APA submission

WA Renewable Hydrogen Target for electricity generation in the South West Interconnected System

10 November 2022

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Lodged via email: EPWA-info@dmirs.wa.gov.au

10 November 2022

RE: APA Submission to the WA Government's Renewable Hydrogen Target

Dear Ms McMahon,

Thank you for the opportunity to consult on the design of a Renewable Hydrogen Target (RHT) for electricity generation in the South West Interconnected System (SWIS). APA appreciates the opportunity to contribute to Energy Policy WA's (EPWA) consultation on delivering WA's renewable hydrogen ambition and stimulating demand for a domestic renewable hydrogen market.

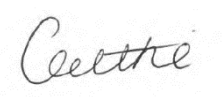
APA is an ASX listed owner, operator, and developer of energy infrastructure assets across Australia. As well as an extensive network of natural gas pipelines, we own or have interests in gas storage and generation facilities, electricity transmission networks, and over 359MW of renewable generation infrastructure, with a further 88MW under construction.

We support the development of a RHT and future policy developments that help to establish a domestic renewable hydrogen market. APA is actively engaged in projects which support WA's hydrogen economy. Our first Pathfinder project is seeking to enable the conversion of around 43-kilometres of the Parmelia Gas Pipeline (PGP) in WA into Australia's first 100 per cent hydrogen-ready transmission pipeline.

APA agrees that the RHT should have a 10 per cent target. Given the hydrogen and renewable gas industries are in their infancies, the RHT should be flexible and adaptable to future market fluctuations. For this reason, we strongly support a use-agnostic scheme where hydrogen produced could be used for any purpose.

If you wish to discuss our submission in further detail, please contact John Skinner, on 02 9693 0009 or john.skinner2@apa.com.au.

Regards,



Caroline Beattie
General Manager
Hydrogen and Future Fuels

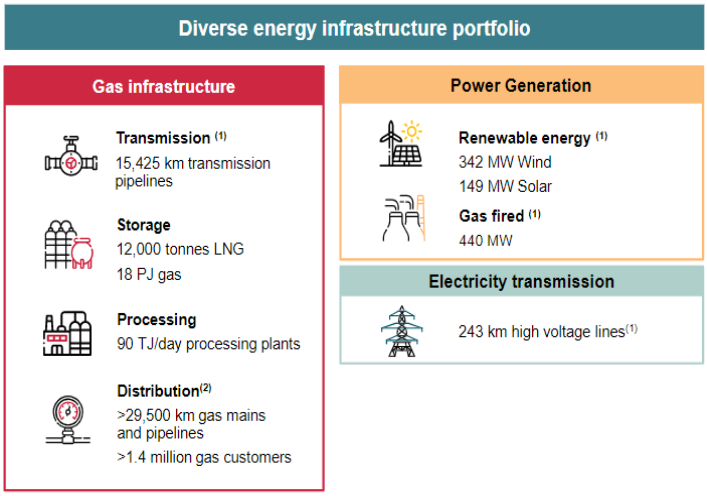
1 Submission

1.1 APA actively supports the transition to a lower carbon future

APA is a leading Australian Securities Exchange (ASX) listed energy infrastructure business. Consistent with our purpose to strengthen communities through responsible energy, our diverse portfolio of energy infrastructure delivers energy to customers in every state and territory on mainland Australia.

Our 15,000 kilometres of natural gas pipelines connect sources of supply and markets across mainland Australia. We operate and maintain networks connecting 1.4 million Australian homes and businesses to the benefits of natural gas. Also, we own or have interests in gas storage facilities and gas-fired power stations.

Figure 1



In August 2022, we published our inaugural Climate Transition Plan which outlines our commitments to support Australia's energy transition and pathway to achieve net zero operations emissions by 2050.

We operate 359 MW of renewable generation infrastructure with a further 88 MW under construction, while our high voltage electricity transmission connects Victoria with South Australia and New South Wales with Queensland.

Most recently, we have completed the acquisition of Basslink Pty Ltd, which owns and operates the 370km high voltage direct current electricity interconnector between Victoria and Tasmania. The acquisition adds a third electricity interconnector to APA's energy infrastructure portfolio and is consistent with our strategy to play a leading role in the energy transition.

1.1.1 APA's growing footprint in renewable hydrogen generation

Through our Pathfinder Program, we are investigating how hydrogen, future fuels and other emerging technologies can support a lower carbon future.

APA is actively engaged in projects which support WA's hydrogen economy. Our first Pathfinder project is seeking to enable the conversion of around 43-kilometres of the Parmelia Gas Pipeline (PGP) in WA into Australia's first 100 per cent hydrogen-ready transmission pipeline – the 'PGP Conversion Project'.[1] In addition, in May 2022, APA

[1] APA, *APA set to unlock Australia's first hydrogen-ready transmission pipeline* (Media Release, 23 February 2021) <https://www.apa.com.au/news/media-statements/2021/apa-set-to-unlock-australias-first-hydrogen-ready-transmission-pipeline/>.

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and Wesfarmers Chemicals, Energy and Fertilisers (WesCEF) (part of Wesfarmers Ltd) executed a Memorandum of Understanding (MoU) to undertake a pre-feasibility study to assess the viability to produce and transport renewables-based hydrogen using this section of APA's PGP.[2]

In Phase One of the PGP Conversion Project, the pipeline was assessed as suitable for 100 per cent hydrogen service without any requirement to reduce operating pressure of the pipeline. Phase Two testing, supported by a $300,000 grant under the Renewable Hydrogen Fund (WA), is underway and involves testing the pipeline material in a gaseous hydrogen environment. Preliminary findings are positive and validate Phase 1 results.

In Queensland, APA has also joined a consortium of Australian and Japanese energy players to establish the State's largest green hydrogen project.[3] The consortium is finalising a detailed feasibility study, which commenced in September 2021, into the development of a large-scale green hydrogen project in Central Queensland. The project proposes to export green hydrogen to Japan and supply large industrial customers in the Central Queensland region to support emissions reduction for the domestic industry. When built, the proposed green hydrogen project will be the largest in Queensland. Commencing production in the mid-2020s, the project will scale up to over 3,000 MW of electrolysis capacity by the early 2030s.

In NSW, APA has recently signed a MoU with other consortium partners to carry out an expanded green hydrogen feasibility study in the Hunter Valley region.[4] The study will map key operational and commercial plans for the project which involves exploring the development of a renewables-based hydrogen production facility. The facility forms part of a proposed 'Hunter Energy Hub' development, which would combine grid-scale batteries, solar thermal storage, wind and pumped hydrogen.

1.2 APA supports development of the RHT and a domestic hydrogen market

This section relates to Question 3 in the consultation paper

APA supports the WA Government's proposal to establish a RHT in the SWIS. Policy settings which stimulate demand and supply in a domestic renewable hydrogen market are essential if the industry is to become established.

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[2] APA, *Australia's first potential conversion of a gas transmission pipeline to pure hydrogen a step closer* (Media Release, 6 May 2022) <https://www.apa.com.au/globalassets/media-statements/2022/australias-first-potential-conversion-of-a-gas-transmission-pipeline-to-pure-hydrogen-a-step-closer.pdf>.

[3] APA, *APA Group joins international hydrogen consortium* (Media Release, 15 September 2021) <https://www.apa.com.au/globalassets/media-statements/2021/apa-group-joins-international-hydrogen-consortium.pdf>.

[4] AGL, *AGL and Fortescue Future Industries' green hydrogen feasibility study underway in the Hunter* (Media Release, 9 August 2022) < https://www.agl.com.au/about-agl/media-centre/asx-and-media-releases/2022/august/agl-and-fortescue-future-industries--green-hydrogen-feasibility->.

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Hydrogen has been identified as one of Australia's key comparative advantages and a logical option to help decarbonise the economy.[5] APA is actively leading innovation efforts to unlock the new technologies required to lead the development of an advanced hydrogen industry in Australia. Much of APA's gas pipeline infrastructure is adjacent to some of the best geographical areas for hydrogen production in Australia.

In our view, hydrogen will play a critical role in Australia's transition towards net zero. Hydrogen's value and potential may be most effectively realised through a use-agnostic scheme. Limiting the use of hydrogen for electricity generation may not be harnessing the ways hydrogen can play a valuable role:

- As a decarbonised form of energy or feedstock alternative for industries currently utilising natural gas.
- As fuel for hydrogen transport, aligning with one of the strategic focus areas of the WA Renewable Hydrogen Strategy and Roadmap[6].
- As a demand side management option, e.g. hydrogen production is switched off at times of high electricity prices, or switched on to bolster low demand days.

In addition to the uses of hydrogen listed above, hydrogen may also be used to produce electricity as a means of firming renewables when they are not producing, or when there is a sudden concentration in demand.

Effective planning, policy certainty and well-designed market-based mechanisms provide for the most efficient, least cost transition to a net zero economy. When considering the potential design of a RHT, we support EPWA's proposal to introduce an obligation on retailers and large users to purchase a portion of their electricity from renewable sources, such as renewable hydrogen.

Given the certificate scheme is expected to allow a broad use of hydrogen across the economy, we support a renewable hydrogen certificate scheme which levies the cost of participation on electricity retailers and large electricity consumers in the SWIS. Placing the liability on the wide pool of electricity retailers and large consumers in the SWIS is appropriate to achieve broader industry development and reduced consumer costs long-term.

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[5] Australian Government, *Technology Investment Roadmap – First Low Emissions Technology Statement – 2020,* 18.
[6] Government of Western Australia, *Western Australian Renewable Hydrogen Strategy and Roadmap* (November 2020) 16. <https://www.wa.gov.au/system/files/2020-12/Western%20Australian%20Renewable%20Hydrogen%20Roadmap%20-%20November%202020.pdf>.

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1.3 Flexibility is encouraged when designing a certificate scheme

This section relates to Questions 2, 6 & 7 in the consultation paper

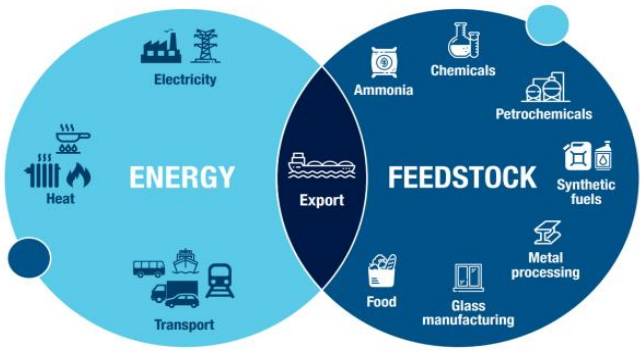
APA agrees that the RHT should have a 10 per cent target. In contrast to a smaller initial target, a 10 per cent target will generate a larger demand stimulation effect and greater economies of scale.[7] As such, we recommend maintaining an initial 10 per cent target with periodic reviews of the scheme as required, to ensure it is meeting its key objective: to stimulate local demand for hydrogen and act as a key catalyst for broader industry development.[8]

The Renewable Energy Target (RET) was one of the Energy System Objective schemes reviewed by EPWA in the consultation paper.[9] The RET provides an illustrative precedent for the time and adjustments required to successfully deliver an Energy System Objective scheme. As acknowledged by the consultation paper,[10] despite myriad challenges experienced over its history, the RET is considered a successful initiative that accelerates the deployment of renewable generation across Australia. As reported by the Commonwealth's Clean Energy Regulator in January 2021, the Large-scale RET of 33,000 GWh hours of additional renewable energy was met on a 12-month rolling basis.[11]

1.3.1 Formalising discussion on a 'use-agnostic' scheme

Stimulating growth for a domestic hydrogen market requires a flexible and holistic approach. In our view, there are significant challenges associated with prescribing the use of renewable hydrogen to generating electricity which should be addressed prior to finalising a RHT design.

Figure 1.1: Uses of hydrogen



Source: Western Australian Renewable Hydrogen Strategy

Accordingly, we encourage WA Government to expand and/or formalise discussion on a use-agnostic renewable hydrogen certificate scheme. (as outlined in Figure 1.1 from the consultation paper, extracted above)

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[7] Government of Western Australia, *Renewable Hydrogen Target for electricity generation in the South West Interconnected System* (Consultation Paper, October 2022) 20.
[8] Government of Western Australia, *Renewable Hydrogen Target for electricity generation in the South West Interconnected System* (Consultation Paper, October 2022) 6.
[9] Ibid 29-30.
[10] Ibid 29.
[11] Australian Government, 'Large-scale Renewable Energy Target market data' *Renewable Energy Target* (Web Page, 25 October 2022) < https://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/Large-scale-Renewable-Energy-Target-market-data>.

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A RHT which limits the use of renewable hydrogen for electricity generation potentially gives rise to challenges associated with energy efficiency, commercial attraction and widespread adoption. As an example, extensive and resource-intensive testing may be required for transmission pipelines that will be delivering hydrogen as energy to the electricity generation under this approach (see section 1.4).

As defined by the consultation paper, renewable hydrogen means molecular hydrogen produced via electrolysis that is powered by renewable energy.[12] This type of fuel dispatchable generation naturally results in substantial energy efficiency losses and impacts hydrogen's commercial appeal.

At this stage, deploying hydrogen may be of greatest value and viability in industries where producing hydrogen via electrolysis will grow to be commercially feasible and where there is no efficient alternative renewable electricity option. Examples include, but are not limited to, industrial-scale manufacturing and heavy transport.

With the gradual uptake of hydrogen in these compelling use case industries, investment and consumer confidence will rise in the renewable hydrogen sector. In turn, this may help the hydrogen market to grow to scale in line with increasing demand. As acknowledged by the RHT paper, widening the scope of opportunities for renewable hydrogen use may stimulate domestic demand substantially more than restricting use to electricity generation.[13]

To ensure the delivery of a holistic and longstanding certificate scheme, we encourage EPWA to include potential designs of a use-agnostic scheme when designing the RHT. This will enable industry's involvement and advice in overcoming relevant technical and commercial challenges, and potentially unlock other opportunities to stimulate demand for hydrogen.

A use-agnostic certificate scheme will also be more aligned to policies across jurisdictions, such as the NSW Renewable Fuel Scheme – legislated by the NSW Government to begin in 2024 and run until 2044. National consistency should be strongly encouraged to enable wider ongoing relevance, growth in trade markets and reduced compliance costs.

1.4 Achieving an industry wide RHT requires funding and cost-effective options

This section relates to Questions 2, 6 & 7 in the consultation paper

1.4.1 Funding considerations for future RHT developments

Achieving a RHT requires funding to conduct research and testing which proves viability of any option.

[12] Government of Western Australia, *Renewable Hydrogen Target for electricity generation in the South West Interconnected System* (Consultation Paper, October 2022) 12.
[13] Ibid 7.

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At this preliminary stage of policy development, funding considerations seem outside the consultation scope. However, EPWA may consider the following arrangements to inform discussion on costs and the potential impact of renewable hydrogen generation:

- APA is currently seeking Australian Energy Regulator (AER) approval for a technical study to examine the safety and integrity of pipelines in the Victorian Transmission System (VTS), given the likelihood that hydrogen may be injected into the VTS in the future. The forecast capex for the proposed study is $37.9 million, which APA is proposing be spread over a 10 year period commencing in 2023.
- As referenced by the RHT paper,[14] the NSW Government has provided $78 million to EnergyAustralia, with the Australian Government contributing $5 million, to make the Tallawarra B power station hydrogen ready.
- In the UK, the recent Energy Security Bill 2022 (currently in the House of Lords) has proposed a levy to help support the UK Government's ambition for up to 10 GW of low carbon hydrogen production capacity by 2030.[15] It is expected that from 2025 at the latest, all revenue support for low carbon hydrogen production will be levy funded, subject to consultation and legislation being in place.

1.4.2 Cost-efficiency of repurposing gas infrastructure for hydrogen and maintaining social licence

Gas infrastructure has an essential role to play in helping Australia transition to net zero. The long-term investment required for the transition, and therefore the cost to consumers, could be significant where the increasing value of electricity transmission assets may flow on consumers and widely across the NEM.

The cost-effectiveness of pipeline infrastructure has been considered in the *Pipelines vs Powerlines: A Technoeconomic Analysis in the Australian Context* report, produced by GPA Engineering and commissioned by the Australian Pipelines & Gas Association (APGA).[16]

The report indicates that hydrogen pipelines are likely to play a central role in Australia's net zero energy market. Hydrogen pipelines, for the purpose of energy transport and storage, were found to be up to four times more cost-competitive when compared to electricity transmission infrastructure, in the context of like distance and capacity scenarios.

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[14] Ibid 15.
[15] UK Energy Security Bill, 6 July 2022: https://www.gov.uk/government/collections/energy-security-bill
[16] Australian Pipelines & Gas Association, *Pipelines vs Powerlines: A Technoeconomic Analysis in the Australian Context* (Final Report, 24 August 2021).

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Repurposing natural gas pipelines to transport hydrogen is considered to have significant advantages:

- Converting existing gas networks is more cost-efficient in comparison to constructing new, dedicated hydrogen pipelines.[17]
- Gas pipeline networks are already available and socially accepted (routes, including rights of way and use). [18]
- Technologies for converting the natural gas infrastructure to hydrogen operation are already being developed.

The RHT paper acknowledges that commercial gas turbines have been capable of operating using fuel mixes that contain 5 to 95 per cent hydrogen (by volume) in recent years.[19] Studies undertaken by companies such as Siemens Energy note the importance and cost-effective nature of using hydrogen as fuel in gas turbines. Siemens' *Hydrogen Power with Siemens Gas Turbines* white paper noted that all newly built Siemens gas turbines can burn different levels of hydrogen in the fuel mix.[20]

As part of APA's PGP Conversion Project in WA, 43km of the gas transmission pipeline was assessed as suitable for 100 per cent hydrogen service without any requirement to reduce operating pressure of the pipeline. Preliminary findings of Phase 2 are positive and validate Phase 1 results.

While Australia has only recently begun advancing cost-effective opportunities for a domestic hydrogen generation market, other countries around the world, particularly in Europe, are further ahead. An increasing number of projects around the world are demonstrating the potential for re-use of gas infrastructure to transport renewable gases.

For example, studies carried out as part of the European Hydrogen Backbone initiative found that repurposing gas pipelines for hydrogen would equate to ~10-15 per cent of the costs involved for constructing new hydrogen pipelines (including decommissioning natural gas operation, water pressure tests, dismantling of connections etc.). The capital cost per km of repurposed hydrogen pipelines is still substantially lower, at ~33 per cent of the cost of building new hydrogen pipelines.[21]

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[17] Ibid, Amber Grid et al, *European Hydrogen Backbone* (Report, April 2022) <https://ehb.eu/files/downloads/ehb-report-220428-17h00-interactive-1.pdf>.
[18] European Union Agency for the Cooperation of Energy Regulators, *Transporting Pure Hydrogen by Repurposing Existing Gas Infrastructure: Overview of existing studies and reflections on the conditions for repurposing* (16 July 2021) 6.
[19] Government of Western Australia, *Renewable Hydrogen Target for electricity generation in the South West Interconnected System* (Consultation Paper, October 2022) 13.
[20] Siemens Energy, *Hydrogen Power with Siemens Gas Turbines* (White Paper, 2020) <https://www.infrastructureasia.org/-/media/Articles-for-ASIA-Panel/Siemens-Energy---Hydrogen-Power-with-Siemens-Gas-Turbines>.
[21] Amber Grid et al, *European Hydrogen Backbone* (Report, April 2022) 17-8 <https://ehb.eu/files/downloads/ehb-report-220428-17h00-interactive-1.pdf>.

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In the Netherlands, the Gasunie hydrogen pipeline has been transporting hydrogen along a modified natural gas pipeline since 2018. In June 2021, Gasunie announced a significant expansion of the Dutch hydrogen transmission network, with 85 per cent of the new network reusing existing natural gas pipelines (see case study below).

Case study: Gasunie repurposing transmission pipelines in the Netherlands

In November 2018, Gasunie, the Netherlands' gas transmission operator, started transporting hydrogen along a 12km long stretch of repurposed natural gas pipeline. The pipeline will transport more than 4,000 tons of hydrogen per year for industrial purposes, saving over 10,000 tons of carbon emissions each year.[22]

Figure 2: Gasunie's hydrogen transmission pipeline

On 30 June 2021 the Netherlands Ministry of Economic Affairs and Climate Policy announced that it will commission Gasunie to develop the national infrastructure for the transport of hydrogen.[23] The project, with an estimated investment of €1.5 billion, is scheduled for completion in 2027. Most importantly, the new national hydrogen network will consist of 85% reused natural gas pipelines, resulting in costs four times lower than if entirely new pipelines were laid.

1.5 The RHT should be adaptable to a wider set of challenges

This section relates to Question 5, 15, 16, 17 in the consultation paper

The hydrogen and renewable gases industries are in their infancies. Accordingly, the RHT should be designed with a key focus on adaptability to future market fluctuations and challenges.

The RHT paper provides for three specific contexts of using hydrogen for electricity generation. This includes:

[22] Gasunie, 'Gasunie hydrogen pipeline from Dow to Yara brought into operation' *News* (Web Page, 27 November 2018) <https://www.gasunie.nl/en/news/gasunie-hydrogen-pipeline-from-dow-to-yara-brought-into-operation>.
[23] Gasunie, 'Dutch-German cooperation secures European future of hydrogen' *News* (Web Page, 6 July 2021) <https://www.gasunie.nl/en/news/dutch-german-cooperation-secures-european-future-of-hydrogen>.

1. blending with natural gas fuel sources used to supply existing or new gas turbines
2. generation in gas turbines as the sole fuel source and/or
3. direct generation of electricity when used in fuel cells.[24]

As part of delivering a RHT, extensive and resource-intensive assessment may be required for infrastructure that will be producing, transporting and receiving hydrogen as energy or feedstock, including:

- Gas turbines
- Fuel cells
- Gas Power Generators (GPG)
- Pipelines
- End-users' infrastructure (e.g. industrial equipment, at-home appliances).

Determining a realistic ramp up period for the RHT will need to take such factors into account. We encourage EPWA to maintain an initial 10 per cent target with periodic reviews of the scheme as required, particularly should the certificate scheme extend its applicability to multiple sectors/liable entities.

To exemplify, the European Commission's 'Hydrogen Strategy for a climate neutral Europe' provides three phases to develop a clean hydrogen economy:[25]

- Phase 1 (2020-24) aims to decarbonise existing hydrogen production for current uses such as the chemical sector and promote it for new applications. This phase relies on the installation of at least 6 Gigawatt of renewable hydrogen electrolysers in the EU by 2024 and aims to produce up to 1 million tonne of renewable hydrogen.
- Phase 2 (2024-30) aims to install at least 40 GW of renewable hydrogen electrolysers by 2030 and the production of up to 10 million tonnes of renewable hydrogen in the EU. Hydrogen use will gradually be expanded to new sectors including steelmaking, trucks, rail and some maritime transport applications.
- Phase 3 (2030-50) anticipates renewable hydrogen technologies to reach maturity and deployed at largescale to reach all hard-to-decarbonise sectors.

Technical considerations examined by the RHT could also go beyond discussion on gas turbine conversions for fuel mixes. Examples are provided below:

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[24] Government of Western Australia, *Renewable Hydrogen Target for electricity generation in the South West Interconnected System* (Consultation Paper, October 2022) 13.
[25] European Commission, *Hydrogen Strategy for a climate neutral Europe* (8 July 2020) <file:///C:/Users/alikan/OneDrive%20-%20APA%20Group/Downloads/EU_Hydrogen_Strategy.pdf.pdf> .

- The consultation paper does not discuss downstream augmentations from the gas turbines, i.e., how industry will safely transport or distribute molecular hydrogen to GPGs which are currently connected to pipelines (both distribution and transmission). For a relatively new industry such as renewable gases, the RHT's certificate scheme should allow for different options, including:
    - Developing new hydrogen GPGs
    - Converting existing GPGs which enable hydrogen blends.
- Availability of funding to test feasibility of existing infrastructure is not discussed by the RHT consultation paper. As an example:
    - APA is currently seeking approval for a technical study to examine the safety and integrity of pipelines in the VTS for potential hydrogen injection in the future. We are concerned that the impact on the integrity of the pipelines and facilities from hydrogen is unknown.
    - When hydrogen is absorbed into the steel of pipelines, the ductility, toughness and fatigue life of the steel is reduced.
    - The hydrogen safety and integrity study would provide information enabling APA to quantify the integrity impacts and suitability for hydrogen blending and remedial works or changes in operation required to ensure continued safe operation of the VTS.
- Industry may resist implementing modifications required for incompatible infrastructure for hydrogen-fuelled gas.

Aside from technical barriers, there are also commercial factors which will likely impact the feasibility and timeline in which the RHT is delivered, such as:

- Pushback from end users to pay the premium required for renewable hydrogen, when compared to fossil fuels
- Cost of hydrogen and its influence on widespread adoption
- Geo-political challenges, e.g. Russia's invasion of Ukraine demonstrating the impact of inflationary pressures across the global economy to Australian energy consumers
- International uptake and developments, including the implementation of lessons learnt from successful 100 per cent hydrogen trials.

1.6 Continued investment in gas infrastructure is essential during the energy market transition

The National Electricity Market is going through a period of fundamental change. In navigating this period of transition, gas infrastructure has an essential role to play in helping Australia meet its net zero ambitions targets. Given its importance to the

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security and reliability of the energy system, we must continue to invest in our gas system.

Recent experience has demonstrated the role that gas plays in supporting renewables and providing a critical backup when large renewable generation is not available. As the penetration of renewable energy sources increases, and aging coal power stations retire, GPG will be critical in meeting electricity demand and maintaining the security of the system. This is because extended periods of low wind and solar will require significant volumes of dispatchable resources to be available to support the reliability and security of the system.

The ability of gas turbines to quickly ramp up and provide long term dispatchable generation shows they will be a critical part of the energy system for many years to come.

GPG also has the advantage that it can be located close to major demand centres. This reduces exposure to transmission capacity constraints often experienced by the overconcentration of renewable generation in common areas of the grid. This advantage may become critical if there are delays in building the necessary transmission investment which supports renewable energy projects.

It is essential that we continue to invest in, and maintain, our gas infrastructure. This will ensure that consumers continue to receive both reliable gas and electricity as the energy market transitions.

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Consultation Questions

Question	Feedback
RHT for electricity generation	
1. What are some examples of an objective or objectives that could be used to assess the benefits, costs and impacts of a RHT for electricity generation?	APA agrees with the objectives of the RHT as outlined in the consultation paper, particularly for the RHT to act as a catalyst for broader industry development. We appreciate the importance of measurable, pragmatic objectives which guide the RHT's successful delivery. Therefore, EPWA may also consider expanding the 'Industry development' objective (or creating a separate one) which speaks to driving the technologies and innovation needed to deliver the RHT in the SWIS' electricity generation.
2. How might other uses of renewable hydrogen be accommodated under a RHT certificate scheme? How might Government otherwise support and/or encourage other use cases for hydrogen?	Stimulating growth for a domestic hydrogen market requires a flexible and holistic approach. In our view, there are significant challenges associated with prescribing the use of renewable hydrogen to generating electricity which should be addressed prior to finalising a RHT design. We encourage WA Government to expand and/or formalise discussion on a use-agnostic renewable hydrogen certificate scheme. (refer Figure 1.1)
Considering hydrogen	
3. What role do you believe renewable hydrogen can play in the decarbonisation of electricity generation? To what extent will a RHT for electricity generation in the SWIS assist in achieving the decarbonisation objectives of the State Government?	Hydrogen has been identified as one of Australia's key comparative advantages and a logical option to help decarbonise the economy.[26] Enabling growth in the hydrogen industry is a key component to decarbonising electricity generation in WA and broadly speaking, in achieving the renewable energy transition in Australia. Generating a larger demand stimulation effect and economies of scale through a RHT will likely assist in achieving the decarbonisation objectives of WA Government. This is especially the case considering the SWIS is WA's main electricity network. See section 1.1 of APA's submission for further details.

[26] Australian Government, *Technology Investment Roadmap – First Low Emissions Technology Statement – 2020,* 18.

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4. What role can the infrastructure associated with the production of renewable hydrogen (i.e. renewable electricity generation facilities, electrolysers, transport and storage infrastructure) play in the broader SWIS?	Hydrogen infrastructure can provide additional demand side management options in the SWIS, for example hydrogen production is switched off at times of high electricity prices or switched on to balance low demand days. Hydrogen turbines can perform grid firming solutions to support VRE. Furthermore, a RHT can support decarbonisation of the gas network as well as the SWIS.
Technical feasibility	
5. To the extent you are able please reflect on some of the technical issues, challenges and considerations in the utilisations of hydrogen in the generation of electricity. To what extent can these technical issues and challenges be overcome? How should this impact on the consideration of a RHT for electricity generation in WA?	The hydrogen and renewable gases industries are in their infancies. Accordingly, the RHT should be designed with a key focus on adaptability to future market fluctuations and challenges. As part of delivering a RHT, extensive and resource-intensive testing may be required for infrastructure that will be producing, transporting and receiving hydrogen as energy. Repurposing natural gas pipelines to transport hydrogen is considered to have significant advantages. As part of APA's PGP Conversion Project in WA, 43km of the gas transmission pipeline was assessed as suitable for 100 per cent hydrogen service without any requirement to reduce operating pressure of the pipeline. Preliminary findings of Phase 2 are positive and validate Phase 1 results. Also, the RHT paper currently does not discuss how industry will safely transport/distribute molecular hydrogen to GPGs which are currently connected to pipelines. For a relatively new industry such as renewable gases, the RHT's certificate scheme should allow for different options, including: • Developing new hydrogen GPGs • Converting existing GPGs which enable hydrogen blends.
Certificate schemes for RHT for electricity generation in the SWIS	
6. Do you believe a renewable hydrogen electricity generation certificate-based scheme represents an efficient and effective means to deliver a RHT for electricity generation in the SWIS? Please explain your answer.	To achieve the RHT, we agree with EPWA's proposal to introduce an obligation on retailers and potentially large users to purchase a portion of their electricity from renewable sources, such as renewable hydrogen. Given the certificate scheme is expected to allow a broad use of hydrogen across the economy, we support a renewable hydrogen certificate scheme which levies the cost of participation on electricity retailers and large electricity consumers in the SWIS. Placing the liability on the wide pool of electricity retailers and large

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	consumers in the SWIS is appropriate to achieve broader industry development and reduced consumer costs long-term.
7. What are some other approaches which could be considered alongside a renewable hydrogen electricity generation certificate scheme that would provide a framework to deliver on the objectives or outcomes sought?	Government support is essential to help kickstart hydrogen demand. In addition to certification schemes, reverse auctions or power purchase agreements for renewable gas may be considered to encourage supply and demand. These pathways have been considered and undertaken by the Victorian Renewable Energy Target.
Liable entities	
8. Is the proposed approach of certification, deemed liability and certificate transfer an efficient and effective way to deliver on the intent of the RHT for electricity generation? Are there alternative approaches which could better deliver on the objectives?	No comment.
Exemptions	
9. What are the benefits, costs and impacts of an exemptions regime for a RHT for electricity generation?	No comment.
Renewable fuels	
10. Should the RHT for electricity generation consider alternative renewable fuels as eligible for the creation of the Renewable Hydrogen Electricity Generation Certificate? Why or why not?	In addition to hydrogen, renewable gases such as synthetic and biomethane will be important contributors to the decarbonisation of the gas system. We would support WA Government considering a broader Renewable Gas Target that incorporates renewable gases beyond hydrogen.

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Setting a target	
11. Please consider the benefits, costs and implications of a 1%, 5% and 10% RHT for electricity generation in the SWIS on your business or industry, and provide commentary on how you would expect to react from a commercial and investment perspective to each target level.	APA supports a 10 per cent RHT, with periodic reviews of the scheme to ensure it is meeting its objectives and delivering outcomes for customers. In contrast to a 1 per cent or 5 per cent target, an initial 10 per cent target provides industry with greater investment confidence and a more certain pathway for the ongoing development of the industry.
12. At a whole-of-economy and/or sectoral level, what do you consider to be some of the benefits, costs and implications of a 1%, 5% and 10% target?	APA agrees that the RHT should have a 10 per cent objective to generate a larger demand stimulation effect which leads to economies of scale.[27]
Target terms	
13. Is the suggested approach of a medium-term aggregate target, with annual entity targets, an efficient and effective means to achieve the objectives of the RHT for electricity generation in the SWIS? Why or why not?	No comment.
14. To what extent should banking and borrowing of liabilities be permitted under the scheme? What are the benefits and costs of a borrowing mechanism as described in the paragraph above?	We appreciate that the RHT design has been informed by existing Energy System Objective schemes, such as the Renewable Energy Target (RET) and recommend EPA consider parallel rules in such policies to ensure alignment. Additionally, EPWA may also consider a transitional approach, whereby the capacity to 'borrow' certificates may start high and be reduced periodically for liable entities to ensure they are given sufficient lead time for the scale up of investment required.

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Scheme commencement and ramp up	
15. How soon do you believe a RHT for electricity generation in the SWIS could be feasibly delivered from a technical perspective (i.e. if cost was not a consideration)? Please reflect on your own organisation and/or sector when providing your answer.	Calculating a realistic ramp up period for the RHT will need to take myriad factors into account, including realistic timeframes to overcome technical challenges. As an example, APA is currently seeking approval for a technical study to examine the safety and integrity of pipelines in the VTS for potential hydrogen injection in the future. The forecast capex for the proposed study is $37.9 million. As observed in our testing program for the PGP Conversion Project, there is significant complexity involved in testing pipeline viability before renewable hydrogen can be transported to the grid. We encourage EPWA to maintain an initial 10 per cent target with periodic reviews of the scheme as required, particularly should the certificate scheme extend its applicability to multiple sectors/liable entities. The European Commission's 'Hydrogen Strategy for a climate neutral Europe' provides for three phases to develop a clean hydrogen economy.
16. Similar to the above, how soon do you believe a RHT for electricity generation in the SWIS could be feasibly delivered from a commercial or economic perspective (i.e. if cost was a consideration)? Please reflect on your own organisation and/or sector when providing your answer.	As above.

[27] Government of Western Australia, *Renewable Hydrogen Target for electricity generation in the South West Interconnected System* (Consultation Paper, October 2022) 20.

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17. Over what period of time do you believe is an appropriate ramp up period for the RHT for electricity generation in the SWIS? In providing your answer reflect on the actions your organisation and/or sector would need to take to participate in the scheme.	As above.
Hydrogen cost outlook	
18. In the short (<5 years), medium (5-15 years) and long (15+ years) term, where do you expect the cost of production of renewable hydrogen to move from the estimated levels of today? What do you expect to be the drivers of this change?	No comment.
Hydrogen demand and electrolyser capacity	
19. To what extent do you believe the above scenarios are reasonable and achievable? Please explain your answer with reference to your previous answers regarding the objectives of the scheme.	No comment.
20. How would you expect the levels of hydrogen demand for electricity generation in the SWIS to be met at various points in the supply chain? Would you expect a single generator would emerge and provide all certificates?	At this preliminary stage, it is difficult to discern whether one very large renewable hydrogen producer will prevail. A larger target reduces the risk of a single supplier emerging and providing all certificates. Fostering competition in the renewable hydrogen market is in line with the RHT's proposed objectives. We fully support this objective, as competition and innovation are key to helping drive down the cost of hydrogen production.
21. Would you expect one very large renewable hydrogen producer, a number of very small renewable hydrogen producers, or some other combination, to emerge in the State as a result of the scheme? Alternatively, would a domestic-focused producer have sufficient scale to operate in a domestic market only?	As above.


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