Perdaman urea plant to increase emissions in Western Australia and misses green fertiliser opportunity

The Perdaman urea project at Murujuga, Western Australia, will drive up fossil gas use and emissions at the expense of Australian taxpayers.

By Piers Verstegen, Thomas Houlie, Bill Hare
April 2023
Summary

- The Perdaman urea facility, to be located close to Aboriginal rock art proposed for World Heritage listing at Murujuga in the Pilbara region of Western Australia (WA), will be the largest gas user in the state, using 125TJ/day of fossil gas, equivalent to all gas used for electricity generation on the WA South-West interconnected grid (SWIS).

- Total annual emissions from this urea fertiliser project (Scope 1 and 3) will emit emissions equivalent to about 3% of 2005 emission levels in Western Australia.  

- The inception of this new fossil gas urea fertiliser facility represents a lost opportunity to base new fertiliser production capacity on green hydrogen/ammonia in a region with likely the lowest cost of renewable energy in the world. This contrasts starkly with the initiative in Queensland to convert a fossil fuel-based urea factory to one driven by green ammonia with a very substantial reduction in greenhouse gas emissions. The rapid scaling up of green fertiliser produced with renewable-derived hydrogen has been identified as a global technology breakthrough that could trigger a ‘cascade of tipping points to accelerate the net zero transition’.

- The facility will use 70% of the domestic gas reservation requirement from the Woodside Scarborough project. This will leave just 4.5% of the gas from Scarborough for other gas users in WA at a time when a gas supply shortage is predicted.

- The facility will generate around 200 million tonnes (MtCO₂e) of greenhouse gas emissions over its lifetime including Scope 3 emissions. This is about the same as the total cumulative emissions savings from all facilities under the Australian Government’s proposed reforms to the Safeguard Mechanism by 2030.

- Perdaman proposes to offset the majority of direct emissions from the facility, however no details on the type or location of offsets are available.

- The Perdaman project will enjoy the benefits of over half a billion dollars (around $530M) in infrastructure funding as various grants, loans and subsidies from State and Commonwealth Governments. This includes $255 million from the

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1 Warming Western Australia
Northern Australia Infrastructure Fund (NAIF) and over $270 million from the WA State Government.

- The facility will release atmospheric pollutants that are harmful to human health, and will significantly increase the pollution that is thought to be impacting the rock art proposed for world heritage listing at Murujuga. This includes up to 368 tonnes of Nitrogen Dioxide (NOx), 429 tonnes of fine particulates (PM10), and 390 tonnes of ammonia (NH3) each year.

- The facility will be located within a few hundred metres of Hearson’s Cove beach, and Deep Gorge, the popular tourist location to view petroglyphs at Murujuga. The WA Environmental Protection Authority (EPA) has stated that there may be a threat of serious or irreversible damage to rock art from industrial air emissions from the proposal.

Gas use and supply for the Perdaman project
Globally and in Western Australia, fossil gas use must decrease significantly by 2030 in order to meet temperature and emissions reduction goals.

The Perdaman urea facility would be the largest user of fossil gas in Western Australia, creating a very large new demand for gas.

Gas use by the project
- The Perdaman facility would use 125TJ/day of fossil gas.
- The gas used by Perdaman would be almost the same as the total amount of gas used for electricity generation on the Southwest Interconnected System (SWIS) by 11 gas-fired generators.
- As a company, only Alcoa would use more gas across its three alumina refining facilities in WA.

Gas supply
- The Perdaman facility is contracted to use gas from the Woodside Scarborough development. Perdaman would use about 70% of the domestic gas reservation (domgas) commitment from the Scarborough project, which is estimated at 180TJ/day. This will leave just 4.5% of the gas from Scarborough for other gas users in WA at a time when a gas supply shortage is predicted.

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5 Ibid.
Carbon emissions
The Perdaman facility will be a very large new source of carbon pollution.

Before mitigation measures, the total lifetime emissions from the facility would be around 200 million tonnes (MtCO2e). This is roughly the same as the total savings estimated to be achieved by the Australian Governments reforms to the Safeguard Mechanism by 2030 (205 million tonnes cumulative abatement).

Key GHG emissions data:
- Scope 1 (direct) greenhouse has pollution from the facility will be 0.65 million tonnes CO2e- per year or 52 million tonnes (MtCO2e) over the life of the facility.\(^6\)
- Perdaman plans to decrease the annual net scope 1 emissions by 20% every 5 years from 2030 to 2050 onwards, bringing the lifetime net emissions to 9.75 million tonnes.
- It is not clear what level of real emission abatement would occur under these plans and does not specify the amount of actual abatement that will be conducted on-site. While the company mentions various mitigation measures\(^7\) its states that “the purchase and surrender of offsets [will] make-up any shortfall in achieving the net Scope 1 GHG emission reduction targets through avoidance and reduction actions”.
- Most if not all of the proposed abatement is likely to be conducted by purchasing offsets, which would not reduce emissions at all. The type, location and other details of the intended offsets have not been disclosed.
- Scope 3 (indirect) pollution is estimated at 1.83 million tonnes CO2e per year or 146 million tonnes over the life of the facility.
- Total emissions (Scope 1 and 3) over the life of the facility will be just under 200 million tonnes CO2e.
- The Perdaman plant will results in emissions equivalent to 3.1% of Western Australia’s 2005 GHG emissions.\(^8\)

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\(^6\) EPA Report 1705

\(^7\) They include, according to the EPA report 1705: “using ammonia production technology which results in a substantially smaller fired heater being required compared to other technology, eliminates the need for a steam boiler and steam power generation, using a thermally efficient combined cycle gas turbine, maximised waste heat steam recovery systems, using a hydraulic turbine to recover process energy in the Acid Gas Recovery Unit, collecting fuel gas containing streams and reusing them in the fired heater, high efficiency pumps, a low energy reverse osmosis desalination plant”.

\(^8\) Warming Western Australia
Lifetime emissions from the proposed Perdaman Facility
(Millions of tonnes CO2e-)

Lifetime emissions from the proposed Perdaman facility
compared with total savings from Safeguard Mechanism (all
facilities) to 2030
Other harmful air pollutant emissions
Ongoing concerns have been raised about the impact of industrial pollution including acid gas emissions on the Murujuga rock art proposed for World heritage listing. Independent scientific studies have shown that existing levels of industrial emissions on the Burrup are already affecting the rock art.

The Perdaman facility would be a very large new source of industrial pollution on the Burrup. The facility is located directly adjacent to Deep Gorge, the most popular tourist site for viewing the petroglyphs.

When assessing the project, the WA EPA said:

“The EPA considers that there may be a threat of serious or irreversible damage to rock art from industrial air emissions (in particular, urea particulates and NH3) from the proposal accelerating the natural weathering. The EPA considers that there is lack of full scientific consensus about potential residual cumulative impacts on the significant environmental values (including social surroundings values) associated with rock art within Murujuga.”

According to the air quality study for the facility\(^9\), during normal operation the Perdaman project will release between 243 and 368 tonnes of nitrogen dioxide (NOx), between 360 and 429 tonnes of particulates, and between 382 and 390 tonnes of Ammonia (NH3) every year for the 80-year lifetime of the facility.

Emissions data for these pollutants is summarised below:\(^{10}\)

<table>
<thead>
<tr>
<th></th>
<th>NOx</th>
<th>PM10</th>
<th>NH3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kg/day</td>
<td>664 - 1007</td>
<td>986 - 1175</td>
<td>1047 - 1070</td>
</tr>
<tr>
<td>Tonnes/year</td>
<td>243 - 368</td>
<td>360 - 429</td>
<td>382 - 390</td>
</tr>
</tbody>
</table>


10\(\) The air quality study of the plant considers two scenarios: The “upset conditions” scenario, defined as operations at approximately 60% of the normal rate. The report mentions that “normal operating parameters for the plant are typically near 100% of design”, an assumption taken into account into the “normal operations” scenario.
Grants and subsidies

The Perdaman project will enjoy the benefits of over half a billion dollars (around $530M) in infrastructure funding as various grants, loans and subsidies from State and Commonwealth Governments.

This includes total funding from the Northern Australia Infrastructure Fund (NAIF) of $255 million\(^\text{11}\) and a further $255 million from the WA State Government.\(^\text{12}\)

The funds are allocated as follows:

- $364 million to the Dampier Port to construct a new cargo wharf to accommodate Perdaman urea exports.
- $140 million to the Water Corporation for the Burrup Seawater Supply Scheme upgrade to supply the project with desalinated seawater\(^\text{13}\)
- $25 million from Main Roads WA for works on Burrup Road to accommodate the Perdaman project.


Current approvals (March 2023)
The Perdaman facility has been granted primary environmental approvals by the WA Minister for the Environment (under the WA Environmental Protection Act) and the Commonwealth Minister for the Environment (under the Environment Protection and Biodiversity Conservation Act).

The facility also has approval for impact on a number of Aboriginal Heritage sites under Section 18 of the Aboriginal Heritage Act (WA). Controversially, this includes the relocation of several petroglyphs that are sacred to traditional owners and which were the subject of an unsuccessful application to Minister Plibersek to protect.

The project still requires additional Works Approvals and operational licenses from the Department of Water and Environmental Regulation (DWER).

Perdaman announced its Final Investment Decision on April 26, 2023, and the construction of the facility commenced the same day.

Works Approval for rock crushing and screening plant

Perdaman applied for a Works Approval for "preliminary works associated with crushing and screening, which could be described as site preparation works" in November 2021, which was granted by the DWER in July 2022.

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The DWER decision reports states that the purpose of this approval is:

*for the construction of a concrete batch plant and mobile crushing and screening plant to support construction of the urea plant.*

**Bulk earthworks associated with the urea plant will include the use of a mobile crushing and screening plant for processing rock excavated from the site. Processed rock material will be used as fill to level the site in preparation for construction of the urea plant and pavement materials for site roads.**

The mobile crushing and screening plant will be used at various locations within the prescribed premises boundary (shown in W6630/2021/1). The mobile crushing and screening plant will only operate at locations within the approved disturbance footprint – clearing boundary. Excavated material will be stockpiled up to 5m in height near the mobile crushing and screening plant. Information provided in the application indicates that concrete from the concrete batching plant will be used within the project development envelope, which approximately represents the premises boundary for the urea production facility once operational.

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Design and construction / installation requirements</th>
<th>Infrastructure location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crushing and screening</td>
<td>Metso Lokotrack LT125 Mobile Crushing Plant Transfer conveyors Kleemann MS19D Track Screen Komatsu WA600 loader Dust suppression sprays installed at material transfer locations on the Jaw Crusher, Cone Crushers (2), Triple Deck Screen and product stackers (3). Plant to be equipped with exhaust mufflers from the Original Equipment Manufacturer (OEM) or systems meeting or exceeding the OEM specifications Earthen bund around the premises boundary to prevent surface water run-off from the crushing and screening plant and associated processed material stockpiles being discharged from the premises.</td>
<td>Figures 2 and 3</td>
</tr>
</tbody>
</table>

**Relocation / removal of petroglyphs**

It is not known if the crushing and batching operations include impacts on the Aboriginal Heritage sites authorised under Section 18 of the AH Act, or will include the relocation of the petroglyphs.
It has been said that the MAC Circle of Elders must oversee the relocation of the petroglyphs. There does not appear to be any binding condition requiring this, however the approved Aboriginal Heritage Management Plan for the facility does require that the MAC Circle of Elders is consulted at key stages, and prior to ground-disturbing activities taking place.

Maps and locations
Note – GIS co-ordinates of the boundaries can be found in the DWER Works Approval.