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Hydrogen Regulation in Oceania

Enabling Renewable Hydrogen Licensing on Complex Land Uses

Madeline Taylor

5.1 INTRODUCTION

Hydrogen and its derivates are widely touted as an essential component in the quest for global decarbonisation. Hydrogen is a versatile and dynamic energy carrier that can be harnessed as an alternative feedstock in industrial processes, transportation, and storage, and may be blended with natural gas as an alternative to fossil fuels, amongst other potential applications.[1] More than forty countries have released hydrogen strategies, and the International Energy Agency (IEA) has predicted the low-emissions hydrogen sector value may increase from $1.4 billion in 2023 to $12 billion by 2030.[2] To reach these projections, it is widely recognised that 'the emergence of a clean hydrogen economy depends on regulation'.[3] Planning and licensing hydrogen with concurrent land uses is a piece of the hydrogen regulatory rubric. Licensing and permitting procedures to assess and manage hydrogen land uses must be efficient, transparent, and coordinated to minimise planning assessment lead times and ensure sustainable siting of hydrogen coexisting with other land uses.[4]

The Oceania region is increasingly targeting the production and export of renewable hydrogen, also referred to as 'green hydrogen', which is typically produced by separating hydrogen from oxygen via electrolysis of water to harness renewable energy.[5] Other than water

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[1] IRENA, 'International Trade and Green Hydrogen: Supporting the Global Transition to a Low-Carbon Economy' (2023) <https://irena.org/Publications/2023/Dec/International-trade-and-green-hydrogen-Supporting-the-global-transition-to-a-low-carbon-economy> accessed 10 December 2023.

[2] International Energy Agency, 'Global Hydrogen Review 2023' (2023) <https://iea.blob.core.windows.net/assets/ecdfc3bb-d212-4a4c-9ff7-6ce5b1e19cef/GlobalHydrogenReview2023.pdf> accessed 10 October 2023.

[3] Sonja van Renssen, 'The hydrogen solution?' (2020) 10 Nature Climate Change 799. See also Gerry Nagtzaam and Steve Kourabas, 'Hydrogen Regulation' in Gerry Nagtzaam, Katie O'Bryan, and Mark Beaufoy (eds), *Legal Pathways to Deep Decarbonisation in Australia* (Lexis Nexis 2023) 227–253.

[4] International Energy Agency, 'Global Hydrogen Review 2023' (2023) <https://iea.blob.core.windows.net/assets/ecdfc3bb-d212–4a4c-9ff7–6ce5b1e19cef/GlobalHydrogenReview2023.pdf> accessed 10 October 2023.

[5] Other emerging methods to create renewable hydrogen include concentrated solar, direct solar desalination, or photocatalytic methods. However, this chapter will focus on electrolysis as the most mature technology in renewable (or green) hydrogen production. Electrolysis requires water which is split into hydrogen (H_2) and oxygen (O_2) within an electrolyser. See Ruven Fleming, 'The Hydrogen Revolution and Natural Gas: A New Dawn in the European

requirements for electrolysis, considerable amounts of land are also critical for large-scale renewable hydrogen production. Land access and use are required to host the suite of renewable hydrogen infrastructure supporting its generation and further infrastructure to enable export. For example, the co-location of wind and solar farms to efficiently produce renewable hydrogen requires an estimated land area of about 168,000 square kilometres (km²). This positions countries with large amounts of cleared land situated in proximity to existing energy infrastructure and ports, like Australia, at an advantage. Up to 11 per cent of Australia (872,000 km²) has been estimated as highly suitable for renewable hydrogen production.[6]

Countries with existing high penetration of renewable energy into their electricity generation mix, coupled with ample water reservoirs without the necessity for desalination,[7] may also enjoy advantages in establishing a renewable hydrogen sector. In New Zealand, renewables provide 82 per cent of electricity generation, primarily comprising its significant hydropower capacity representing 55.6 per cent,[8] coupled with accessible fresh water basins, and between 600 and 10,000 mm of rainfall per annum across the country.[9]

Renewable hydrogen development consequently requires strategic planning due to the land use footprints of projects, requiring renewable energy generation, electrolyser siting, and export and transportation infrastructure. Without a clear regulatory approach for renewable hydrogen siting, licensing, and development assessment, communities may contest renewable hydrogen projects based on conflicting land uses and the preservation of existing land rights.

This chapter examines renewable hydrogen policies and regulatory trends in Oceania. Specifically, it analyses the regulatory approach taken by two of the most proactive Australian states with renewable hydrogen ambitions, Western Australia and South Australia, and their recent regulatory reforms for renewable hydrogen licensing on pastoral land. In so doing, it surveys the emerging challenges and opportunities for renewable hydrogen siting by exposing crucial legal processes to avoid land use conflict for the renewable hydrogen sector.

The chapter is structured as follows. Firstly, it first explores the different national hydrogen strategies in Australia and New Zealand (Section 5.2). Secondly, it analyses and compares the new regulatory amendments and new hydrogen licensing regulation on pastoral land uses in Western Australia and South Australia (Section 5.3). Finally, it concludes by charting the

Union?' in Damilola Olawuyi and Eduardo Pereira (eds) *The Palgrave Handbook of Natural Gas and Global Energy Transitions* (Palgrave Macmillan 2022); Ruven Fleming 'Clean or renewable – Hydrogen and power-to-gas in EU energy law' (2021) 39(1) Journal of Energy and Natural Resources Law 43; Ruven Fleming and Gijs Kreeft, 'Power-to-Gas and Hydrogen for Energy Storage under EU Energy Law' in Martha Roggenkamp and Catherine Banet (eds) *European Energy Law Report XIII* (Intersentia Cambridge 2020) 101–125.

[6] COAG Energy Council, 'Australia's National Hydrogen Strategy' (2019) <https://dcceew.gov.au/sites/default/files/documents/australias-national-hydrogen-strategy.pdf> accessed 20 October 2022. See also Paul J. Burke, Fiona J. Beck, Emma Aisbett, Kenneth G. H. Baldwin, Matthew Stocks, John Pye, Mahesh Venkataraman, Janet Hunt, and Xuemei Bai. 'Contributing to regional decarbonization: Australia's potential to supply zero-carbon commodities to the Asia-Pacific' (2022) 278 Energy 123563 (hereinafter: COAG Energy Council, 'Australia's National Hydrogen Strategy').

[7] For example, Australia's 2019 National Hydrogen Strategy highlights the need for water desalination to support renewable hydrogen as Australia is one of the driest continents in the world. Australian Government, 'Australia's National Hydrogen Strategy' (2019) <www.dcceew.gov.au/sites/default/files/documents/australias-national-hydrogen-strategy.pdf> accessed 10 September 2023. See also Tina Soliman Hunter, Kerryn Brent, Alex Wawryk, Jordie Pettit, and Nate Camatta, 'Hydrogen production in Australia from renewable energy: No doubt green and clean, but is it mean?' (2023) 41 Journal of Energy and Natural Resources Law 1.

[8] Castalia, 'New Zealand Hydrogen Scenarios Report' (2022) <https://mbie.govt.nz/dmsdocument/20118-new-zealand-hydrogen-scenarios-pdf> accessed 10 October 2023 (hereinafter: Castalia, 'New Zealand Hydrogen Scenarios Report').

[9] World Bank, 'New Zealand Climatology' (2023) <https://?climateknowledgeportal?.worldbank.org/country/new-zealand/climate-data-historical> accessed 10 December 2023.

challenges for the development of renewable hydrogen regulation to realise hydrogen licensing coexistence with pastoral land uses in both Australia and New Zealand (Section 5.4).

5.2 THE OCEANIA REGION AS A POTENTIAL HYDROGEN POWERHOUSE

New Zealand and Australia aim to become the leading hydrogen production powerhouses of the Oceania region. Existing renewable hydrogen strategies in both New Zealand and Australia rest on their innate advantages – increasing renewable energy[10] penetration and proximity to Asian energy markets.[11] Both countries hold federal Commonwealth systems of government regulating overarching hydrogen strategies with subnational states, territories, or provinces regulating planning and land use.[12] Hence, consideration of existing federal strategies for the production and potential export of hydrogen is examined in Sections 5.2.1 and 5.2.2 below before an analysis of hydrogen licensing and land use systems at the state level.

5.2.1 *New Zealand's Hydrogen Roadmap*

Renewable hydrogen will play a crucial role in shaping New Zealand's energy landscape as the nation works towards achieving its legislated target of net zero greenhouse gas (GHG) emissions (excluding biogenic methane)[13] by 2050.[14] More than twenty hydrogen projects stretching from Marsden Point in the North Island to Invercargill in the South Island are in development or being considered in New Zealand's early-stage hydrogen ecosystem.[15] However, New Zealand does not hold a finalised national hydrogen strategy, with its first Hydrogen Roadmap due for release in late 2024.

The lag in creating a national hydrogen policy in New Zealand is due to several factors, including the low projections of hydrogen reaching just 8 per cent of total energy demand domestically.[16] Such low projections are in stark contrast to Australian demand projections for hydrogen, which may represent 20 per cent of total energy demand in 2050.[17] The low demand estimate and delayed delivery of a national hydrogen in New Zealand has created a regulatory

[10] Alberto Boretti, 'Green hydrogen to address seasonal variability of wind and solar energy production in Australia' (2023) 53 International Journal of Hydrogen Energy <https://sciencedirect.com/science/article/pii/S0360319923046918> accessed 10 December 2023; Alberto Boretti, 'The progress toward net-zero passes through hydrogen also in New Zealand' (2023) 53 International Journal of Hydrogen Energy <https://sciencedirect.com/science/article/pii/S036031992303820X?casa_token=_Qb10BYiEuUAAAAA:KsEFctQOosi_QbGKTAzC86lB9C6DM2TJG4pf6DjmU8F5G9rI4m4hB3iHgowxTn4N-wfHf7C-bgs> accessed 12 December 2023.

[11] Kim Beasy, 'Hydrogen economies and energy futures: A new Australian dream?' (2022) 91 Energy Research and Social Science 102751; Kim Beasy, Oluwadunsin Ajulo, Sherridan Emery, Stefan Lodewyckx, Charmaine Lloyd, and Amirul Islam, 'Advancing a hydrogen economy in Australia: Public perceptions and aspirations' (2023) 53 International Journal of Hydrogen Energy <https://sciencedirect.com/science/article/pii/S0360319923059104> accessed 30 November 2023.

[12] Constitution Act 1986 (NZ); Commonwealth of Australia Constitution Act (The Constitution) 1977 (Aus).

[13] New Zealand's domestic emissions reduction target for biogenic methane is to 24–47 per cent below 2017 levels by 2050, including to 10 per cent below 2017 levels by 2030. Ministry for the Environment (NZ), 'Greenhouse Gas Emissions Targets and Reporting (2023) <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/emissions-reduction-targets/greenhouse-gas-emissions-targets-and-reporting/> accessed 3 December 2023.

[14] Climate Change Response (Zero Carbon) Amendment Act 2019 (NZ).

[15] New Zealand Government, 'Hydrogen in New Zealand' (2023) <https://mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-strategies-for-new-zealand/hydrogen-in-new-zealand/> accessed 12 November 2023.

[16] Ibid.

[17] Castalia, 'New Zealand Hydrogen Scenarios Report' 21.

and policy environment 'at least three years behind Australia',[18] particularly in terms of secured capital investment and hydrogen standards adoptions. To date, New Zealand's developing hydrogen policy position has focused on hydrogen applications to decarbonise industrial processes, evident in an over NZ$ 30 million budgetary commitment to accelerate the adoption of renewable hydrogen to decarbonise energy in hard-to-abate sectors, particularly ammonia manufacturing.[19]

The first national response to hydrogen in New Zealand was the 2019 Vision for Hydrogen in New Zealand ('2019 Hydrogen Vision').[20] The 2019 Hydrogen Vision targeted New Zealand's 84 per cent renewable electricity penetration,[21] representing the fourth highest in the Organisation for Economic Development and Co-operation (OECD), with a goal to transition to 90 per cent renewable energy by 2025 and 100 per cent by 2030.[22] However, as a consultation Green Paper rather than a finalised national policy, the 2019 Hydrogen Vision produced feedback to inform the creation of a national hydrogen strategy.

Following the 2019 Hydrogen Vision, the Interim Hydrogen Roadmap was released in 2023 to provide another stocktake of policy options and invite another round of consultation to support renewable hydrogen development in New Zealand.[23] Similarly to the 2019 Hydrogen Vision, the Interim Hydrogen Roadmap is seeking feedback on the overarching potential policy focus to optimise hydrogen to contribute to New Zealand's domestic emissions reduction goals, stimulate economic development, and, interestingly, bolster its energy security and resilience. New Zealand's decision to prohibit new petroleum permits outside Taranaki onshore[24] and become more reliant on petroleum imports has seen energy security become a new potential policy pillar for hydrogen. A focus on hydrogen to create energy security exists in contrast to Australia, where energy security is not evident in hydrogen policymaking to date. In emphasising the importance of domestic use of hydrogen at the household and industrial levels, the Interim Hydrogen Roadmap rules out the case for government incentivisation and support to scale-up a hydrogen export industry.[25] A domestically focused hydrogen roadmap in New Zealand represents another point of comparison to Australia's export-orientated hydrogen policy focus.[26]

Consistent with the previous 2019 Hydrogen Vision, a similar emphasis in the Interim Hydrogen Roadmap is placed on the potential for renewable hydrogen to decarbonise industrial production of fertiliser-based chemicals, particularly as New Zealand is largely dependent on the

[18] Standards New Zealand, 'Hydrogen Standards Review' (2023) 33 <https://standards.govt.nz/assets/documents/news/hydrogen-report-v2.pdf> accessed 10 November 2023.

[19] New Zealand Government, 'Budget 2023, Support for Today Building for Tomorrow' (2023) <www.beehive.govt.nz/feature/budget-2023-support-today-building-tomorrow#:~:text=Budget%202023%20strikes%20a%20careful,a%20more%20sustainable%20fiscal%20position> accessed 10 December 2023 (hereinafter: Standards New Zealand, 'Hydrogen Standards Review').

[20] New Zealand Government, 'A Vision for Hydrogen in New Zealand: Green Paper' (2019) <https://mbie.govt.nz/dmsdocument/6798-a-vision-for-hydrogen-in-new-zealand-green-paper> accessed 10 September 2023 (hereinafter: New Zealand Government, 'A Vision for Hydrogen in New Zealand: Green Paper').

[21] In 2021, the percentage of total renewable energy supply in New Zealand is comprised of 55.6 per cent hydroelectricity; 17.7 per cent geothermal; 7.6 per cent wind; 0.5 per cent solar. Castalia, 'New Zealand Hydrogen Scenarios Report'.

[22] New Zealand Government, 'A Vision for Hydrogen in New Zealand: Green Paper'.

[23] New Zealand Government, 'Hydrogen Interim Roadmap' (2023) <https://mbie.govt.nz/dmsdocument/26911-interim-hydrogen-roadmap-pdf> accessed 20 October 2023 (hereinafter: New Zealand Government, 'Hydrogen Interim Roadmap').

[24] As enacted in the Crown Minerals (Petroleum) Amendment Bill (2018).

[25] Ibid 5.

[26] As discussed below in Section 5.2.2.

importation of urea.[27] For example, the Balance Agri-Nutrients Plant in Kapuni is New Zealand's only ammonia-urea manufacturing facility, producing 730 tonnes of urea per day with an annual natural gas consumption of 7 petajoule (PJ).[28] The Balance Agri-Nutrients Plant is cited as a key project to develop a green hydrogen production facility to enable the production of lower-carbon urea and offset up to 12,000 tonnes of domestic emissions.[29] Agriculture represents 48 per cent of the gross GHG emissions for New Zealand and a legislated price on emission from agricultural activities to meet its Emissions Trading Scheme will likely commence on 1 January 2026.[30] In preparation for an agriculture-sector-specific emissions price and reporting scheme, the opportunity to decarbonise ammonia processing to create 'green ammonia urea'[31] specifically targets hydrogen as an important potential alternative feedstock to natural gas.[32] This policy position fundamentally differs from Australia's approach prioritising hydrogen exports as an initial policy platform with industrial feedstock usage for hydrogen as a secondary policy priority.

To support the development of a national energy strategy, Standards New Zealand completed its review of the current gaps in existing natural gas standards for hydrogen in 2023. The Standards New Zealand review identifies the overlapping regulatory regimes spanning gas safety, electrical safety, land transport, and other hazards and the six existing standards relevant to hydrogen for possible revision.[33] In particular, NZS 5442:2008 – Specification for reticulated natural gas – has not been holistically updated since 2008, with the most recent interim revision to permit blending of biomethane. However, the blending of hydrogen with natural gas is currently not permitted under NZS 5442:2008.[34] The resulting review advocates for a safety-focused guidance handbook and support for coordinated cross-agency action to implement standards amendments as a preliminary step to support a domestic hydrogen sector.[35]

The 2023 New Zealand Hydrogen Regulatory Pathway review similarly analysed forty-four Acts and ninety-three regulations and rules that may be relevant to hydrogen based on safety, use, markets, measurements, infrastructure, and resources to support a hydrogen sector. The Hydrogen Regulatory Pathway review critiques prescriptive rule-based regulatory requirements for gas usage resulting in regulatory gaps or uncertainty over hydrogen transportation. For example, the Hazardous Substances and New Organisms Act (1996) (NZ) prohibits the production of refrigerated liquefied hydrogen and exposes policy opaqueness as to whether hydrogen blends would fall under the Commerce Act (1986) (NZ), which currently does not define or

[27] As recognised by Castalia, New Zealand imports 654,000 tonnes of fertiliser per annum primarily from Malaysia and Saudi Arabia. Castalia, 'New Zealand Hydrogen Scenarios Report' 46.

[28] Environmental Protection Authority, 'Kapuni Green Hydrogen Project' (2023) <https://epa.govt.nz/fast-track-consenting/referred-projects/kapuni/#:~:text=Electricity%20will%20be%20generated%20by,an%20electrolysis%20plant> accessed 9 December 2023.

[29] New Zealand Government, 'Hydrogen Interim Roadmap'.

[30] New Zealand Ministry of Environment, 'Deferral of NZ ETS reporting obligations for animals–farmer activities' (2023) <https://environment.govt.nz/assets/publications/climate-change/Deferral-of-NZ-ETS-reporting-obligations-for-animals-farmer-activities-Discussion-document.pdf> 20 August 2023. The NZ ETS backstop will consist of two parts processor-level pricing farm-level pricing for animals – farmer activities.

[31] Haris Ishaq, Muhammad Faisal Shehzad, and Curran Crawford, 'Transient modelling of a green ammonia production system to support sustainable development' (2023) 48 International Journal of Hydrogen Energy 39254.

[32] Castalia, 'New Zealand Hydrogen Scenarios Report' 19.

[33] NZS 5263:2003 Gas detection and odorization; NZS 5266:2014 Safety of gas appliances; NZS 5255:2014 + A1 Safety verification of existing gas installations; NZS 5259: 2015 Gas measurement; NZS 5266:2014 Safety of gas appliances; and NZS 5442:2008 Specification for reticulated natural gas. Twenty shared standards with Australia were also reviewed.

[34] Standards New Zealand, 'Hydrogen Standards Review' 30.

[35] Ibid.

incorporate the regulation of blended gases. The Hydrogen Regulatory Pathway review recommends similar policy developments completed in the EU, particularly in Germany and the Netherlands, including 'the development of dedicated small–medium scale renewable generation for direct connection to electrolysers to be used as hydrogen "hubs"'.[36]

An additional differing policy juncture between New Zealand and Australia is New Zealand's emphasis on supporting just transition goals for communities hosting hydrogen. Supporting landholders and communities in proximity or hosting hydrogen projects has been emphasised since the 2019 Vision. A focus on creating just outcomes for communities associated with hydrogen production is reiterated in the Interim Hydrogen Roadmap through the establishment of the $100 million ten-year Regional Hydrogen Transition Initiative.[37] The Regional Hydrogen Transition will provide governmental rebates to support first-mover hydrogen projects through long-term contracts between government and commercial hydrogen consumers.

In awarding long-term contracts, the Regional Hydrogen Transition Initiative targets creating a 'Just Transition' for key regions, including Southland, traditionally an oil and gas region, and Taranaki to support the transition of workers within the New Zealand Aluminium Smelter at Tiwai Point. To access the Regional Hydrogen Transition Initiative rebate, proponents must demonstrate how their proposal meets the four elements of the Regional Hydrogen Transition benefit sharing model: (1) selecting a just transitions region; (2) Iwi (meaning cultural, environmental, social, and economic opportunities must be reflected in contractual applications) and the community; (3) renewable energy generation; (4) contribution to the development of the hydrogen economy. Community benefit funds, regional skills and training commitments, and contracting with new renewable energy generation may be conditions to satisfy the four outlined criteria.[38]

Overall, New Zealand's comparatively domestic and justice-focused hydrogen strategy represents an interesting approach to support key hydrogen projects that aim to help build and test early-stage projects while engaging directly with communities. Australia's National Hydrogen Strategy takes a more responsive, interventionist, and export-focused policy and regulatory approach to establishing its hydrogen ambitions, as explored below.

5.2.2 *Australia's National Hydrogen Strategy*

Australia's hydrogen export objectives are evident in its pioneering of the first liquified international trade of hydrogen to Japan in 2022. The Suiso Frontier shipped 75 tonnes of liquified hydrogen to Japan as part of the Hydrogen Energy Supply Chain (HESC) project. The HESC project positions Australia as a key exporter of hydrogen to Japan to 225 kilotonnes (kt) per year in the 2030s.[39] Although the potential for hydrogen exports first became a policy focus for Australia in 2019, developing a hydrogen economy was first highlighted in Australia in 2002 when the Renewable Energy Technology Roadmap labelled renewable hydrogen as having 'huge future potential'.[40] Nearly two decades later, Australia's first National Hydrogen

[36] PWC, 'New Zealand Hydrogen Regulatory Pathway' (2022) 66 <https://mbie.govt.nz/dmsdocument/25671-new-zealand-hydrogen-regulatory-pathway> accessed 10 November 2023.

[37] Government of New Zealand, 'Regional Hydrogen Transition Draft Technical Design Paper' (2023) <https://static1.squarespace.com/static/5c350d6bcc8fedc9b21ec4c5/t/64e2836b29e7580ddd4dbd3b/1692566380938/regional-hydrogen-transition-draft-technical-design-paper.pdf> accessed 10 October 2023.

[38] Ibid.

[39] HESC, 'HESC Project' (2023) <https://?hydrogenenergysupplychain?.com/> accessed 11 November 2023.

[40] Parliament of Australia, 'Development of Australia's Hydrogen Industry 2000 to 2021: A Chronology' (2022) <https://aph.gov.au/About_Parliament/Parliamentary_departments/Parliamentary_Library/pubs/rp/rp2223/Chronologies/

Strategy was released in 2019 underpinned by three key policy goals to facilitate fifty-seven joint actions around seven themes[41] targeting the renewable hydrogen pricing stretch goal of reaching AU$2 per kg ($H_2$ (hydrogen) under $2) originally set in the Low Emissions Technology Statement.[42] This cost target is ambitious, with stand-alone wind and solar projects (financed over twenty years) utilising renewable electrolysis to produce renewable hydrogen currently projected to cost AU$4–12/kg.[43]

To create the rapid reduction of hydrogen production costs, in 2023 the federal public renewable energy funding body, the Australian Renewable Energy Agency, announced the establishment of the AU$2 billion Hydrogen Headstart Fund with a further $2 billion announced in the 2024–2025 Australian Federal Budget.[44] The Hydrogen Headstart Fund will award production credits to support large-scale renewable hydrogen projects to cover the commercial gap between the cost of hydrogen produced and the sale price of the hydrogen, or its derivatives.[45] The Hydrogen Headstart Fund projects will be funded from 2026/27 for a maximum funding period of ten years.[46] While this funding is dwarfed compared to other hydrogen funding schemes in the European Union and United States,[47] it is likely to support the first large-scale renewable hydrogen export projects in Australia.

To become a 'hydrogen production powerhouse'[48] by 'shipping sunshine' in the form of liquefied hydrogen to the world, Australia has adopted a responsive regulatory stance to ensure regulatory reform facilitating investment.[49] The responsive regulatory approach is built upon the proportional regulatory intervention required to meet regulatory objectives according to the responsive regulation pyramid, originally conceptualised and championed by Braithwaite.[50]

The responsive regulation pyramid aims to promote voluntary compliance at the 'base' of the pyramid, through guidelines that are typically industry-led, with increasing severity of stations at the 'apex' of the pyramid. This responsive regulatory approach was also adopted within Australia's East Coast Domestic Gas Market. For example, Australia created its leading global liquified natural gas export sector without any legislation mandating gas reservation for Australia's largest gas market. In line with a responsive approach, Australia has adopted an industry-led agreement and code of conduct to prevent gas supply shortfalls and secure

Hydrogen#:~:text=ARENA%20releases%20a%20summary%20report,be%20completed%20by%20early%202022> accessed 18 November 2022.

[41] The seven themes underpinning Australia's current hydrogen strategy are: National coordination; Developing production capacity, supported by local demand; Responsive regulation; International engagement; Innovation and R&D; Skills and workforce; and Community confidence. See Australian Hydrogen Council, 'Government Policies' (2022) <https://h2council.com.au/government-hydrogen-policies/> accessed 20 November 2022.

[42] Australian Government, 'Technology Investment Roadmap: First Low Emissions Technology Statement – 2020' (2020) <https://consult.dcceew.gov.au/low-emissions-technology-statement-2022> accessed 23 October 2023.

[43] Muhammad Haider Ali Khan, Rahman Daiyan, Zhaojun Han, Martin Hablutzel, Nawshad Haque, Rose Amal, and Iain MacGil, 'Designing optimal integrated electricity supply configurations for renewable hydrogen generation in Australia' (2021) 24(6) iScience 102539.

[44] Australian Government, 'Hydrogen Headstart Program' (2024) <www.dcceew.gov.au/energy/hydrogen/hydrogen-headstart-program> accessed 15 June 2024.

[45] ARENA, 'Hydrogen Headstart Guidelines' (2023) <https://arena.gov.au/assets/2023/10/Hydrogen-Headstart-Guidelines.pdf> accessed 1 December 2023 (hereinafter: ARENA, 'Hydrogen Headstart Guidelines').

[46] Ibid.

[47] João Moura and Isabel Soares, 'Financing low-carbon hydrogen: The role of public policies and strategies in the EU, UK and USA' (2023) 5 (2) Green Finance 165.

[48] COAG Energy Council, 'Australia's National Hydrogen Strategy' v.

[49] Ibid.

[50] John Braithwaite, 'Restorative Justice and Responsive Regulation: The Question of Evidence' (2016) 51 RegNet Research Papers, Canberra: Regulatory Institutions Network 28.

competitively priced gas for the domestic gas market with the LNG export sector.[51] Similarly, five industry codes of practice are being developed with the hydrogen industry, as discussed below.

Australia has built its strategy around enabling 'clean hydrogen', rather than a narrower approach targeting renewable hydrogen only, as is the case in New Zealand. Clean hydrogen pathways are not restricted to renewable hydrogen but rather include gasification through thermochemical reactions with coal as a feedstock and steam methane reforming using natural gas coupled with carbon capture and storage. The responsive pathway to realise Australia's position as a hydrogen exporter is divided into two phases. The first phase between 2019 and 2025 seeks to provide 'foundations and demonstrations'[52] of hydrogen by undertaking priority pilot, trials, and demonstration projects; assess supply chain infrastructure needs; build demonstration hydrogen hubs; and develop supply chains for prospective hydrogen hubs to scale-up supported by bilateral agreements, including with Germany, Japan, and The Netherlands.[53]

From 2025 to 2030 the second hydrogen strategy phase seeks to create 'large-scale activisation'[54] of hydrogen to scale up industry capacity for hydrogen supply chain to support export industry infrastructure and create a domestic market with explicit public benefits.[55] Overall, four key progress measures for the success of Australia's hydrogen industry are mapped, ranging from Australia developing an internationally accepted certification regime to hydrogen providing jobs and economic benefits.[56] Yet no baseline data, data sharing, or demand and production targets have been set to assess progress towards these measures.

Since the development of the National Hydrogen Strategy, the interim 2022 State of Hydrogen report provides an update on the advancement and progress towards realising Australia's overall goal of becoming a top three hydrogen exporter. The State of Hydrogen Report confirms 'Australia has around 40 percent of all announced global hydrogen projects, with the Australian pipeline valued from $230 billion to $300 billion'.[57] To support the development of a hydrogen projects pipeline to support export, the federal Australian government is also developing a proposed Guarantee of Origin Scheme.[58] The Guarantee of Origin Scheme seeks to track and verify emissions associated with hydrogen production and its derivatives. The proposed Guarantee of Origin Scheme will also create a mechanism for renewable energy certification in direct response to the revised EU Renewable Energy Directive and supporting delegated acts defining renewable fuels of non-biological origin (RFNBOs).[59]

[51] The East Coast Gas Market. Western Australia, by comparison, does hold a domestic gas reservation policy. Australian Domestic Gas Security Mechanism (ADGSM) is negotiated with east coast LNG exporters via a Heads of Agreement rather than gas reservation legislation. See Australian Government, 'Heads of Agreement: The East Coast Domestic Gas Supply Commitment' (2022) <https://industry.gov.au/sites/default/files/2022-09/heads_of_agreement_the_australian_east_coast_domestic_gas_supply_commitment.pdf> accessed 10 November 2023.

[52] COAG Energy Council, 'Australia's National Hydrogen Strategy' x.

[53] Australian Government, 'Australia's International Clean Energy Partnerships' (2023) <https://dcceew.gov.au/climate-change/international-climate-action/international-partnerships> accessed 2 December 2023.

[54] COAG Energy Council, 'Australia's National Hydrogen Strategy' xi.

[55] Kim Beasy, Sherridan Emery, Kerrin Pryor, and Tuong Anh Vo, 'Skilling the green hydrogen economy: A case study from Australia' (2023) 48 International Journal of Hydrogen Energy 19811.

[56] COAG Energy Council, 'Australia's National Hydrogen Strategy' xiii.

[57] Australian Government, 'State of Hydrogen Report' (2022) <https://dcceew.gov.au/sites/default/files/documents/state-of-hydrogen-2022.pdf> accessed 10 October 2023, ix (hereinafter: Australian Government, 'State of Hydrogen Report').

[58] Australian Government, 'Australia's Guarantee of Origin Scheme: Consultation Papers' (2023) <https://consult.dcceew.gov.au/aus-guarantee-of-origin-scheme-consultation> accessed 20 May 2023.

[59] European Commission, 'Renewable Hydrogen Production: New Rules Formally Adopted' (2023) <https://energy.ec.europa.eu/news/renewable-hydrogen-production-new-rules-formally-adopted-2023-06-20_en> accessed 10 September 2023.

In a similar vein to the EU-based CertifHY scheme,[60] an industry-led Zero Carbon Certification Scheme has been launched by peak industry body the Smart Energy Council to promote the creation of an Australian hydrogen export sector.[61] The first renewable hydrogen project to receive pre-certification is Yara's green ammonia plant currently being built in the Pilbara, Western Australia. While certification schemes are crucial, particularly to support hydrogen exports, to implement hydrogen initiatives and schemes, one of the key inhibitors to rapidly building up the Australian hydrogen supply chain is the need for consistency in 'implementing standards, regulations, and certification'[62] for hydrogen at the national and state levels in Australia. This has led the federal Australian government to conduct its current holistic review of the National Hydrogen Strategy with a revised strategy anticipated in 2024.

Since 2022, the Australian government has been undertaking a national Review of Hydrogen Regulation to ensure hydrogen safety[63] and development.[64] At the federal level, several regulatory amendments are being planned to support the development of the Australian hydrogen sector ranging from safety laws to hydrogen transportation. In a responsive approach, new standards will be co-designed with the industry under five codes of practice, on hydrogen production; ammonia production; hydrogen refuelling; hydrogen appliances; and ammonia appliances, and are likely to be finalised in 2024.

As an interim measure before the finalisation of the five codes of practice and to support immediate applications of hydrogen blending into the domestic East Coast Gas Market, the federal National Gas Law (NGL) and National Energy Retail Law (NERL)[65] have been amended to incorporate hydrogen. As the Australian Constitution makes no express reference to energy, responsibility for energy market regulation falls within the plenary legislative power of the states and territories. Exercising cooperative federalism, participating jurisdictions have adopted a 'unitary regulatory system'[66] whereby each state adopts national laws mirroring the South Australian energy legislation. The NGL and NERL previously regulated third-party access to pipeline services and other services of 'natural gas processable gas' only.[67] Hydrogen did not fall under the definition of a naturally occurring gas and consequently the NGL and NERL are being amended pursuant to the recent passage of the Statutes Amendment (National Energy Laws) (Other Gases) Act 2023. Under the amendment, hydrogen is explicitly defined as a 'relevant covered gas' to enable low-level blends of hydrogen with gases within the domestic East Coast Gas network.[68]

As the discussion above illustrates, enthusiasm and strategies are not lacking to develop hydrogen sectors in Australia and New Zealand. However, robust national regulatory frameworks

[60] For an analysis of hydrogen classifications in the EU see Ruven Fleming, 'Clean or renewable – Hydrogen and power-to-gas in EU energy law' (2019) 39 Journal of Energy and Natural Resources Law 43.

[61] Smart Energy Council, 'Zero Carbon Certification Scheme' (2023) <https://smartenergy.org.au/zero-carbon-certification-scheme/> accessed 12 November 2023.

[62] Australian Government, 'State of Hydrogen Report' 59.

[63] See Fatemeh Salehi, Rouzbeh Abbassi, Mohsen Asadnia, Billy Chan, and Longfei Chen, 'Overview of safety practices in sustainable hydrogen economy – An Australian perspective' (2022) 478 International Journal of Hydrogen Energy 34689.

[64] Australian Government, 'Review of Hydrogen Regulation: Hydrogen Industry Consultation' (2022) <https://consult.dcceew.gov.au/review-of-hydrogen-regulation> accessed 10 September 2023.

[65] The NGL and NERL are encapsulated within the National Gas (South Australia) Act 2008 (SA) and the National Energy Retail Law (South Australia) Act 2011 (SA) along with supplementary rules and regulation.

[66] Lee Godden and Anne Kallies, 'Governance of the Energy Market in Australia' in Michael Faure (ed) *Elgar Encyclopedia of Environmental Law* (Edward Elgar 2021) 208.

[67] Statutes Amendment (National Energy Laws) (Other Gases) Act 2023 s 5.

[68] Ibid s 148AA.

providing the foundation for hydrogen production, processing, and potential export are evidently at differing states of maturity. Australia has enacted the first federal changes to permit the regulation of gas pipelines blended with hydrogen in amending the NGL and NERL. Developing domestic hydrogen capacity and infrastructure early is crucial to reaching export and decarbonisation goals for industrial processes such as ammonia in New Zealand. From an export perspective, the entire hydrogen production lifecycle must be effectively regulated to provide commercial investment certainty and conformity with international hydrogen certification and greenhouse gas calculation methodologies.[69] From a domestic perspective and to activate a hydrogen export sector, the planning, assessment, and licensing regime to rapidly scale up renewable hydrogen production is crucial, as explored below in Section 5.3.

5.3 HARMONISING HYDROGEN LAND USE: COMPARING AUSTRALIAN STATE APPROACHES TO RENEWABLE HYDROGEN LICENSING ON PASTORAL LAND

Developing renewable hydrogen economies in Australia and New Zealand will require the planning and allocation of licences and the management of competing land uses. This regulatory need arises from the fact that renewable hydrogen infrastructure will require the industrial use of land which may conflict with existing non-industrial uses. One of the key land use competitions with hydrogen production, particularly in Australia and potentially in New Zealand, is on pastoral lease Crown land traditionally reserved for pastoral land uses. The cost of constructing transmission infrastructure and accessing large areas of cleared land in proximity to major energy load centres will likely increase the economic viability of renewable hydrogen. These elements are often evident in pastoral leasehold land, which covers 44 per cent of Australia[70] and 37 per cent of New Zealand,[71] rendering it ideal to use for hydrogen production. However, this may lead to regulatory complexities over how hydrogen licences should be assessed and awarded by regulators in pastoral land use zones previously prohibited to utility-scale energy development.

This section will be confined to an analysis and comparison of the recent regulatory reforms to support hydrogen production facilities on pastoral lands in two Australian states, Western Australia and South Australia.[72] Although New Zealand also holds a pastoral leasehold system, New Zealand has recently overhauled its previous environment and planning law, the Resource Management Act 1991 (NZ), and enacted two new pieces of legislation: the Natural and Built Environment Act 2023 (NZ) (NBA) and the Spatial Planning Act 2023 (SPA) (NZ), to be phased in over a ten-year period.[73] Neither statute currently contains any express reference to hydrogen. Consequently, this chapter will focus on the Australian state experience, representing a more mature regulatory environment with express reforms relating to hydrogen.

[69] Particularly in conformity with the EU Delegated regulations defining renewable hydrogen under the Renewable Energy Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast).

[70] Australian Government Productivity Commission, 'Pastoral Leases and Non-Pastoral Land Use' (2002) <https://pc.gov.au/research/completed/pastoral-leases#:~:text=Pastoral%20leases%20exist%20on%20around,areas%20and%20the%20tropical%20savannas> accessed 30 October 2023.

[71] Ministry for the environment, 'Land' (2023) <www.linz.govt.nz/guidance/crown-property/crown-pastoral-land-management/leases-and-licences-crown-pastoral-land> accessed 1 December 2023.

[72] Section 51(xxxvii) of the Australian Constitution expressly enables the states and territories to refer powers to the Commonwealth Parliament to make laws on the matter which is referred.

[73] The Crown Pastoral *Land Reform Act* 2022 (NZ) also does not refer to hydrogen.

5.3.1 *Defining Pastoral Leases*

Following colonisation by Britain, and to prevent unauthorised settlement, the majority of Australia's rural arid and semi-arid lands were granted as a Crown statutory estate called pastoral leases. Pastoral leases as a tenure system became formalised by the landmark 1847 Order in Council and 'established 14-year leases in the unsettled districts and gave lessees renewal and compensation rights'[74] as a form of progressive land settlement requiring that land is held for 'pastoral purposes' only – traditionally sheep and cattle grazing. Pastoral leases are vast in Australia, currently constituting nearly half of Australia's mainland (equating to 338 million hectares).[75]

Unlike traditional common law or equitable leases, pastoral leases are purely a creature of statute to permit Crown-owned land to be leased for commercial grazing, agricultural, horticultural, or other supplementary pastoral use. Pastoral lease terms vary greatly within Australian states and territories. For example, in NSW pastoral leases are perpetually equated to a right to possess the land for an indefinite period.[76] In Queensland, the Northern Territory, and Western Australia pastoral leases are generally fixed-term agreements that expressly do not afford leaseholders a right to exclusive possession.[77] Eighty-seven per cent of Western Australia consists of rangelands and 38 per cent of the rangelands are held under pastoral leases.[78] Forty per cent of South Australia consists of land held under pastoral leases.

The high renewable energy potential, existing oil and gas infrastructure, and the need to access land to produce large-scale renewable hydrogen projects have led to Western Australia and South Australia either amending their pastoral lease regulation or creating new hydrogen licensing regulations to access pastoral land. Western Australia was the first Australian state to amend its pastoral leasehold regulation to accommodate renewable hydrogen siting, which will be discussed in more detail in Section 5.3.2.

5.3.2 *Diversification Leases: The Western Australian Approach*

Western Australia is the largest Australian state, covering 2.5 million km². One-third of the Western Australian state landmass is held under pastoral leases.[79] Pastoralism became the central socio-economic land use in Western Australia from the late 1890s, attracting settlers in the rangelands to farm. From the 1920s onwards, pastoral leases became increasingly popular, with cattle and sheep stations becoming a key sector of the Western Australian economy. In particular, pastoral leases have become common in the Pilbara region, one of nine regions located in Western Australia, the geographical size of Spain, with large rangelands

[74] J. H. Holmes and L. D. P. Knight, 'Pastoral lease tenure in Australia: Historical relic or useful contemporary tool?' (1994) 16(1) Rangelands Journal 106.

[75] Austrade, 'Pastoral Leases' (2022) <https://austrade.gov.au/land-tenure/land-tenure/pastoral-leases#:~:text=Pastoral%20leases%20are%20primarily%20situated,is%20subject%20to%20pastoral%20leasing> accessed 3 November 2022.

[76] Crown Land Management Act 2016 (NSW).

[77] *Wik Peoples v Queensland* (1996) 187 CLR 1; *Western Australia v Ward* (2002) 213 CLR 1.

[78] Pastoral leases represent 857,833 km² of Western Australia. Government of Western Australia, 'Rangelands of Western Australia' (2022) <https://agric.wa.gov.au/rangelands/rangelands-western-australia> accessed 10 October 2023.

[79] Western Australian Auditor General, 'Management of Pastoral Lands in Western Australia' (2017) <https://audit.wa.gov.au/reports-and-publications/reports/management-pastoral-lands-western-australia/auditor-generals-overview/> accessed 10 September 2023.

and considerable endowments of iron ore, lithium, gold, copper, nickel, and offshore petroleum.[80]

The Pilbara will become one of the most important hydrogen-producing regions in Australia. Its strategic geographical location close to Asian markets on Australia's west coast coupled with existing mining and petroleum value chains and petroleum export infrastructure have created the ideal conditions for prospective hydrogen hubs. The five hydrogen production hubs planned in the Pilbara region to be connected by hydrogen pipelines are touted as strategic zoning areas 'to provide common user infrastructure to support renewable hydrogen supply chain activity',[81] with the potential to produce from 3 to over 10 million tonnes of hydrogen per annum by 2050.[82]

For example, the H2Kwinana Hydrogen Hub will host a 100 megawatt (MW) electrolyser to produce over 14,000 tonnes of green hydrogen per annum for industrial use, heavy transport, and export.[83] The development of hydrogen hubs in the Pilbara sparked the need to consider reform to permit hydrogen production facilities on pastoral land. As pastoral leases are Crown-owned and restricted to pastoral activities,[84] alternative land uses and planning approvals for hydrogen infrastructure were previously not permitted pursuant to the Land Administration Act 1997 (WA).[85] To unlock the potential for hydrogen in Western Australia, pastoral leases need to host multi-purpose industrial land uses.[86]

The default statutory prohibition of any development activities other than pastoral for pastoral leases led to the first regulatory shift in Australia relating to hydrogen land use. While pastoralist landholders could previously apply for a diversification permit to undertake activities for non-pastoral purposes, such permits were only granted in limited circumstances and would not allow for the development of hydrogen and other renewable projects. The Crown could also acquire[87] and terminate pastoral leasehold interests for 'public works' land uses,[88] which holds a limited definition, including public infrastructure such as public schools and hospitals, and did not expressly include energy development. Consequently, a new non-exclusive land tenure type, the Diversification Lease, was proposed and enacted in the Land and Public Works Legislation Amendment Act 2023 (WA) (LPWLA Act).[89]

[80] OECD, 'Pilbara, Australia' (2023) <https://oecd.org/regional/Pilbara-mining-region-PH.pdf> accessed 13 September 2023.

[81] Government of Western Australia, 'Western Australia: An Outstanding Place for Renewable Hydrogen Investment' (2022) <https://wa.gov.au/system/files/2022-07/220629_Hydrogen%20Prospectus-Web.pdf> accessed 20 November 2022.

[82] Ibid.

[83] The Hon Madeleine King MP, '$70 million investment in Kwinana Hydrogen Hub enables major step forward for WA hydrogen industry' (2023) <https://minister.industry.gov.au/ministers/king/media-releases/70-million-investment-kwinana-hydrogen-hub-enables-major-step-forward-wa-hydrogen-industry#:~:text=Site%20works%20for%20H2Kwinana%20are,in%20Australias%20heavy%20vehicle%20fleet> accessed 20 November 2023.

[84] Land Administration Act 1997 (WA) Civ 3.

[85] However, pursuant to s 5 of the Land Administration Act 1997 (WA), the rights over Crown land in respect of minerals, petroleum, geothermal energy or geothermal energy resources are not impacted by the pastoral leasehold regime.

[86] Eddie J. B. van Etten, 'Changes to land tenure and pastoral lease ownership in Western Australia's central rangelands: Implications for co-operative, landscape-scale management' (2013) 35 The Rangeland Journal 37.

[87] Land Administration Act 1997 (WA) Div 2.

[88] Public Works Act 1902 (WA) s 2.

[89] Land and Public Works Legislation Amendment Act 2023 (WA) amends a suite of legislation including: Conservation and Land Management Act 1984 (WA); Duties Act 2008 (WA); Land Administration Act 1997 (WA); Mining Act 1978 (WA); Planning and Development Act 2005 (WA); Public Works Act 1902 (WA). For the purpose of this chapter, amendments to the Land Administration Act 1997 (WA) concern the introduction of the Diversification Lease.

The LPWLA Act amends the Land Administration Act 1997 (WA) (LAA Act) and the Public Works Act 1902 (WA) to permit the grant of a new Diversification Lease 'for any purpose or purposes'[90] on unallocated Crown land or to enable existing and new pastoral leases to be transferred to diversification leases.[91] In adapting existing pastoral land regulation to enable non-pastoralist activities supporting a hydrogen sector, Western Australia has adopted an 'adaptive' approach by amending its existing pastoral lands regulation.[92] Adaptive management is often deployed in the context of natural resources regulation and aims to adapt legal frameworks to accommodate new technologies and monitor outcomes potentially requiring adaptive amendments to existing legislation.[93]

The adaptive approach permits Diversification Leases to be applied for in a streamlined approach prospectively and retrospectively on unallocated Crown land, new pastoral leases, and existing pastoral leases to permit hydrogen production and other activities, including carbon farming and renewable energy. A Diversification Lease will be awarded by the Minister for Lands and will be an optional tenure type available to both pastoral lessees and energy proponents without the conferral of exclusive possession.[94] However, unlike pastoral leases, diversification leases are designed for diverse non-exclusive and concurrent land uses including, but not exclusive to, grazing livestock, horticulture, renewable hydrogen, and carbon farming.[95]

Diversification lessees must maintain the condition of the pastoral land and prevent land degradation.[96] It remains unclear whether the diversification lessee must act in accordance with standards and guidelines that will be set under powers afforded to the statutory Pastoral Lands Board pursuant to Division 2A of the LPWLA Act.[97] Such standards are applicable for pastoral leaseholders, setting out benchmarks and objectives about the condition of land held under pastoral leases.[98] As leasehold rental payments will not be afforded to landholders but rather will be received by the Crown, an assessment regimen requiring environmental impact assessments to preserve pastoral activities following Pastoral Lands Board guidelines is crucial.

Diversification lessees must satisfy the relevant Minister, rather than the Pastoral Lease Board as the statutory authority for pastoral leases, that land under the lease will be treated 'using methods of best environmental management practice appropriate to the area where the land is situated'.[99] Environmental management practices are currently undefined. Guidance for diversification lessees should be issued, particularly in consideration for water licensing, given water requirements for electrolysis and enduring water scarcity in the Pilbara region.[100]

Diversifying pastoral leasehold land uses and conditions in Western Australia to permit renewable hydrogen development is crucial to support the development of hydrogen hubs.

[90] Land and Public Works Legislation Amendment Act 2023 (WA) Pt 6A, s 92B.
[91] Ibid s 92C(3).
[92] Madeline Taylor and Tina Soliman Hunter, *Agricultural Land Use and Natural Gas Extraction Conflicts: A Global Socio-Legal Perspective* (Routledge 2019).
[93] Nicola Swayne, 'Regulating coal seam gas in Queensland: Lessons in an adaptive environmental management approach?' (2012) 29 Environmental and Planning Law Journal 163.
[94] Land and Public Works Legislation Amendment Act 2023 (WA), Pt 6A, s 92D.
[95] Ibid Pt 6A.
[96] Ibid Pt 6A, s 92F.
[97] The Pastoral Lands Board is the statutory authority with joint responsibility with the Minister for Lands for administering Western Australian pastoral leases in accordance with Pt 7 of the Land Administration Act 1997 (WA).
[98] Land and Public Works Amendment Act 2023 (WA), s 100A.
[99] Ibid s 92F.
[100] Government of Western Australia, Department of Planning, Lands and Heritage, 'Guiding the Use of Diversification Leases on Crown Land under the Land Administration Act 1997' (2023) <https://wa.gov.au/system/files/2023-08/policy-framework-diversification-leases.pdf> accessed 29 November 2023.

Pastoralists, rather than energy proponents alone, are permitted to apply for diversification leases to acquire additional income through new land use activities, such as carbon sequestration.[101] Carbon management and sequestration activities often operate on at least a twenty-five-year project lifecycle, hence the amendment to permit pastoral leases and accompanying diversification leases to a maximum of fifty years via re-grant or extension is another important development.[102] However, pastoralists must be adequately consulted and informed when considering the option to surrender pastoral leasehold lands in favour of a diversification lease. Arguably, the direct co-location of pastoralist activities alongside renewable energy production supporting renewable hydrogen, for example by way of agrivoltaics,[103] appears a missed opportunity as a mixed agricultural and renewable energy activity and land use does not appear to be expressly included within the LPWLA Act.

An alternative regulatory approach to extending the permissibility of renewable hydrogen within existing pastoral regulatory frameworks is to create bespoke and specific renewable hydrogen development principles, assessments, and licensing procedures. South Australia has taken this approach in its recently enacted Hydrogen and Renewable Energy Act 2023 (SA) (HRE Act).

5.3.3 *Hydrogen Generation Licences: The South Australian Approach*

South Australia is the vanguard of renewable energy success in Australia. It has transitioned its energy system from 1 per cent to 68 per cent renewable energy in a fifteen-year period and is forecast to reach 90 per cent renewable energy by 2025.[104] In 2022, South Australia became the first Australian state with 85.4 per cent of electricity demand being contributed by solar and wind.[105] With such high variable-renewable energy penetration, South Australia has set its policy sights on becoming a 'world-class renewable hydrogen supplier'.[106] An initial hydrogen export feasibility study has projected South Australian renewable and blue hydrogen[107] could satisfy 10 per cent of Rotterdam's hydrogen demand in 2050, forecast to reach 18 million tonnes per annum by 2050.[108] This policy aim seeks to be realised through South Australia's Hydrogen Action Plan setting out twenty key actions across five areas to integrate hydrogen into its domestic energy system and scale up renewable hydrogen production for export.

[101] Western Australian Government, 'Land and Public Works Legislation Amendment Act 2023 Frequently Asked Questions' (2023) <https://wa.gov.au/government/document-collections/land-and-public-works-legislation-amendment-act-2023> accessed 13 December 2023.

[102] Land and Public Works Legislation Amendment Act 2023 (WA), s 105.

[103] Madeline Taylor, 'Planning the energy transition: A comparative examination of large-scale solar energy siting on agricultural land in Australia' (2022) 18(2) Utrecht Law Review 70; Madeline Taylor, Jordie Pettit, Takashi Sekiyama, and Maciej Sokolowski, 'Justice-driven agrivoltaics: Facilitating agrivoltaics embedded in energy justice' (2023) 188 Renewable and Sustainable Energy Reviews 1.

[104] Government of South Australia, 'South Australia's Hydrogen Action Plan' (2019) <https://energymining.sa.gov.au/industry/modern-energy/hydrogen-in-south-australia/hydrogen-files/south-australias-hydrogen-action-plan-online.pdf> accessed 10 December 2023 (hereinafter: Government of South Australia, 'South Australia's Hydrogen Action Plan').

[105] Renew Economy, 'South Australia Hits Stunning New High in Race to Renewables-Only Grid' (2023) <https://reneweconomy.com.au/south-australia-hits-stunning-new-high-in-race-to-renewables-only-grid/> accessed 20 May 2023.

[106] Government of South Australia, 'South Australia's Hydrogen Action Plan' 19.

[107] As defined and discussed in Chapter 2 by Leigh Hancher and Simina Suciu in this book.

[108] Government of South Australia, 'South Australia–Port of Rotterdam Hydrogen Supply Chain Pre-feasibility Study' (2021) <https://energymining.sa.gov.au/__data/assets/pdf_file/0007/733237/RELEASE_FINAL_SA_-_Rotterdam_H2_Supplychain_pre-FS_report_-_exec_summary_presentation.pdf> accessed 24 November 2023.

Building on its success in regulating tight and shale gas as Australia's leading onshore gas producer,[109] action two of the South Australian Hydrogen Action Plan is to establish a 'world class regulatory framework'[110] to build community and investor confidence as a key action. Similar to Western Australia, South Australia has also sought to amend its pastoral leasehold conditions to encourage renewable hydrogen development and 'unlock land access to pastoral land'.[111]

For example, the Planning and Design Code (SA), a statutory instrument representing the policies, rules, and classifications for land use planning, previously restricted renewable energy facility land uses, in Rural Land Zones where land is used wholly or mainly for primary production, such as pastoral leases.[112] Renewable energy facilities were defined to include solar, tidal, hydropower, biomass, and/or geothermal. However, hydrogen facilities were not recognised or defined under the Planning and Design Code (SA). This regulatory gap led the South Australian Productivity Commission in 2022 to recommend the Pastoral Land Management and Conservation Act 1989 (SA) (PLMC Act) be amended to enable renewable energy development and corresponding renewable hydrogen development on pastoral leases.[113]

Wind farm developments were previously the only utility-scale renewable energy developments permissible on pastoral land under s 49J of the PLMC Act with ministerial approval in South Australia. The PLMC Act governs land use and permissible development on pastoral land. As a pastoral lessee holds limited property rights to undertake pastoral activities only, applications seeking to access or use pastoral lease land for non-pastoral purposes are to be assessed by the Pastoral Unit and Pastoral Board and require ministerial approval. Applications are assessed according to their potential impact on the ongoing viability of pastoral activities, and their alignment with the objects of the PLMC Act to 'make provision for the management and conservation of pastoral land'.[114] Under the PLMC Act, all land uses apart from pastoralism and ancillary activities, mining, and wind farms are treated as 'non-pastoral' purposes or alternative land uses.

Despite advances in permitting wind farm development on pastoral land, other renewable energy activities were incompatible with pastoral activities under the PLMC Act. Thus, any application to develop pastoral land for renewable hydrogen production by co-locating would involve 'excising the required land, changing the tenure and issuing of Crown licence(s) to facilitate land access and use'.[115] This clear regulatory gap for renewable hydrogen development creating investment uncertainty and the need to access pastoral land has led to the enactment of the first bespoke hydrogen regulatory framework in Australia – the HRE Act.

The HRE Act provides a streamlined land use approvals and licensing scheme for hydrogen and renewable energy projects on pastoral leasehold land, other Crown land tenures defined as

[109] See Barry Goldstein, Michael Malavazos, and Belinda Hayter, 'Leading Practice Regulation for Unconventional Reservoir Development in South Australia' in Michal C. Moore, Ian G. Cronshaw, and R. Quentin Grafton (eds), *Risks, Rewards and Regulation of Unconventional Gas: A Global Perspective* (Cambridge University Press 2016).

[110] Government of South Australia, 'South Australia's Hydrogen Action Plan' 23.

[111] Government of South Australia, 'Hydrogen and Renewable Energy Act: Explanatory Guide to the Bill' (2023) <https://energymining.sa.gov.au/__data/assets/pdf_file/0019/905311/Explanatory_Guide_to_the_HRE_Bill.pdf> accessed 1 December 2023 (hereinafter: Government of South Australia, 'Hydrogen and Renewable Energy Act: Explanatory Guide to the Bill').

[112] See Planning and Design Code (SA) Pt 2.

[113] South Australian Productivity Commission, 'Final Report Inquiry into South Australia's Renewable Energy Competitiveness' (2022) 11 <https://sapc.sa.gov.au/__data/assets/pdf_file/0007/847348/Renewable-Energy-Competitiveness-Final-Report-Website-Version.pdf> accessed 10 November 2023.

[114] Pastoral Land Management and Conservation Act 1989 (SA) s 1.

[115] Ibid.

'designated land',[116] And some freehold land as 'non-designated land'. The corresponding amendment of the PLMC Act upon the enactment of the HRE Act permits 'renewable energy infrastructure and the undertaking of associated infrastructure activities'.[117] The HRE Act is underpinned by the proposed legislative objective to 'establish an effective, efficient and flexible regulatory framework for the constructing, operating, maintaining and decommissioning of renewable energy infrastructure and facilities for generating hydrogen for commercial purposes'.[118] This objective represents a pivot away from a rules-based and adaptive approach to enact new regulation in the existing PLMC Act to a principle-based or goal-setting approach specifically for renewable hydrogen licensing to enable coexistence with other land uses in South Australia.[119]

Principle-based regulation is outcome orientated and describes the method of achieving a regulatory outcome by setting a general objective, standard, or duty without specifying the means of achieving that outcome in absolute terms.[120] Conversely, rule-based regulation places the proponent as an adversary, constantly testing and finding methods to check and reinterpret regulatory inconsistencies, requiring continuous amendments and updates to accommodate new legal issues. Principle-based regulation seeks to produce a regulatory system that is more effective and sustainable in the face of changing circumstances and complex technological developments in emerging sectors such as renewable hydrogen development.[121] By taking a principle-based approach in South Australia, the HRE Act will permit regulators to actively participate in managing renewable hydrogen to encourage co-location with other land uses and activities, such as pastoral lessees, by regulating and enforcing the conditions of production and hydrogen development. This approach functions to ensure the activities of renewable hydrogen titleholders are aligned with broad regulatory principles. Similarly, France has also taken a goal-setting approach to the regulation of hydrogen transport.[122]

The HRE Act provides the legal framework for Crown-owned land and waters, including pastoral leases to be identified and declared as suitable for the operation of renewable energy infrastructure and establish a competitive merit-based hydrogen generation licensing regime.[123] Where the release area comprises pastoral land, 'occurrence of the Minister responsible for the administration of the Pastoral Land Management and Conservation Act 1989 (SA) is also required'.[124] Following the release of an HRE Act area, a competitive process for determining access to and use of pastoral land by the award of a hydrogen generation licence which authorises the construction, installation, operation, maintenance, and decommissioning of a hydrogen generation facility which must not exceed 5 km^2.[125]

[116] Government of South Australia, 'Hydrogen and Renewable Energy Act: Explanatory Guide to the Bill'; Hydrogen and Renewable Energy Act 2023 (SA) s 4.
[117] Pastoral Land Management and Conservation Act 1989 (SA) s 4.
[118] Hydrogen and Renewable Energy Act 2023 (SA) s 3(b).
[119] Ibid s 3(j).
[120] Neil Gunningham and Darren Sinclair, 'Integrative regulation: A principle-based approach to environmental policy' (2018) 24(4) Law and Social Inquiry 853.
[121] Julia Black, 'Forms and Paradoxes of Principles-based Regulation' (2008) LSE Legal Studies Working Paper No. 13/2008, 3(4).
[122] See Chapter 16 by Kleopatra-Eirini Zerde in this book.
[123] Hydrogen and Renewable Energy Act 2023 (SA) s 10.
[124] Ibid s 10(4)(a).
[125] Ibid s 14 and s 37. However, a licensee will likely be able to apply for multiple licences concurrently held and overlapping, approved by the relevant minister, meaning a proposed hydrogen generation facility exceeding 5 km^2 may require multiple licences.

In contrast to Western Australia's diversification lease, the environmental assessment and requirements for hydrogen production licences are clear. An Environmental Impact Report and Statement of Environmental Objectives[126] to assess and manage any adverse effects, the 'risk of any significant long-term damage'[127] on the environment 'as far as reasonably practicable',[128] and ensuring rehabilitation of pastoral land will be required pursuant to the HRE Act. Finally, an operational management plan must be accepted and approved prior to the commencement of authorised operations.[129]

In comparison to the Western Australian approach, the HRE Act expressly requires an access agreement to be entered into with a pastoral lessee before undertaking authorised operations under a hydrogen generation licence. Mandating an access agreement under the HRE Act explicitly recognises and protects the incumbent and persevering property rights of pastoralists. The access agreement must include an agreement as to any compensation that may be payable for the resumption of pastoral land for the purpose of a hydrogen generation facility or by associated infrastructure[130] and access conditions to the licence area or in the vicinity of the licence area.[131] A process to mediate the negotiation of an access agreement is also stipulated within s 41 of the HRE Act including powers for the Minister to facilitate and assist in obtaining a land access agreement or determination by the South Australian Environment, Resources and Development Court. The South Australian government is currently finalising the HRE Regulations,[132] which will include consultation requirements and criteria for the release area and licensing stages and the role of pastoralists and their interests during the negotiation of the land access agreement and throughout the hydrogen generation licence term.[133]

As illustrated in the above discussion, the HRE Act not only creates the first hydrogen-specific planning and licensing regulation in Australia but also elevates the rights of pastoral leaseholders by expressly requiring access agreements and potential compensation to be negotiated prior to the award of a hydrogen generation licence. This position fundamentally differs from Western Australia's diversification lease which expressly recognises pastoral leases retaining non-exclusive possessory rights over pastoral land and is silent as to whether pastoral lessees may receive compensation or require an access agreement. It is also notable that South Australia has chosen to implement hydrogen licensing interests in comparison with Western Australia's approach to diversification leasehold interests. Consequently, hydrogen licences in South Australia may lead to challenges regarding the transferability of hydrogen licences between entities. In establishing a competitive tender process, the HRE Act seeks to uphold 'environmentally sustainable and safe'[134] development of land use for hydrogen production by requiring an Environmental Impact Assessment including decommissioning and rehabilitation requirements.

Overall, the HRE Act, combined with its supplementary regulations currently in draft form, introduces a principle-based regulatory approach to the Australian hydrogen regulatory environment. It remains to be seen whether the HRE Act will enable an 'effective, efficient and flexible

[126] Ibid Div 4.
[127] Ibid s 58 (b).
[128] Hydrogen and Renewable Energy Act 2023 (SA) s 58 (a).
[129] Ibid s 66.
[130] Pastoral Land Management and Conservation Act 1989 (SA) s 39.
[131] Hydrogen and Renewable Energy Act 2023 (SA) s 41.
[132] Hydrogen and Renewable Energy Regulations 2024 (SA).
[133] Government of South Australia, 'Hydrogen and Renewable Energy Regulations Information Sheet' (2023) <https://energymining.sa.gov.au/__data/assets/pdf_file/0007/967543/HRE-Act-Regulations-consolidated-information-sheet.pdf> accessed 6 December 2023.
[134] Ibid 10.

regulatory framework'.[135] However, its principle-based requirements coupled with mandating access agreements provide enhanced regulatory certainty for hydrogen proponents and pastoral lessees alike.

5.4 CONCLUSION

Australia and New Zealand in the Oceania region have clear ambitions to become regional and global leaders in renewable hydrogen production. The federal Australian regulatory framework is actively being amended using a responsive regulatory approach commencing with the amendment to its National Gas Law and National Energy Retail Law and the current review of its National Hydrogen Strategy. However, many crucial aspects of the future renewable hydrogen supply chain and licensing systems will be regulated by states and territories. In practical terms, this requires measurable national strategies aligned with state and territory planning systems to design regulatory frameworks covering various aspects of the renewable hydrogen supply chain and, importantly, the siting of renewable hydrogen projects.

New Zealand is at the initial stages of mapping regulatory reform priorities to create its first federal hydrogen roadmap. Regulatory amendments will likely commence with amending natural gas pipeline standards and a rebate scheme to enable a just transition for hydrogen-hosting communities. The Regional Hydrogen Transition Initiative framework will likely stir a similar debate and suite of regulatory reform to permit the development of renewable hydrogen through a competitive licensing scheme on complex and overlapping land uses.

The differing approaches in Western Australia and South Australia to hydrogen regulation are apparent in regulatory amendments made to existing pastoral land legislation or the introduction of new hydrogen licensing regulations for renewable hydrogen facilities on pastoral land. As the renewable hydrogen regulatory landscape undergoes rapid changes in Australia, the effectiveness of South Australia's principles-based approach encapsulated in the HRE Act and Western Australia's adaptive strategy in establishing diversification leases is uncertain. The question remains as to which regulatory path will be more effective in encouraging renewable hydrogen development while maintaining and upholding pastoral land uses. Lessons from both states will be instrumental in shaping New Zealand's approach to hydrogen planning and licensing within its recently enacted Natural and Built Environment Act 2023 (NZ) and Spatial Planning Act 2023 (NZ) and its Regional Hydrogen Transition Initiative.

Principles for renewable hydrogen development are crucial to guide and develop consistent and coherent licensing and planning regulatory regimes. Objectives and supporting standards to encourage the award of hydrogen production licences while preserving multiple land uses are becoming important in the hydrogen regulatory ecosystem. Realising Australia and New Zealand's hydrogen aspirations undoubtedly raise evolving and persistent legal questions concerning the allocation of licences on complex and multiple land uses, particularly pastoral land.

Regardless of the differing approaches in Western Australia and South Australia's hydrogen licensing regime, and the emerging hydrogen roadmap in New Zealand under development, it is crucial for both Australia and New Zealand to establish supportive legal frameworks for hydrogen development. Such frameworks must be crafted with careful consideration to maintain the balance between pastoral land uses and potential future complexities in land utilisation for renewable hydrogen.

[135] Hydrogen and Renewable Energy Act 2023 (SA) s 3(b).

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