



Impact Analysis

Hydrogen Production Tax Incentive

The Treasury

October 2024

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Glossary

AEMO	Australian Energy Market Operator
ARENA	Australian Renewable Energy Agency
ATO	Australian Taxation Office
CEFC	Clean Energy Finance Corporation
CER	Clean Energy Regulator
DCCEEW	Department of Climate Change, Energy, the Environment and Water
FID	Final Investment Decision
GO	Guarantee of Origin
HPTI	Hydrogen Production Tax Incentive
IEA	International Energy Agency

Terminology on hydrogen

Blue hydrogen	Hydrogen produced through natural gas (or methane) using steam methane reforming, with a significant proportion of the carbon dioxide emissions created as a by-product captured and stored in deep subsurface geological formations (carbon capture and storage technology)
Clean hydrogen	Refers to both green and blue hydrogen
Green hydrogen	Hydrogen produced through renewable energy sources such as solar and wind power through electrolysis
Renewable hydrogen	Hydrogen produced using renewable energy or processes with little to no emissions

1. Executive Summary

The purpose of this Impact Assessment is to inform a decision by Government on options to support additional renewable hydrogen production and provide information on the policy and regulatory impacts of Australia adopting a production tax credit that applies to the renewable hydrogen sector, also known as a production tax incentive.

A production tax credit is a refundable tax credit provided by the Australian Government that allows the recipient to receive a direct reduction in their tax liability to the Australian Taxation Office (ATO) related to the production of the eligible product. It assists to make the eligible product more price-competitive with, in this case, non-renewable energy sources. If a recipient did not have a tax liability, they would receive a cash refund.

PROBLEM

There are several hard-to-abate industrial sectors that require new energy sources to be decarbonised. These include ammonia and methanol production, steelmaking and the heavy transport sector. Renewable hydrogen can be a low-emissions substitute for hydrogen that is produced through emissions-intensive methods and has potential to replace natural gas in steelmaking.

Renewable hydrogen would support decarbonisation of these sectors. However, the current costs of producing renewable hydrogen make it uncompetitive compared with hydrogen produced through more emissions-intensive methods. There are two main cost barriers in the renewable hydrogen sector: the cost of electrolyzers, and the input cost of renewable electricity.

There are some existing Government support mechanisms which address the capital cost of electrolyzers. However, the gap between the expected sales price and levelised cost of hydrogen produced through renewable electricity is not fully addressed by these. The only measure designed to address this, the Hydrogen Headstart program, is a competitive, merit based program designed to provide grant funding to a small number of projects.

GOVERNMENT OBJECTIVE

The Government's key objective in tackling this policy problem is to support the growth of a competitive renewable hydrogen industry and Australia's decarbonisation.

OPTIONS AND IMPACTS

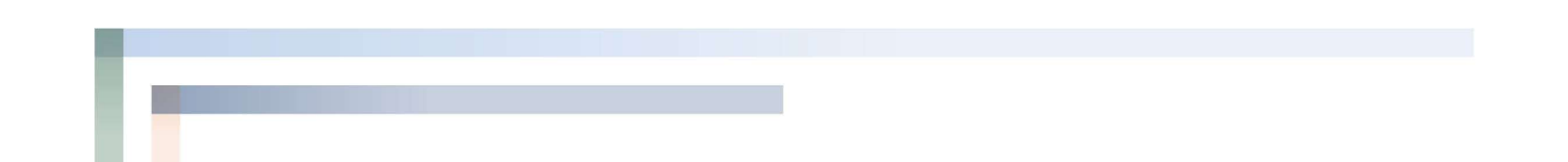
Three options are considered in this Impact Assessment:

- Option 1: maintain the status quo and not intervening to address the cost gap of renewable hydrogen production,
- Option 2A: introduce a Hydrogen Production Tax Incentive (HPTI) with a deadline for final investment decision (FID) by 2030, and
- Option 2B: introduce a HPTI with deadline for commencement of production by 2033.

The second and third options involve the same design parameters, but different forms of deadlines for a project's eligibility. A deadline was considered essential to ensure that the policy achieves the intent of bringing forward new investment.

DESIGN CONSIDERATIONS

The proposed production tax credit would provide a \$2 refundable credit per kilogram of renewable hydrogen produced for up to ten years, between 1 July 2027 and 30 June 2040. To be eligible, a taxpayer would need to be corporation subject to income tax in Australia. Only facilities with an electrolyser or equivalent with a capacity of 10 megawatts (MW) or above would be eligible to claim



the credit, and credits would only be provided for hydrogen produced with an emissions intensity of under 0.6 kilograms of carbon dioxide equivalent per kilogram of hydrogen (as certified by the Clean Energy Regulator (CER) through the Guarantee of Origin (GO) scheme).

The design parameters were informed by analysis of data available to the Government through the Hydrogen Headstart program, consideration of comparable international regimes and targeted and public consultation.

RECOMMENDATION

The three options are assessed against the problem and the Government's objectives. Option 1 - the status quo - would not produce sufficient renewable hydrogen to support decarbonisation over the long term or production at scale. The net benefits of Options 2A and 2B are then compared against the status quo and each other, finding that the greatest net benefit is expected from Option 2A.

Option 2A – introducing a HPTI with a FID deadline of 30 June 2030 - will support the development of additional renewable hydrogen production capacity to meet Australia's decarbonisation goals and support production at scale. The FID deadline will support the Government's objectives and target the policy problem of increasing production of renewable hydrogen, while incentivising the bring forward of new investment and providing greater certainty to investors regarding their project's eligibility for the HPTI during earlier stages of project development.

CONSULTATION

Consultation was taken with industry and other relevant stakeholders prior to the announcement of the HPTI in the 2024-25 Budget. This consultation informed the design parameters that were included in the budget announcement and the consultation paper released in June 2024.

Subsequent to the announcement, public consultation was undertaken, with the public invited to submit written submissions to the Treasury between 28 June 2024 and 12 July 2024. Eighty-two written submissions were received in response.

Targeted consultation was also undertaken by the Treasury and the Department of Climate Change, Energy and the Environment (DCCEEW) with project proponents, state and territory governments, peak industry bodies and government special investment vehicles (specifically, the Clean Energy Finance Corporation (CEFC) and Australian Renewable Energy Agency (ARENA)).

IMPLEMENTATION

The HPTI will rely heavily on the GO scheme, which will be administered by the CER and the delivery of the credit will be through the tax system, which is administered by the ATO. Consequently, a co-administration system for implementing the HPTI via both the CER and ATO has been proposed.

EVALUATION

Treasury and DCCEEW will provide advice to the Treasurer and Minister for Climate Change and Energy on the performance of the incentive.

The policy will be evaluated over time through observing the number of facilities registering to access the concession, the amount of production verified under the GO scheme, the quantity of credits accessed and feedback from the ATO and taxpayers on the administration of the tax system. The ATO will produce annual reports on the amount of incentive provided, and the GO scheme will also produce a regularly updated publicly available register.

The GO scheme will provide a transparent and verified emissions accounting framework covering hydrogen.

2. Background

In 2022, the Australian Government ('the Government') committed to a target of reducing domestic net greenhouse emissions to 43 per cent below 2005 levels by 2030, and to net zero greenhouse gas emissions by 2050 through the introduction of the *Climate Change Act 2022*. The Government's legislated targets gave effect to Australia's international commitment to emissions reductions under the Paris Agreement through its Nationally Determined Contribution submission - updated in 2022.

These emissions reduction targets require an urgent and substantial transformation of Australia's economy. The Government is developing sectoral plans which look beyond 2030, covering electricity and energy, transport, industry, resources, the built environment, and agriculture and land.

The Government is taking steps to reach its emissions reduction targets across these sectors through significant initiatives, including progressing priority transmission projects and accelerating investment in dispatchable energy and storage. The Government is also taking steps to reach its target of 82 percent renewable electricity by 2030, which is critical to delivering cheaper, more reliable energy in a decarbonising economy.

Reaching net zero emissions will require abatement across all sectors of the economy, and in some cases, this will require new technologies, fuels and feedstocks to emerge and to be deployed at scale.

Australia's economy includes several industrial sectors that face significant challenges to decarbonise, often referred to as 'hard-to-abate' sectors. These include the production of iron and steel, refining of mineral resources, long haul transportation (including heavy road, aviation and shipping) and production of ammonia. These sectors and activities currently rely on fossil fuel-based carbon-emitting production processes including the use of coal, gas and diesel. Decarbonising Australia's electricity grids will also require dispatchable energy solutions suited to managing seasonal renewable variability. Low carbon energy and resources markets will need to develop rapidly to facilitate the decarbonisation required of these sectors in the coming decades.

To support emissions reduction in these hard-to-abate sectors, the Government has introduced the Safeguard Mechanism which will require Australia's largest carbon emitters to reduce their emissions in line with Australia's climate targets. Meeting targets under the Safeguard Mechanism will require the development and adoption of new technologies in many sectors.

For some hard-to-abate sectors, electrification will be unsuitable or impractical as a decarbonisation pathway. For such sectors, renewable hydrogen will play an important role in addressing emissions reduction in these sectors as it can directly substitute hydrogen produced through emissions intensive methods and has shown potential as a substitute for natural gas, particularly in steel-making.

2.1 Hydrogen production processes

Hydrogen can be produced through a variety of different processes with varying emissions intensities. While the end product of these processes, hydrogen, is chemically identical, colour coding language is used in the energy industry to differentiate between the different processes used to produce hydrogen and their emissions intensities.

For the purposes of this Impact Analysis, renewable hydrogen refers to hydrogen produced through methods using renewable technologies. The vast majority of renewable hydrogen that is expected to be produced over the coming decade will be through electrolysis.¹

The other key processes discussed in this Impact Assessment are:

¹ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, 2024) ('*National Hydrogen Strategy 2024*'), 42.

- **Green hydrogen** refers to hydrogen produced through renewable energy sources such as solar and wind power through electrolysis;
- **Blue hydrogen** refers to hydrogen produced through natural gas (or methane) using steam methane reforming (or coal gasification), with a significant proportion of the carbon dioxide emissions created as a by-product captured and stored in deep subsurface geological formations (carbon capture and storage technology);²
- **Grey hydrogen** refers to hydrogen produced through natural gas (or methane) using steam methane reforming, but without the use of carbon capture and storage used to capture emissions as in the case of blue hydrogen, and
- **Black and brown hydrogen**, refers to hydrogen produced through black coal or lignite (brown coal) through a process known as coal gasification.

Often, clean hydrogen refers to both ‘green’ and ‘blue’ hydrogen. However, as the International Energy Agency (IEA) notes, there are no agreed definitions for these terms internationally and this can obscure the potential emissions intensity of these processes.³

The International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) has developed a standard methodology for calculating the greenhouse gas emissions intensity of different hydrogen production routes.⁴ The Government has introduced legislation to establish a domestic scheme,⁵ the GO scheme, which is aligned with the methodologies of the IPHE.

2.2 Importance of renewable hydrogen

For the purposes of this Impact Analysis, renewable hydrogen refers to hydrogen produced through methods using renewable technologies. The vast majority of renewable hydrogen that is expected to be produced over the coming decade will be through electrolysis.⁶

Renewable hydrogen is a broader term that encapsulates all green hydrogen allowing for other production methods that use renewable technologies to produce hydrogen with little to no emissions. Other production methods that can produce renewable hydrogen include biomass conversion (which converts organic material into hydrogen)⁷ and photocatalytic hydrogen (which uses sunlight to directly split water into hydrogen and oxygen without requiring electrical energy input).⁸ While the gasification of organic material in biomass conversion may produce some emissions, it can be considered renewable if the organic material used extracts carbon dioxide from the atmosphere during growth, thereby reducing the lifecycle emissions of the process.

² Australian Government, Geoscience Australia, *Australian Energy Hydrogen*,

³ Timur Gul and Noe van Hulst, IEA, *Why Clearer Terminology for Hydrogen Could Unlock Investment and Scale Up Production* (Commentary, 29 June 2023) < <https://www.iea.org/commentaries/why-clearer-terminology-for-hydrogen-could-unlock-investment-and-scale-up-production>>.

⁴ International Partnership for Hydrogen and Fuel Cells in the Economy, *Methodology for Determining the Greenhouse Gas Emissions Associated with the Production of Hydrogen* (Working Paper, July 2023).

⁵ *Future Made in Australia (Guarantee of Origin Charges) Bill 2024* and *Future Made in Australia (Guarantee of Origin Consequential Amendments and Transitional Provisions) Bill 2024*.

⁶ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, 2024) (*‘National Hydrogen Strategy 2024’*), 42.

⁷ Srinivasan, V., Temminghoff, M., Charnock, S., Hartley, P. (2019). *Hydrogen Research, Development and Demonstration: Priorities and Opportunities for Australia*, CSIRO, 40.

⁸ *Ibid*, 47.

At present, the vast majority of projects in the pipeline to produce renewable hydrogen are those using electrolysis which is powered by electricity sourced from renewable energy (either directly, or indirectly where the project is grid-connected).

The Australian Government, working with the states and territories, released the inaugural National Hydrogen Strategy in 2019. This included a number of actions that established the early foundations for a future Australian hydrogen industry, including infrastructure assessment, review of regulatory frameworks, workforce, skills and training, and a focus on hydrogen hubs.

To build on these early activation measures, in 2024 the Australian Government released two significant policy frameworks focussed on scaling up Australia's hydrogen industry – the Future Made in Australia package through the 2024-25 Budget,⁹ and the updated 2024 National Hydrogen Strategy (National Hydrogen Strategy from hereon).

The Safeguard Mechanism

The Safeguard Mechanism is the Australian Government's policy for reducing emissions at Australia's largest industrial facilities.

It sets legislated limits—known as baselines—on the greenhouse gas emissions of these facilities. These emissions limits will decline, predictably and gradually. These limits will help achieve Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050.

The Safeguard Mechanism is enacted through the *National Greenhouse and Energy Reporting Act 2007* (the NGER Act) and other legislation.

Safeguard Mechanism facilities have an annual emissions limit known as a baseline. In general, baselines will fall by 4.9% each year to 2030. This will enable industrial facilities to contribute to Australia's emissions reduction targets. This baseline decline rate applies to all Safeguard facilities, including existing and new facilities. Different rates may be approved for facilities classed as a trade-exposed baseline-adjusted facility.

The business with operational control of the facility must ensure its net emissions do not exceed the baseline determined by the Clean Energy Regulator.¹⁰

The National Hydrogen Strategy 2024 notes 'the Safeguard Mechanism provides a regulatory obligation to manage and reduce emissions, which will help drive hydrogen adoption by some facilities'.¹¹ Businesses in hard-to-abate sectors that are subject to the Safeguard Mechanism in Australia will benefit from access to a viable option for reducing emissions, which will assist them to comply with their Safeguard Mechanism requirements and meet demand from customers for a lower-emissions product.

2.3 Comparative Advantage in Renewable Hydrogen

As discussed in the Future Made in Australia National Interest Framework Supporting Paper, Australia holds several key advantages that suggest it will have a comparative advantage in producing renewable hydrogen. Principally, Australia has world class renewable energy resources at prices that should be internationally competitive. This can provide Australian producers an advantage because energy costs make up more than half the cost of producing hydrogen using present-day electrolyser technology.

⁹ Australian Government, Budget 2024-25 *Budget Paper Number 2*, 67.

¹⁰ Department of Climate Change, Energy, the Environment and Water, *Safeguard Mechanism* (Web Page) <<https://www.dcccew.gov.au/climate-change/emissions-reporting/national-greenhouse-energy-reporting-scheme/safeguard-mechanism>>.

¹¹ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024), 64.

Australia's skilled workforce will also be advantageous to establish a domestic renewable hydrogen industry, but our clean energy workforce will need to be scaled up to meet the full potential of renewable hydrogen in Australia.

3. The policy problem

3.1 Renewable hydrogen is needed for Net Zero

Renewable hydrogen has the potential to be a low-emissions substitute for hydrogen and natural gas in several hard-to-abate industrial sectors that require new energy sources to be decarbonised. While electrification will play a significant role in the decarbonisation of several sectors in Australia, it will not be an effective or economical substitute in specific sectors, particularly those which rely on natural gas or hydrogen produced through emissions intensive production methods (sectors which hydrogen is already an important component of). These sectors currently use fossil fuels and hydrogen as a source to produce heat or require the hydrogen molecules in chemical processes.

While renewable hydrogen is potentially the most suitable solution to support decarbonisation of these sectors, the costs of producing renewable hydrogen currently make it uncompetitive compared with hydrogen produced through more emissions-intensive methods noting most hydrogen today is made using either gas or, less commonly, coal. There are two main cost barriers in the renewable hydrogen sector: the cost of electrolyzers, and the input cost of renewable electricity. The cost of both of these is expected to reduce over time.

Analysis under the *National Hydrogen Strategy 2024* suggests that Safeguard Mechanism facilities could drive demand of 0.03-0.3 million tonnes of hydrogen by 2030 and 0.2-0.6 million tonnes of hydrogen by 2035.¹² The demand for hydrogen by the safeguard mechanism facilities is used as a proxy for the hydrogen required to support Australia's decarbonisation ambitions.

Potential uses for renewable hydrogen

Hydrogen is a flexible fuel, which is transportable and storable to varying degrees depending on the derivative. Hydrogen has high calorific value, good thermal conductivity and a high reaction rate. Therefore, hydrogen has the potential to replace fossil fuels in processes such as the manufacturing of steel, which currently relies on the burning of metallurgical coal and natural gas.¹³

Analysis commissioned for the *National Hydrogen Strategy 2024* identified numerous hard-to-abate sectors for which hydrogen represents a prospective decarbonisation pathway.¹⁴

Ammonia: Eighty per cent of all fossil-fuel based hydrogen producers are associated with ammonia production (with the remaining 20 per cent associated with crude oil refining).¹⁵ The main use of ammonia in Australia is for making fertiliser, which is essential to Australia's agriculture sector. It is also used for producing explosives. The production of ammonia, fertilisers and commercial explosives

¹² Australian Government, Department of Climate Change, Energy the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024) 75.

¹³ Wenguo Liu et al, 'The Production and Application of Hydrogen in Steel Industry', *International Journal of Hydrogen Energy*, Volume 46, Issue 17 (2021) <<https://www.sciencedirect.com/science/article/abs/pii/S0360319920347376>>.

¹⁴ ARUP analysis and report, *Activating Domestic Demand for Hydrogen*, produced for Australian Government, Department of Climate Change, Energy the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024) 95.

¹⁵ Australian Government, Department of Climate Change, Energy, the Environment and Water, *State of Hydrogen 2022* (Report, 2022), 10.

accounted for approximately 5.4 million tonnes (or 1.1 per cent) of Australia's carbon dioxide or equivalent emissions in 2020.¹⁶

Iron and steel: Steel production is also responsible for significant emissions due to the reliance on fossil fuels for iron ore processing. Globally, the steel production industry (encompassing iron ore processing, as 98 per cent of iron ore is used in steel making, and steel is an alloy consisting mostly of iron, and less than 2 per cent carbon)¹⁷ is estimated to be responsible for 7 to 9 per cent of all greenhouse gas emissions.¹⁸ Australia produces almost half of the world's iron ore, making it a significant contributor to these figures.

Decarbonising this sector requires the elimination of metallurgical coal in the iron-making process and gas in high temperature heating, which electrification is ill-suited for. The use of renewable hydrogen in facilities involving direct reduced iron and electric arc furnaces is a prospective pathway for achieving this.

Alumina: Australia is the world's second largest exporter of alumina, currently producing around 20 million tonnes of alumina per year.¹⁹ Australia's alumina refining industry currently relies on natural gas or coal as the main source of energy for process heating requirements in refineries. Both electrification and hydrogen are potential pathways for achieving decarbonisation, with the most prospective option likely to depend on site-specific factors. The alumina refining industry produced 14.9 million tonnes (or 3.0 per cent) of Australia's carbon dioxide or equivalent emissions in 2020.²⁰

Heavy transport: Transport was responsible for 21 per cent of Australia's emissions in 2023. The decarbonisation pathways are expected to vary across different segments of the industry. For example, battery electric vehicles have emerged as the leading means of decarbonising light and medium-sized road vehicles, but it is currently unclear if battery technologies will be suitable for long-distance, heavy payload transport applications.

Support for grid-firming: Australia's future electricity system is expected to be dominated by renewable energy generation, specifically wind and solar, under the Australian Energy Market Operator's (AEMO) *Step Change Scenario*.²¹ However, to balance these variable power sources the grid also needs dispatchable power, such as hydropower or natural gas, which is available as needed and keeps the grid stable. AEMO, and the Government's hydrogen strategy propose that hydrogen could provide an alternative dispatchable capacity, augmenting the role of grid-scale batteries.

3.2 Renewable hydrogen is at an early development stage

Renewable hydrogen projects currently face several challenges to deployment. Most renewable hydrogen is produced through an electrolyser which is reliant on electricity generated by renewable

¹⁶ CSIRO and ClimateWorks Centre 2023, *Pathways to Industrial Decarbonisation: Phase 3 Technical Report*, Australian Industry Energy Transitions Initiative, 112.


¹⁷ World Steel Association, 'Fact Sheet: Steel and Raw Materials' (Factsheet, March 2018) <https://www.steel.org.au/getattachment/458fa31b-2586-47bb-a645-9411140863dd/WSA_fact_raw_materials_2018.pdf>, 1.

¹⁸ Jisoo Kim et al., 'Decarbonizing the iron and steel industry: A systematic review of sociotechnical systems, technological innovations, and policy options' *Energy Research and Social Science*, Volume 89 (July 2022), quoting data from the International Energy Agency.

¹⁹ Department of Industry, Science and Resources, *Resources and Energy Quarterly: June 2024* (Quarterly Report, June 2024), 106.

²⁰ Deloitte and the Australian Government, Australian Renewable Energy Agency, *A Roadmap for Decarbonising Australian Alumina Refining: In Collaboration with Australian Renewable Energy Agency, and in Consultation with Participants Alcoa, Rio Tinto and South32* (Report, November 2022), 1.

²¹ AEMO, *2024 Integrated System Plan 2024* (Final Report, June 2024) <<https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp>>.



energy. The cost of electrolyzers and renewable electricity are the key drivers of upfront capital costs and ongoing production costs, respectively. First-mover projects, referring to those investing in the industry in the coming decade, face a gap between the levelised cost of hydrogen for renewable hydrogen production and its expected sales price for the foreseeable future.²²

Without Government support, renewable hydrogen will not be price-competitive with natural gas or hydrogen produced through more emissions-intensive production methods, to be a commercially viable substitute in hard-to-abate sectors. The need for Government intervention to focus on supporting renewable hydrogen production, over other hydrogen production methods including use of natural gas with carbon capture and storage, is discussed in greater detail in Section 4.2 (Rationale for Government intervention).

The IEA reports the hydrogen production cost from unabated natural gas was estimated at USD 0.8-5.7/kg H₂ in 2023 depending on market and the cost of natural gas, while the production cost from renewable sources ranged from around USD 3.5-12/kg.²³

In Australia, DCCEE's assessment of the emerging pipeline of renewable hydrogen projects suggests there remains a significant difference between the levelised cost of hydrogen produced through renewable electricity (\$6-\$10/kg H₂) and offtake prices associated with assessed projects (\$3-\$7/kg H₂).²⁴ This assessment accords with analysis undertaken by CSIRO for the *National Hydrogen Strategy 2024*, which suggests the levelised cost of renewable hydrogen production through electrolysis in 2025 is expected to fall within a range of \$5-\$11/kg H₂, depending on the electrolyser employed.²⁵ Similarly, analysis from Bloomberg New Energy Finance, suggests the levelised cost of renewable hydrogen sits between \$5-\$10/kg H₂, depending on the varying costs in electrolyzers and renewable electricity, and the capacity factors across markets.²⁶

Renewable hydrogen production costs are projected to decline over the medium to long-term. Cost reductions are expected to be driven both by reductions in renewable electricity (as the biggest ongoing component of the hydrogen costs) and electrolyzers.

In covering the cost of electrolyser-projects more generally, in its recently published report, *Global Hydrogen Review 2024*, the IEA stated:

Full development of the entire electrolyser project pipeline of almost 520 GW would achieve similar global cost reductions as in the NZE [Net Zero Emissions] Scenario. In China, global deployment at such a level would mean that the vast majority of the production from its current electrolyser project pipeline (1 Mtpa) would be cheaper than hydrogen produced from unabated coal. Globally, by 2030, more than 5 Mtpa could be produced at a cost competitive with production from unabated fossil fuels, and up to 12 Mtpa with a cost premium of USD 1.5/kg H₂.²⁷

²² Levelised cost of hydrogen is a method that evaluates the total expenses involved in producing hydrogen throughout its lifecycle, including capital and operational costs (European Hydrogen Observatory, *Levelised Cost of Hydrogen (LCOH) Calculator Manual* (Report, June 2024), 7).

²³ International Energy Agency (IEA) *Global Hydrogen Review 2024* (Report, October 2024).

²⁴ Internal DCCEE analysis based on confidential project data provided by applicants for the Hydrogen Headstart program.

²⁵ Australian Government, Department of Climate Change, Energy the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024) 45.

²⁶ Bloomberg New Energy Finance, 2023 Hydrogen Levelized Cost Update, 2023.

²⁷ IEA, *Global Hydrogen Review 2024* (Report, October 2024), 11.

The cost of renewable electricity is projected to decline by 40 to 60 per cent by 2050.²⁸ Similarly, electrolyser costs are projected to decline by 88 to 94 per cent in the same period.²⁹

However, the narrowing of the cost gap for hydrogen production will depend on a number of factors including achieving cost reductions through economies of scale in deployment. This is also noted by the IEA in its recently published review, *Global Hydrogen Review 2024*, where it notes the future cost evolution for low-emissions hydrogen will depend on numerous factors, ‘particularly on the level and pace of deployment’.³⁰

A positive externality can arise from catalysing investment in early mover large scale projects to support workforce and supply chain development, and building experience within industry and the finance sector with large scale hydrogen projects. As such, growing a large-scale, commercially viable hydrogen industry can contribute to further cost reductions for the renewable hydrogen sector. However, achieving scale in Australia’s hydrogen industry this decade is unlikely without Government intervention, due to the challenges outlined.

Further, modelling for the *National Hydrogen Strategy 2024* found that in 2035 around 1 million tonnes of hydrogen produced using renewable energy or fossil fuels with substantial carbon capture and storage would be required annually in its central scenario, as part of a national net zero pathway by 2050 (not including additional hydrogen for export), and about 2 million tonnes in 2040.³¹ This target is part of a growth trajectory aligned with driving the economies of scale to drive down prices, accelerate growth and build industry experience.³² This has been observed in solar energy, where relevant markets became economically sustainable once production economies of scale reached a ‘tipping point’, particularly in China. Utility scale solar PV, operating without government assistance, is now generating attractive returns on investment.³³

This figure of hydrogen production, expressed as a range of 0.5-1.5 million tonnes annually by 2030 and 3-5 million tonnes annually by 2035 is used as a proxy for the growth required to support production at scale.³⁴

Importing hydrogen would be a costly alternative to producing renewable hydrogen in Australia for domestic use. Importing renewable hydrogen would require converting hydrogen into liquid or conversion of the hydrogen into a carrier such as ammonia from the exporting destination, shipping costs to transport the product to Australia and a further process to convert the liquid hydrogen or ammonia back to hydrogen in Australia.³⁵

3.3 Existing supports do not address the gap in operating costs for sufficient producers

²⁸ P Graham, J Hayward, J Foster and L Havas, 2023, GenCost 2022-23: Final report, CSIRO, Australia, www.csiro.au/en/research/technology-space/energy/GenCost.

²⁹ P Graham, J Hayward, J Foster and L Havas, 2023, GenCost 2022-23: Final report, CSIRO, Australia, www.csiro.au/en/research/technology-space/energy/GenCost.

³⁰ IEA, *Global Hydrogen Review 2024* (Report, October 2024), 11.

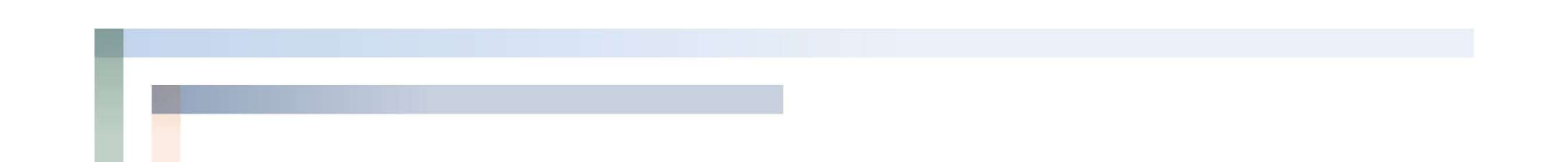
³¹ Australian Government, Department of Climate Change, Energy the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024), 63.

³² Australian Government, Department of Climate Change, Energy the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024), 15.

³³ EY Global, *How to Capture the Sun: the Economics of Solar Investment* (Article, 14 February 2020) <https://www.ey.com/en_pt/financial-services/how-to-capture-the-sun-the-economics-of-solar-investment>.

³⁴ Targets from Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, 2024), 91.

³⁵ Tansu Galimova, Mahdi Fasihi, Dmitrii Bogdanov and Christian Breyer, ‘Impact of international transportation chains on cost of green e-hydrogen: Global cost of hydrogen and consequences for Germany and Finland’ *Applied Energy*, Volume 347, 2023.



The Australian Government has several existing initiatives to support growth and innovation in the emerging hydrogen sector (see Appendix B for greater detail). These include funding for research and development, grants for capital and infrastructure projects and low-interest concessional finance, capital grant funding to encourage innovation and research, support for common-user infrastructure and development of appropriate regulatory frameworks. Addressing these barriers are essential foundations for industry growth, but will not, by themselves, address the cost gap impeding large-scale projects from progressing from feasibility to operation phases.

The cost gap facing these projects is driven largely by ongoing operational expenses, such as renewable electricity, which exceed the revenues these projects expect from the sale of their product in the near term. Industry consultation for the *National Hydrogen Strategy 2024* reinforced that grant funding for capital projects and concessional finance are not adequate to fully close this cost gap and support early mover projects to reach large-scale production. Early mover projects face higher costs that are likely to persist over the life of the project. However, supporting these early projects will be essential to achieving economies of scale, stimulating demand for hydrogen, and strengthening domestic and international supply chains.

Market analysis, as well as industry consultation conducted for the National Hydrogen Strategy review and the design of the Hydrogen Headstart program, revealed ongoing revenue support would be necessary to address the cost gap for early mover projects. To make an early-stage project bankable, industry advised that they need cost support to cover the gap between production cost and sale price, a stable policy environment and long term offtake agreements. As a first step to addressing this barrier, the Australian Government introduced the Hydrogen Headstart program. This program will provide revenue support to a small number of early-mover, large-scale projects. It will help these projects bridge the cost gap and build experience across industry through knowledge sharing requirements. This is a competitive program with a limited budget and will otherwise not be available for wider take-up by the broader base of projects needed to scale up the industry.

While programs such as Hydrogen Headstart are essential to supporting the initial investment in the industry, greater investment in renewable hydrogen is necessary to achieve the economies of scale that will drive cost reductions over the longer term that will ultimately support the reduction of the cost gap.

This barrier could become entrenched over time if renewable hydrogen industries are established in other jurisdictions and other countries succeed in capturing early global offtake opportunities.³⁶

³⁶ Deloitte Australia's *Hydrogen Tipping Point* (Article, 27 February 2023)
<<https://www.deloitte.com/au/en/Industries/power-utilities-renewables/perspectives/australia-hydrogen-tipping-point.html>>.

4. Case for government action/objective of reform

4.1 Rationale for government intervention to address decarbonisation commitments

As the IEA noted in 2020, the global pathway to net-zero emissions by 2050 “requires all governments to significantly strengthen and then successfully implement their energy and climate policies... the path to net-zero emissions is narrow: staying on it requires immediate and massive deployment of all available clean and efficient energy technologies.”³⁷

Australia has demonstrated its commitment to addressing the international impacts of climate change through a number of actions, including through its role as a party to the Paris Climate Accords (the Paris Agreement).

In its most recent National Determined Contribution in 2022, Australia increased its ambition of its 2030 target, committing to reduce greenhouse gas emissions 43 per cent below 2005 levels by 2030 and reaffirmed its commitment to achieve net zero emissions by 2050.³⁸ As discussed in previous sections, the Government has also demonstrated its commitment to these international obligations introducing legislation reflecting these targets in 2022 through the introduction of *Climate Change Act 2022*.

4.2 Rationale for Government intervention in renewable hydrogen sector specifically

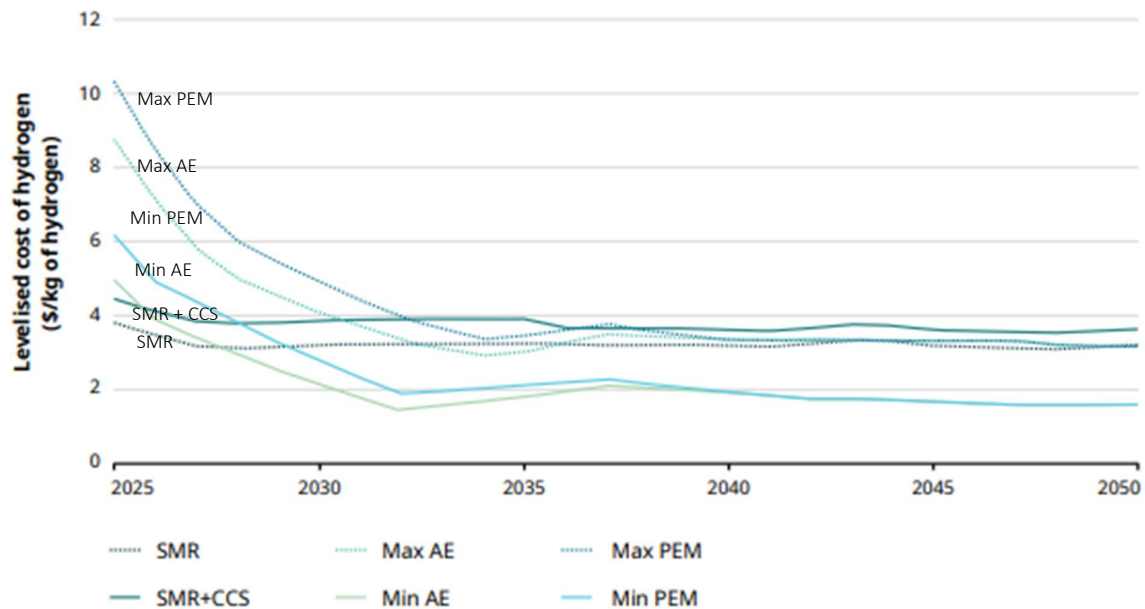
As discussed in Section 3, intervention to support the development of the renewable hydrogen sector is justifiable in the context of the Government’s decarbonisation agenda and domestic emission reduction targets. Beyond decarbonising existing uses of hydrogen in the economy, such as in producing ammonia, renewable hydrogen is an enabler of green manufacturing, with the potential to underpin green commodity production in a range of sectors, particularly where electrification is not an option.

Various analyses have demonstrated that, in the long-term, hydrogen produced through renewable electricity will be more cost-effective than other hydrogen production techniques. For example, Figure 1 demonstrates the costs of current technologies such as steam methane reforming using natural gas (SMR) are less than hydrogen produced through electrolysis. However, CSIRO’s modelling indicates that the current high costs faced by using electrolysis technologies are expected to fall to similar, or lower, levels than those faced by SMR by around 2035. This cost reduction will depend significantly on the scale and pace of deployment, as noted in Section 3.

³⁷ IEA, *Net Zero by 2050: A Roadmap for the Global energy Sector*, 2020, <https://www.iea.org/reports/net-zero-by-2050> 13-14.

³⁸ Australian Government, *Australia’s Nationally Determined Contribution (Communication, 2022)*, 3.

Figure 1: Cost Projections for Hydrogen Production



Source: *National Hydrogen Strategy 2024*, based on data from CSIRO 2024 Scenario modelling of the production and consumption of hydrogen in Australia.³⁹ Note: PEM = Proton exchange membrane electrolyser. AE = Alkaline electrolyser. SMR = Steam methane reforming, SMR + CCS = Steam methane reforming + Carbon Capture and Storage

The Government recognised this in the *National Hydrogen Strategy 2024*, noting the following:

The Australian policy landscape has subsequently shifted, with commitments to a net zero economy by 2050 and ambitious goals for emissions-reduction and renewable generation in 2030... In light of these commitments, the Australian Government has prioritised its policy efforts and financial support towards renewable hydrogen projects, which are clearly aligned with Australia’s net zero goals.⁴⁰

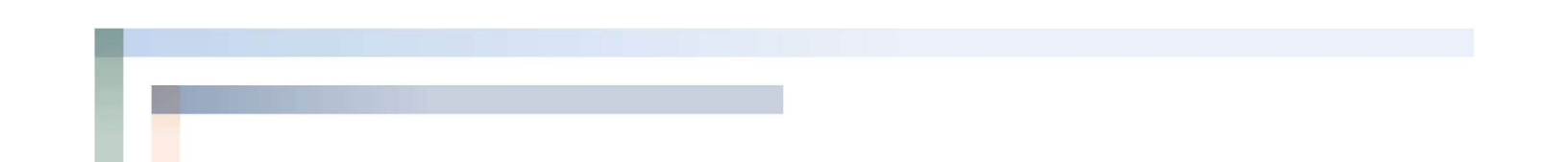
The *National Hydrogen Strategy 2024* also notes a number of key considerations for prioritising renewable hydrogen specifically:

- the Australian project pipeline, based on IEA data, is overwhelmingly focussed on renewable hydrogen production projects, which is consistent with the global trend;
- expectation of future offtake preferences for renewable hydrogen in some global market;
- modular and scalable nature of electrolyser-based production;
- high cost of achieving high carbon capture rates (greater than 90%), and
- expectation that electrolyser-based production will decrease in cost compared to a relatively static cost of carbon capture and the increasing cost of fossil fuels.⁴¹

³⁹ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024).

⁴⁰ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024), 42.

⁴¹ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024), 42.



Without action to enable renewable hydrogen to compete with its more emissions intensive counterparts, renewable hydrogen is unlikely to be produced at scale in Australia, limiting its availability for hard-to-abate sectors to decarbonise in the coming years.

4.3 Objective of Government intervention

Primary objective of Government intervention

The primary objective of government intervention is to narrow the gap between the cost of producing renewable hydrogen and the cost of producing emissions-intensive hydrogen, over the period during which renewable energy prices fall and renewable hydrogen production becomes cost-competitive. Closing this gap now is important, as doing so will allow the domestic industry to keep pace with growth in the international hydrogen market as well as supporting our decarbonisation commitments.

Specifically, the government intervention aims to:

- Bring forward investment decisions in large-scale renewable hydrogen projects to make renewable hydrogen available sooner, supporting the development of an industry, and
- Increase renewable hydrogen production over the near- and medium-term to facilitate decarbonisation, and in support of Australia's long-term target to produce 15 million tonnes of hydrogen by 2050 (including milestones of 0.5 million tonnes by 2030 and 3 million tonnes by 2035).

Without the availability of a low-cost pathway to decarbonise, such as domestically produced renewable hydrogen, Australia's industry may not be able to meet its emissions reductions targets. This is especially true for high heat industrial processes, such as steelmaking. The costs of transporting, converting and storing hydrogen means it is unlikely to be commercial to import hydrogen in the short to medium term. In addition to this, the energy required to produce renewable hydrogen will prevent many of Australia's trading partners being able to decarbonise their own industries, let alone export hydrogen. This may lead to decreased production or higher costs being passed on to consumers.

Catalysing investment in early mover large scale projects will also support cost reductions by learning-by-doing, workforce and supply chain development, and building experience within industry and the finance sector with large scale hydrogen products.

Constraints and barriers to achieving the primary objectives outlined include:

- Sustained high renewable electricity prices which could result in the cost gap not resolving over the medium term as projected;
- Insufficient investment in renewable electricity generation and related infrastructure, such as transmission lines;
- A slower than expected growth in demand for hydrogen and derivative products, which impacts the case for investment;
- Unforeseen supply chain issues and price hikes in capital costs, such as for electrolyzers (due to the nature of the energy transition worldwide, supply chain issues in clean energy projects are not uncommon and could cause projects, and therefore potential production, to stall), and
- Possibility of a slower transition in the economy to invest in assets that are hydrogen powered rather than fossil fuel powered.

Further objectives of Government intervention

Early market intervention could position Australia to be a reliable global supplier of renewable hydrogen.

Australia has a comparative advantage with renewable hydrogen. Australia has abundant renewable energy resources that are expected to be globally competitive. Energy costs make up a significant proportion of the costs of producing hydrogen. With early market intervention, Australia could become a competitive and leading supplier of renewable hydrogen globally.⁴²

In contrast to many international neighbours, Australia has vast renewable energy resources and land. Geoscience Australia notes that around 3 per cent of Australia's land is suitable for green hydrogen production based on access to renewable electricity and water supplies.⁴³ Australia also has high-capacity-factor renewable energy. These will be enduring comparative advantages, allowing the Australian renewable hydrogen industry to be commercially viable once the period of support ends.

Without support, the Australian renewable hydrogen industry is still expected to have these comparative advantages in the long-term. However, with the current cost gap and a range of competitive subsidy regimes introduced in foreign jurisdictions⁴⁴ investment is unlikely to occur at the scale required in coming years for Australia to meet our decarbonisation goals or stake its position as a supplier in the global market.

Australia's transition is not occurring in isolation. Australia's neighbours and key trading partners that rely on Australia for natural gas and coal for energy generation are also increasing efforts to meet net zero. Australian exports could play an important role in supporting decarbonisation in countries that will be reliant on importing low-emissions energy and products from other nations to meet their climate targets.

Several economies such as Japan, Republic of Korea and Germany are considering clean or low-emissions hydrogen as a key source for powering vehicles, generating electricity, powering their manufacturing sector and heating – uses that extend beyond those anticipated in Australia. In certain economies, renewably-sourced hydrogen is also one of the most commercially feasible low-emissions options for grid-firming and for decarbonising the transport sector.

Developing a renewable hydrogen industry could facilitate a comparative advantage in energy-intensive, low-emissions industries

The 2024-25 Budget National Interest Framework Supporting Paper also highlights the importance of renewable hydrogen production at scale for developing Australia's comparative advantage in energy-intensive, low-emissions industries, noting the interdependencies of multiple sectors and low-cost

⁴² Australian Government, The Treasury, *Future Made in Australia: National Interest Framework Supporting Paper* (Supporting Paper, May 2024) 17.

⁴³ Australian Government, Australian Trade and Investment Commission, 'Hydrogen, Australia's Next Big Export Industry' (Web Page) <<https://international.austrade.gov.au/en/do-business-with-australia/sectors/energy-and-resources/hydrogen#:~:text=Green%20hydrogen%20production,renewable%20electricity%20and%20water%20supplies>>.

⁴⁴ For example, the United States has committed to a 10-year clean hydrogen production tax credit worth up to US\$3 per kilogram of eligible hydrogen produced through its Inflation Reduction Act and Canada has committed to tax rebates between 15 to 40 percent of costs associated with the purchase and installation of eligible equipment for clean hydrogen projects.

renewable hydrogen being a 'key enabler of commercial green metals operations.'⁴⁵ The paper notes that building new low-emissions industries at scale requires sustainable energy and fuels (such as renewable hydrogen) to be available at-scale, and accelerating the delivery of such energy is foundational to this.⁴⁶

Renewable hydrogen is the most economically viable opportunity long-term for producing green metals.⁴⁷ Using locally produced hydrogen in the production of green iron (and other green metals) can deliver cost and emissions benefits compared to a scenario where the iron ore and energy are shipped separately to international destinations. Increasing Australia's onshore value-adding of our commodity exports to produce lower embedded emissions metals is a prospective and relatively low-cost pathway to indirectly export Australia's renewable energy resources.

Global demand for green iron and steel is forecast to grow significantly by 2050. As hydrogen can provide a clean source of industrial process heat to the refining of our mineral resources, greater availability of competitively-priced renewable hydrogen would enable the export of hydrogen embodied green metals, such as iron and alumina.⁴⁸

The National Hydrogen Strategy 2024 drew on the economic modelling published by Accenture, which estimated Australia's renewable hydrogen industry development and related exports could contribute \$28.9 billion in GDP per year and create around 33,000 direct and indirect jobs in 2040, with further economic benefits from other industries like green metals.⁴⁹

4.4 Alternatives to Government action

There are no alternatives to addressing the problems outlined besides Government action, due to the misalignment of commercial incentives and public interest in the case of renewable hydrogen production in the short-term.

Government intervention in the market is justified where particular market failures are present, intervention can partially or wholly address those market failures, and the benefits of such intervention outweigh the costs. A market failure exists where negative externalities from more emissions-intensive production methods are not appropriately priced into global markets, so that cleaner production methods that present lower total costs (taking into account environmental impacts) or cost effective abatement opportunities are not able to compete.

A market failure can also exist for nascent sectors where the important learnings of early movers can help those that come later to produce at a lower cost, as these learnings are not factored into the commercial benefits of the early investments. Given the presence of positive externalities, without government support, there will be an underinvestment in cleaner production methods, which slows down the learning-by-doing process and prolongs the use of more emissions-intensive production processes.⁵⁰

⁴⁵ Australian Government, The Treasury, *Future Made in Australia: National Interest Framework Supporting Paper* (Supporting Paper, May 2024).

⁴⁶ Australian Government, The Treasury, *Future Made in Australia: National Interest Framework Supporting Paper* (Supporting Paper, May 2024).

⁴⁷ Grattan Institute, *Green Metals Consultation Paper 2024* (Consultation Paper, 2024).

⁴⁸ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024), 10.

⁴⁹ Accenture, *Sunshot: Australia's Opportunity to Create 395,000 Clean Jobs* (Report commissioned by ACF, WWF, Business Council of Australia and Australian Council of Trade Unions, October 2021) <https://d3n8a8pro7vhmx.cloudfront.net/bca/pages/6621/attachments/original/1634169147/Sunshot_-_Clean_Exports_Research_Report_-_Embargoed_-_131021.pdf?1634169147> 14.

⁵⁰ Australian Government, The Treasury, *Future Made in Australia National Interest Framework Supporting Paper* (Supporting Paper, May 2024), 5.

5. Policy options

Although there are several options the Government could pursue, three key options that would specifically address the problem covered above are discussed in this section. Option 1 is to not introduce further measures specifically addressing the cost gap between producing renewable hydrogen and emissions-intensive hydrogen. That is, retain the status quo. Option 2 is to introduce a HPTI consistent with the Government's announcement.

Within Option 2, two design options are considered below:

- Option 2A is to introduce the HPTI with a FID deadline.
- Option 2B is to introduce a HPTI with a first eligible production deadline.

Details on the net benefits and impacts of each option are considered in Section 6.

The Government announced an intention to introduce the HPTI with a FID deadline of 30 June 2030 (Option 2A). To inform the detailed design of the HPTI, the Government carried out a 2-week public consultation and two targeted consultations with stakeholders (see Section 8 below).

5.1 Option 1 – Maintain Status Quo

The Government has the option of not introducing new measures to intervene in the renewable hydrogen industry.

Existing policies already provide some support for the renewable hydrogen industry. This includes the Hydrogen Headstart Program and the Regional Hydrogen Hubs Program. ARENA provides funding for clean energy technology research, development and deployment and supports improvements in hydrogen technologies and projects and renewable energy generation. The government also provides some support for large scale projects by proving new commercial models and providing confidence to capital markets provide, this includes via concessional finance through government special investment vehicles (the CEFC and the National Reconstruction Fund).⁵¹ Greater details on Government support for the renewable hydrogen sector are outlined in Appendix B.

However, as covered in Section 3, these policies may not be sufficient to support the development of the renewable hydrogen industry at scale. Most of these policies are targeted at addressing the capital costs faced by a relatively small number of renewable hydrogen projects. The Hydrogen Headstart Program will provide a production credit to a small number of projects to address the cost gap the selected projects face. None of these policies address the cost-gap that a wider base of renewable hydrogen projects will face until the costs of production decrease, and they would be inadequate to meet the objectives set by Government.

The net benefits and impacts of maintaining the status quo are discussed in greater detail in Section 6.

5.2 Option 2: Introduce a HPTI

The Government has the option of introducing a tax incentive to support the production of renewable hydrogen. A HPTI could be designed to: incentivise producers to bring forward investment; reach a large number of eligible producers; support the establishment of a renewable hydrogen industry; and scale-up as the industry grows. Each of the options below are expected to achieve the Government's objectives .

⁵¹ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024), 9.

Common Features of a HPTI

The following parameters have been considered as suitable parameters for a tax credit. These have been considered in line with the intention to narrow the cost gap compared with unabated fossil-fuel based hydrogen production methods, incentivise early movers, generate production at scale, and support only the cleanest hydrogen.

Nature of payment

Incentive flat rate of \$2

The proposed flat rate of payment (paid per kilogram of renewable hydrogen produced) is AU\$2. This figure was reached after assessing Australia's pipeline of hydrogen projects, and analysing the current and expected costs associated with hydrogen production in Australia over time as well as the project's ability to leverage other forms of support, such as state and territory support and international schemes.

This figure was also considered in the context of international regimes, where a flat-rate of \$2 was considered competitive.

A flat-rate was considered more appropriate and administratively simpler than a tiered-rate (providing a credit of different amounts for hydrogen produced with different levels of emissions intensity). The intensity threshold proposed (0.6 kg carbon dioxide equivalent per kg of hydrogen produced) would capture only the cleanest hydrogen, consistent with the Government's Net Zero objectives.

Refundable

It is expected that many of these producers will not be making a profit for a number of years after commencing production, and will therefore not pay tax in those years. A refundable offset would provide value to these producers in these early years, supporting their cash-flows. Without this refundable design, they would receive no benefit in these early years which could reduce its effectiveness as an incentive. This is also aligned with international regimes, such as the United States' comparable tax credit for clean hydrogen.

Eligibility criteria


Time-limited to 10 years with a final end date of 30 June 2040

As outlined in Section 2 (Problem), the cost of producing renewable hydrogen relative to emissions intensive hydrogen is expected to decline over time. From approximately 2040, it is expected that hydrogen produced from renewable electricity through electrolysis, which will be the vast majority of renewable hydrogen production in the coming decade, will be commercially competitive, reflecting Australia's natural competitive advantages in renewable energy production.⁵²

The 10-year limit and 2040 end date were chosen to ensure sufficient assistance is provided to have a meaningful impact on investment decisions and incentivise potential producers to bring future investment plans forward, and to ensure the regime is competitive with comparable international schemes.

Threshold requirement of a 10MW electrolyser or equivalent

⁵²Thomas Longden, Frank Jotzo, Mousami Prasad, Richard Andrews, Zero-Carbon Energy for the Asia-Pacific Grand Challenge (ZCEAP), Crawford School of Public Policy, Australian National University, *Green hydrogen production costs in Australia: implications of renewable energy and electrolyser costs*, [2020 09 01 - ZCEAP - CCEP Working Paper - Green hydrogen production costs.pdf \(anu.edu.au\)](https://www.anu.edu.au/files/2020/09/01-ZCEAP-CCEP-Working-Paper-Green-hydrogen-production-costs.pdf).



Support must be provided to projects that are able to produce renewable hydrogen at-scale which are able to support decarbonisation of hard-to-abate sectors and position Australia to be an exporter. The cost of hydrogen from electrolysis can also be reduced significantly via scaling of plant capacities.⁵³

The 10MW threshold strikes a balance between supporting large-scale production, while recognising that renewable hydrogen projects are still in the early stages of scaling up in Australia, and a range of use cases which can benefit from smaller production facilities.

In nascent industries such as renewable hydrogen, smaller projects can be important for market-making capability and technical learnings that may benefit the wider industry.

Emissions intensity threshold

The threshold of 0.6kg CO₂e/kgH₂ is intended to be an achievable standard that is not prohibitively burdensome on producers, while ensuring that support is targeted to renewable hydrogen. This figure is similar to the cleanest tiers of support under other international tax credits (0.45kgCO₂e/kgH₂ for the US Clean Hydrogen Production Tax Credit and 0.75kgCO₂e/kgH₂ for the Canadian Clean Hydrogen Investment Tax Credit).

Time-capped with deadline for eligibility

To incentivise investors to bring forward investment so that production commences sooner, a deadline for eligibility and time-limiting of the incentive were considered essential. Two forms of deadlines were considered (Options 2A and 2B).

Administration of the Scheme

The HPTI will be co-administered by the ATO and the CER.

Hydrogen producers seeking to claim the HPTI will be required to register with the CER, as the administrator of the GO Scheme, which will be used to verify the details of their eligible hydrogen production.

Hydrogen producers will claim the HPTI from the ATO through their annual tax return. The ATO will report publicly on the amount of incentive claimed by participants.

Option 2A: Introduce HPTI with a FID Deadline by 2030

This option would require a taxpayer to have made a FID on the relevant hydrogen production facility by 30 June 2030 in order to access the HPTI. Considering the renewable hydrogen industry in Australia is in the early stages of emerging, this deadline strikes a balance between allowing projects to have a realistic opportunity to meet the deadline and be eligible for the incentive, while limiting the eligibility from projects which enter production in later years and have fewer challenges due to the projected decline in production costs.


This is in line with the policy intent to incentivise a bring-forward in investment, rather than subsidising projects that are anticipated to come online regardless.

Option 2B: Introduce HPTI with a First Production Deadline by 2033

This option would require a taxpayer to have commenced production of eligible hydrogen by 30 June 2033 in order to access the HPTI.

A first production deadline by 2033 is approximately equivalent to the 2030 FID deadline. Consultation for the HPTI suggested the average gap between FID and project operation was approximately three years. However, this timeline is not consistent across all projects, with ranges reported from around

⁵³ CSIRO, *National Hydrogen Roadmap* (Report, 2018) xvi.



18 months for smaller projects, to up to around five years for some large projects. Therefore, the impact of the first production deadline relative to the FID deadline may differ depending on the nature of the project and the entity's own decision-making processes.

6. Net benefits of each option

The options will be evaluated based on their ability to address the problems identified. In particular, they will be evaluated based on the quantity of hydrogen produced relative to Australia's decarbonisation needs, the complexity of the policy and its administrative requirements, and relative fiscal costs. A comparison of how the three options meet the Government's objectives is discussed in Section 7; that section also includes a discussion of caveats and modelling context for this evaluation

6.1 Option 1 – Maintain status quo

Benefits

Under the status quo the Government would not introduce further support for renewable hydrogen. Existing Government support under the status quo includes the first announced round of Hydrogen Headstart and other State and Federal Government programs. The status quo does not include further expenditure by the Government.

The hydrogen produced under the status quo would reach the lower bound of the level of hydrogen expected to be demanded by Safeguard Mechanism facilities in 2030 (0.03-0.3 million tonnes of hydrogen), but would be insufficient to support decarbonisation in 2035 (0.2-0.6 million tonnes of hydrogen by 2035).⁵⁴

Maintaining the status quo would also impose no additional compliance and administrative costs on regulators or industry. Costs of introducing new or amending legislation would also be avoided. Producers of hydrogen under any option would be expected to register a production profile with the Clean Energy Regulator to verify emissions under the Guarantee of Origin (GO) scheme. GO certificates will be necessary to sell hydrogen given the link to emissions abatement.

Costs

The cost of Option 1 is not nil, but does not impose *additional* costs to Government. Round 1 of Hydrogen Headstart has a budget of \$2 billion. ARENA has separately committed over \$315 million to 48 renewable hydrogen projects since 2017. Around \$500 million of Australian Government funding administered by the Department of Climate Change, Energy, the Environment and Water has separately been committed for regional hydrogen hubs in places such as the Hunter, Gladstone and the Spencer Gulf.⁵⁵ This makes comparisons between options difficult to assess on a like-for-like basis.

Under the status quo, there would be no generalised mechanism for supporting renewable hydrogen producers across the industry to address the cost gap. As a result, there would be no measures to enable the industry to scale up to the level necessary to deliver the hydrogen needed for Australia's net zero goals. Industry would be limited in how they could decarbonise, relying on more expensive imported hydrogen or purchasing credit units from other emitters, in either case resulting in higher costs passed on to Australian consumers.

The estimates of production under the Status Quo do not meet the targets set out under the National Hydrogen Strategy that link to the industry growth objectives. As this number is used as a proxy to assess whether the option will drive the production at scale, this option will not meet this objective.

Therefore, under Option 1 Australia's hard-to-abate sectors would likely require alternative pathways to reach Net Zero targets, which will involve costs of their own. Delayed action could reduce the

⁵⁴ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024), 75.

⁵⁵ ARENA, *Six shortlisted for \$2 billion Hydrogen Headstart funding* (Web Page, 21 December 2023) <[Six shortlisted for ...~https://arena.gov.au/news/six-shortlisted-for-2-billion-hydrogen-headstart-funding/](https://arena.gov.au/news/six-shortlisted-for-2-billion-hydrogen-headstart-funding/)>.

competitiveness of some of Australia’s industries, particularly given the scale of direct investment in clean energy technology in other jurisdictions.

Who will be impacted

The Australian community will be impacted if Australia fails to meet its decarbonisation goals and commitments. The risk of rising temperatures will present new economic challenges ,that could impact labour productivity, capital investment, and demand for our exports. As shown in the 2023 Intergenerational Report (IGR), rising temperatures are expected to result in reductions in labour productivity and hours worked, particularly for employees who work outdoors such as in agriculture, construction and manufacturing. Agricultural yields are expected to decline with climate change. The increased frequency and severity of natural disasters will also lead to reductions in output through disruptions to economic activity and destruction of property and infrastructure.⁵⁶

Facilities under the Safeguard Mechanism in hard-to-abate sectors may need to curtail their activities or face higher costs from purchasing credits if they cannot find alternative sources of clean energy, depending on government and market requirements. This would likely lead to lower employment in such facilities, lower prosperity in the communities in which they are located, and weaker growth in the broader economy.

Rather than waiting for more favourable conditions in Australia, investors looking to invest in the renewable hydrogen industry may choose jurisdictions with more extensive production support or other conditions that make production more cost-competitive. This could delay scale, as well as the establishment of a green hydrogen industry relative to our emissions reductions goals.

6.2 Option 2A: Introduce a HPTI with a 30 June 2030 FID deadline

Benefits

The table below shows the production estimated to be eligible for the HPTI.

Table 2: Estimated production of renewable hydrogen (tonnes) eligible for the PTI under Option 2A

	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32
Production eligible for the HPTI	0	0	0	296,000	424,705	609,374	609,374	609,374

	2032-33	2033-34	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40
Production eligible for the HPTI	609,374	609,374	609,374	609,374	609,374	525,222	507,206	489,190

Table 2 shows production estimated to be eligible for the HPTI is less than the total production estimated for Australia, as not all production will meet the eligibility requirements. Eligible production declines from 2037-38 onwards in the table above, as individual facilities reach their 10-year limit and are no longer eligible for the HPTI. However, production by these facilities is expected to continue.

In consultation with DCCEEW, Treasury has sourced aggregated production forecasts of green hydrogen from private sector forecasts, and then applied the proposed policy’s eligibility triggers and

⁵⁶ Australian Government, Budget 2024-25, *Budget Paper 1, Statement 3: Fiscal Strategy and Outlook*, 107.

limits to determine eligible production. These eligibility triggers and limits include the emissions intensity threshold, timing requirement for project commencement and final investment decision, and the 10-year facility-level eligibility cap. Other information on the modelling methodology is set out in section 7.2.

The above process specifically addresses the level of hydrogen supported by the HPTI. Additional production of hydrogen that does not meet all of the eligibility criteria of the incentive is not captured above, such as hydrogen from projects that take FID after 2030, or hydrogen from smaller scale producers with a capacity below 10MW. Total hydrogen produced will likely exceed that supported by the HPTI, particularly in the latter years of the incentive.

Option 2A is expected to support production of approximately 0.6 million tonnes of renewable hydrogen annually from 2029-30 onwards, and a total of 7.1 million tonnes by the end of the policy in 2039-40. These estimates are inclusive of production expected to be supported by the Hydrogen Headstart program and/or other State and Federal Government support. There is difficulty isolating the precise amounts of production eligible under each policy (i.e. HPTI and Hydrogen Headstart) through the aggregated private sector forecasts.⁵⁷ Due to the nascency of the sector, changes in economic conditions, as well as the wide range of global support options that could be available to a particular project it is not possible to disaggregate current projections from projections that were made at a different time, under different conditions.

The 0.6 million tonnes of renewable hydrogen production supported by the HPTI in 2029-30, is roughly enough to decarbonise all renewable hydrogen-replaceable processes in our existing ammonia and vertically integrated steel facilities in Australia.⁵⁸ Doing so can abate about 11.7 million tonnes CO₂-e or 2.7 per cent of domestic emissions (based on 2022 and 2023 production and emissions).⁵⁹

- For ammonia, this involves using renewable hydrogen in place of carbon-intensive hydrogen produced using gas.
- For steel, this involves using hydrogen in place of metallurgical coal to produce iron from iron ore.

This is of a sufficient level to support aspects of Australia's decarbonisation ambition, meeting the anticipated demand of the Safeguard covered firms (0.03-0.3 million tonnes of hydrogen in 2030, 0.2-0.6 million tonnes of hydrogen by 2035).⁶⁰

The estimated production is also consistent with the National Hydrogen Strategy's growth targets to support production at scale (0.5-1.5 million tonnes annually by 2030). Estimated production supported by the HPTI will not alone be sufficient to satisfy the 2035 target of 3-5 million tonnes, however this does not take into account green hydrogen projects coming online that will not be eligible for the HPTI due to FID occurring after 2030, or projects that otherwise do not meet the eligibility criteria.

Who will be impacted

⁵⁷ Ibid.

⁵⁸ Replacing all grey hydrogen produced in Australia for use in ammonia would require roughly 0.41 Mt. To produce enough green steel (using the hydrogen direct reduced iron process) to replace current crude steel production using iron ore would require roughly 0.25Mt.

⁵⁹ Displacing grey hydrogen production for ammonia gives 4.1Mt CO₂e emissions impact. Displacing vertically integrated steel production process gives 7.6 Mt CO₂e emissions impact.

⁶⁰ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, September 2024) 75.

Renewable hydrogen producers will benefit through the HPTI support they receive. The credit would impact the commercial prospects of producers in the longer-term, as renewable hydrogen production costs are expected to fall over time and ultimately be lower than other forms of hydrogen production. This could provide the foundation for a renewable hydrogen industry in Australia.

Directly and indirectly, Australia's economy is likely to benefit from greater investment in this industry. As noted previously, Australia's renewable hydrogen industry development and related exports could contribute \$28.9 billion in GDP per year by 2040 and create around 33,000 direct and indirect jobs, with further economic benefits from other downstream industries like green metals.⁶¹ The hydrogen produced under Option 2 would contribute to this.

The broader Australian community would benefit to the extent that the HPTI increases the use of renewable hydrogen and assists Australia's decarbonisation goals. For example, if renewable hydrogen were used in the production of green steel, displacing all current steel production in Australia using iron ore, domestic emissions could fall by about 7.5 Mt CO₂-e or 1.7 per cent (based on 2023 production and emissions). Further, if Australia were to produce and export green iron using renewable hydrogen and abundant Australian iron ore, this could displace carbon-intensive iron production overseas and lead to a larger global abatement impact.

Australia's manufacturing sector, hydrogen users and related supply chains will benefit from greater availability of lower cost renewable hydrogen and derivative products.⁶² In particular, businesses in hard-to-abate sectors in Australia will benefit from access to a viable option for reducing emissions, which will assist them to comply with their Safeguard Mechanism requirements and meet demand from customers for a lower-emissions product.

Regional Australia is also likely to be impacted by the transition to net zero. The development of a renewable hydrogen industry to underpin new clean manufacturing industries will support Regional Australia transition from being dependent on emissions intensive industries.

Costs

Compared to the status quo, the primary risk associated with introducing a HPTI is the potential cost of the policy to the Government. Option 2A was costed by Treasury in the Federal Budget 2024-25 context as having an estimated cost to the budget of \$6.7 billion over ten years from 2024-25, and an average of \$1.1 billion per year from 2034-35 to 2040-41. Treasury's costing of the 2024-25 Budget HPTI measure assumed that eligible production from 2030-31 until 2037-38 is equal to 2029-30 levels, reflecting the requirement to have entered production or take FID before 30 June 2030.


Policy benefits and costs with using a FID Deadline

Benefits

To incentivise investors to bring forward investment so that production commences sooner, a deadline for eligibility and time-limiting of the incentive is necessary. The benefit of using a FID deadline is that this is a critical milestone in all resource and energy infrastructure projects and represents the commitment of substantial financial resources to proceed with the execution of the project. Using FID as an eligibility criterion would act as a threshold to ensure that a project proponent seeking to claim the HPTI is committed to executing the renewable energy project in a timely way. For taxpayers seeking to claim the HPTI, it is a milestone that is broadly within their planning and control,

⁶¹ Accenture, *Sunshot: Australia's Opportunity to Create 395,000 Clean Jobs* (Report commissioned by ACF, WWF, Business Council of Australia and Australian Council of Trade Unions, October 2021) <https://d3n8a8pro7vhmx.cloudfront.net/bca/pages/6621/attachments/original/1634169147/Sunshot_-_Clean_Exports_Research_Report_-_Embargoed_-_131021.pdf?1634169147>.

⁶² As discussed in Section 3.2, the costs associated with transporting and converting hydrogen carriers make importing renewable hydrogen a costly alternative to producing it in Australia for domestic use.



and is therefore relatively at low risk of being impacted by factors outside of their control (for example, construction delays or supply chain disruptions).

Delays due to unforeseen circumstances or factors outside of the control of the business that impact the commencement of production would not affect the business' ability to access the incentive, although it could impact the value and duration of access to the incentive depending on the circumstances. A comparison of Options 2A and 2B is discussed in greater detail in Section 7 (Recommended Option).

However, a consequence of such a deadline is that businesses that do not take FID prior to this deadline would not be eligible for the incentive. It is expected to limit the number of participants to the scheme as there are several announced or planned projects that would likely come online at the end of the next decade. This also limits the cost of the incentive as projects that do not make the deadline would not be eligible for support.

Costs

FID is not a legally defined concept and this could be an integrity risk. However, this risk could be mitigated by clear legislative or regulatory requirements of the HPTI claimant to demonstrate evidence of and steps taken to reach FID. FID would need to be assessed by a regulator, such as the CER, however claimants would document such a decision as part of the normal course of business. This is considered a minor regulatory cost.

Option 2A is expected to result in a medium overall compliance cost impact, comprising a medium implementation impact and a low increase in ongoing compliance costs. The options are expected to cost \$100,000 per claimant for implementation, and \$12,000 per year for ongoing reporting requirements.

The regulatory impact cost assessment assumes that the compliance cost will vary between companies and that there will be some new reporting and verification activities that will need to be designed and dealt with.

6.3 Option 2B: Introduce a HPTI with a 30 June 2033 production deadline

Net Benefits (in comparison to Option 2A)

A deadline for first production by 2033 to qualify for the HPTI is a clear and measurable criterion, consistent with the principles of tax law. A production deadline is expected to impose lower compliance costs, as commencement of production can be evidenced through GO certificates. The production deadline would target support to early mover projects and incentivise the bring forward of investment.

Option 2B could provide the same type of benefits to Option 2A, that is, better commercial prospects for renewable hydrogen producers in Australia, economic benefits for the community and greater supply of renewable hydrogen for downstream industries. The date for commencement of production chosen, that is 2033, was proposed as it would have provided the closest equivalent proxy to a FID in 2030. This is because industry feedback during consultation indicated that a typical period between FID and first production was three years, however it was also noted that individual project factors mean that the range could be between approximately 18 months to five years.

However, a production deadline presents an inflexible hurdle that some companies may not be able to meet due to factors outside of their control. The uncertainty that this policy change introduces may cause some projects to be ineligible and this may affect investment. The impact of a production deadline on projects would greatly vary based on their individual circumstances, such as their specific financing arrangements and stage of project development. On the basis of the greater policy certainty

provided by Option 2A, it is expected that the net benefit from a regulatory perspective would not support Option 2B.

6.4 Comparison of Regulatory Costs

Businesses seeking the support from the Government through the incentives contemplated under Options 2A and 2B are expected to be large, sophisticated taxpayers who would generally obtain tax and legal advice in the course of doing business and in lodging their returns.

Table 3: Regulatory cost comparison

	Registration Costs	Costs to claim	Reporting Costs
Option 1	0	0	0
Option 2A	<p>Medium: Businesses will register a production profile with the Guarantee of Origin (GO) Scheme and elect to receive the incentive.</p> <p>It is assumed that businesses would register with the GO Scheme in any event to support certification of emissions given interactions with Safeguard Mechanism and other reporting frameworks.</p>	<p>Low: Businesses will be able to claim the incentive as part of their normal tax return process, relying on GO Certificates as evidence of their claim.</p>	<p>Negligible: The ATO will be required to report publicly on the amount of incentive paid to each recipient after two years.</p>
Option 2B	Medium; as above	Low; as above	Negligible; as above

7. Recommended Option

The three options are assessed against their ability to meet the Government objective of supporting the growth of a renewable hydrogen industry and Australia’s decarbonisation. In some cases these are binary decisions, where the policy will either be able to meet the objective or not. In other cases this may be a matter of degree and policies can be assessed on net benefit terms. The policies are further assessed based on qualitative assessments of the policy outcomes they support. This results in an outcome where the policy that has the greatest net benefit is identified.

Production milestones

To determine whether the policy can support the growth of a renewable hydrogen industry, production volumes are assessed against the National Hydrogen Strategy’s production targets.⁶³ As noted in section 3, these figures are used as a proxy to understand the impact of the policy on the required level of hydrogen production growth to support production at scale and industry growth. This outlines that Australia’s progress will be measured against the following annual hydrogen base and stretch production milestones:

- 2030: 0.5 - 1.5 million tonnes
- 2035: 3 – 5 million tonnes
- 2040: 5 – 12 million tonnes

Decarbonisation objectives

To determine whether the policy can meet Australia’s decarbonisation goals the hydrogen production volumes are assessed against the volume of hydrogen required to meet the demand of the Safeguard Mechanism covered facilities (covered in Section 2). Analysis for DCCEE’s emission projections suggest that Safeguard facilities could drive demand of 0.03 to 0.3 million tonnes of renewable hydrogen by 2030 and 0.2 to 0.6 by 2035.⁶⁴ As noted in section 3, these figures are used as a proxy to understand the impact of the policy on the required level of hydrogen production to support decarbonisation.

Caveats, estimations and limitations have been noted in the prior sections, including the difficulty in disaggregating individual forms of Government support to isolate impacts, as well as the uncertainty in projections for a nascent sector such as hydrogen.

7.1 Recommended option and decision-making process

The preferred option is Option 2A, that is, to introduce a HPTI with the requirement that eligible projects have a FID taken by 2030. In Table 4, the decision-making process and factors used to analyse the degree to which each option will support meeting the government’s objectives are summarised.

Table 4: Overview of alignment of options with government objectives

	Option 1: Maintain status quo	Option 2A: HPTI with a 30 June 2030 FID deadline	Option 2B: HPTI with a deadline for commencement of production by 2033
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⁶³ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, 2024), 91.

⁶⁴ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, 2024), 64.

Renewable hydrogen production estimates		2030: 0.6 million tonnes 2035: 0.6 million tonnes	In line with option 2A⁶⁵
Objective 1: Establish industry at scale <ul style="list-style-type: none"> 0.5 - 1.5 million tonnes annually by 2030 3 - 5 million annually by 2035⁶⁶ 	Under the status quo Australia is not expected to meet the required level of production to support the development of an industry at scale.	Option 2 will support a baseline level of production in 2030, however further investment by industry will be required to support growth to 2035 and beyond.	
Objective 2: Meet production required for decarbonisation targets Safeguard facilities' demand for renewable hydrogen: ⁶⁷ <ul style="list-style-type: none"> 0.03-0.3 million tonnes of hydrogen by 2030 0.2-0.6 million tonnes of hydrogen by 2035 	Option 1 will support a low level of decarbonisation in 2030, however will not be sufficient to meet the requirements in 2035	Option 2 is projected to meet demand driven by Safeguard facilities in 2030 and 2035.	
Cost	No <i>additional</i> direct cost to Government.	\$6.7 billion over ten years from 2024-25, and an average of \$1.1 billion per year from 2034-35 to 2040-41	In line with Option 2A
Regulatory impacts	No regulatory impact	Medium overall compliance cost impact, comprising a medium implementation impact and a low increase in ongoing compliance costs	In line with Option 2A
Impact on investor certainty		In comparison to a first production deadline	First production deadline creates investment

⁶⁵ A production deadline of 2033 was considered with the intention that production supported would be similar to that under Option 2A. However, modelling was undertaken on an aggregated production forecast basis rather than project-by-project basis due to the extremely limited nature of data available on the nascent renewable hydrogen industry in Australia. The differences in estimated production under Options 2A and 2B are unquantifiable as a result, as project-specific circumstances would play a significant role.

⁶⁶ Targets from Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, 2024), 91.

⁶⁷ Australian Government, Department of Climate Change, Energy, the Environment and Water, *National Hydrogen Strategy 2024* (Report, 2024), 64.

		which is vulnerable to more factors outside the control of a project proponent, a FID deadline provides greater investment certainty.	uncertainty and bankability concerns.
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Below, the decision-making process for concluding on this option is covered, including the key factors that were considered and the alignment with the options considered with the objectives of resolving the problem.

Overview

In Section 6, the benefits and costs of the key three options were considered, these being:

- **Option 1:** maintain the status quo (Government chooses not to intervene to address the problem);
- **Option 2A:** introduce a HPTI with a deadline for a FID by 2030 and
- **Option 2B:** introduce a HPTI with a deadline to have commenced production by 2033.

Option 1, the status quo, will not lead to the production of hydrogen at a scale necessary to support the policy objective of establishing a renewable hydrogen industry (discussed in greater detail in Section 6.1) at scale and bring forward investment. A quantitative analysis based on estimates of this are above. While the status quo will not present additional costs or regulatory impacts, it fails to achieve the Government’s objectives.

The key consequences of an absence of market intervention are described below.


- *Decarbonisation:* Australia’s highest greenhouse gas emitting facilities, covered by the Safeguard Mechanism, include steel, iron and ammonia producers. Renewable hydrogen is the most viable long-term solution to decarbonising these sectors. Considering the demand that could be driven by Safeguard facilities by 2030 and 2035, the level of renewable hydrogen produced under Option 1 could be sufficient to meet demand from Safeguard facilities by 2030 but not 2035.
- *Comparative advantage:* If scale is not achieved, Australia’s comparative advantage in capturing its market share of renewable hydrogen production could be reduced. This has the potential to impact Australia’s export economy and gross domestic product (GDP)=.

Options 2A and 2B were considered as the preferable options for addressing the problem as they have a greater chance of meeting the Government’s objectives. Introducing a production tax credit for the renewable hydrogen industry with several common design parameters means most benefits and risks are common to both options. The projected benefits on decarbonisation of Australia’s hard-to-abate sectors and the Australian economy are outlined above. As such, introducing a production tax credit with these common parameters is considered preferable to maintaining the status quo.

Option 2A is expected to support a total of 7.1 million tonnes of renewable hydrogen by the end of the policy in 2039-40, with annual production by 2030 of over 0.6 million tonnes. Complementary support from other Australian Government initiatives and the ability to leverage international support could see annual production increase beyond this in the 2030s.

A deadline for the HPTI was considered necessary to ensure the policy intent of bringing forward new investment is achieved. The primary difference between these two options is what form and year the deadline takes – a deadline for a FID by 2030 or a deadline for first production by 2033.

Advantages of a deadline for FID over commencement of production



Option 2A is considered preferable to Option 2B, as the second poses a higher investment risk in comparison to the first for projects within four to five years of the proposed production deadline.

Consultation undertaken during policy development, and analysis by DCCEE, found that typically there was approximately a three-year period between a FID being taken on a renewable hydrogen project and the project first commencing production, with this varying between 18 months and 5 years according to the project size and individual arrangements. As such, the intention of considering production deadline of 2033 in place of a FID deadline in 2030 was based on the intent to capture and incentivise as similar a pool of projects as possible.

However, consultation with the CEFC informed Treasury's view that the risks of a production deadline (which are briefly covered in Section 6) were significantly more severe for industry stakeholders seeking to benefit from the tax credit. Informed by consultation with the CEFC and its own analysis, Treasury considered the key risks of a deadline of first production by 2033 over a deadline for FID by 2030.

A deadline for commencement of production would likely disadvantage projects taking FID between 2028 and 2033 over those taking FID in the mid-2020s, as the former would be more likely to be affected than the latter both in terms of the project's own viability and their debt-financing arrangements. This has the potential to lower the number of projects which are able to take FID and come into operation at all, particularly in the context of Australian hydrogen industry which is still in its infancy.

While CEFC noted many projects of this nature have a build time of approximately three years, any projects taking a FID four to five years before the proposed production deadline would lead to greater project uncertainty. The risk of not meeting the deadline and resulting disqualification from eligibility for the PTI would have a material impact on project returns.

There are a number of factors that are outside of the control of project proponents when developing a renewable energy infrastructure project. This can include supply chain disruptions and construction issues. In particular, renewable markets have experienced high volatility because of the fluctuations in the supply and price of raw materials and regulatory environments.⁶⁸ This can impact on the "bankability" of infrastructure projects taking FID. Bankability is explained briefly below:

A bankable contract is a contract with a risk allocation between the Contractor and the Project Company that satisfies the Lenders. Lenders focus on the ability (or more particularly the lack thereof) of the Contractor to claim additional costs and/or extensions of time as well as the security provided by the Contractor for its performance. The less comfortable the Lenders are with these provisions, the greater amount of equity support the Sponsors will have to provide. In addition, Lenders will have to be satisfied as to the technical risk of the technology proposed and other project-specific features. Obviously price is also a consideration, but that is usually considered separately to the bankability of the contract because the contract price (or more accurately the capital cost of the facility) goes more directly to the bankability of the project as a whole.⁶⁹

Contrasting a deadline where the project proponent(s) have much greater control – FID – in comparison to a production deadline, which is much more vulnerable to delays for reasons described above, a lender would reasonably be highly cautious of incorporating the tax credit into a project's cash flow modelling and ability to repay their loan – particularly for projects closer to the first production deadline of 2033. The consequence is that projects closer to this first production deadline

⁶⁸ McKinsey and Company, *Renewable-Energy Development in a Net-Zero World: Disrupted Supply Chains* (Article, 17 February 2023) <<https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/renewable-energy-development-in-a-net-zero-world-disrupted-supply-chains>>.

⁶⁹ PwC, *Key Bankability Issues for Renewable Energy Projects* (Report, March 2023) <<https://www.pwc.com.au/energy-transition/papers/11-bankability-issues-renewable-energy-projects.pdf>>.

may be required to provide greater equity support or demonstrate a higher hurdle rate of return for the project, which has the likelihood of preventing some projects (which under a FID scenario would have proceeded) from proceeding.

The risks of introducing a HPTI with a first production deadline were considered to outweigh the administrative concerns with defining FID and ensuring integrity in determining if a FID is eligible. The binary nature of the outcome if the deadline, whether this was a production or FID deadline, being that the taxpayer would be wholly ineligible for the credit for a particular project lent weight to the idea that the deadline should not be one that could be missed due to factors outside of the control of the taxpayer, such as a production deadline.

7.2 Caveats and modelling context

Like most policies, there are uncertainties and unknown events that can impact the effectiveness of the policy. For example, the renewable hydrogen industry is in its infancy in Australia and is still evolving. The time-capped design of the policy and inclusion of a deadline may also constrain production if there are broader supply chain or cost increases across the industry.

Similarly, in understanding the quantitative impacts outlined in sections 6 and 7 there are uncertainties around the outlook for renewable hydrogen production reflecting the nascency of the sector, noting only 1 per cent of global hydrogen production is produced from renewable energy through electrolysis.⁷⁰

Proponents of hydrogen production facilities may also utilise one or more forms of support before making investment decisions, making isolating the impacts of individual programs difficult. Assessments of these projects may also change where other governments introduce new forms of support that impact the economics of projects in a particular location. Production under the status quo includes assumptions of support from foreign and domestic programs.

For Option 2 estimated eligible hydrogen production was based on third-party production estimates with assumptions to adjust for eligibility and demand based on estimates and information from Treasury and DCCEE. Through these consultations, it was established that the level of production in these profiles (particularly over the nearer term), had assumed that a degree of generic policy support would be provided.

7.3 Implementation of recommended option


Implementation overview

The HPTI relies on two regulatory functions: administration of the GO scheme by the CER and the tax system by the ATO.

The Government has consulted with both bodies and considered it appropriate that a pre-registration process with the CER would allow for a 'pre-assessment' of the eligibility of the taxpayer and facility, including whether criteria such as FID by 2030, the 10 MW electrolyser equivalent threshold and corporation status are satisfied. It is reasonable that this step is available to the taxpayer anywhere between their point of registration with the CER for a production profile under the GO scheme and seeking to claim the HPTI.

Eligible entities, in accordance with the GO scheme, are able to produce their own certificates as long as they hold a production profile. Under the legislation for the GO, currently in Parliament, the certificates go through a registration process and verification with the CER. This provides a natural point for ensuring integrity in the process.

⁷⁰ Australian National University, *Are We Overestimating Green Hydrogen Production* (Policy Brief, August 2024) < <https://policybrief.anu.edu.au/are-we-overestimating-green-hydrogen-production/>>.



Following this verification process, the entity may use their registered certificates to seek the tax credit from the ATO, lodging their certificates with their annual tax return.

Implementation risks

Possible risks to implementation have been identified as follows.

Multiple owners

A risk identified is the delivery of the tax credit benefit where there are multiple owners of a project or facility. Often, energy and resource projects are undertaken by multiple owners, usually in the form of an ‘unincorporated joint venture’ which allows them to pool their assets and equity, while sharing the risk. Careful management of how the credit can be administered in these scenarios will be necessary to ensure that all eligible entities have a fair entitlement to the credit, but the credit is not overpaid (for example, through double-payment).

Scaling up of production

During targeted and public consultation undertaken in June to July 2024, a further potential issue identified was the scaling up of projects. Several stakeholders noted that renewable hydrogen project proponents start with a small amount of production and (in the case of green hydrogen) smaller electrolyser, but ‘stack on’ further electrolysers (as these are modular in nature). This allows the project proponents to test the technology and feasibility of the production before scaling up. It is important to ensure that the FID is defined in a way to ensure that only production capacity outlined at FID is eligible, to avoid significant expansions of a project which were not planned prior to taking FID, are not entitled to the benefit.

These risks were taken into account in drafting and finalising the legislation.

8. Consultation

Treasury and DCCEEW held consultation on the early design ('pre-budget consultation') and detailed design of the HPTI measure announced by the Government as part of the Future Made in Australia plan in the 2024-25 Federal Budget. While consultation prior to the 2024-25 Budget announcement of the measure was targeted and confidential in nature, consultation subsequent to this included both targeted and public consultation. Stakeholder views and feedback is summarised below for each stage of consultation, including how this was incorporated or considered in the early and detailed design of the policy.

8.1 Pre-budget consultation (prior to announcement)

Treasury, DCCEEW and the Net Zero Economy Agency held targeted, confidential targeted consultations prior to the Government's announcement of the HPTI measure.

The purpose of this consultation was to test the key features of the HPTI. These features included the incentive rate of \$2 per kilogram of hydrogen, the emissions intensity threshold of 0.6 kilogram of carbon dioxide equivalent per kilogram of hydrogen produced, the 10MW electrolyser equivalent threshold, the FID deadline criterion and the time-limited nature of the measure.

During this consultation, Treasury and DCCEEW also considered the interaction between the proposed HPTI with existing hydrogen support policies, and the specific implications of the HPTI on Government Business Enterprises.

Consultation was held with a range of stakeholders including hydrogen industry bodies, prospective and operating hydrogen producers, Government special investment vehicles, and state governments.

Consultees welcomed the proposal and indicated it would make a meaningful improvement to the financial prospects for renewable hydrogen production in Australia. Stakeholders considered it would help narrow the current cost gap for renewable hydrogen and would help attract investment. Consultees broadly agreed with the proposed project parameters. Treasury and DCCEEW noted the issues raised in the confidential consultations and agreed they could be explored further during public consultation before finalising the proposed design.

8.2 Detailed Policy Design Consultations

The Government announced HPTI in the 2024-25 Budget, to support the growth of a competitive renewable hydrogen industry as a part of the Government's Future Made in Australia package.

After the announcement, Treasury published a consultation paper and conducted a two-week public consultation from 28 June to 12 July 2024. The purpose of this consultation was to seek stakeholder feedback on the proposed design and administration details ahead of the finalisation of the policy.

Eighty-two written submissions were provided by a range of stakeholders, including 46 project developers, 7 industry bodies, 4 tax advisors, 5 unions and 3 state and territory governments.

Alongside the public consultation, Treasury and DCCEEW conducted targeted consultation discussions with 23 key stakeholders to discuss the proposed design and administration in greater detail.

Entity type

Industry bodies

Project proponents

Consulting firms



Banks

Government-associated agencies

State Governments

Stakeholder Views and Impact on Policy Design

Stakeholders again welcomed the HPTI and the support it would provide for renewable hydrogen production.

The main issues raised were:

- The rate of support (\$2/kg) on its own will not close the cost gap entirely;
- The duration of support (10 years) may be insufficient;
- Taking a FID by 30 June 2030 would be difficult for projects;
- The 10MW equivalent capacity and single site requirements preventing smaller scale and dispersed projects from claiming the support including those that could support the heavy mobility sector through re-fuelling stations;
- That companies ought to be able to elect when the 10 year period commences (in cases where they have commenced production prior to 2030), as projects tend to scale up over time and would want to optimise the support they receive;
- That the incentive should support other forms of low-carbon hydrogen production, such as hydrogen produced through emissions-intensive processes with carbon-capture and storage to capture emissions;

Grid matching, which was raised in the consultation paper as a potential requirement was broadly accepted, with stakeholders agreeing with the need to ensure that hydrogen production does not inadvertently increase emissions across the relevant electricity grid.

The policy was adjusted by allowing projects to elect when the 10 year claim period for their project commences. All other policy design specifications were retained. These issues were identified during the development of the policy, and it was considered that a change in the policy was not required.

The following sections provide further detail on consideration these issues raised in the stakeholder feedback.

Incentive Rate


Stakeholders noted throughout the consultation that although the \$2/kg rate of support would have a meaningful impact on the financial prospects for renewable hydrogen production in Australia, it may not fully offset the gap between production costs and prices for all projects.

Stakeholders who suggested the cost gap was larger than \$2/kg estimated the current cost gap to range from \$4 to \$8 per kilogram of hydrogen.

This feedback was in line with information that was considered prior to the consultation discussions. Insights from the first round of the Hydrogen Headstart program showed a significant variance in cost gaps between renewable hydrogen projects.

Stakeholders also noted that there are other forms of support in the renewable hydrogen space that will be introduced, that will also help address the cost gap if they are able to work alongside the HPTI. For example, NSW government initiatives and Japan's contracts for difference scheme.

Following consultation, the decision was made to retain the \$2/kg rate of support. Taking other prospective support into account providing support above \$2/kg would provide a windfall gain to



some renewable hydrogen projects that are able to stack a range of initiatives, while increasing the fiscal impact to the federal budget.

Duration of support

Many consultees considered that extending the support over 15 years would be beneficial as many of their costs are locked in for this timeframe. These costs include their offtake arrangements, renewable energy contracts and their financing arrangements.

Following consultation, the decision was made to retain the 10-year limit on each facility. This is consistent with the support provided under the Hydrogen Headstart program and the US Inflation Reduction Act.

FID by 30 June 2030

Stakeholders noted that the FID by 30 June 2030 cut-off was generally feasible for projects currently under consideration, but any projects that were not already quite progressed would be unlikely to meet this timeframe. This would encourage projects currently under consideration to bring forward their FID in a timely manner, but may not provide sufficient time for new projects to complete the necessary steps to reach a FID and bring forward their investment.

The FID deadline is considered important to ensure that the policy aligns with the intent to bring forward investment and provide support to first movers.

As outlined above, a production deadline was considered as an alternative to the FID deadline. However, this was considered to be just as difficult for projects to achieve, and would also increase the uncertainty of the investment as delays in the construction phase that are out of a project's control could jeopardise its ability to access the credit.

Single site and 10MW equivalent requirements

Several stakeholders suggested that the 10MW equivalent capacity requirement and requirement to be on a single site be removed. This would allow for smaller scale projects or dispersed projects such as refuelling highways to be eligible for the HPTI. The 10MW threshold was suggested to be too large given the current largest electrolyser in Australia is 1.25MW.

In contrast, other stakeholders recommended the 10MW threshold be increased, so that support is targeted at the projects that will produce at-scale and represent value for investment. However, most stakeholders did not have an issue with the threshold.

Following consultation, the decision was made to retain these design specifications. The minimum capacity requirement strikes a balance between pursuing large-scale production and supporting a range of use cases which can benefit from smaller production facilities.


Regarding dispersed production (such as refuelling highways), other initiatives, such as ARENA funding through the Advancing Renewables Program or the Future Made in Australia Innovation Fund, or bespoke initiatives like Hydrogen Highways are better placed to support pilot and demonstration scale projects.

Exclusion of blue hydrogen

A few stakeholders suggested that the HPTI should not be limited to renewable hydrogen, and that other lower-emissions hydrogen production (such as blue hydrogen) can help provide a broader suite of clean energy solutions.

J-Power and Sumitomo Corporation in their joint submission outlined the following:

“Limiting the eligibility of the HPTI to renewable hydrogen will marginalise these nascent industries, which offer numerous benefits to Australia including job creation, technological advancements, skill transfer in emissions intensive industries, and a



significant reduction in overall greenhouse gas emissions. Clean hydrogen industries are pivotal for transitioning to a sustainable, long-term hydrogen economy.”

Following consultation, the decision was made to retain this design specification. Excluding blue hydrogen production is aligned with the intention of the policy to only support renewable hydrogen production. This will ensure that Government support is targeted to projects that will provide the most value in terms of emissions reduction.

Ability to elect when the claim period begins

Some stakeholders requested the design of the HPTI allow entities to elect when the 10-year period for a project commences, rather than it automatically starting once they begin eligible production.

This would allow for entities to maximise the amount they can receive in scenarios where their electrolyser during first eligible production is not operating at full capacity. Stakeholders suggested some projects go through various testing phases in the commencement period. If the 10-year period was to automatically commence, they would be required to claim for this testing phase where they are not operating at the optimal capacity.

Noting the incentive is not indexed to inflation, and the HPTI has the 2040 end date, entities do not have an incentive to unduly delay claiming. It is consistent with the policy intent that the entity can claim for larger scale production.

Following consultation, the decision was made to adopt this suggestion in the design specifications, allowing an entity to choose when their 10-year period commences in relation to a project.

8.3 Confidential Consultation on draft legislation

In October 2024, Treasury, with representatives from DCCEEW undertook confidential consultation with participants and peak bodies in the hydrogen industry. The purpose of this consultation was for consultees to provide feedback on draft legislation and explanatory materials.

Consultees welcomed the draft legislation and indicated that the legislation would provide further certainty for investors and would assist with Australia’s ambition to establish a renewable hydrogen industry.

Evaluation/Review

The effectiveness of the preferred option can be monitored and evaluated against the Government’s objectives as outline in the table below.


Objectives	Success Metrics
<p>Primary objectives</p>	<ul style="list-style-type: none"> Increase in number of renewable hydrogen production by 1 July 2030 relative to estimates under the status quo (measured against Australia’s long-term targets of producing 0.5 million tonnes of hydrogen by 2030, 3 million tonnes by 2035, and 15 million tonnes by 2050)
<ul style="list-style-type: none"> Support investment in large scale renewable hydrogen projects Support decarbonisation to meet Australia’s Net Zero commitments 	
<p>Further Objectives</p>	
<ul style="list-style-type: none"> Position Australia as a renewable hydrogen exporter 	<ul style="list-style-type: none"> Adoption of renewable hydrogen by hard-to-abate sectors
<ul style="list-style-type: none"> Facilitate a comparative advantage in energy-intensive, low-emissions industries 	<ul style="list-style-type: none"> Export volumes of renewable hydrogen, including in embodied products
	<ul style="list-style-type: none"> The number of long-term offtake agreements in place for renewable hydrogen from domestic iron and steel-making
	<ul style="list-style-type: none"> The number of long-term offtake agreements in place for renewable hydrogen from ammonia industry

The policy will be evaluated by Treasury and DCCEEW, in consultation with the ATO and CER, at milestones based on the availability of the following data:

- periodic reporting on the GO Scheme public register by the CER, which will include the number of registered hydrogen producers, the quantity of hydrogen produced and associated emissions intensity levels;
- annual reporting by the ATO on the level of tax incentive claimed under the HPTI;
- regular (at least annual) surveys and reports on investment intentions and capital expenditure, such as those produced by data and analytics providers and the Australian Bureau of Statistics;
- modelling commissioned as part of future updates to the National Hydrogen Strategy or similar initiatives on the quantity of hydrogen produced and quantity required to meet Australia’s net zero goals.

Treasury and DCCEEW will also monitor the implementation and effectiveness of the policy over time through regular outreach and engagement with the hydrogen industry, industries expected to be consumers of renewable hydrogen, regulators and relevant community groups.

This monitoring and evaluation will compare the actual and updated projections of hydrogen production with updated estimates of expected demand and requirements to meet Australia’s net zero goals. It will also monitor the number of hydrogen producers and recipients of the HPTI, and



developments in the cost of producing renewable hydrogen in Australia relative to traditional production methods and production of green hydrogen overseas. It will also identify feedback from stakeholders on the administration arrangements, such as the application process and claiming of the incentive through annual tax returns, and developments in the hydrogen industry more broadly.

Key milestones in this ongoing evaluation include the start date of 1 July 2027, the FID cut-off date of 1 July 2030, the dates at which the Government has expressed hydrogen production targets (2030 and 2035) and the preparation of future National Hydrogen Strategy updates.

Treasury and DCCEEW will provide advice to the Treasurer and Minister for Climate Change and Energy on the performance on the incentive, including the production during the duration of the incentive, number of recipients, and feedback from stakeholders.

Appendix A: Status of the IA at each major decision point

Decision Point	Timeframe	Status of the IA
Development of the HPTI NPP	March 2024	Treasury consulted with Office of Impact Analysis (OIA) on the standard of IA required, if any. OIA indicated an IA is required as this policy is more than likely to have a minor impact.
Government consideration of the HPTI	April 2024	Treasury prepared a draft IA for consultation with the OIA and consideration by the Government alongside advice on potential policy options.
Detailed design consideration of HPTI	June 2024 – October 2024	Consultation with stakeholders to develop detailed design, feedback and data. Revised draft IA provided to OIA for feedback.
Government consideration of feedback from consultation and detailed design options	October 2024	Revised draft IA included alongside advice on detailed design for Government consideration
First Pass Final Assessment	October 2024	Revised IA provided to OIA for assessment.
Second Pass Final Assessment	October 2024	Revised IA provided to OIA for assessment. The IA was assessed as adequate.
Introduction of HPTI and design specifications	November 2024	Assessed IA provided to decision maker.

Appendix B: Renewable hydrogen policy context

Existing policies

The Australian Government has several existing initiatives to support growth and innovation in the emerging hydrogen sector. These initiatives comprise grant programs for research and development and capital projects, low-interest concessional finance, and production support designed to address commercial barriers to large-scale production.

The Government has also released the *National Hydrogen Strategy 2024* in Partnership with States and Territories.

ARENA Support

ARENA plays an important role in funding clean energy technology research, development, and deployment, including in the hydrogen sector and for related technologies.

Through the 2024-25 Budget, the Australian Government provided a \$5.1 billion to boost ARENA and support it to develop and commercialise technologies critical to net zero. This funding includes \$1.9 billion over 10 years to continue its core investments in renewable energy and related technologies over the long term.

To date, ARENA has \$236 million to 43 renewable hydrogen projects from early-stage research to deployment projects and studies. Projects have included hydrogen refuelling and hydrogen trucks, hydrogen for producing green ammonia, hydrogen for use in alumina refining, gas blending and remote power.

Regional Hydrogen Hubs Program

The Government is investing in the Regional Hydrogen Hubs Program to support the development of hydrogen hubs in key regional locations in Australia. Hydrogen hubs are locations where producers, users and exporters of hydrogen work side by side to share infrastructure and expertise. They will help the hydrogen industry springboard to scale.

This funding will be delivered to successful applicants as grant funding to support capital projects and development and design studies. Hub funding has been announced for projects in the Pilbara and Kwinana in Western Australia, Bell Bay in Tasmania, Gladstone and Townsville in Queensland, and Port Bonython in South Australia.

Concessional Finance


The novel nature of renewable hydrogen technology adds risk to projects, which is directly proportional to a hydrogen project's financing costs. The risk of not realising a return can mean projects struggle to secure sufficient capital to see them through early development.

The Australian Government has engaged and developed a core of specialist investment groups to support hydrogen projects with a range of financial products, including the CEFC, the Northern Australia Infrastructure Facility, Export Finance Australia, and the National Reconstruction Fund.

The CEFC established the \$300 million Advancing Hydrogen Fund in 2020. To date, there have been limited viable investment opportunities, due mainly to a mismatch between investment return and risk settings, as well as the maturity of projects.

Production Support – Hydrogen Headstart Program

Hydrogen Headstart is a competitive program which is designed to bridge this commercial gap through a production credit provided to large scale renewable hydrogen projects in Australia, over a maximum 10-year period. The program aims to accelerate development of Australia's hydrogen



industry, catalyse clean energy industries and help Australia connect to new global hydrogen supply chains to take advantage of renewable hydrogen's jobs and investment potential.

In the 2023-24 Budget, the Australian Government announced it would invest up to \$2 billion in the Hydrogen Headstart Program. In the 2024-25 Budget, the Government committed an additional \$2 billion to the program, bringing total support to \$4 billion.

Hydrogen Headstart provides targeted, time-limited support for a small number of early-mover, innovative projects that face higher barriers to deployment. It will provide a production credit to a small number of selected projects to address the respective cost gaps they face.