

SUBMISSION TO THE CLEAN ENERGY REGULATOR

GO Cost Recovery Implementation Statement — New Production Pathways

Submitter: AMBE Energy Australia Pty Ltd (ACN 696 990 119) | 1 June 2026 | Consultation closes 8 June 2026

Submitter Details	
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Address	302 Charlemont Road, Armstrong Creek VIC 3217
Relevant pathway	Hydrogen by solid gasification and pyrolysis
Project status	Pre-commercial development. Feasibility engagement with Barwon Water underway. Technology partnership discussions active. ARENA EOI target Q3 2026.
Publication consent	AMBE Energy Australia consents to publication of this submission in full.

EXECUTIVE SUMMARY

AMBE Energy Australia Pty Ltd is developing Australia's first commercial biomass gasification green hydrogen project, targeting Plant 1 at a Geelong region site with a commissioning target of Q4 2028. To our knowledge we are the only Australian commercial proponent engaged in this consultation specifically for the hydrogen by solid gasification and pyrolysis pathway. This submission makes seven recommendations across five substantive areas — fee waiver structure, tiered fees for small-scale distributed production, biochar carbon permanence accounting, feedstock counterfactual emissions, and bilateral alignment with India's National Green Hydrogen Mission.

1. ABOUT AMBE ENERGY AND THIS PATHWAY

Parameter	Detail
Process design	Oxygen-blown downdraft biomass gasification producing fuel cell grade hydrogen (99.97% purity at 90% PSA recovery). AI-enabled control system guaranteeing 7,200 hours/year plant availability.
Confirmed H2 yield	~70 g H2/kg dry Pinus Radiata feedstock for oxygen-blown process. Confirmed by technology partner CTO 20 May 2026. Reference: Energies 2014, doi.org/10.3390/en7074342 (C-H-O composition comparison with tested feedstock).
Carbon conversion	85-95% of feedstock carbon converts to syngas at reactor outlet. Confirmed from pilot data at IIT Ropar.
Biochar yield — woody	2-4% dry weight. Fixed carbon 50-60%. Surface area 300-500 m2/g.
Biochar yield — agricultural	17-19% dry weight — paddy straw, canola straw, sugarcane bagasse. Highest biochar yield feedstocks.
Carbon intensity	-10 to -13 kg CO2e/kg H2 without CCS. IEA Bioenergy Task 33 (February 2025) confirms -15 to -22 with CCS. Most carbon-negative hydrogen pathway commercially available.
Seven revenue streams	Green hydrogen wholesale, food-grade CO2, agricultural CO2, medical CO2, biochar (agricultural and battery), ACCUs, organic waste gate fees.
Research partner	Deakin University REACH Trailblazer (0M). NDA executed. Six researchers engaged. Independent LCA, biochar battery, Viva Energy oxygen integration study.
GO scheme position	Only known Australian commercial proponent for this pathway in this consultation.

2. POSITIONS AND RECOMMENDATIONS

2.1 Fee Waiver Period — Must Commence from Methodology Determination Date

The proposed full fee waiver for FY 2025-26 is strongly supported. The solid gasification and pyrolysis pathway has no operating commercial plant in Australia and its methodology determination has not yet been made. Imposing cost recovery obligations before the methodology exists is unreasonable and will deter the early engagement that produces better methodology outcomes.

The critical issue is the trigger date. A producer certifying in 2028 under a methodology determined in 2027 should receive the full transition period benefit from 2027 — not find themselves entering a regime already two years into phase-in because the clock started at GO scheme commencement in November 2025.

Recommendation 1

The CER must confirm that the fee waiver transition period for each new PGO pathway commences from the date of methodology determination for that specific pathway — not from the GO scheme commencement date of 3 November 2025. This is essential for the solid gasification and pyrolysis pathway whose methodology determination timeline is still uncertain.

2.2-Tiered Fee Structure for Small-Scale Distributed Production

The solid gasification and pyrolysis pathway is uniquely suited to distributed small-scale plants of 400 to 1,000 kg H₂/day near regional biomass waste streams. This distributed model delivers public benefits — regional decarbonisation, waste management, circular economy, permanent carbon removal — that large centralised production cannot. A fee structure calibrated for large-scale electrolysis plants places a disproportionate burden on small-scale distributed producers whose administrative burden is lower and whose public benefit per dollar is higher.

Recommendation 2

Introduce a tiered registration and annual fee structure for the PGO with a reduced category for plants producing below 2,000 kg H₂/day (approximately 730 tonnes H₂/year). This encourages distributed production delivering the regional and environmental benefits the GO scheme is designed to support.

2.3 Biochar Carbon Permanence — The Most Important Technical Issue in This Submission

Biomass gasification produces biochar as a co-product that permanently sequesters carbon for hundreds to thousands of years. This permanent carbon removal is the defining characteristic that makes solid gasification hydrogen the most carbon-negative hydrogen production pathway commercially available. If the methodology does not include biochar permanence within the system boundary, GO certificates for this pathway will systematically understate the carbon benefit by 10-20 kg CO₂e/kg H₂.

At IPCC biochar stability factors of 0.7-0.9 and confirmed biochar yields of 2-4% for woody feedstocks and 17-19% for agricultural feedstocks, the carbon removal contribution is material and measurable. For agricultural feedstocks producing 17-19% biochar yield, the carbon removal through biochar alone can match or exceed the hydrogen production carbon benefit. Omitting this from the methodology is scientifically incorrect and commercially damaging to proponents of this pathway.

Recommendation 3

The methodology determination for hydrogen by solid gasification and pyrolysis must explicitly include permanent biochar carbon sequestration as a carbon removal mechanism within the well-to-gate system boundary, using an IPCC-consistent biochar stability factor of 0.7-0.9. Allocation between hydrogen and biochar co-products should follow ISO 14040 mass-based or energy-based allocation. This is the single most commercially significant methodology design decision for this pathway.

2.4 Waste Feedstock Counterfactual Emissions

AMBE Energy's Plant 1 uses forestry residue that would otherwise be burned or landfilled, and organic waste from water utilities that would otherwise generate landfill methane. Both feedstocks have documented counterfactual emission pathways. For agricultural residue feedstocks — paddy straw, cereal straw, canola straw — stubble burning emits approximately 1.2-1.8 kg CO₂e per kg of straw burned. A methodology that ignores these counterfactual emissions understates the carbon benefit of waste biomass gasification.

Recommendation 4

Waste biomass feedstocks with documented counterfactual emission pathways should receive avoided emission credits in the carbon intensity calculation, consistent with the ACCU scheme's organic waste methodology. This

applies particularly to agricultural residues where stubble burning avoidance is a verifiable and material environmental benefit.

2.5 Multi-Product CO2 Allocation

Oxygen-blown biomass gasification produces biogenic CO2 as a co-product — approximately 219 tonnes per year at 400 kg H2/day. This CO2 is captured, purified to food-grade standard, and sold as an industrial gas replacing fossil-derived CO2. The methodology must specify how carbon accounting is allocated across co-products and how biogenic CO2 captured for commercial use is treated.

Recommendation 5

The methodology should specify mass-based or energy-based allocation of emissions across co-products following ISO 14040 and should credit biogenic CO2 captured and utilised commercially as a displacement of fossil-derived CO2 where the application substitutes for fossil CO2 that would otherwise be produced.

2.6 Independent LCA — Australian University Role

AMBE Energy has engaged Deakin University's REACH Trailblazer programme for an independent lifecycle analysis of this pathway using Australian feedstocks. This will be the first Australian peer-reviewed LCA of oxygen-blown biomass gasification hydrogen and will be made available to the CER as part of the certification process. The IEA Bioenergy Task 33 (February 2025) specifically identifies independent LCA of this pathway as a critical knowledge gap.

Recommendation 6

The CER should actively engage Australian university research programmes as part of methodology development for solid gasification and pyrolysis. Independent peer-reviewed LCA by accredited Australian researchers provides the most credible evidentiary basis for methodology determination. AMBE Energy can facilitate this engagement through our Deakin University REACH partnership.

2.7 Bilateral Alignment — India National Green Hydrogen Mission

AMBE Energy's technology partner is certified under India's National Green Hydrogen Mission (NGHM) — India's equivalent certification framework — since August 2023 specifically for biomass gasification hydrogen. Under ECTA and the Australia-India bilateral hydrogen partnership, alignment between NGHM and the GO scheme methodology for this pathway would facilitate bilateral hydrogen trade and reduce certification costs for bilateral projects.

Recommendation 7

The CER should consider engaging with India's National Green Hydrogen Mission administrators on methodology alignment for solid gasification and pyrolysis hydrogen certification. AMBE Energy can facilitate this introduction through our bilateral technology partnership.

3. SUMMARY OF RECOMMENDATIONS

#	Recommendation	Priority
1	Waiver period commences from methodology determination date — not GO scheme commencement	Essential
2	Tiered fee structure — reduced category for plants below 2,000 kg H2/day	Important
3	Biochar carbon permanence included in system boundary at IPCC factor 0.7-0.9	Essential — most significant
4	Counterfactual emissions from waste feedstocks credited in carbon intensity	Important
5	Multi-product CO2 allocation methodology specified per ISO 14040	Important
6	CER engagement with Australian universities for independent LCA	Recommended
7	Bilateral engagement with India NGHM for methodology alignment	Strategic