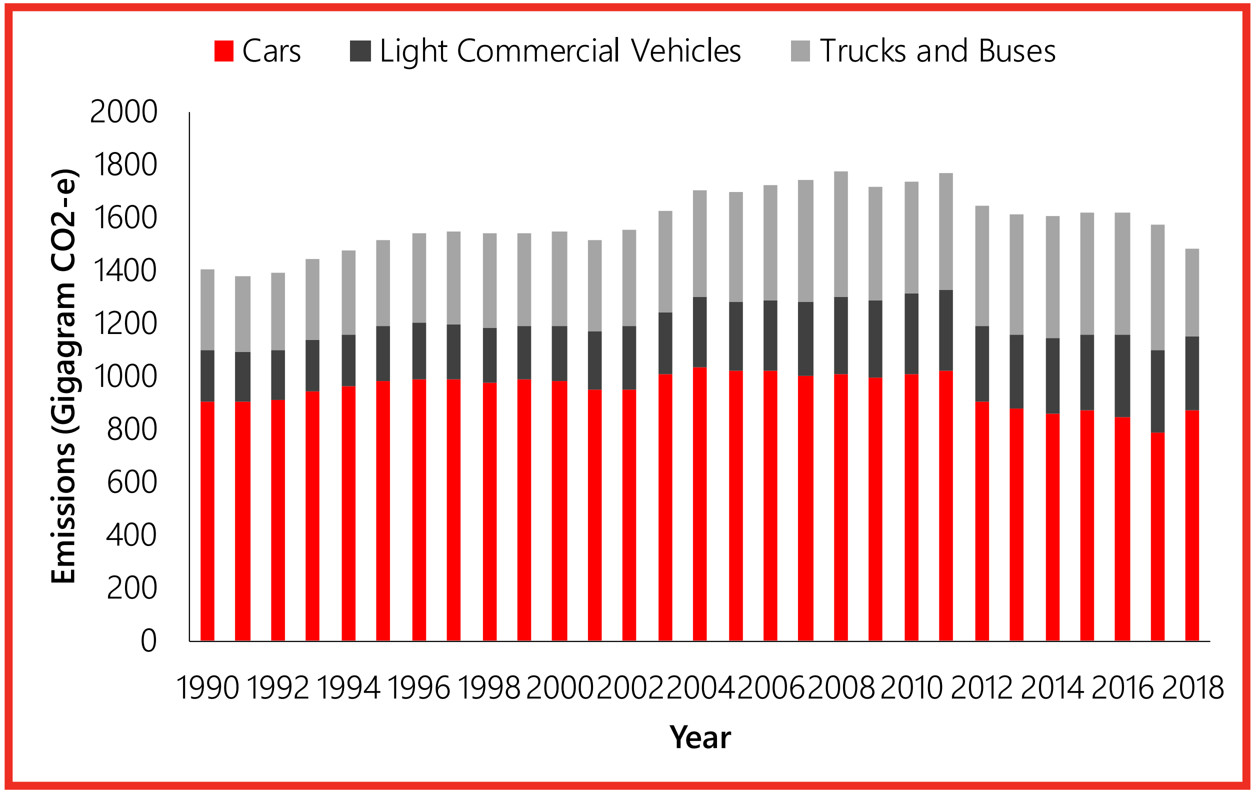


Figure 6: Tasmanian vehicle emissions
(source: Australian Greenhouse Emissions Information Systems)

The case for reducing transport emissions in Tasmania

There is a compelling case for promoting the transition to a low- or zero-emissions transport system in Tasmania. Reducing transport emissions will:

1. Diversify and increase demand for renewable energy generated in Tasmania and reduce dependence on imported fossil fuels
2. Reduce net emissions by a further 19% over time contributing to the creation of a sustainable net zero economy with less dependence on land use credits
3. Reinforce Tasmania's brand as an innovative and sustainable island with a high uptake and visible use of zero-emissions transport technology
4. Support partnerships and innovations in renewable transport solutions (eg. hydrogen and marine)
5. Improve air quality and the health of Tasmanians

Text box 8 : Which low emissions transport solution should Tasmania adopt?

There is a global debate as to whether batteries or hydrogen fuel cells offer the best technology to support a zero-emissions transport system.

In the Tasmanian context elements of both technologies should be promoted with personal and light vehicles battery powered and renewable hydrogen used for heavy vehicle, marine and remote applications.

Batteries are the preferred zero-emissions technology for light vehicles because they:

- Capitalise on Tasmania's 100% renewable electricity
- Have more efficient (80%) energy transfer relative to hydrogen
- Provide greater consumer choice
- Provide lower cost and more recharging options

For heavy transport and marine applications hydrogen fuel cells may be the preferred option because:

- There is greater range and rapid refuel for commercial 'around the clock' applications
- Hydrogen refuelling stations are expensive and only available at transport hubs
- They are only ~35% energy efficient with 65% of energy from source electricity lost during production and combustion

The fact that there are two rival technologies does not mean we should persevere with the status quo – it is about choosing the best technology for Tasmania's current and future situation.

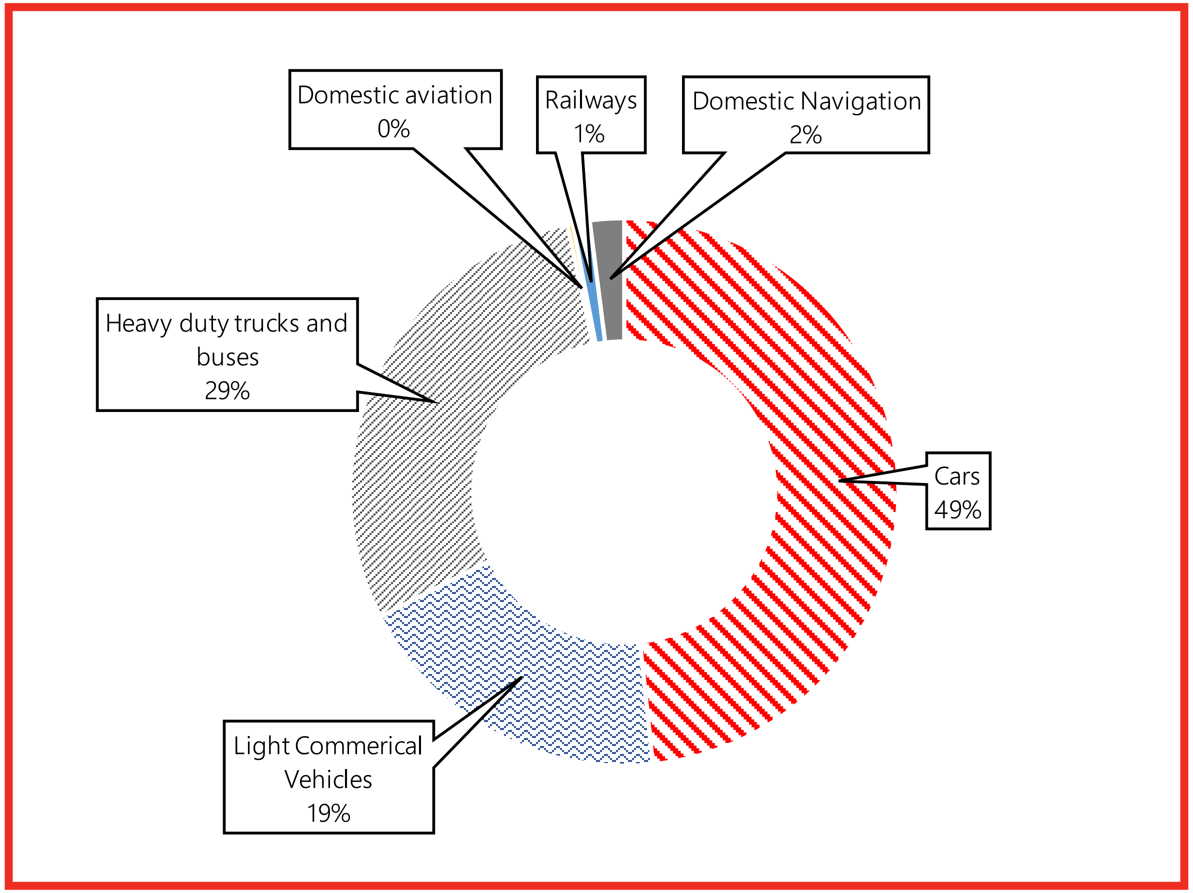


Figure 7: Transport emissions in Tasmania
(source: Australia State Emissions Inventory)

Bearing in mind these benefits it is also important to recognise that achieving this transition in an equitable and cost-effective way will take time. This is especially true for a small jurisdiction such as Tasmania.

The role of hybrid vehicles in Tasmania's pathway to low-emssions transport

Whilst battery-operated electric vehicles (BEVs) are the preferred light vehicle type for Tasmania's transport future (see below), hybrid vehicles offer a transition technology to a lower emissions future. Combining a small combustion engine with the use of an additional electric motor, hybrid vehicles achieve greater fuel efficiency. The Tasmanian Government recently announced a greater uptake of hybrid vehicles, with "an ambitious target for electric and hybrid vehicles across the government fleet".[18] This is an important initiative to both lower the emissions of the Government fleet and to increase the exposure to electric vehicle technology in Tasmania.

Figure 8 The benefits of emissions standards to car owners and Australia
(source: Climate Change Authority)

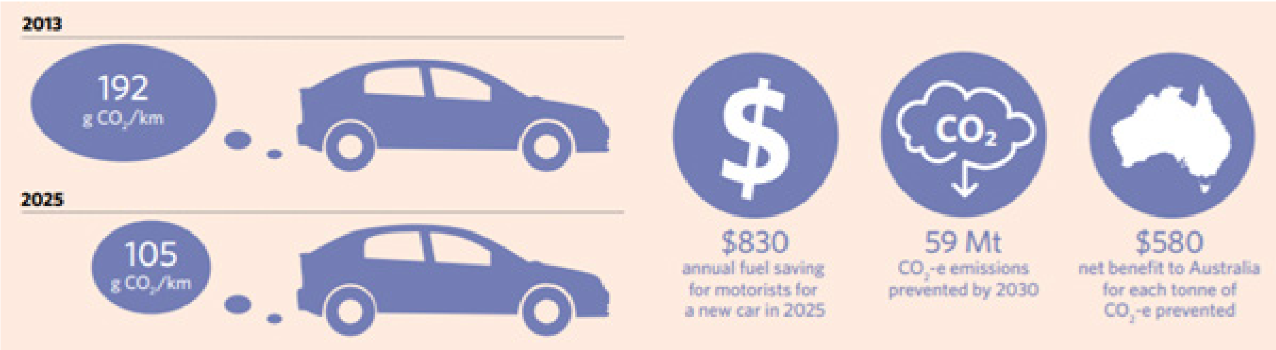


Table 4: Electric vehicle sales in Tasmania (source: ARENA Australian BEV Market Study)

		2020	2025	2030	2035	2040
No intervention	Sales	227	860	5,321	12358	17,521
	Percentage of market	1%	4%	22%	47%	73%
Medium intervention	Sales	242	5,359	12,885	23,853	34,751
	Percentage of market	1%	22%	49%	76%	100%
High intervention	Sales	916	9,757	18,430	33,739	43,562
	Percentage of market	4%	37%	64%	88%	100%

Setting a battery electric vehicle target for new light vehicle sales

Medium to long-term targets for new battery electric vehicle (BEV) sales are being adopted globally. These are having varying degrees of success, depending on the mix of strategies in place to support the transition. Australia is a laggard among wealthy industrial countries in terms of the uptake of BEVs due to the lack of a price on carbon, relatively cheap fossil fuel prices and the absence of national vehicle emissions standards (see below). The absence of national incentives means that car manufacturers are reluctant to promote BEVs in the Australian market which limits choices for consumers.

Despite the lack of national incentives, the transition to low-emissions vehicles is inevitable with all major international car manufacturers planning to phase out combustion engines in mainstream models over the course of the *TREAP* period. In the Australian context, ARENA's *BEV Market Study* provides state-level estimates of BEV uptake for three scenarios and the Tasmanian data from this study is presented below. The

AEMO medium intervention scenario would see BEV sales as 22% of new car sales in Tasmania in 2025 increasing to 100% of new car sales by 2040. As a transition measure, hybrid vehicles with CO_2 emissions of less than 95 gCO_2/km can be included in the 2025 EV target.

Recommendation

10. The Tasmanian Government should actively promote clean transport options through the adoption of targets for the percentage of new electric vehicle sales in Tasmania in line with the AEMO medium intervention scenario and support. It should also advocate for national vehicle emissions standards.

State-level strategies for achieving the battery electric vehicle target

Emerging evidence from around the world has identified key factors which promote the uptake of BEVs. The development of charging infrastructure and associated products is a pre-condition for the growth in BEV use as is a broader suite of transport and infrastructure design features which enable drivers to use their cars on a daily basis. Once infrastructure is in place an appropriate supply of suitable and affordable vehicles needs to be developed to drive widespread adoption of BEVs in a car market.

The following initiatives would support Tasmania's proposed BEV target:

1. **Charging infrastructure** and planning measures so that BEVs can be used as a part of everyday life. The Tasmanian Government has already implemented and granted the BEV ChargeSmart Grants Program. The investment aims to ensure a statewide network of Fast Charging and Destination Charging options for BEV users. The investment is important in supporting the uptake and adoption of BEVs which will drive supply and greater consumer choice (e.g The Good Car Company). However, more infrastructure is required to create an 'electric highway' throughout Tasmania.

2. **Procurement and fleet purchases**. Government and fleet purchases represent a significant proportion of

Text box 9: The Good Car Company

The GCC is a community-based enterprise aimed at improving the availability of affordable electric vehicles in Tasmania. Through individual private purchases and community bulk-buying options the company imports late model second hand electric cars from Japan providing much needed choice for Tasmanians who want to drive EVs. The business has joined the EnergyLab 2020 startup Accelerator program to expand the business and promote the uptake of EVs nationally. The venture is an excellent example of how community action and enterprises can contribute to Tasmania's renewable energy and low emissions future.

new car sales in Tasmania with the State Government purchasing approximately 5% (~900pa) of new vehicles in their own right. If all levels of government and other organisations prioritise zero-emissions vehicles through procurement this will promote supply and create a second-hand market for BEVs over time. The Tasmanian Government's recently announced policy of increasing the number of BEVs and hybrid vehicles in its fleet is to be commended. Strategies for encouraging other organisations to purchase and use BEVs wherever practical should also be developed. In order to reinforce Tasmania's reputation as a sustainable low-carbon tourism destination, strategies to promote the uptake of BEVs in hire fleets should be developed.

3. **Supply agreements and trials**. The uptake of BEVs is often limited by supply constraints and a lack of suitable and affordable vehicle options. While hybrid vehicles are becoming more widely available on the Australia market, at present only a handful of BEV models are available in Australia and sell at a significant premium to equivalent conventional models. Strategies for increasing supply include government procurement and working with manufacturers and importers to introduce new models and increase consumer choice. The Good Car Company is an innovative Tasmanian approach to improving the supply of BEVs on the local market.

4. **Direct financial incentives.** Direct financial incentives have been effective in increasing demand for BEVs in a number of overseas markets. Specific initiatives vary widely from direct government rebates through to concessional vehicle tax, registration and insurance charges. In the Tasmanian context direct subsidies should only be used to complement the measures outlined above in order to meet BEV targets. These subsidies should only be provided on a means-tested basis owing to the cost to taxpayers combined with the fact that most new car purchases

Text box 10: Electric vehicles and University of Tasmania leadership

The University of Tasmania, like many organisations, is actively contributing to reducing transport related emissions.

Key Initiatives include:

- First Tasmanian fleet to have electric vehicles (3 Nissan Leafs in 2014/15)
- With support from state government installed electric charging stations across the state at campuses and university accommodation
- Sustainable transport strategy based on large surveys taken every two years
- UTAS has developed a Sustainable Transport Strategy 2017-2021 that includes specific strategic actions:
  - SA7 – Continue to grow the proportion of electric and hybrid vehicles in the UTAS fleet
  - SA37 – Continue to participate in state-wide planning and community-driven initiatives for electrification of the Tasmanian vehicle fleet

are made by wealthier households.

5. **Advocating for national emissions standards.** At a national level, Australia is among a small minority of countries without mandatory GHG standards in place for cars, despite this being identified as a key action by the Federal Government to meet its 2030 emissions targets.[19] In 2018, Australia's average emissions for passenger vehicles was 41% (169.8 gCO2/km) higher than the EU where the current fleet-wide average emissions for new vehicles is 95 gCO2/km.[20] While we do not believe it is practical for the Tasmanian Government to introduce a state-level passenger vehicle emissions standard, Tasmania should advocate for national regulation of g/km fuel efficiency standard. Based on the EU experience this would ensure importers actively promote BEVs in Australia in order to meet their compliance targets at least-cost.

Researchers at UTAS with expertise in clean energy transport include:

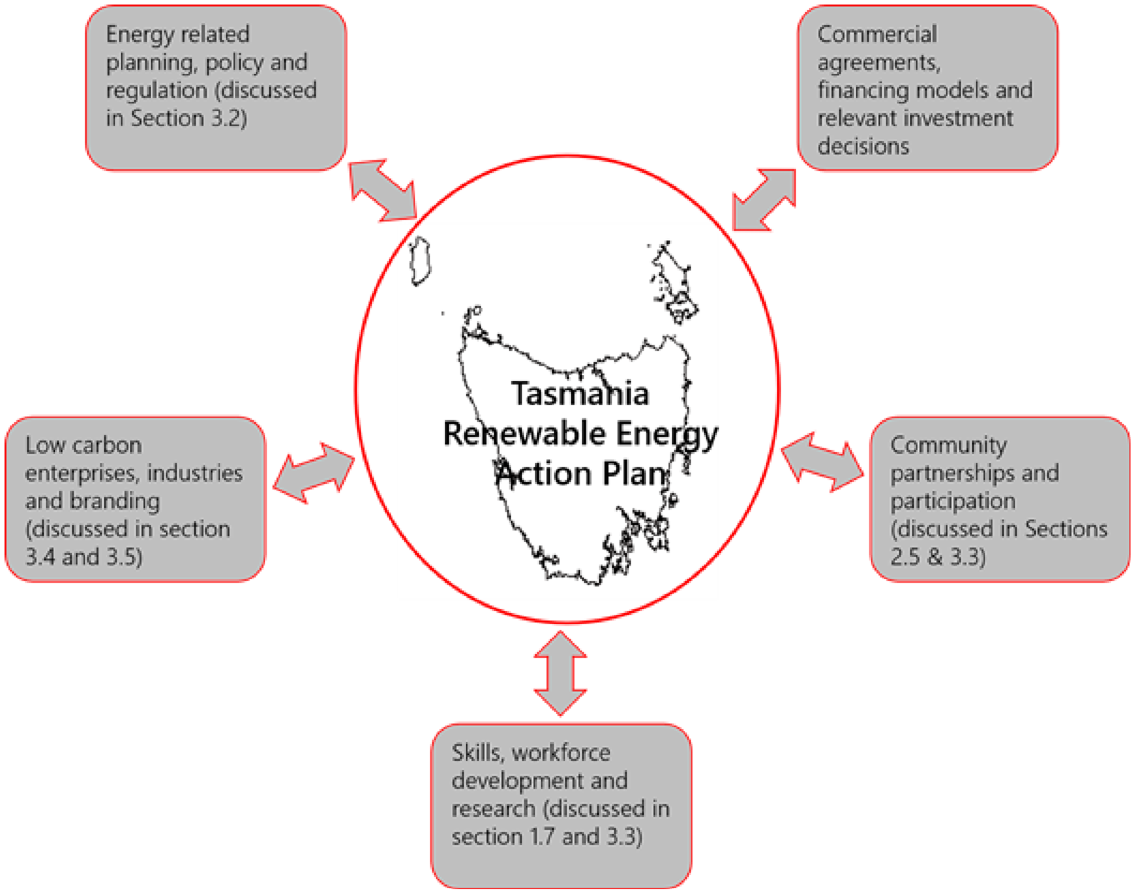
- Associate Professor Evan Franklin
- Professor Jason Byrne
- Dr Matthew Harrison
- Dr Philippa Watson
- Professor Irene Penesis

1.6 Establishing Renewables Tasmania to enhance governance, coordination and planning for the Tasmanian energy sector

The *TREAP* outlines one of the largest and most significant development agendas in Tasmania's recent history. This requires considerable planning and coordination in order to deliver sustainable, long-term benefits to the State. Given the scale and complexity of this agenda and its implications for the broader economy and community there is a strong case for establishing an entity to coordinate the implementation of the *TREAP* and the broader transition to a sustainable low-carbon economy. This could be the role of the proposed 'Renewables Tasmania'.

Strong, overarching governance is especially important given that competition law limits the extent to which State-owned energy businesses can collaborate to provide broad-based leadership on Tasmania's energy future. Moreover, developing, delivering, measuring, reviewing (and adjusting if

Figure 9: Coordinating the Tasmanian Renewable Energy Action Plan



required) a comprehensive, long-term energy development strategy will require contributions from across all levels of government, a broad cross-section of industries, research and training organisations and the wider community. Reflecting this, a number of Australian jurisdictions have established specific entities to coordinate and promote renewable energy development and innovations.

As a cornerstone of Queensland's COVID-19 economic recovery, in September 2020, the Queensland Government established a new $500 million Renewable Energy Fund. The Fund will allow state-owned energy companies such as CleanCo (sub-section 1.1) to increase public ownership of both commercial renewable energy projects and supporting infrastructure, as well as help Queensland reach its renewable energy target.

In many Australian jurisdictions local governments and regional development organisations have been identified as key partners in the development and management of medium- to large-scale renewable energy opportunities and these entities should be key stakeholders of Renewables Tasmania. Tasmanian local councils are already promoting innovative renewable energy projects, for example, the City of Hobart's ideas around Virtual Power Networks and the City Scale Energy Storage project.[21]

Based on local needs and existing international models an entity such as Renewables Tasmania should coordinate the following elements in order to implement the *TREAP*:

1. Energy-related planning, policy and regulation (discussed in section 3.2)
2. Commercial agreements, financing models and relevant investment decisions (subject to the scope and governance of Renewables Tasmania)
3. Community partnerships and participation (discussed in sections 2.5 and 3.3)
4. Skills, workforce development and research (discussed in sections 1.7 and 3.3)
5. Low-carbon enterprises, industries and branding (discussed in sections 3.4 and 3.5)

Governance and resourcing

The primary role of Renewables Tasmania should be to provide State-level coordination for the future development of the energy sector and associated industries and be responsible for delivering the *TREAP*. A range of governance models would be suitable so long as relevant stakeholders have an opportunity to engage and contribute through a board or other consultation mechanisms. Developing options for community representation in the structure of Renewables Tasmania would signal to Tasmanians that their concerns are valued and taken seriously. To ensure cost effectiveness, wherever possible existing resources should be shared or pooled and staff with appropriate expertise from across government or the sector could be seconded to Renewables Tasmania. Depending on the scope of Renewables

Tasmania specific expertise (e.g. project finance) may have to be sourced externally. Renewables Tasmania would also have to develop effective models and mechanisms for working with relevant government agencies and businesses to establish joint programs of work. Above all, Renewables Tasmania, would be responsible for implementing *Tasmania's Renewable Energy Action Plan*.

> "Above all, Renewables Tasmania, would be responsible for implementing *Tasmania's Renewable Energy Action Plan*."

Renewables Tasmania could also be responsible for outreach and developing collaborations elsewhere in Australia and beyond. Tasmania could join existing sub-national climate action and renewable energy coalitions such as the Under2 MoU (international coalition of states/ provinces committed to reducing emissions) and commit to the Climate Leadership Declaration, signed in July 2017 by east-coast mainland state and territory governments.

This declaration could be developed into a formalised clean economies' agreement potentially yielding significant international trade and branding opportunities.

Recommendation

11. Establish Renewables Tasmania as the entity responsible for developing, delivering and managing the *Tasmanian Renewable Energy Action Plan* by providing the effective coordination of relevant stakeholders across governments, industries, research and training organisations and the wider community.

Researchers on governance and its applicability to renewable energy at the University of Tasmania include:

- Professor Richard Eccleston
- Dr Ben Parr
- Dr Clinton Levitt
- Professor Irene Penesis

1.7 Establishing a Renewable Energy Centre of Excellence to promote innovation, research and collaboration

The global transition away from carbon-based energy systems will have profound consequences for economies and communities the world over. Tasmania, with its significant renewable energy assets and expertise, has clear potential to shape and capitalise on this transition to renewable energy systems and low-carbon industries. Establishing a collaborative Renewable Energy Centre of Excellence would help realise this opportunity and promote renewable energy innovation for and from Tasmania. The Centre would coordinate resources and expertise to meet industry needs, promote innovation and renewables enterprises and conduct solutions-focused research. The Centre would also inform future training and skills development and serve as a link for Tasmania between industry and research centres across Australia and beyond, including the community. The proposed centre of excellence would work closely with Renewables Tasmania but would be independent of Government.

The proposed Centre of Excellence would:

- Be solutions-focused providing applied research and analysis to meet the needs of Tasmanian industry and community
- Build stronger connections between industry experts and existing research centres and training hubs such as the Blue Economy CRC, the UTAS Future Energy Group, the Centre for Renewable Energy and Power Systems and the AMC ocean renewable energy research group.
- Draw on the relevant elements of existing research centres and institutes focused on the needs of the Tasmanian economy and community such as IMAS and TIA

Successful collaborative research centres to promote renewable energy innovation which could provide the basis for a Tasmanian model include those in Text box 11.

Recommendation

12. Establish an independent Tasmanian Renewable Energy Centre of Excellence to promote innovation and collaboration.

Text box 11: Examples of successful energy research centres

C4NET, the Centre for New Energy Technologies, is a Victorian-based, industry-led, government-supported research network which focuses on data analysis to inform the design of new energy systems. C4NET engages in a wide range of academic and research partnerships on a project basis.

The Melbourne Energy Institute (MEI) is a succesful applied research centre at the University of Melbourne. Established in 2010, the MEI has an annual budget approaching $10 million and is funded by the University of Melbourne, the Victorian Government and over 20 industry partners.

Text box 12: Australian Maritime College: Expertise in Marine Renewable Energy

The University of Tasmania is an international leader in the provision of education and research for the maritime, marine and Antarctic sectors. UTAS has particular strengths in offshore energy and ocean systems through the Australian Maritime College (AMC). Through its two national centres, National Centre for Maritime Engineering and Hydrodynamics (NCMEH) and the National Centre for Ports and Shipping (NCPS), the AMC has the expertise to deliver strong research outcomes for a wide range of Marine Renewable Energy projects.

This was demonstrated in the most recent (2018) Excellence in Research for Australia (ERA) assessment by the Australian Research Council (ARC) when AMC's research into Maritime Engineering was awarded the maximum ranking of "5: well above world standard". AMC also received the maximum ranking of "HIGH" in both research impact and engagement with industry.

The AMC has world class facilities for the testing of prototype marine renewable energy solutions. Key facilities include the state-of-the-art Cavitation Laboratory, the Towing Tank and Model Test Basin, which are suitable for scale model testing of ocean wave energy, offshore wind prototypes and ocean current turbine models. Capabilities for offshore renewable research at AMC also include site evaluation, forecasting of waves and ocean currents, Strategic Environmental Assessments (SEA) and numerical modelling. Other relevant AMC facilities include autonomous underwater vehicles (AUV) and a fleet of training vessels, including and the 35m purpose-built Bluefin; all used by students, researchers, industry partners and commercial clients alike.

As with most of AMC's facilities, a combination of collaborative research and commercial consultancies has been completed. These projects have included experiments on many varied types of marine renewable energy devices, particularly wave and tidal energy converters. Several projects have also been supported by the Australian Renewable Energy Agency (ARENA) in collaboration with industry. Industry collaborators have included Wave Swell Energy, Bombora Wave Power, Elemental Energy Technologies (Mako Turbines), AMOG Consulting, CSIRO, Carnegie Wave Energy, BioPower Systems, Atlantis, Sabella, Australian Ocean Energy Group, Oceanlinx and Eurogen Power and more recently the BECRC.

Priority 2: Making energy work for the Tasmanian community

Priority 2 focuses on the direct benefits the *TREAP* can to deliver for the Tasmanian community in terms of providing affordable and reliable renewable energy. Here we examine the impact of the *TREAP* on energy prices and energy security as well as the role of digitalisation, smart-meters and grids in the renewable energy future of Tasmania. Energy on farms and agricultural emissions are considered as well as energy efficiency and its contribution to lowering Tasmanian emissions.

2.1 Implications for energy prices and security

Energy prices in Tasmania

Access to affordable and reliable electricity is a priority for households and businesses alike and rising electricity prices cause personal hardship and threaten the viability of businesses. In many cases this hardship has been exacerbated by the COVID-19 pandemic.

Since 2015 (and the abolition of the national price on carbon) wholesale energy prices in the NEM have increased by approximately 40% and Tasmanian wholesale prices have not been immune from this trend (see Figure 10). This is mainly due to transmission charges, which are the most highly regulated component of the end price of electricity, and that the increase in transmission prices has been 'required' to cover the cost in what could be described as over-investment in transmission infrastructure. Indeed, there have been concerns that a growing number of low-income Tasmanian households are experiencing fuel or energy poverty and are forced to ration heating in winter months. In response to these pressures the Tasmanian Government legislated to cap increases in retail and small business electricity

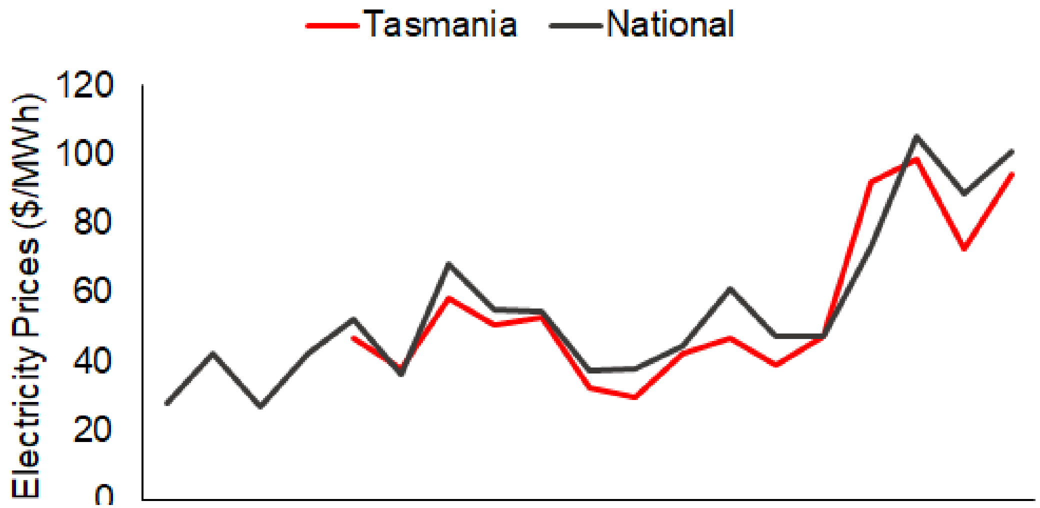


Figure 10: Wholesale electricity prices 2001-2019
(source: AER, 2020)

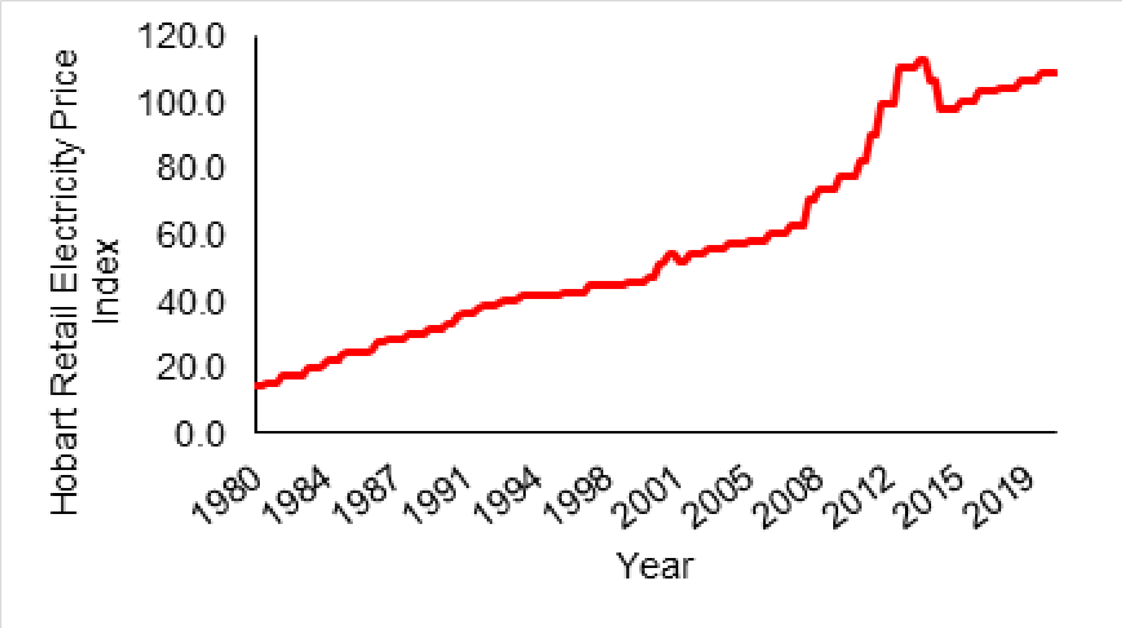


Figure 11: Hobart's retail electricity price index since 1980

(source: ABS, CPI, 2020)

prices to CPI in 2018 and, as part its recent COVID-19 response has fixed electricity prices until July 2021. Aurora Energy has also implemented a number of support measures and payment plans to assist households and businesses meet electricity costs. These support measures are important but must be complemented by long-term strategies to ensure that low-income Tasmanian households can access reliable and affordable energy.

Legislated retail price caps, such as those introduced as part of the Tasmania-First Energy Policy, provide short term financial relief for customers but can only be sustained if underlying generation and transmission cost do not rise. If these costs do rise it will reduce the profitability of government owned energy companies and associated returns to taxpayers. For this reason, it is important to assess the long-term implications of the TRET on long-term energy prices in Tasmania.

Impact of Marinus Link on Tasmanian energy prices

Transmission and distribution charges account for approximately 50% of retail electricity prices and overinvestment in transmission infrastructure has been blamed for significant electricity price rises across Tasmania in the early 2000s.[22] Rigorous oversight of the cost allocation process will need to occur in order not to repeat the mistakes of the past.

The long-term impact of Marinus Link on Tasmanian electricity prices is difficult to determine and will depend on the cost allocation model applied to the project (see section 1.2). However, on balance, Marinus Link may deliver lower long-term electricity prices than would otherwise be the case.

RIT-T Analysis

The Marinus Link project has been subjected to a Regulated Investment Test for Transmission (RIT-T) to establish the

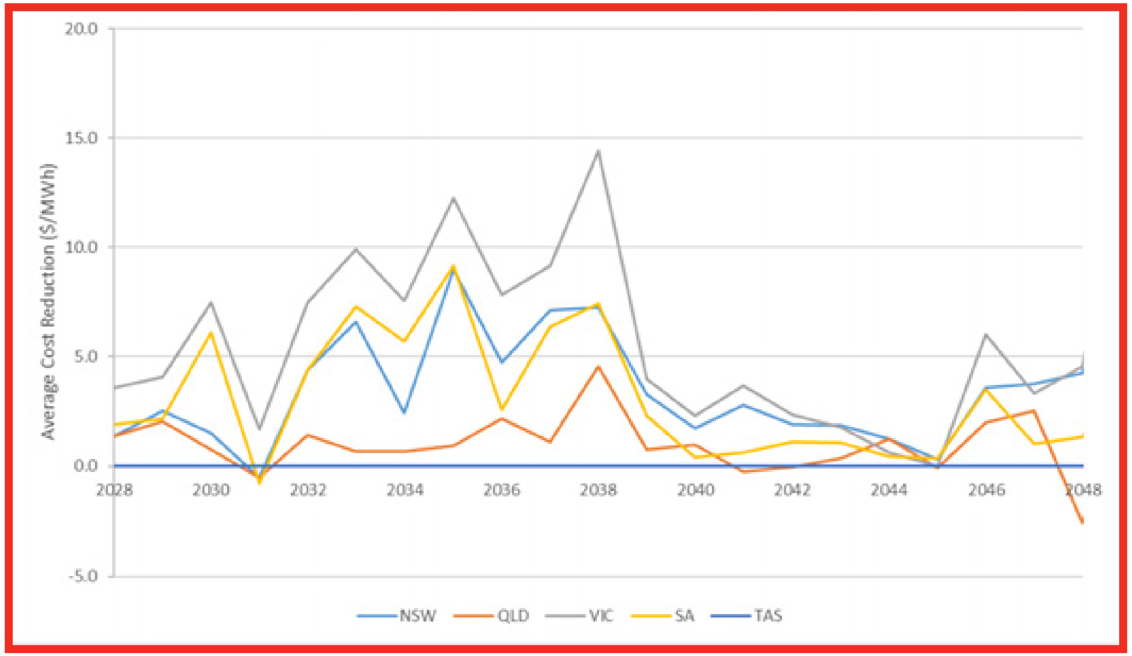


Figure 12: Forecast annual reduction of marginal energy costs (average across all scenarios)
(source: ARENA, RIT-T Assessment, 2019)

net benefit of the project to consumers in the NEM. This analysis estimated an overall benefit of $1.67 billion across the NEM with Victorian consumers being the greatest beneficiaries over the next 20 years. The analysis suggests that Tasmanian prices will be unaffected reflecting the Tasmanian Government commitment that prices in Tasmania will not increase as a result of Marinus Link and supporting transmission. However, as we have noted, this commitment is only sustainable if Marinus reduces the underlying cost of generation and transmission.

Increased interconnection, arbitrage and possible benefits for Tasmanian electricity consumers

Assuming a fair cost allocation model is established, proponents argue that Marinus Link will deliver lower electricity prices in Tasmania and improve energy security that would otherwise be the case. This is because increased interconnection will enable Hydro Tasmania to sell more firming capacity into the NEM at a premium price during lulls in wind and solar generation while Tasmanian consumers will be able to access more low cost wind and solar energy when it is available. In short, greater interconnection will allow Hydro Tasmania to sell more electricity in the NEM when and where it is most valuable which will deliver a financial return to Tasmanian taxpayers and consumers. Finally, increased integration should see the fixed costs of maintaining Tasmania's electricity infrastructure spread over a larger customer base reducing long term cost pressures.

Increased interconnection, combined with guidelines in relation to minimum hydro storage levels, will also improve energy security in Tasmania given the increased capacity to import electricity via the Marinus Link. This is an important consideration given the potential impact of climate change on rainfall in Tasmania and its implications for hydro storages.

A fair price for energy?

There is a growing debate about energy justice and the need to provide energy at a 'fair' price which balances the cost of supply, environmental impacts and a consumer's ability to pay. As we have noted, Aurora Energy has introduced a range of strategies to support low-income consumers to access affordable electricity but there is a case to develop a more comprehensive approach to energy justice. One option is to allocate a percentage of energy business profits to additional concession or customer support schemes or to fund energy efficiency measures in the homes of low-income consumers. Smart-meters and real time data on household energy use and costs may enable some consumers to monitor and manage energy costs although evidence from Victorian suggests the benefits are limited and smart-meters enabled easier disconnection. Perhaps the greatest beneficiaries of smart-meter systems are households with home-use solar panels, batteries and personal electric vehicles rather than the most needy energy consumers.

Recommendation

13. Conduct further independent analysis and facilitate public discussion about the impact of Marinus Link on Tasmanian electricity prices for a range of likely scenarios.

Experts at the University of Tasmania include:

- Professor Jason Byrne
- Dr Phillipa Watson

2.2 Digitalisation, smart-meters and grids

There is a growing emphasis on digitalisation of the energy sector, including through mandatory installation of advanced digital meters in all households, public access to data, real time information on energy supply including from small scale generation and storage from fixed and vehicle-based batteries. These elements will be key features of advanced renewable systems and complement a number of other energy futures such as community energy hubs as they would allow the main electricity network or micro-grids to run efficiently. As this technology becomes more established in Tasmania's electricity system future network-based demand for energy and associated generation and transmission and distribution infrastructure may decline. Even in the event that demand for network-sourced energy continues to grow smart-meters and grids will allow consumers and network operators alike to use and deliver energy more efficiently.

Care must be taken to ensure that consumers are informed and understand the costs and

Text box 13 Case study - CONSORT - Bruny Island Battery Trial
http://brunybatterytrial.org/

The CONSORT Bruny Island Trial was a collaboration between The University of Tasmania, ANU and The University of Sydney, TasNetworks and Reposit Power which was funded by ARENA. The trial utilised solar and battery technology to assess how batteries can be used by private residences to provide their energy whilst simultaneously used to support the grid. Located on Bruny Island, which commonly utilises a diesel generator to back-up the grid, the project not only addressed the potential for Bruny Island to be less reliant on diesel generators, but the potential for such technology to support other grids. Seeking to address this knowledge gap, the project looked at the complex algorithms underpinning this technology and use of household energy production, pricing dimensions of network support and household responses to the new technology. The project allowed a reduction in diesel use by one third with only 34 battery systems installed. A key finding for batteries supporting the grid was that a good forecasting of load in the immediate future enabled greater network support, reducing over dispatch or under dispatch. It also demonstrated how households are key collaborators in the design and operation of distributed energy systems. The project highlighted the potential for household energy production systems to assist in stabilising grids by offering available energy in periods of high demand, whilst simultaneously enabling households to benefit from their own energy production.

implications of digitisation and mandatory smart-meters as well as the benefits. A top-down mandatory approach to smart-meters must have a strong community engagement component, particularly for low-income households that may not have always had positive experiences with smart-meters.

Micro-grids, from large- to small-scale, add to the diversification of solutions to issues of energy security not only for those within these grids, but for the wider system too. Tasmania can look to the positive experiences of many Victorian micro-grids within strata title developments. Public acceptance of these micro-grids has been high, with residents in control of using batteries or not and able to trade energy peer-to-peer with fellow residents. In the Victorian town of Yackandandah the community is building three micro-grid networks in an effort to become 100 per cent renewable. The micro-grid trial features 14 houses set up with solar panels and subsidised batteries. Residents are happy knowing that the power they are using comes from solar panels on their own rooves or else from those of their neighbours: "It means that you'll be purchasing your energy at a competitive rate, knowing it's just coming from your neighbour's roof, rather than from some generator far, far away."[23]

Recommendations

14. Promote the further rollout of smart metering systems based on learnings from the national and Tasmanian experiences to date and continue micro-grid trials.
15. Consider the data infrastructure required for Tasmania as digital meters become more widespread, including privacy issues and ways to encourage start-up companies and business opportunities based on the data collected.

Experts at the University of Tasmania include:

- Professor Heather Lovell

2.3 On-farm electricity generation and agricultural emissions

Agriculture is one of Tasmania's fastest growing and most productive sectors and promoting on-farm generation could reduce energy costs for farmers and make a contribution to the TRET. As with the wider Tasmanian economy, increasing on-farm renewable energy generation and using low emissions fuels can serve as a foundation for reducing net emissions across Tasmanian agriculture more generally. This will be a critical challenge for Tasmania's growing farming sector given it currently contributes 28% of state-wide emissions in an average year. In drought years, emissions from the sector are greater due to loss of soil carbon and surface vegetation although there is also significant potential to expand land-based carbon sequestration to offset other sources of emission across the Tasmanian economy.

There are multiple benefits for Tasmanian farmers from on-farm electricity. First, on-farm generation may help reduce high energy costs. Were these costs to increase greatly, it may limit the further expansion of irrigation in the Midlands and Northern Tasmania in line with the ambitions of the State Government's AgriVision 2050. On-farm generation will help reduce farmers exposure to spot-price volatility and may enable dairy farmers to avoid paying a higher price for electricity in the evenings when demand is high. Barriers to expanding on-farm generation include uncertainty about the current and projected on-farm generation in Tasmania and regulatory and barriers and cost allocation issues associated with establishing on-farm, behind the meter grids and storage. As a principle, the cost of on-farm generation, transmission and connection should be borne by the land owner, as is already largely the case under Tasmanian irrigation schemes.

Affordable, secure and environmentally sustainable energy along different segments of the agri-food chain will be necessary to underpin future growth in the sector. Energy access provided by on-farm energy systems have the potential to enhance agricultural profitability, increase resilience to climate variability and eventually contribute to greater food productivity. Tasmania can become a national leader in the installation and generation of renewable energy on farm which, when combined with a broader emissions reduction strategy for the sector, could ensure that farmers can leverage Tasmania's emerging low-carbon brand.

Recommendations

16. Promote the development of farm-based micro-grids to generate, store or export renewable energy while upholding the principle that the cost of on-farm generation, transmission and connection should be borne by the land owner.

Experts on electricity at the University of Tasmania include:

- Associate Professor Matthew Harrison

2.4 Energy efficiency

Energy efficiency measures provide cost-effective, immediate and practical ways to reduce GHG emissions. Improving energy efficiency should be a priority for the *TREAP*.[24] Furthermore, there is compelling evidence that well designed energy efficiency programs are among the most effective strategies for reducing energy use and costs and enhancing health and wellbeing. For example, a recent UTAS study found that improving energy efficiency in social housing had a social return on investment of $3.51 for every dollar spent.[25] Other studies have shown that that there are strong correlations between good insulation and good health, with better insulation resulting in decreased rates of asthma and respiratory problems, a decrease in pharmacy costs and GP visits and economic benefits to the public health system.[26]

Energy efficiency programs should focus on social and community housing, and private rental properties as well as low income owner occupier households. The Get Smart Bill Program that operated in Greater Hobart as part of the Federal Governments' Low-Income Energy Efficiency Program, proved a success and could be built on. Energy efficiency is also very important and a sound policy response to help with COVID-19 recovery (eg. creating jobs, keeping people warmer at home, and saving month on bills and reducing stress). More specific policy measures could include mandatory disclosure of energy ratings on sale of properties. Mandatory disclosure could drive market signals in the right direction thereby rewarding those that invest in energy efficiencies in their homes. Mainland jurisdictions are developing this policy area. Further mechanisms could include landlord tax incentives for implementing energy saving measures; additional funding for targeted retrofits for the worst performing and highest risk social housing stock, and provision of microfinance to help people invest in energy efficient appliances and home upgrades.[27] More widespread policy responses can maximize emission reductions. For example, the current required energy efficiency rating in Tasmania is six stars, although the cost difference to produce an energy efficiency rating of ten is minimal. Research indicates that Tasmania's rating system could be improved. The Government could reinstitute the Renewable Energy Loan Scheme.

Lastly, there are many technological opportunities to promote efficiencies in the industrial sector. Energy efficiency options here include high temperature waste gases being captured to generate electricity; reducing external electricity demand and utilising the GHG emissions that would otherwise be sent into the atmosphere. Co-generation could also be further realised in Tasmania, such as the Energy Recovery Unit at Bell Bay – a significant investment which has increased efficiency, reduces costs and environmental emissions over the long-term.[28]

Recommendation

17. Continue energy efficiency programs established and investigate expanding programs as a part of COVID-19 recovery efforts including re-establishing those that were previously successful.

Experts at the University of Tasmania include:

- Professor Heather Lovell
- Dr Phillipa Watson
- Veryan Hann

Priority 3: Growing the economy, providing regional jobs and delivering long-term community benefits

Priority 3 focuses on the considerable indirect and broader community benefits which expanding the renewable energy sector could potentially deliver in terms of employment, regional development and establishing Tasmania as a leader in the transition to a low-carbon economy.

3.1 Community engagement and benefit sharing

Evidence from successful, large-scale renewable energy projects internationally highlights the view that genuine, deep and ongoing engagement and collaboration with the Tasmanian community will be essential for successful realisation of the *TREAP*.

Community engagement

Just as the needs and aspirations of communities vary, so too do the most appropriate and effective models of community engagement for large energy projects. There is however a consensus among experts that effective community engagement involves more than traditional 'top down' consultation where government or developers provide information about a proposal and seek limited input into minor design features. We should aspire to a collaborative approach to development projects which is consistent with, and contributes to identified community needs and aspirations.

A collaborative model of engagement should be based on a detailed understanding of the needs and aspirations of communities, both those directly involved in a project ('local' community) and Tasmania as a whole, and how a project might contribute to these ambitions. Authentic and transparent engagement also requires frank and honest discussions about project risks and how they can be managed, as well as the contribution a development project can feasibly make to a community. A good deal of engagement has already been undertaken by the energy industry and government in relation to the *TREAP* but these efforts could be better coordinated (see sub-section 1.6) and formalised to ensure that projects do deliver relevant, long-term benefits to host communities and Tasmania as a whole.

The need to explain how renewable energy developments can deliver tangible and relevant benefits to communities, both local and across Tasmania as a whole, can be addressed through carefully designed thematic consultation. Consultation on social indicators and analysis such as community place value mapping and social returns on investment should be key elements of the *TREAP*. Analysis currently being undertaken by the State Government on the type, location, and longevity of

Text box 14: The ACT Government's guiding principles for community engagement for renewable energy projects

- Mutual benefit
- Mutual respect
- Relationship building
- Authenticity
- Appropriateness
- Ongoing engagement
- Transparency and responsiveness[29]

Text box 15: Which community?

Community consultation must be inclusive, including as many individuals and community groups and leaders as possible. In order to do this it is important to define and identify relevant communities.

Who to engage?

The more exclusive the development and decision-making process, the less socially viable it becomes. Engagement should be open and inclusive rather than limited to formal community and business leaders.

Which scale?

It is also important to engage with and differentiate between 'local' communities, who are involved with and host developments (although defining 'local' challenging with long distance transmission infrastructure) and Tasmania as a whole. The costs and benefits of renewable energy projects and the associated engagement strategy vary depending on the level of community concerned.

Engagement with the Tasmanian Aboriginal community

Given the potential impacts of renewable energy projects 'on country' and respecting that Lutruwita is Aboriginal land, engagement and collaboration with the Tasmanian Aboriginal community is crucial.

Ultimately broad-based community support comes through consultation and interaction, which must be an iterative and ongoing process for the duration of a project.

employment associated with proposed renewable developments and the training required to secure energy-related jobs will be critically important. Environmental and landscape impacts including the likely number and location of energy developments in designated Renewable Energy Zones and associated transmission infrastructure required to meet the TRET target of an additional 2000MW of new renewable energy generation should be prepared and discussed with communities, as should considerations and assessment of bushfire and other climate-related risks.

Analysis of several models of community engagement and benefit sharing demonstrate how community engagement and benefit sharing combine to influence the community support for large-scale energy projects (see Figure 13).

Figure 13 illustrates how community engagement options can range from informing the community of a proposed development (weak) through to empowering the community (strong). Similarly, benefit sharing can be scaled from (weak) offering unpaid jobs in a project through to with high levels of local employment and possibly co-ownership (acknowledging associated risks).

In terms of the vertical axis, emphasis can be placed on proponents approaching communities to pitch investment opportunities (top-down) or communities approaching proponents (bottom-up). Successful projects usually involve a combination of these two processes. For developments of the scale proposed in the *TREAP* impartial intermediaries – independent of government, industry and community – can play a crucial role in bringing companies and communities together.

Governments can play a hands-off (ie. do nothing) or hands-on (ie. legislative) role. Governments can offer an incentive for companies to choose stronger community engagement and benefits sharing options (eg Victorian model). Government incentives should aim to encourage 'Green Zone' collaborations between companies and communities.

It is important to acknowledge that there will be trade-offs associated with any proposed large-scale renewable energy project and that there are limits to the extent of community control and associated benefits large scale projects can deliver. Maximising these returns increases the prospects of establishing broad-based community support.

Benefit sharing

Community support for large-scale energy projects is strongest when they deliver tangible and relevant benefits to local

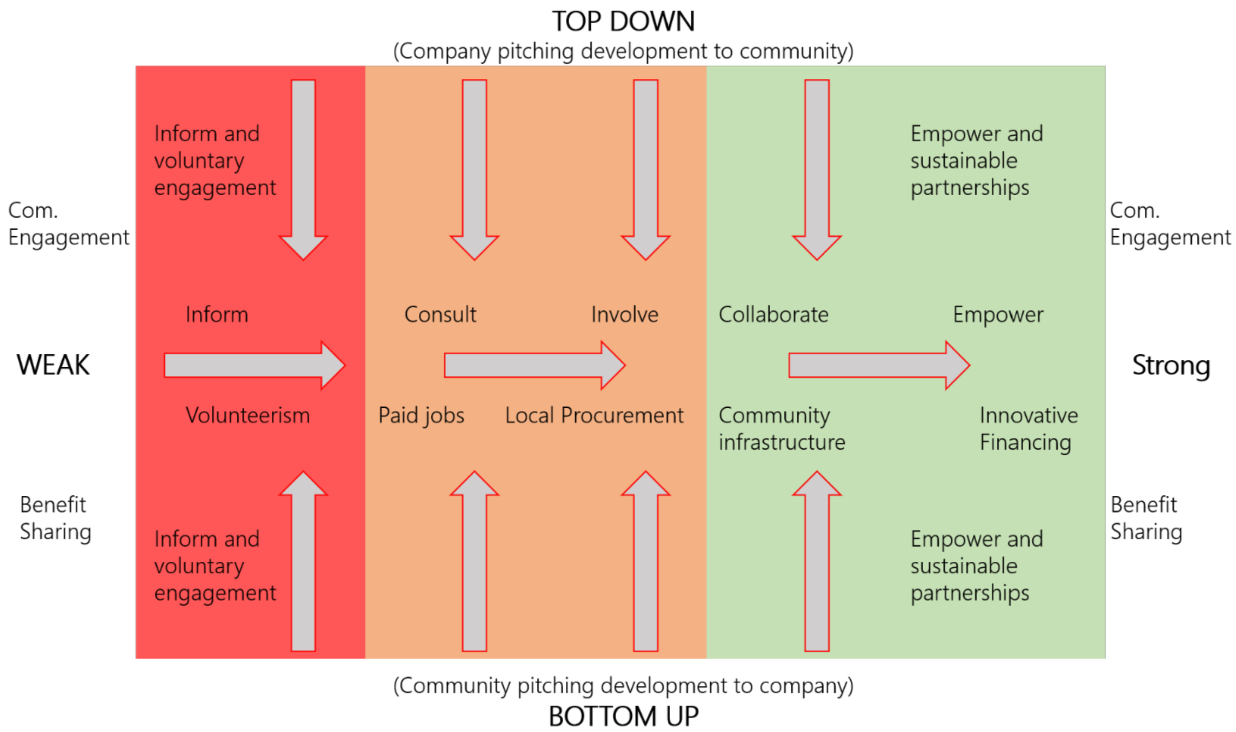


Figure 13: Community engagement and benefit sharing matrix

Text box 16: Innovative and leading jursidiction policies and models worth investigating

Victorian Government - Community Engagement and Benefit Sharing in Renewable Energy Development

Clean Energy Council (Australia) - Benefit Sharing for Renewable Energy Projects

Scottish Government - Shared Ownership of Onshore Renewable Energy Developments

European Union model - Community Power

United Kingdom model - Community Energy Strategy

communities and a central objective of this submission is to outline a range of possible strategies to maximise these potential community benefits. While the *TREAP* rightly identifies the direct economic and energy system benefits from expanding renewable energy generation in Tasmania, more could be done to promote the long-term, indirect benefits for both local communities and Tasmania as whole.

Potential benefits to Tasmanian communities associated with the *TREAP* are as follows:

1. Direct and indirect employment during the construction phase (sub-section 3.3)
2. Enhance skills and training opportunities for Tasmanians (sub-section 3.3)
3. Increase investment in social and physical infrastructure in regional Tasmania + supporting population growth (see below)
4. Reduce the cost and increase reliability of electricity in Tasmania (sub-section 2.1)
5. Increase the size and profitability (and return to taxpayers) of the Tasmanian energy sector (see below)
6. Increase the size of Tasmania's contribution to national emissions reduction
7. Promote the development of emerging low-carbon industries (sub-section 3.5)
8. Enhance Tasmania's brand as an innovative low-carbon economy (sub-section 3.4)

Maximising local procurement is another important strategy for maximising the community benefits from renewable energy projects. While the majority of specialist components for renewable energy projects are sourced internationally, as is construction and installation equipment, many inputs can and should be sourced locally. All state-owned energy companies have established local procurement policies and the *Interim Report* of the Premier's Economic and Social Recovery Advisory Council (July 2020) has recommended a 'if not, why not' approach for to using local suppliers. Given the scale of investment envisaged under the *TREAP* there should be a sector-wide assessment of likely procurement needs so local suppliers and contractors are better able to anticipate and meet expected demand.

A more formal approach would be to subject renewable energy projects to local content requirements (LCRs). This may involve, for example, that 60% of the equipment and 90% of the services needed would need to be sourced locally or on-Island in order for the project to receive approval or funding. Such an approach would have to be accompanied by an assessment of local provider's capacity to supply required good and services.

The *TREAP* and its potential contribution to reducing carbon in Tasmania could make a long-term contribution to community development in some of the most disadvantaged regions of the state. Developing a shared vision for developing innovative and sustainable industries which draw on our strengths and assets as a community could deliver significant term-benefits for Tasmania.

Energy sector profits and dividends to taxpayers

Tasmania's three key energy companies are state owned (although new wind projects have been developed by private operators) allowing the Tasmanian Government and wider community can secure a financial return from the sector. Our analysis (Figure 14 below), finds that state-owned energy companies have contributed over $150 million per annum to the Tasmanian government in dividends and tax equivalents in four of the last five years and will contribute over 7% of own source revenue over the forward estimates. The combined profitability of the three businesses peaked when a national price on carbon was in place between 2012 and 2014.

This financial contribution to the Tasmanian Government is significant and proportionally larger than in any other Australian jurisdiction. Given the size of this contribution it will be important to consider the implications of the

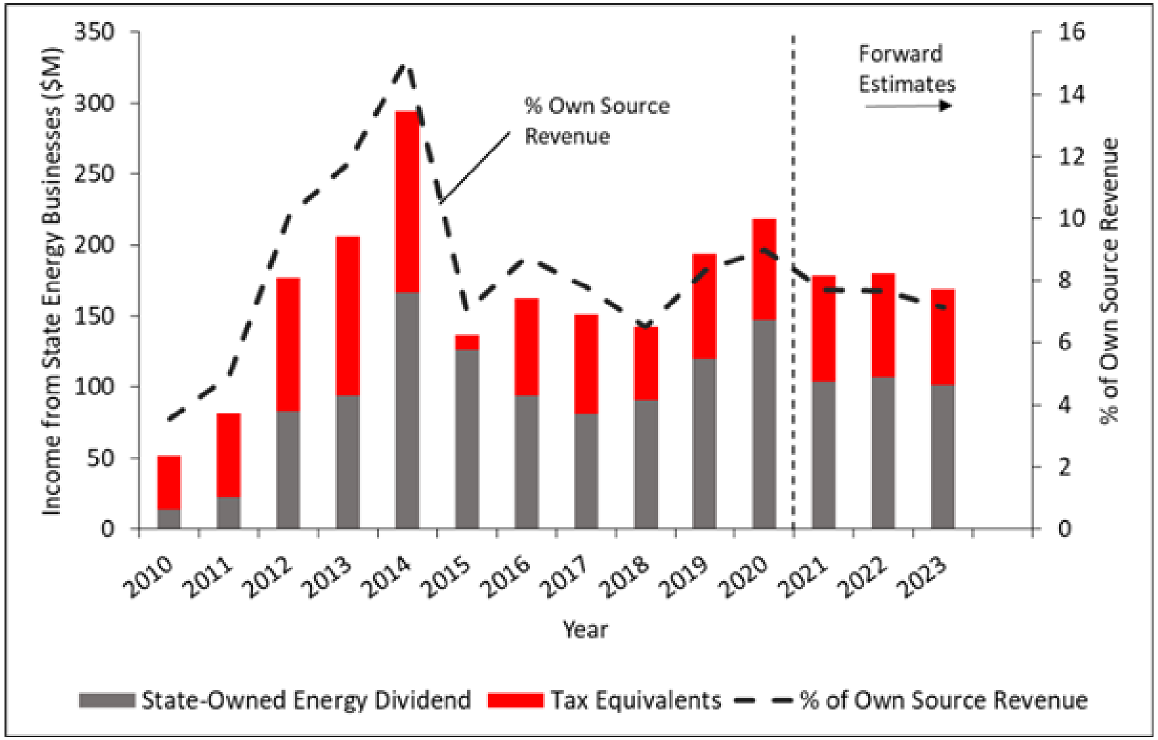


Figure 14: Return for taxpayers from state-owned emergy companies

(source: Tasmanian Budget Papers)

TREAP for the return to government from these state-owned businesses. Specific issues to consider include:

- Will price caps legislated under the *Tasmanian First Energy Policy* result in reduced profitability and return to government?
- Given current levels of debt, will Tasmanian energy companies be able to sustain dividends as they invest in significant projects such as BoN and Marinus?
- If Marinus does not proceed (section 1.2) will Tasmanian energy companies be able to sustain dividends in a smaller market with ageing infrastructure?

Community development funds and partnership models

One approach to benefit sharing is to establish a regime whereby local communities have a financial stake in and/or receive a financial return from renewable energy projects. The aim here is to provide an on-going return to local communities during the operational phase of renewable energy projects when there is little direct employment. A shared equity approach allows local communities to invest in local projects creating a shared commitment to and return (and associated risk) from projects potentially enhancing community support for renewable energy developments.[30] This approach has been successful in small-scale renewable developments (typically less than 1MW) but is less suited to investment of the scale outlined in the *TREAP*.[31]

A more appropriate model for Tasmania might be for a negotiated community development 'fee', based on project costs, to be invested in a perpetual community development fund with the aim of providing a direct, long-term return to local communities who host renewable energy projects. A proportion of dividends and tax equivalents from State-owned energy companies could also be paid into such a fund. The proposed community development fund should be managed at State-level with appropriate community representation and used to fund community infrastructure, development projects or perhaps small-scale renewable energy projects. Managing this fund and coordinating community engagement could be a function of Renewables Tasmania.

Recommendations

18. Develop a coordinated, sector-wide approach to community engagement and collaboration based on best practice principles.
19. Develop a co-created Tasmanian Aboriginal community consultation plan.
20. Establish a renewable energy community development fund.

Experts at the University of Tasmania include:

- Professor Jason Byrne
- Dr Phillipa Watson
- Veryan Hann

3.2 Renewable infrastructure planning and coordination

The Renewable Energy Coordination Framework, which is expected to fall under the remit of Renewables Tasmania (see sub-section 1.6), will coordinate and support renewable energy development and transmission across Tasmania's three Renewable Energy Zones (REZs) (the North West, North East, and Midlands).[32]

According to the *TREAP*, the Framework will seek to maximise community engagement and benefit sharing outcomes as well as address land-use and planning issues. Deep and ongoing community consultation is required in each designated REZ and along transmission infrastructure corridors. Community support for renewable energy projects is dependent on the extent to which consultation and decision-making involves communities as well as the concerns of environmental and cultural impacts.

A priority objective for the Renewable Energy Coordination Framework will be to engage with the industry and communities to identify REZs and associated transmission corridors required to support the additional 2000 MW of renewable generation likely to be required to meet the TRET. These zones should be identified with reference to their renewable energy potential, their proximity to existing transmission infrastructure and impact on environmental, indigenous heritage and cultural and wider landscape values. Identifying the likely scale and location of renewable energy infrastructure required to the *TREAP* will be important for securing community support.

Options to enhance collaboration between energy planning and the broader planning system include establishing a joint planning schedule, including the consideration of broader landscape values in renewable energy planning, conducting community impact assessments, understanding and engaging with landscape values, and ensuring that agreed community concerns cannot be overturned during the infrastructure roll-out. Energy planning and the broader planning systems must also be integrated and align with the community engagement and benefit sharing process (see sub-section 3.1).

The risks associated with fast tracking energy planning approval processes must be communicated and understood by specialist energy planners, general planning professionals and the wider community.

Tasmania can lead the nation not just in renewable energy production and technology, but also in best-practice planning approaches.

Recommendations

21. Use the proposed Renewable Energy Coordination Framework to better integrate energy and land use planning to ensure planning systems are involved in all stages of a renewable energy development.

22. Work with industry and communities to identify specific Renewable Energy Zones and associated transmission infrastructure required to deliver the estimated 2000MW of new wind generation required under the Tasmanian Renewable Energy Target by 2040.

3.3 Employment from design, construction, operation and beyond

Marinus Link is expected to deliver a total of 1400 direct and indirect jobs in Tasmania during peak construction and unlock an additional 2300 construction jobs from broader renewable energy projects (Table 5). Total direct employment from *TREAP*-related projects based on published industry sources is estimated at approximately 4000 jobs during peak construction in about 2030 with about 1500, mostly hydrogen-related, ongoing operation positions by the mid-2030s expected.

Renewable energy projects are increasingly capital rather than labour intensive (Marinus Link is expected to deliver 1 job per $2 million capex). However, the scale of the proposed investment is such that the *TREAP* will deliver significant employment opportunities in Tasmania during the extended construction phase. Preliminary estimates of the skills required during the construction phase of renewable energy projects are provided below (Figure 15) while indirect jobs will be created in a much wider range of

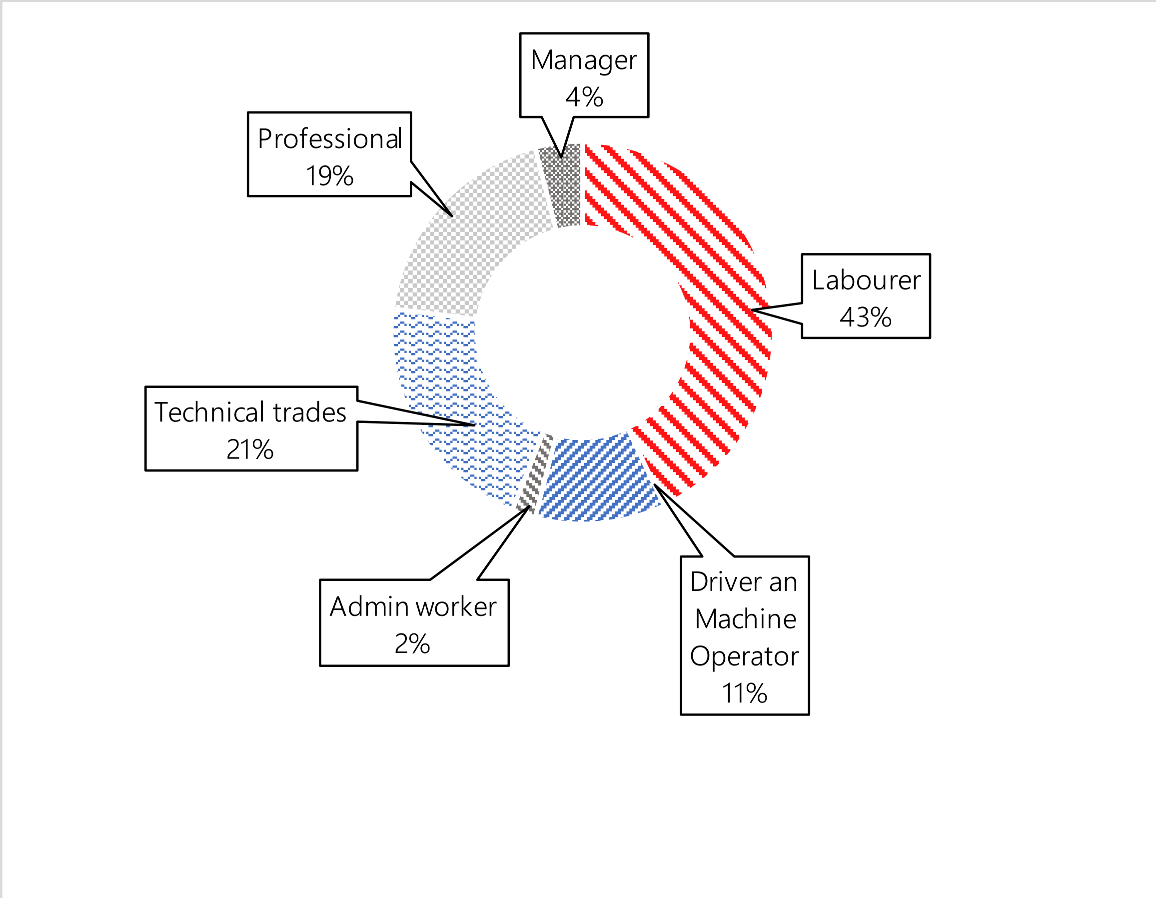


Figure 15: Estimate of *TREAP*-related employment by occupation

Table 5: Preliminary estimates of *TREAP*-related employment

Project	Direct employment during construction	Indirect employment during construction	Ongoing employment
Marinus Link	300	1,100	70
Battery of the Nation	400	1,200	400
New generation renewable projects	2,300	9,200	125
Renewable hydrogen	1,000	4,000	900
Total employment	**4,000**	**15,500**	**1,495**

occupations.

Maximising the employment return on investment for Tasmania

It will be important to develop an energy sector workforce development and training program strategy to maximise local employment and achieve the broadest social and economic returns from *TREAP*-related projects. The aim should be to identify future energy sector workforce needs and provide appropriate training opportunities and career pathways as soon as possible to maximise the number of Tasmanians who have the necessary skills to contribute to the design and delivery of renewable energy projects. In the absence of a strategic training program it is likely that projects will have to secure skilled labour from interstate or abroad, reducing the longer-term benefits for Tasmania. Shortages of skilled labour, either due to travel restrictions or competition from other large-scale energy projects, represent a significant risk to *TREAP* projects.

A focus on identifying future employment needs and providing industry-relevant training to enable Tasmanians to secure work in emerging industries is a central element of the place-based strategic growth strategy being pursued by the Tasmanian Government.

Training and skills

Tasmania's renewable energy transformation will draw upon skills and training from across the Tasmanian community. Small and medium business operators, high-school and vocational training graduates, and University graduates will each have a part to play if we are to double renewable energy production by 2040.

In May this year the State Government established the Tasmanian Energy and Infrastructure Workforce Advisory Committee, with membership from both industry peak bodies, State-owned energy companies, the private sector and education providers (including the University of Tasmania), which will advise the State Government about priorities and investment in training. While it is acknowledged that there is much opportunity to grow a "high value, highly skilled labour force", having a detailed level of analysis of future workforce needs is critical to mapping need against supply. The work of the Committee will also focus on the implementation of the $16 million investment under the project agreement for Energising Tasmania, which is intended to provide investment to develop a skilled workforce in the renewable energy and related sectors.

To date, most emphasis has been placed on the services and 'hard' skills required to physically build and operate Tasmania's renewable energy infrastructure.[8] Missing in the discussion is the role that humanities and social science graduates can play, beyond generic managers and administrators. Fundamentally the *TREAP* will have a profound and complex impact on the social and political environment. Social science graduates (and professionals) develop and use methods to analyse, unravel, understand and address these complexities. Graduates who are trained to be sensitive to the social context working alongside technology experts, are critical for better decision-making and project outcomes, and should not be neglected in any workforce development planning.

> "If technology and science are to contribute to sustainable human development, it needs to be done in deep conversation about what we value, what it is to be human, what sort of society we want to become and how we embody those values in laws and social structures."
>
> University of Tasmania Vice Chancellor, Professor Rufus Black

Recommendations

23. Continue the Energising Tasmania program and the work of the Tasmanian Energy and Infrastructure Workforce Advisory Committee as a priority.
24. Ensure the Energising Tasmania initiative includes tertiary education qualifications in the industry workforce plan.
25. Promote the employment dividends and broader training and career opportunities that stem from expanding the renewable energy sector in Tasmania.

3.4 Promoting our renewable, low-carbon brand

Doubling renewable energy by 2040 and becoming a world leader in renewable energy production and technology can significantly enhance Tasmania's 'place brand' - an authentic and widely-held vision of our core values and aspirations which can be used to build a more prosperous, inclusive and sustainable community both in Tasmania and beyond.

Community benefits of place branding

Building a shared vision for Tasmania's renewable energy and low emissions future is an ambitious project, but one which could deliver significant community and economic benefits. The challenge is to create a connection between the high-level policy objectives and commercial imperatives central to the *TREAP* and the aspirations and concerns of members of the Tasmanian community. Detailed research conducted by Brand Tasmania with a broad cross-section of Tasmanians identified a strong alignment between the aims of the *TREAP* and widely held Tasmanian values including being innovative and harnessing the power of the land in respectful and sustainable ways. This research also identified a strong island culture, of coping with adversity and developing strong self-sufficient communities. While many Tasmanians opposed the flooding of Lake Pedder and the proposal to dam the Franklin Riven, 'The Hydro' is widely viewed as an organisation that has made a significant contribution to shaping contemporary Tasmania.

With careful and considered engagement and collaboration there is an opportunity to foster grass roots community support for a renewable, low-emissions Tasmania which would greatly enhance the long-term social and political viability of the *TREAP* agenda. However, this will require a strong commitment to supporting

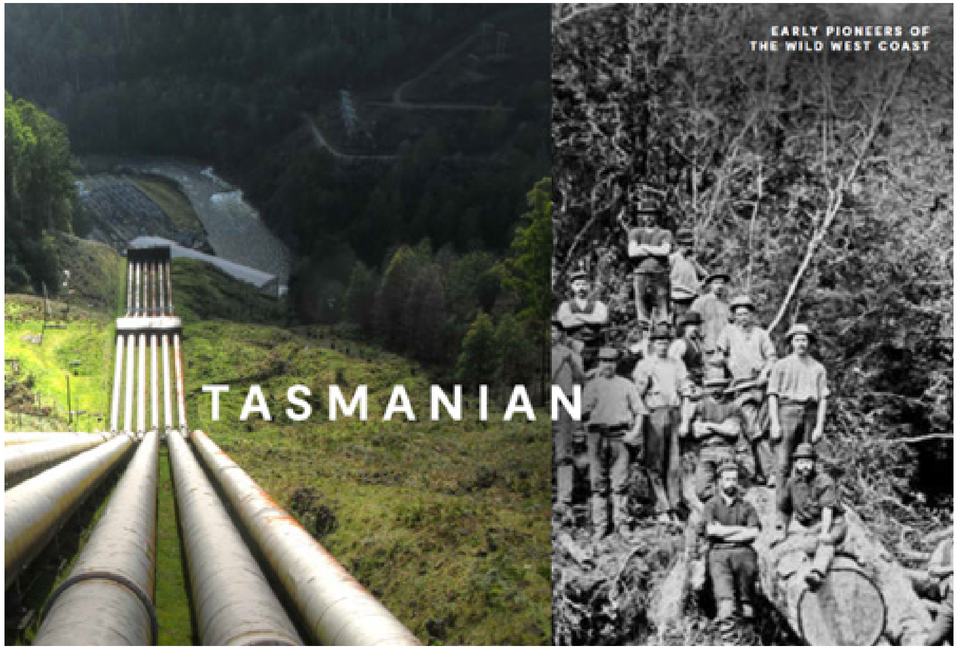


Figure 16: Hydro's contribution is widely recognised
(source, Brand Tasmania)

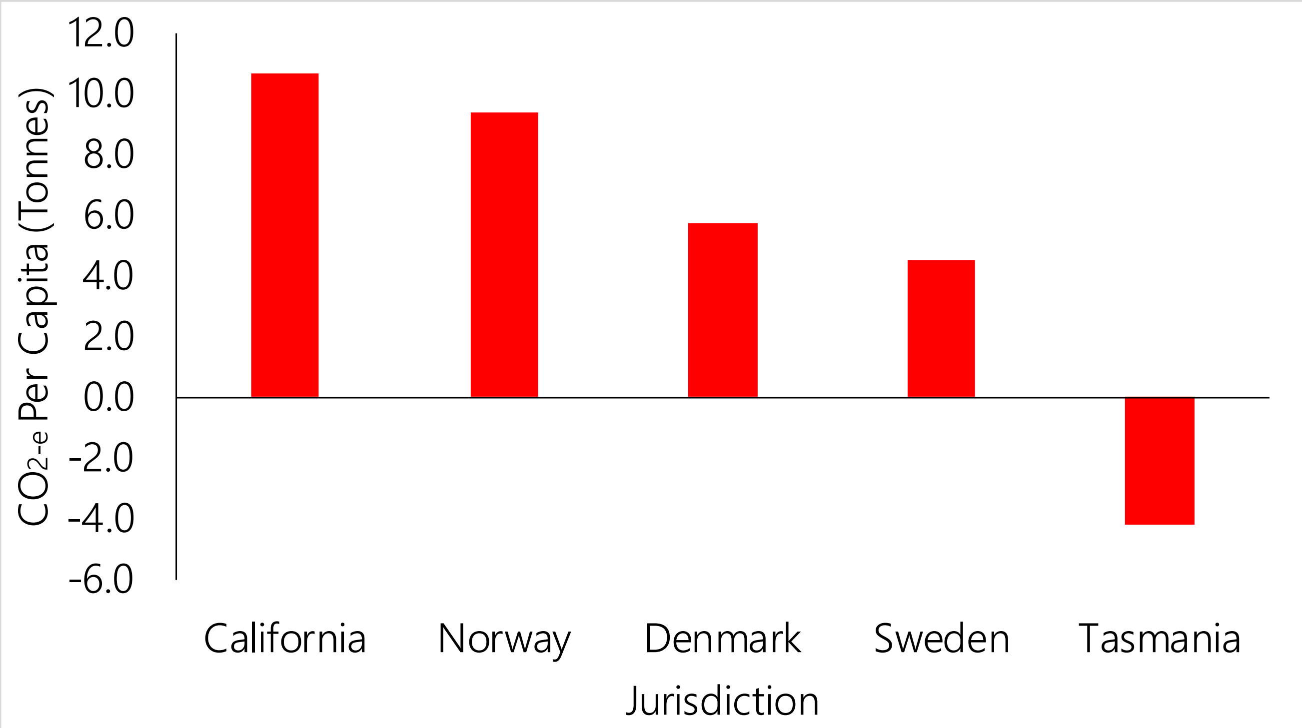


Figure 17: Tasmania is globally competitive in net emissions per capita
(source: national emissions inventory, ourworldindata)

community participation and engagement including grass roots programs to support 'being renewable' in a wide range of ways which are of relevance to Tasmanians and their communities. As noted in sub-section 3.3, building employment in renewable and low-carbon industries across a wide range of communities and occupations will also help build support for the brand by delivering tangible benefits to a broad cross-section of Tasmanians whether they be the indigenous communities, long-term residents or new arrivals.

Economic benefits of place branding

Place branding, or the ability to develop a credible and distinctive story about who we are, what we stand for, and what we can offer the wider world, can be a powerful marketing tool which can deliver significant economic and social benefits.

Tasmania already has an international reputation as a state which can offer quality wilderness and cultural experiences and an enviable lifestyle, a reputation which in recent years has underpinned our strong

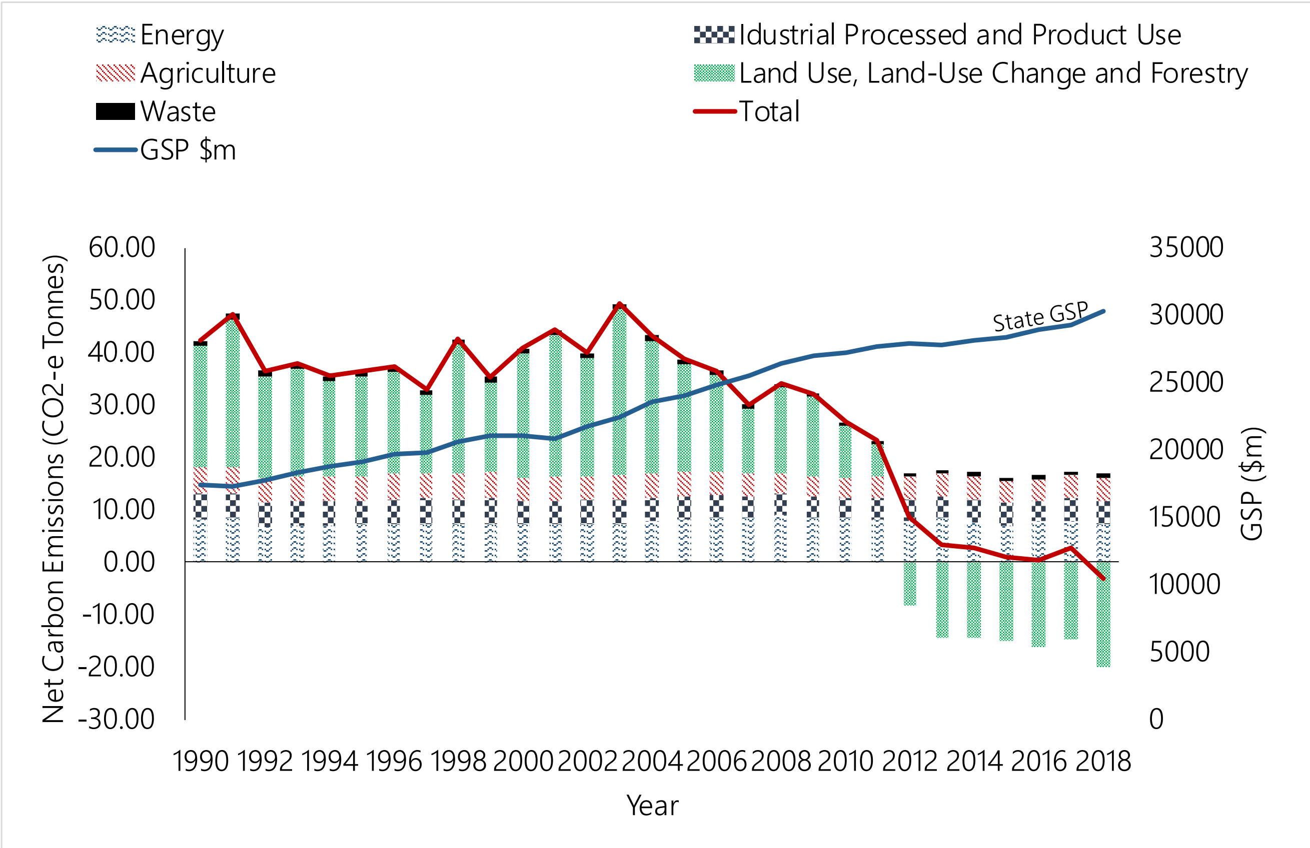


Figure 18: Tasmanian emissions profile and Gross State Product (GSP)

(source data: Australia Emissions Inventory and ABS)

tourism and export performance and migration-led population growth. The *TREAP* has the potential to build on this brand by establishing Tasmania as a centre for renewable energy innovation and an island which leads the world in reducing carbon emissions. Tasmania can be an example of how to live and work more ethically and sustainably.

Establishing this brand would enhance Tasmania's reputation as a:

- place to visit and to live whether for tourism, education or for longer-term migration
- producer and supplier of sustainable, low-carbon products
- place to invest and innovate in renewable energy and low-emissions technologies, systems and products.

Achieving a credible and effective brand as a leader in renewable energy production and emissions reduction requires more than marketing and acquiring formal recognition and certification, it demands

Text box 17: Examples of emissions-focused place-branding

Copenhagen has an international reputation as a green and ambitious city with innovative sustainability solutions, which is a fundamental part of its place-brand. The 'green sector' in Copenhagen is growing, with employment, turnover and exports rising over recent years, as well as the attraction of new business opportunities and a thriving tourism industry attracted to the city for its innovative and environmentally conscious culture. In this respect, Copenhagen has unabashedly harnessed itself to a low-emissions future and sees this action as a 'growth locomotive' (Copenhagen Climate Plan 2025).

The Canadian province of **British Columbia** has a similar energy system to Tasmania and is positioning itself as a global player in green energy. BC's electricity supply mix is dominated by hydro-electric at 84%, followed by biomass, natural gas, wind, and oil. The province launched 'cleanBC' in 2018, a government initiative to support BC's pathway towards a sustainable future with renewable energy at its centre. A central element of the cleanBC vision is to provide a 'blueprint' to grow the economy, encouraging BC companies to be 'first movers' and 'capture a significant share of the growing clean energy and low-carbon products market'. This includes positioning BC as a destination for new investment and industry looking to meet the growing demand for low-carbon products, services and technologies; advancing innovation, supporting economic opportunities for indigenous peoples and communities and 'enhancing and marketing a clean BC brand internationally'. (cleanBC 2018 Climate Strategy)

deep engagement from across the Tasmanian community and commitment to changing practices over time.

Tasmania as a zero-emission tourist destination

As international tourism slowly recovers from the COVID-19 pandemic it is likely that there will be greater demand for ethical and sustainable travel creating significant opportunities for carbon neutral destinations and experiences. Tasmania, based on 2018 greenhouse gas emissions data, is one of the few non-urban jurisdictions globally which has reached net zero emissions (Figure 17).

This world leading performance is largely due to a combination of renewable electricity generation and significant land-use offsets as a result of increasing forest reserves since 2012 (see Figure 18).

> "In order to develop a credible and sustainable zero emissions status it will also be necessary to reduce emission across the economy."

Not only will this reduce Tasmania's dependence on land-use credits, but in the case of tourism, becoming a leader in the uptake of zero emissions vehicles for example, adds to the authenticity of claiming to be at the forefront of emissions reduction technologies in a way that securing abstract carbon offsets cannot.

3.5 Renewable energy and low-carbon innovation

In order to deliver long-term employment outcomes and to capitalise on and build Tasmania's brand as an innovative, low-emissions economy it will be necessary to establish and grow new industries around our reliable renewable energy resources. At the same time, it will also be important to support existing sectors, such as agriculture and transport, to transition to low-emissions technologies and practices. Developing on-island uses for our renewable energy will also deliver a greater return on our energy assets and will reduce exposure to national and international energy markets.

Tasmania, as a globally competitive supplier of renewable energy, could become a hub for advanced manufacturing. As Ross Garnaut has argued, renewable energy is harder to transport than fossil fuels which will see more manufacturing and energy intensive production being located near renewable energy suppliers such as Tasmania.[33] The best approach may be to promote emissions reduction technologies in existing industries such as marine manufacturing, offshore aquaculture and minerals processing (see innovation case studies below). The proposed Renewables Tasmania could work with industry and other agencies to identify and promote low-carbon industries of the future.

The development of renewable energy and low emissions-related industries would be supported by applied research coordinated and supported by the proposed Renewable Energy Centre of Excellence which would itself generate employment and support the further expansion of Tasmanian based energy-related professional and consulting services such as those provided by Entura and other specialist consulting and advisory services.

Innovation case study 1
Domestic use of renewable hydrogen in heavy transport, heating and industrial processes

In addition to supplying export markets (sub-section 1.3) Tasmanian certified renewable hydrogen could be used in a wide range of on-island applications which would reduce Tasmania's emission profile. Hydrogen is best utilised to power vehicles that carry heavy loads and/or travel long distances and future-thinking trucking businesses in Tasmania should be encouraged to trial hydrogen power in their operations (sub-section 1.3). Hydrogen can also provide reliable power to energy intensive industries that currently use gas or coal in their production processes. Aluminium, zinc, concrete, and pulp and paper businesses could transition to renewable hydrogen, which would enhance their brand and sustainability credentials. Gas provides 7% of Tasmania's energy needs so developing and deploying hydrogen-based gas substitutes would reduce heating and industrial carbon emissions while supporting the development of Tasmania's green hydrogen industry. Tasmania also has an opportunity to produce truly green ammonia using renewable energy for use in fertiliser on-island and for export to low-carbon agricultural producers on the mainland and abroad under the label of "Tasmanian Green Hydrogen Fertiliser".

Innovation case study 2
Hosting zero-emissions data centres

Data centres underpin all online and 'cloud-based' computing activity. Physically they comprise rows and rows of computer towers. To operate, they need a lot of electricity, ideally in a cool climate given cooling is the major energy requirement, and excellent connectivity. Given COVID-19 has increased the rate of technological adoption, demand for data centres is expected to increase 300% by 2030, while the emissions they generate is coming under increasing scrutiny. Global data-companies are responding to this challenge and are increasingly seeking secure, low emissions electricity supply with good connectivity to set-up shop. Data centres are increasingly being established in regional communities given improved connectivity and lower land prices and Tasmania has an opportunity to attract data centres subject to establishing sufficient connectivity. Consideration should be given to increasing Tasmania's connectivity into national or international networks perhaps through incorporating data capacity into Marinus Link's design.

Innovation case study 3
Low emissions marine technologies and use in remote locations (Antarctica)

Tasmania has a growing maritime industries sector, is a leader in marine and Antarctic research and is an established polar gateway. There is a clear opportunity to apply renewable energy expertise and assets to drive the next wave of innovation in Tasmania's marine and Antarctic industries. Shipping, from smaller offshore vessels such as ferries and tugs through to oceangoing liners and container ships, currently use heavy fuel oil or compressed gas for their operations. These hydrocarbons are a major source of emissions, the global shipping fleet contribute ~3% of global C02 equivalent emissions annually.[34] Maritime industries are under pressure to reduce these emissions. One of the key technologies proposed to achieve this is hydrogen fuel cells. Tasmania is well placed to apply innovative hydrogen-based technology for maritime use. We have an emerging innovation cluster around renewable energy, the hydrogen industry, and deep expertise in maritime research

Table 6: Levelised Cost of Energy (LCoE) of major power generation technologies in Europe (source: BloombergNEF)

Energy source	LCoE (c€/kWh)
Onshore wind	5.8-7.6
Coal	7.2
Gas	8.5-9.4
Offshore wind	8.5-15 (6.4 by 2020 and 6 by 2025)

(AMC) and construction (Incat and Richardson Devine) to offer prospective investors. Innovative Tasmanian ferry operators such as Roche Brothers are in the early stages of developing hydrogen fuel cell options. Hydrogen may also have application in remote power systems such as on King, Flinders and Bruny Islands or Antarctic bases. If we can develop and refine low emissions remote generation systems we can export these technologies to the world.

Innovation case study 4
Floating offshore renewables for Australian utility-scale market

Harnessing energy from wind for electricity generation first started onshore. However, offshore wind farms are becoming more popular due to the higher quality of wind in the sea (less turbulence and higher capacity factor), the scarcity of onshore locations and lower construction costs. In 1991 Denmark developed its first offshore wind farm in Vindeby and since then offshore wind has grown enormously - at the end of 2017 global offshore installed power was more than 18 GW. Recent estimates of offshore floating wind potential in Europe, US and Japan alone come to 7,000 GW.

The advantages of offshore (and particularly floating offshore) include:

- Offshore wind volume is higher: Up to 33% than adjacent onshore sites
- Offshore wind farms are effective at night complementing land-based wind generation to supply continuous electricity
- 85% of Australians live within 50 km from the coast minimising the need for long distribution networks and reducing bushfire risks
- Floating technologies are able to access emplacements that are further from the coast and/or at greater water depths, where fixed-bottom foundations are not economically viable
- Larger turbines can be used for offshore wind (15 MW turbines are currently being

developed) taking advantage of scale economies

- Lower environmental and social impacts (compared to onshore wind), since wind farms are increasingly located well offshore

Offshore wind should not be regarded as an alternative to other renewables but part of the Australian distributed low-emission energy mix. Onshore wind energy is currently the cheapest source of electricity generation in the majority of places in the world although by 2025 the price of offshore wind is expected to be comparable (see Table 6).

The Blue Economy CRC is leading a project developing Multi-use offshore, high energy platforms designed to host the offshore renewable technologies of the future. The project is being led by Dr Nagi Abdussamie and includes 10 industry and research partners.[35]

Innovation case study 5
Offshore renewables for Tasmanian aquaculture

Offshore industries, like shipping more generally, are heavily reliant on fossil fuels to power their operations. The Tasmanian salmon industry is an example of an offshore industry seeking to decarbonise operations.

In 2018, diesel accounted for approximately 50% of Tassal's (Tasmania's largest salmon producer) 443,000 GJ energy demand, producing emissions exceeding 32kT CO2-e during the production of 30,000 tonnes of farmed salmon. Total annual fossil fuel-based energy use across the Tasmanian salmon industry is estimated to be 126 GWh per annum.

Tasmania's salmon industry plans to double in production by 2030 and will have to expand offshore into deeper and more exposed operating environments to achieve this target. Moving further offshore will significantly increase energy demands given the need to sever the current ties to land-based power and increase offshore transport requirements.

A shift to renewable energy powered, off-grid energy solutions for the offshore aquaculture sector has the benefit of displacing CO2 emissions (anticipated to be more than 100 kT CO2-e by 2030), reducing noise and diesel costs and risk of diesel transport in more exposed operating conditions.

Floating wind generation presents a relatively mature technology with distinct advantages to meet the needs of a remote area power system in an offshore environment. The 250 GWh per annum energy demand forecast for Tasmania's salmon Marine Farming Zones represents an installed capacity of approximately 100 MW to replace an estimated $85 million of diesel and 130,000 t CO2-e emissions per annum.

The salmon aquaculture sector is one of several offshore industries that will be seeking to transition to future sustainable off-grid energy solutions. This application will enable demonstration of technology, build awareness of the technology benefits, establish a supply chain, with a view to delivery to future utility scale market potential.

Research on the development of low-emissions solutions for Australia's offshore industries is being hosted by The Blue Economy CRC a scoping study project on offshore/high energy aquaculture systems - energy demand analysis, led by Dr Mark Hemer, CSIRO.

Innovation case study 6

Renewable hydrogen certification, carbon certification and financial products

Tasmania can use its renewable energy and emissions credentials to become a centre for developing carbon financial and certification products. The challenge of climate change will drive trillions of dollars new investment in low carbon products, processes and financial instruments.

Developing credible, innovative financial and certification products will have numerous long-term benefits. These include supporting Tasmanian exports such as renewable hydrogen or zero-carbon products produced 100% new, renewable electricity generation backed by certified renewable power purchasing agreements. There will also be opportunities to attracting investment in renewable energy projects and low-carbon industries through the issuance of green bonds and other financial products. Other options include establishing a best-practice, an on-island carbon offset regime used exclusively to offset local emissions adding to claims of being a net-zero emissions island. Certified Tasmanian carbon offsets could be used to offset emission produced during travel to the Tasmania further enhancing our brand as being a sustainable, low-carbon travel destination.

Carbon finance and certification could also serve as the basis of a small but significant area of specialisation in environmental financial services with potential to create professional employment, training and service exports.

Innovation case study 7
Wave and tidal energy

The Australian Wave Energy Atlas project, led by CSIRO Marine Laboratories (Hobart) and co-funded by ARENA delivers high quality spatial planning information that is crucial for wave energy developers and marine planners to identify prospective regions for wave energy developments.

The assessment has found that the wave energy resource off Tasmania's West Coast has one of the highest yearly wave energy density resources in the world at approximately 80-100 kW/m or total wave energy of approximately 131,400 GWh . Harnessing just 10% of Tasmania's West Coast wave energy resource could deliver all of Tasmania's energy demand (approx. 13,000 GWh per year).

The Australian Tidal Energy Project, AUSTEn, led by the Australian Maritime College (AMC), UTAS and was funded by ARENA. The aim of the project has been to map Australia's tidal energy resource in detail and assess its economic feasibility and ability to contribute to the country's energy needs.

The project has demonstrated that Tasmania is also home to substantial tidal stream resource specifically located around the Furneaux Island group in the North-East and around the Hunter Island group in the North-West. Banks Strait tidal energy resource alone has a total annual estimate of approximately 350 MW (3 TWh/yr; flux of 1650 W/m2, over a 10 km wide channel, 25 m deep). Furthermore, tidal stream energy is fully predictable with first evidence of grid-balancing benefits being demonstrated in Europe. This provides a significant resource as either an off-grid application for Flinders Island or to the NEM via mainland Tasmania. A full resource assessment and site characterisation of Banks Strait was also performed as part of the Australian Tidal Energy Project.

Recommendations

26. Coordinate and promote research, innovation and investment in renewable energy and associated low-carbon industries.
27. Develop Tasmanian-specific carbon finance products, energy purchasing agreements and on-island offsets.
28. Further develop Tasmania's renewable energy and low emissions place brand opportunities. These include grassroots community participation, certifying organisations and products and establishing Tasmania as an example to the world.

Endnotes

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[1] This submission uses the term 'low-carbon economy' as shorthand for an economy that has reduced net emissions of all greenhouse gases down to a sustainable level. A sustainable level means net-zero by 2050 and net-negative beyond that ('climate-positive'), in order to compensate for likely overshoot of the Paris Agreement's 1.5- and 2-degree Celsius targets.

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[4] The Victorian Renewable Energy Target (VRET) includes residential home and other small scale generation on the basis that it encourages the development and take-up of such technologies.

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[17] CSIRO, 'Biomass and waste-to-energy', https://www.csiro.au/en/Research/EF/Areas/Renewable-and-low-emission-tech/Biomass-to-energy

[18] Peter Gutwein, quoted in the *Mercury*, 'Premier eyes low emissions future to tackle climate change threat', 21/8/2020,

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List of recommendations

General Recommendations

1. 'New renewable energy generation' should be defined for the purposes of the Tasmanian Renewable Energy Target and include specific provisions relating to 'new' renewable generation, the methodology for measuring output and including behind-the-meter generation.

2. The Tasmanian Renewable Energy Target should encourage diversity of supply, and support new energy generation capacity that can provide a degree of flexibility and dispatchability of energy produced.

3. Based on the proposed development of the first phase of the Marinus interconnector an interim Tasmanian Renewable Energy Target of 4,850 GWh (46% of the 2040 target) of additional renewable energy generation by 2030 should be legislated. The *TREAP* should also be subject to an independent review every five years.

4. The Tasmanian Government should outline how it intends to achieve the Tasmanian Renewable Energy Target in the event it does not implement an established approach for encouraging new renewable energy generation.

Priority 1: Transforming Tasmania into a global renewable energy powerhouse

5. Marinus Link (and the Tasmanian Renewable Energy Target) should only proceed if a beneficiary pays cost allocation model is applied to the project. The Tasmanian Government should determine the cost-allocation threshold beyond which Project Marinus is no longer in the long-term financial interest of Tasmania.

6. That Marinus Link be established as a regulated asset in order to minimise the long-term financial risk to the Tasmanian Government.

7. The Tasmanian Government should oppose hydrogen certification where gas-produced hydrogen is promoted as being 'green' or low-carbon hydrogen in key export markets.

8. The Tasmanian Government should collaborate with other jurisdictions on the development of a comprehensive 'sustainable hydrogen' certification standard.

9. Bioenergy generation in Tasmania should focus on small-scale operations using existing waste materials for feed stock. Native forests products should be excluded from the process.

10. The Tasmanian Government should actively promote clean transport options through the adoption of targets for the percentage of new electric vehicle sales in Tasmania in line with the AEMO medium intervention scenario and support clean public transport options.

11. The Tasmanian Government should establish Renewables Tasmania as the entity responsible for developing, delivering and managing the *TREAP* by providing the effective coordination of relevant

stakeholders across governments, industries, research and training organisations and the wider community.

12. The Tasmanian Government should establish an independent Tasmanian Renewable Energy Centre of Excellence to promote innovation and collaboration.

Priority 2: Making energy work for the Tasmanian community

13. Conduct further independent analysis and facilitate public discussion about the impact of Marinus Link and Battery-of-the-Nation on Tasmanian electricity prices for a range of likely scenarios.
14. Promote the further rollout of smart-metering systems based on learnings from the national and Tasmanian experiences to date and continue renewable energy micro-grid trials.
15. Consider the data infrastructure required for Tasmania as digital meters become more widespread, including privacy issues and ways to encourage start-up companies and business opportunities based on the data collected.
16. Consider regulatory changes to make it easier to establish farm-based micro-grids to generate, store or export renewable energy while upholding the principle that the cost of on-farm transmission and connection should be borne by the landowner.
17. Continue established energy efficiency programs established and investigate expanding programs as a part of COVID-19 recovery efforts including re-establishing those that were previously successful.
18. Develop a coordinated, sector-wide approach to community engagement and collaboration based on best practice principles.
19. Develop a co-created Tasmanian Aboriginal community consultation plan.
20. Establish a renewable energy community development fund.
21. Use the proposed Renewable Energy Coordination Framework to better integrate energy and land use planning to ensure planning systems are involved in all stages of a renewable energy development.
22. Work with industry and communities to identify specific REZs and associated transmission infrastructure required to deliver the estimated 2000MW of new wind generation required under the TRET by 2040.

Priority 3: Growing the economy and providing jobs

23. Continue the Energising Tasmania program and the work of the Tasmanian Energy and Infrastructure Workforce Advisory Committee as a priority.
24. Ensure the Energising Tasmania initiative includes tertiary education qualifications and a medium-term industry workforce plan.

25. Promote the employment dividends and broader training and career opportunities that stem from expanding the renewable energy sector in Tasmania.
26. Coordinate and promote innovation and investment in renewable energy and associated low-carbon industries.
27. Develop Tasmanian-specific carbon finance products, energy purchasing agreement and on-island offsets.
28. Further develop Tasmania's renewable energy and low-emissions place brand opportunities. These include grassroots community participation, certifying organisations and products and establishing Tasmania as an example to the world.

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