How CO_2-to-Diesel Technology Could Help Reach Net-Zero Emissions Targets: A Canadian Case Study

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Process Simulation Assumptions

Details of assumed operating parameters for simulation of different units are presented in this section. For the Amine based CO_2 capture unit, data were extracted from Rubin & Rao, 2002 [1] and data for Reverse water gas shift (RWGS) unit are according to Dimitriou *et al.*, 2015. [2] For the Fischer-Tropsch (FT), product recovery and energy recovery units, simulation parameters are presented in **Table S1**.

Unit	**Simulation Parameters**
Syngas preheater	T_{in}=335 K, T_{out}=493 K, P=22.7 atm, CO=36437 kg/hr, H_2=5229 kg/hr
FT reactor	Plug flow fixed bed reactor, T_{in}=493 K, T_{out}=861 K, P=22.7 atm,, CO=36437 kg/hr, H_2=5229 kg/hr, H_2/CO (molar)=1.99, ΔP=3 atm, Mixed HC output=31039 kg/hr
Mixed hydrocarbon expander	P_{in}=19.78 atm, P_{out}=10 atm, T_{in}=861 K, T_{out}=833 K
Mixed hydrocarbon cooler	T_{in}=833 K, T_{out}=633 K, Mixed HC flowrate=31039 kg/hr, P=10 atm
Products recovery unit	Mixed HC flowrate=19891 kg/hr, T_{in}=633 K, Output products: Diesel=11885 kg/hr, Kerosene=599 kg/hr, Gasoline=521 kg/hr, Light gaseous HC=6393 kg/hr, Wax=11147 kg/hr
Hydrocracker unit (wax recovery)*	T=597 K, P=35 atm, Input was flowrate=11147 kg/hr, H_2/wax (wt/wt)=0.06, Output products: Diesel=2943 kg/hr, Kerosene=613 kg/hr, Gasoline=11 kg/hr, Wax=7580 kg/hr
Boiler	Input fuel (wax and light HC)=8679 kg/hr, Water=21500 kg/hr, T_{water}=298 K, P_{water}=122 atm, T_{steam}=838 K, P_{steam}=122 atm, Excess air for combustion=20%, $T_{flue\ gas}$=1673 K, Flue gas=123562 kg/hr, $P_{flue\ gas}$=1 atm
Steam turbine	$T_{steam,in}$=838 K, $P_{steam,in}$=122 atm, $T_{steam,in}$=373 K, $P_{steam,in}$=1 atm
Heat exchanger 1	$T_{flue\ gas,in}$=1673 K, Flue gas_{in}=123562 kg/hr, $P_{flue\ gas}$=1 atm, $T_{flue\ gas,out}$=320 K, Flue gas_{out}=123562 kg/hr, Water=80000 kg/hr, T_{water}=298 K, Steam=80000 kg/hr, T_{steam}=383 K, Flue gas_{out}=123562 kg/hr
Combustor	Input fuel (wax and light HC)=5786 kg/hr, Excess air for combustion=20%, $T_{flue\ gas}$=2096 K, Flue gas=82375 kg/hr, P=1 atm
Heat Exchanger 2	$T_{flue\ gas,in}$=2096 K, Flue gas_{in}=82375 kg/hr, $P_{flue\ gas}$=1 atm, $T_{flue\ gas,out}$=320 K, Flue gas_{out}=123562 kg/hr, Water=48000 kg/hr, T_{water}=298 K, T_{steam}=973 K, Steam=48000 kg/hr, Flue gas_{out}=82375 kg/hr
*Design data from Bouchy *et al.*, 2009 [3]	

Table S1. Fischer Tropsch, product recovery, and energy recovery simulation parameters

Overall Mass and Energy Balance

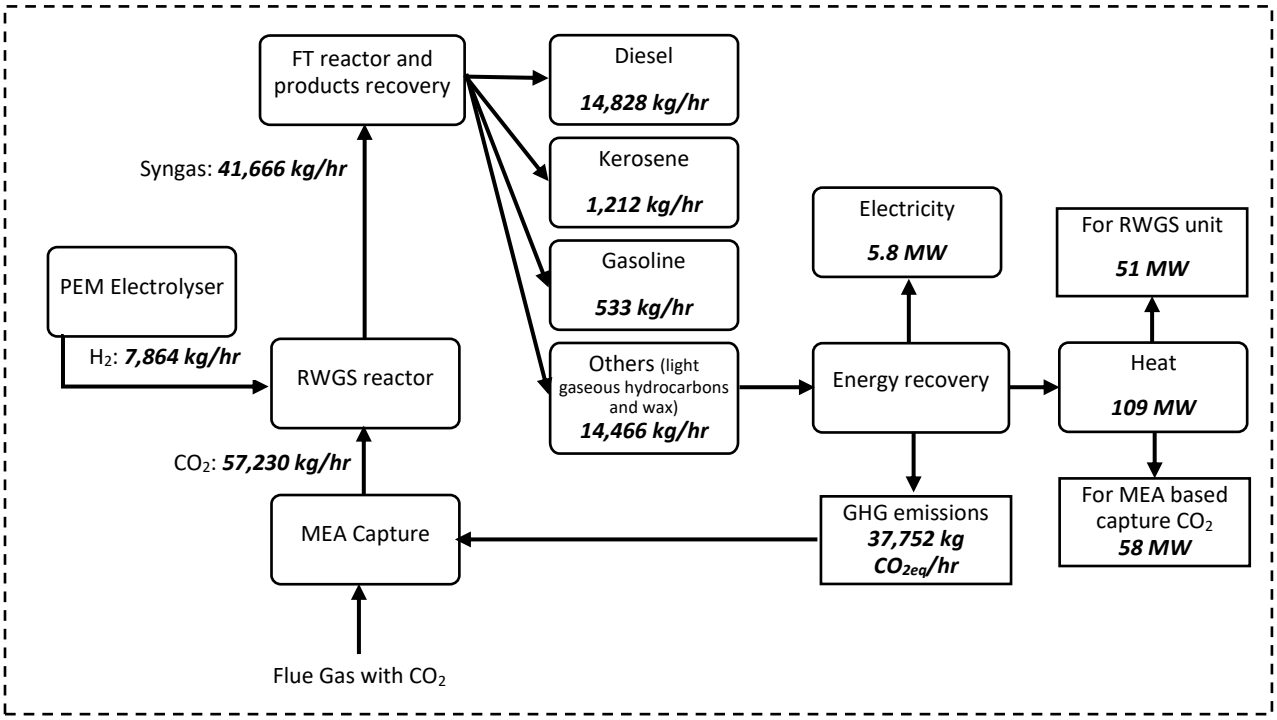

Figure S1. Overall mass and energy balance of the CO_2-to-diesel process modelled in the present work.

Techno-Economic Analysis and Life Cycle Assessment Data

A techno-economic analysis (TEA) was carried out based on previously developed methods. The equipment costs were evaluated using cost scaling methods. [4] The reference equipment costs are shown in **Table S2**. All equipment costs were converted into 2019 costs using chemical engineering plant cost index (CEPCI). Total installed purchased equipment cost (PEC) was evaluated by adding all the equipment costs. Cost factors of 33% PEC as additional direct costs and 50% of total direct costs as indirect costs to evaluate fixed capital investment (FCI) cost. [5] Also, an additional 5% of FCI was calculated as working capital to evaluate total capital investment cost. [2] **Table S3** shows the cost of electricity and water for operating the plant. Ratio factors was used to evaluate labor, maintenance and other overheads of OPEX cost. [6] An additional stack replacement cost based on 60% of original installed cost was used to represent. [7] A plant operation time of 8000 hours per year and discount rate of 7% for capital investment was employed, using previously developed formulae by the authors. [8]

Table S2. Reference cost values use to evaluate PEC.

Process unit	Reference cost (US$M)	Reference capacity	Reference year	Scaling factor	Installation factor	Sources
PEM water electrolyzer	0.307	1 MW_{el}	2015	1	1.33	Mayyas *et al.*, 2019 [9]
Gas pre-heating HEX	1.15	40 MW_{th}	1987	0.6	1	

Flue gas quench	1.14	2390 t/d	2007	0.6	1	Swanson *et al.*, 2010 [10]
RWGS reactor	0.45	2000 (CO+H2) kmol/hr	2002	0.6	1.7	Rafati *et al.*, 2017 [11]
Amine based CO_2 capture	20.5	2198 t/d	2007	0.7	1	Swanson *et al.*, 2010 [10]
Syngas compressor	2.15	2 MW	2007	0.67	1.7	
FTS reactor	2.5	2.5 mmscf/h	2007	0.67	1.7	Garret, 2012 [12]; Rafati *et al.*, 2017 [11]
Syngas cooler and condensing HX	0.8	40 MW	1987	0.67	1.61	Garret, 2012 [12]
FT product upgrade and recovery	245.3	286 m^3/h FT liquid	2002	0.7	1	Rafati *et al.*, 2017 [11]
Steam generating heat recovery	2.5	24 MW_{th}	2007	1	1	Rafati *et al.*, 2017 [11]
Steam cycle	15.1	30 MW_e	2007	0.67	1	Rafati *et al.*, 2017 [11]
Flue gas blower	0.5	1.6 M GPM	1998	0.6	1.7	Loh *et al.*, 2002 [13]
PSA H_2 removal	51.49	9600 feed kmol/h	2002	0.7	1	Rafati *et al.*, 2017 [11]

Based on capital, materials and utility costs, the remaining operating costs were evaluated using cost factor methods. [6] A summary of calculated values for Quebec in 2027 – at a capacity of 1 $MtCO_2eq$/year - is provided in **Table S3**.

Table S3. Operating costs given in CA$M.

Description	**Costs (CA$M)**
Material and utility costs	
- Electricity	552.46
- Water	3.10
Other operating costs	
- Operating labor	2.21
- Operating supervision	0.33
- Maintenance labor	35.16
- Maintenance material	35.16
- Operating supplies	10.55
- Laboratory charges	0.44
- Insurances and taxes	35.16
- Plant overhead	22.62
- Administrative cost	5.66
- Distribution, marketing and R&D	78.10
Total annual operating cost	780.95

The carbon footprint of constructing and decommissioning of the pathway was assumed to be similar to an organic chemical plant that has been reported in the Ecoinvent life cycle inventory database. [14] This value corresponds to 378k tonnes of CO_2 after scaling based on product flow rates of the pathway and reference organics chemical plant. The carbon footprints of operational energy and materials are given in **Table S4**. The carbon footprint of diesel production up to plant gate was calculated considering all the emissions due to electricity and water use and plant construction and decommission.

Table S4. Cost and carbon footprint of utilities.

Description	Cost	Carbon footprint	Sources
Water	0.12/t	2.82 x 10^{-5} kg CO_2eq/kg	Wernet *et al.*, 2016 [14]
Electricity	Region Dependent	Region Dependent	CER, 2020 [15]

Additional Modelling Estimates and Assumptions

We leverage TEA and life cycle assessment (LCA) provided in the preceding sections. PEM electrolyzer costs are estimated using NREL's cost manufacturing study assuming a production rate of 1000, 1 MW electrolyzers per year. [9] Emissions from construction of the electrolyzers were assumed to be encompassed by the estimate for emissions from construction of the facility. Lifetime emissions intensity for diesel was taken as 104.5 gCO_2eq/MJ, [16] while the baseline emissions intensity for biodiesel was assumed to be 26 gCO_2eq/MJ. [17] Emissions intensity for CO_2-derived diesel was calculated using our LCA. Combustion emissions for diesel and biodiesel were taken as 71.73 gCO_2eq/MJ and 5.92 gCO_2eq/MJ, respectively. [18] Since reliable data is not available for combustion emissions associated with CO_2-derived diesel, we take the diesel emissions intensity as a conservative estimate. The energy content of diesel was assumed to be 38.68 GJ/m^3. [19] We assume a CO_2-to-diesel plant life of 25 years and a discount rate of 7%. For the oil refinery capacity that is substituted for our CO_2-to-diesel process, a plant life of 22.6 years with a depreciation rate of 0.118 is estimated based on depreciation profiles of oil refineries in Canada. [20] Costs for an oil refinery were estimated based on capacity to be replaced, with associated capital costs estimated at 15%. [21][22] The process is provided in **Figure S2**. A scaling factor of 0.55 for oil upgrading technology was used. [23] For simplicity, co-products during product refining and upgrade were assumed to be equivalent for both the CO_2-to-diesel and oil refining process.

Incumbent Diesel Production Process

We base our incumbent technology off of an oil refinery with units that produce as much diesel and gasoline as possible. [21] The units and flow rates through the units, normalized to 1 BPD of diesel is provided in **Figure S2**. This is based off of a scheme provided in literature. [21] In the reference case, the production capacity is 23,454 BPD. [21]

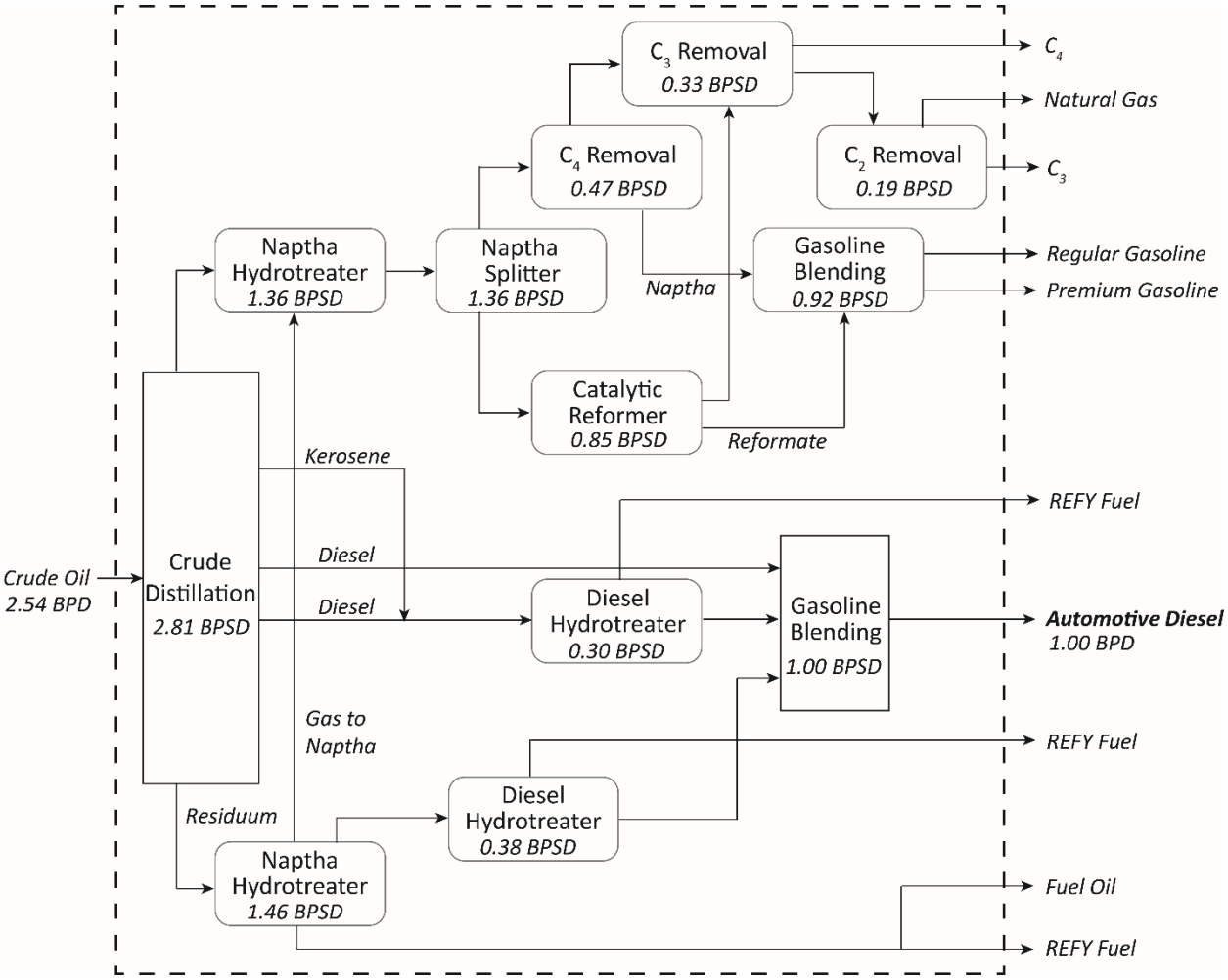

Figure S2. The incumbent diesel producing technology that is replaced by the proposed CO_2-to-diesel process. The process was designed to produce as much gasoline and diesel as possible. The crude oil and automotive diesel streams are provided in barrels per calendar day, while the units are given in barrels per day in operation.

Estimates for Diesel Production Process

Estimates for unit costs and utility consumption were based off of values provided in literature and scaled to the required capacity. [21][22] Capital costs were scaled using a 0.55 scaling factor [23] and associated costs accounted for an additional 15% of capital costs. [21]

Table S5. The capital costs and utilities for each unit in the incumbent diesel production process on the basis of a barrel of oil per day (BPD).

Unit	Capital Cost (2019 US$/BPD)	Steam (lbs/BPD)	Water (gals/BPD)	Power (kWh/BPD)	Fuel (MMBtu/BPD)
Light End Units	441	25	12	0.4	0
Catalytic Reformer	3341	50	15	12	0.35
Hydrotreater (Naptha)	835	0	4	6	0.12
Hydrotreater (Diesel)	1285	30	8	1.5	0.12

Wash Plants	182	1	2.5	0.4	0
Naptha Splitters	386	0	9	0.4	0.1
Thermal Crackers	2142	70	20	3	0.5
Fluid Catalytic Cracker	4241	20	20	7	0
Crude Distillation	1477	19	20	0.2	0.09

2026 Canada Energy Regulator Variables

For our first analysis, we investigate how learning rate effects the costs and energy consumption of the proposed CO_2-to-diesel process. To isolate this effect from additional factors such as utility costs and emissions intensities for electricity generation, we assume constant values for these factors based on the 2026 Canada Energy Regulator (CER) projections. [15] These values are provided in **Table S6**.

Table S6. The 2026 Canada Energy Regulator values used to isolate the learning effects due to capacity increase of the proposed CO_2-to-diesel process.

Unit	**2026 CER Value**
Electricity Price (CA$/MWh)	89.36
Electricity Emissions Intensity (gCO_2eq/kWh)	95.74
Steam Price (CA$/kg)	0.03
Gas Price (CA$/GJ)	10.80
Crude Oil Price (CA$/bbl)	72.60

Emissions Intensity by Source

Emissions intensities for each region were determined based on the amount of electricity generated by source and the emissions intensity for each source of electricity generation. [15][24] The average efficiency for electricity generation by source was determined based on data from the International Energy Agency. [25] The emissions intensities used are provided in **Table S7**.

Table S7. The emissions intensity of electricity generation and efficiency of electricity generation used for this study.

Source	**Emissions Intensity (gCO2eq/MJ)**	**Efficiency**	**Emissions Intensity (gCO_2eq/kWh)**
Solar	0		0
Wind	0		0
Hydro	0		0
Nuclear	0		0
Biomass	4.59	37.0%	44.64
Natural Gas	49.88	34.5%	520.34
Diesel	74.08	27.5%	971.19
Heavy Fuel Oil	74.58	27.5%	977.74
Coal	90.87	40.2%	814.77

List of Learning Rates

Learning rates for the capital costs of each unit, as well as the sub-components that make up the proton exchange membrane (PEM) electrolyzer and the Fischer-Tropsch (FT) reactor are provided in **Table S8**, along with the source it is derived from. Components for the PEM electrolyzer [9][26] and FT reactor [26] were taken from literature. Learning rates were based on either the same, or when not available, similar technology. Calculation of the final learning rate for these units was based on an average weighted by cost.

Table S8. The learning rates of each unit, along the sub-components for the PEM electrolyzer and the FT reactor.

Component	Sub-Component	Learning Rate	Source(s)
PEM Electrolyzer		12.9%	[26]
	Stack Assembling & End Plates	8%	[26]
	Small Parts	5%	[26]
	MEA Manufacturing/Frame	8%	[26]
	Catalyst Cathode/Anode	8%	[26]
	Catalyst Coated Membrane	22%	[26]
	Bipolar Plates	22%	[26]
	Porous Transport Layer	22%	[26]
	Cell Stack Total	16.4%	[26]
	Power Electronics	12%	[26]
	Gas Conditioning	7%	[26]
	Balance of Plant	13%	[26]
Gas Pre-Heater before RWGS reactor		4%	[27]
Flue Gas Quench and Particulate Removal		2%	[27]
RWGS Reactor		11%	[26][29]
MEA Capture		11%	[30]
Syngas Feed Compressor		5%	[28]
FT Reactor		12.3%	[26]
	Reactor	15%	[26]
	Catalyst	8%	[26]
	Heat Management	15%	[26]
	Reactor Total	13.9%	[26]
	Power Electronics	12%	[26]
	Gas Conditioning	7%	[26]
	Balance of Plant	13%	[26]
Syngas Cooler Water Condensing HX		4%	[27]
FT Product Upgrading		4.0%	[28]

Boiler Steam Generation		1%	[27]
Steam Cycle		4%	[27]

Diesel Demand

The diesel demand used in this study are based on data from the CER 2020 Energy Futures Evolving Scenario. [15] Biodiesel demand was calculated from this CER data for biofuels, assuming a constant value of 11% of biofuel is biodiesel based on the 2018 composition of biofuel. [31] Projections for the CO_2-derived diesel is determined based on our three policy scenarios. The overall demand over the period of 2026 to 2050 is provided in **Table S9**. All values are provided in PJ. The corresponding compositions of the diesel pool for each policy scenario are provided in **Table S10-S12**.

Table S9. Demand of each type of diesel for each year from 2026 to 2050 under each policy scenario. All values are provided in PJ.

Year	Diesel Demand	Biodiesel Demand	CO_2-Derived Diesel (Existing Policy Scenario)	CO_2-Derived Diesel (Growth Scenario)	CO_2-Derived Diesel (Continued Policy Development Scenario)
2026	756.09	13.23	0.00	0.00	0.00
2027	750.78	14.14	12.25	12.25	12.25
2028	740.12	15.35	24.50	24.50	24.50
2029	727.61	17.22	36.75	36.75	36.75
2030	713.48	19.20	49.00	49.00	49.00
2031	705.44	19.25	49.00	49.98	61.25
2032	694.08	19.31	49.00	50.98	73.50
2033	686.07	19.35	49.00	52.00	85.75
2034	677.15	19.46	49.00	53.04	98.00
2035	668.25	19.57	49.00	54.10	110.25
2036	655.11	19.51	49.00	55.18	122.50
2037	646.22	19.45	49.00	56.29	134.75
2038	637.74	19.40	49.00	57.41	147.00
2039	629.57	19.36	49.00	58.56	159.25
2040	620.87	19.32	49.00	59.73	171.50
2041	610.90	19.54	49.00	60.93	183.75
2042	600.26	19.76	49.00	62.14	196.00
2043	588.79	19.98	49.00	63.39	208.25
2044	576.56	20.21	49.00	64.65	220.50
2045	563.26	20.43	49.00	65.95	232.75
2046	548.83	20.64	49.00	67.27	245.00
2047	533.34	20.85	49.00	68.61	257.25
2048	516.70	21.05	49.00	69.98	269.50
2049	498.98	21.24	49.00	71.38	281.75
2050	480.05	21.41	49.00	72.81	294.00

Table S10. Composition of the diesel pool for each year from 2026 to 2050 under each the Existing Policy Scenario. Numbers may not round up exactly to 1.0 due to rounding errors.

Year	Diesel	Biodiesel	CO_2-Derived Diesel
2026	0.98	0.02	0.00

2027	0.97	0.02	0.02
2028	0.95	0.02	0.03
2029	0.93	0.02	0.05
2030	0.91	0.03	0.07
2031	0.91	0.03	0.07
2032	0.90	0.03	0.07
2033	0.90	0.03	0.07
2034	0.90	0.03	0.07
2035	0.90	0.03	0.07
2036	0.90	0.03	0.07
2037	0.90	0.03	0.07
2038	0.90	0.03	0.07
2039	0.89	0.03	0.08
2040	0.89	0.03	0.08
2041	0.89	0.03	0.08
2042	0.89	0.03	0.08
2043	0.89	0.03	0.08
2044	0.88	0.03	0.08
2045	0.88	0.04	0.08
2046	0.88	0.04	0.09
2047	0.87	0.04	0.09
2048	0.87	0.04	0.09
2049	0.86	0.04	0.09
2050	0.86	0.04	0.10

Table S11. Composition of the diesel pool for each year from 2026 to 2050 under each the Growth Scenario. Numbers may not round up exactly to 1.0 due to rounding errors.

Year	Diesel	Biodiesel	CO_2-Derived Diesel
2026	0.98	0.02	0.00
2027	0.97	0.02	0.02
2028	0.95	0.02	0.03
2029	0.93	0.02	0.05
2030	0.91	0.03	0.07
2031	0.90	0.03	0.07
2032	0.90	0.03	0.07
2033	0.90	0.03	0.07
2034	0.90	0.03	0.08
2035	0.89	0.03	0.08
2036	0.89	0.03	0.08
2037	0.89	0.03	0.08
2038	0.88	0.03	0.09
2039	0.88	0.03	0.09
2040	0.88	0.03	0.09
2041	0.87	0.03	0.10
2042	0.87	0.03	0.10
2043	0.86	0.03	0.10

2044	0.86	0.03	0.11
2045	0.85	0.04	0.11
2046	0.85	0.04	0.12
2047	0.84	0.04	0.12
2048	0.83	0.04	0.13
2049	0.82	0.04	0.14
2050	0.81	0.04	0.15

Table S12. Composition of the diesel pool for each year from 2026 to 2050 under each the Continued Policy Development Scenario. Numbers may not round up exactly to 1.0 due to rounding errors.

Year	Diesel	Biodiesel	CO_2-Derived Diesel
2026	0.98	0.02	0.00
2027	0.97	0.02	0.02
2028	0.95	0.02	0.03
2029	0.93	0.02	0.05
2030	0.91	0.03	0.07
2031	0.89	0.03	0.08
2032	0.87	0.03	0.10
2033	0.85	0.03	0.12
2034	0.83	0.03	0.14
2035	0.81	0.03	0.16
2036	0.79	0.03	0.18
2037	0.77	0.03	0.20
2038	0.75	0.03	0.22
2039	0.72	0.03	0.25
2040	0.70	0.03	0.27
2041	0.68	0.03	0.29
2042	0.65	0.03	0.32
2043	0.63	0.03	0.34
2044	0.60	0.03	0.37
2045	0.57	0.04	0.40
2046	0.53	0.04	0.43
2047	0.50	0.04	0.46
2048	0.46	0.04	0.50
2049	0.42	0.04	0.54
2050	0.37	0.04	0.59

S-Curve Demand Projections

As described in the main text, based on linearly growing CO_2-derived diesel projections, we fit S-curve distributions to determine the likely diffusion of the proposed CO_2-to-diesel process. The difference between the S-curve projections and the scenario projections is made up through import/export of CO_2-derived diesel. The cumulative capacity and growth per year under each policy scenario using the S-curve is provided in **Table S13-S15**.

Table S13. Composition of the diesel pool for each year from 2026 to 2050 under each the Existing Policy Scenario. The growth rate and saturated capacity are 26.0% and 49.00 PJ, respectively. All values are provided in PJ.

Year	Cumulative Capacity	Capacity Growth	Imports Needed
2026	0.00	10.02	0.00
2027	10.02	2.24	2.23
2028	12.26	2.55	12.24
2029	14.81	2.82	21.94
2030	17.63	3.03	31.37
2031	20.66	3.16	28.34
2032	23.82	3.18	25.18
2033	27.00	3.10	22.00
2034	30.10	2.92	18.90
2035	33.02	2.67	15.98
2036	35.68	2.37	13.32
2037	38.06	2.05	10.94
2038	40.11	1.74	8.89
2039	41.85	1.45	7.15
2040	43.40	1.19	5.70
2041	44.49	0.96	4.51
2042	45.45	0.77	3.55
2043	46.21	0.61	2.79
2044	46.82	0.48	2.18
2045	47.31	0.38	1.69
2046	47.68	0.30	1.32
2047	47.98	0.23	1.02
2048	48.21	0.18	0.79
2049	48.39	0.14	0.61
2050	48.53	0.00	0.47

Table S14. Composition of the diesel pool for each year from 2026 to 2050 under each the Growth Scenario. The growth rate and saturated capacity are 27.8% and 72.81 PJ, respectively. All values are provided in PJ.

Year	Cumulative Capacity	Capacity Growth	Imports Needed
2026	0.00	10.02	0.00
2027	10.02	2.65	2.23
2028	12.68	3.18	11.82
2029	15.85	3.71	20.90
2030	19.56	4.22	29.44
2031	23.78	4.64	26.20
2032	28.42	4.93	22.56
2033	33.36	5.05	18.64
2034	38.40	4.97	14.64
2035	43.47	4.72	10.73
2036	48.09	4.32	7.09
2037	52.41	3.82	3.88

2038	56.23	3.29	1.18
2039	59.52	2.76	-0.96
2040	62.27	2.27	-2.54
2041	64.54	1.83	-3.61
2042	66.37	1.46	-4.22
2043	67.82	1.15	-4.44
2044	68.97	0.89	-4.32
2045	69.86	0.69	-3.92
2046	70.56	0.53	-3.29
2047	71.09	0.41	-2.48
2048	71.50	0.31	-1.52
2049	71.81	0.24	-0.43
2050	72.05	0.00	0.76

Table S15. Composition of the diesel pool for each year from 2026 to 2050 under each the Continued Policy Development Scenario. The growth rate and saturated capacity are 34.4% and 294.00 PJ, respectively. All values are provided in PJ.

Year	Cumulative Capacity	Capacity Growth	Imports Needed
2026	0.00	10.02	0.00
2027	10.02	3.92	2.23
2028	13.94	5.35	10.56
2029	19.29	7.21	17.46
2030	26.50	9.55	22.50
2031	36.05	12.36	25.20
2032	48.42	15.55	25.08
2033	63.97	18.87	21.78
2034	82.83	21.90	15.17
2035	104.73	24.15	5.52
2036	128.88	25.19	-6.38
2037	154.07	24.78	-19.32
2038	178.85	23.01	-31.85
2039	201.86	20.26	-42.61
2040	222.12	17.02	-50.62
2041	239.14	13.73	-55.39
2042	252.88	10.73	-56.88
2043	263.61	8.18	-55.36
2044	271.79	6.11	-51.29
2045	277.90	4.50	-45.15
2046	282.40	3.28	-37.40
2047	285.68	2.37	-28.43
2048	288.05	1.71	-18.55
2049	289.76	1.22	-8.01
2050	290.98	0.00	3.02

Levelized Cost of Carbon Abatement for Policy Scenarios and Diesel Substitution Cases

The levelized cost of carbon abatement (LCCA) for each region in Canada between 2027 and 2050 is provided in **Table S16-S29** for each policy scenario and case of diesel substitution.

Table S16. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Canada average values. All values are provided in CA$/tCO$_2$eq.

Canada Average						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	663.10	663.10	663.10	703.50	708.24	759.31
2028	668.17	666.09	658.74	708.88	711.44	754.46
2029	665.57	659.54	639.83	706.10	704.45	733.20
2030	658.67	647.72	613.71	698.73	691.79	703.83
2031	648.79	632.76	585.11	688.15	675.74	671.80
2032	637.98	617.09	556.96	676.57	658.93	640.40
2033	627.45	602.14	530.94	665.29	642.92	611.56
2034	617.96	588.79	508.00	655.15	628.66	586.33
2035	609.87	577.43	488.55	646.51	616.54	565.16
2036	603.19	568.03	472.49	639.39	606.56	547.89
2037	597.83	560.46	459.58	633.69	598.54	534.21
2038	593.64	554.50	449.46	629.25	592.26	523.69
2039	590.45	549.91	441.72	625.87	587.44	515.85
2040	588.07	546.42	435.92	623.36	583.81	510.15
2041	586.36	543.84	431.67	621.57	581.15	506.15
2042	585.16	541.96	428.60	620.33	579.23	503.41
2043	584.36	540.63	426.42	619.52	577.89	501.59
2044	583.87	539.71	424.90	619.03	576.99	500.44
2045	583.61	539.12	423.86	618.78	576.43	499.75
2046	583.51	538.76	423.18	618.71	576.11	499.38
2047	583.54	538.57	422.75	618.76	575.97	499.24
2048	583.64	538.52	422.50	618.89	575.97	499.24
2049	583.80	538.57	422.40	619.08	576.06	499.36
2050	583.99	538.69	422.41	619.30	576.23	499.57

Table S17. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Newfoundland & Labrador values. All values are provided in CA$/tCO$_2$eq.

Newfoundland & Labrador						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	534.03	534.03	534.03	553.91	556.19	579.95

2028	539.64	538.76	535.38	559.84	561.27	581.99
2029	541.81	539.08	529.53	562.26	561.84	576.59
2030	542.10	536.96	519.88	562.75	559.90	567.30
2031	540.59	532.85	508.20	561.35	555.88	555.91
2032	538.32	528.03	496.07	559.16	551.10	544.08
2033	535.78	523.06	484.25	556.66	546.17	532.59
2034	533.42	518.53	473.50	554.33	541.66	522.23
2035	531.41	514.63	464.12	552.37	537.81	513.33
2036	529.83	511.45	456.28	550.83	534.68	506.04
2037	528.67	508.97	449.96	549.73	532.27	500.34
2038	527.90	507.11	445.05	549.01	530.50	496.08
2039	527.44	505.79	441.36	548.61	529.26	493.07
2040	527.23	504.89	438.69	548.46	528.46	491.06
2041	527.22	504.33	436.81	548.51	527.99	489.80
2042	527.34	504.01	435.52	548.69	527.76	489.09
2043	527.55	503.87	434.66	548.96	527.71	488.75
2044	527.82	503.86	434.12	549.29	527.78	488.66
2045	528.13	503.94	433.78	549.64	527.93	488.71
2046	528.44	504.07	433.59	550.00	528.12	488.85
2047	528.76	504.24	433.51	550.36	528.35	489.04
2048	529.07	504.43	433.50	550.70	528.59	489.25
2049	529.36	504.64	433.55	551.02	528.85	489.49
2050	529.63	504.85	433.64	551.32	529.10	489.74

Table S18. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Prince Edward Island values. All values are provided in CA$/t$CO_2$eq.

Prince Edward Island						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	509.88	509.88	509.88	531.60	534.11	560.41
2028	515.39	514.28	510.16	537.47	538.87	561.31
2029	516.38	512.98	501.45	538.68	537.77	552.73
2030	514.86	508.49	487.99	537.29	533.35	539.15
2031	511.26	501.74	472.31	533.74	526.55	523.26
2032	506.74	494.09	456.06	529.19	518.80	506.76
2033	502.02	486.41	440.36	524.42	511.01	490.87
2034	497.63	479.35	426.05	519.99	503.86	476.46
2035	493.80	473.19	413.49	516.13	497.62	463.93
2036	490.61	468.01	402.83	512.94	492.41	453.44
2037	488.10	463.83	394.12	510.43	488.23	445.02
2038	486.19	460.57	387.22	508.54	484.99	438.51
2039	484.80	458.08	381.90	507.20	482.56	433.66
2040	483.84	456.25	377.92	506.29	480.79	430.18

2041	483.23	454.94	375.00	505.73	479.56	427.78
2042	482.57	453.66	372.35	505.10	478.32	425.46
2043	481.95	452.51	370.09	504.48	477.18	423.42
2044	481.40	451.52	368.25	503.94	476.20	421.74
2045	481.05	450.83	366.96	503.60	475.53	420.61
2046	480.86	450.37	366.07	503.43	475.09	419.89
2047	480.79	450.09	365.48	503.37	474.84	419.46
2048	480.79	449.94	365.11	503.40	474.72	419.23
2049	480.86	449.90	364.90	503.48	474.70	419.15
2050	480.96	449.93	364.82	503.60	474.76	419.19

Table S19. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Nova Scotia values. A negative value is meaningless and indicates that no carbon is abated. All values are provided in CA$/t$CO_2$eq.

Nova Scotia						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	-846.39	-846.39	-846.39	-804.21	-799.83	-758.59
2028	-878.05	-881.51	-891.25	-832.87	-831.12	-793.46
2029	-922.71	-932.34	-960.37	-872.63	-875.50	-844.46
2030	-979.50	-998.85	-1057.86	-922.65	-932.75	-913.30
2031	-1045.66	-1079.40	-1189.64	-980.27	-1001.01	-1001.57
2032	-1120.57	-1174.64	-1367.41	-1044.78	-1080.38	-1113.12
2033	-1198.15	-1277.60	-1590.82	-1110.71	-1164.47	-1241.36
2034	-1277.28	-1387.49	-1876.53	-1177.12	-1252.40	-1388.89
2035	-1356.54	-1502.77	-2247.56	-1242.83	-1342.70	-1557.45
2036	-1434.05	-1620.72	-2732.72	-1306.32	-1433.11	-1746.05
2037	-1508.20	-1738.41	-3371.58	-1366.37	-1521.42	-1951.85
2038	-1577.45	-1852.59	-4213.62	-1421.87	-1605.32	-2168.51
2039	-1640.65	-1960.21	-5319.77	-1472.04	-1682.84	-2387.17
2040	-1696.97	-2058.63	-6755.81	-1516.36	-1752.43	-2597.03
2041	-1746.17	-2146.27	-8593.12	-1554.79	-1813.36	-2789.00
2042	-1788.11	-2221.85	-10864.88	-1587.33	-1865.12	-2954.40
2043	-1823.37	-2285.72	-13588.99	-1614.53	-1908.29	-3091.18
2044	-1852.64	-2338.78	-16733.65	-1637.01	-1943.75	-3200.32
2045	-1876.55	-2381.89	-20160.35	-1655.31	-1972.28	-3283.66
2046	-1895.88	-2416.43	-23685.09	-1670.06	-1994.96	-3345.46
2047	-1911.40	-2443.81	-27097.90	-1681.87	-2012.82	-3390.24
2048	-1923.79	-2465.37	-30219.07	-1691.28	-2026.82	-3422.24
2049	-1933.66	-2482.30	-32926.44	-1698.77	-2037.77	-3444.90
2050	-1941.51	-2495.59	-35173.82	-1704.73	-2046.35	-3460.98

Table S20. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the New Brunswick values. All values are provided in CA$/tCO$_2$eq.

New Brunswick						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	539.94	539.94	539.94	564.67	567.53	597.70
2028	544.67	543.30	538.38	569.67	571.13	596.32
2029	543.84	539.75	526.25	568.87	567.51	583.51
2030	539.98	532.44	508.85	564.88	559.93	564.99
2031	533.78	522.64	489.25	558.43	549.71	544.15
2032	526.42	511.73	469.06	550.72	538.29	522.63
2033	518.97	501.01	449.93	542.92	527.06	502.27
2034	512.09	491.21	432.73	535.71	516.80	484.06
2035	506.03	482.65	417.82	529.36	507.85	468.35
2036	500.89	475.40	405.26	523.97	500.27	455.22
2037	496.81	469.62	395.26	519.70	494.25	444.92
2038	493.65	465.10	387.48	516.41	489.57	437.07
2039	491.26	461.64	381.58	513.93	486.01	431.25
2040	489.51	459.06	377.19	512.12	483.36	427.06
2041	488.29	457.18	374.04	510.86	481.45	424.18
2042	487.24	455.58	371.42	509.78	479.82	421.75
2043	486.36	454.25	369.31	508.87	478.46	419.79
2044	485.67	453.19	367.68	508.16	477.39	418.28
2045	485.25	452.49	366.57	507.72	476.67	417.33
2046	485.01	452.03	365.84	507.48	476.22	416.75
2047	484.91	451.76	365.37	507.38	475.97	416.43
2048	484.90	451.63	365.10	507.38	475.86	416.29
2049	484.95	451.59	364.96	507.45	475.85	416.28
2050	485.05	451.64	364.93	507.56	475.91	416.36

Table S21. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Quebec values. All values are provided in CA$/tCO$_2$eq.

Quebec						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	295.43	295.43	295.43	306.30	307.55	320.54
2028	301.14	300.43	297.72	312.29	312.84	323.34
2029	303.53	301.26	293.50	314.86	313.84	319.29
2030	304.09	299.78	285.87	315.55	312.45	311.66
2031	302.84	296.33	276.35	314.36	309.01	302.02
2032	300.78	292.11	266.36	312.31	304.75	291.89

2033	298.37	287.67	256.55	309.89	300.25	281.92
2034	296.06	283.52	247.59	307.56	296.05	272.85
2035	294.03	279.88	239.74	305.51	292.37	264.94
2036	292.35	276.84	233.12	303.84	289.31	258.34
2037	291.06	274.41	227.74	302.54	286.86	253.03
2038	290.10	272.52	223.49	301.60	284.98	248.92
2039	289.46	271.11	220.25	300.97	283.59	245.85
2040	289.06	270.10	217.84	300.59	282.60	243.65
2041	288.85	269.40	216.10	300.42	281.94	242.12
2042	288.80	268.95	214.86	300.39	281.52	241.09
2043	288.86	268.69	214.00	300.48	281.29	240.44
2044	288.99	268.56	213.43	300.64	281.20	240.05
2045	289.18	268.53	213.05	300.86	281.21	239.83
2046	289.40	268.58	212.82	301.10	281.29	239.75
2047	289.63	268.67	212.70	301.36	281.42	239.75
2048	289.87	268.80	212.66	301.62	281.58	239.81
2049	290.11	268.97	212.68	301.88	281.77	239.93
2050	290.34	269.15	212.76	302.13	281.97	240.09

Table S22. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Ontario values. All values are provided in CA$/t$CO_2$eq.

Ontario						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	745.56	745.56	745.56	777.42	781.09	819.67
2028	749.63	748.15	742.81	781.76	783.93	817.24
2029	748.53	744.21	729.73	780.77	780.03	803.91
2030	743.90	735.87	710.23	776.06	771.50	783.66
2031	737.22	725.32	688.73	769.19	760.63	761.38
2032	729.64	713.94	666.87	761.35	748.86	738.75
2033	722.34	703.14	646.56	753.80	737.70	717.87
2034	715.83	693.54	628.53	747.07	727.81	699.54
2035	710.57	685.69	613.55	741.65	719.76	684.61
2036	706.44	679.43	601.39	737.43	713.39	672.80
2037	703.33	674.60	591.81	734.27	708.51	663.77
2038	701.06	670.96	584.46	731.98	704.88	657.12
2039	699.48	668.31	578.99	730.41	702.27	652.44
2040	698.44	666.42	575.03	729.40	700.46	649.31
2041	697.80	665.13	572.25	728.80	699.25	647.34
2042	697.47	664.29	570.34	728.53	698.51	646.20
2043	697.36	663.78	569.06	728.47	698.09	645.62
2044	697.41	663.51	568.23	728.57	697.91	645.41
2045	697.55	663.40	567.70	728.77	697.89	645.42
2046	697.75	663.40	567.39	729.03	697.98	645.57

2047	697.99	663.49	567.23	729.31	698.13	645.78
2048	698.25	663.62	567.17	729.61	698.33	646.04
2049	698.51	663.79	567.19	729.91	698.56	646.32
2050	698.76	663.99	567.27	730.20	698.81	646.61

Table S23. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Manitoba values. All values are provided in CA$/t$CO_2$eq.

Manitoba						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	291.84	291.84	291.84	302.41	303.62	316.24
2028	297.48	296.79	294.15	308.33	308.87	319.07
2029	299.87	297.65	290.06	310.90	309.90	315.17
2030	300.44	296.21	282.59	311.60	308.56	307.72
2031	299.19	292.80	273.18	310.40	305.15	298.22
2032	297.11	288.58	263.26	308.34	300.90	288.17
2033	294.66	284.11	253.48	305.88	296.38	278.24
2034	292.29	279.92	244.49	303.50	292.14	269.14
2035	290.19	276.22	236.58	301.39	288.40	261.17
2036	288.45	273.11	229.88	299.64	285.26	254.49
2037	287.08	270.59	224.41	298.28	282.74	249.08
2038	286.06	268.63	220.07	297.27	280.78	244.87
2039	285.34	267.15	216.73	296.57	279.31	241.69
2040	284.88	266.07	214.23	296.13	278.26	239.38
2041	284.62	265.31	212.39	295.89	277.53	237.75
2042	284.52	264.81	211.09	295.82	277.06	236.64
2043	284.54	264.50	210.18	295.86	276.79	235.93
2044	284.64	264.34	209.56	296.00	276.66	235.49
2045	284.80	264.28	209.16	296.18	276.64	235.24
2046	285.00	264.31	208.91	296.41	276.70	235.13
2047	285.22	264.39	208.77	296.65	276.81	235.11
2048	285.45	264.51	208.72	296.90	276.96	235.16
2049	285.67	264.66	208.73	297.14	277.13	235.26
2050	285.89	264.83	208.80	297.38	277.33	235.41

Table S24. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Saskatchewan values. A negative value is meaningless and indicates that no carbon is abated. All values are provided in CA$/t$CO_2$eq.

Saskatchewan						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	-945.15	-945.15	-945.15	-860.85	-852.49	-777.22

2028	-998.41	-1004.28	-1021.39	-905.74	-901.01	-827.18
2029	-1072.06	-1088.88	-1140.94	-965.75	-967.59	-897.64
2030	-1167.41	-1203.00	-1322.82	-1041.55	-1054.47	-994.67
2031	-1283.26	-1349.98	-1604.35	-1131.12	-1162.12	-1126.66
2032	-1423.80	-1541.22	-2076.66	-1236.62	-1296.11	-1311.11
2033	-1590.89	-1788.77	-2973.63	-1357.87	-1460.24	-1573.05
2034	-1788.81	-2113.90	-5238.31	-1496.14	-1661.66	-1964.36
2035	-2018.61	-2541.69	-19590.11	-1649.90	-1904.91	-2578.70
2036	-2279.67	-3106.52	12750.10	-1816.35	-2193.40	-3621.87
2037	-2569.17	-3856.25	5155.79	-1991.50	-2528.41	-5648.74
2038	-2881.62	-4857.35	3408.59	-2170.30	-2907.63	-10824.20
2039	-3206.55	-6191.22	2664.30	-2345.86	-3320.76	-42850.91
2040	-3534.61	-7983.27	2266.88	-2513.29	-3756.87	31795.25
2041	-3856.42	-10420.22	2029.08	-2668.73	-4202.51	13524.54
2042	-4163.05	-13784.77	1877.32	-2809.39	-4642.58	9414.93
2043	-4446.06	-18499.83	1777.08	-2933.24	-5060.57	7684.22
2044	-4700.45	-25274.38	1709.18	-3040.04	-5444.45	6775.06
2045	-4922.48	-35277.05	1662.82	-3129.96	-5783.93	6248.00
2046	-5112.35	-50774.69	1630.83	-3204.59	-6076.00	5922.95
2047	-5271.54	-76566.83	1608.74	-3265.64	-6320.75	5716.28
2048	-5403.04	-125170.84	1593.50	-3315.10	-6521.74	5582.55
2049	-5510.14	-242078.44	1583.12	-3354.78	-6683.74	5495.96
2050	-5596.50	-831187.19	1576.20	-3386.43	-6812.66	5440.31

Table S25. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Alberta values. A negative value is meaningless and indicates that no carbon is abated. All values are provided in CA$/t$CO_2$eq.

Alberta						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	-412.38	-412.38	-412.38	-397.83	-396.29	-381.59
2028	-425.51	-426.29	-428.19	-410.16	-409.20	-394.86
2029	-439.90	-441.62	-446.04	-423.46	-423.14	-408.90
2030	-455.64	-458.63	-466.84	-437.88	-438.41	-424.54
2031	-471.24	-475.94	-490.00	-452.04	-453.74	-441.23
2032	-486.71	-493.58	-515.75	-465.99	-469.21	-459.09
2033	-501.58	-510.97	-543.37	-479.31	-484.32	-477.48
2034	-515.78	-527.98	-572.78	-491.97	-498.98	-496.30
2035	-529.13	-544.31	-603.42	-503.82	-512.96	-515.18
2036	-541.48	-559.70	-634.58	-514.76	-526.05	-533.66
2037	-552.72	-573.88	-665.28	-524.69	-538.06	-551.20
2038	-562.81	-586.71	-694.54	-533.58	-548.88	-567.35
2039	-571.73	-598.10	-721.46	-541.42	-558.44	-581.70
2040	-579.54	-608.06	-745.48	-548.29	-566.78	-594.12

2041	-586.23	-616.56	-765.93	-554.17	-573.88	-604.35
2042	-591.93	-623.72	-782.86	-559.17	-579.84	-612.58
2043	-596.73	-629.67	-796.45	-563.38	-584.79	-619.00
2044	-600.74	-634.57	-807.15	-566.90	-588.85	-623.92
2045	-604.06	-638.56	-815.38	-569.82	-592.16	-627.60
2046	-606.81	-641.80	-821.63	-572.24	-594.84	-630.33
2047	-609.06	-644.41	-826.33	-574.22	-597.01	-632.34
2048	-610.92	-646.53	-829.87	-575.85	-598.77	-633.83
2049	-612.44	-648.26	-832.56	-577.19	-600.20	-634.97
2050	-613.70	-649.68	-834.66	-578.30	-601.39	-635.88

Table S26. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the British Columbia values. All values are provided in CA$/t$CO_2$eq.

British Columbia						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	517.38	517.38	517.38	538.51	540.93	566.40
2028	522.87	521.83	517.93	544.33	545.73	567.58
2029	524.15	520.95	510.02	545.84	545.06	559.89
2030	523.10	517.10	497.65	544.94	541.31	547.54
2031	519.93	510.92	482.91	541.81	535.11	532.68
2032	515.84	503.84	467.58	537.70	527.95	517.20
2033	511.43	496.61	452.61	533.25	520.61	502.09
2034	507.28	489.90	438.89	529.04	513.79	488.30
2035	503.61	483.99	426.81	525.33	507.80	476.25
2036	500.53	478.99	416.54	522.22	502.75	466.13
2037	498.04	474.91	408.11	519.72	498.65	457.94
2038	496.11	471.68	401.38	517.79	495.41	451.55
2039	494.68	469.19	396.18	516.36	492.94	446.73
2040	493.65	467.32	392.26	515.36	491.11	443.24
2041	492.95	465.95	389.37	514.69	489.78	440.78
2042	492.52	464.98	387.28	514.29	488.87	439.12
2043	492.28	464.32	385.80	514.09	488.26	438.03
2044	492.20	463.89	384.77	514.04	487.89	437.36
2045	492.22	463.64	384.06	514.10	487.69	436.97
2046	492.31	463.52	383.60	514.23	487.62	436.78
2047	492.45	463.49	383.31	514.40	487.64	436.72
2048	492.63	463.54	383.16	514.61	487.73	436.76
2049	492.82	463.63	383.11	514.83	487.87	436.87
2050	493.02	463.77	383.13	515.06	488.05	437.04

Table S27. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Yukon values. All values are provided in CA$/t$CO_2$eq.

Yukon						
	Fossil Fuel Diesel Substitution			Diesel Pool Substitution		
Year	Existing Policy Scenario	Growth Scenario	Continued Policy Development Scenario	Existing Policy Scenario	Growth Scenario	Continued Policy Development Scenario
2027	666.68	666.68	666.68	699.09	702.85	742.66
2028	669.78	667.96	661.65	702.35	704.21	737.25
2029	665.54	660.23	643.19	697.86	696.04	717.01
2030	658.80	649.40	620.52	690.79	684.66	692.47
2031	650.18	636.62	596.49	681.74	671.24	666.70
2032	641.20	623.69	573.21	672.32	657.67	641.90
2033	632.53	611.38	551.52	663.22	644.78	618.94
2034	624.70	600.34	532.18	655.03	633.23	598.62
2035	617.92	590.79	515.45	647.92	623.26	581.17
2036	612.22	582.75	501.35	641.95	614.88	566.62
2037	607.54	576.15	489.79	637.06	608.02	554.83
2038	603.79	570.84	480.56	633.15	602.51	545.55
2039	600.85	566.65	473.36	630.09	598.18	538.45
2040	598.59	563.39	467.85	627.74	594.84	533.16
2041	596.88	560.91	463.72	625.98	592.30	529.31
2042	595.70	559.12	460.79	624.77	590.49	526.73
2043	594.91	557.86	458.74	623.97	589.24	525.05
2044	594.41	557.00	457.33	623.48	588.41	523.99
2045	594.13	556.44	456.37	623.21	587.88	523.37
2046	594.01	556.09	455.73	623.11	587.57	523.03
2047	593.99	555.90	455.33	623.12	587.42	522.89
2048	594.05	555.83	455.10	623.20	587.39	522.89
2049	594.16	555.84	454.99	623.34	587.45	522.98
2050	594.30	555.93	454.99	623.50	587.57	523.14

Table S28. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Northwest Territories values. All values are provided in CA$/t$CO_2$eq.

Northwest Territories						
	Fossil Fuel Diesel Substitution			Diesel Pool Substitution		
Year	Existing Policy Scenario	Growth Scenario	Continued Policy Development Scenario	Existing Policy Scenario	Growth Scenario	Continued Policy Development Scenario
2027	5006.75	5006.75	5006.75	7459.08	7883.51	18232.98
2028	4612.92	4527.91	4280.12	6608.22	6757.70	11485.84
2029	4035.96	3861.87	3407.95	5499.01	5402.02	7055.32
2030	3567.26	3338.66	2787.30	4681.43	4459.77	5008.15
2031	3189.83	2928.97	2336.03	4068.61	3783.06	3847.30
2032	2889.58	2609.98	2001.88	3606.35	3287.96	3113.23
2033	2651.11	2360.88	1749.87	3253.71	2918.81	2616.08
2034	2461.86	2165.96	1557.68	2982.24	2639.71	2264.59

2035	2311.46	2012.99	1410.00	2771.48	2426.33	2009.08
2036	2191.64	1892.53	1295.99	2606.58	2261.62	1819.88
2037	2095.97	1797.45	1207.89	2476.73	2133.58	1678.24
2038	2019.55	1722.37	1140.01	2374.13	2033.67	1571.82
2039	1958.45	1663.02	1087.89	2292.79	1955.44	1491.75
2040	1909.54	1616.07	1047.98	2228.12	1894.01	1431.49
2041	1870.48	1579.02	1017.64	2176.75	1845.83	1386.37
2042	1841.36	1551.75	996.37	2138.68	1810.67	1355.83
2043	1819.56	1531.58	981.39	2110.33	1784.87	1335.10
2044	1803.24	1516.67	970.85	2089.19	1765.91	1321.07
2045	1791.02	1505.64	963.44	2073.41	1751.98	1311.62
2046	1781.88	1497.50	958.24	2061.65	1741.77	1305.32
2047	1775.10	1491.54	954.65	2052.93	1734.35	1301.22
2048	1770.08	1487.22	952.20	2046.50	1728.99	1298.63
2049	1766.41	1484.14	950.59	2041.80	1725.20	1297.11
2050	1763.75	1481.99	949.59	2038.40	1722.58	1296.33

Table S29. The LCCA between 2027 and 2050 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Nunavut values. A negative value is meaningless and indicates that no carbon is abated. All values are provided in CA$/t$CO_2$eq.

Nunavut						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	-119.25	-119.25	-119.25	-118.42	-118.34	-117.45
2028	-120.65	-120.60	-120.38	-119.81	-119.67	-118.53
2029	-121.58	-121.38	-120.67	-120.72	-120.42	-118.74
2030	-122.26	-121.83	-120.50	-121.38	-120.85	-118.48
2031	-122.60	-121.95	-120.02	-121.71	-120.94	-117.91
2032	-122.78	-121.89	-119.41	-121.86	-120.85	-117.20
2033	-122.84	-121.72	-118.73	-121.91	-120.66	-116.41
2034	-122.85	-121.53	-118.07	-121.91	-120.45	-115.65
2035	-122.85	-121.35	-117.48	-121.89	-120.25	-114.95
2036	-122.85	-121.19	-116.96	-121.89	-120.07	-114.33
2037	-122.87	-121.07	-116.54	-121.89	-119.94	-113.82
2038	-122.91	-120.99	-116.21	-121.92	-119.84	-113.41
2039	-122.96	-120.94	-115.97	-121.96	-119.78	-113.08
2040	-123.02	-120.92	-115.80	-122.02	-119.75	-112.84
2041	-123.09	-120.93	-115.67	-122.08	-119.75	-112.66
2042	-123.17	-120.95	-115.59	-122.15	-119.76	-112.53
2043	-123.25	-120.98	-115.54	-122.23	-119.78	-112.43
2044	-123.33	-121.02	-115.51	-122.31	-119.81	-112.37
2045	-123.41	-121.06	-115.49	-122.38	-119.85	-112.33
2046	-123.48	-121.11	-115.49	-122.46	-119.90	-112.31
2047	-123.56	-121.16	-115.50	-122.53	-119.94	-112.30

2048	-123.63	-121.21	-115.52	-122.59	-119.99	-112.30
2049	-123.69	-121.26	-115.54	-122.66	-120.04	-112.31
2050	-123.75	-121.31	-115.58	-122.71	-120.09	-112.34

Emissions Avoided for Policy Scenarios and Diesel Substitution Cases

The cumulative emissions avoided for each region in Canada between 2027 and 2075 is provided in **Table S30-S43** for each policy scenario and case of diesel substitution.

Table S30. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Canada average values. All values are provided in $MtCO_2eq$.

Canada Average						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	0.79	0.79	0.79	0.74	0.74	0.69
2028	1.75	1.78	1.89	1.65	1.67	1.65
2029	2.93	3.05	3.44	2.76	2.85	3.00
2030	4.34	4.63	5.61	4.09	4.33	4.90
2031	6.02	6.57	8.63	5.67	6.15	7.52
2032	7.97	8.93	12.75	7.52	8.36	11.11
2033	10.21	11.72	18.30	9.63	10.98	15.93
2034	12.73	14.98	25.59	12.00	14.03	22.25
2035	15.51	18.69	34.94	14.62	17.50	30.32
2036	18.53	22.83	46.56	17.47	21.38	40.35
2037	21.77	27.37	60.58	20.53	25.63	52.41
2038	25.20	32.27	76.97	23.77	30.22	66.48
2039	28.79	37.47	95.59	27.16	35.09	82.42
2040	32.52	42.94	116.16	30.67	40.21	100.00
2041	36.36	48.62	138.39	34.29	45.52	118.95
2042	40.29	54.47	161.95	38.00	51.00	139.02
2043	44.28	60.46	186.57	41.77	56.60	159.94
2044	48.34	66.56	211.98	45.60	62.30	181.52
2045	52.44	72.74	237.99	49.47	68.09	203.58
2046	56.58	78.99	264.45	53.37	73.93	226.00
2047	60.75	85.29	291.22	57.30	79.82	248.67
2048	64.94	91.63	318.23	61.25	85.75	271.53
2049	69.14	98.00	345.41	65.21	91.71	294.52
2050	73.36	104.39	372.70	69.19	97.68	317.60
2051	73.36	104.39	400.00	69.19	97.68	340.68
2052	73.36	104.39	426.51	69.19	97.68	363.07
2053	73.36	104.39	452.70	69.19	97.68	385.19
2054	73.36	104.39	478.44	69.19	97.68	406.91
2055	73.36	104.39	503.57	69.19	97.68	428.10

2056	73.36	104.39	527.85	69.19	97.68	448.55
2057	73.36	104.39	551.02	69.19	97.68	468.05
2058	73.36	104.39	572.77	69.19	97.68	486.31
2059	73.36	104.39	592.77	69.19	97.68	503.07
2060	73.36	104.39	610.72	69.19	97.68	518.08
2061	73.36	104.39	626.40	69.19	97.68	531.13
2062	73.36	104.39	639.67	69.19	97.68	542.15
2063	73.36	104.39	650.57	69.19	97.68	551.16
2064	73.36	104.39	659.25	69.19	97.68	558.30
2065	73.36	104.39	665.98	69.19	97.68	563.80
2066	73.36	104.39	671.05	69.19	97.68	567.93
2067	73.36	104.39	674.78	69.19	97.68	570.94
2068	73.36	104.39	677.46	69.19	97.68	573.10
2069	73.36	104.39	679.34	69.19	97.68	574.60
2070	73.36	104.39	680.63	69.19	97.68	575.62
2071	73.36	104.39	681.47	69.19	97.68	576.28
2072	73.36	104.39	681.99	69.19	97.68	576.69
2073	73.36	104.39	682.27	69.19	97.68	576.91
2074	73.36	104.39	682.39	69.19	97.68	577.01
2075	73.36	104.39	682.39	69.19	97.68	577.01

Table S31. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Newfoundland & Labrador values. All values are provided in $MtCO_2eq$.

Newfoundland & Labrador						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	1.26	1.26	1.26	1.21	1.21	1.16
2028	2.79	2.85	3.00	2.69	2.73	2.77
2029	4.65	4.83	5.43	4.48	4.64	4.99
2030	6.86	7.29	8.76	6.61	6.99	8.04
2031	9.46	10.28	13.29	9.11	9.86	12.18
2032	12.45	13.85	19.38	11.99	13.28	17.74
2033	15.84	18.04	27.44	15.26	17.30	25.06
2034	19.62	22.87	37.88	18.90	21.92	34.53
2035	23.77	28.33	51.08	22.89	27.14	46.47
2036	28.26	34.38	67.35	27.21	32.93	61.14
2037	33.05	40.98	86.80	31.81	39.25	78.63
2038	38.10	48.07	109.39	36.67	46.02	98.89
2039	43.37	55.57	134.89	41.73	53.18	121.72
2040	48.82	63.41	162.97	46.97	60.68	146.80
2041	54.42	71.55	193.20	52.35	68.45	173.76
2042	60.14	79.91	225.17	57.85	76.44	202.23
2043	65.96	88.46	258.50	63.45	84.60	231.87

2044	71.86	97.16	292.86	69.11	92.90	262.40
2045	77.82	105.97	328.01	74.84	101.31	293.60
2046	83.82	114.86	363.72	80.61	109.80	325.27
2047	89.87	123.83	399.85	86.42	118.36	357.30
2048	95.94	132.84	436.28	92.25	126.96	389.58
2049	102.03	141.90	472.93	98.10	135.60	422.04
2050	108.14	150.98	509.73	103.98	144.27	454.63
2051	108.14	150.98	546.54	103.98	144.27	487.21
2052	108.14	150.98	582.08	103.98	144.27	518.64
2053	108.14	150.98	617.14	103.98	144.27	549.62
2054	108.14	150.98	651.52	103.98	144.27	579.99
2055	108.14	150.98	684.99	103.98	144.27	609.52
2056	108.14	150.98	717.26	103.98	144.27	637.97
2057	108.14	150.98	747.97	103.98	144.27	665.00
2058	108.14	150.98	776.72	103.98	144.27	690.26
2059	108.14	150.98	803.08	103.98	144.27	713.38
2060	108.14	150.98	826.67	103.98	144.27	734.03
2061	108.14	150.98	847.21	103.98	144.27	751.95
2062	108.14	150.98	864.56	103.98	144.27	767.04
2063	108.14	150.98	878.77	103.98	144.27	779.36
2064	108.14	150.98	890.07	103.98	144.27	789.12
2065	108.14	150.98	898.80	103.98	144.27	796.63
2066	108.14	150.98	905.38	103.98	144.27	802.26
2067	108.14	150.98	910.21	103.98	144.27	806.38
2068	108.14	150.98	913.68	103.98	144.27	809.32
2069	108.14	150.98	916.11	103.98	144.27	811.38
2070	108.14	150.98	917.77	103.98	144.27	812.77
2071	108.14	150.98	918.86	103.98	144.27	813.68
2072	108.14	150.98	919.54	103.98	144.27	814.24
2073	108.14	150.98	919.91	103.98	144.27	814.55
2074	108.14	150.98	920.06	103.98	144.27	814.67
2075	108.14	150.98	920.06	103.98	144.27	814.67

Table S32. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Prince Edward Island values. All values are provided in $MtCO_2eq$.

Prince Edward Island						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	1.10	1.10	1.10	1.06	1.05	1.00
2028	2.45	2.50	2.64	2.35	2.39	2.40
2029	4.08	4.25	4.77	3.92	4.05	4.33
2030	6.03	6.41	7.70	5.78	6.11	6.99
2031	8.31	9.03	11.70	7.96	8.61	10.59

2032	10.93	12.17	17.07	10.48	11.60	15.43
2033	13.91	15.86	24.18	13.33	15.11	21.80
2034	17.23	20.10	33.38	16.51	19.15	30.04
2035	20.87	24.89	45.03	19.99	23.70	40.42
2036	24.81	30.20	59.36	23.75	28.75	53.15
2037	29.00	35.98	76.49	27.76	34.24	68.32
2038	33.41	42.18	96.36	31.98	40.13	85.86
2039	38.01	48.74	118.77	36.38	46.35	105.60
2040	42.77	55.59	143.41	40.93	52.86	127.24
2041	47.66	62.70	169.92	45.60	59.60	150.48
2042	52.65	70.00	197.97	50.37	66.53	175.03
2043	57.73	77.47	227.26	55.22	73.61	200.63
2044	62.89	85.07	257.50	60.14	80.82	227.04
2045	68.09	92.78	288.47	65.11	88.12	254.06
2046	73.34	100.57	319.96	70.13	95.51	281.51
2047	78.63	108.42	351.84	75.18	102.95	309.29
2048	83.94	116.32	384.00	80.25	110.43	337.30
2049	89.27	124.25	416.36	85.34	117.95	365.47
2050	94.62	132.21	448.86	90.45	125.50	393.76
2051	94.62	132.21	481.37	90.45	125.50	422.05
2052	94.62	132.21	512.77	90.45	125.50	449.33
2053	94.62	132.21	543.74	90.45	125.50	476.22
2054	94.62	132.21	574.11	90.45	125.50	502.58
2055	94.62	132.21	603.68	90.45	125.50	528.21
2056	94.62	132.21	632.19	90.45	125.50	552.90
2057	94.62	132.21	659.32	90.45	125.50	576.35
2058	94.62	132.21	684.72	90.45	125.50	598.26
2059	94.62	132.21	708.01	90.45	125.50	618.32
2060	94.62	132.21	728.87	90.45	125.50	636.22
2061	94.62	132.21	747.04	90.45	125.50	651.78
2062	94.62	132.21	762.42	90.45	125.50	664.90
2063	94.62	132.21	775.05	90.45	125.50	675.64
2064	94.62	132.21	785.15	90.45	125.50	684.19
2065	94.62	132.21	793.01	90.45	125.50	690.84
2066	94.62	132.21	799.01	90.45	125.50	695.89
2067	94.62	132.21	803.46	90.45	125.50	699.62
2068	94.62	132.21	806.67	90.45	125.50	702.31
2069	94.62	132.21	808.93	90.45	125.50	704.19
2070	94.62	132.21	810.47	90.45	125.50	705.46
2071	94.62	132.21	811.48	90.45	125.50	706.29
2072	94.62	132.21	812.10	90.45	125.50	706.80
2073	94.62	132.21	812.45	90.45	125.50	707.09
2074	94.62	132.21	812.59	90.45	125.50	707.20
2075	94.62	132.21	812.59	90.45	125.50	707.20

Table S33. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Nova Scotia values. All values are provided in $MtCO_2eq$.

Nova Scotia						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	-0.86	-0.86	-0.86	-0.90	-0.91	-0.96
2028	-1.88	-1.91	-2.00	-1.98	-2.02	-2.24
2029	-3.06	-3.15	-3.44	-3.23	-3.35	-3.87
2030	-4.38	-4.57	-5.19	-4.62	-4.87	-5.91
2031	-5.81	-6.15	-7.26	-6.16	-6.57	-8.37
2032	-7.35	-7.86	-9.62	-7.81	-8.43	-11.26
2033	-8.97	-9.69	-12.21	-9.55	-10.44	-14.59
2034	-10.64	-11.60	-14.99	-11.37	-12.56	-18.34
2035	-12.37	-13.58	-17.85	-13.25	-14.76	-22.46
2036	-14.12	-15.59	-20.68	-15.17	-17.04	-26.89
2037	-15.88	-17.61	-23.37	-17.12	-19.35	-31.54
2038	-17.66	-19.64	-25.83	-19.09	-21.69	-36.33
2039	-19.43	-21.66	-28.01	-21.07	-24.04	-41.18
2040	-21.20	-23.66	-29.88	-23.05	-26.40	-46.04
2041	-22.97	-25.65	-31.45	-25.03	-28.75	-50.89
2042	-24.73	-27.62	-32.76	-27.02	-31.09	-55.70
2043	-26.48	-29.57	-33.85	-29.00	-33.43	-60.47
2044	-28.23	-31.51	-34.75	-30.98	-35.76	-65.21
2045	-29.98	-33.43	-35.52	-32.96	-38.09	-69.93
2046	-31.72	-35.35	-36.19	-34.93	-40.41	-74.63
2047	-33.46	-37.26	-36.77	-36.91	-42.73	-79.32
2048	-35.19	-39.17	-37.30	-38.88	-45.05	-84.00
2049	-36.92	-41.07	-37.79	-40.85	-47.36	-88.68
2050	-38.66	-42.97	-38.25	-42.82	-49.68	-93.36
2051	-38.66	-42.97	-38.71	-42.82	-49.68	-98.03
2052	-38.66	-42.97	-38.31	-42.82	-49.68	-101.75
2053	-38.66	-42.97	-37.64	-42.82	-49.68	-105.15
2054	-38.66	-42.97	-36.66	-42.82	-49.68	-108.19
2055	-38.66	-42.97	-35.36	-42.82	-49.68	-110.83
2056	-38.66	-42.97	-33.75	-42.82	-49.68	-113.04
2057	-38.66	-42.97	-31.86	-42.82	-49.68	-114.83
2058	-38.66	-42.97	-29.72	-42.82	-49.68	-116.18
2059	-38.66	-42.97	-27.40	-42.82	-49.68	-117.10
2060	-38.66	-42.97	-25.01	-42.82	-49.68	-117.65
2061	-38.66	-42.97	-22.64	-42.82	-49.68	-117.90
2062	-38.66	-42.97	-20.40	-42.82	-49.68	-117.92
2063	-38.66	-42.97	-18.40	-42.82	-49.68	-117.81
2064	-38.66	-42.97	-16.68	-42.82	-49.68	-117.63

2065	-38.66	-42.97	-15.27	-42.82	-49.68	-117.45
2066	-38.66	-42.97	-14.16	-42.82	-49.68	-117.28
2067	-38.66	-42.97	-13.31	-42.82	-49.68	-117.15
2068	-38.66	-42.97	-12.69	-42.82	-49.68	-117.05
2069	-38.66	-42.97	-12.24	-42.82	-49.68	-116.98
2070	-38.66	-42.97	-11.93	-42.82	-49.68	-116.94
2071	-38.66	-42.97	-11.73	-42.82	-49.68	-116.91
2072	-38.66	-42.97	-11.60	-42.82	-49.68	-116.90
2073	-38.66	-42.97	-11.53	-42.82	-49.68	-116.89
2074	-38.66	-42.97	-11.50	-42.82	-49.68	-116.89
2075	-38.66	-42.97	-11.50	-42.82	-49.68	-116.89

Table S34. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the New Brunswick values. All values are provided in $MtCO_2eq$.

New Brunswick						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	1.03	1.03	1.03	0.98	0.98	0.93
2028	2.29	2.34	2.47	2.19	2.22	2.23
2029	3.83	3.98	4.48	3.66	3.79	4.05
2030	5.67	6.03	7.28	5.42	5.74	6.57
2031	7.84	8.54	11.14	7.50	8.13	10.03
2032	10.37	11.58	16.38	9.91	11.01	14.74
2033	13.25	15.17	23.40	12.67	14.42	21.03
2034	16.49	19.33	32.59	15.76	18.38	29.24
2035	20.06	24.07	44.32	19.18	22.89	39.71
2036	23.95	29.36	58.90	22.89	27.91	52.69
2037	28.11	35.16	76.45	26.87	33.42	68.27
2038	32.51	41.41	96.93	31.08	39.36	86.43
2039	37.12	48.04	120.15	35.49	45.66	106.98
2040	41.90	55.01	145.79	40.06	52.27	129.62
2041	46.82	62.24	173.46	44.76	59.14	154.02
2042	51.86	69.69	202.80	49.57	66.21	179.86
2043	56.99	77.32	233.47	54.48	73.46	206.85
2044	62.20	85.10	265.18	59.45	80.84	234.72
2045	67.47	92.99	297.66	64.49	88.33	263.25
2046	72.78	100.96	330.70	69.57	95.90	292.25
2047	78.14	109.01	364.16	74.69	103.54	321.61
2048	83.52	117.10	397.92	79.83	111.22	351.22
2049	88.92	125.23	431.89	84.99	118.94	381.00
2050	94.34	133.40	466.01	90.18	126.68	410.91
2051	94.34	133.40	500.14	90.18	126.68	440.82
2052	94.34	133.40	533.23	90.18	126.68	469.80

2053	94.34	133.40	565.92	90.18	126.68	498.41
2054	94.34	133.40	598.03	90.18	126.68	526.50
2055	94.34	133.40	629.36	90.18	126.68	553.89
2056	94.34	133.40	659.63	90.18	126.68	580.33
2057	94.34	133.40	688.51	90.18	126.68	605.54
2058	94.34	133.40	715.62	90.18	126.68	629.16
2059	94.34	133.40	740.55	90.18	126.68	650.86
2060	94.34	133.40	762.94	90.18	126.68	670.30
2061	94.34	133.40	782.49	90.18	126.68	687.23
2062	94.34	133.40	799.07	90.18	126.68	701.55
2063	94.34	133.40	812.71	90.18	126.68	713.30
2064	94.34	133.40	823.62	90.18	126.68	722.67
2065	94.34	133.40	832.11	90.18	126.68	729.93
2066	94.34	133.40	838.56	90.18	126.68	735.44
2067	94.34	133.40	843.35	90.18	126.68	739.51
2068	94.34	133.40	846.80	90.18	126.68	742.44
2069	94.34	133.40	849.22	90.18	126.68	744.48
2070	94.34	133.40	850.86	90.18	126.68	745.86
2071	94.34	133.40	851.94	90.18	126.68	746.76
2072	94.34	133.40	852.61	90.18	126.68	747.31
2073	94.34	133.40	852.98	90.18	126.68	747.62
2074	94.34	133.40	853.13	90.18	126.68	747.75
2075	94.34	133.40	853.13	90.18	126.68	747.75

Table S35. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Quebec values. All values are provided in $MtCO_2eq$.

Quebec						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	1.27	1.27	1.27	1.23	1.22	1.17
2028	2.82	2.88	3.04	2.72	2.76	2.80
2029	4.70	4.89	5.48	4.53	4.69	5.05
2030	6.93	7.37	8.85	6.69	7.07	8.13
2031	9.55	10.38	13.42	9.21	9.96	12.32
2032	12.57	13.99	19.57	12.12	13.42	17.93
2033	16.00	18.22	27.69	15.42	17.48	25.32
2034	19.82	23.10	38.22	19.09	22.14	34.87
2035	24.01	28.60	51.53	23.12	27.41	46.92
2036	28.54	34.71	67.92	27.48	33.26	61.70
2037	33.37	41.36	87.51	32.13	39.62	79.34
2038	38.46	48.51	110.26	37.03	46.45	99.77
2039	43.77	56.07	135.94	42.14	53.68	122.77
2040	49.27	63.98	164.21	47.42	61.24	148.04

2041	54.92	72.18	194.64	52.86	69.08	175.21
2042	60.69	80.61	226.82	58.40	77.13	203.89
2043	66.56	89.23	260.37	64.04	85.36	233.75
2044	72.50	97.99	294.96	69.76	93.73	264.50
2045	78.51	106.87	330.33	75.53	102.21	295.92
2046	84.57	115.83	366.28	81.35	110.77	327.83
2047	90.66	124.86	402.64	87.21	119.39	360.09
2048	96.78	133.95	439.30	93.09	128.07	392.60
2049	102.93	143.07	476.18	99.00	136.78	425.29
2050	109.09	152.23	513.22	104.92	145.52	458.12
2051	109.09	152.23	550.26	104.92	145.52	490.94
2052	109.09	152.23	586.03	104.92	145.52	522.59
2053	109.09	152.23	621.30	104.92	145.52	553.78
2054	109.09	152.23	655.89	104.92	145.52	584.36
2055	109.09	152.23	689.56	104.92	145.52	614.10
2056	109.09	152.23	722.03	104.92	145.52	642.73
2057	109.09	152.23	752.92	104.92	145.52	669.94
2058	109.09	152.23	781.83	104.92	145.52	695.37
2059	109.09	152.23	808.34	104.92	145.52	718.64
2060	109.09	152.23	832.07	104.92	145.52	739.42
2061	109.09	152.23	852.72	104.92	145.52	757.45
2062	109.09	152.23	870.16	104.92	145.52	772.64
2063	109.09	152.23	884.45	104.92	145.52	785.03
2064	109.09	152.23	895.80	104.92	145.52	794.85
2065	109.09	152.23	904.58	104.92	145.52	802.40
2066	109.09	152.23	911.18	104.92	145.52	808.06
2067	109.09	152.23	916.04	104.92	145.52	812.20
2068	109.09	152.23	919.53	104.92	145.52	815.16
2069	109.09	152.23	921.97	104.92	145.52	817.23
2070	109.09	152.23	923.64	104.92	145.52	818.63
2071	109.09	152.23	924.73	104.92	145.52	819.55
2072	109.09	152.23	925.41	104.92	145.52	820.11
2073	109.09	152.23	925.78	104.92	145.52	820.42
2074	109.09	152.23	925.94	104.92	145.52	820.55
2075	109.09	152.23	925.94	104.92	145.52	820.55

Table S36. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Ontario values. All values are provided in $MtCO_2eq$.

Ontario						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	1.10	1.10	1.10	1.06	1.05	1.00
2028	2.45	2.50	2.64	2.35	2.38	2.40

2029	4.09	4.25	4.78	3.92	4.06	4.34
2030	6.04	6.43	7.75	5.79	6.13	7.03
2031	8.35	9.09	11.82	8.01	8.67	10.72
2032	11.03	12.30	17.35	10.57	11.73	15.71
2033	14.08	16.09	24.71	13.49	15.34	22.34
2034	17.49	20.47	34.31	16.76	19.52	30.96
2035	21.25	25.44	46.51	20.37	24.25	41.89
2036	25.32	30.97	61.58	24.27	29.52	55.36
2037	29.68	37.00	79.64	28.44	35.26	71.47
2038	34.27	43.49	100.66	32.84	41.44	90.16
2039	39.07	50.37	124.41	37.44	47.99	111.24
2040	44.04	57.57	150.58	42.20	54.84	134.42
2041	49.15	65.04	178.78	47.09	61.95	159.34
2042	54.38	72.73	208.60	52.09	69.26	185.67
2043	59.69	80.59	239.71	57.18	76.73	213.08
2044	65.08	88.58	271.78	62.33	84.33	241.32
2045	70.52	96.68	304.59	67.54	92.03	270.18
2046	76.01	104.86	337.92	72.80	99.80	299.48
2047	81.53	113.11	371.65	78.08	107.64	329.10
2048	87.08	121.40	405.66	83.39	115.52	358.96
2049	92.65	129.73	439.87	88.72	123.43	388.98
2050	98.24	138.09	474.22	94.07	131.37	419.12
2051	98.24	138.09	508.58	94.07	131.37	449.26
2052	98.24	138.09	541.83	94.07	131.37	478.39
2053	98.24	138.09	574.65	94.07	131.37	507.14
2054	98.24	138.09	606.86	94.07	131.37	535.33
2055	98.24	138.09	638.25	94.07	131.37	562.78
2056	98.24	138.09	668.53	94.07	131.37	589.23
2057	98.24	138.09	697.36	94.07	131.37	614.38
2058	98.24	138.09	724.35	94.07	131.37	637.89
2059	98.24	138.09	749.11	94.07	131.37	659.41
2060	98.24	138.09	771.26	94.07	131.37	678.61
2061	98.24	138.09	790.55	94.07	131.37	695.28
2062	98.24	138.09	806.83	94.07	131.37	709.31
2063	98.24	138.09	820.17	94.07	131.37	720.76
2064	98.24	138.09	830.77	94.07	131.37	729.82
2065	98.24	138.09	838.96	94.07	131.37	736.78
2066	98.24	138.09	845.12	94.07	131.37	742.00
2067	98.24	138.09	849.65	94.07	131.37	745.81
2068	98.24	138.09	852.90	94.07	131.37	748.54
2069	98.24	138.09	855.18	94.07	131.37	750.44
2070	98.24	138.09	856.73	94.07	131.37	751.72
2071	98.24	138.09	857.75	94.07	131.37	752.56
2072	98.24	138.09	858.37	94.07	131.37	753.08
2073	98.24	138.09	858.72	94.07	131.37	753.36
2074	98.24	138.09	858.87	94.07	131.37	753.48

2075	98.24	138.09	858.87	94.07	131.37	753.48

Table S37. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Manitoba values. All values are provided in $MtCO_2eq$.

Manitoba						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	1.29	1.29	1.29	1.24	1.24	1.19
2028	2.87	2.92	3.08	2.76	2.81	2.84
2029	4.77	4.96	5.56	4.60	4.76	5.13
2030	7.03	7.47	8.97	6.79	7.18	8.25
2031	9.69	10.53	13.60	9.34	10.11	12.50
2032	12.75	14.18	19.82	12.29	13.61	18.18
2033	16.22	18.46	28.04	15.63	17.72	25.66
2034	20.08	23.40	38.67	19.36	22.44	35.33
2035	24.32	28.97	52.12	23.44	27.78	47.51
2036	28.91	35.14	68.66	27.85	33.69	62.45
2037	33.79	41.87	88.44	32.55	40.13	80.26
2038	38.94	49.09	111.38	37.51	47.03	100.89
2039	44.31	56.72	137.28	42.68	54.34	124.11
2040	49.87	64.71	165.77	48.02	61.98	149.61
2041	55.58	72.99	196.44	53.52	69.90	177.01
2042	61.41	81.51	228.87	59.12	78.03	205.93
2043	67.34	90.21	262.67	64.83	86.35	236.04
2044	73.35	99.06	297.51	70.60	94.80	267.05
2045	79.42	108.02	333.14	76.44	103.36	298.73
2046	85.54	117.07	369.34	82.32	112.00	330.89
2047	91.69	126.18	405.96	88.24	120.71	363.41
2048	97.87	135.35	442.88	94.19	129.47	396.18
2049	104.08	144.56	480.02	100.15	138.27	429.13
2050	110.31	153.80	517.32	106.14	147.09	462.21
2051	110.31	153.80	554.62	106.14	147.09	495.30
2052	110.31	153.80	590.62	106.14	147.09	527.19
2053	110.31	153.80	626.13	106.14	147.09	558.62
2054	110.31	153.80	660.94	106.14	147.09	589.41
2055	110.31	153.80	694.83	106.14	147.09	619.37
2056	110.31	153.80	727.50	106.14	147.09	648.20
2057	110.31	153.80	758.58	106.14	147.09	675.60
2058	110.31	153.80	787.66	106.14	147.09	701.20
2059	110.31	153.80	814.31	106.14	147.09	724.62
2060	110.31	153.80	838.17	106.14	147.09	745.52
2061	110.31	153.80	858.92	106.14	147.09	763.65
2062	110.31	153.80	876.44	106.14	147.09	778.92

2063	110.31	153.80	890.79	106.14	147.09	791.38
2064	110.31	153.80	902.19	106.14	147.09	801.24
2065	110.31	153.80	911.00	106.14	147.09	808.82
2066	110.31	153.80	917.62	106.14	147.09	814.51
2067	110.31	153.80	922.49	106.14	147.09	818.66
2068	110.31	153.80	925.99	106.14	147.09	821.63
2069	110.31	153.80	928.44	106.14	147.09	823.70
2070	110.31	153.80	930.11	106.14	147.09	825.11
2071	110.31	153.80	931.21	106.14	147.09	826.02
2072	110.31	153.80	931.88	106.14	147.09	826.59
2073	110.31	153.80	932.26	106.14	147.09	826.90
2074	110.31	153.80	932.41	106.14	147.09	827.02
2075	110.31	153.80	932.41	106.14	147.09	827.02

Table S38. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Saskatchewan values. All values are provided in $MtCO_2eq$.

Saskatchewan						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	-0.46	-0.46	-0.46	-0.51	-0.51	-0.56
2028	-1.00	-1.02	-1.06	-1.10	-1.13	-1.30
2029	-1.62	-1.66	-1.79	-1.78	-1.85	-2.22
2030	-2.29	-2.37	-2.63	-2.54	-2.67	-3.34
2031	-3.00	-3.14	-3.55	-3.35	-3.56	-4.65
2032	-3.74	-3.93	-4.47	-4.19	-4.50	-6.11
2033	-4.48	-4.72	-5.29	-5.06	-5.46	-7.66
2034	-5.21	-5.48	-5.87	-5.93	-6.43	-9.22
2035	-5.91	-6.18	-6.06	-6.80	-7.37	-10.68
2036	-6.58	-6.81	-5.71	-7.64	-8.26	-11.92
2037	-7.22	-7.36	-4.69	-8.45	-9.10	-12.86
2038	-7.81	-7.83	-2.92	-9.24	-9.88	-13.42
2039	-8.36	-8.21	-0.40	-10.00	-10.60	-13.57
2040	-8.88	-8.52	2.82	-10.73	-11.26	-13.34
2041	-9.37	-8.77	6.67	-11.43	-11.87	-12.76
2042	-9.83	-8.96	11.04	-12.12	-12.44	-11.89
2043	-10.27	-9.11	15.84	-12.79	-12.97	-10.78
2044	-10.69	-9.21	20.97	-13.44	-13.47	-9.49
2045	-11.10	-9.29	26.35	-14.08	-13.95	-8.06
2046	-11.50	-9.35	31.93	-14.71	-14.41	-6.52
2047	-11.88	-9.38	37.63	-15.33	-14.85	-4.92
2048	-12.26	-9.41	43.44	-15.95	-15.29	-3.26
2049	-12.63	-9.42	49.33	-16.56	-15.72	-1.56
2050	-13.00	-9.42	55.26	-17.17	-16.14	0.16

2051	-13.00	-9.42	61.20	-17.17	-16.14	1.88
2052	-13.00	-9.42	67.59	-17.17	-16.14	4.16
2053	-13.00	-9.42	74.12	-17.17	-16.14	6.61
2054	-13.00	-9.42	80.79	-17.17	-16.14	9.26
2055	-13.00	-9.42	87.57	-17.17	-16.14	12.10
2056	-13.00	-9.42	94.42	-17.17	-16.14	15.13
2057	-13.00	-9.42	101.28	-17.17	-16.14	18.30
2058	-13.00	-9.42	108.03	-17.17	-16.14	21.57
2059	-13.00	-9.42	114.55	-17.17	-16.14	24.85
2060	-13.00	-9.42	120.68	-17.17	-16.14	28.03
2061	-13.00	-9.42	126.26	-17.17	-16.14	31.00
2062	-13.00	-9.42	131.17	-17.17	-16.14	33.65
2063	-13.00	-9.42	135.34	-17.17	-16.14	35.93
2064	-13.00	-9.42	138.76	-17.17	-16.14	37.80
2065	-13.00	-9.42	141.47	-17.17	-16.14	39.29
2066	-13.00	-9.42	143.55	-17.17	-16.14	40.43
2067	-13.00	-9.42	145.12	-17.17	-16.14	41.28
2068	-13.00	-9.42	146.25	-17.17	-16.14	41.89
2069	-13.00	-9.42	147.06	-17.17	-16.14	42.32
2070	-13.00	-9.42	147.61	-17.17	-16.14	42.60
2071	-13.00	-9.42	147.97	-17.17	-16.14	42.79
2072	-13.00	-9.42	148.20	-17.17	-16.14	42.90
2073	-13.00	-9.42	148.33	-17.17	-16.14	42.96
2074	-13.00	-9.42	148.38	-17.17	-16.14	42.99
2075	-13.00	-9.42	148.38	-17.17	-16.14	42.99

Table S39. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Alberta values. All values are provided in $MtCO_2eq$.

Alberta						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	-1.23	-1.23	-1.23	-1.28	-1.28	-1.33
2028	-2.71	-2.76	-2.89	-2.81	-2.87	-3.13
2029	-4.45	-4.60	-5.07	-4.62	-4.80	-5.50
2030	-6.45	-6.78	-7.86	-6.70	-7.08	-8.57
2031	-8.71	-9.31	-11.38	-9.06	-9.73	-12.48
2032	-11.22	-12.19	-15.73	-11.68	-12.76	-17.37
2033	-13.96	-15.42	-21.03	-14.54	-16.16	-23.40
2034	-16.91	-18.97	-27.35	-17.63	-19.92	-30.70
2035	-20.04	-22.82	-34.75	-20.93	-24.00	-39.36
2036	-23.34	-26.93	-43.20	-24.40	-28.38	-49.42
2037	-26.77	-31.27	-52.67	-28.01	-33.01	-60.84
2038	-30.31	-35.80	-63.03	-31.75	-37.85	-73.53

2039	-33.95	-40.48	-74.17	-35.58	-42.87	-87.34
2040	-37.65	-45.29	-85.91	-39.49	-48.02	-102.08
2041	-41.41	-50.19	-98.15	-43.47	-53.29	-117.58
2042	-45.21	-55.17	-110.75	-47.49	-58.64	-133.68
2043	-49.04	-60.20	-123.61	-51.56	-64.06	-150.24
2044	-52.90	-65.27	-136.67	-55.65	-69.53	-167.13
2045	-56.78	-70.38	-149.87	-59.76	-75.04	-184.29
2046	-60.68	-75.52	-163.18	-63.89	-80.58	-201.62
2047	-64.59	-80.67	-176.55	-68.04	-86.14	-219.10
2048	-68.50	-85.84	-189.97	-72.19	-91.72	-236.67
2049	-72.43	-91.01	-203.43	-76.36	-97.31	-254.32
2050	-76.36	-96.20	-216.92	-80.53	-102.91	-272.02
2051	-76.36	-96.20	-230.40	-80.53	-102.91	-289.72
2052	-76.36	-96.20	-242.65	-80.53	-102.91	-306.09
2053	-76.36	-96.20	-254.48	-80.53	-102.91	-321.99
2054	-76.36	-96.20	-265.79	-80.53	-102.91	-337.32
2055	-76.36	-96.20	-276.48	-80.53	-102.91	-351.95
2056	-76.36	-96.20	-286.45	-80.53	-102.91	-365.75
2057	-76.36	-96.20	-295.58	-80.53	-102.91	-378.55
2058	-76.36	-96.20	-303.77	-80.53	-102.91	-390.23
2059	-76.36	-96.20	-310.93	-80.53	-102.91	-400.63
2060	-76.36	-96.20	-317.02	-80.53	-102.91	-409.67
2061	-76.36	-96.20	-322.05	-80.53	-102.91	-417.31
2062	-76.36	-96.20	-326.07	-80.53	-102.91	-423.59
2063	-76.36	-96.20	-329.19	-80.53	-102.91	-428.60
2064	-76.36	-96.20	-331.55	-80.53	-102.91	-432.50
2065	-76.36	-96.20	-333.28	-80.53	-102.91	-435.46
2066	-76.36	-96.20	-334.53	-80.53	-102.91	-437.65
2067	-76.36	-96.20	-335.42	-80.53	-102.91	-439.26
2068	-76.36	-96.20	-336.04	-80.53	-102.91	-440.40
2069	-76.36	-96.20	-336.46	-80.53	-102.91	-441.20
2070	-76.36	-96.20	-336.75	-80.53	-102.91	-441.75
2071	-76.36	-96.20	-336.93	-80.53	-102.91	-442.12
2072	-76.36	-96.20	-337.05	-80.53	-102.91	-442.34
2073	-76.36	-96.20	-337.11	-80.53	-102.91	-442.47
2074	-76.36	-96.20	-337.13	-80.53	-102.91	-442.52
2075	-76.36	-96.20	-337.13	-80.53	-102.91	-442.52

Table S40. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the British Columbia values. All values are provided in $MtCO_2eq$.

British Columbia						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**

2027	1.15	1.15	1.15	1.10	1.10	1.05
2028	2.56	2.60	2.75	2.46	2.49	2.51
2029	4.26	4.42	4.97	4.09	4.23	4.53
2030	6.28	6.67	8.02	6.03	6.38	7.31
2031	8.66	9.41	12.18	8.31	8.99	11.08
2032	11.40	12.69	17.79	10.94	12.12	16.14
2033	14.51	16.53	25.21	13.92	15.79	22.83
2034	17.98	20.97	34.83	17.25	20.02	31.49
2035	21.79	25.99	47.03	20.90	24.80	42.42
2036	25.91	31.55	62.06	24.85	30.10	55.85
2037	30.30	37.62	80.06	29.07	35.88	71.89
2038	34.94	44.14	100.98	33.51	42.09	90.49
2039	39.78	51.04	124.62	38.14	48.66	111.45
2040	44.79	58.27	150.65	42.94	55.53	134.48
2041	49.94	65.76	178.69	47.87	62.66	159.25
2042	55.20	73.46	208.35	52.91	69.99	185.41
2043	60.55	81.34	239.28	58.03	77.48	212.66
2044	65.97	89.35	271.18	63.22	85.10	240.72
2045	71.45	97.47	303.81	68.47	92.81	269.40
2046	76.97	105.66	336.97	73.76	100.60	298.52
2047	82.53	113.92	370.51	79.07	108.45	327.96
2048	88.11	122.23	404.34	84.42	116.35	357.64
2049	93.71	130.58	438.37	89.78	124.28	387.48
2050	99.33	138.95	472.55	95.17	132.24	417.44
2051	99.33	138.95	506.72	95.17	132.24	447.40
2052	99.33	138.95	539.75	95.17	132.24	476.31
2053	99.33	138.95	572.32	95.17	132.24	504.81
2054	99.33	138.95	604.28	95.17	132.24	532.75
2055	99.33	138.95	635.40	95.17	132.24	559.93
2056	99.33	138.95	665.41	95.17	132.24	586.12
2057	99.33	138.95	693.98	95.17	132.24	611.01
2058	99.33	138.95	720.74	95.17	132.24	634.28
2059	99.33	138.95	745.29	95.17	132.24	655.59
2060	99.33	138.95	767.26	95.17	132.24	674.62
2061	99.33	138.95	786.40	95.17	132.24	691.14
2062	99.33	138.95	802.58	95.17	132.24	705.06
2063	99.33	138.95	815.84	95.17	132.24	716.42
2064	99.33	138.95	826.38	95.17	132.24	725.42
2065	99.33	138.95	834.52	95.17	132.24	732.35
2066	99.33	138.95	840.66	95.17	132.24	737.54
2067	99.33	138.95	845.17	95.17	132.24	741.34
2068	99.33	138.95	848.41	95.17	132.24	744.05
2069	99.33	138.95	850.68	95.17	132.24	745.94
2070	99.33	138.95	852.23	95.17	132.24	747.23
2071	99.33	138.95	853.25	95.17	132.24	748.07
2072	99.33	138.95	853.88	95.17	132.24	748.58

2073	99.33	138.95	854.23	95.17	132.24	748.86
2074	99.33	138.95	854.37	95.17	132.24	748.98
2075	99.33	138.95	854.37	95.17	132.24	748.98

Table S41. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Yukon values. All values are provided in $MtCO_2eq$.

Yukon						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	0.97	0.97	0.97	0.93	0.92	0.87
2028	2.17	2.21	2.34	2.07	2.10	2.10
2029	3.63	3.78	4.26	3.46	3.58	3.82
2030	5.38	5.73	6.93	5.13	5.43	6.22
2031	7.45	8.13	10.63	7.11	7.71	9.52
2032	9.86	11.02	15.65	9.40	10.45	14.01
2033	12.61	14.45	22.36	12.02	13.70	19.99
2034	15.69	18.42	31.14	14.97	17.47	27.80
2035	19.09	22.94	42.34	18.21	21.75	37.73
2036	22.79	27.97	56.23	21.73	26.52	50.01
2037	26.75	33.48	72.94	25.51	31.74	64.77
2038	30.93	39.42	92.45	29.50	37.37	81.95
2039	35.31	45.73	114.57	33.67	43.35	101.40
2040	39.85	52.35	139.00	38.01	49.62	122.84
2041	44.53	59.23	165.40	42.46	56.13	145.96
2042	49.32	66.32	193.37	47.03	62.84	170.44
2043	54.19	73.57	222.58	51.67	69.71	195.95
2044	59.13	80.95	252.73	56.39	76.70	222.27
2045	64.13	88.44	283.58	61.15	83.78	249.17
2046	69.17	96.00	314.96	65.95	90.94	276.51
2047	74.24	103.62	346.71	70.79	98.15	304.16
2048	79.34	111.30	378.73	75.65	105.41	332.03
2049	84.46	119.00	410.95	80.53	112.71	360.06
2050	89.60	126.74	443.31	85.43	120.02	388.21
2051	89.60	126.74	475.67	85.43	120.02	416.35
2052	89.60	126.74	507.06	85.43	120.02	443.62
2053	89.60	126.74	538.06	85.43	120.02	470.54
2054	89.60	126.74	568.50	85.43	120.02	496.97
2055	89.60	126.74	598.18	85.43	120.02	522.72
2056	89.60	126.74	626.85	85.43	120.02	547.56
2057	89.60	126.74	654.19	85.43	120.02	571.22
2058	89.60	126.74	679.84	85.43	120.02	593.38
2059	89.60	126.74	703.42	85.43	120.02	613.72
2060	89.60	126.74	724.58	85.43	120.02	631.94

2061	89.60	126.74	743.06	85.43	120.02	647.80
2062	89.60	126.74	758.71	85.43	120.02	661.19
2063	89.60	126.74	771.56	85.43	120.02	672.15
2064	89.60	126.74	781.80	85.43	120.02	680.85
2065	89.60	126.74	789.73	85.43	120.02	687.55
2066	89.60	126.74	795.69	85.43	120.02	692.57
2067	89.60	126.74	800.08	85.43	120.02	696.25
2068	89.60	126.74	803.24	85.43	120.02	698.87
2069	89.60	126.74	805.45	85.43	120.02	700.71
2070	89.60	126.74	806.95	85.43	120.02	701.95
2071	89.60	126.74	807.94	85.43	120.02	702.76
2072	89.60	126.74	808.55	85.43	120.02	703.26
2073	89.60	126.74	808.89	85.43	120.02	703.53
2074	89.60	126.74	809.03	85.43	120.02	703.64
2075	89.60	126.74	809.03	85.43	120.02	703.64

Table S42. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Northwest Territories values. All values are provided in $MtCO_2eq$.

Northwest Territories						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	0.14	0.14	0.14	0.09	0.09	0.04
2028	0.32	0.33	0.36	0.22	0.22	0.12
2029	0.57	0.61	0.74	0.41	0.42	0.31
2030	0.92	1.01	1.37	0.67	0.72	0.65
2031	1.36	1.56	2.36	1.01	1.14	1.26
2032	1.92	2.29	3.87	1.46	1.72	2.22
2033	2.61	3.21	6.07	2.02	2.47	3.70
2034	3.43	4.36	9.20	2.70	3.41	5.85
2035	4.37	5.74	13.44	3.49	4.56	8.83
2036	5.45	7.36	19.00	4.39	5.91	12.79
2037	6.64	9.19	25.99	5.40	7.45	17.82
2038	7.94	11.23	34.45	6.51	9.18	23.95
2039	9.34	13.46	44.32	7.70	11.07	31.15
2040	10.81	15.84	55.50	8.96	13.11	39.33
2041	12.36	18.36	67.80	10.29	15.26	48.36
2042	13.96	21.00	81.00	11.67	17.52	58.07
2043	15.61	23.72	94.93	13.09	19.86	68.30
2044	17.29	26.51	109.40	14.54	22.25	78.94
2045	19.00	29.36	124.28	16.02	24.70	89.87
2046	20.74	32.24	139.46	17.52	27.18	101.01
2047	22.49	35.17	154.86	19.04	29.70	112.31
2048	24.25	38.11	170.42	20.57	32.23	123.72

2049	26.03	41.08	186.10	22.10	34.78	135.21
2050	27.82	44.06	201.86	23.65	37.35	146.76
2051	27.82	44.06	217.62	23.65	37.35	158.30
2052	27.82	44.06	233.24	23.65	37.35	169.81
2053	27.82	44.06	248.78	23.65	37.35	181.27
2054	27.82	44.06	264.16	23.65	37.35	192.63
2055	27.82	44.06	279.29	23.65	37.35	203.82
2056	27.82	44.06	294.06	23.65	37.35	214.77
2057	27.82	44.06	308.32	23.65	37.35	225.34
2058	27.82	44.06	321.87	23.65	37.35	235.41
2059	27.82	44.06	334.51	23.65	37.35	244.81
2060	27.82	44.06	346.02	23.65	37.35	253.37
2061	27.82	44.06	356.22	23.65	37.35	260.96
2062	27.82	44.06	365.00	23.65	37.35	267.48
2063	27.82	44.06	372.30	23.65	37.35	272.89
2064	27.82	44.06	378.18	23.65	37.35	277.23
2065	27.82	44.06	382.76	23.65	37.35	280.59
2066	27.82	44.06	386.23	23.65	37.35	283.11
2067	27.82	44.06	388.78	23.65	37.35	284.95
2068	27.82	44.06	390.62	23.65	37.35	286.26
2069	27.82	44.06	391.91	23.65	37.35	287.17
2070	27.82	44.06	392.79	23.65	37.35	287.78
2071	27.82	44.06	393.37	23.65	37.35	288.18
2072	27.82	44.06	393.72	23.65	37.35	288.43
2073	27.82	44.06	393.92	23.65	37.35	288.56
2074	27.82	44.06	394.00	23.65	37.35	288.61
2075	27.82	44.06	394.00	23.65	37.35	288.61

Table S43. The emissions avoided between 2027 and 2075 for each policy scenario and fossil fuel diesel substitution and diesel pool substitution cases based on the Nunavut values. All values are provided in $MtCO_2eq$.

Nunavut						
	Fossil Fuel Diesel Substitution			**Diesel Pool Substitution**		
Year	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**	**Existing Policy Scenario**	**Growth Scenario**	**Continued Policy Development Scenario**
2027	-6.51	-6.51	-6.51	-6.55	-6.56	-6.61
2028	-14.43	-14.69	-15.47	-14.53	-14.80	-15.71
2029	-23.93	-24.82	-27.65	-24.10	-25.02	-28.09
2030	-35.13	-37.18	-44.03	-35.38	-37.47	-44.74
2031	-48.14	-52.00	-65.79	-48.48	-52.42	-66.89
2032	-62.99	-69.49	-94.30	-63.44	-70.06	-95.94
2033	-79.66	-89.76	-131.08	-80.25	-90.51	-133.45
2034	-98.09	-112.83	-177.63	-98.82	-113.78	-180.98
2035	-118.16	-138.61	-235.26	-119.04	-139.79	-239.88
2036	-139.70	-166.93	-304.88	-140.76	-168.38	-311.09

2037	-162.55	-197.56	-386.79	-163.79	-199.30	-394.96
2038	-186.52	-230.21	-480.62	-187.95	-232.26	-491.11
2039	-211.43	-264.59	-585.38	-213.07	-266.98	-598.55
2040	-237.13	-300.41	-699.69	-238.98	-303.15	-715.86
2041	-263.46	-337.41	-821.96	-265.53	-340.51	-841.39
2042	-290.31	-375.36	-950.61	-292.59	-378.84	-973.54
2043	-317.56	-414.06	-1084.22	-320.08	-417.92	-1110.85
2044	-345.15	-453.35	-1221.61	-347.89	-457.60	-1252.07
2045	-372.98	-493.09	-1361.80	-375.96	-497.75	-1396.21
2046	-401.02	-533.20	-1504.06	-404.23	-538.26	-1542.50
2047	-429.22	-573.57	-1647.82	-432.67	-579.04	-1690.37
2048	-457.53	-614.16	-1792.66	-461.22	-620.04	-1839.36
2049	-485.94	-654.90	-1938.29	-489.87	-661.20	-1989.18
2050	-514.43	-695.77	-2084.47	-518.60	-702.48	-2139.58
2051	-514.43	-695.77	-2230.66	-518.60	-702.48	-2289.98
2052	-514.43	-695.77	-2370.33	-518.60	-702.48	-2433.77
2053	-514.43	-695.77	-2507.56	-518.60	-702.48	-2575.07
2054	-514.43	-695.77	-2641.56	-518.60	-702.48	-2713.09
2055	-514.43	-695.77	-2771.37	-518.60	-702.48	-2846.83
2056	-514.43	-695.77	-2895.79	-518.60	-702.48	-2975.09
2057	-514.43	-695.77	-3013.46	-518.60	-702.48	-3096.43
2058	-514.43	-695.77	-3122.87	-518.60	-702.48	-3209.32
2059	-514.43	-695.77	-3222.50	-518.60	-702.48	-3312.20
2060	-514.43	-695.77	-3311.05	-518.60	-702.48	-3403.70
2061	-514.43	-695.77	-3387.62	-518.60	-702.48	-3482.88
2062	-514.43	-695.77	-3451.89	-518.60	-702.48	-3549.41
2063	-514.43	-695.77	-3504.25	-518.60	-702.48	-3603.66
2064	-514.43	-695.77	-3545.67	-518.60	-702.48	-3646.62
2065	-514.43	-695.77	-3577.54	-518.60	-702.48	-3679.71
2066	-514.43	-695.77	-3601.46	-518.60	-702.48	-3704.58
2067	-514.43	-695.77	-3618.99	-518.60	-702.48	-3722.83
2068	-514.43	-695.77	-3631.56	-518.60	-702.48	-3735.92
2069	-514.43	-695.77	-3640.36	-518.60	-702.48	-3745.10
2070	-514.43	-695.77	-3646.35	-518.60	-702.48	-3751.36
2071	-514.43	-695.77	-3650.28	-518.60	-702.48	-3755.47
2072	-514.43	-695.77	-3652.70	-518.60	-702.48	-3758.00
2073	-514.43	-695.77	-3654.04	-518.60	-702.48	-3759.40
2074	-514.43	-695.77	-3654.60	-518.60	-702.48	-3759.99
2075	-514.43	-695.77	-3654.60	-518.60	-702.48	-3759.99

References

[1] Rubin, E., & Rao, A. (2002). *A Technical, Economic and Environmental Assessment of Amine-based CO2 Capture Technology for Power Plant Greenhouse Gas Control*. Retrieved from https://www.osti.gov/servlets/purl/804932.

[2] Dimitriou, I., García-Gutiérrez, P., Elder, R. H., Cuéllar-Franca, R. M., Azapagic, A., & Allen, R. W. K. (2015). Carbon dioxide utilisation for production of transport fuels: process and economic analysis. Energy Environ. Sci., *8*(6), 1775–1789.

[3] Bouchy, C., Hastoy, G., Guillon, E., & Martens, J. A. (2009). Fischer-Tropsch waxes upgrading via hydrocracking and selective hydroisomerization. Oil and Gas Science and Technology, *64*(1), 91–112.

[4] Peters, M. S., Timmerhaus, K. D., West, R. E., Timmerhaus, K., & West, R. (1968). *Plant design and economics for chemical engineers* (Vol. 4). Book, McGraw-Hill New York.

[5] Hamelinck, C. N., Faaij, A. P. C., den Uil, H., & Boerrigter, H. (2004). Production of FT transportation fuels from biomass; technical options, process analysis and optimisation, and development potential. Energy, *29*(11), 1743–1771.

[6] Albrecht, F. G., König, D. H., Baucks, N., & Dietrich, R.-U. (2017). A standardized methodology for the techno-economic evaluation of alternative fuels–A case study. Fuel, *194*, 511–526.

[7] Brynolf, S., Taljegard, M., Grahn, M., & Hansson, J. (2018). Electrofuels for the transport sector: A review of production costs. Renewable and Sustainable Energy Reviews, *81*, 1887–1905.

[8] Ahmadi, L., Kannangara, M., & Bensebaa, F. (2020). Cost-effectiveness of small scale biomass supply chain and bioenergy production systems in carbon credit markets: A life cycle perspective. Sustainable Energy Technologies and Assessments, *37*, 100627.

[9] Mayyas, A., Ruth, M., Pivovar, B., Bender, G., and Wipke, K. (2019) Manufacturing Cost Analysis for Proton Exchange Membrane Water Electrolyzers, National Renewable Energy Laboratory.

[10] Swanson, R. M., Platon, A., Satrio, J. A., Brown, R. C., & Hsu, D. D. (2010). *Techno-economic analysis of biofuels production based on gasification* (RPRT). National Renewable Energy Lab.(NREL), Golden, CO (United States).

[11] Rafati, M., Wang, L., Dayton, D. C., Schimmel, K., Kabadi, V., & Shahbazi, A. (2017). Techno-economic analysis of production of Fischer-Tropsch liquids via biomass gasification: The effects of Fischer-Tropsch catalysts and natural gas co-feeding. Energy Conversion and Management, *133*, 153–166. JOUR.

[12] Garret, D. (2012). *Chemical engineering economics*. Springer.

[13] Loh, H. P., Lyons, J., & White, C. W. (2002). *Process equipment cost estimation, final report* (RPRT). National Energy Technology Lab.(NETL), Morgantown, WV (United States).

[14] Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., & Weidema, B. (2016). The ecoinvent database version 3 (part I): overview and methodology. The International Journal of Life Cycle Assessment, *21*(9), 1218–1230.

[15] Canada Energy Regulator (2020) Canada's Energy Future 2020: Energy Supply and Demand Projections to 2050. Government of Canada. https://doi.org/10.35002/zjr8-8x75

[16] Sleep, S., Guo, J., Laurenzi, I. J., Bergerson, J. A., and MacLean, H. L. (2020). Quantifying Variability in Well-to-wheel Greenhouse Gas Emission Intensities of Transportation Fuels Derived from Canadian Oil Sands Mining Operations. J. Clean. Prod. *258*, 120639.

[17] Environment and Climate Change Canada (2019) Clean Fuel Standard: Proposed Regulatory Approach. Government of Canada. https://www.canada.ca/en/environment-climate-change/services/managing-pollution/energy-production/fuel-regulations/clean-fuel-standard/regulatory-approach.html [Accessed: 11 March 2021].

[18] Organization of Public Services and Procurement Canada (2020) Canada Gazette, Part I, Volume 154, Number 51: Clean Fuel Regulations. Government of Canada. https://gazette.gc.ca/rp-pr/p1/2020/2020-12-19/html/reg2-eng.html [Accessed: 11 March 2021]

[19] Canada Energy Regulator (2016) Energy Conversion Tables. Government of Canada https://apps.cer-rec.gc.ca/Conversion/conversion-tables.aspx?GoCTemplateCulture=en-CA#s1ss1 [Accessed: 11 March 2021].

[20] Statistics Canada (2007) The Canadian Productivity Review: Depreciation Rates for the Productivity Accounts, Government of Canada.

[21] Treese, S. A., Pujadó, P. R., and Jones, D. S. J. (2015) Handbook of Petroleum Processing, ed. 2. Springer, Cham.

[22] Energetics Incorporated (2006) Energy bandwidth for Petroleum Refining Processes. U.S. Department of Energy. https://www.energy.gov/sites/prod/files/2013/11/f4/bandwidth.pdf [Accessed: 11 March 2021].

[23] Sapkota, K., Oni, A. O., Kumar, A., and Linwei, M. (2018) The Development of a Techno-Economic Model for the Extraction, Transportation, Upgrading, and Shipping of Canadian Oil Sands Products to the Asia-Pacific Region. Appl. Energy *223*, 273-292.

[24] Canada Energy Regulator (2020) Canada's Renewable Power Landscape 2017 – Energy Market Analysis. Government of Canada https://www.cer-rec.gc.ca/en/data-analysis/energy-commodities/electricity/report/2017-canadian-renewable-power/canadas-renewable-power-landscape-2017-energy-market-analysis-ghg-emission.html [Accessed: 11 March 2021].

[25] IEA (2020) World Energy Balances. International Energy Agency. https://doi.org/10.1787/enestats-data-en

[26] Zauner, A., Böhm, H., Rosenfeld, D. C., and Tichler, R. (2018). Innovative Large-scale Energy Storage Technologies and Power-to-Gas Concepts after Optimization: Report on Learning Curves and Economies of Scale.

[27] National Energy Technology Laboratory (2013) Technology Learning Curve (FOAK to NOAK). U.S. Department of Energy.

[28] Thomassen, G., Van Passel, S., and Dewulf, J. (2020) A Review on Learning Effects in Prospective Technology Assessment. Renew. Sust. *130*, 109937.

[29] Schoots, K., Ferioli, F., Kramer, G. J., and Van der Zwaan, B. C. C. (2008) Learning Curves for Hydrogen Production Technology: An Assessment of Observed Cost Reductions. Int. J. Hydrog. *33*(11), 2630-2645.

[30] Rubin, E. S., Yeh, S., Antes, M., Berkenpas, M., and Davison, J. (2007). Use of Experience Curves to Estimate the Future Cost of Power Plants with CO_2 Capture. Int. J. Greenh. Control *1*(2), 188-197.

[31] Bradford, H. (2019) Canada: Biofuels Annual 2019, USDA Foreign Agriculture Service. https://www.fas.usda.gov/data/canada-biofuels-annual-5 [Accessed: 11 March 2021].