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Australian Government

Department of Industry, Science, Energy, and Resources

By email: renewablegas@industry.gov.au

Extending the national gas regulatory framework to hydrogen blends and renewable gases

AGL Energy (AGL) welcomes the opportunity to comment on the Energy Ministers' proposed reforms to extend the national gas regulatory framework to hydrogen blends and renewable gases.

AGL is a leading integrated essential service provider, with over 180 years' experience of innovation and a passionate belief in progress – human and technological. We operate the country's largest electricity generation portfolio, are its largest private investor in renewable energy, and provide over 4 million electricity, gas, and telecommunications services to our residential, small and large business, and wholesale customers. Our operated gas storage inventory has storage capacity of over 20PJ, we operate over 1900MW of gas-fired generation, and we sell over 150PJ p.a. of gas to customers across Australia.

It is imperative that Australia reduces its emissions from combustion of natural gas in order to meet its long-term emissions reduction objective and contribute to limiting global warming under the terms of the Paris Agreement. To achieve this outcome, the energy currently provided by the combustion of natural gas must be reduced or met from a mix of alternate energy sources that produce zero-emissions; principally, renewable electricity or renewable gases.

We strongly support investigations into the ability for natural gas to be replaced by zero-emissions methane and other zero-emissions gases, such as hydrogen, and the appropriate scale for doing so in the context of competing technologies to decarbonise Australia's economy over time.

While the substantial support that is currently being directed towards hydrogen is useful in understanding the feasibility of replacing natural gas in various use cases, policy makers must carefully consider how best to transition away from the combustion of natural gas over the long-term, particularly to ensure that the life of regulated natural gas infrastructure is not inadvertently extended, or that natural gas use is not supported where other technologies that are both cheaper and lower in emissions are available to meet the same need.

The risk of false equivalencies

The consultation refers to two categories of new products that it seeks to regulate—namely, 'natural gas equivalents' (**NG Equivalents**) and 'other gas products' (**OG Products**)—without detailed discussion of the likely technical specification of these products. While accommodating new products within the existing gas specification is a sensible starting point from which to approach a regulatory framework for new gas products, much more caution should be exercised

when describing new gas products as NG Equivalents, even where those new gas products contain constituent products at low concentrations.

Natural gas as currently produced, transported, and used by consumers, is a relatively homogenous product that is bound by strict technical specifications[1]. While natural gas varies in its composition, the fundamental properties of natural gas for use in Australia are well-established, closely monitored, and maintained to a very tight specification to prevent risks to public safety by the supply of off-specification gas, and further risks to public safety associated with curtailment of the injection, subsequent system disruption, and re-lights in gas consumer premises.

Hydrogen (H_2), however, has significantly different physical properties to natural gas. Most notably, the heating value and density of hydrogen is materially different from methane (CH_4), the principal constituent gas (~90-95%) of most natural gas blends. Biomethane and synthetic methane, however, do not have differing physical properties as they are chemically identical to 'natural' methane used in natural gas.

Hydrogen also has very different chemical properties to constituent gases in natural gas blends, which has implications for reactivity with metals and other substances that natural gas interacts with throughout the supply chain, as well as for end-use purposes.

As can be seen from the table below, many of the properties of hydrogen are markedly different from natural gas and its main component, methane.

Property[2]	Methane (CH_4)	Natural Gas (NG)	Hydrogen (H_2)	
Molecular weight (kg/kmol)	16.043	17.919	2.016	*(11% of NG)*
Density (g/m^3)	668	802	81	*(10% of NG)*
Higher heating value (MJ/m^3)	39.8	38.8	10.8	*(28% of NG)*
Wobbe Index (MJ/m^3)	53.5	54.4	46.4	*(85% of NG)*

The impact of these differences is likely to be material at scale, especially when considering the ambitious hydrogen targets currently being considered in Australia. To use a concrete example, a natural gas blend, while suitable for combustion in an end-use appliance, is likely to have a different heating value as a result of the differing densities and heating value of constituent gases.

In a practical sense, this has implications for the regulation of non-natural gas products, as much of the current regulatory framework for natural gas is derived from calculations that consider either the volume or the energy (i.e. the calorific value) of gas. For example, the difference between hydrogen and natural gas is such that it takes approximately 3.3 cubic meters of hydrogen to

[1] For example, see AEMO gas quality limits under the National Gas Rules https://www.aemo.com.au/-/media/Files/Gas/DWGM/2017/Gas-Quality-Guidelines-Version-10.pdf and also AS 4564-2011, *Gas Safety (Gas Quality) Regulations 2007* (Vic), AEMO's Gas Quality Standard and Monitoring Guidelines, etc.
[2] Table adapted from Quintino, Nascimento, & Fernandes, 'Aspects of Hydrogen and Biomethane Introduction in Natural Gas Infrastructure and Equipment', *Hydrogen* 2021 2(3) 301-318

match the energy of one cubic meter of natural gas, so a 10% hydrogen blend would equate to a 25% increase in gas volume for the same energy.

This may have a material impact when measuring wholesale volumes of gas as well as billing for end use customers. In the absence of any adjustments, hydrogen blends will provide less energy for consumers at the same volume, leading to an increase in costs for participants that purchase gas on a volumetric basis (i.e. most customers).

Ensuring accurate measurement of the energy value of new products

The proposed approach to apply current natural gas regulation to NG Equivalents simply because such blends can be consumed by the majority of end use appliances ignores the fundamental differences between natural gas and these emerging products and blends. While the existing regulatory framework will provide a reasonable basis for regulation of NG Equivalents, corresponding adjustments across a range of regulations will need to be made to ensure that the attributes of gas at various points in the supply chain are measured accurately.

The broad definition of an NG Equivalent should not be derived simply from the ability to be consumed by existing natural gas appliances; any new product must be able to be measured with a greater degree of certainty at various points in the natural gas system, with regulation that clearly sets out the rights and liabilities in terms of accurately measuring and billing for the correct volume and/or calorific value of the energy transported and supplied. This should extend to all parties including producers, shippers, retailers, users, and the market operator.

Even at initial low levels, these principles should be clarified for certainty as concentrations may increase in following years, increasing the scale and scope of the problem.

> **Recommendation 1:** Consider more closely the current natural gas specification and the appropriate technical bounds for NG Equivalents, particularly with respect to volume and energy density, including responsibility for measuring and reporting on gas specification at various points in the network.
>
> **Recommendation 2:** Where changes to gas specification result in increased costs for end users or market participants, consider how to appropriately quantify these costs (i.e. through effective metering or other calculations), and how customers or participants will be able to recover those costs through the regulatory framework.

Challenges even at low levels of hydrogen concentrations

Much debate has occurred over the ability of the current gas network (including pipeline infrastructure and also end-use appliances) to accommodate new products, and in particular the level of hydrogen that can be injected into the network before technical challenges arise.[3]

The federal government's *National Hydrogen Strategy* suggested that preliminary technical and regulatory investigations did not find any significant implications for gas quality or safety from blending up to 10% hydrogen by volume in gas distribution networks, where the gas mixture is

[3] For a comprehensive discussion of these issues see: Quintino, Nascimento, & Fernandes, 'Aspects of Hydrogen and Biomethane Introduction in Natural Gas Infrastructure and Equipment', *Hydrogen* 2021 2(3) 301-318

homogenous throughout the network. The current consultation appears to have broadly adopted this claim in its approach to regulate NG Equivalents with concentrations up to 10% hydrogen.

More specifically, however, the technical report to support the initial claim in the *National Hydrogen Strategy* "found that addition of up to 10% hydrogen by volume in the natural gas distribution networks has no significant impacts for the applicable Australian standards, but that a review of Australian standards applicable to downstream installations and appliances should also be completed to enable upscale of hydrogen injection into the gas distribution networks."[4] The report also identified a range of various standards, including safety standards, that would need to be investigated to ensure blends approaching 10% hydrogen would be fit for end use purposes.

Despite these recommendations for further review, the overall safety and suitability of hydrogen blends approaching a 10% level for all end uses in Australia has still not been comprehensively investigated.

While recent evidence suggests that most Type A appliances[5] can operate safely even beyond homogenous 10% hydrogen blends, the impact on Type B appliances (i.e., various large commercial and industrial appliances) is far less certain, with the limit of hydrogen concentration that can be managed by some specific appliances being much lower than 10%.

For example, gas engines and compressed natural gas (CNG) infrastructure are only likely to be able to accommodate up to 2% hydrogen in a natural gas blend.[6] This includes some gas-powered generation currently connected to the National Electricity Market (NEM), as well as critical gas storage facilities that support Australia's gas market such as AGL's Newcastle Gas Storage Facility in New South Wales. These facilities would likely not be able to operate at >2% hydrogen concentrations without additional costs to augment infrastructure.

Furthermore, discussions surrounding concentration limits generally refers to a *homogenous* gas blend, which is unlikely to be the case given the current ad hoc regime of various injections across the network not in accordance with any prescribed standard or blending protocol. The result of current practices is that the gas network may have localised concentrations of hydrogen or other constituent gases that are much higher than if the hydrogen was injected under a fixed blending protocol.

For the purposes of the current consultation, the regulatory framework should more closely consider the impact of injecting various constituent gases in the gas network that differ from current natural gas specification, and the impact this may have on various appliances and infrastructure. Due care should be given to the impact of low-level concentrations on Type B gas appliances and particularly sensitive assets, such as gas storage facilities and gas engines, both at large and small scale.

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[4] GPA Engineering, (2019) Hydrogen in the Gas Distribution Network

[5] Domestic and light commercial appliances are classified as Type A appliances. These include cookers, space heaters, central heaters, water heaters, catering equipment and leisure appliances, which are covered under the AS/NZS 5263 – Gas appliances series of standards, AS 4563 – Commercial catering gas equipment, and AS 3645:2017 – Essential Safety Requirements for Gas Equipment

[6] GPA Engineering, (2019) Hydrogen in the Gas Distribution Network

Where the resulting impact is likely to impose a cost on an end-user or market participant, the regulatory framework must clarify responsibilities as to covering the cost of regulated infrastructure (i.e. pipelines, gas meters and other measuring equipment, and other gas infrastructure), and the obligation to replace or augment gas infrastructure and appliances to accommodate these blends in a way that maintains public safety.

Currently, responsibility for various issues caused by off-specification gas is unclear. The present consultation is an opportunity to review regulatory responsibilities for the specification, measurement, and delivery of gas that meets end-use needs safely and efficiently.

For the avoidance of doubt, concerns with low levels of hydrogen concentrations in Type B appliances and other sensitive appliances is no reason to prevent trials or delay injections and feasibility studies into hydrogen. It is likely that the most efficient system-wide solution to problems caused by low-level concentrations of hydrogen is likely to be retrofitting appliances, even if the policy decision is that such costs must be borne by end-users.

The key point is that information regarding the specification of low-level blends (even during trials) must be transparent and available, so that hydrogen concentrations and broader gas specification now and into the future can be known to end users. This will lead to greater clarity surrounding responsibilities and liabilities (both regulated and contractual) regarding appliance replacement or retrofitting as a result of hydrogen injection.

> **Recommendation 3:** Consider the impact of low levels of hydrogen concentrations especially on Type B gas appliances and how the requirement to augment affected infrastructure should be regulated, including cost recovery for affected participants.
>
> **Recommendation 4:** Implement a more transparent process for the injection of gases in the existing gas network to support a more homogenous blend that is less likely to affect existing infrastructure and appliances.

While the staged approach to regulate NG Equivalents prior to OG Products may go some way to addressing these concerns, issues arising from the different physical and chemical properties of hydrogen and other gases in the gas network may arise at much lower concentrations than are currently forecast by the consultation.

These issues should be considered by the regulatory framework, or otherwise the regulatory framework to support the injection of hydrogen and other gases should be delayed by such time as the issues affected downstream infrastructure are better understood. These issues should be covered by the regulatory framework, or otherwise the regulatory framework to support the injection of hydrogen and other gases should be delayed by such time as the issues affected downstream infrastructure are better understood.

Indeed, we consider there is merit in allowing existing projects to continue in a ‘regulatory sandbox’ approach, where regulatory issues can be understood in further detail, prior to concentrations of hydrogen increasing to levels that begin to cause material impacts for customers and market participants.

A similar approach was taken in the electricity sector, with the appropriate regulatory treatment for Virtual Power Plants (VPP) only requiring consultation and formal adoption in relevant electricity

regulation after a number of VPP trials to understand their success. Not only did this help define the scope of required regulatory changes, it enabled small to medium scale entrants to participate in trials without major entry costs that may otherwise be prohibitive under national gas legislation.

Further responses to the detailed questions raised in the paper are attached below.

If you have any queries about this submission, please contact Aleks Smits, Senior Manager Policy, asmits@agl.com.au, or Chris Streets, Senior Manager Wholesale Markets Regulation, cstreets@agl.com.au.

Yours sincerely,

Elizabeth Molyneux

General Manager Policy & Markets Regulation

AGL Energy

Attachment 1: Officials' Consultation Paper – Stakeholder feedback template

Submission from AGL Energy

Chapter 4: Extending the NGL and NERL to natural gas equivalents

No.	Questions	Feedback
Section 4.3: Potential approach to extending the NGL		
Section 4.2.1: Extension to NG equivalents and related facilities and activities		
1	What are your views on the potential approach to extending the application of the NGL to NG equivalents and related facilities and activities? Are there any other approaches that you think would better achieve the objectives of Energy Ministers (see section E.3)?	As elaborated on in our cover letter, the designation of hydrogen blends up to 10% as NG equivalents is misleading, noting that hydrogen blends quickly diverge from current gas specification even at low levels of concentrations (especially regarding volume and heating value). A better approach would be to broadly consider appropriate current and/or future gas specifications that are inclusive of low level hydrogen blends, and ensure that gas specification is appropriately measured throughout the network to meet these defined specifications. In our view, accurate metering of hydrogen injection and concentration levels is likely to be a no-regrets step towards the future needs of the network, and can ensure that minimum changes are required to the existing gas regulatory framework. Concentrations could also be increased over time in a predicable way to allow for efficient retrofitting and building of new infrastructure.
2	What are your views on the policy intention to enable all elements of the national gas regulatory framework to apply to NG equivalents and their related facilities and activities in the same way that they do to natural gas?	As above, this is relatively sensible step at low levels of hydrogen concentrations (i.e. <2%), but unlikely to be a satisfactory outcome for higher concentrations, where it is effectively a different product that is being regulated. As biomethane and synthetic methane are chemically identical to methane, there is no need to regulate them differently.
3	What are your views on the NGL requiring jurisdictions to make a local regulation to confirm when a gas or gas blend authorised for supply through a pipeline (or part of a pipeline) is an NG equivalent?	It would be preferable if this regulation were consistent at a national level; we see no benefit for divergent regulations to accommodate new gas products nationally, conversely there is likely to be substantial benefit in ensuring consistency in the delivery of new gas products nationally.
4	Who is likely to operate the blending facilities involved in the creation of NG equivalent blends?	Blending facilities should be able to be managed by any party that can meet the necessary protocols for blending, noting that we consider such protocols are critical to ensure consistency in blending processes to ensure the downstream safety and efficient use of the gas appliances connected to the network. This may require some centralised accreditation, potentially by AEMO, or regulation through an appropriate safety or technical standard. Additionally, appropriate measuring equipment would be required at the injection point to measure injected volumes and provide assurance of homogenous blends.
5	Do you think blending facilities should be subject to the same economic regulatory framework that applies to pipelines? Please explain your response to this question.	It is unlikely that the most efficient development pathway for the development of blending facilities is through regulated payments to network operators. As an alternate, we consider that blending facilities appropriately regulated could be developed by a number of interested parties—for example, private businesses, statutory corporations, or ringfenced entities—leading to outcomes that are likely to be much more efficient and minimise costs for end-use gas customers in accordance with the current National Gas Objective.

No.	Questions	Feedback
6	Are there any specific physical characteristics of NG equivalents or the supply chain for these products that you consider should be taken into account when extending the natural gas regulatory framework to NG equivalents?	As per our covering letter, we note that NG Equivalents should be restricted by their adherence to current physical and chemical limits of existing natural gas specification, including heating values, density, Wobbe Index, etc. Liability for exceedance of these limits should be considered under the new regulatory regime as there are likely to be downstream impacts on users, including potential billing and safety issues.
7	Are there any other observations you would like to make about the potential approach to extending the application of the NGL to NG equivalents and related facilities and activities?	In a broad sense, the intention and structure of the NGL is to deliver the National Gas Objective, which related to natural gas only. It is unclear how the development of new gas products fits into this objective, as new gas products are unlikely to be lower cost and are likely to be developed to meet differing objectives, in particular to reduce emissions. The economic regulation of gas infrastructure should consider the broader impacts of passing through costs to customers for the production, injection, transportation, and measurement of non-natural gas products and the rationale for passing this through to natural-gas users and gas market participants. While this may indeed be the policy intention, that intention should be clarified throughout the regulatory framework (i.e. by placing caps or targets on the amount of costs that should be passed through to customers and the objectives for pursuing what may be inefficient outcomes for gas customers in the short-term).
8	Are there any other changes that you think need to be made to the NGL to accommodate NG equivalents and related facilities and activities?	As per our covering letter, hydrogen-blended products above a certain concentration are not equivalent to current natural gas. Much more effort needs to be put into understanding the implications of delivering products that are outside current natural gas specification and corresponding adjustments that need to occur to apply natural gas regulation across the existing framework on that basis.
Section 4.2.2: Extension to constituent gases and related facilities and activities		
9	What are you views on the proposal to amend the NGL to enable the national gas regulatory framework to apply to the constituent gases and related facilities and activities involved in the supply of NG equivalents (where appropriate to do so) set out in section 4.2.2?	It is not clear that there is a need to apply the full suite of national gas regulation to infrastructure that does not transport natural gas. Expanding the scope of economic regulation infrastructure to other gases, (especially hydrogen, but potentially other gases or liquid fuels, such as ammonia or synthetic fuels), seems to be at the edges of the purpose of the National Gas Law and its associated framework. In our view, while injection of new products into existing gas networks should certainly be regulated (e.g. through blending protocols, standards, and metrology procedures), there is unlikely to be an urgent need to expand the full scope of the NGL to cover the production and transportation of gases other than natural gas, given current low volumes. In our view this should be managed by careful management of gas specification in the first instance and then separately once gases fall outside of the allowed gas specification.
10	What are your views on the proposal that pipelines involved in the transportation of a constituent gas (e.g. a hydrogen pipeline) be subject to economic regulation under the NGL and NGR?	As volumes of transported gases other than natural gas increase, it will likely be prudent to consider the economic regulation of the production and transportation of hydrogen or other gases in a future context that is distinct from historic natural gas regulatory frameworks. For example, it may be more appropriate to consider parties other than the existing monopoly providers of regulated gas infrastructure as the developers, owners, and operators of these new assets. It is also likely that existing incentives and cost recovery mechanisms for regulated entities will need to change to accommodate future incentives to reduce gas volumes as well as the emissions intensity of transported gas. It is however very challenging to make these broader assessments as to the appropriate framework for economic regulation when the quantities of future gases are at present very speculative.

No.	Questions	Feedback
11	Are there any other observations you would like to make about the potential approach to extending the application of the NGL to constituent gases and related facilities and activities?	In a broad sense, the intention and structure of the NGL is to deliver the National Gas Objective, which currently relates to natural gas only. It is unclear how the development of other gas products will fit into this objective. The development and production of constituent gases such as hydrogen is primarily driven by emissions reductions objectives rather than the efficient delivery of gas for end-use purposes. Given the differing objectives of developing hydrogen infrastructure, it may be more appropriate to set up more streamlined and specific regulation to support the commercial development of a hydrogen economy. This is also likely to be beneficial for new entities that wish to participate in hydrogen trials as barriers to entry will be reduced.
12	Are there any other approaches that you think would better achieve the objectives of Energy Ministers (see section E.3)?	New hydrogen infrastructure can likely be developed under a 'regulatory sandbox' approach, which will streamline projects and allow flexibility of approach to accommodate various circumstances. As volumes increase and the ecosystem of new gas products becomes more apparent, specific regulation can be adopted that directly covers new products and infrastructure.
13	Are there any other changes that you think need to be made to the NGL to accommodate constituent gases and related facilities and activities?	In the long-term, many aspects of the NGL would not be relevant for products other than natural gas products. Rather than rely on a number of exclusions from the current framework, it would seem to make more sense to build up specific legislation for hydrogen and other gases, based on appropriate safety standards and the specific needs of new products.
Section 4.2.2: Extension of market bodies' functions and powers		
14	What are your views on the potential approach to extending market body functions and powers set out in section 4.2.3 to: (a) NG equivalents and related facilities and activities? (b) constituent gases and related facilities and activities?	The current consultation is an opportunity to clarify existing responsibility for gas specification and quality throughout the gas network from production and injection to end-use applications. In particular, we see an important role for AEMO to ensure gas quality is fit for purpose and appropriate adjustment have been made to allow for changes in calorific value and volumes of gases in the network as a result of the injection of non-natural gases. We consider that the AER and AEMC require more direction on the overall objective for the regulation of products other than natural gas, which could be provided by jurisdictions. This would allow the rule maker and regulator to more effectively balance the merits of incentivising new gas products against the existing NGO that is solely focused on the efficient delivery of natural gas.
15	Do you think arrangements are needed for distribution pipelines attached to the DWGM and STTM to provide for independent management of blending limits (or gas specification requirement) imposed by a jurisdiction? If you think AEMO or another third party should be responsible for this function, please explain what costs and benefits you think would be associated with it doing so.	It would be relatively straightforward to develop a standardised blending process or protocol with associated metrology requirements to ensure blending limits are within specification and result in known calorific values. AEMO would be able to develop such a procedure; alternately, gas specification could be expanded to accommodate low levels of blending with new products. This would be as simple as expanding current procedures to ensure gas safety is maintained in other respects, for example, through the addition of odorant to natural gas prior to injection. In our view it would be far more preferable for these standards to be developed on a nationally consistent basis rather than by separate jurisdictions. Compliance costs to ensure gases are blended safely into gas networks are likely to be minimal given the commensurate benefits of ensuring gas is fit for purpose for all end uses and safe for customers. The absence of these protocols may result in non-blended gases moving around the network in a non-homogenous way, creating safety issues for end use customers and uncertainty in the delivered energy of gas volumes.

No.	Questions	Feedback
16	Are there any other changes to market body functions and powers required to accommodate NG equivalents, their constituent gases, or related facilities and activities?	There are likely to many functions that are relevant for constituent gases and new products, such as hydrogen, which do not currently extend to natural gas. An example is certainty of origination and emissions associated with hydrogen production. The key point is that new products should not be treated as the same as natural gas under existing regulation, as they are fundamentally different and are being developed for different purposes. Separate regulation of new products from natural gas will allow regulation to evolve to take account of the different characteristics of new gas products, particularly relating to their emissions intensity, origin, and resulting characteristics and end-uses.
17	Are there any other approaches that you think would better achieve the objectives of Energy Ministers?	Specific regulatory objectives and legislative intention put in place for the development of new gas products, which are separate from the existing NGO and NGL framework.
Section 4.3: Potential approach to extending the NERL		
18	What are your views on the potential approach to extending the application of the NERL to NG equivalents set out in section 4.3?	If gas specification is tightly adhered to, there should be no need to change the NERL to accommodate the delivery of new gas products to customers. Importantly, however, adjustments will need to be made to customer billing to ensure that energy values are accurate; this requires accurate heating value of gases at a wholesale level and effective metrology procedures in place to ensure customers are paying for the right amount of energy being consumed. Liability for gas quality should more closely examined, especially as gas retailers are not currently able to control the quality of gas injections or the heating value of delivered gas that may have a high hydrogen content.
19	What are your views on the potential approach to extending the AER's and AEMC's functions and powers under the NERL to NG equivalents set out in section 4.3?	The AER and AEMC require further clarity on the objectives of selling new gas products to customers other than natural gas; for example, through a high-level policy directive that expands the scope of the existing NERO. The sale of new products is a substantial divergence for the NERL that needs to considered more closely.
20	Are any other changes to the NERL or the market bodies' functions and powers under the NERL required to accommodate NG equivalents?	
21	Are there any other approaches that you think would better achieve the objectives of Energy Ministers (see section E.3)?	

Chapter 5: Accommodating other gas products in the NGL and NERL over time

No.	Questions	Feedback
22	What are your views on the potential approach to allowing the NGL to accommodate OG products over time, as described in section 5.1?	There are inherent safety concerns in delivering new gases that are different to the existing regulated natural gas product, which is bound by a tight technical specification. The rationale for expanding the natural gas regulatory framework to other products is currently not well defined and seems contrary to the current NGO. We consider that a better approach would include specific regulation relating to new products (most likely hydrogen but possibly others such as ammonia or synthetic fuels), including appropriate safety and quality standards for these new products that are set in advance and adhered to over time. Where existing regulated infrastructure is used to deliver new products, adjustments should be made to regulated returns under a specific regime that considers the costs and benefits of new gases in comparison to other competing technologies. We see no significant barriers in building up specific legislation for hydrogen and other gases from the ground up to ensure it is fit for purpose. Such an

		approach is also likely to promote competition among producers and other participants, as barriers to entry could be reduced. In our view, the transportation of new gases in many instances is likely to require more bespoke solutions than existing pipeline infrastructure. For example, certain end uses are likely to require gases of a very strict specification (e.g. producing zero emissions, meeting a technical need such as in feedstocks, or for certain uses such as synthetic aviation fuel). Fuels at these specifications will not be appropriate for blending in natural gas networks and therefore will require transportation through mechanisms other than existing gas pipelines (e.g. point-to-point truck, rail, or shipping haulage), and appropriate regulation to meet those objectives.
23	Could amending the NGL in the manner described in section 5.1 lead to any unintended consequences? If so, please explain what those unintended consequences may be.	Yes, it is very likely that existing rights and liabilities relating to natural gas will be conflated with hydrogen or other constituent gases, or blends, which are not equivalent products to natural gas. As one example, the economic regulation of pipelines requires networks to submit on required capex and opex spend to deliver forecast volumes of gas to customers in the most efficient way, which does not currently include hydrogen, ammonia, synthetic fuels, or other gases. It is not clear how the AER or AEMC would seek to regulate large capex programs to build or augment infrastructure in order to produce and distribute new products in the existing gas network, and whether such programs would be in the best interests of natural gas customers. Such fundamental issues require clarification for the long-term efficient operation of the gas networks.
24	What are your views on the proposal to apply the economic regulatory provisions to pipelines involved in the haulage of OG products and their constituent gases?	More certainty is required over the cost of infrastructure to support higher concentrations of hydrogen; it is not clear that existing framework of economic regulation for gas infrastructure is appropriate to consider these issues. Furthermore, it is not clear that the economic regulation of covered natural gas pipelines is the most effective regulatory regime for a new product that is adjacent to natural gas. There may be opportunities to regulate the haulage of hydrogen and other gases differently, providing more optionality for the producers and transporters of these gases as well as for other market participants and end users.
25	Are any other changes to the NGL required to accommodate OG products?	It is likely that the emissions intensity of gases will become a material issue in the future. Due attention should be given to the way that the emissions intensity of gas can be measured accurately and how participants can be incentivised to decrease gas usage over time. Accurate measurement of renewable gas concentrations and incentives to switch from emissions-intensive gas to zero-emissions gas should be inherent in the regulatory framework.
26	Are there any other approaches that you think would better achieve the objectives of Energy Ministers (see section E.3)?	Specific legislation for new products, i.e. hydrogen, ammonia, synthetic fuels, that is developed to meet a more specific legislative purposes (i.e. meeting a prescribed target through a range of private sector investment) under specific technical guidelines and safety protocols. In our view, volumes of new products do not yet require consideration of such a broad regulatory regime as currently exists for natural gas. Pipelines or other haulage means for new products are likely to be able to be funded by private operators.
27	What are your views on the potential approach to allowing the NERL to accommodate OG products, as described in section 5.2?	Clarification on liability for safety issues and gas specification, as well as billing errors from new products, must be clarified before the NERL can apply to new gas products.
28	What are your views on the second potential approach to allowing the NERL to accommodate OG products, as described in section 5.2?	

29	Could amending the NERL in the manner described in section 5.2 lead to any unintended consequences? If so, please explain what those unintended consequences may be.	
30	Are any other changes to the NERL required to accommodate OG products?	
31	Are there any other approaches that you think would better achieve the objectives of Energy Ministers (see section E.3)?	