Deloitte Access Economics

Advancing Australia

Harnessing our comparative energy advantage

Supplementary analysis

Australian Petroleum Production & Exploration Association Limited

November 2012

Deloitte.

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1 Introduction

The Australian oil and gas sector is in the midst of an unprecedented phase of investment involving some of the largest projects ever undertaken in this country. This new capacity will dramatically expand operational output over the next two decades, providing a substantial boost to national income and taxation revenue. On the back of current investments, Australia is set to become the world's second largest exporter of liquefied natural gas, strengthening economic linkages within our region.

These economic benefits were discussed at length in our recent analysis *Advancing Australia: Harnessing our comparative energy advantage*. As a supplement to that study, this note sets out additional analysis of the economic impacts of the industry over a longer timeframe to 2035. This has been undertaken to reflect the long term economic life of many existing and forthcoming gas projects. It also recognises that beyond the current pipeline of projects, a 'second wave' of new investment is being actively considered.

It should be noted that the extended analytical horizon (which spans a period 23 years from today) involves considerable uncertainty. In particular, it is very difficult to forecast economic growth, advances in technology, external political dimensions and other dynamic factors which will impact energy prices and the investment climate into the future. This analysis has therefore adopted a range of scenarios which represent current perspectives on plausible investment and price outcomes. The key objective for the analysis has been to highlight reasonable economic prospects for Australia's oil and gas industry in the decades ahead.

2 Investment and production scenarios

The analysis has been based around three discrete scenarios (see Table 2.1 and Table 2.2). Scenario 1 represents a more conservative outlook for longer term industry investment and production, while Scenarios 2 and 3 highlight the potential economic 'up-side' if currently identified oil and gas projects are successfully commercialised. The investment and production profiles for these scenarios are shown in Chart 2.1 and Chart 2.2. Scenarios are modelled to 2035.

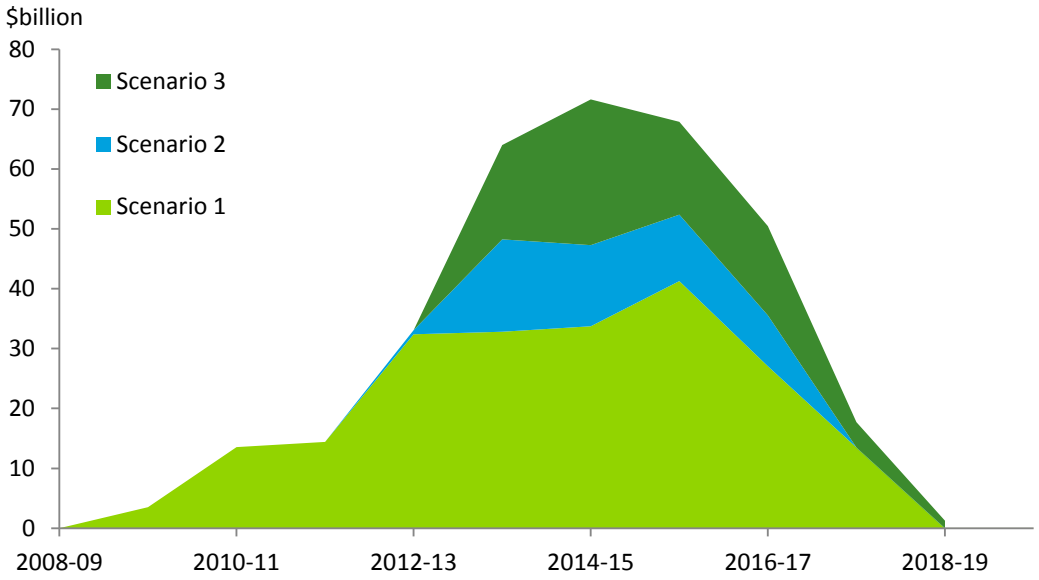
The economy-wide impacts of new oil and gas investment and production are modelled using the Deloitte Access Economics Regional General Equilibrium Model (DAE-RGEM). The model projects macroeconomic aggregates such as GDP and employment. In practical terms, changes in macroeconomic variables under the various scenarios are reported as percentage deviations to a 'reference case' or baseline.

Table 2.1: Incremental and total capex, 2035 scenarios

Scenario	Description	Incremental capex ($b)	Total capex ($b)
1 Central development	Includes all oil and gas projects (as identified in our previous analysis) which are either currently committed or considered highly likely to proceed.	--	217.0
2 Medium development	Includes all oil and gas projects in the central scenario as well as projects deemed 'under consideration' in Deloitte Access Economics Investment Monitor (indicating a final investment decision is expected relatively soon). Other projects where evidence suggests an investment decision is likely to be made relatively soon have also been included.	49.3	266.3
3 High development	Includes projects in the low and medium scenarios as well as other currently proposed projects that may be some time away from a final investment decision	76.0	342.3

Source: Deloitte Access Economics

Chart 2.1: Oil and gas industry capex, 2035 scenarios



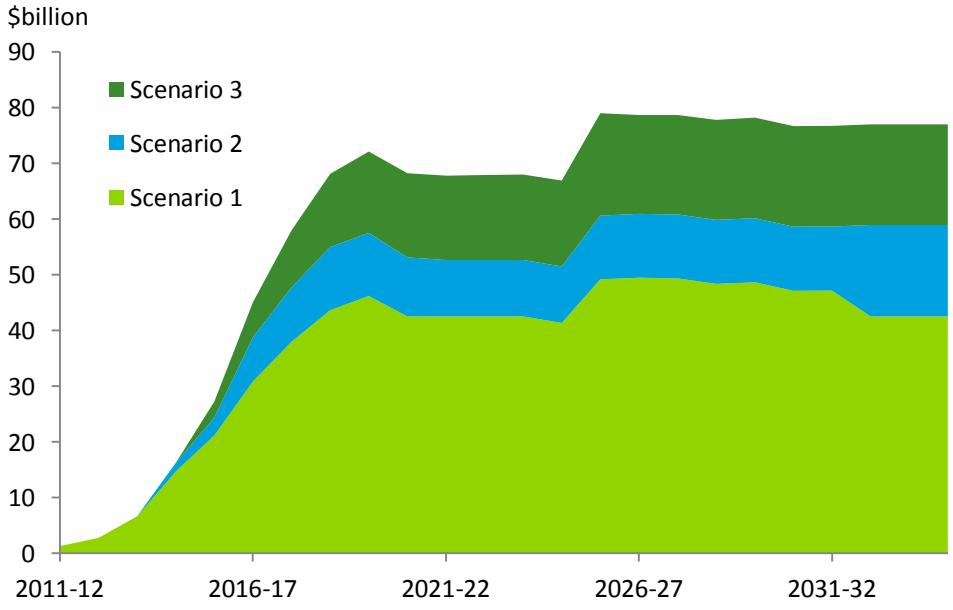
Source: Deloitte Access Economics

Table 2.2: Incremental and total opex, 2035 scenarios

Scenario	Incremental opex ($b)	Total opex ($b)
1 Central development	--	411.5
2 Medium development	211.1	622.6
3 High development	303.7	926.3

Source: Deloitte Access Economics

Chart 2.2: Oil and gas industry opex, 2035 scenarios



Source: Deloitte Access Economics

3 Conservative and stronger investment outlooks

Economic contribution

The economic contributions of the oil and gas industry over the three investment and production scenarios are shown in Tables 3.1-3.3. Under the stronger growth outlooks, the industry's total economic contribution is projected to peak to around 4.7% (Scenario 2) and 4.9% (Scenario 3) of the national economy in 2020, before moderating by the end of the modelling period.

Table 3.1: Industry economic contribution, Scenario 1 Central development

	NPV (2012-35)	2012	2015	2020	2025	2030	2035
Oil and gas							
Value added ($b)	599.9	32.3	37.6	64.7	60.1	67.1	61.2
Direct value added ($b)	509.5	27.4	31.9	55.0	51.1	57.0	52.0
Indirect value added ($b)	90.4	4.9	5.7	9.8	9.1	10.1	9.2
Direct value added, share of GDP (%)		1.9	2.0	2.9	2.3	2.2	1.8
Total value added, share of GDP (%)		2.2	2.4	3.5	2.7	2.6	2.1
Exploration							
Value added ($b)	12.1	1.0	1.1	0.8	1.1	1.2	1.5
Total							
Value added ($b)	612.0	33.3	38.7	65.5	61.2	68.2	62.7
Share of GDP (%)		2.3	2.4	3.5	2.8	2.7	2.2

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Table 3.2: Industry economic contribution, Scenario 2 Medium development

	NPV (2012-35)	2012	2015	2020	2025	2030	2035
Oil and gas							
Value added ($b)	680.7	32.3	39.0	75.5	69.8	78.0	76.9
Direct value added ($b)	578.2	27.4	33.1	64.1	59.3	66.3	65.3
Indirect value added ($b)	102.6	4.9	5.9	11.4	10.5	11.8	11.6
Direct value added, share of GDP (%)		1.9	2.1	3.4	2.7	2.6	2.3
Total value added, share of GDP (%)		2.2	2.4	4.0	3.2	3.1	2.7
Exploration							
Value added ($b)	14.1	1.0	1.3	1.3	1.3	1.4	1.8
Total							
Value added ($b)	694.8	33.3	40.3	76.8	71.1	79.5	78.7
Share of GDP (%)		2.3	2.5	4.7	3.2	3.1	2.7

Note: NPV uses a discount rate of 7%. Exploration figures have been adjusted from 2015 to account for the expected impact of additional projects on exploration levels relative to Scenario 1.
Source: Deloitte Access Economics

Table 3.3: Industry economic contribution, Scenario 3 High development

	NPV (2012-35)	2012	2015	2020	2025	2030	2035
Oil and gas							
Value added ($b)	786.9	32.3	39.0	89.4	84.5	95.2	94.1
Direct value added ($b)	668.3	27.4	33.1	76.0	71.7	80.9	79.9
Indirect value added ($b)	118.6	4.9	5.9	13.5	12.7	14.4	14.2
Direct value added, share of GDP (%)		1.9	2.1	4.1	3.3	3.2	2.8
Total value added, share of GDP (%)		2.2	2.4	4.8	3.9	3.8	3.2
Exploration							
Value added ($b)	17.1	1.0	1.7	1.3	1.7	1.8	2.3
Total							
Value added ($b)	804.0	33.3	40.7	90.8	86.2	97.1	96.4
Share of GDP (%)		2.3	2.5	4.9	3.9	3.8	3.3

Note: NPV uses a discount rate of 7%. Exploration figures have been adjusted from 2015 to account for the expected impact of additional projects on exploration levels relative to Scenario 1.
Source: Deloitte Access Economics

Economy-wide impacts

The broader macroeconomic impacts of the three investment and production scenarios over the period to 2035 are detailed in Tables 3.4-3.6. Under each longer term scenario, GDP and national employment increase significantly above the reference case.

Scenario 1 Central development

- GDP to 2035 is modelled to increase by about $357 billion in NPV terms.
- The employment impacts are projected to peak over the short term at the height of the construction phase, with FTE employment increasing by about 103,000 in 2012. The wage rate is also modelled to increase by about 1.3% at 2035.

Scenario 2 Medium development

- GDP is modelled to increase by about $397 billion in NPV terms.
- FTE employment increases by about 109,000 in 2015 when construction peaks. Compared to Scenario 1, employment is higher overall and remains elevated for substantially longer reflecting a 'second wave' of industry investment. The wage rate increases by about 1.4% at the end of the modelling period.

Scenario 3 High development

- Under this scenario the gains to the national economy are highest. GDP over the period to 2035 is modelled to increase by about $455 billion in NPV terms as more ambitious long term industry investments are commercialised.
- FTE employment is modelled to increase by about 167,000 in 2015 at the height of the project construction phase, reducing to just over 16,000 by 2035. Once again, wages are driven higher, increasing by about 2.0% at the end of the modelling period.

All scenarios, particularly the medium and high development cases, highlight the demand for labour associated with installation of new production capacity in the oil and gas sector. As noted in our earlier study, addressing labour constraints represents a core economic policy challenge for government — one which necessarily becomes more urgent in an environment where broader development costs are increasing.

Table 3.4: Economic impacts, Scenario 1 Central development

% deviation from baseline		2012	2015	2020	2025	2030	2035
GDP		1.4	2.2	2.3	1.9	1.8	1.6
Employment		1.0	0.7	0.3	0.1	0.1	0.1
Real wage		1.3	2.2	2.2	1.8	1.5	1.3
Consumption		0.1	2.2	2.1	1.6	1.5	1.4
Investment		1.4	14.3	4.7	1.8	1.6	1.4
Deviation from baseline	**NPV (2012-35)**	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**
GDP ($b)	356.7	21.0	34.3	40.2	37.8	37.4	36.9
Employment ('000 FTE)		103.1	77.8	39.0	11.6	10.8	9.9

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Table 3.5: Economic impacts, Scenario 2 Medium development

% deviation from baseline		2012	2015	2020	2025	2030	2035
GDP		1.4	2.6	2.2	2.1	2.0	1.7
Employment		1.0	1.0	0.2	0.2	0.1	0.1
Real wage		1.3	2.7	2.2	1.9	1.6	1.4
Consumption		0.1	2.8	2.0	1.8	1.7	1.6
Investment		1.4	19.3	3.2	2.6	1.7	1.2
Deviation from baseline	**NPV (2012-35)**	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**
GDP ($b)	396.6	20.6	41.6	38.9	43.0	43.2	42.2
Employment ('000 FTE)		100.0	109.2	18.8	19.0	13.2	11.1

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Table 3.6: Economic impacts, Scenario 3 High development

% deviation from baseline		2012	2015	2020	2025	2030	2035
GDP		1.4	3.4	2.6	2.5	2.2	1.9
Employment		1.0	1.6	0.1	0.1	0.1	0.1
Real wage		1.3	3.6	3.1	2.7	2.4	2.0
Consumption		0.1	3.8	2.5	2.4	2.3	2.2
Investment		1.4	27.2	2.3	1.9	0.8	1.4
Deviation from baseline	**NPV (2012-35)**	**2012**	**2015**	**2020**	**2025**	**2030**	**2035**
GDP ($b)	455.2	20.6	53.3	45.2	48.4	48.6	45.8
Employment ('000 FTE)		100.0	167.0	13.1	18.8	11.2	16.1

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Industry tax payments

Projected industry tax payments under both low and high royalty cases for the three longer term investment scenarios are shown below (see Tables 3.7-3.9).

Estimates are based on two tax parameter scenarios:

- A low case which assumes that a base level of resource taxation is paid over the modelling period at the rate of 2.5% of gross sales value for new oil and gas projects.
- A higher case which assumes on average that a higher level of petroleum royalties are paid over the period based on 5% of a project's gross sales value. Deloitte Access Economics regards the higher case as more likely, although this will depend on underlying cost structures for individual projects.

In 2010-11, the oil and gas industry paid approximately $7.9 billion in tax, consisting of $4.4 billion in corporate taxes and $3.5 billion in production taxes (which include royalties and excise, PRRT and other taxes).

Based on projections of future output to 2035 and a 5% royalty rate, the tax paid by the industry is forecast to rise by $13 billion in Scenario 1, compared with $15.8 billion and $18.9 billion for higher growth Scenarios 2 and 3 respectively.

It should be noted that the figures show relatively little deviation because higher royalty payments reduce the amount of company tax payable.

Table 3.7: Oil and gas tax payments, Scenario 1 Central development

Contribution ($b)	NPV (2012-35)	2012	2015	2020	2025	2030	2035
Low royalty scenario							
Corporate	86.3	4.9	5.6	9.1	8.5	9.4	8.7
Production taxes	41.3	3.8	3.3	3.7	3.6	3.8	3.6
Total	127.6	8.7	8.8	12.9	12.1	13.2	12.3
High royalty scenario							
Corporate	83.7	4.9	5.5	8.8	8.2	9.1	8.3
Production taxes	50.1	3.8	3.6	4.9	4.6	5.0	4.7
Total	133.8	8.7	9.1	13.7	12.8	14.1	13.0

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Table 3.8: Oil and gas tax payments, Scenario 2 Medium development

Contribution ($b)	NPV (2012-35)	2012	2015	2020	2025	2030	2035
Low royalty scenario							
Corporate	97.1	4.9	5.8	10.6	9.8	10.9	10.8
Production taxes	43.4	3.8	3.3	4.0	3.8	4.1	4.0
Total	140.5	8.7	9.1	14.6	13.6	15.0	14.8
High royalty scenario							
Corporate	93.8	4.9	5.6	10.1	9.4	10.5	10.3
Production taxes	54.4	3.8	3.7	5.4	5.1	5.6	5.5
Total	148.2	8.7	9.4	15.5	14.5	16.1	15.8

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Table 3.9: Oil and gas tax payments, Scenario 3 High development

Contribution ($b)	NPV (2012-35)	2012	2015	2020	2025	2030	2035
Low royalty scenario							
Corporate	111.3	4.9	5.8	12.4	11.8	13.2	13.1
Production taxes	46.2	3.8	3.3	4.4	4.2	4.5	4.5
Total	157.5	8.7	9.1	16.8	16.0	17.7	17.5
High royalty scenario							
Corporate	107.2	4.9	5.6	11.9	11.3	12.6	12.5
Production taxes	59.9	3.8	3.7	6.2	5.9	6.5	6.4
Total	167.1	8.7	9.4	18.1	17.2	19.1	18.9

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Appendix A: Analysis to 2025 — Conservative investment outlooks

As a complement to the very long term economic analysis (Scenarios 1-3), an additional scenario has been modelled over the period to 2025. The key objective of this analysis (Scenario 1A) is to highlight the impact of an LNG development failing to proceed.

The modelling has been based around two conservative outlooks for oil and gas project development and production.

- **Scenario 1 Central development** — Assumes the commencement of all oil and gas projects (as identified in our previous analysis) which are either currently committed or considered highly likely to proceed.
- **Scenario 1A Low LNG development** — Includes all projects in Scenario 1, with the exception of a hypothetical 'average-scale' LNG development.

The capital expenditure and operational revenue profiles for these two 2025 scenarios are shown in Table A.1 and Table A.2 (see also Chart A.1 and Chart A.2).

Table A.1: Incremental and total capex, 2025 scenarios

Scenario	Incremental capex ($b)	Total capex ($b)
1 Central development	--	217.0
1A Low LNG development	- 23.2	193.8

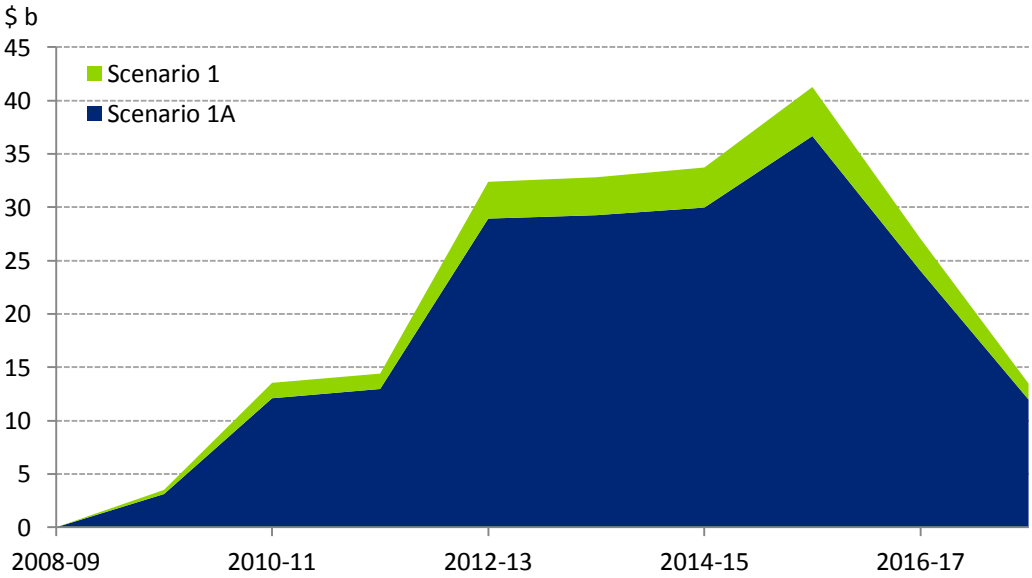
Source: Deloitte Access Economics

Table A.2: Incremental and total opex, 2025 scenarios

Scenario	Incremental opex ($b)	Total opex ($b)
1 Central development	--	411.5
1A Low LNG development	- 50.1	361.4

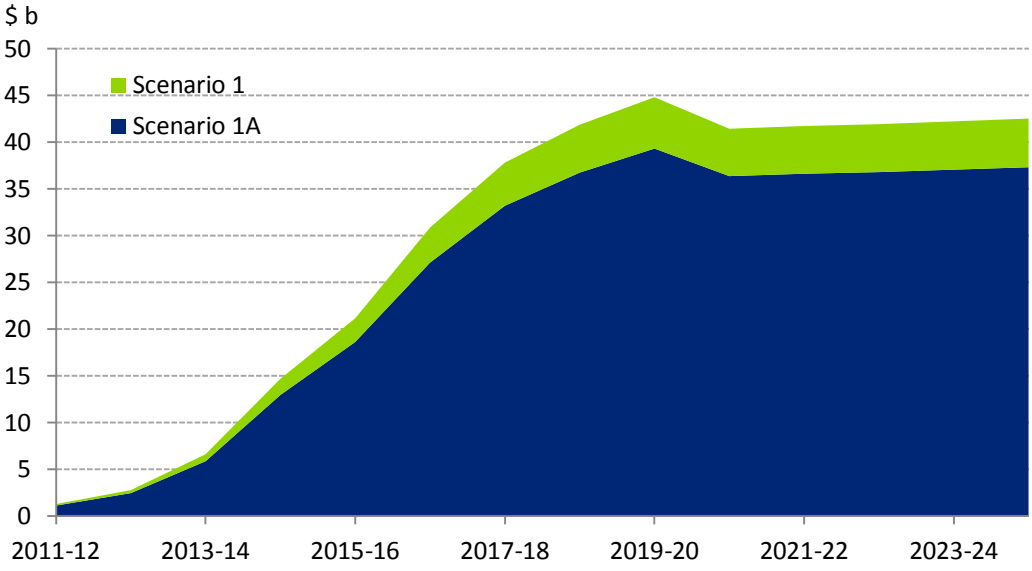
Source: Deloitte Access Economics

Chart A.1: Oil and gas industry capex, Scenario 1 and Scenario 1A



Source: Deloitte Access Economics

Chart A.2: Oil and gas industry opex, Scenario 1 and Scenario 1A



Source: Deloitte Access Economics

Economic contribution estimates

The economic contributions of the oil and gas industry over the 2025 modelling scenarios are shown in Table A.3 and Table A.4. The industry's total economic contribution is projected to peak around 3.5% at 2020 under Scenario 1. In contrast, the peak of the economic contribution of the industry is marginally lower under Scenario 1A, around 3.2% at 2020.

Table A.3: Industry economic contribution, Scenario 1 Central development

	NPV (2012-25)	2012	2015	2020	2025
Oil and gas					
Value added ($b)	421.0	32.3	37.6	64.7	60.1
Direct value added ($b)	357.6	27.4	31.9	55.0	51.1
Indirect value added ($b)	63.5	4.9	5.7	9.8	9.1
Direct value added, share of GDP (%)		1.9	2.0	2.9	2.3
Total value added, share of GDP (%)		2.2	2.4	3.5	2.7
Exploration					
Value added ($b)	9.1	1.0	1.1	0.8	1.1
Total					
Value added ($b)	430.1	33.3	38.7	65.5	61.2
Share of GDP (%)		2.3	2.4	3.5	2.8

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Table A.4: Industry economic contribution, Scenario 1A Low LNG development

	NPV (2012-25)	2012	2015	2020	2025
Oil and gas					
Value added ($b)	392.7	32.1	35.9	58.2	56.3
Direct value added ($b)	333.6	27.3	30.5	49.4	47.8
Indirect value added ($b)	59.2	4.8	5.4	8.8	8.5
Direct value added, share of GDP (%)		1.9	1.9	2.6	2.2
Total value added, share of GDP (%)		2.2	2.2	3.1	2.6
Exploration					
Value added ($b)	9.1	1.0	1.1	0.8	1.1
Total					
Value added ($b)	401.8	33.1	37.0	59.0	57.3
Share of GDP (%)		2.3	2.3	3.2	2.6

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Economy-wide impacts

The economic impacts of these two outlooks for the oil and gas industry to 2025 are shown in Table A.5 and Table A.6.

Scenario 1 Central development

- Over the period to 2025 GDP is modelled to increase by about $261.4 billion in NPV terms.
- FTE employment increases by about 103,000 in 2012 at the height of the construction phase, reducing to about 11,500 by 2025. Wages are also projected to be elevated throughout the next two decades, increasing by about 1.8% at 2025.

Scenario 1A Low LNG development

- Compared to Scenario 1, there are reduced economic gains from a lower (but still substantial) project investment pipeline.
- GDP is modelled to increase by about $234.4 billion in NPV terms. In contrast to Scenario 1, there is a reduction in overall economic output of around $27 billion in NPV terms associated with the cancellation of an 'average-scale' LNG project.
- FTE employment is modelled to increase by about 91,000 in 2012 at the height of the construction phase, reducing to 9,300 by 2025. Again, while overall employment remains elevated, it is lower than Scenario 1. This reduction is most prominent over the medium term while construction is occurring. Employment under Scenario 1A is 11,700 FTEs and 12,700 FTEs lower than Scenario 1 at 2012 and 2015 respectively.

Table A.5: Economic impacts, Scenario 1 Central development

% deviation from baseline		2012	2015	2020	2025
GDP		1.4	2.2	2.3	1.9
Employment		1.0	0.7	0.3	0.1
Real wage		1.3	2.2	2.2	1.8
Consumption		0.1	2.2	2.1	1.6
Investment		1.4	14.3	4.7	1.8
Deviation from baseline	**NPV (2012-25)**	**2012**	**2015**	**2020**	**2025**
GDP ($b)	261.4	21.0	34.3	40.2	37.8
Employment ('000 FTE)		103.1	77.8	39.0	11.6

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Table A.6: Economic impacts, Scenario 1A Low LNG development

% deviation from baseline		2012	2015	2020	2025
GDP		1.4	2.2	2.3	1.9
Employment		1.0	0.7	0.3	0.1
Real wage		1.3	2.2	2.2	1.8
Consumption		0.1	2.2	2.1	1.6
Investment		1.4	14.3	4.7	1.8
Deviation from baseline	**NPV (2012-25)**	**2012**	**2015**	**2020**	**2025**
GDP ($b)	234.4	18.8	30.1	34.3	31.9
Employment ('000 FTE)		91.4	65.1	10.7	9.3

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Industry tax payments

Industry tax payments under the conservative investment scenarios to 2025 for both the low and high royalty tax cases are shown in Table A.7 and Table A.8. These estimates include tax paid by current operating projects.

Based on projections of future output, the tax paid by the industry is forecast to increase by $12.8 billion in Scenario 1 and $12.1 billion in Scenario 1A based on the 5% royalty rate.

Table A.7: Oil and gas tax payments, Scenario 1 Central development

Contribution ($b)	NPV (2012-25)	2012	2015	2020	2025
Low royalty scenario					
Corporate	67.5	4.9	5.6	9.1	8.5
Production taxes	32.4	3.8	3.3	3.7	3.6
Total	99.9	8.7	8.8	12.9	12.1
High royalty scenario					
Corporate	65.4	4.9	5.5	8.8	8.2
Production taxes	39.3	3.8	3.6	4.9	4.6
Total	104.7	8.7	9.1	13.7	12.8

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

Table A.8: Oil and gas tax payments, Scenario 1A Low LNG development

Contribution ($b)	NPV (2012-25)	2012	2015	2020	2025
Low royalty scenario					
Corporate	57.3	4.8	5.3	8.3	8.0
Production taxes	30.4	3.8	3.2	3.5	3.5
Total	87.7	8.7	8.6	11.8	11.5
High royalty scenario					
Corporate	55.8	4.8	5.2	8.0	7.7
Production taxes	35.2	3.8	3.6	4.5	4.4
Total	91.1	8.7	8.8	12.5	12.1

Note: NPV uses a discount rate of 7%
Source: Deloitte Access Economics

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