



INVESTORS *for*  
PARIS COMPLIANCE

INVESTOR BRIEF:

## ESTIMATING ENBRIDGE'S SCOPE 3 EMISSIONS

### ABOUT INVESTORS FOR PARIS COMPLIANCE

Investors for Paris Compliance (I4PC) is a shareholder advocacy organization that works to hold Canadian publicly-listed companies accountable to their net zero commitments. More information can be found [here](#).

### INTRODUCTION

This year, Investors for Paris Compliance (I4PC) is re-filing a shareholder proposal with Enbridge regarding its scope 3 emissions. At issue is the company's contention that it does not need to take responsibility for the end use emissions of the fossil fuels it transports despite those emissions being material to its business success. Last year the proposal received 24.5% support, with a further 4% abstaining, for a total of 28.5% breaking with management.

Because the company refuses to calculate and disclose these emissions, I4PC has calculated our own estimate using publicly available metrics coupled with accepted emissions factors. This is a rough calculation that the company can and should improve on using better data, but it provides a ballpark estimate that is useful primarily to show the trend line — one that continues to rise, calling into question the company's commitment to transition.

## ESTIMATING SCOPE 3 END USE EMISSIONS FOR ENBRIDGE

Enbridge operates gas utilities and does report end use emissions — category 11, "use of sold products"<sup>1</sup> — from these operations. But the company does not report the same category of emissions from its vast network of transmission pipelines transporting fossil fuel liquids and gas.

To estimate these emissions, we used publicly available data and took a conservative approach to assumptions, values, and calculations. This approach has likely resulted in emissions being underestimated.

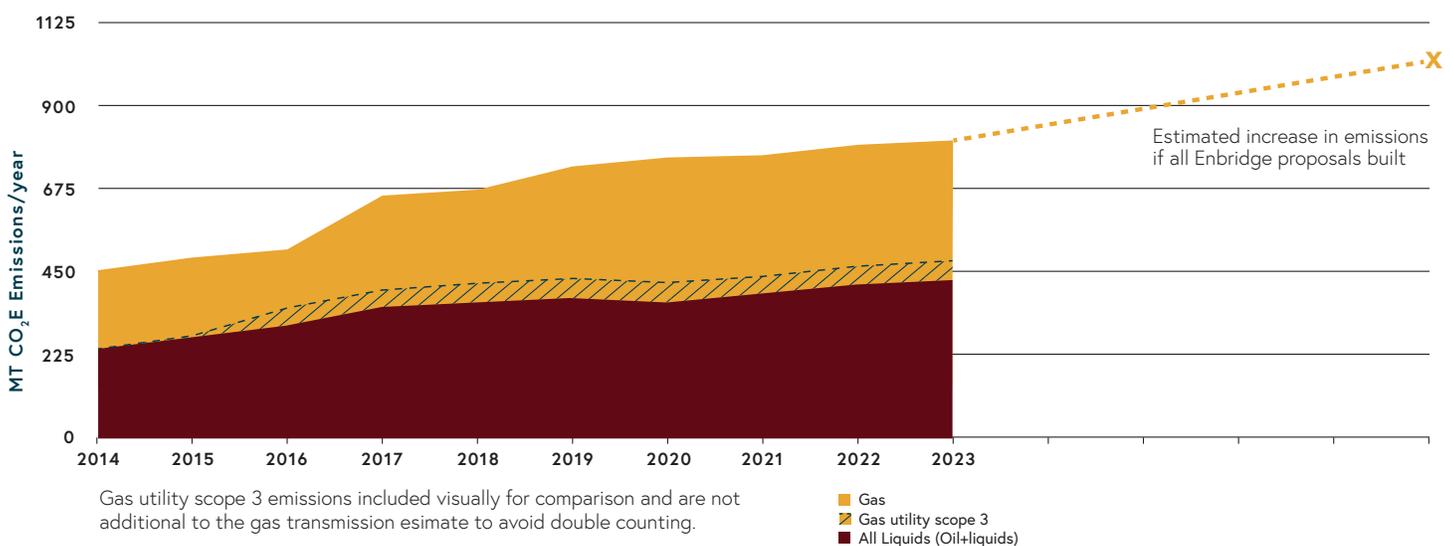
Natural gas metrics were collected from Enbridge publications and reports, and downstream emissions calculated using emission factors from the US EPA's Greenhouse Gases Equivalencies Calculator.<sup>2</sup> For total natural gas volumes transported we excluded the volumes from those Enbridge's gas transmission pipelines (Algonquin Gas Transmission, Maritimes & Northeast and Vector Pipelines) that are downstream of larger pipelines (Texas Eastern Transmission and Alliance Pipelines).<sup>3</sup> Additionally, natural gas volumes were discounted by annual estimated non-energy use of natural gas in the US.<sup>4</sup>

Oil volume metrics were collected from the Canada Energy Regulator (CER), using data from the Enbridge Mainline and Normal Wells pipelines.<sup>5</sup> Downstream emission coefficients were collected from the Rocky Mountain Institute's Oil Climate Index.<sup>6</sup> As these categorize liquid types differently, a conservative approach was taken to applying coefficients to the CER's metrics, more heavily weighing lower emissions liquid types.

There is more detail about our methodology in the appendix.

- 1 GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard <https://ghgprotocol.org/corporate-value-chain-scope-3-standard/>.
- 2 <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>
- 3 <https://www.enbridge.com/map#map:infrastructure,gaspipelinetrans>
- 4 Annual US non-energy use of natural gas 2014-2021 <https://unstats.un.org/unsd/energystats/dataPortal>
- 5 <https://www.cer-rec.gc.ca/en/data-analysis/facilities-we-regulate/pipeline-profiles/index.html>
- 6 Oil Climate Index plus Gas <https://ociplus.rmi.org/>

### ESTIMATING ENBRIDGE SCOPE 3 CATEGORY 11 EMISSIONS



In terms of results, the estimate is 20 times more than Enbridge's currently reported end use emissions. Furthermore, that gap will grow significantly with Enbridge's plans to grow its gas transmission capacity by approximately 10.8 bcf/day,<sup>7</sup> which would result in an additional 216 MT of end use emissions.

Note that even Enbridge's liquids-related scope 3 category 11 emissions continue to rise.

For a sense of scale, note that Enbridge has calculated about a 0.5 MT reduction in scope 3 emissions through its investments in renewable natural gas, demand side management with its utility customers and renewable energy.

In total, Enbridge's scope 3 category 11 emissions have grown by about 76% since 2014, with gas-related emissions growing by about 75%. If all planned, proposed and/or approved future gas transmission projects proceed, Enbridge's scope 3 category 11 emissions would rise by an additional 27% from 2023 levels.

## SCOPE 3 EMISSIONS AND THE ENERGY TRANSITION

In the oil and gas sector, greenhouse gas emissions occur from the lifecycle of a product from production (upstream) through transportation (midstream) to final use (downstream). About 80% of emissions comes from use or combustion of the product<sup>8</sup> and are known as scope 3 "category 11" emissions,<sup>9</sup> named by the GHG Protocol.

Scope 3 emissions are an indicator of a company's positioning in the energy transition. Scope 1 and 2 emissions are more about a company's operations, and scope 3 emissions are more about its market. The global energy transition driven by rapidly progressing technological shifts to low or zero emitting energy technologies is progressing at a pace much faster than predicted.<sup>10</sup> This transition will see oil and gas demand plateau and then decrease as capital is reallocated to non-fossil fuel sources of energy.<sup>11</sup>

A company with high or increasing scope 3 emissions is at higher business risk during this transition than one with low or decreasing scope 3 emissions. With just over half of oil and gas companies reporting scope 3 emissions in their CDP reports,<sup>12</sup> this represents a significant blind spot to oil and gas investors who require complete disclosure regarding material risk.

The trend line of Enbridge's scope 3 category 11 emissions shows that despite a few renewable energy projects, the company is not transitioning — indeed, it is doubling down on the fossil fuel economy.

7 <https://www.enbridge.com/projects-and-infrastructure>

8 CDP Technical Note: Relevance of Scope 3 Categories by Sector." [https://cdn.cdp.net/cdp-production/cms/guidance\\_docs/pdfs/000/003/504/original/CDP-technical-note-scope-3-relevance-by-sector.pdf](https://cdn.cdp.net/cdp-production/cms/guidance_docs/pdfs/000/003/504/original/CDP-technical-note-scope-3-relevance-by-sector.pdf)

9 GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard

10 <https://rmi.org/the-energy-transition-in-five-charts-and-not-too-many-numbers/>

11 <https://rmi.org/insight/the-great-reallocation/>

## REPORTING STANDARDS

There is relevant scope 3 emissions reporting guidance from standards such as the CDP, the GHG Protocol, the Global Reporting Initiative (GRI) and investor-led Climate Engagement Canada (CEC). All of these bodies provide specific guidance on the need for company's participating in their processes to report material scope 3 category 11 emissions:

- CDP provides explicit guidance to midstream companies that scope 3 reporting should include category 11 emissions for "from the use of goods and services sold by the reporting company."<sup>13</sup>
- The GHG Protocol, cited by the CDP as providing guidance for the CDP climate questionnaire, encourages companies to report scope 3 emissions based on the relative size of the scope 3 emissions and the company's business goals, two criteria that apply well in this situation given the large scale of emissions in question and Enbridge's planned gas transmission expansion.<sup>14</sup>
- Enbridge cites the GRI Universal Standards, and GRI 11 Oil and Gas Sector Standard as the standard for its Sustainability report.<sup>15</sup> These two GRI standards are clear that companies should report on scope 3 emissions including scope 3 emissions "related to the use of oil and gas products."<sup>16</sup>
- Enbridge is a target of the investor-led Climate Engagement Canada which has set a benchmark indicating that use of sold products is applicable for scope 3 calculation for oil and gas distribution companies.<sup>17</sup>

## CONCLUSION

Enbridge's liquids and gas transmission represent 84% of its earnings.<sup>18</sup> The category 11 emissions with use of these products enables Enbridge's business. These emissions are inseparable from its success in its current model.

In 2020 Enbridge said, "our long-term goal is to expand the scope of our public disclosure of Scope 3 emissions within the next 2-3 years."<sup>19</sup> Yet in 2024, more than three years later, the company has not only failed to follow through, but is actively disputing the need to report by opposing the I4PC shareholder proposal.

Enbridge is failing to accurately and completely report its scope 3 emissions by omitting the category 11 emissions related to the end use emissions associated with its pipeline and transmission services. This exclusion omits and obscures a growing source of risk that is critical for the company, shareholders, and others in assessing Enbridge's relative position in a dynamic and changing energy market.

- 12 CDP Technical Note: Relevance of Scope 3 Categories by Sector [https://cdn.cdp.net/cdp-production/cms/guidance\\_docs/pdfs/000/003/504/original/CDP-technical-note-scope-3-relevance-by-sector.pdf](https://cdn.cdp.net/cdp-production/cms/guidance_docs/pdfs/000/003/504/original/CDP-technical-note-scope-3-relevance-by-sector.pdf)
- 13 CDP Technical Note: Relevance of Scope 3 Categories by Sector [https://cdn.cdp.net/cdp-production/cms/guidance\\_docs/pdfs/000/003/504/original/CDP-technical-note-scope-3-relevance-by-sector.pdf](https://cdn.cdp.net/cdp-production/cms/guidance_docs/pdfs/000/003/504/original/CDP-technical-note-scope-3-relevance-by-sector.pdf)
- 14 GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, at 12.
- 15 Enbridge 2022 Sustainability report pg 4 "Reporting Standards" [https://www.enbridge.com/~/\\_media/Enb/Documents/Reports/Sustainability-Report-2022/Enbridge\\_SR\\_2022.pdf](https://www.enbridge.com/~/_media/Enb/Documents/Reports/Sustainability-Report-2022/Enbridge_SR_2022.pdf)
- 16 GRI 11 Oil and Gas Sector Standard <https://globalreporting.org/pdf.ashx?id=12336>
- 17 CEC Net Zero Benchmark, at 7.
- 18 Enbridge 2023 10-K report <https://enbridge.gcs-web.com/static-files/1d0a0615-95ac-43c0-b9b4-68b044bf1aa0>
- 19 Enbridge CDP 2020-2023 reports

## APPENDIX

### ENBRIDGE SCOPE 3 CATEGORY 11 EMISSIONS (MT CO2E)

PRODUCT TYPE	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
All Liquids	241.22	277.37	306.60	355.50	368.70	379.00	368.20	390.50	418.20	428.70
Gas	215.61	212.96	207.40	302.30	308.40	357.00	392.40	376.40	376.40	376.40
Total category 11 emissions	456.83	490.33	514.01	657.87	677.17	736.16	760.77	767.02	794.76	805.24
Gas utility scope 3	not reported	not reported	45.80	44.83	49.80	53.10	53.10	47.30	48.30	53.80

### ENBRIDGE FUTURE SCOPE 3 CATEGORY 11 EMISSIONS

PLANNED GAS EXPANSION	CAPACITY	TARGET START DATE	LOCATION	ANNUAL SCOPE 3 CATEGORY 11 EMISSIONS
Venice Extension Project	1.26	2024	Texas	25.3
Aspen Point Program	0.535	2026	BC	10.7
Rio Bravo Pipeline Project	4.5	Proposed, 2026	Texas	90.3
Sunrise Expansion Program	0.3	Proposed, 2028	BC	6.0
Westcoast Connector Gas Transmission Project	4.2	Approved	BC	84.3
Total				216.7

### FURTHER DETAILS ABOUT ESTIMATION METHODOLOGY

The estimates for Enbridge's scope 3 category 11 emissions are for Enbridge's natural gas and oil/liquids transmission assets, natural gas and oil storage, natural gas processing.

Because there is a higher level of uncertainty with publicly available data for these estimates, a conservative approach was applied to assumptions, values, and procedures. This approach has likely resulted in emissions being underestimated.

### Natural Gas Transmission Estimates:

- Sources for Enbridge's transported volume of natural gas came from a variety of sources as there is no single publicly reported source for Enbridge's natural gas transmission. We used Enbridge 10-k reports plus other Enbridge reports and documents to find total volumes. In years where volumes were not reported, the previous year's volumes were used as assumed volume.
- Natural gas emissions were calculated using emission factors from the US EPA's Greenhouse Gases Equivalencies Calculator <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>
- We discounted total natural gas volumes by 9.7% to account for non-energy use of natural gas in the US (source: <https://unstats.un.org/unsd/energystats/dataPortal>)
- We did not include volumes of gas transported through Algonquin Gas Transmission (3.09 bcf/day) and Maritimes & Northeast Pipelines (.8 bcf/day) as the conservative approach is to assume that these pipelines are supplied by Enbridge's Texas Eastern Transmission Pipeline.
- We discounted the volumes of gas transported through the Vector Pipeline (calculated as .945 bcf/day) as the conservative approach is to assume that this pipeline is supplied by Alliance Pipeline, 50% owned by Enbridge (Enbridge's share is .8 bcf/day).
- Based on a conservative approach, natural gas volumes used to calculate scope 3 category 11 emission were 4.7 bcf/day less than what Enbridge states its transmission capacity was in 2022.
- In 2017 natural gas emissions increased as a result of Enbridge's acquisition of Spectra Energy.

### Oil and Liquids Estimates:

- Data regarding the volume of oil and liquids that Enbridge moved through its transmission assets were collected from the CER. Data is inclusive of the Enbridge Mainline and Enbridge Norman Wells. Throughput metrics from CER were converted from MMb/d to b/d. See table 1 below.
- Emissions coefficients for oil and liquids were calculated as follows:
  - Baseline emissions per barrel was collected from OCI (see table 2 below), which offers a breakdown of emissions per barrel by oil and liquid type throughout the value chain, in Kg/b.
  - To calculate for downstream emissions, upstream and midstream emissions sources were removed, leaving downstream carbon and methane emissions by oil and liquid type, as well as by source.

- Methane emissions were adjusted to CO<sub>2</sub>e using a multiplier of 25.
- Where OCI offers additional stratification by source, a mean was calculated for all oil and liquid types with more than one source. See table 3 below.
- Where OCI and CER categorize oil and liquid types differently, the following categorization was applied:
  - ▶ 'Domestic Heavy' as defined by the CER included OCI emissions coefficients on 'Sour Heavy Oil' and 'Sour Extra Heavy Oil.'
  - ▶ 'Domestic Light/NGL' as defined by the CER included OCI emissions coefficients on 'Sweet Light Oil,' 'Sour Light Oil,' and 'Sour Wet Gas.'
  - ▶ 'Foreign Light' and 'Domestic Light' as defined by the CER included OCI emissions coefficients on 'Sweet Light Oil' and 'Sour Light Oil.'
- A conservative subtotal coefficient was calculated as follows:
  - ▶ The mean of all included OCI oil types in a given category was calculated.
  - ▶ That mean was given a 0.25 weighting in the coefficient, and the resource type from each category with the lowest emissions intensity was given a 0.75 weighting.
- Total emissions were calculated as follows:
  - A final coefficient was calculated taking the subtotal coefficient and:
    - ▶ Multiplying by 365 to convert b/d to b/a.
    - ▶ Dividing by 1000 to convert KgCO<sub>2</sub>/b to MtCO<sub>2</sub>/b.
  - The coefficient for each oil and liquid type was multiplied by capacity to create the final calculation.

**TABLE 1**

Source: <https://www.cer-rec.gc.ca/en/data-analysis/facilities-we-regulate/pipeline-profiles/index.html>  
<https://ociplus.rmi.org/>

PIPELINE	TYPE	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Enbridge Mainline	Domestic Heavy (B/d)	937000	1118000	1341000	1490000	1639000	1685000	1680000	1684000	1907000	2070000	2105000
Enbridge Mainline	Domestic Light/NGL (B/d)	801000	876000	782000	780000	769000	893000	938000	881000	846000	885000	921000
Enbridge Mainline	Foreign Light (B/d)	0	0	61400	135000	121000	51400	85400	56600	10200	2000	9300
Norman Well	Domestic Light (B/d)	13800	13600	12300	11000	1300	3000	8700	6600	7400	6500	4900

TABLE 2

Source: <https://www.cer-rec.gc.ca/en/data-analysis/facilities-we-regulate/pipeline-profiles/index.html>  
<https://ocplus.rmi.org/>

FIELD NAME	ASSAY NAME	LOCATION	DEFAULT REFINERY CONFIGURATION	OIL OR GAS OR CONDENSATE	RESOURCE TYPE	SOUR OR SWEET	DOWNSTREAM METHANE INTENSITY (KGCH4/BOE)	DOWNSTREAM METHANE INTENSITY CO2E (KGCO2E/BOE)	DOWNSTREAM METHANE COMBUSTION ONLY	DOWNSTREAM METHANE COMBUSTION ONLY CO2E	DOWNSTREAM: PLASTICS DISPOSAL (KGCO2/BOE)	DOWNSTREAM: GASOLINE FOR CARS (KGCO2/BOE)	DOWNSTREAM: JET FUEL FOR PLANES (KGCO2/BOE)	DOWNSTREAM: DIESEL FOR TRUCKS AND ENGINES (KGCO2/BOE)	DOWNSTREAM: FUEL OIL FOR BOILERS (KGCO2/BOE)	DOWNSTREAM: PETROLEUM COKE FOR POWER (KGCO2/BOE)	DOWNSTREAM: LIQUID HEAVY ENDS FOR SHIPS (KGCO2/BOE)	DOWNSTREAM: NATURAL GAS LIQUIDS (KGCO2/BOE)	DOWNSTREAM: LIQUEFIED PETROLEUM GASES (KGCO2/BOE)	DOWNSTREAM: PETROCHEMICAL FEEDSTOCKS (KGCO2/BOE)	DOWNSTREAM: NATURAL GAS (KGCO2/BOE)	DOWNSTREAM: CARBON DIOXIDE INTENSITY (KGCO2/BOE)	DOWNSTREAM CO2E TOTAL
Bakken-CA	Midale_Solomon	Onshore	Medium Conversion	Oil	Light Oil	Sour Oil	0.021134976	0.5283744	0.021134974	0.52837435	14.78510813	97.85282594	44.17759399	102.569689	10.79929391	4.02E-10	56.85052372	19.92431093	6.467814088	4.538420164	7.239961833	360.6671216	361.195496
Bakken-CA	Midale_Solomon	Onshore	Medium Conversion	Oil	Light Oil	Sour Oil	0.021064773	0.526619325	0.021064771	0.526619275	14.87303219	97.85282594	44.17759399	102.569689	10.79929391	4.02E-10	56.85052372	19.92431093	6.467814088	4.538420164	7.239961833	360.7550456	361.2816649
Cardium	Light Sour Blend_Crude Monitor_New	Onshore	Medium Conversion	Gas	Wet gas	Sour Gas	0.266644346	6.66610865	0.012434917	0.310872925	3.244856018	43.735729	21.571374	45.00374615	7.172318537	1.61E-10	52.82684043	17.25165573	2.448442749	0.978792847	158.9857674	352.24073	358.9068387
Cardium	Light Sour Blend_Crude Monitor_New	Onshore	Medium Conversion	Gas	Wet gas	Sour Gas	0.266628888	6.6657222	0.012419459	0.310486475	3.26401081	43.735729	21.571374	45.00374615	7.172318537	1.61E-10	52.82684043	17.25165573	2.448442749	0.978792847	158.9857674	352.2598848	358.925607
Christina Lake	CHRISTINA LAKE_Solomon	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.031369449	0.784236225	0.031369448	0.7842362	14.38468617	102.3934352	36.45591739	141.8807308	14.59481954	30.4961344	54.89881059	0	7.734475388	5.590080246	0	402.8390095	403.6232457
Christina Lake	CHRISTINA LAKE_Solomon	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.031304601	0.782615025	0.0313046	0.782615	14.47988166	102.3934352	36.45591739	141.8807308	14.59481954	30.4961344	54.89881059	0	7.734475388	5.590080246	0	402.934205	403.71682
Cold Lake	Cold Lake Blend_Solomon	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.031971087	0.799277175	0.031971086	0.79927715	14.3135656	101.080632	37.07960426	138.0478454	14.63800375	32.23860884	57.90471473	0	7.851693078	6.03168946	0	403.1546677	403.9539449
Cold Lake	Cold Lake Blend_Solomon	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.031907939	0.797698475	0.031907938	0.79769845	14.41214672	101.080632	37.07960426	138.0478454	14.63800375	32.23860884	57.90471473	0	7.851693078	6.03168946	0	403.2532488	404.0509473
Duvernay	Mixed Sweet Blend_Crude Monitor	Onshore	Hydroskimming	NGL/Condensate	Condensate	Sweet Gas	0.173498293	4.337457325	0.015684598	0.39211495	2.928924417	49.4232329	25.93084671	50.83499107	10.78094824	1.91E-10	96.23121461	29.78915918	2.394500149	5.546910284	95.04328845	363.3571057	367.694563
Duvernay	Mixed Sweet Blend_Crude Monitor	Onshore	Hydroskimming	NGL/Condensate	Condensate	Sweet Gas	0.173498052	4.3374513	0.015684357	0.392108925	2.984538231	49.4232329	25.93084671	50.83499107	10.78094824	1.91E-10	96.23121461	29.78915918	2.394500149	5.546910284	95.04328845	363.4127195	367.7501708
Firebag	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037875302	0.94688255	0.037875302	0.94688255	13.10517609	94.41390564	28.19128963	141.2707233	15.38826199	48.20736098	81.6083048	0	9.246909462	8.687735494	0	431.4319319	432.3788145
Firebag	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037826792	0.9456698	0.037826792	0.9456698	13.22144684	94.41390564	28.19128963	141.2707233	15.38826199	48.20736098	81.6083048	0	9.246909462	8.687735494	0	431.5482027	432.4938725
Foothills	Canada Hibernia_Exxon	Onshore	Medium Conversion	NGL/Condensate	Condensate	Sweet Gas	0.022839204	0.5709801	0.02255193395	0.5637983488	9.676879184	60.48096051	31.40615875	78.74543496	7.471114833	4.52E-10	82.33598695	55.81545495	4.91250701	17.26420669	0.230230779	331.0747279	331.645708
Foothills	Canada Hibernia_Exxon	Onshore	Medium Conversion	NGL/Condensate	Condensate	Sweet Gas	0.022835284	0.5708821	0.02254801395	0.5637003488	9.851892264	60.48096051	31.40615875	78.74543496	7.471114833	4.52E-10	82.33598695	55.81545495	4.91250701	17.26420669	0.230230779	331.249741	331.8206231
Fort Hills	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037450533	0.936263325	0.037450534	0.93626335	13.0214093	92.66439137	27.66889769	138.65294	15.10311348	47.31406602	80.09608166	4.676444808	9.075561821	8.526749492	0	428.2729062	429.2091695
Fort Hills	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037402023	0.935050575	0.037402024	0.9350506	13.13607023	92.66439137	27.66889769	138.65294	15.10311348	47.31406602	80.09608166	4.676444808	9.075561821	8.526749492	0	428.3875671	429.3226177
Foster Creek	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037875302	0.94688255	0.037875302	0.94688255	13.10517609	94.41390564	28.19128963	141.2707233	15.38826199	48.20736098	81.6083048	0	9.246909462	8.687735494	0	431.4319319	432.3788145
Foster Creek	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037826792	0.9456698	0.037826792	0.9456698	13.22144684	94.41390564	28.19128963	141.2707233	15.38826199	48.20736098	81.6083048	0	9.246909462	8.687735494	0	431.5482027	432.4938725
Hebron	Hebron 2018_Solomon	Offshore	Deep Conversion	Oil	Heavy Oil	Sour Oil	0.030687606	0.76719015	0.030687607	0.767190175	11.60387631	77.21910823	44.7331626	168.5902771	16.32451211	27.67317739	57.85524851	5.125140969	8.327803853	6.935176317	0	417.4523071	418.2194973
Hebron	Hebron 2018_Solomon	Offshore	Deep Conversion	Oil	Heavy Oil	Sour Oil	0.030642426	0.76606065	0.030642427	0.766060675	11.70060374	77.21910823	44.7331626	168.5902771	16.32451211	27.67317739	57.85524851	5.125140969	8.327803853	6.935176317	0	417.5490345	418.3150952
Hibernia	Canada Hibernia_Statoil	Offshore	Hydroskimming	Oil	Light Oil	Sweet Oil	0.022191255	0.554781375	0.022191254	0.55478135	9.045360556	70.69836276	45.53455319	90.66902877	19.71888756	4.25E-10	208.773831	9.926279868	4.067348298	1.526078244	0	458.433652	458.9884334
Hibernia	Canada Hibernia_Statoil	Offshore	Hydroskimming	Oil	Light Oil	Sweet Oil	0.022144629	0.553615725	0.022144628	0.5536157	9.088875079	70.69836276	45.53455319	90.66902877	19.71888756	4.25E-10	208.773831	9.926279868	4.067348298	1.526078244	0	458.4771665	459.0307822
Horizon	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037875302	0.94688255	0.037875302	0.94688255	13.10517609	94.41390564	28.19128963	141.2707233	15.38826199	48.20736098	81.6083048	0	9.246909462	8.687735494	0	431.4319319	432.3788145
Horizon	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037826792	0.9456698	0.037826792	0.9456698	13.22144684	94.41390564	28.19128963	141.2707233	15.38826199	48.20736098	81.6083048	0	9.246909462	8.687735494	0	431.5482027	432.4938725
Jackfish	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037443554	0.93608885	0.037443555	0.936088875	13.02003295	92.63564565	27.66031443	138.6099281	15.0984283	47.29938857	80.07123479	4.753282018	9.072746462	8.524104381	0	428.2210012	429.1570901
Jackfish	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037395043	0.934876075	0.037395045	0.934876125	13.13466743	92.63564565	27.66031443	138.6099281	15.0984283	47.29938857	80.07123479	4.753282018	9.072746462	8.524104381	0	428.3356357	429.2705118
Jackpine	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037875302	0.94688255	0.037875302	0.94688255	13.10517609	94.41390564	28.19128963	141.2707233	15.38826199	48.20736098	81.6083048	0	9.246909462	8.687735494	0	431.4319319	432.3788145
Jackpine	Athabasca Mining_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037826792	0.9456698	0.037826792	0.9456698	13.22144684	94.41390564	28.19128963	141.2707233	15.38826199	48.20736098	81.6083048	0	9.246909462	8.687735494	0	431.5482027	432.4938725
Kearl	Kearl Blend_Solomon	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.03262886	0.8157215	0.032628862	0.81572155	15.83615843	107.3089258	28.66636807	131.7315787	13.50206223	33.10504205	59.35633422	0	8.202810178	6.47314833	0	397.7092796	398.5250011
Kearl	Kearl Blend_Solomon	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.032558406	0.81396015	0.032558408	0.8139602	15.94358113	107.3089258	28.66636807	131.7315787	13.50206223	33.10504205	59.35633422	0	8.202810178	6.47314833	0	397.8167023	398.6306625
MacKay River	Athabasca Thermal_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037832885	0.945822125	0.037832885	0.945822125	13.01151133	93.01969234	26.85764171	136.5689958	15.04996963	48.71130155	81.45628518	4.749260715	9.041226898	8.519970618	0	428.4658852	429.4117073
MacKay River	Athabasca Thermal_Alberta.ca	Onshore	Deep Conversion	Oil	Extra-Heavy Oil	Sour Oil	0.037784411	0.944610275	0.037784411	0.944610275	13.12608266	93.01969234	26.85764171	136.5689958	15.04996963	48.71130155	81.45628518	4.749260715	9.041226898	8.519970618	0	428.5804565	429.5250668
Montney AB	Light Sour Blend_Crude Monitor_New	Onshore	Medium Conversion	Gas	Wet gas	Sour Gas	0.203683038	5.09207595	0.014727437	0.368185925	4.306750855	50.19853572	24.39915498	54.4321675	5.868473423	1.88E-10	26.89327631	34.39298549	3.259512335	7.455679653	123.0079059	326.7587625	331.8508385
Montney AB	Light Sour Blend_Crude Monitor_New	Onshore	Medium Conversion	Gas	Wet gas	Sour Gas	0.203680624	5.0920156	0.014725022	0.36812555	4.38276892	50.19853572	24.39915498	54.4321675	5.868473423	1.88E-10	26.89327631	34.39298549	3.259512335	7.455679653	123.0079059	326.8347805	

**TABLE 3**

RESOURCE TYPE	DOWNSTREAM METHANE INTENSITY (kgCH <sub>4</sub> /boe)	DOWNSTREAM METHANE INTENSITY CO <sub>2</sub> E (KGco <sub>2</sub> e/BOE)	DOWNSTREAM CARBON DIOXIDE INTENSITY (kgCO <sub>2</sub> /boe)	DOWNSTREAM CO <sub>2</sub> E TOTAL
Condensate Sweet	0.09816770825	2.454192706	347.2735735	349.7277662
Light oil Sweet	0.022167942	0.55419855	458.4554093	459.0096078
Heavy oil Sour	0.030665016	0.7666254	417.5006708	418.2672962
Extra Heavy Oil Sour	0.03640415968	0.910103992	423.9509628	424.8610668
Wet Gas Sweet	0.375220197	9.380504925	326.0484174	335.4289223
Light oil Sour	0.0210998745	0.5274968625	360.7110836	361.2385805
Wet Gas Sour	0.295087922	7.37719805	334.2025409	341.5797389