



**RUNAWAY TRAIN:** The impact of WA's LNG industry on meeting our Paris targets and national efforts to tackle climate change

CCWA & Clean State Report: October 2019

Clean  
State



**The Conservation Council of WA is proud to present this report as the state's foremost non-profit, non-government conservation organization, representing almost 150,000 supporters and 105 member groups.**

CCWA has been an advocate for conservation and a sustainable Western Australia for more than 50 years, working directly with the government, media, industry, community groups, and political parties to promote a more sustainable WA and to protect our natural environment.

We acknowledge that we meet and work on the land of the Nyoongar people. We pay respect to their Elders – past, present, and future – and acknowledge the important role all Aboriginal and Torres Strait Islander people continue to play in advancing a more sustainable Western Australia.

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# Key Findings

This is the first time a report has investigated the full impact of greenhouse gas emissions from WA Liquefied Natural Gas (LNG). It investigates the domestic pollution generated here in WA from mining and export of LNG (scope 1 emissions), and found just two companies, Chevron and Woodside responsible for the overwhelming majority of runaway pollution that places our Paris commitments in jeopardy.

## 1. WA LNG pollution is breaching the Paris Agreement

LNG production in WA is the fastest growing pollution source in Australia and has been the primary driver of recent national emissions growth.

Australia's international commitment under the Paris Agreement requires pollution to be reduced by 26-28% from the 2005 baseline year. **But current and proposed LNG projects coming online since 2005 will add 41.6 million tonnes of pollution a year, equivalent to a 61% increase on WA's 2005 emissions baseline, and an 8% increase above Australia's 2005 baseline.**

## 2. Gas is WA's biggest polluter, dwarfing all other pollution sources

The rapid expansion in LNG production in Western Australia in combination with inadequate carbon pollution controls has had a dramatic impact on the state's total emissions: while all other states' emissions are falling, WA's have **risen by 23% since 2005.**

Emissions from current WA LNG facilities make up 36% of WA's total annual emissions. If the proposed Woodside Burrup Hub expansion is approved, opening up the Browse and Scarborough gas fields, emissions from WA's current and proposed LNG facilities will account for 47% of WA's annual emissions.

Carbon pollution from Chevron's Wheatstone and Gorgon projects is almost three times more than WA's Muja power station – WA's oldest and dirtiest coal fired power station.

Pollution from WA's five currently operating LNG facilities is so high that Chevron and Woodside are in the Top 10 list of Australia's highest emitters.

**Pollution from WA's current and proposed LNG facilities combined will be as high as the total annual emissions from countries including Ireland, Sweden, Hong Kong and New Zealand.**

## 3. Chevron and Woodside are responsible for most of this pollution and there are no effective controls on their operations

Current controls on carbon pollution from WA LNG projects were found to be completely inadequate. Where conditions have been imposed, they vary, and have either not been met or the license condition has been removed.

## 4. WA LNG pollution cancels out Australia's national efforts to reduce emissions

### Gas vs Emissions Reduction Fund (ERF)

Over the next twelve years, the total cumulative emissions from WA's five current LNG facilities (384Mt) will cancel out the entire amount of abatement expected to be delivered under the ERF (375Mt).

At a total cost of \$4.55 billion the ERF is effectively an Australian taxpayer-funded offset program for Chevron and Woodside's operations to 2031.

## Gas vs Renewable Energy Target (RET)

Annual carbon pollution from WA's current LNG projects cancels out the entire pollution savings from all of Australia's renewable energy every year.

The Renewable Energy Target (RET) of 20% by 2020 covers every solar panel, large solar farm and all wind power installed in Australia since 2001. It's been described as Australia's largest and most effective carbon abatement policy and is helping us avoid about 26 million tonnes of pollution each year.

Yet the level of pollution from WA LNG is 1.2 times the amount we are saving every year with renewable energy in Australia

### Gas vs Rooftop Solar PV

**Annual carbon pollution from WA's five LNG plants (32Mt) is almost five times greater than the savings made by every single solar panel across 2.1 million Australian rooftops every year.**

20% of Australian homes now have solar on their rooftops, with over 2.1 million solar PV systems installed nationwide. Australia's fleet of solar rooftops are generating about 8.5GWh of electricity which in turn avoids about 6.6 million tonnes of pollution. These savings are dwarfed by the annual emissions from WA LNG.

## 5. Offsetting LNG pollution in WA would create 4000 jobs

A study commissioned by CCWA investigated the abatement potential and economic benefit to WA of offsetting direct emissions generated by the LNG industry within the state.

**It found the potential for 80 million tonnes of emissions offsets per year here in WA. Offsetting 30 million tonnes per year – an amount just short of the total emissions from WA LNG – would create around 4,000 jobs.**

These new jobs would include tree plantings, large scale renewable energy, and rangeland regeneration and savannah burning activities, and would also have significant benefits to WA's natural environment.

## 6. There is no such thing as clean gas

This report looked at the seven most common myths about gas and found:

- Gas is still a fossil fuel and breaks the carbon budget.
- Elevated methane levels negate any 'advantage' over coal.
- A major international review of LNG infrastructure found that the threat to the climate from LNG is 'as large or larger than coal'.
- There is no evidence for Australian gas 'reducing emissions overseas' and the concept of burning more fossil fuels to reduce emissions is perverse
- New gas projects will only lock in another 40-60 years of carbon pollution and are highly risky projects that will risk billions of dollars into stranded assets
- Large-scale, low cost renewables can now displace both coal and gas, and
- Complying with the IPCC and Paris Agreement goals means reducing gas, not increasing it.

# Executive Summary

## A precedent study

This report presents the first thorough investigation of direct carbon emissions from Western Australia's Liquefied Natural Gas (LNG) industry, revealing alarming growth in pollution that is placing Australia's Paris Agreement targets in jeopardy and undermining Australia's national efforts on climate change.

## The scale of pollution

Chevron and Woodside are two of Australia's largest carbon polluters. Five currently operating WA LNG facilities are in the Top 10 list of WA's highest polluters and produce more than double the emissions of WA's three coal-fired power stations. Yet WA Government measures to control and regulate carbon pollution from LNG have been and remain totally ineffective at constraining pollution growth from the sector. Where conditions to control pollution have been imposed on some LNG projects, they are inconsistent, inadequate, unenforceable, and in some cases have been removed altogether.

This report found WA LNG pollution will account for 36% of WA's total emissions and 6% of national emissions at full production. If Woodside's proposed Burrup Hub expansion is approved and the Browse and Scarborough fields are exploited, the WA LNG sector will be responsible for almost half of Western Australia's total pollution (47%) and almost 8% of Australia's annual emissions.

This report also compared emissions from LNG production in WA to other major emissions sources. Factoring in further expansions proposed by Woodside, WA LNG emissions will be more than one quarter (28%) of that from Australia's existing fleet of coal fired power stations, and almost equivalent (96%) to the pollution from every single passenger vehicle in Australia. At full production, WA LNG pollution is comparable to the annual emissions of Ireland, Switzerland, New Zealand and Hong Kong.

## The impact on the Paris Agreement targets

A focus of this research has been investigating the impact of emissions from WA LNG projects on our ability to reach the Paris Agreement targets. Under the Paris Treaty, Australia has committed to reducing total national greenhouse gas emissions by 26-28% below its 2005 level by 2030. Immediate action to undertake rapid reductions is specified in the Paris Agreement and all signatory countries have been asked to outline their plans to achieve net zero emissions in 2050.

This report investigated WA LNG projects that have commenced operations since Australia's 2005 Paris baseline year and found current facilities together with proposed expansions will add 41.6Mt CO<sub>2</sub>-e pollution every year, which represents a 61% increase relative to WA's 2005 baseline and an 8% increase relative to Australia's 2005 baseline.

This growth in pollution from WA LNG operations since 2005 effectively adds 8% to Australia's current emissions reduction target, increasing it to 33-35% by 2030, forcing all other states and sectors of the economy to compensate for WA's runaway growth in LNG pollution.

This report also found the impact of WA LNG pollution on WA's 'carbon budget'. To achieve the modest target of 26-28% emissions decrease on 2005 levels by 2030, WA's total annual emissions will need to drop to 49Mt – however without any controls, emissions from current and proposed LNG facilities will be 41.6Mt – or 85% of this amount.

These significant increases in WA LNG pollution are found to be in breach of the Paris Agreement and actions necessary to keep global warming within the long-term global temperature goal.

## The impact on national efforts to reduce emissions

WA LNG emissions were also found to be fundamentally undermining Australia's national efforts to tackle carbon pollution. Specifically:

- Just 12 years' of WA LNG emissions will cancel out the entire abatement expected to be delivered by the \$4.5 billion Emissions Reductions Fund (ERF)
- Annual WA LNG pollution is 1.2 times greater than the annual carbon savings delivered by all installed renewable energy capacity under the Renewable Energy Target (RET)
- Annual WA LNG emissions are almost five times greater than the annual carbon savings delivered by Australia's 2.1 million solar rooftops.

## The danger of the 'clean gas' myth

The report also investigated commonly made claims about gas contributing to global efforts to tackle climate change, through claimed displacement of other dirtier fuels. Such claims were found to be misleading and dangerous. Considered across its entire lifecycle, elevated methane levels as well as emissions from gas production negate any 'advantage' over coal. Gas is a polluting fossil fuel that is competing with renewable energy in global efforts to phase out the use of coal.

A major international review of LNG infrastructure found that the threat to the climate from LNG is 'as large or larger than coal' and the IPCC has said that global gas use must decline, not increase in order to meet global climate targets. New gas projects will lock in another 40-60 years of carbon pollution and are at high risk of becoming stranded assets given that large-scale, low cost renewables and storage can now displace both coal and gas.

## The opportunity to control emissions from WA LNG

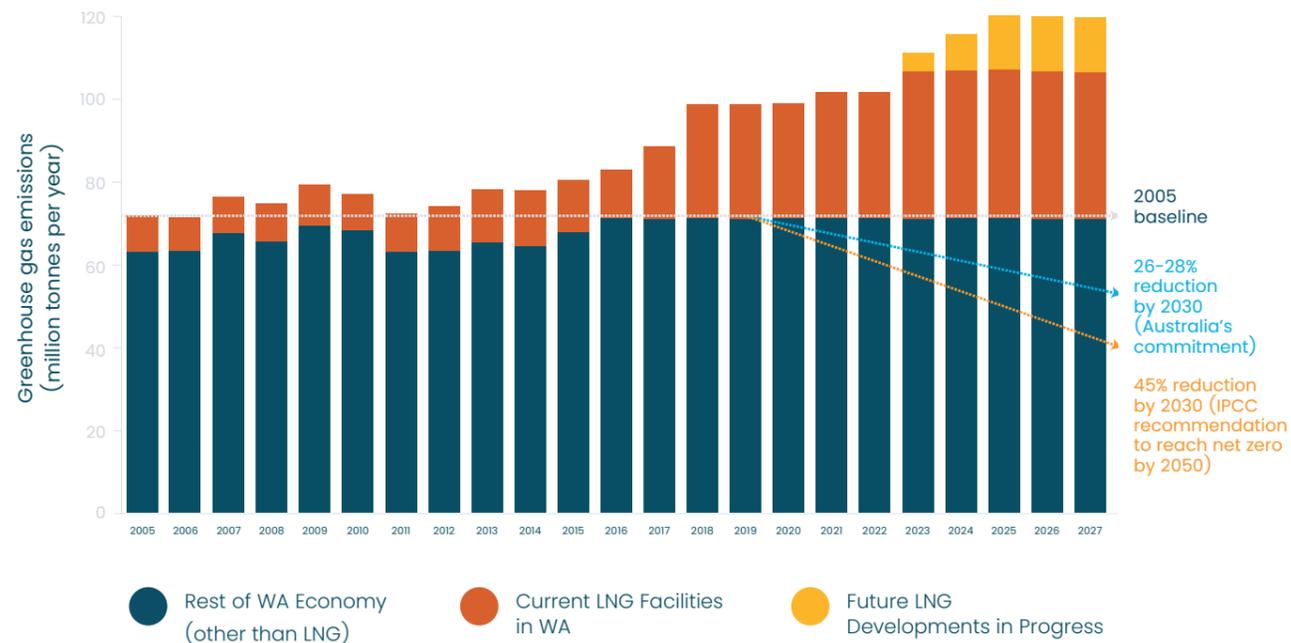
Despite the alarming size and scale of Western Australia's LNG pollution problem, solutions have been proposed that would prevent this pollution burden from being transferred to the Australian community and other businesses. For example, the WA Environmental Protection Authority has recommended that conditions be reinstated and strengthened to require that WA LNG companies offset emissions through investments in activities such as tree planting, carbon farming and renewable energy.

Previous analysis has identified the potential to deliver 80 million tonnes of emissions offsets per year here in Western Australia, and that offsetting current WA LNG emissions would create over 4,000 jobs in the state. These carbon pollution offset activities would not only deliver economic benefits to regional Western Australia, but could also provide significant benefits to WA's natural environment.

**The runaway emissions of WA's LNG industry have gone largely unnoticed in Australia's national debate on climate change, but they can no longer be ignored.**

This report strengthens the case for immediate action to update Western Australia's policy approach for assessing and controlling pollution by WA's LNG industry.

**Figure 1: Trajectory of emissions from WA LNG facilities from 2005, compared with the rest of the economy**



# 1. Introduction

## Background and scope of this report

**Liquefied Natural Gas (LNG) developments in Western Australia have been identified by the Australian Government as the fastest-growing carbon pollution source in Australia, and the primary driver of recent increases in Australia’s overall emissions. However, until now there has been no comprehensive analysis of how much carbon pollution will result from WA’s LNG sector, including the impacts of this pollution on state and national efforts to meet Australia’s targets under the Paris Agreement.**

Australia has recently overtaken Qatar as the world’s largest net exporter of LNG <sup>1</sup> with the greatest share produced by new facilities in the North West of WA.

This growth in production is occurring at a time when there is an increasing focus on LNG as a major threat to the global climate. The International Panel on Climate Change (IPCC) has said that near-term reductions in natural gas production will be required to meet international carbon pollution reduction goals. Other climate and energy analysts are calling for a moratorium on LNG development globally. A major international review of LNG infrastructure released in July 2019 found that the threat to the climate from LNG is ‘as large or larger than coal’.<sup>2</sup>

Emissions data for WA LNG projects has been notoriously difficult to find due to time lags in reporting and aggregation of data, making it difficult to assess the true impact of greenhouse gas emissions generated by WA LNG facilities.

## Data collected in this report

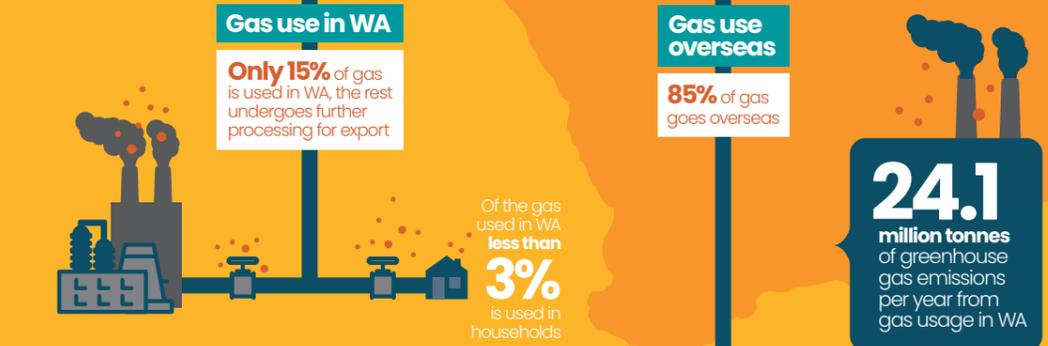
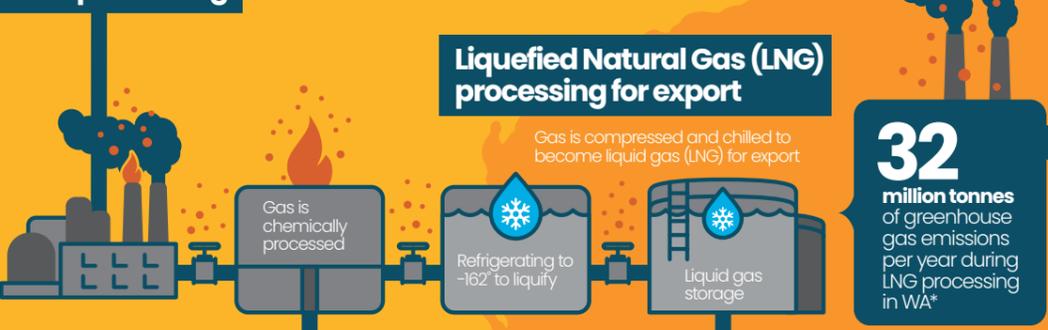
The data used in this report is direct emissions data sourced from the LNG industry itself. Figures are quoted from public documents released by LNG companies as part of the Environmental Impact Assessment from each of these projects. It is likely that these figures are significant underestimates of the true pollution from these facilities, as the gas industry consistently relies on highly conservative estimates of fugitive emissions (methane), which can have a very significant impact on overall pollution. No real-time monitoring data for fugitive emissions from WA LNG production is available.

# Gas mining and export is WA's biggest polluter, responsible for **193.2 million tonnes of climate pollution every year**

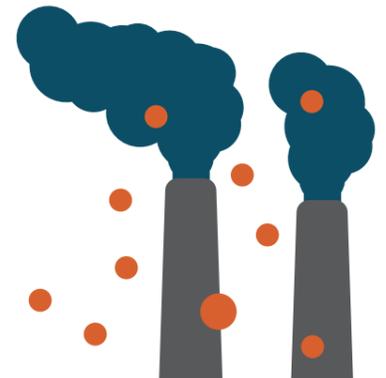
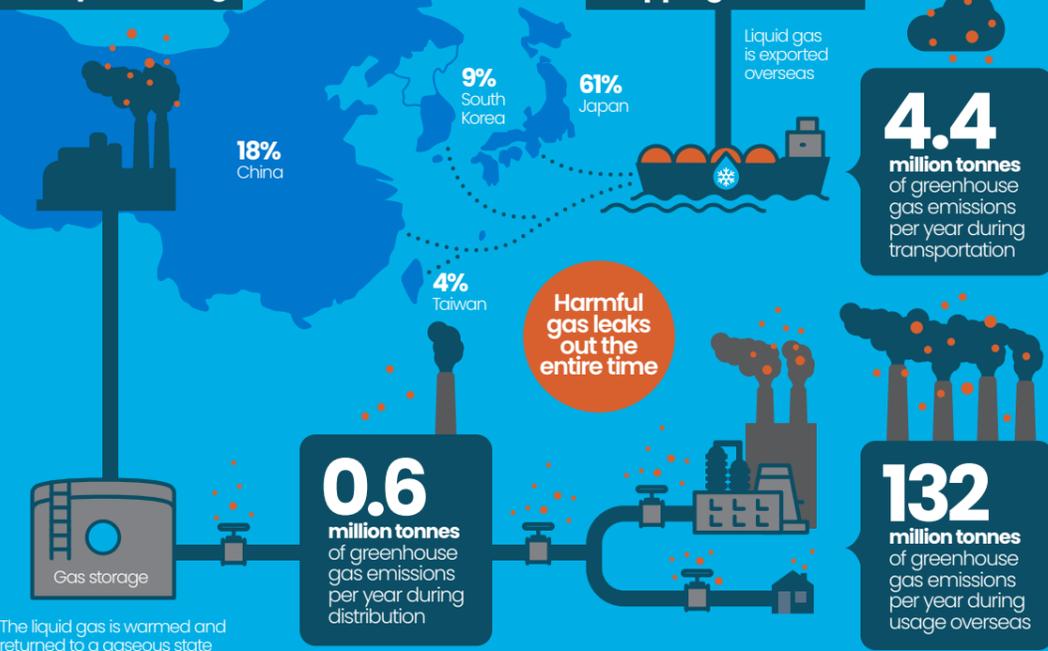
## Exploration and drilling



## Gas processing



## Gas processing



**32 million tonnes** of greenhouse gas emissions per year during LNG processing in WA\*

\* This figure is the direct emissions for five currently operating WA LNG facilities at full production and is the focus of this report.

## Sources of pollution in the LNG production process

In 2018 CCWA investigated the impact of the full life cycle emissions (direct + indirect) of the WA LNG industry and found gas mining and export responsible for 193.2 million tonnes of climate pollution every year.

The production of LNG is extremely energy intensive and is one of the most polluting forms of energy production. Both direct (scope 1) and indirect (scope 3) carbon pollution results from the LNG production process.

Direct carbon pollution results from almost every stage in the in the LNG production system, including:

- energy used to process the gas;
- venting large volumes of 'reservoir gas' or CO2 occurring naturally in the gas reservoirs;
- fugitive methane emissions at all stages in production;
- flaring; and
- energy used to extract and pump the gas to processing facilities.

Indirect carbon pollution resulting from transporting and burning the LNG overseas is much greater than the direct pollution.

**For the purposes of this study indirect emissions have not been included as they are not accounted for in Australia and are not included in the Paris targets. However, the impact of the full lifecycle emissions of WA's LNG industry on global emissions will be the subject of future investigation by CCWA.**

This study also examines, for the first time, the impact of the proposed expansion to the Burrup Hub. The Burrup Hub and its cumulative impact on emissions is the subject of a separate Clean State/CCWA briefing paper.

## 2. Overview of WA's LNG industry

In recent years, Western Australia has been at the epicenter of a dramatic expansion in Liquefied Natural Gas (LNG) production capacity. Over half of this production capacity has come online in just the last three years.

Of the ten currently operating LNG facilities in Australia, five very large plants are located off Western Australia's North West coast (Figure 2) and account for 56% of the

total Australian LNG capacity. Three LNG facilities are located onshore on the Pilbara coast, one on Barrow Island, and one is a floating facility (the largest floating LNG plant in the world). Further expansion is proposed with the development of the Browse Basin and Scarborough gas fields as part of Woodside's Burrup Hub expansion.

Figure 2: Australian LNG Projects and annual capacity - current and proposed



### WA's LNG industry – current and proposed facilities

A summary of currently operating and proposed LNG plants, their capacity and GHG emissions are shown in the table below. **Note full references have been provided in a more detailed version of this table at the Appendix.**

Table 1: Currently operating and proposed LNG facilities in WA

	Project	Operator	Start	End date	Production capacity (Mt)	GHG emissions per year (MtCO <sub>2</sub> -e)
<b>Current</b>	North West Shelf	Woodside joint venture (JV) inc. BHP, BP, Chevron, Japan Australia LNG, Shell	1989	Mid 2020s	16.9	7.6
	Pluto	Woodside JV inc. Kansai Electric, Tokyo Gas	2012	40 years	4.9	2
	Gorgon	Chevron JV inc. ExxonMobil, Shell, Osaka Gas, Tokyo Gas, JERA	2016	50 years	15.6	9.74*
	Wheatstone	Chevron JV inc. KUFPEC, Woodside, Kyushu Electric, JERA	2018	30 years	8.9	10
	Prelude	Shell JV inc. Inpex, CPC, KOGAS	2018	25 years	3.6	2.3-2.7
	<b>Proposed Burrup Hub expansion*</b>	Browse Basin	Woodside JV inc. Shell, BP, Japan Australia LNG, PetroChina)	2026	2070	16.9
Scarborough		Woodside/BHP	2023	2055	12	2.6

\* Chevron announced commencement of its geosequestration project on 8th August 2019 with the target to capture 80% of its reservoir gas, bringing emissions down to 5.1-6Mt with CCS. Given the technology is unproven and the condition is not enforceable – and considering the time it will take to sequester a significant amount of carbon pollution – we have not included the claimed emission reduction as part of this report.

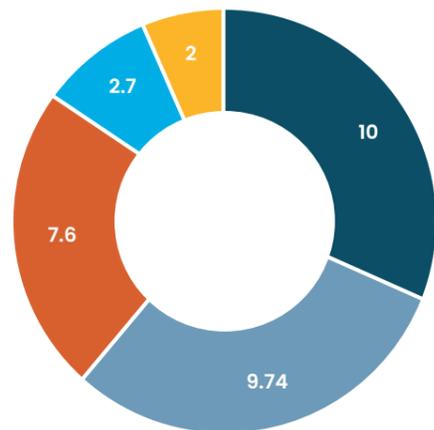
# The Burrup Hub and proposed expansion is the subject of a separate Clean State/CCWA briefing paper.

## WA LNG project size

The charts below show how the projects compare to each other in terms of their total emissions. They show:

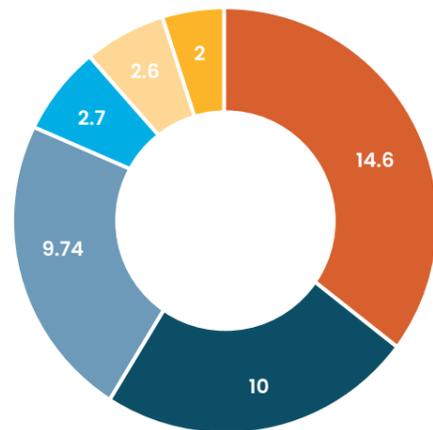
- For current projects, Chevron's Gorgon and Wheatstone projects account for more than half of all WA LNG emissions.
- For all projects (proposed and combined), Woodside's Burrup Hub complex will dwarf all others and be one of the most emissions intensive projects in Australia.

**Figure 3:**  
Current WA LNG



- Wheatstone Chevron
- Gorgon Chevron
- North West Shelf Woodside
- Pluto Woodside
- Prelude Shell

**Figure 4:**  
Current and Proposed WA LNG



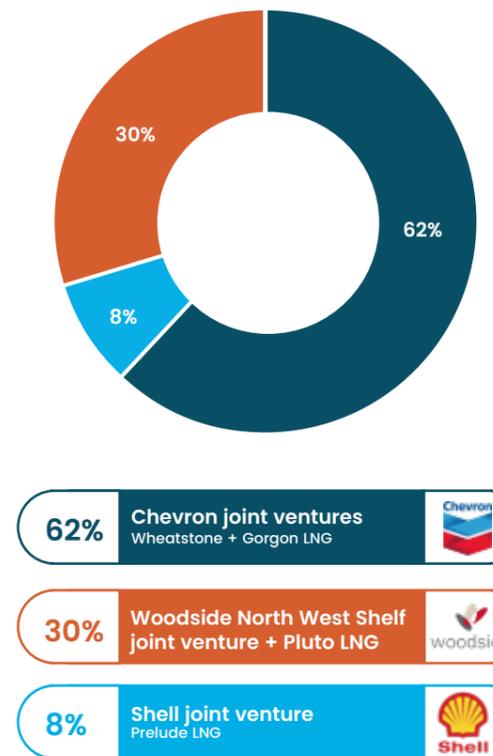
- Wheatstone Chevron
- Gorgon Chevron
- Browse (including North West Shelf) Woodside
- Pluto (including Pluto expansion) Woodside
- Scarborough Woodside
- Prelude Shell

## Emissions by operator

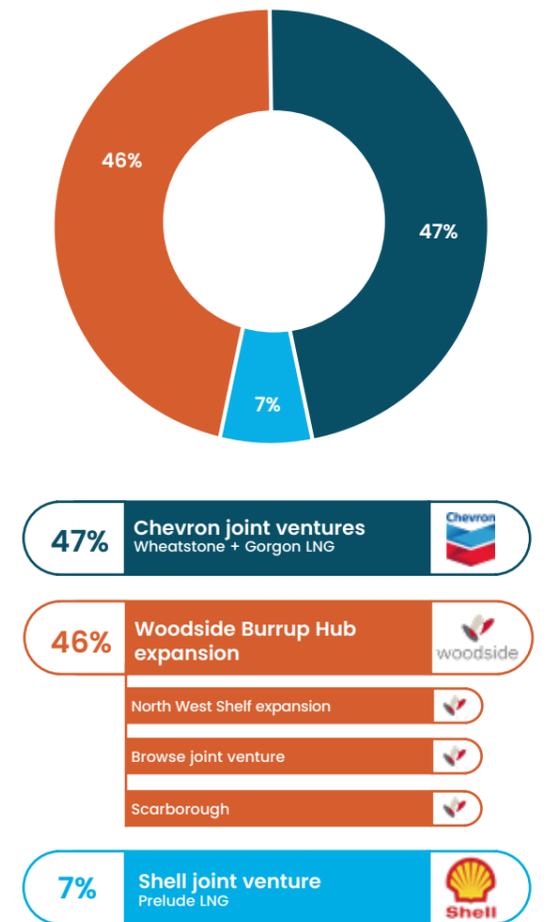
The following charts show the proportion of emissions generated by different operators. It shows Chevron is by far the biggest polluter, accounting for more than 60% of all LNG pollution in WA.

If the proposed Browse Burrup Hub expansion is allowed, Woodside will account for 46% of all WA LNG pollution in WA.

**Figure 5:** Share of current WA LNG emissions by operator.



**Figure 6:** Share of current and proposed WA LNG emissions by operator.



## Australia’s biggest polluters

Chevron and Woodside are in the Top 10 list of Australia’s highest emitters<sup>3</sup>, and are the only entities in that list that aren’t from the electricity sector (Table 2). Just ten companies are responsible for over half of Australia’s direct greenhouse gas emissions. And just two companies – Chevron and Woodside – are responsible for 14% of Australia’s scope 1 emissions (and growing).

**Table 2: Australia’s 10 highest greenhouse gas emitters scope 1**

(Source: Clean Energy Regulator 2019)

AGL Energy	43.1 million tonnes
Energy Australia Holdings	21.7 million tonnes
Stanwell Corporation	17.4 million tonnes
Origin Energy Ltd	17.2 million tonnes
CS Energy Ltd	14.7 million tonnes
Chevron Australia	12.0 million tonnes
Pioneer Sail Holdings	11.3 million tonnes
OzGen Holdings Australia	11.0 million tonnes
Woodside Petroleum Ltd	10 million tonnes
NRG Victoria Pty Ltd	8.5 million tonnes
	<b>152.2 million tonnes (50.2% scope 1 emissions reported)</b>

## Western Australia’s biggest polluters

All five currently operating WA LNG facilities are in the Top 10 list of WA’s highest emitters (Table 3). In fact they’re in the first, second, third, seventh and eighth position. **The table shows 70% of pollution from WA’s 10 biggest emitters is from LNG.**

**Emissions from Chevron’s Wheatstone and Gorgon projects are three times larger than WA’s biggest coal fired power station (Figure 7–9).**

**Table 3: WA’s 10 highest carbon polluters**

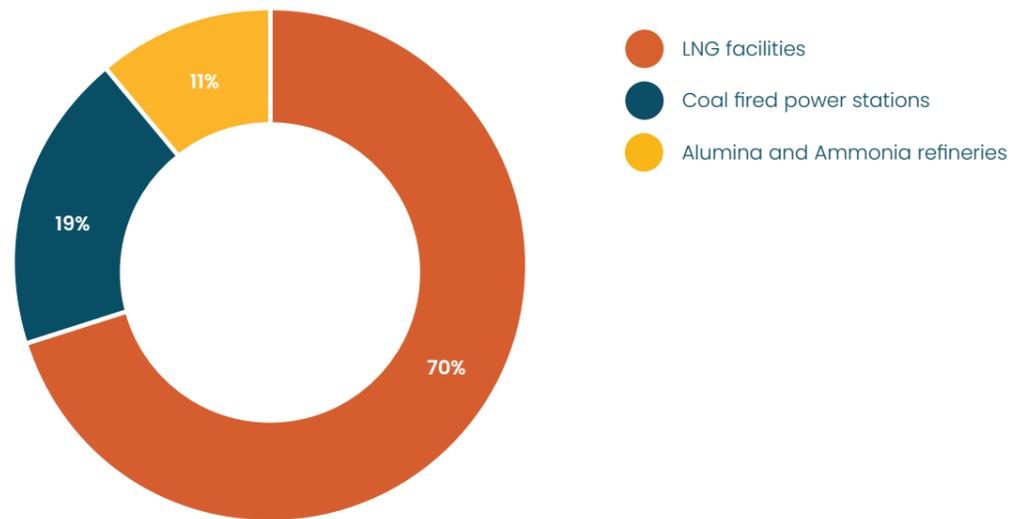
Facility name	Operator	Emissions*
Wheatstone Operations	Chevron	10 million tonnes
Gorgon Operations	Chevron	9.74 million tonnes
North West Shelf Project	Woodside	7.65 million tonnes
Muja Power Station (black coal)	Synergy	3.98 million tonnes
Worsley Alumina Refinery/mine	South32	3.58 million tonnes
Bluewaters Power 1&2 (black coal)	Synergy	2.96 million tonnes
Prelude LNG	Shell	2.7 million tonnes
Pluto LNG	Woodside Burrup	1.93 million tonnes
Collie Power station (black coal)	Synergy	1.85 million tonnes
YPF Ammonia Plant	Yara Pilbara Fertilizers	1.51 million tonnes
		<b>Total: 45.9 million tonnes</b>
		<b>Total LNG: 32 million tonnes (70% of total)</b>

Source: Emissions for all non-LNG facilities were for 2017-18 from the Clean Energy Regulator (May 2019) and CCWA data<sup>4</sup>. Emissions for all LNG facilities use emissions anticipated at full production.

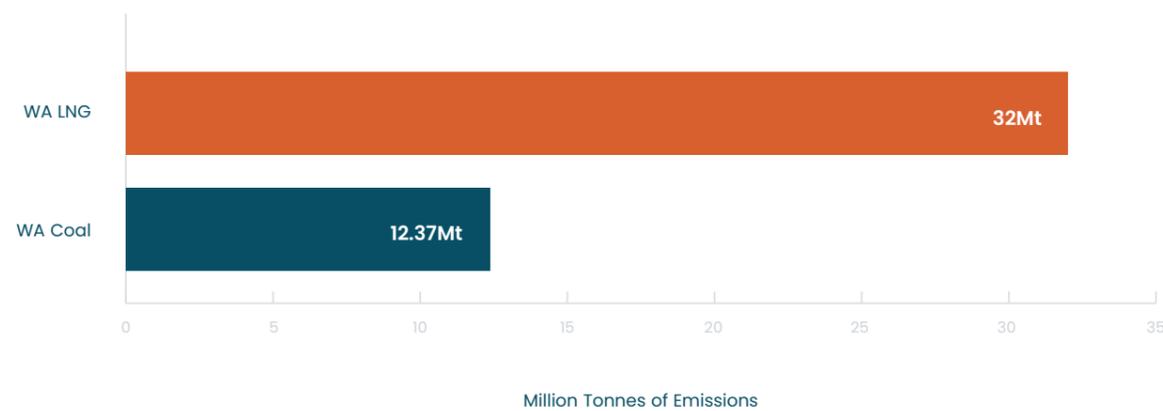
## Key finding

**Just two companies – Chevron and Woodside – are responsible for 14% of Australia’s scope 1 emissions (and growing).**

**Figure 7: Share of pollution from WA's 10 biggest emitters**



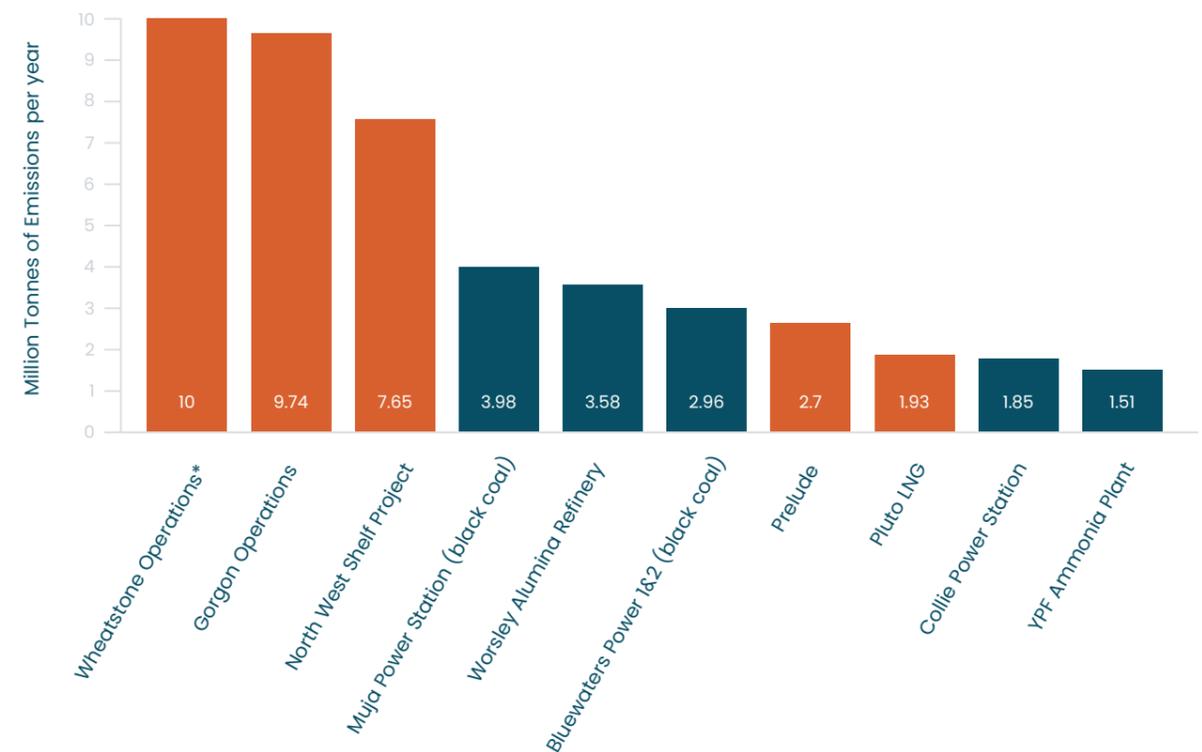
**Figure 8: Comparison of pollution from coal and LNG in WA**



Emissions from five operating WA LNG facilities produces 32Mt per annum, compared with emissions from WA coal fired power stations and the Alumina refinery of 12.37Mt. (Figure 9)

**This means WA LNG produces 2.5 times the pollution from burning black coal in WA.**

**Figure 9: Western Australia's ten biggest CO<sub>2</sub> emitters**



Source: Emissions for all non-LNG facilities were for 2017-18 from the Clean Energy Regulator (May 2019) and CCWA figures. Emissions for all LNG facilities use emissions anticipated at full production.

### 3. Current regulation and control of greenhouse gas emissions from WA LNG

With the exception of the Shell Prelude floating LNG facility (which is located in Australian Commonwealth waters), carbon pollution and other emissions from WA LNG projects are regulated by the West Australian Government under the Environmental Protection Act. State conditions are variable, usually requiring some

level of offsetting of emissions, **however in most cases these conditions have either been removed or have not been implemented.**

Table 4 provides a summary of conditions regulating greenhouse gas emissions for current and proposed WA LNG facilities.

**Table 4: Greenhouse gas conditions for current and proposed WA LNG facilities**

Project	Operator	Start	Carbon pollution controls or offset conditions
<b>North West Shelf</b>	Woodside /NWS Joint venture	1989	<b>No controls on pollution.</b> No offsets are required, however the 1989 State approval required ‘best available technologies’ at the time. These conditions are currently under review by the WA EPA as part of the Browse / Burrup Hub proposal which would significantly extend the operating life of this facility.
<b>Pluto</b>	Woodside	2012	<b>Conditions to partially offset pollution however compliance in doubt.</b> Conditions required ‘reservoir gas’(0.24Mtpa) <sup>5</sup> to be offset. Compliance with conditions is unclear due to questionable additionality of offsets and lack of surrendering or retirement of offset certificates, and a lack of enforcement to date.
<b>Gorgon</b>	Chevron	2016	<b>Conditions not complied with or enforced (currently under review).</b> State government approval conditions require 80% of ‘reservoir gas’ emissions (3.4-4 million tonnes each year) <sup>6</sup> from the Gorgon facility to be captured and pumped underground (geosequestration or CCS) delivering a 40% reduction in the project’s total emissions. Chevron received \$60m in federal funding for the geosequestration project. It announced geosequestration had begun on August 8th 2019, more than two years after production commenced. Delays were due to ‘ongoing technical problems’ <sup>7</sup> and Chevron has also been accused of deliberately mismanaging the geosequestration project. <sup>8</sup> No penalties were imposed by the WA government for emissions not sequestered over this period, and alternative offsets were not provided by Chevron despite state conditions requiring them in the event the geosequestration is not successful. A review is currently underway by the WA Environmental Protection Authority to examine and clarify the intended start-date for the geosequestration condition at the request of the WA Minister for the Environment. There is no federal requirement for sequestration and under the Commonwealth Safeguard Mechanism Chevron has set itself an emissions limit of 8.3MtCO <sub>2</sub> -e per year – which assumes CCS does not operate successfully. <sup>9</sup>

<b>Wheatstone</b>	Chevron	2018	<b>Conditions removed (currently under review).</b> Project was originally approved with conditions to offset reservoir emissions (2.6Mtpa) as a minimum. These conditions were removed <sup>10</sup> when a national price on carbon was introduced and have not been reinstated. The conditions are currently under review by the WA Environmental Protection Authority at the request of the WA Minister for the Environment.
<b>Prelude</b>	Shell	2018	<b>Conditions not implemented.</b> The Shell Prelude facility is regulated by the Commonwealth Government as it is located in Commonwealth waters. Original recommendation by the Commonwealth Department of Environment in 2009 was to offset 100% emissions from the facility. <sup>11</sup> It is unclear what level of emissions reduction is required for this facility, if any.
<b>Browse Basin</b>	Woodside led JBV	2026	<b>Currently under assessment.</b> No GHG controls have been proposed by Woodside. The Browse Basin project is currently under assessment by State and Commonwealth Governments. If it goes ahead the project will extend the life of the existing North West Shelf LNG facility for at least 25 years <sup>12</sup> and add a further 7MtCO <sub>2</sub> -e just through venting CO <sub>2</sub> and pumping the feed gas, making Browse the most pollution intensive gas development in Australia. The final investment decision is expected in late 2020. <sup>13</sup>
<b>Scarborough</b>	Woodside /BHP	2023-30	<b>Currently under assessment. No GHG controls have been proposed by Woodside.</b> The final investment decision is due in 2020 and Woodside is targeting for development to be completed in 2023. <sup>14</sup>

**It is clear from the above summary that the current controls on WA LNG projects are completely inadequate in controlling carbon pollution from these projects.** Where conditions have been imposed, they vary. Conditions have either not been met or have been removed. The failure of current pollution controls on WA LNG can be put down to several factors, including:

- Inadequate and weak conditions (all projects)
- Non-compliance with conditions and lack of enforcement (Chevron Gorgon)
- Questionable provision of offsets (Woodside Pluto)
- Removal of conditions (Chevron Wheatstone)
- Government failure to implement recommended conditions (Shell Prelude)

While some conditions are being reviewed, it’s startling to find these major polluters are operating without any controls in place at all.

The WA EPA is currently reviewing its assessment guidelines on how it will consider greenhouse gas emissions in its future assessments of developments in WA.

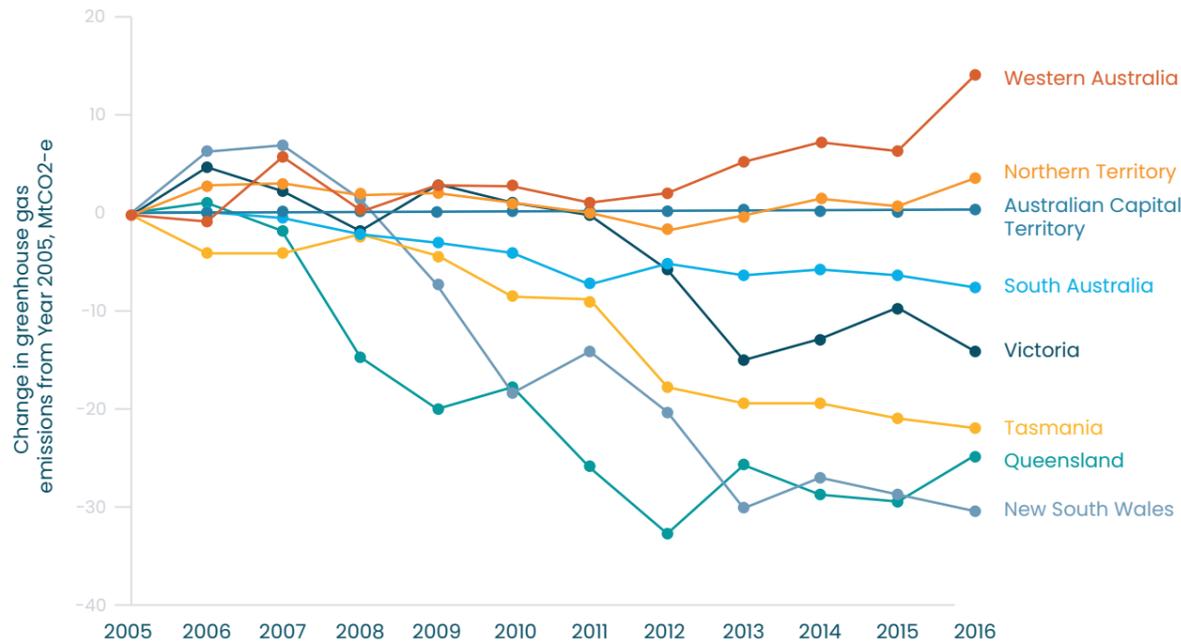
# 4. Impact of WA LNG on Western Australian emissions

The rapid expansion in LNG production in Western Australia has had a dramatic impact on the state's total annual emissions (Figure 10). WA is the only state in Australia with emissions that have been rising since 2005, and this can be directly attributed to the LNG industry.

WA's emissions have risen significantly since 2005. The only states with recently rising emissions are those in which major LNG projects are operating: Queensland (Gladstone LNG), the NT (Inpex LNG) and WA. All rises in emissions are due to LNG production and development.

The impact of Western Australia's LNG industry on the state's annual greenhouse gas emissions is discussed below (Table 5).

Figure 10: States and Territories greenhouse gas emissions trends, 2005–2016



Source: Government of Western Australia presentation April 18, 2019

Table 5: Current LNG facilities compared with Western Australia's annual emissions

Project	Operator	Start	LNG Production capacity (Mt)	GHG emissions (MtCO <sub>2</sub> -e)	GHG as % WA emissions
North West Shelf	Woodside/NWS Joint venture	1989	16.9	7.6	9%
Pluto	Woodside	2012	4.9	2	2%
Gorgon	Chevron	2016	15.6	9.74	11%
Wheatstone	Chevron	2018	8.9	10	11%
Prelude	Shell	2018	3.6	2.3-2.7	3%
			<b>49.9</b>	<b>32</b>	<b>36%</b>

GHG emissions from five currently operating WA LNG facilities amount to 32MtCO<sub>2</sub>-e at full production. WA's GHG emissions in 2017 were 88.5Mt. **The total annual GHG emissions from the five LNG plants are equivalent to over one third (36%) of WA's total annual GHG emissions.**

**This means more than one third of WA's total pollution comes from just two companies.**

**Table 6: Proposed Woodside Burrup Hub Expansion compared with Western Australia’s annual emissions**

Project	Operator	Start	LNG Production capacity (Mt)	GHG emissions (MtCO <sub>2</sub> -e)	GHG as % WA emissions (88.5MtCO <sub>2</sub> -e)
Browse Basin + NWS	Woodside led JBV	2026	10	14.6	16.5%
Scarborough + Pluto expansion	Woodside/BHP	2023-30	12	2.6	3%
			<b>22</b>	<b>17.2</b>	<b>19.5%</b>

Emissions from two proposed LNG expansions currently being assessed (Woodside’s Browse and Scarborough fields) will emit 17.2 million tonnes of GHG per year.

Compared with WA’s current emissions of 88.5Mt, the total emissions from exploiting these two new fields will be equivalent to almost 20% of WA’s total emissions.

**Table 7: All emissions – current and proposed WA LNG facilities compared with WA’s annual emissions**

	Total
LNG Production capacity (Mt)	64.9
GHG emissions (MtCO <sub>2</sub> -e)	41.6
<b>GHG as % WA emissions (88.5MtCO<sub>2</sub>-e)</b>	<b>47%</b>

When combined, all current and proposed WA LNG projects would emit 41.6MtCO<sub>2</sub>-e per year, equivalent to more than half (47%) of WA’s total annual GHG emissions.

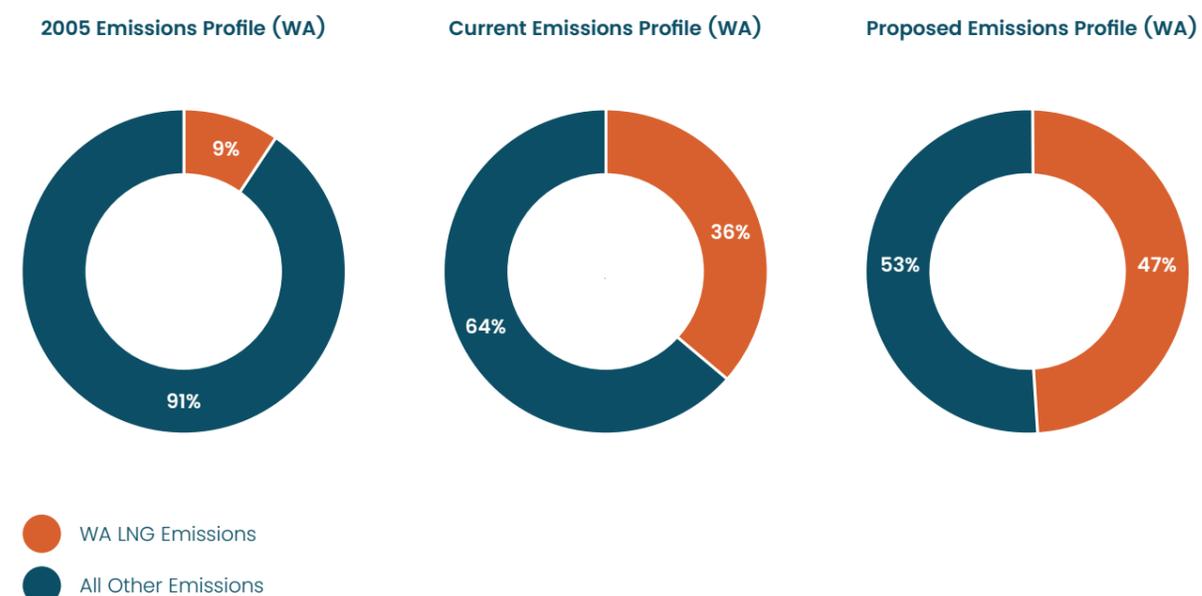
If the proposed Burrup Hub expansion is allowed to proceed, LNG production will contribute to almost half of WA’s total annual emissions.

### A growing proportion of WA’s emissions over time

Over time, emissions from LNG have dramatically increased as a proportion of WA’s total greenhouse gas pollution. In 2005, emissions from one LNG plant (North West Shelf) was 7.6Mt and equivalent to about 9% of WA’s total emissions profile. By 2019, emissions from five operating plants was 32Mt at full production and equivalent to over one third of our total emissions (36%), as shown in the charts below.

If Woodside’s proposed Burrup Hub expansion goes ahead, LNG pollution will amount to 41.6Mt, equivalent to almost half of WA’s total emissions (47%). This means just two companies, Woodside and Chevron, along with their joint venture partners, will be responsible for almost half of WA’s total emissions.

**Figure 11: Proportion of WA’s total annual emissions from LNG mining and export**



## 5. Impact of WA LNG on Australian emissions

The rapid expansion in LNG production in Western Australia is the most significant industrial driver of carbon pollution increases in Australia. This was acknowledged by Australia's former Environment Minister, Melissa Price, in 2018:

**'The...increase in emissions was largely driven by the LNG production for export, which the volumes increased by some 25.4 per cent.'** – Melissa Price, 9 October 2018<sup>16</sup>

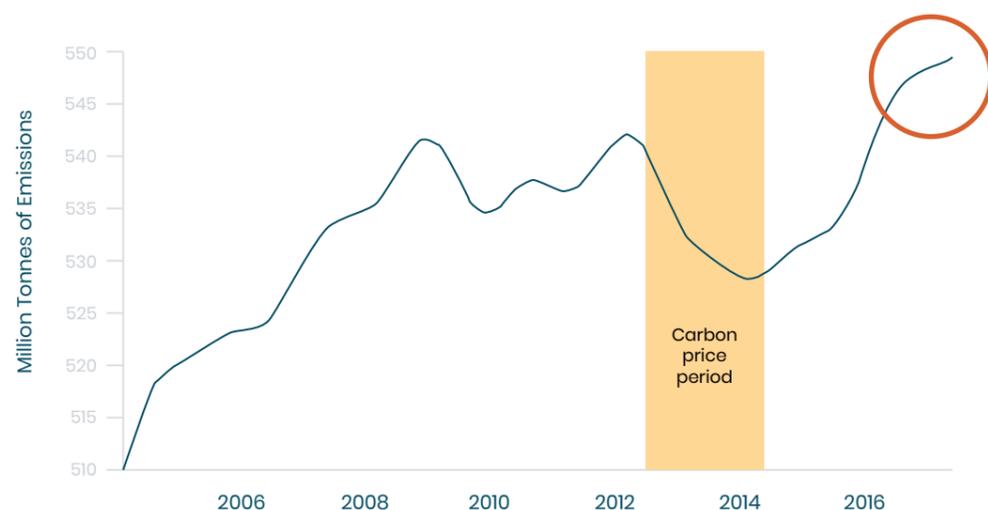
The role of LNG production was also described in the Quarterly Update of Australia's National Greenhouse Gas Inventory for March 2019, the Department of Environment and Energy states:

**'Emissions for the year to March 2019 are estimated to be 538.9Mt CO<sub>2</sub>-e, up 0.6 per cent or 3.1Mt CO<sub>2</sub>-e, on the previous year, primarily due to increased LNG exports.'**

The March 2019 figures also show Australia's fugitive emissions have increased by 60% since 2004 and now account for 11.1% of Australia's total emissions by sector.

The Western Australian LNG industry (WA LNG) is responsible for most of the increase in exports and pollution. The impact of the WA LNG industry on Australia's annual emissions is shown in the table below.

**Figure 12: Total annual greenhouse gas emissions**  
Excluding land use, land use change and forestry



Source: Table adapted from Greg Jericho, 9 January 2019<sup>17</sup>

The impact of WA's LNG industry on Australia's annual greenhouse gas emissions is discussed below.

**Table 8: Current WA LNG emissions compared with Australia's total emissions**

Project	Operator	Start	LNG Production capacity (Mt)	GHG emissions (MtCO <sub>2</sub> -e)	GHG as % Australian emissions (538MtCO <sub>2</sub> -e)
North West Shelf	Woodside/NWS joint venture	1989	16.9	7.6	1.4%
Pluto	Woodside	2012	4.9	2	0.4%
Gorgon	Chevron	2016	15.6	9.74	2%
Wheatstone	Chevron	2018	8.9	10	2%
Prelude	Shell	2018	3.6	2.3-2.7	0.5%
			<b>49.9</b>	<b>32</b>	<b>6.3%</b>

Total GHG emissions from five currently operating LNG facilities amount to 32MtCO<sub>2</sub>-e at full production. Australia's GHG emissions in 2017 were 538Mt. Current production therefore accounts for over 6% (6.3%) of Australia's total annual emissions.

**Table 9: Proposed Woodside Burrup Hub expansion emissions compared with Australia's total emissions**

Project	Operator	Start	LNG Production capacity (Mt)	GHG emissions (MtCO <sub>2</sub> -e)	GHG as % Australian emissions (538MtCO <sub>2</sub> -e)
Browse Basin + NWS	Woodside NWS joint venture and Browse joint venture	2026	16.9	14.6*	2.7%
Scarborough + Pluto expansion	Woodside/BHP	2023-30	12	2.6	0.5%
			<b>28.69</b>	<b>17.2</b>	<b>3.2%</b>

\*Includes emissions from existing NWS facility which will be used to process gas from the Browse field

Emissions from Woodside's proposed Burrup Hub expansion (exploiting the Browse and Scarborough fields) will emit 17.2 million tonnes of GHG per year, which would be equivalent to 3.2% of Australia's annual emissions.

**Table 10: All emissions – current and proposed WA LNG facilities compared with Australia’s total emissions**

	Total
LNG Production capacity (Mt)	58.9
GHG emissions (MtCO <sub>2</sub> -e)	41.6
<b>GHG as % Australian emissions (88.5MtCO<sub>2</sub>-e)</b>	<b>7.7%</b>

When combined, all current and proposed WA LNG projects would emit 41.6MtCO<sub>2</sub>-e per year, equivalent to almost 8% (7.7%) of Australia’s annual GHG emissions.

It’s important to note these figures are only for direct emissions, that is, pollution generated by extracting and processing for export (scope 1 emissions). When full lifecycle emissions are added (scope 2 and 3), including the pollution generated by shipping the gas overseas (4.4MtCO<sub>2</sub>-e), storage and distribution (0.6MtCO<sub>2</sub>-e) and eventual combustion (132MtCO<sub>2</sub>-e) WA’s LNG industry is responsible for about 193 million tonnes of pollution every year.<sup>18</sup>

Key finding

**When combined, all current and proposed WA LNG projects would emit 41.6MtCO<sub>2</sub>-e per year, equivalent to almost 8% (7.7%) of Australia’s annual GHG emissions.**

## 6. Comparison with other major emitters

This report compares the emissions from WA LNG to other major emitters and sectors of the economy in Australia.

### Electricity

**Total GHG emissions from current LNG facilities (32Mt) are equivalent to about 17% of emissions from Australia’s entire electricity sector.** The electricity sector is the single largest source of greenhouse gas emissions in Australia (184Mt) and responsible for 33% of our total emissions (in the year to December 2017).

### Coal-fired power stations

The Clean Energy Regulator (CER) maintains a register of all electricity generators in Australia, including the amount of electricity and GHG emissions produced by each per year. Based on the most recent year (2016-17) the amount of GHG emissions produced from all of Australia’s coal-fired power stations was 151Mt. Emissions from five current LNG plants (32Mt) are equivalent to approximately 21% of the total annual emissions produced from Australia’s coal-fired power stations. **Emissions from current and proposed LNG facilities combined (41.6Mt) would be equivalent to 28% of all coal-fired power stations.**

### Transport

**Emissions from all current and proposed LNG plants is equivalent to almost half (41.6%) of the total emissions from Australia’s entire Transport sector.** Transport is Australia’s second largest source of greenhouse gas emissions, emitting 100Mt per year and responsible for 18% of Australia’s emissions in the year to December 2017.<sup>19</sup>

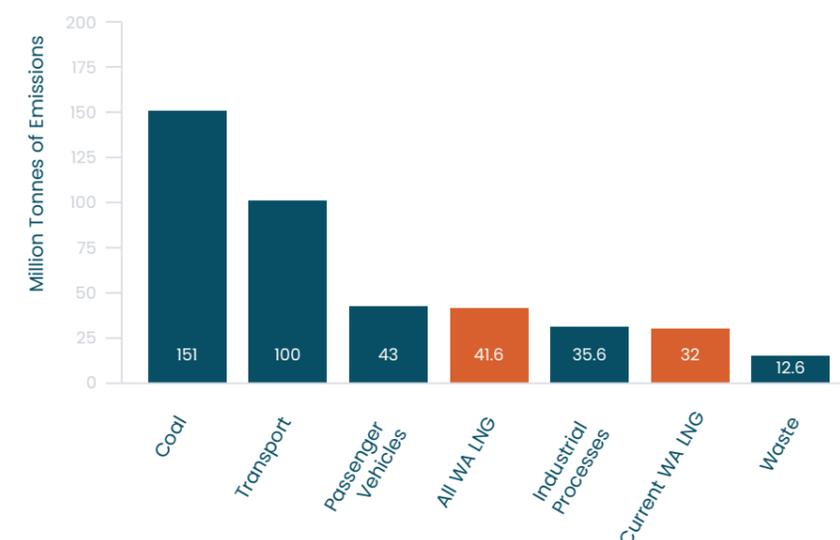
### Passenger vehicles

According to the ABS, passenger vehicles in Australia in 2015-16 travelled a total of 175,899 million km and used 18,606 ML of fuel, equivalent to about 43Mt CO<sub>2</sub>-e.<sup>20</sup> Emissions from the five LNG plants (32Mt) is equivalent to almost three quarters (74%) of the total annual emissions from every single passenger vehicle driven in Australia driven over a year. **Emissions from all current and proposed LNG facilities would be equivalent to 96% of Australia’s entire passenger vehicle emissions over a year.**

### Waste

If approved, GHG emissions from Woodside’s Browse project (14.6MtCO<sub>2</sub>-e) will be significantly larger than Australia’s entire waste sector (12.6Mt), which is the seventh largest source of greenhouse gas emissions in Australia and responsible for 2% of Australia’s emissions.<sup>21</sup>

**Figure 13: WA LNG pollution compared with major emitters in Australia**



## 7. Comparison with other countries' emissions

Using figures from the Global Carbon Atlas<sup>22</sup> we compared the annual pollution from WA's currently operating LNG facilities (32Mt) to the total annual emissions of other countries. We found:

Emissions from current WA LNG facilities (32MtCO<sub>2</sub>e) are almost as high as the annual emissions of countries including Denmark (36Mt) and New Zealand (36Mt).

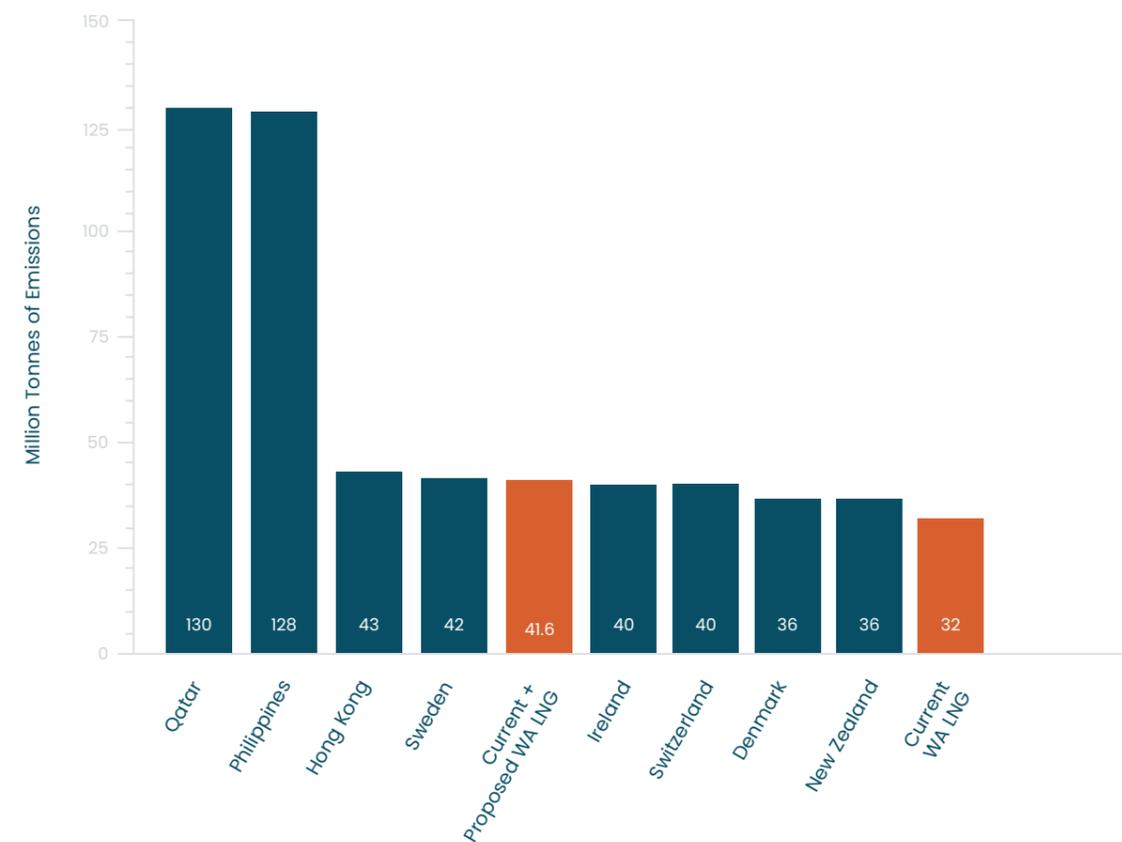
Emissions from current and proposed LNG facilities combined (41.6MtCO<sub>2</sub>-e) will be:

- Higher than the annual emissions of countries including Ireland (40Mt) and Switzerland (40Mt) and just under that of Sweden (42Mt) and Hong Kong (43Mt)

- One third of the annual emissions of Qatar (130Mt) and the Philippines (128Mt)

If approved, emissions from Woodside's Burrup Hub project (17.2Mt) will be significantly more than the annual emissions of Cambodia (7.9MtCO<sub>2</sub>-e), Zimbabwe (10MtCO<sub>2</sub>-e) and Afghanistan (13Mt).

Figure 14: WA LNG pollution compared with other countries



## 8. Our commitments under the Paris Agreement

### Australia's responsibility under the Paris Agreement

**Australia has committed to reducing total national greenhouse gas emissions by 26–28% below its 2005 level (532Mt) by 2030 under the Paris Treaty. This means our greenhouse gas emissions will need to be down to about 450 million tonnes a year by 2030 to meet the current target– or down to 333 million tonnes to meet the IPCC's target of 45 per cent reductions by 2030.<sup>23</sup>**

Article 4.1 of the Paris Agreement specifies that, in order to reach the temperature limit set under the Agreement, that countries should aim to reach a global peak emissions as soon as possible, undertake rapid reductions thereafter and reach zero emission sometime in the second half of the century in accordance with best available science.

The United Nations has asked all signatory countries to outline their plans to achieve net zero emissions by 2050 ahead of a climate action summit in New York in September 2019.<sup>24</sup>

Our emissions need to peak in 2020 and start falling rapidly soon after, and deep cuts across every sector will be needed in order to achieve the trajectory needed to reach net zero emissions by 2050.<sup>25</sup>

**Increasing emissions of the gas industry are in breach of the Paris Agreement and contradict the best available science on what is needed to meet the Paris Agreement long-term temperature goal.**

New research by Carbon Tracker shows how out of alignment the oil and gas industry is with the goals and aspirations of the Paris Agreement. It shows the oil and gas in projects that have already been approved will take the world past 1.5°C, assuming carbon capture and storage remains sub-scale. It also names the Gorgon stage 2 project as number three in the top 6 list of oil and gas projects globally that are non-compliant with the Paris Agreement.

### Western Australia's responsibility under the Paris Agreement

**The responsibility for meeting the Paris Agreement in Australia is a shared responsibility by the Australian government and the individual states.**

As Environmental law expert Dr Hugh Finn explains:

*The Paris Agreement imposes obligations on Australia – and while it's the executive (Commonwealth) that enters into treaties, the obligations of treaties rests in the states, so those obligations rest not only on the Commonwealth Government but on the states as well. The reality is with treaty obligations, states almost always legislate to implement those. Without state legislation or action those obligations would not be met.<sup>26</sup>*

According to Dr Finn, Australian states have an even stronger obligation under international treaties such as the Paris Agreement when action at the Commonwealth level is inadequate to deliver Australia's commitments:

*My view is that Commonwealth legislation will not achieve our treaty obligations. The reality is the states have to step into that vacuum and help us meet our Paris commitments.<sup>27</sup>*

This therefore affirms the legal position that Western Australia is responsible for taking action to meet the Paris Agreement. At the time of writing this report the WA government announced an 'aspiration to net zero', however the new policy also allows big polluters to set their own emissions targets. The key test will be whether emissions will be reduced in the near term, and whether projects will be approved that significantly increase emissions.

As outlined in Figure 11 on the next page, all states have net zero emissions reduction targets by 2050, in line with the Paris Agreement. Three Australian States have enshrined these targets in legislation.

Figure 15: Australian states and territories emissions targets



## 8.1 Impact of WA LNG emissions on WA's 2005 Paris baseline

Under the Paris Treaty, Australia has committed to reducing total national greenhouse gas emissions by 26-28% below 2005 levels. Yet the reality is that uncontrolled emissions from WA's LNG industry are increasing Australia's emissions and putting our ability to meet this target into jeopardy.

Emissions from current and proposed LNG projects (operating post 2005) have been investigated to determine their impact on Australia's Paris Agreement baseline and commitments.

Table 11: Impact of WA LNG on Western Australia's 2005 emissions baseline\*

	Project	Operator	Start	GHG emissions (MtCO <sub>2</sub> -e)	% increase relative to WA's 2005 Baseline
<b>Current</b>	Pluto	Woodside	2012	2	2%
	Gorgon	Chevron	2016	9.74	15%
	Wheatstone	Chevron	2018	10	15%
	Prelude	Shell	2018	2.3-2.7	4%
<b>Proposed Burrup Hub expansion</b>	Browse Basin	Woodside JV	2026	14.6	21%
	Scarborough	Woodside /BHP	2023-30	2.6	4%
<b>Total</b>				<b>41.6</b>	<b>61% increase</b>

\* To calculate the impact of Burrup Hub expansion facilities on the 2005 baseline we only counted emissions from projects commencing after 2005. Emissions from the North West Shelf project which came online in 1989 were therefore excluded.

**Our research shows:**

- Emissions from four current LNG projects (operating after 2005) are emitting 24.4MtCO<sub>2</sub>-e at full production, which represents a 36% increase on WA's 2005 emissions baseline
- Chevron's Gorgon and Wheatstone projects are the states single biggest polluters and emitting 19.74MtCO<sub>2</sub>-e at full production, which represents a 30% increase on WA's 2005 baseline
- Emissions from current and proposed projects combined will add 41.6MtCO<sub>2</sub>-e of pollution every year at full production, equivalent to a 61% increase relative to WA's 2005 emissions baseline

Key finding

**Emissions from all current and proposed projects will add 41.6 million tonnes of greenhouse gas pollution every year at full production, equivalent to a 61% increase on WA's 2005 emissions baseline.**

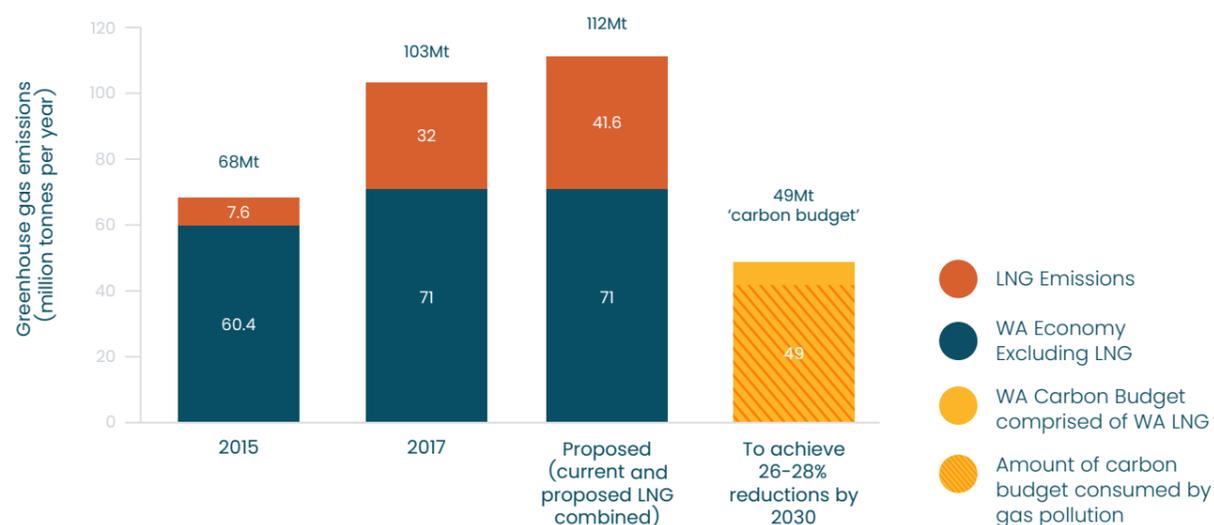
**WA's Carbon budget**

Another way to represent the impact of WA LNG emissions to WA is to look at the proportion of WA's 'carbon budget' that would be used by LNG emissions. **To achieve the modest target of a 26-28% decrease in emissions on 2005 levels by 2030, WA's annual emissions will need to drop to 49Mt, but emissions from current and proposed LNG facilities are 41.6Mt, which would be 85% of this amount (Figure 16).**

**This means that without any controls on pollution, the rest of the WA economy needs to reduce its emissions from around 71 million tonnes per year to just 7.4 million tonnes by 2030 – or by 90%.**

In other words, without any action by the LNG industry to curb its pollution WA will have an emissions reduction target of 90% by 2030 to reach the modest national target of 26-28% reduction by 2030. This is an impossible ask on the rest of the economy and community.

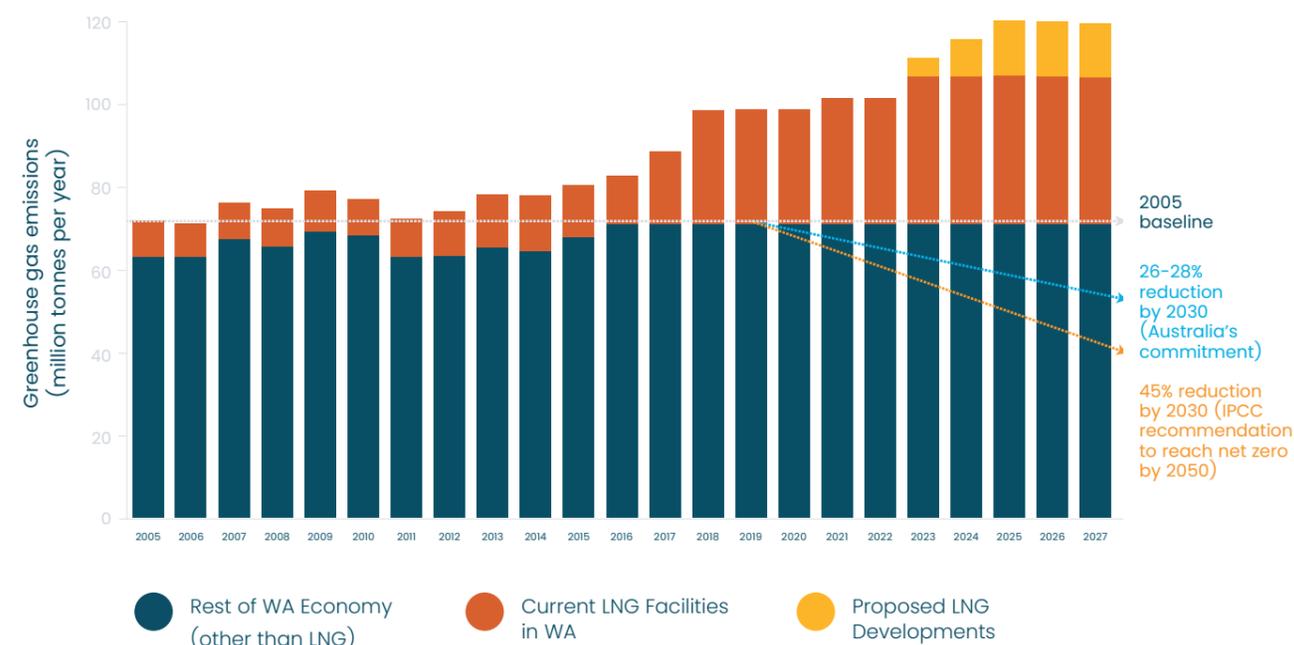
**Figure 16: WA's Carbon Budget to 2030 versus WA LNG emissions**



## 8.2 Cumulative impact of WA LNG emissions

The cumulative total of emissions from LNG facilities coming online since 2005 and their impact on the ability to achieve the Paris targets is shown below (Figure 17).

**Figure 17: Trajectory of emissions from WA LNG facilities from 2005, compared with the rest of the economy**



The graph shows that, compared to the emissions from the rest of the WA economy which have remained relatively stable since 2005, emissions from WA LNG are rising almost exponentially.

This increase is at odds with our international commitment made under the Paris Treaty to reduce emissions by 26-28% below our 2005 baseline.

It also shows the size of the abatement task to reach net zero emissions by 2050 given the trajectory of WA's rising emissions.

**Immediate action to contribute to the peaking of global emissions by around 2020 is clearly indicated in the Paris Agreement and is supported by the recent IPCC 1.5° Special Report.**

**The increasing emissions of the LNG industry are in breach of the Paris Agreement and contradict the best available science on what is needed to meet the long-term temperature goals committed to under the Paris Agreement.**

## 8.3 Impact of WA LNG emissions on Australia's 2005 Paris baseline

This section examines the impact of WA LNG on Australia's ability to reach the Paris targets.

Emissions from current and proposed projects (operating post-2005) were investigated to determine the impact on Australia's Paris commitments.

**Table 12: Detailed impact of emissions by project on Australia's 2005 baseline emissions**

	Project	Operator	Start	GHG emissions (MtCO <sub>2</sub> -e)	% increase relative to Australia's 2005 baseline (532MtCO <sub>2</sub> -e) <sup>28</sup>
<b>Current</b>	Pluto	Woodside	2012	2	0.4%
	Gorgon	Chevron	2016	9.74	1.8%
	Wheatstone	Chevron	2018	10	2%
	Prelude	Shell	2018	2.3-2.7	0.5%
<b>Proposed Burrup Hub expansion</b>	Browse Basin	Woodside JV	2026	14.6	2.7%
	Scarborough	Woodside/BHP	2023-30	2.6	0.5%
<b>Total</b>				<b>41.6</b>	<b>8% increase</b>

Australia has committed to a 5% reduction of GHG by 2020 and a 26-28% reduction of GHG on 2005 figures by 2030. But our findings show:

- Emissions from four current LNG projects that came online after 2005 represent a 4.7% increase to Australia's 2005 baseline.
- Combined emissions from current and proposed WA LNG projects will increase Australia's emissions by 41.6MtCO<sub>2</sub>-e, equivalent to an 8% increase above 2005 levels.**

- This means, if unchecked, this pollution effectively adds another 8% to Australia's current emission reduction target, making it 33-35% by 2030.
- The unchecked pollution from just 5 facilities owned by three corporations is forcing all other sectors of the Australian economy to do the heavy lifting to compensate for the runaway emissions.**

### Key finding

**Combined emissions from current and proposed LNG projects will increase Australia's emissions by 41.6 million tonnes, equivalent to an 8% increase on Australia's 2005 baseline.**

### Impact of the proposed Burrup Hub expansion on our 2005 Paris baseline

It's worth noting the impact of Woodside's proposed Burrup Hub expansion separately:

- Emissions from Woodside's Browse and Scarborough projects would emit another 17.2MtCO<sub>2</sub>-e, representing a 25% increase on WA's 2005 baseline levels, and 3.2% increase on Australia's 2005 baseline.**
- The Browse project, if approved, will be the most emissions intensive development in Australia, adding an additional 7 million tonnes just through venting and pumping the gas 900km and about another 7.6 million tonnes from processing at the North West Shelf LNG facility. This project alone will emit pollution equivalent to 2.7% increase over Australia's total 2005 baseline.

**Just two companies - Woodside and Chevron - are responsible for most of the runaway pollution that is in breach of the Paris Agreement and puts our national target in jeopardy.**

## 9. Comparing WA LNG pollution with national emissions reduction efforts

To achieve a 26% reduction from 2005 levels by 2030, Australia will need to reduce its cumulative emissions between 2020 and 2030 by about 850Mt.<sup>29</sup>

The Department of Environment and Energy has estimated that this could be achieved by a reduction of approximately 375Mt through projects supported through the Emissions Reduction Fund, another 175Mt from energy efficiency measures implemented through the National Energy Productivity Plan, 120Mt from vehicle efficiency measures through the National Energy Productivity Plan, 85Mt from reduced ozone and HFCs and the remaining 205Mt from technological improvements and 'other sources of abatement'.<sup>30</sup>

**In the same 10-year period, the five current LNG plants will produce about 320MtCO<sub>2</sub>-e, equivalent to almost half of the national reduction task.**

This section compares WA LNG pollution with major Australian initiatives to reduce pollution:

- The Emissions Reduction Fund
- The Renewable Energy Target; and
- Solar rooftops

### WA LNG pollution compared with abatement delivered by the Emissions Reduction Fund (ERF)

#### The Emissions Reduction Fund

In 2014 the Australian Government repealed the price on carbon. The carbon price generated about \$13.8 billion in revenue and reduced emissions by 40 million tonnes in just two years of operation. It covered 60% of Australia's emissions and was paid by 348 businesses, including Woodside which had the highest liability outside the electricity sector and paid \$171.9 million in its first year.

In its place the Government set up the Emissions Reduction Fund and provided \$2.55 billion for activities to reduce emissions and 'help achieve Australia's 2020 emissions reduction target of five per cent below 2000 levels by 2020 and 26-28 per cent below 2005 emissions by 2030'.<sup>31</sup> In February 2019 the Emissions Reduction Fund was rebadged as the Climate Solutions Fund and provided with an additional \$2 billion in funding, bringing total investment to \$4.55 billion.

To date, 37.3 million tonnes of abatement has been achieved by the Emissions Reduction Fund.<sup>32</sup> (Table 13)

**Table 13: Emissions Reduction Fund outcomes to date**

	Eighth auction (December 2018)	Cumulative total
Abatement purchased	3.3 million tonnes	193 million tonnes
<b>Abatement delivered</b>		<b>37.3 million tonnes</b>
Average price per tonne	\$13.82	\$12
Total committed	\$45 million	\$2.29 billion
Total contracts	34	457
<b>Contracts completed</b>		<b>20</b>
Total projects	36	477

Source: Australian Government Department of the Environment and Energy (December 2018)

### Key finding

**It will take just 12 years for current LNG facilities to cancel out the entire abatement expected to be delivered over the lifetime of the \$4.5 billion Emissions Reduction Fund.**

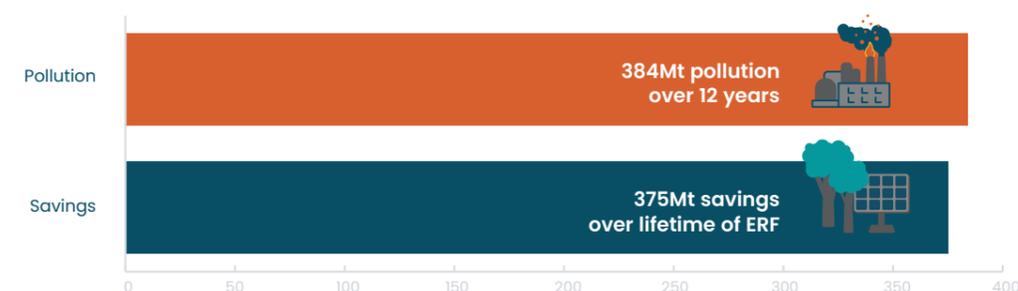
Comparing WA's LNG emissions to abatement purchased under the Emissions Reduction Fund we found:

- The Emissions Reduction Fund has delivered a total of 37.3 million tonnes of abatement to date, which is only slightly larger than the amount WA's five current LNG facilities emit each year without any controls (32MtCO<sub>2</sub>-e).
- At the most recent auction 34 carbon abatement contracts were awarded to deliver 3.3 million tonnes of abatement, but this is almost ten times smaller than the annual emissions of WA's five current LNG

facilities.

- Annual emissions from Chevron's Gorgon facility (9.74MtCO<sub>2</sub>-e) are three times higher than the total abatement purchased in the most recent auction (3.3Mt).
- **The Australian government has invested \$4.55 billion into the Emissions Reduction Fund, meaning 100% of this funding is effectively being provided by taxpayers to offset the operations of Woodside, Chevron, Shell and BHP's five WA LNG facilities over the next twelve years.**

**Figure 18: 12 years of WA LNG pollution will cancel out all savings made by the \$4.5 billion Emissions Reduction Fund**



## WA LNG pollution compared with abatement delivered by the Renewable Energy Target

### The Renewable Energy Target (RET)

The Renewable Energy Target (RET) is a target for at least 33,000 gigawatt-hours (GWh) of Australia's electricity to be produced from new renewable sources by 2020.

The RET has been described as 'Australia's largest and most effective carbon abatement policy, as well as being a very cost-effective policy for stimulating investment in new generation capacity' by the Clean Energy Council.

To date it's delivered 8400 megawatts of renewable energy<sup>33</sup> and is expected to deliver about 360 million tonnes of carbon abatement over its lifetime.<sup>34</sup> This includes:

- 58Mt over 2015–2020 — about the same as annual emissions from all of Australia's passenger cars and light commercial vehicles
- 299Mt over 2015–2030 — more than half of Australia's current total annual emissions.<sup>35</sup>

Using an average emission factor of 0.796t CO<sub>2</sub>-e/MWh, we calculated the annual emissions avoided by the renewable energy generation installed under the RET to be 26.3Mt CO<sub>2</sub> per year.

**This means the annual emissions of WA's five LNG plants (32Mt) are 1.2 times the annual savings being made through the RET (26.3Mt).**<sup>36</sup>

Figure 19: WA LNG pollution is canceling out all savings made annually by the RET



## Key finding

**The annual emissions of WA's five currently operating LNG plants (32Mt) are 1.2 times more than the emissions saved every year through the Renewable Energy Target. This means that emissions from Chevron and Woodside WA LNG operations are larger than the annual savings being made from every single renewable energy installation across Australia under the RET.**

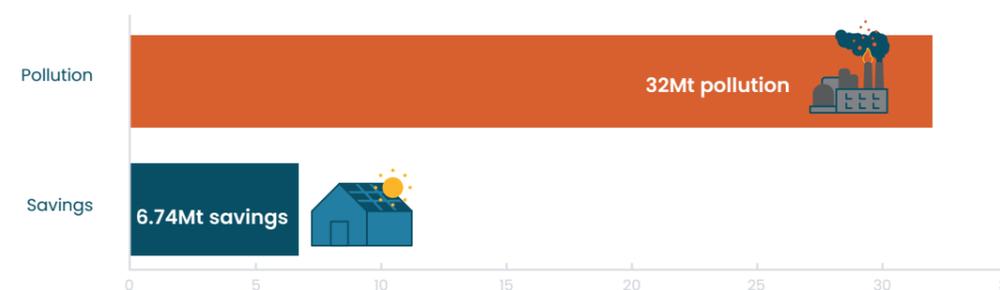
## WA LNG pollution compared with abatement delivered by Rooftop Solar PV

### Solar PV

Australians love rooftop solar power. The Solar Council estimate Australians are installing 6 solar panels every minute. 20% of Australian homes now have solar on their rooftops, with over 2.1 million solar PV systems installed nationwide (at June 2019).<sup>37</sup> Australia's total installed rooftop solar was generating about 8.56GWh of electricity to June 2019, which in turn saved about 6.67Mt CO<sub>2</sub>.<sup>38</sup>

**This means the annual emissions of WA's five LNG plants (32Mt CO<sub>2</sub> generated) are almost five times greater than the total emissions saved each year by Australia's entire fleet of rooftop solar panels across 2.1 million homes (6.74Mt CO<sub>2</sub> saved).**

Figure 20: WA's LNG pollution is 5 times larger than the savings being made by Australia's 2.1 million solar rooftops



# 10. The opportunity for offsets and job creation here in WA

The opportunity to reinstate and strengthen pollution controls on LNG projects in WA has the potential to address Western Australia’s largest source of carbon pollution, while creating a substantial new driver for jobs growth and investment in the WA economy.

While offsets can currently be purchased from throughout Australia and internationally, there is an untapped opportunity for WA to capture significant employment and other benefits by requiring offsets for LNG emissions that are sourced from within Western Australia.

A recent study by Reputex investigated the abatement potential and economic benefit to WA of offsetting direct emissions generated by the LNG industry

within the state.<sup>39</sup> **It found there are approximately 80 million tonnes of emissions offsets available per year** identified across agriculture, renewable energy, carbon farming, and vegetation management activities including rangeland regeneration and savannah burning; (Figure 21). **The same report also found offsetting 30 million tonnes per year would create around 4000 jobs, with the largest portion in the South-West and Southern Rangelands (Figure 22).**

The largest source of new job creation would be in reforestation plantings (1,190 new jobs), followed by large scale renewable energy (614), rangeland regeneration (249) and savannah burning (186); with all remaining jobs attributed to other land-sector projects (1,694). Not only would this be of direct benefit to the WA economy

and community by creating long term careers in sunrise industries, but would have significant benefits to WA’s natural environment and biodiversity.

This compares to an estimated 2340 direct and indirect jobs in WA created by the Gorgon, Wheatstone and North West Shelf projects – the three largest facilities currently operating in WA and the only projects for which jobs data is publicly available.<sup>40</sup>

This approach would be in line with the NT government which is currently developing a ‘buy NT-first’ policy for offsets for emissions generated by its onshore gas industry. It was reported that this would generate a fund of between \$880 million to \$3.4billion per year by 2022.<sup>41</sup>

Currently there is little incentive for LNG companies to make investments that would reduce their pollution. Requirements to offset all carbon pollution to a net zero target would also create a market incentive for the LNG sector to invest in measures to mitigate GHGe, including installing renewables and battery storage at production plants, as Conoco Phillips announced recently for its Darwin LNG facility.

## Offsetting is not a silver bullet

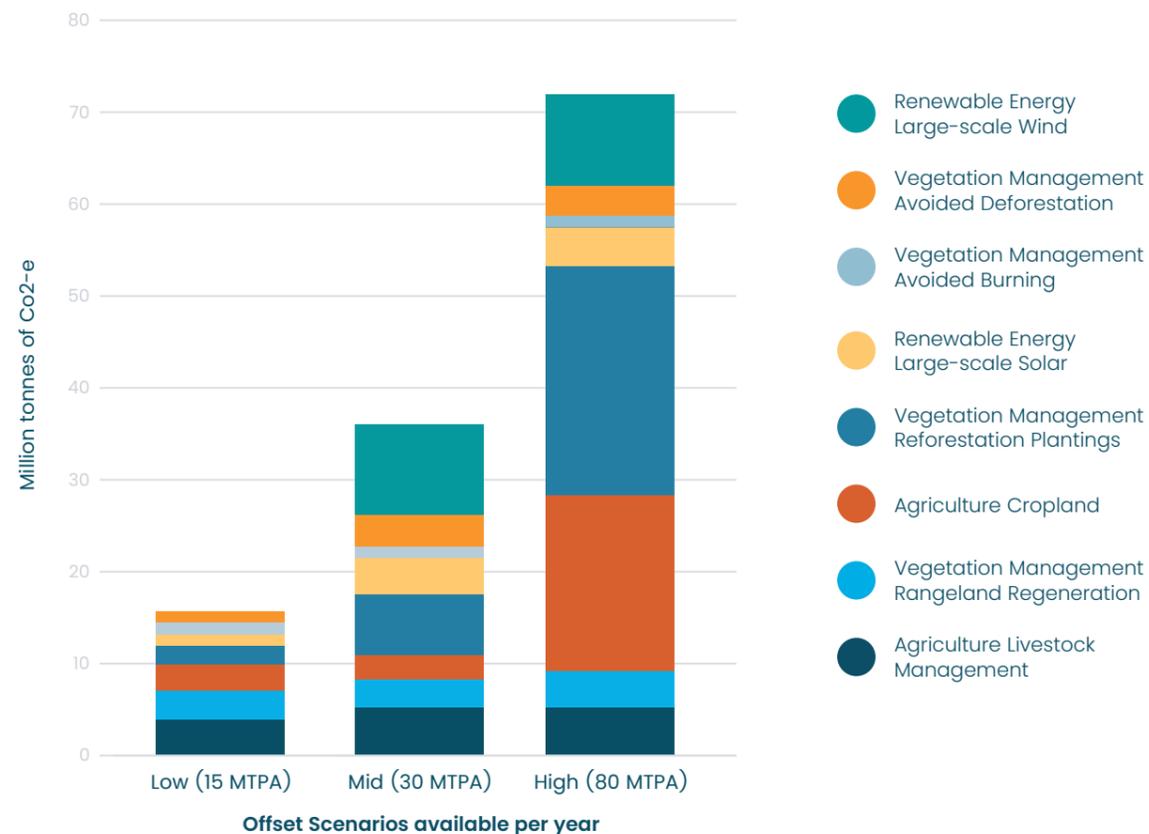
While offsets can play a role as a partial solution to emissions from existing LNG operations, the availability of offsets is limited. Offsets should not be used as a default measure to allow fossil fuel expansion which in turn forecloses opportunities to offset emissions in other parts of the economy where reduction is more difficult, expensive, or not an option. Offsets should only be used once LNG companies have exhausted all possible efforts to reduce their emissions first.

In the words of UN Environment Program:

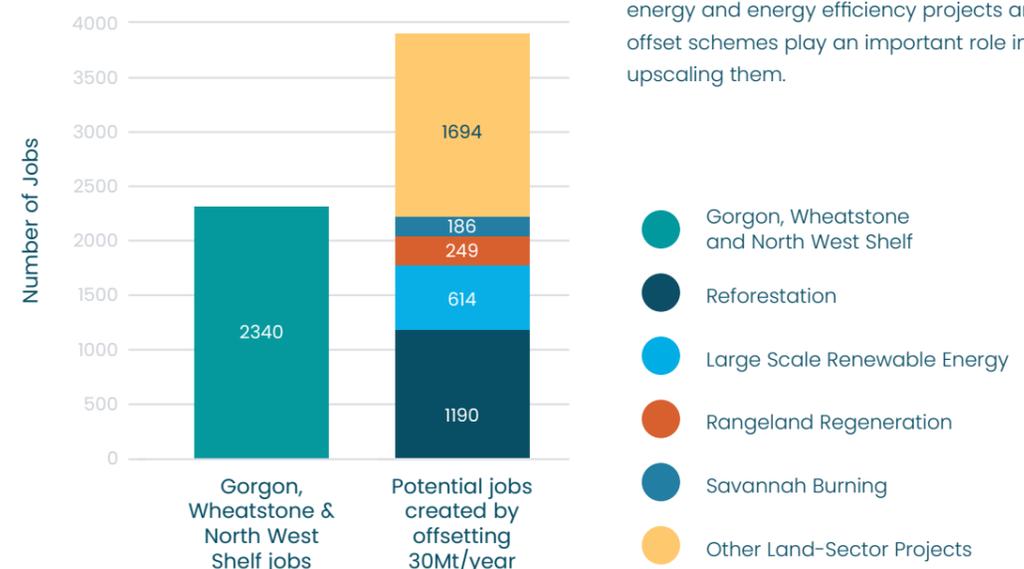
*‘Offsets are only part of the answer... If we are serious about averting catastrophic planetary changes, we need to reduce emissions by 45% by 2030. Trees planted today can’t grow fast enough to achieve this goal... What we must look at is how these actions sum up to reflect the true cost of emissions and the urgency of their reduction. It cannot simply be a one-for-one model. If one tonne of sequestered CO2 is the price of one carbon credit, we still need to deliver the missing 45 per cent emissions’ reduction, as well as the future projected increase.’*

The UN Environment Program supports carbon offsets as a temporary measure leading up to 2030, and a tool for speeding up climate action. It also argues renewable energy and energy efficiency projects are critical and offset schemes play an important role in funding and upscaling them.

**Figure 21: Projected GHG offset potential in WA across three scenarios**



**Figure 22: 4000 jobs created by offsetting LNG emissions compared with existing jobs in WA LNG**



# 11. The 'Clean Gas' Myth

Claims are often made by the gas industry that LNG is 'cleaner' than coal and it's needed for a 'transition' to a low carbon future. Federal Minister for Emissions Reduction Angus Taylor has even made the claim that Australia's gas exports are good for the climate by reducing emissions overseas. These statements have been found to be unsubstantiated and misleading at a time when the global task of reducing global emissions to zero is more urgent than ever. In this final section we look at the most dangerous myths about gas, and the realities for each.



## 1. Gas is still a fossil fuel that breaks the carbon budget

Even if global coal use was eliminated overnight, burning the oil and gas we're already digging up would blow the 1.5 degree carbon budget.

There is a strong and clear scientific consensus that there is too much carbon in the atmosphere. We have surpassed the 'safe' level of 350 parts per million (ppm) and have reached one degree of warming. The world is now approaching 415ppm which will make keeping within 1.5 degrees of warming almost impossible.

The implications are simple: there is no room for new fossil fuel development – gas included – within the Paris Agreement goals.

**At the most fundamental level, burning more fossil fuels won't save the climate.**



## 2. Gas is not 'cleaner' than coal

Perhaps the most common myth is the claim that gas is '50 percent cleaner than coal'. But this doesn't take into account the emissions across the **full life cycle** of gas, including extraction, processing, transport, and storage in addition to those emitted when it is burned to create energy.

**Over a full life cycle analysis research has shown gas does not have much advantage over coal in terms of CO2 emissions, and a major international review of LNG infrastructure released in July 2019 found the threat to the climate from LNG is 'as large or larger than coal'.**

Achieving **net-zero emissions** by 2050 is essential to limit global warming to 1.5 degrees. Research by Carbon Tracker shows that even if global coal use was eliminated overnight, burning the oil and gas reserves already being exploited will take the world past 1.5°C. <sup>42</sup>



## 3. The methane problem

**When we consider methane, a far more potent greenhouse gas than CO2, elevated methane levels negate any 'advantage' over coal.**

Carbon dioxide emissions are only one part of the picture. Gas is mostly methane, an extremely potent greenhouse gas that traps 86 times more heat than CO2 over a 20-year period. Methane is responsible for 25% of global warming to date.

When the gas industry claims that gas is 'cleaner' than coal, it's ignoring the huge amounts of methane released into the atmosphere at all stages of its lifetime, known as 'fugitive emissions'. These emissions escape during drilling and extraction, transportation in pipelines and storage, and eventual combustion. It's estimated to be as much as 9% of the entire volume of the gas resource.

**The IPCC Special Report modelled pathways that limit global warming to 1.5°C – all involved deep reductions to methane and gas emissions. Yet Australia's fugitive emissions have increased by 60% since 2004.**<sup>43</sup>

Fugitive emissions are now the fifth largest source of greenhouse gas emissions in Australia and growing.

A series of reports including a recent study in *Science* has shown that gas's lifecycle methane emissions are much higher than previously estimated, which only further undermines the notion of any climate advantage over coal. <sup>44 45</sup>



## 4. Australian gas is not reducing emissions overseas

The gas industry and Australian Government has claimed LNG has the potential to lower emissions in import countries by around 148Mt per year.<sup>46 47</sup> This report finds this claim to be unfounded and misleading.

According to the IEA report *The Role of Gas in Today's Energy Transitions*, most of the push for coal-to-gas switching in China is occurring in areas to replace coal-fired boilers in residential and industrial settings (which are a major contributor to poor air quality), not power plants. This report found no evidence of gas replacing coal in any power stations overseas to date.

The truth is, Australia is now the world's largest exporter of coal,<sup>48a</sup> which means our gas is being burnt overseas in addition to coal not instead of! And for every tonne of LNG produced in Australia around 2.8 tonnes of greenhouse gas pollution is emitted when combusted in a second country.<sup>48b</sup> Australia exported 70 million tonnes of LNG in 2018, which will emit 197 million tonnes of CO2 when burned. That's additional emissions. Not 'savings'.

The only thing that would genuinely reduce emissions overseas is to export or encourage the adoption of renewable energy.

**The reality is our gas is being burnt in addition to – not instead of – coal, and our exports are significantly increasing global emissions.**

### Key finding

**Requirements for Chevron, Shell and Woodside to offset their pollution would create around 4000 jobs in WA.**



### 5. Large-scale, low-cost renewables can now displace both coal and gas

In most markets bulk renewables – utility scale wind and solar power plants – are now the cheapest form of power and are already able to compete with new coal or gas plants on a levelized cost of energy (LCOE) <sup>49</sup> basis in Germany, the United Kingdom, China, Australia, and the United States. <sup>50</sup>

Even the CEO of Australia’s largest energy company AGL has stated the transition from a coal-power-dominated grid to low-carbon generation will largely bypass or leapfrog ‘baseload’ gas, and instead shift straight to large-scale wind and solar. <sup>51</sup>

Wind and solar plants coupled with battery storage are also getting cheaper. The price of dispatchable, storable renewable energy, unlike the volatile gas market, is tied only to technology costs that are going down almost exponentially. Recent forecasts suggest it may be cheaper to build new renewables plus storage than to continue operating natural gas plants by 2035. <sup>52</sup>

**Even if we ignored the climate problems, based just on the economics the time is up on gas.**



### 6. New gas projects will only lock in another 40–60 years of pollution

Gas is a ‘transition fuel’ to a cleaner economy. The reality is that building new gas infrastructure requires **massive** multibillion-dollar investments and **decades** of operation to becoming profitable.

No investors today expect to retire their asset earlier than 30 years into its lifetime at a minimum, meaning gas plants being built or expanded today could still be operating beyond 2050, when we know emissions must be net zero. **Woodside wants to continue producing LNG from its proposed \$44 billion Burrup Hub expansion until 2070!**

The IPCC Special Report shows that gas use for energy and methane emissions need to reduce significantly and immediately in order to have any hope of meeting Paris Agreement. The report modelled pathways that limit global warming to 1.5°C which required a reduction in primary energy produced by gas of 25% in 2030 and 74% in 2050, with renewables projected to supply up to 85% of electricity by 2050.

Global gas demand will peak and decline within the next 10–15 years as the world implements the Paris Agreement. The inevitable phase out of gas combined with the falling cost of renewable alternatives will make new LNG projects untenable and unprofitable in the long term and throw into question their financial viability. A recent report found at least 202 LNG terminals worth \$1.3 trillion are in development worldwide and called for a moratorium on new gas infrastructure given the high risk of these investments becoming stranded assets. <sup>53</sup>

**By locking in decades of carbon pollution, any new LNG expansion is on a collision course with the Paris Agreement and is at a very real risk of becoming a stranded asset.**



### 7. To achieve the Paris goals and stay within the IPCC carbon budget, gas use needs to reduce not increase.

The IPCC has said the world needs to be half decarbonized by 2030, and fully decarbonized by 2050 to keep within 1.5 degrees of warming.

To achieve this it has calculated a ‘carbon budget’ (below) which shows it is crucial for emissions to begin falling after 2020. Any delay to this will make the trajectory to net zero emissions technologically and economically impossible to follow.

While the gas industry claims that gas is ‘helping’ us transition to a safe climate, the reality is time is running out to make the deep cuts necessary to meet the Paris targets.

This is why energy and climate analysts are calling for a moratorium on LNG development globally. The increasing and uncontrolled emissions of the LNG industry are in breach of the Paris Agreement and the best available science.

**The truth is, if emissions continue to rise beyond 2020 or even remain level, the IPCC temperature goals set in Paris become almost unattainable.**

**Figure 23: Trajectories to reach net zero by 2050 based on international carbon budget**

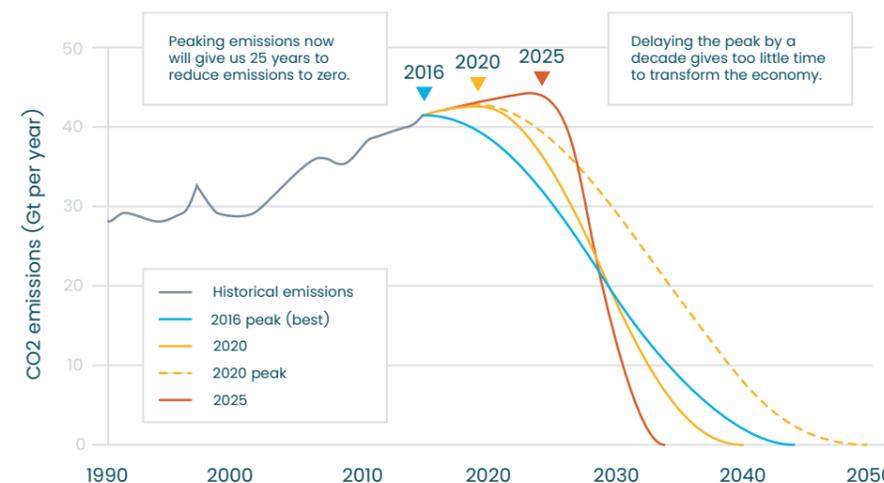


Figure adapted from the IPCC and Global Carbon Project.

## Conclusion

This report presents the first thorough investigation of direct carbon emissions from Western Australia's LNG industry, revealing alarming growth in pollution that is placing Australia's Paris Agreement targets in jeopardy and undermining Australia's national efforts on climate change.

**While other states have achieved emissions reductions since the 2005 Paris baseline year, rapid growth in WA LNG pollution has effectively canceled out these benefits – instead causing Australia's overall carbon pollution to rise significantly over this time.**

The report considers only direct emissions from extracting and processing gas, and does not consider even greater pollution from the combustion of the gas overseas. Despite this, **uncontrolled direct pollution from just two companies – Chevron and Woodside – is already cancelling out the gains made by all solar and wind energy across the entire continent.** If further proposed WA LNG expansions go ahead, the WA LNG sector will be responsible for almost half of Western Australia's total pollution from all sources.

This report shows that WA Government measures to control and regulate carbon pollution from LNG have been, and remain totally ineffective at constraining pollution growth from the sector. Where conditions to control pollution have been imposed on some LNG projects, they are inconsistent, inadequate, unenforceable, and in some cases have been removed altogether.

**As a result, runaway pollution growth from the WA LNG sector has had a dramatic impact on total emissions for WA and Australia and is undermining progress being made on climate change in other states.** WA LNG pollution already accounts for 36% of WA's total emissions and 6% of national emissions. If Woodside's proposed Burrup Hub expansion is approved and the Browse and Scarborough fields are exploited, LNG emissions will account for almost half of WA's total annual emissions, and almost 8% of Australia's annual emissions.

Emissions from LNG production in WA was also compared to other major emissions sources. Factoring in further expansions proposed by Woodside, WA LNG emissions were found to be more than one quarter (28%) of total pollution from Australia's existing fleet of coal fired power stations, and 96% of the pollution from every single passenger vehicle in Australia. WA LNG pollution is comparable to the total annual emissions of Ireland and Switzerland, Sweden and Hong Kong.

Under the Paris Treaty, Australia has committed to reducing total national greenhouse gas emissions by 26–28% below its 2005 level by 2030. Immediate action to reduce emissions is necessary under the Paris Agreement, and is supported by the IPCC 1.5° special report. **This report finds that increases in WA LNG pollution are in breach of the carbon budgets and science underpinning the Paris Agreement and are fundamentally at odds with what is needed to meet the Paris Agreement long-term global temperature goal.**

A focus of this research has been investigating the impact of emissions from WA LNG projects that have commenced operations since Australia's 2005 Paris baseline year, to determine the impact on our state and national emissions baseline, and our ability to reach the Paris emissions reduction targets. **Emissions from WA LNG projects that have commenced operation since 2005 together with proposed expansions will add 41.6Mt CO<sub>2</sub>e pollution every year, which represents a 61% increase relative to WA's 2005 baseline and an 8% increase relative to Australia's 2005 baseline.**

Growth in pollution from WA LNG operations since 2005 effectively adds 8% to Australia's current emissions reduction target, increasing it to 33–35% by 2030, forcing all other sectors of the economy to compensate for WA's runaway growth in LNG pollution. To achieve the modest target of 26–28% emissions decrease on 2005 levels by 2030, WA's total annual emissions will need to drop to 49Mt – however without any controls, emissions from current and proposed LNG facilities will be 41.6Mt – or 85% of this amount.

**WA LNG emissions were also found to be fundamentally undermining Australia's national efforts to tackle carbon pollution:**

- Just 12 years' of WA LNG emissions will cancel out the entire abatement expected to be delivered by the \$4.5 billion Emissions Reductions Fund (ERF)
- Annual WA LNG pollution is 1.2 times greater than the annual carbon savings delivered by all installed renewable energy capacity under the Renewable Energy Target (RET)
- Annual WA LNG emissions are almost five times greater than the annual carbon savings delivered by Australia's 2.1 million solar rooftops.

The report also investigated commonly heard claims made about gas contributing to global efforts to tackle climate change, through claimed displacement of other dirtier fuels. Such claims were found to be misleading and dangerous. Gas is a polluting fossil fuel that is competing with renewable energy in global efforts to phase out the use of coal. Considered across its entire lifecycle, elevated methane levels as well as emissions from gas production negate any 'advantage' over coal.

**A major international review of LNG infrastructure found that the threat to the climate from LNG is 'as large or larger than coal' and the IPCC has said that global gas use must decline, not increase in order to meet global climate targets.** New gas projects will lock in another 40–60 years of carbon pollution and are at high risk of becoming stranded assets given that large-scale, low cost renewables and storage can now displace both coal and gas.

Despite the alarming size and scale of Western Australia's LNG pollution problem, solutions have been proposed that have the potential to prevent this pollution burden from being transferred to Australian taxpayers or businesses. For example, the WA Environmental Protection Authority has recommended that WA Government conditions be reinstated and strengthened, to require that WA LNG companies offset emissions through investments in activities such as tree planting, carbon farming and renewable energy.

**Previous analysis has identified the potential to deliver 80 million tonnes of emissions offsets per year here in Western Australia, and that offsetting current WA LNG emissions would create 4,000 jobs in the state.**

These carbon pollution offset activities would not only deliver economic benefits to regional Western Australia, but could also provide very significant benefits to WA's natural environment.

**The runaway emissions of WA's LNG industry have gone largely unnoticed in Australia's national debate on climate change, but they can no longer be ignored.**

Carbon pollution from a handful of very large LNG projects dominated by Woodside and Chevron is already cancelling out the entire savings of all installed renewable energy under the nation's Renewable Energy Target (RET) and cancelling out the emissions reductions being achieved in other Australian states.

**This report strengthens the case for immediate action to update Western Australia's policy approach for assessing and controlling pollution by WA's LNG industry.**

Failure to implement effective controls will inevitably result in an extremely large carbon pollution reduction burden and associated cost being transferred to Australian households and businesses. Another abatement program at the same size and scale of the Emissions Reduction Fund or Renewable Energy Target will be required to counter just the existing and future pollution growth from the WA LNG industry.

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- <sup>6</sup> Chevron (2018) Gorgon carbon dioxide injection project at <https://australia.chevron.com/-/media/australia/publications/documents/gorgon-co2-injection-project.pdf>
- <sup>7</sup> Under Ministerial Statement 800 Condition 26 states: Greenhouse Gas Abatement Program 'the proponent shall design and construct Carbon Dioxide Injection System infrastructure in conjunction with the Gas Treatment Plant on Barrow Island that is capable of disposing by underground injection, 100% of the volume of reservoir carbon dioxide to be removed during routine gas processing operations on Barrow Island and that would otherwise be vented to the atmosphere.' The Chevron project is covered by the Safeguard Mechanism and currently has a three-year cumulative monitoring period baseline which allows it to have net emissions of approximately 25Mt between 1 July 2017 – 30 June 2020. Prior to this, Gorgon had a single year net baseline of 9 million tonnes. Chevron states in its 2018 *Update to climate change resilience* that it has invested approximately \$1.1 billion into carbon capture, utilization and storage (CCUS) which once operational are expected to reduce GHG emissions by about 5 million metric tonnes per year, the emissions attributable to 620,000 US homes' annual electricity usage. Despite the first LNG production occurring in March 2016 it was reported on 6 March 2016 that Chevron has 'further delayed the underground storage of carbon dioxide from the Gorgon LNG project in the Pilbara by up to 9 months because of continuing technical problems. If injection does not start until the end of this year, then between 7.9 and 11.1 million tonnes of CO<sub>2</sub> which Chevron had planned to bury would instead be released into the atmosphere.' (Source: <https://thewest.com.au/business/oil-gas/chevron-delays-underground-storage-of-carbon-dioxide-for-gorgon-ng-b881125789z>) See also <https://thewest.com.au/business/energy/future-emissions-shock-for-was-major-Ing-players-ng-b881143493z>
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- <sup>9</sup> Figures cited in The Australia Institute (2018) *Gorgon-tuan Problem*. at [https://www.tai.org.au/sites/default/files/P635%20Gorgon-tuan%20Problem%20\[Web\].pdf](https://www.tai.org.au/sites/default/files/P635%20Gorgon-tuan%20Problem%20[Web].pdf)
- <sup>10</sup> Under Ministerial statement 873 a condition of approval by the WA government was to 'prepare a GHG abatement program that demonstrates the proposal is designed and operated in a manner which minimizes GHG emissions as far as practicable' and Condition 19.9 specifically required an offset package to offset the reservoir CO<sub>2</sub> released into the atmosphere from the proposal at a minimum. Under the Safeguard mechanism Chevron has a calculated emissions baseline of 4.09mta.
- <sup>11</sup> Recommendation 5.19 stated 'Given the uncertainty regarding the adoption and implementation of a CPRS, or another equivalent requirement, the Department recommends that prior to commissioning the facility that Shell develops and submits a Greenhouse Gas Strategy to the Minister for approval. The Greenhouse Gas Strategy must include measures to ensure that the proposed FLNG facility will not result in a net increase to Australia's total GHG emissions.' (Australian Government 2010 Department of the Environment, Water, Heritage and the Arts. Prelude Floating Liquefied Natural Gas Facility (EPBC 2008/4146)
- <sup>12</sup> <https://thewest.com.au/news/pilbara-news/browse-gas-onshore-plan-for-dampier-is-on-track-ng-b88808547z>
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- <sup>22</sup> Global Carbon Atlas, using 2017 figures <http://www.globalcarbonatlas.org/en/CO2-emissions>
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- <sup>25</sup> Unfortunately, current federal policies are considered inadequate and ineffective to meet Australia's Paris targets. The UNEP, IEA and OECD have all stated Australia will not meet its commitments under the current mechanisms. The recent Climate Transparency Report found that Australia's target, is not in line with the Paris Agreement. It concluded '*Collectively, the G20 needs to roughly halve emissions in 2030 to meet the Paris goals, but adequate long-term strategies to do so are still lacking*'.
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- <sup>36</sup> Harries (2018). WA LNG industry and GHG Emissions: A Report Prepared for the Conservation Council of Western Australia. Tyto Energy and Environmental Consulting, Wembley, WA.
- <sup>37</sup> Clean Energy Regulator publishes monthly installation figures at <http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations#Smallscale-installations-by-installation-year>
- <sup>38</sup> State/territory PV electricity generation data can be multiplied by the specific state and territory GHG emission factors (tonnes CO<sub>2</sub>e/MWh) obtained from the National Greenhouse Accounts Factor for electricity generation in each state or territory and used to calculate the reduction in GHG emissions achieved by the solar PV systems in each state or territory. The annual figures of solar PV production for 1 May 2017–30 April 2018 of 8099297kWh were disaggregated by state and multiplied by an emission factor for each state, arriving at a total of 6.37Mt CO<sub>2</sub>-e GHG emissions avoided. To update the figure for 2019 we simply extrapolated the average amount of GHG avoided per GW (8.1Gw total generated/6.369 GHG emissions avoided = 1.27Mt avoided per GW. Therefore 8.56Gwh generated / 1.27 = 6.74Mt GHG avoided). We based our calculations on those used by Harries (2018) WA LNG industry and GHG Emissions: A Report Prepared for the Conservation Council of Western Australia. Tyto Energy and Environmental Consulting, Wembley, WA
- <sup>39</sup> Reputex Energy (2018) 'Offsetting Emissions from Liquefied Natural Gas Projects in Western Australia, November 2018
- <sup>40</sup> ACIL Allen Consulting. 2018. *Economic contribution of Chevron in Australia*. At <https://australia.chevron.com/-/media/australia/publications/documents/acil-allen-report-snapshot.pdf>
- <sup>41</sup> Reported in The Australian, 22/10/18
- <sup>42</sup> <https://www.carbontracker.org/reports/breaking-the-habit/>

<sup>43</sup> Quarterly Update of Australia's National Greenhouse Gas Inventory for the March Quarter 2019 at <http://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications/quarterly-update-australias-nggi-mar-2019>

<sup>44</sup> <http://science.sciencemag.org/content/early/2018/06/20/science.aar7204>

<sup>45</sup> <https://www.vox.com/energy-and-environment/2018/7/13/17551878/natural-gas-markets-renewable-energy>

<sup>46</sup> <https://theconversation.com/australias-energy-exports-increase-global-greenhouse-emissions-not-decrease-them-118990>

<sup>47</sup> In a clarifying statement, the Department compared the emissions that would be produced from the combustion of Australia's LNG exports for the year to December 2018 against the emissions generated from the combustion of an equivalent amount of energy of black coal. Under this comparison, the combustion of LNG exports would generate 197.1Mt CO<sub>2</sub>-e, which is around 148Mt CO<sub>2</sub>-e less than the emissions generated by the combustion of the same amount of energy of black coal (345.1Mt CO<sub>2</sub>-e). at <https://www.theguardian.com/environment/2019/jun/07/angus-taylors-claim-lng-exports-reduce-global-emissions-likely-wrong-climate-expert>

<sup>48a</sup> <http://www.worldstopexports.com/coal-exports-country/>

<sup>48b</sup> According to then Federal Department of Climate Change in 2011, these figures are a rule of thumb estimate, supported by evidence found in a number of Australian LNG project Environmental Impact Statement documents, Answers to Questions on Notice Department of Climate Change and Energy Efficiency, *Program 1.1* Question on Notice No.17 at <https://greensmps.org.au/articles/worley-parsons-lng-emissions-report>

<sup>49</sup> LCOE is a measure of a power source that allows comparison of different methods of electricity generation on a consistent basis

<sup>50</sup> OCI cited in <https://www.vox.com/energy-and-environment/2019/5/30/18643819/climate-change-natural-gas-middle-ground>

<sup>51</sup> <https://reneweconomy.com.au/agl-kills-idea-of-gas-as-transition-fuel-wind-solar-storage-cheaper-63013/>

<sup>52</sup> <https://www.vox.com/energy-and-environment/2018/7/13/17551878/natural-gas-markets-renewable-energy>

<sup>53</sup> The New Gas Boom (2019) at <https://globalenergymonitor.org/new-gas-boom/>

<sup>54</sup> Australia's emissions in 2005 were 532MtCO<sub>2</sub>-e : <https://www.abc.net.au/news/2015-08-11/clay-how-does-australias-emissions-target-stack-up/6688942> citing National Greenhouse Gas Inventory at <http://ageis.climatechange.gov.au/>

<sup>55</sup> North West Shelf. Approved for 7.7-9.4MtCO<sub>2</sub>-e [http://www.epa.wa.gov.au/sites/default/files/EPA\\_Report/924\\_B962.pdf](http://www.epa.wa.gov.au/sites/default/files/EPA_Report/924_B962.pdf) Woodside's North West Shelf project's emissions of 7.6

million tonnes a year will rise substantially next decade if it processes gas as planned from the Browse project. Due to the high CO<sub>2</sub> content of the gas and the energy required to pump it 900km to the NWS plant, Browse's offshore operations would emit an average of four million tonnes of CO<sub>2</sub> a year for 50 years, according to a company environmental submission in November, but this estimate did not include the liquefaction of the gas onshore that is usually the dominant source of emissions for an LNG project.

<sup>56</sup> <https://www.australianmining.com.au/oil-gas/woodside-to-create-thousands-of-jobs-at-burrup-hub/>

<sup>57</sup> <https://www.woodside.com.au/our-business/pluto-lng>

<sup>58</sup> Currently Pluto is emitting approximately 2MtCO<sub>2</sub>-e and the total approved emissions is 4.1MtCO<sub>2</sub>-e under EPBC 2006/2968. (Pluto is currently one LNG processing train producing 6Mt of LNG. After 5 years, when the second LNG train comes online, and the total LNG production reaches 12Mt, this would increase to approximately 4.1MtCO<sub>2</sub>-e of CO<sub>2</sub>-e. Carbon pollution from Woodside's Pluto project will rise from the to 4.1MtCO<sub>2</sub>-e if a second LNG train is added to process gas from the new Scarborough field). Sources: Page 342 of Scarborough Offshore Project Proposal Submission June 2019 to NOPSEMA at <https://www.nopsema.gov.au/assets/epdocuments/A679881.pdf> p. 23 of the report, Pluto LNG Development, Burrup Peninsula: Woodside Energy Ltd, Report and recommendations of the Environmental Protection Authority (Environmental Protection Authority Perth, Western Australia, Report 1259) [http://www.epa.wa.gov.au/sites/default/files/EPA\\_Report/2533\\_Bull1259.pdf](http://www.epa.wa.gov.au/sites/default/files/EPA_Report/2533_Bull1259.pdf)

<sup>59</sup> Gorgon, Chevron. NOPSEMA Decision Notification 15th August 2016.

<sup>60</sup> Gorgon: Calculations based on proponent information released in documents as part of several Environmental Impact Assessment processes, including EPA reports 1221, 1323, 1394 and 1539. The Australia Institute estimate the average or peak total CO<sub>2</sub> emissions before CCS are 8.5 to 10Mt per year and 5.1 to 6Mt after CCS per year. Source: Gorgon-tuan Problem. Tom Swann. November 2018 at <https://www.tai.org.au/sites/default/files/P635%20Gorgon-tuan%20Problem%20%5BWeb%5D.pdf>. It has been reported that the Gorgon LNG plant had all its three trains in production for just a third of the 2019 year and emitted nine million tonnes to be the State's biggest carbon polluter. Under the Federal Government's safeguard mechanism, Gorgon must limit its average annual emissions to less than 8.35 million tonnes over the three years to mid-2020. Source: <https://thewest.com.au/business/energy/future-emissions-shock-for-was-major-lng-players-ng-b881143493z>.

<sup>61</sup> <https://australia.chevron.com/our-businesses/wheatstone-project>

<sup>62</sup> Wheatstone. Chevron state the Project will emit 10.4 million tonnes per year, Page 97 Final Environmental Impact Statement/ Response to Submissions on the Environmental Review and management Program for the Proposed Wheatstone Project. February 2011 at [\[l-final-environmental-impact-statement-response.pdf\]\(#\)](https://australia.chevron.com/-/media/australia/our-businesses/documents/volume-</a></p>
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<sup>63</sup> Shell Australia Prelude FLNG Environment Plan Summary p9 <https://www.nopsema.gov.au/assets/epdocuments/A535000.pdf>

<sup>64</sup> Prelude: Shell Australia Prelude FLNG Environment Plan Summary page 9 at <https://www.nopsema.gov.au/assets/epdocuments/A535000.pdf> Source: Page169 of Prelude Floating LNG Project: Draft Environmental Impact Statement (Shell Development (Australia) Proprietary Limited, EPBC 2008/4146) and confirmed by the Minister for Climate Change and Energy Efficiency stating the Department Question No 339 answered 6 December 2010, [https://www.shell.com.au/promos/sustainability/prelude-eis/\\_jcr\\_content.stream/1475632907147/15a771833defe107c1336c8a4854a95607408b1d/prelude-eis.pdf](https://www.shell.com.au/promos/sustainability/prelude-eis/_jcr_content.stream/1475632907147/15a771833defe107c1336c8a4854a95607408b1d/prelude-eis.pdf)

See also <https://greensmps.org.au/articles/greenhouse-gas-emissions-projected-lng-projects>

See also reports it is permitted to emit 2.7MtCO<sub>2</sub>-e when in production. Prelude emitted more than 250,000 tonnes during a year without production, at <https://thewest.com.au/business/energy/future-emissions-shock-for-was-major-lng-players-ng-b881143493z> and see also [http://www.epa.wa.gov.au/sites/default/files/Referral\\_Documentation/North%20West%20Shelf%20Project%20Extension%20Proposal%20Section%2038%20Referral%20Supporting%20Information.pdf](http://www.epa.wa.gov.au/sites/default/files/Referral_Documentation/North%20West%20Shelf%20Project%20Extension%20Proposal%20Section%2038%20Referral%20Supporting%20Information.pdf)

<sup>65</sup> [http://www.epa.wa.gov.au/sites/default/files/Referral\\_Documentation/North%20West%20Shelf%20Project%20Extension%20Proposal%20Section%2038%20Referral%20Supporting%20Information.pdf](http://www.epa.wa.gov.au/sites/default/files/Referral_Documentation/North%20West%20Shelf%20Project%20Extension%20Proposal%20Section%2038%20Referral%20Supporting%20Information.pdf)

<sup>66</sup> As part of the Burrup Hub expansion it's proposed the Browse gas field will be exploited to replace the gas feeding the North West Shelf which is expected to run dry in the 2020s, and will emit an additional maximum annual emissions of 7MtCO<sub>2</sub> just from flaring and pumping gas 900km to the NWS plant inclusive of all vented reservoir gas over 50 years of operation, according to page 29 at [http://www.epa.wa.gov.au/sites/default/files/Referral\\_Documentation/Browse%20to%20NWS%20Development%20Supporting%20Document.pdf](http://www.epa.wa.gov.au/sites/default/files/Referral_Documentation/Browse%20to%20NWS%20Development%20Supporting%20Document.pdf)

Liquefaction onshore at the North West Shelf facility is not included in that estimate and we estimate to be 7.6Mt CO<sub>2</sub>-e the same as the current North West Shelf operations. Browse is being approved by stealth, by carving it up into 7 separate components. Our calculations therefore include emissions from continued operation of the North West Shelf LNG facility. Source: Page 4 EPBC Act referral. Submission #3836 - Scarborough Development nearshore component. Scarborough Development nearshore component at [http://epbcnotices.environment.gov.au/\\_entity/annotation/b0d328fd-f906-e911-931a-00505684324c/a71d58ad-4cba-48b6-8dab-f3091fc31cd5?t=1545800733411](http://epbcnotices.environment.gov.au/_entity/annotation/b0d328fd-f906-e911-931a-00505684324c/a71d58ad-4cba-48b6-8dab-f3091fc31cd5?t=1545800733411) and <https://www.woodside.com.au/our-business/burrup-hub/scarborough-to-pluto>

<sup>67</sup> EPBC Act referral. Submission #3836 - Scarborough Development nearshore component Title of Proposal - Scarborough Development nearshore component P4. <http://>

[epbcnotices.environment.gov.au/\\_entity/annotation/b0d328fd-f906-e911-931a-00505684324c/a71d58ad-4cba-48b6-8dab-f3091fc31cd5?t=1545800733411](http://epbcnotices.environment.gov.au/_entity/annotation/b0d328fd-f906-e911-931a-00505684324c/a71d58ad-4cba-48b6-8dab-f3091fc31cd5?t=1545800733411)

<sup>68</sup> The Pluto project site has environmental approval for a total production capacity of 12 mmtpa, which includes 4-5 mmtpa at the Pluto Expansion (Train 2) liquefaction train, proposed to be developed as a brownfield expansion of the existing plant, and 4.9mmtpa at the existing Pluto facility (Train 1) Source: Pluto LNG Expansion - Commercial Overview 24 July 2019 at <https://www.woodmac.com/reports/lng-pluto-lng-expansion-commercial-overview-55967718>

<sup>69</sup> The \$11 billion Scarborough project will deliver an additional 4-5Mtpa via a 340km pipeline to the existing Pluto facility, and a second train is proposed for processing this gas. The estimated direct emissions for the Pluto LNG Development are in the order of 1.9 Mtpa of CO<sub>2</sub>e (carbon dioxide equivalent) increasing to approximately 4.1 Mtpa of CO<sub>2</sub>e when LNG production increases to 12 Mtpa (the greenhouse gas emissions are based on 95% plant utilisation).

Greenhouse gas emissions associated with the two trains at the Pluto Gas Plant were assessed and approved under the Western Australian Environment Protection Act 1986 and Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC 2006/2968 and Ministerial Statement 757). The total approved greenhouse gas emissions were 4.1 MMTCO<sub>2</sub>e/yr. The Pluto Gas Plant currently emits approximately 2 MM tCO<sub>2</sub>e/yr. Additional emissions attributed to expansion will fall within the remaining 2.1 MMTCO<sub>2</sub>e/yr.

Offshore and marine construction emissions are anticipated to be in the order of 470 000 tonnes of CO<sub>2</sub>e and drilling will contribute a further 50 000 tonnes of CO<sub>2</sub>e. As with onshore construction emissions, these should be considered as order of magnitude estimates as the facility design process is ongoing and details of construction activities are still under development. Source: Page 61-63

Public Environmental Review EPBC Referral 2006/2968 Assessment No. 1632 December 2006 at [http://www.epa.wa.gov.au/sites/default/files/PER\\_documentation/1632-PER-PLUTO%20LNG%20PER.pdf](http://www.epa.wa.gov.au/sites/default/files/PER_documentation/1632-PER-PLUTO%20LNG%20PER.pdf) and Page 342 of Scarborough Offshore Project Proposal Draft for Public Comment - June 2019 Page 342 at <https://www.nopsema.gov.au/environmental-management/offshore-project-proposals/offshore-project-proposals-public-comment/scarborough/>.

# Appendix

## Details of currently operating and proposed LNG facilities in Western Australian and Commonwealth Waters at full capacity

Project	Operator	Start	End date	LNG production Capacity (Mt)	Greenhouse Gas Emissions (MtCO <sub>2</sub> -e)	% above WA 2005 levels (68MtCO <sub>2</sub> -e)	% above Australian 2005 levels (532MtCO <sub>2</sub> -e) <sup>54</sup>
<b>Current projects</b>							
<b>Pre 2005</b>							
<b>North West Shelf (NWS) Project</b>	Woodside NWS joint venture (JV) (inc. BHP, BP, Chevron, Japan Australia LNG, Shell)	1989	Mid 2020s	(16.9)	(7.6) <sup>55</sup>	-	-
<b>Post 2005</b>							
<b>Pluto LNG</b>	Woodside JV (inc. Kansai Electric and Tokyo Gas)	2012	40 years <sup>56</sup>	4.9 <sup>57</sup>	2 <sup>58</sup>	2%	0.4%
<b>Gorgon LNG*</b>	Chevron JV (inc. ExxonMobil, Shell, Osaka Gas, Tokyo Gas and JERA)	2016	50 years <sup>59</sup>	15.6	9.74 <sup>60</sup>	15%	1.8%
<b>Wheatstone LNG</b>	Chevron JV (inc. KUPPEC, Woodside, Kyushu Electric, JERA)	2018	30 years <sup>61</sup>	8.9	10 <sup>62</sup>	15%	2%
<b>Prelude LNG<sup>Δ</sup></b>	Shell JV (inc. Inpex CPC, KOGAS)	2018	25 years <sup>63</sup>	3.6	2.3-2.7 <sup>64</sup>	4%	0.5%
<b>Total current</b>			<b>33</b>	<b>24.4</b>		<b>36%</b>	<b>4.7%</b>
<b>Burrup Hub including proposed expansion<sup>#</sup></b>							
<b>Browse Basin <sup>Δ*</sup></b> (Offshore emissions)	Woodside JV (inc. Shell, BP, PetroChina, Mitsui-Mitsubishi)	2021-2	2070	n/a	7 <sup>66</sup>	10%	1.3%
<b>NWS Project Extension</b> (Onshore processing)	Woodside NWS JV (inc. BHP, BP, Chevron, Japan Australia LNG, Shell)	2026	2070 <sup>65</sup>	16.9 <sup>##</sup>	7.6 <sup>66</sup>	11%	1.4%
<b>Scarborough <sup>Δ**</sup></b> (Offshore emissions)	Woodside/BHP	2023-30	2055	n/a	0.5 <sup>69</sup>	0.7%	0.1%
<b>Pluto</b> (Existing Train 1)	Woodside JV (inc. Tokyo Gas, Kansai Electric)	2012	40 years	(4.9)	(2)	(2%)	(0.4%)
<b>Pluto Expansion</b> (Proposed Train 2)	Woodside JV (inc. Tokyo Gas, Kansai Electric)		2055 <sup>67</sup>	12 <sup>68</sup>	2.1 <sup>69</sup>	3%	0.4%
<b>Total proposed</b>			<b>28.9</b>	<b>17.2</b>		<b>25%</b>	<b>3.2%</b>
<b>(Total Burrup Hub)</b>			<b>(28.9)</b>	<b>(19.2)</b>		<b>(28%)</b>	<b>(3.6%)</b>
<b>Total post 2005 (current and proposed projects)</b>			<b>61.9Mt</b>	<b>41.6MtCO<sub>2</sub>-e</b>		<b>61%</b>	<b>7.9%</b>

Note: The Burrup Hub and proposed expansion is the subject of a separate Clean State/CCWA briefing paper.

Note: Emissions from Ichthys (8.9MtCO<sub>2</sub>-e) and Crux (3MtCO<sub>2</sub>-e) located off WA but processed in NT not included but total a further 11.9MtCO<sub>2</sub>-e.

+ Chevron announced commencement of its geosequestration project on 8th August 2019 with the target to capture 80% of its reservoir gas, bringing emissions down to 5.1-6Mt with CCS. However for the purposes of this report, given the technology is unproven, the condition is not enforceable, and the time it will take to sequester a significant amount of carbon pollution, we have not included the claimed emission reduction as part of this report.

<sup>Δ</sup> LNG fields located in commonwealth waters but counted against WA emissions for the purpose of this study and as listed by the Office of the Chief Economist.

<sup>#</sup> The Burrup Hub Expansion includes a number of activities currently being advanced simultaneously: Scarborough; Pluto Train 2; Browse to NWS Project; NWS Project Extension and Pluto-NWS Interconnector. (Source: Woodside September 2019 Scarborough Overview)

<sup>\*</sup>The Browse project (\$24bn) is the largest untapped conventional gas resource in Australia. If approved, gas from the Browse basin will replace that of the North West Shelf, which is expected to run dry in the 2020s, and become the most emissions-intensive LNG development in Australia. It will emit an additional 7MtCO<sub>2</sub>e just from venting and pumping gas 900km to the NWS facility. It is being approved by stealth, and has been carved up into 7 separate components to conceal the true impact of its total emissions. Browse is being approved by stealth, by carving it up into 7 separate components.

<sup>\*\*</sup>The Scarborough project (\$1bn) will deliver an additional 4-5Mt to the existing Pluto facility onshore via a 340km pipeline and adding a second train onshore for processing. In total, the Pluto facility will process 12Mtpa onshore according to Woodside, and according to the project proposal just submitted to NOPSEMA, has been approved to emit a total of 4MtCO<sub>2</sub>-e combined.

<sup>##</sup> based on production capacity of the North West Shelf

## Get involved



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