Renewable Natural Gas (RNG) – An Incredible Growth Opportunity That Could Last "Until the Cows Come Home"

With governments and multinational corporate entities around the world committing to "net-zero" emission targets, manure-based RNG could be the key to achieving those goals by lowering carbon intensity and reducing greenhouse gas emissions.

- **The historical relationship between energy prices, inflation, and Fed action suggest that the U.S. is headed for a recession and that is negative for energy prices.** The annual inflation rate in the U.S. accelerated to 9.1% in June, the highest since November of 1981, and earlier this year West Texas Intermediate (WTI) prices topped $120 per barrel. On the five previous occasions when the oil price a least doubled in a 12-month period (1973, 1979, 1990, 2000 and 2008), this has led to a recession. The implied Fed funds futures rate and the rate on swaps linked to the December meeting both imply that the effective funds rate will climb from 0.08% in March to ~3.6% by year-end. History shows that a doubling of the oil price, coupled with aggressive Fed tightening, suggest a recession is on the horizon which is clearly negative for energy prices.

- **With high fossil fuel prices, coal consumption rising to record levels despite its negative impact on the environment, rampant inflation, and an impending recession, how can nations across the globe expect to achieve their Climate Goals?** At the 26th Conference of the Parties (COP26), more than 50 countries representing roughly 70% of global CO_2 emissions pledged to meet net-zero emissions targets, including new commitments, which should result in 20% lower coal consumption in the power sector by 2030. However, in the first quarter of 2022, investment banks helped coal companies raise US$9.9 billion as coal demand for power generation continues to rise and this year will match the all-time high set in 2013 of approximately 8 billion metric tons!

- **Renewable Energy Sources Such as Renewable Natural Gas (RNG) and Renewable Diesel MUST BE part of the "Net-Zero" Solution.** RNG is anaerobically generated biogas from organic waste facilities and farms that has been upgraded or refined to replace existing fossil fuel natural gas. RNG produced from organic waste offers a fuel-producing entity the opportunity to lower its carbon intensity (CI), while also generating carbon offset credits. Similarly, renewable diesel is produced from biomass feedstocks including animal fats (tallow), vegetable oils and waste cooking oils. Renewable diesel is also chemically equivalent to petroleum diesel and can therefore be used as a replacement in various applications to reduce greenhouse gas (GHG) emissions.

- **Producing RNG from livestock farms is creating a "Gold Rush" for cow manure.** Methane can be up to 80 times WORSE than Carbon Dioxide (CO_2) in terms of trapping heat in the atmosphere, therefore capturing the methane from decomposing manure at livestock farms and converting it to RNG, can have a dramatic effect on net carbon emissions. As a result, according to various regulatory bodies, while gasoline/diesel has a carbon intensity score of 100, manure based RNG can have NEGATIVE carbon intensity score ranging from -25 to -372.

- **There is a significant RNG opportunity for beef cattle farms vs dairy farms.** The numbers suggest beef cattle feedlots have the size and scale necessary to supply enough feedstock for an "ideal" RNG operation as opposed to dairy farms. Therefore, not only can manure-based RNG help dramatically lower the carbon intensity for fuel producers, but the associated carbon credits can significantly help these corporate entities, including those in the energy and transportation sectors, remain compliant with clean energy regulations.

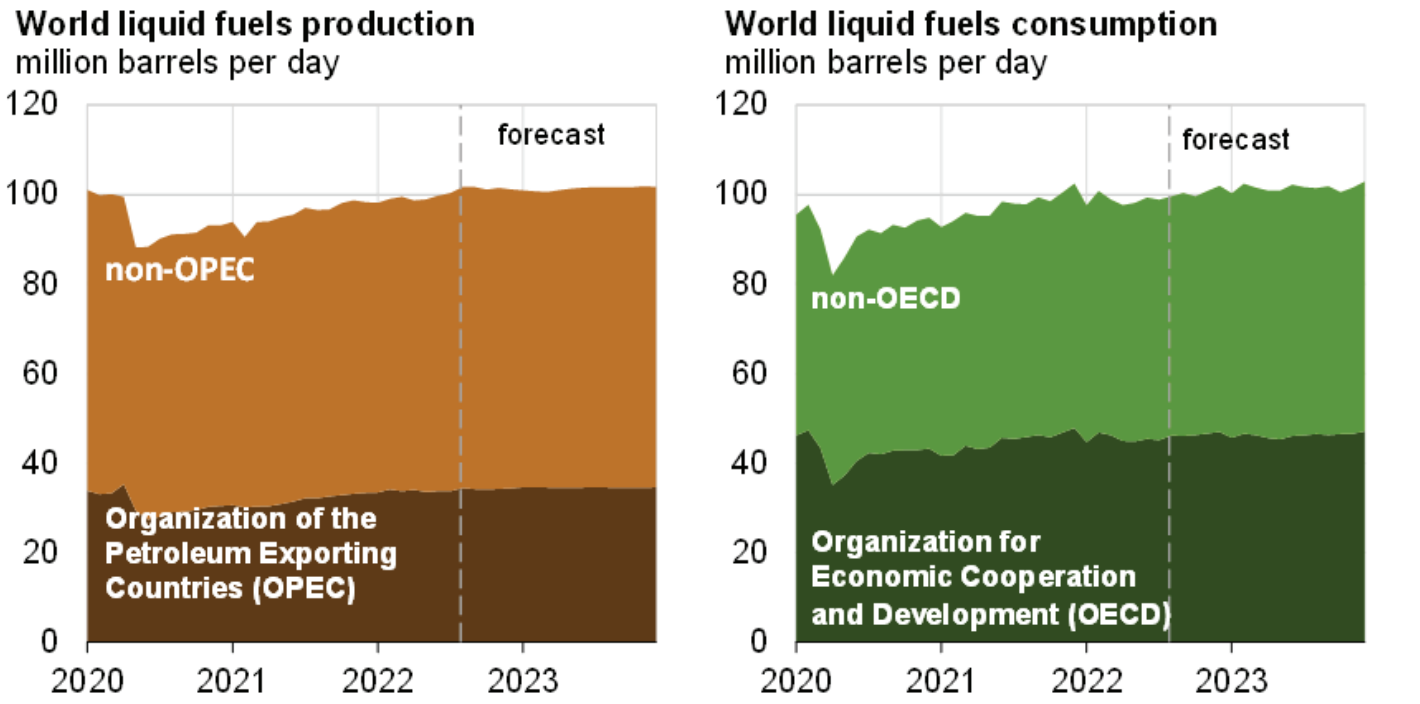
- **In conjunction with Adelaide Capital, INFOR Financial recently co-hosted a Biofuels & Renewables Virtual Panel.** The session highlighted both private and public companies focused on RNG, Renewable Diesel, Renewable Hydrogen, and Energy Transition. Presenting companies included Cowboy Clean Fuels (private), Evergen Infrastructure Corp (EVGN – TSXV) and Tidewater Renewables (LCFS-TSX).

Macro Overview

Energy markets are expected to remain VOLATILE…

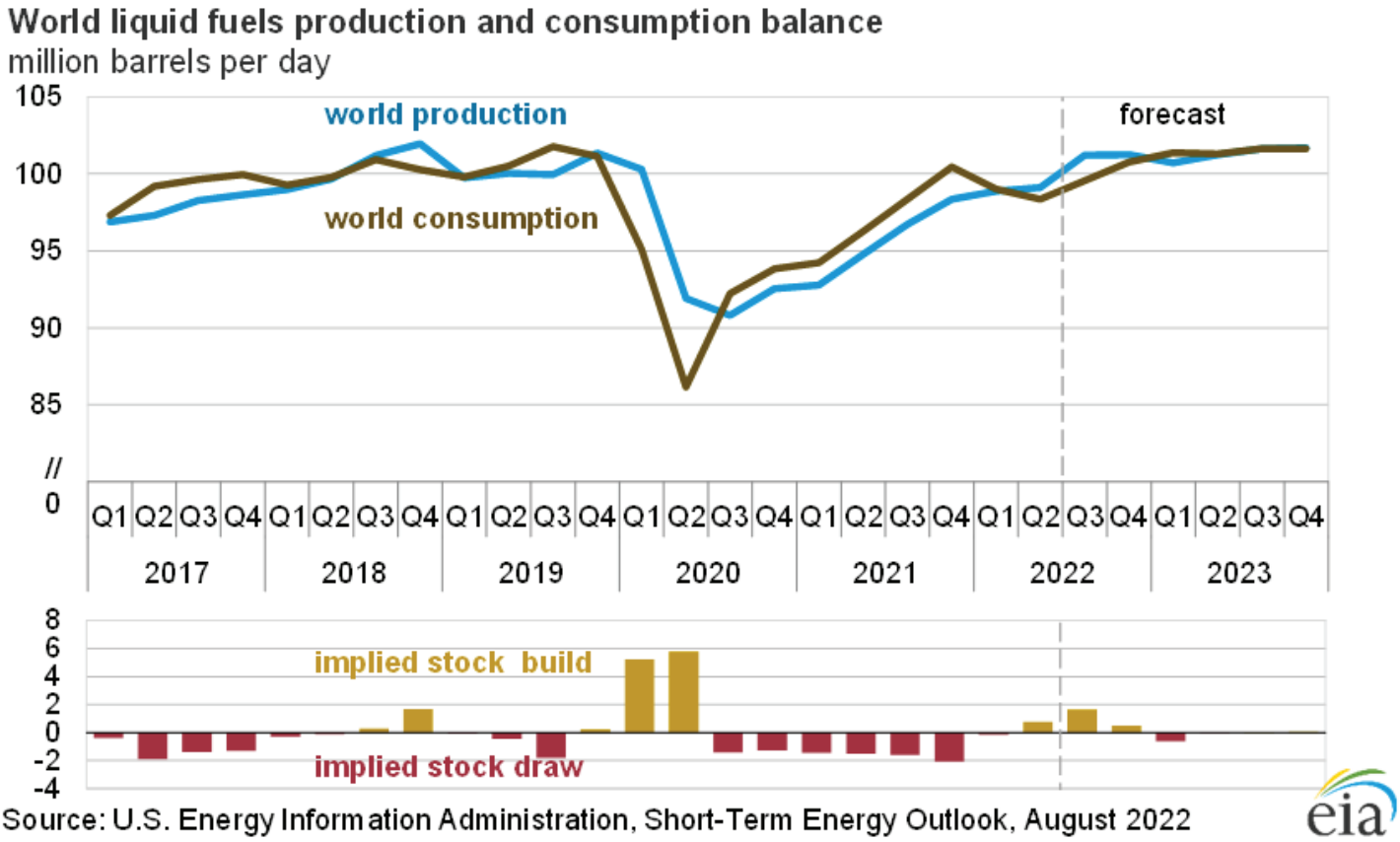
There are a lot of "cross currents" when investors think about supply, demand, and commodity pricing in the global energy markets. More specifically, the U.S. Energy Information Administration (eia) expects global oil demand to reach over 99 million barrels per day (b/d) in 2022 when global oil production is expected to reach approximately 100 million b/d.[1] With the COVID-19 pandemic entering its "seventh wave" coupled with supply disruptions and sanctions due to Russia's invasion of the Ukraine, energy prices remain volatile. Add to that the fact that global oil demand has outpaced total supply since the third quarter of 2020, and this has taken oil inventories in OECD nations to approximately 2.64 billion barrels, which is dangerously close to the lowest levels since 2014.[2]

Going forward, despite the re-emergence of COVID in several nations, many countries have eased restrictions on travel, social gatherings, and business activity. As a result, energy consumption is approaching normalized levels. In July 2022, global petroleum and liquid fuel consumption averaged 98.8 million bbl/d, an increase of 0.9 million bbl/d for the same period in 2021. The eia is forecasting global energy demand to increase by 2.1 million bbl/d in 2022 and by another 2.1 million bbl/d in 2023.[3] It is interesting to note that the eia is expecting world liquids production to be approximately 100 million b/d for 2023, which is almost exactly its' forecast for global liquids consumption:



Source: U.S. Energy Information Administration, Short-Term Energy Outlook, August 2022

Source: eia



Source: eia

If history is any guide, at least one of these eia forecasts will be wrong and there will be a supply/demand imbalance that will be reflected in energy prices as we head into 2023. Clearly, the elephant in the room here is 9% inflation, rising interest rates, and an inverted yield curve (the widest it's been in 22 years) which, historically is a fairly reliable predictor of a recession.

The Historical Relationship between Energy Prices, Inflation, and the U.S. Economy.

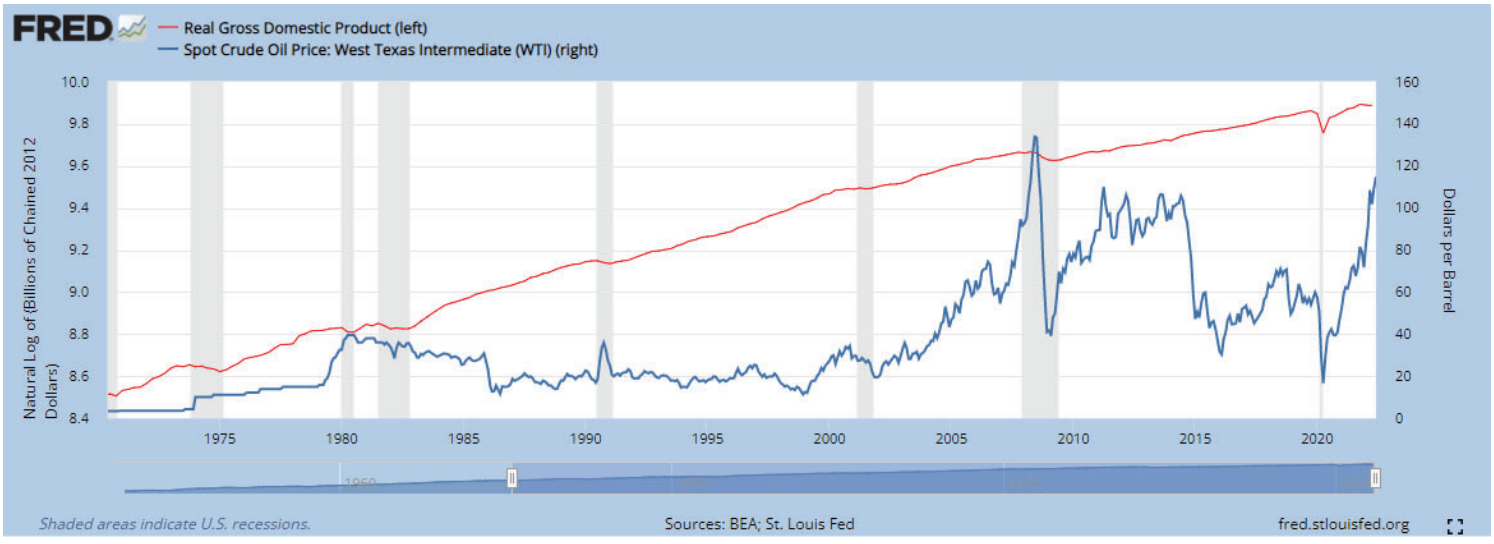
Higher energy prices are a MAJOR contributor to U.S. Inflation…

According to the U.S. Bureau of Labor Statistics, the annual inflation rate in the U.S. accelerated to 9.1% in June of 2022, the highest rate since November 1981. The major driver was higher energy prices, which rose 41.6%, the most since April 1980. These high energy prices were spurred by a 59.9% increase in the price of gasoline, the largest increase since March 1980, a 98.5% increase in fuel oil, a 13.7% increase in electricity, and a 38.4% increase in natural gas, the largest increase since October 2005.[4] In July 2022, the annual inflation rate in the U.S. eased to 8.5% but still remained near its highest level in over 40 years!

While the DOUBLING of the oil price suggests that the U.S. is headed for a Recession…

Earlier this year West Texas Intermediate (WTI) prices topped $120 per barrel, suggesting that the oil price DOUBLED over the past 12 months. According to the data, and a recent article in Barron's[5], on the five previous occasions in 1973, 1979, 1990, 2000 and 2008, when the oil price a least doubled in a 12-month period, this dramatic movement has led to a recession. This seems intuitive as higher oil prices act as a "tax" on household budgets and the resulting cutback on consumer spending has a widespread impact on the broader economy. According to the aforementioned Barron's article, *"every 10% increase in gas prices adds $4 billion in costs to consumers and every 10% increase in oil prices adds $19 billion."*[6]

Rising Oil Prices Have Usually Preceded Most Recessions:



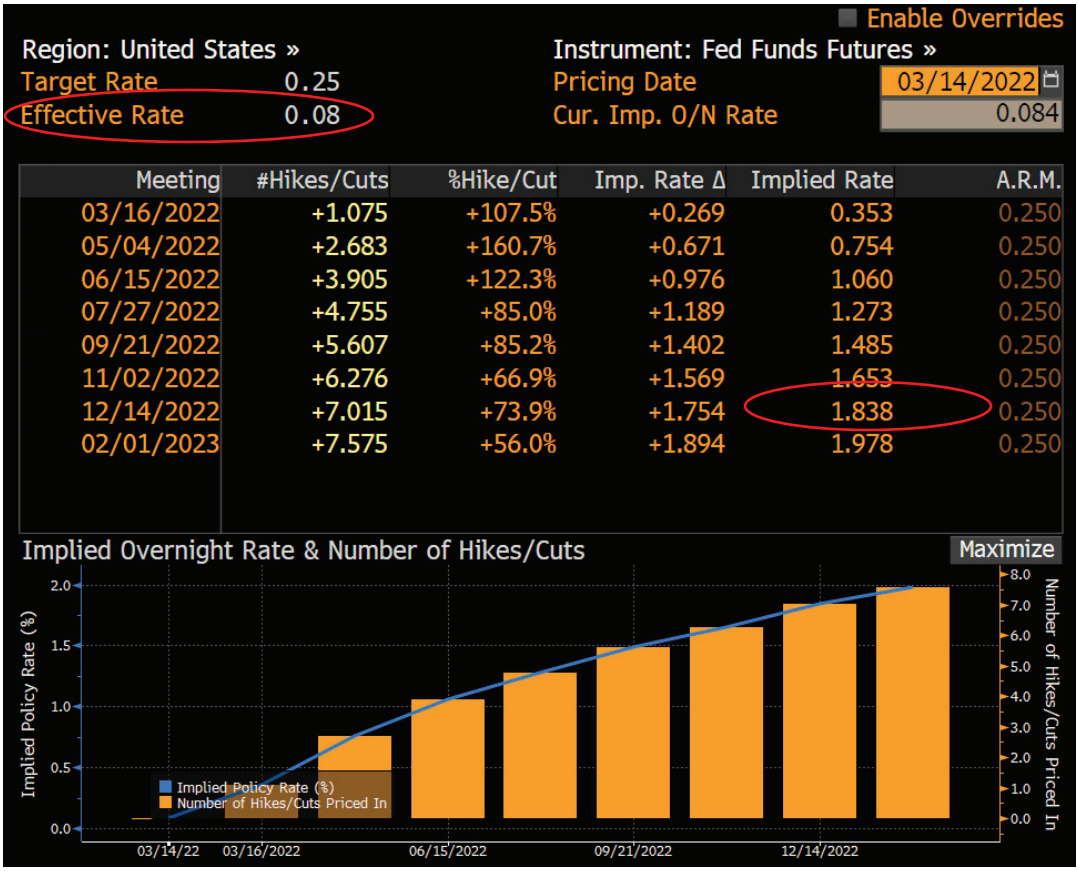
Source: Federal Reserve Bank of St. Louis[7]

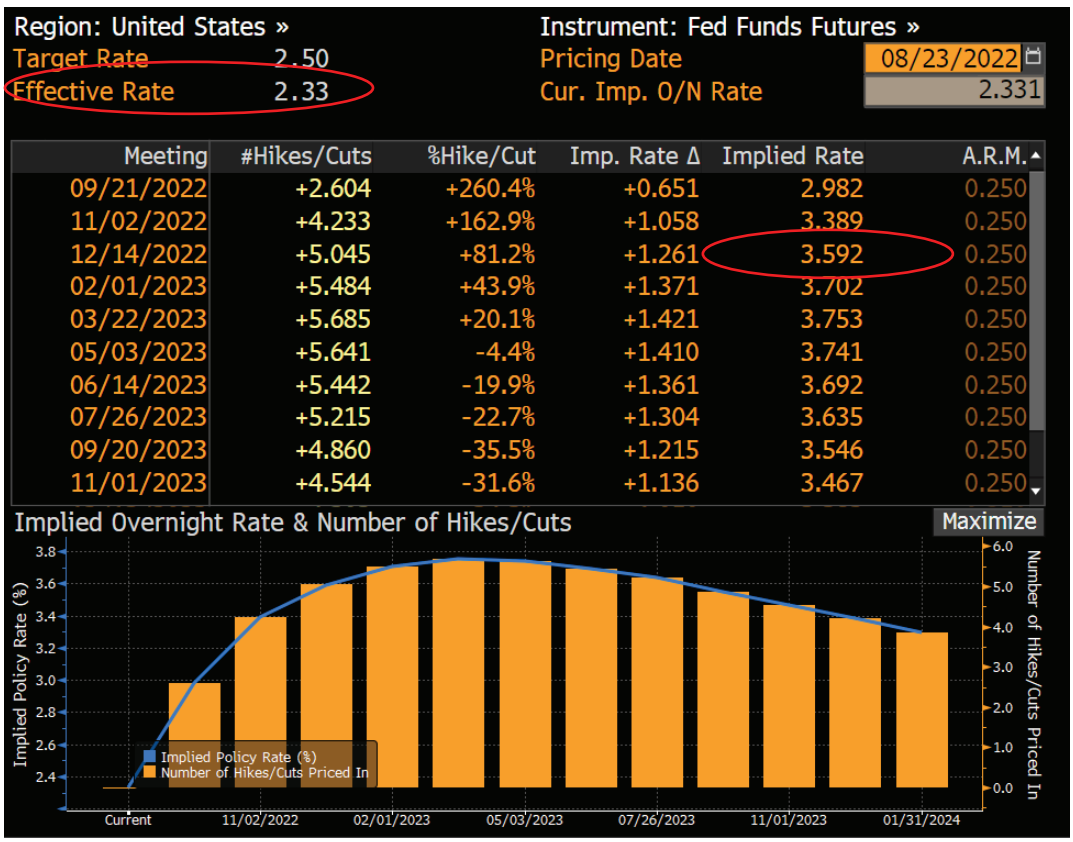
However, one could also argue that Fed actions, coupled with higher energy prices, are a BETTER predictor of recessions…

According to Phillip Braun, clinical professor of finance at Kellogg School of Management, going back to the 1970s, it is a "common misperception" that a rapid increase in the oil price leads to recessions. He notes that in fact, "*the Fed has had contractionary monetary policies in place prior to all three oil price shocks, mostly out of concern about inflation…[and]…[t]hese policies have preceded our recessions and most of the oil shocks that we have experienced, and hence they have caused our recessions."*[8] Mr. Braun goes on to discuss the first large oil increase in 1973 which, due to a U.S. oil embargo, caused oil prices to jump 259% from November 1973 through October 1974. However, prior to this, the U.S. had an economic boom in 1972 and 1973 and the dramatic growth in GDP had the Fed worried about capacity and a strain on the system. As a result, the Fed reduced credit and began a tightening cycle that caused the Fed funds rate to triple and rise even further during the recession that ran from 1973-1975. In November 1978, the Iranian Revolution caused Iranian oil production to drop 77% and in January 1979, Saudi Arabia also curtailed production resulting in a 119% increase in the oil price. This led to the 1979 energy crisis. Once again, about 12 months prior to these events, the Fed started limiting the supply of bank reserves to "cool" inflation concerns, and this caused the Fed funds rate to almost QUADRUPLE. When Iraq invaded Kuwait in July 1990, the oil price soared 93% in the three months following the invasion. In 1987, in response to inflation concerns, the Fed caused money growth to slow and the Fed funds rate to increase, which arguably led to the 1990 recession.[9] During the "irrational exuberance" period of 2000 and the "ninja loan" homebuying period of 2008, the same argument could be made that the Fed's actions, in response to an "overheated" economy, led to an economic shock. In fact, according to a very old article from the Federal Reserve Bank of St. Louis, an "oil price shock" occurs as monetary policymakers are acting to keep the economy from overheating and *"nearly all post-World War II recessions were preceded by higher oil prices and a restrictive monetary policy."*[10]

This does NOT bode well for the oil price and the U.S. Economy, as the market is currently discounting a 350-basis point increase in interest rates by the end of 2022…

According to the following charts, the implied Fed funds futures rate and the rate on swaps linked to the December meeting imply that the effective funds rate will climb to 3.6% by year-end. This is dramatically higher than the 1.84% expected back in March. This further suggests that after the Fed raised rates another 75 basis points at the July 27th meeting, the December rate was still approximately 100 basis points above the current effective rate of 2.33%. After two successive 75 basis point increases this doesn't seem like much, but please recall that from the March 16th policy meeting to the final meeting on December 14th, U.S. interest rates could go from effectively 0.08% to ~3.6%. This represents over a 350-basis point increase or a 40x multiple on interest rates by the end of 2022!



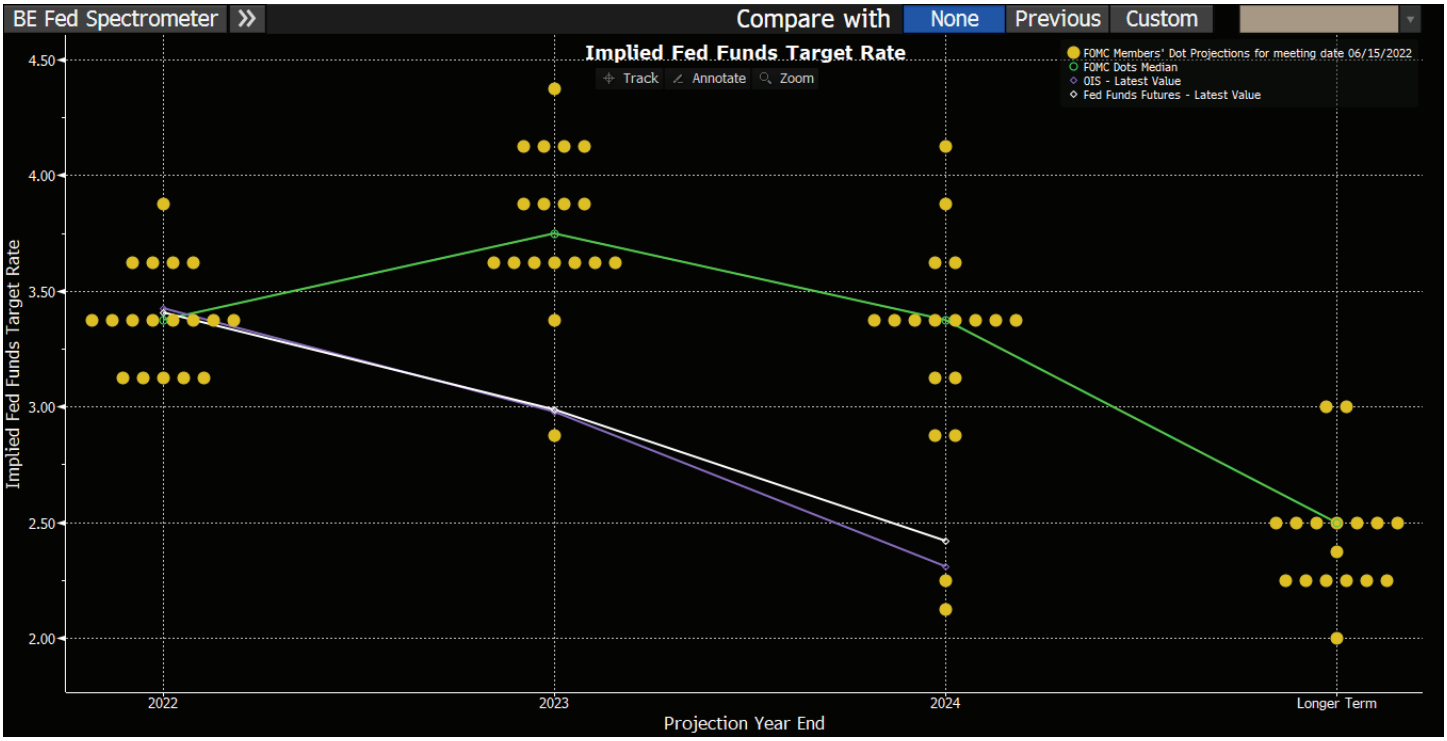


Source: Bloomberg

The Fed's New "Dot Plot" Suggests Rates will climb to 3.375% by the end of 2022...

The Fed's "dot plot" also suggests that the median projection for the benchmark interest rate will be approximately 3.375% at the end of 2022. This is a little lower than the implied Fed funds futures rate as noted above, but still suggests over a 100-basis point increase from the current effective rate and a 330-basis point increase from the March Fed meeting to the final Fed meeting on December 14th.

The Fed's New Dot Plot

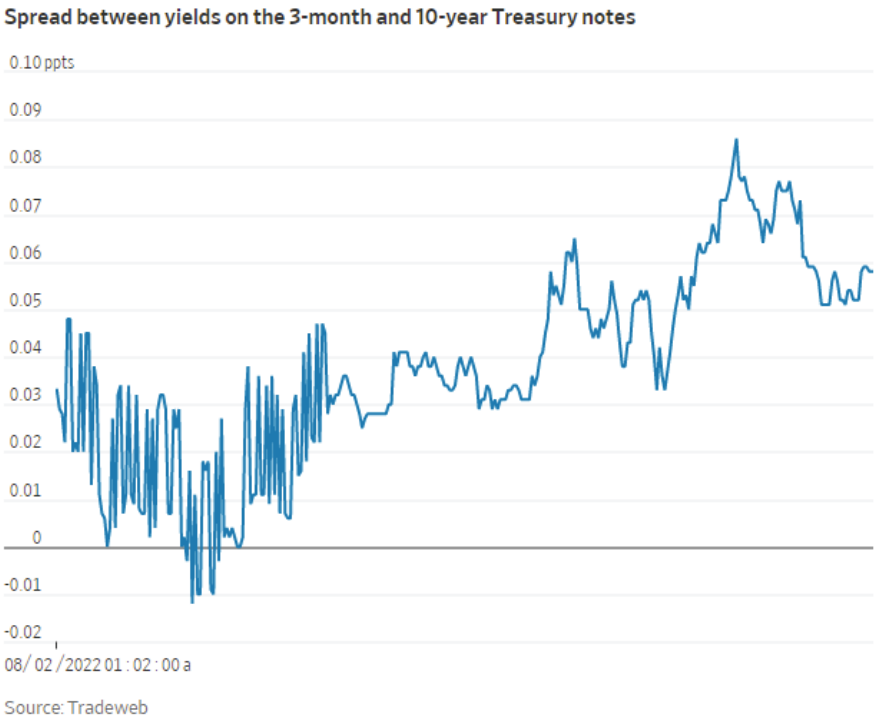


Source: Bloomberg (BE Fed Spectrometer)

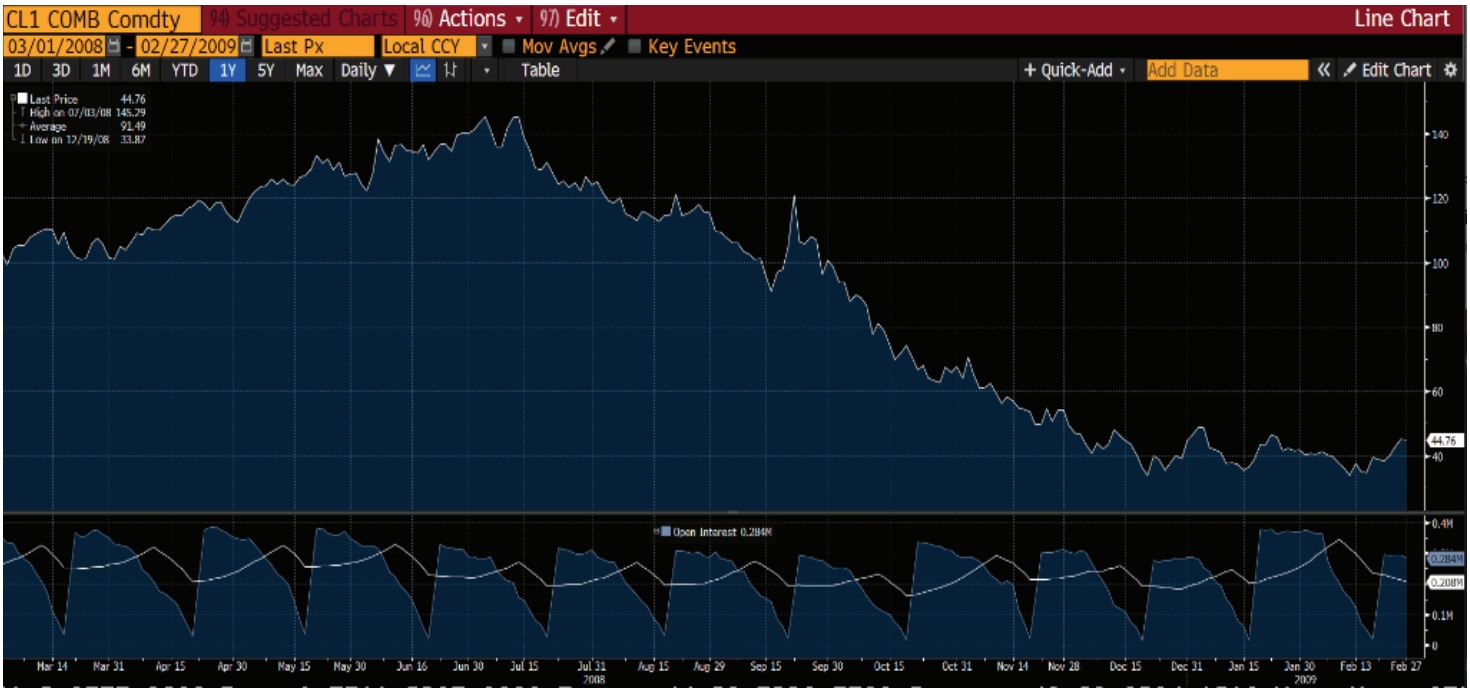
An Inverted Yield Curve Also Suggests that a Recession is Around the Corner…

We might as well just come out and say it: *"the yield between the 2-year and 10-year Treasury Notes recently inverted to its widest point since September 2000."* According to Bloomberg, earlier this month the spread between the 2-year and 10-year got to almost -50 basis points which is the widest spread in approximately 22 years:

It is also interesting to note that the Fed's preferred recession indicator is the spread between the 3-month and 10-year Treasury Note. On Tuesday August 3rd for a brief period, the yield on the 3-year Treasury Bill was higher than the yield on the 10-year Treasuries. The last time this happened was March 2020 during the height of the COVID pandemic market panic and corresponding lockdowns.[11]



A few months after the Nasdaq peaked in March 2000, the oil price peaked at over $37.00 per barrel before bottoming at $17.45 per barrel in November 2001. In addition, the 2008 Great Financial Crisis (GFC) and resulting recession, induced a bear market in oil and gas, sending the price of a barrel of crude oil from over $145.00 in July 2008 to under $34.00 in February 2009.



Source: Bloomberg

Yes, a recession is coming…if it isn't here already.

With high fossil fuel prices, rampant inflation, and an impending recession, how can Countries expect to ACHIEVE their Climate Goals?

According to a recent IEA report, the energy sector is responsible for almost 75% of the emissions that have already pushed global average temperatures 1.1 °C higher since the pre-industrial age.[12] This increase in temperature has led to impacts on global weather patterns, melting glaciers, rising sea levels, coastal erosion, the destruction of natural habitats, possible extinctions, and overall climate change. Scary. However, if the energy sector is the heart of the problem, then the energy sector must be at the heart of the solution. The problem is that even as industrialized nations try to "wean" their citizens off their thirst for energy, the global population is set to grow by another 2.0 billion people by 2050.[13] Add to that the fact that rising incomes create further demand for energy and developing nations are currently in their emission-intensive period of industrialization, today's global energy industry is not capable of turning off the spigot. Therefore, the focus needs to be on cleaner sources of energy and emissions.

At the 21st United Nations Climate Change Conference or Conference of the Parties (COP21) in 2015, the Paris Agreement was born, where every country agreed to work together to limit global warming to 1.5 °C above pre-industrial levels.[14] Last year at COP26, more than 50 countries, as well as the entire European Union, pledged to meet net zero emissions targets. Many of these countries put new commitments on the table, which included low emission sources of power generation (solar PV and wind) that should result in 20% lower coal consumption in the power sector by 2030. Moreover, if all the announced pledges are successful, then global energy-related CO_2 emissions could fall by 40% by 2050.[15] This is "all fine and dandy," however, according to the latest numbers, coal consumption continues to soar!

The "coal conundrum" suggests that due to power demand, coal consumption is rising to record levels DESPITE its negative impact on the environment…

It has been stated again and again that capital needs to be diverted away from coal and toward natural gas for world leaders to meet their respective climate goals. Pundits have argued that coal power needs to be phased out by OECD nations, including the European Union, by 2030 to meet the goals of the Paris Agreement. However, according to a recent Bloomberg article, in the first quarter of 2022 banks helped coal companies raise US$9.9 billion, more than DOUBLE the amount raised during the first quarter of 2021, as coal demand for power generation continues to rise.[16] According to another article, in 2022 coal demand is set match and then break the all-time highs set back in 2013: *"The International Energy Agency this week said global coal demand in 2022 will match the all-time high set in 2013 of about 8 billion metric tons. And next year, coal consumption will set a fresh record high…And it isn't just absolute demand. Even as a share of the world's primary energy, coal consumption remains robust. Last year, coal accounted for 27% of the world's primary energy, a couple of percentage points higher than two decades ago, and about the same level as 50 years ago."*[17] If the global demand for coal, the most environmentally un-friendly fossil fuel, is still rising then the chasm between actual coal demand and the climate goals set by global policymakers has never been wider.

In the past 24 months Thermal Coal has Dramatically Outperformed Oil and Natural Gas:

Source: Bloomberg

Therefore, Renewable Energy Sources Such as Renewable Natural Gas (RNG) and Renewable Diesel MUST BE part of the Solution…

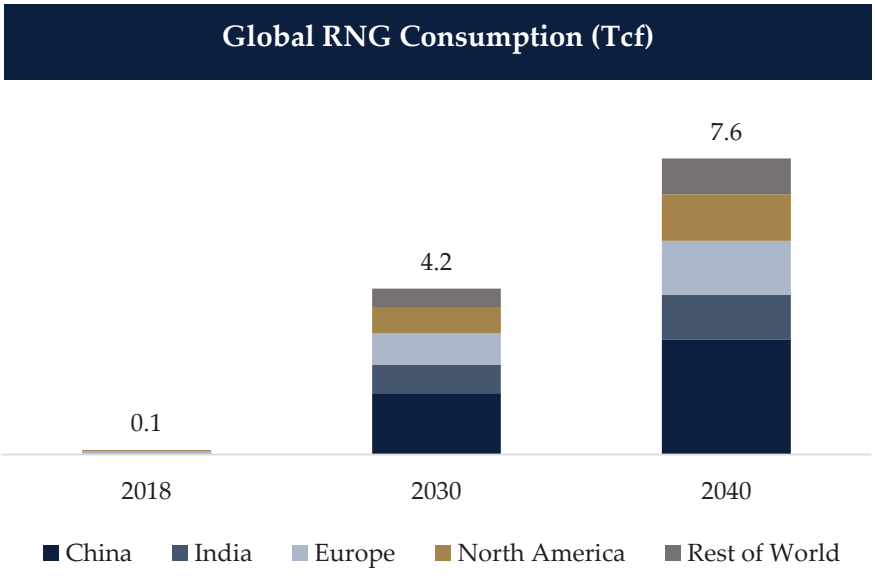
Energy transition is not new.

Over 110 years ago Winston Churchill, then Britain's First Lord of the Admiralty, spearheaded one of the most important energy transitions when he established a Royal Commission on Fuels and Engines to explore shifting the Royal Navy from coal to fuel oil on July 31, 1912.[18] Churchill eventually convinced the navy to abandon coal-fired steam boilers. Since that time the world energy picture has never been the same. In recent years, a "new" energy transition marked by the emergence of newer, cleaner technologies including hydro, solar and wind power has been driven by the fight against climate change and the lowering of our global carbon footprint.

Once again, more than 50 countries, representing roughly 70% of global CO_2 emissions, have pledged to achieve net-zero emissions in the coming years. In addition, dozens of high profile "Blue Chip" companies, including Google, Apple, Nike, Disney, Starbucks, Microsoft, Facebook/Meta, IBM, KPMG, PWC, HP, Amazon, Pepsi, Visa, Sony, Ford, BP, Dell, Shell, etc. have committed to a "Net Zero" carbon emissions footprint by 2030-2050 to address climate change. To make these emission targets, both governments and corporations need to transition to renewable fuels and energy decarbonization, which represents a significant opportunity for two specific emerging renewable fuels: **Renewable Natural Gas (RNG) and Renewable Diesel.**

Renewable Natural Gas (RNG) – What is it?

Renewable Natural Gas (RNG) is anaerobically generated biogas from organic waste facilities and farms that has been upgraded or refined to replace existing fossil fuel natural gas. There are four main sources of raw biogas including municipal solid waste landfills, wastewater treatment and recovery plants, livestock farms and organic waste management operations. Depending on the source, raw biogas usually has between 45-65% methane (or CH_4) content, so it needs to go through a series of contaminant removal and compression steps as part of its conversion to pipeline spec RNG.[19] Today, RNG accounts for only 0.4% of the total natural gas supply and according to the IEA, North America is projected to consume approximately 1.2 Tcf of RNG annually by 2040:



Source: IEA

Sources of biogas

The four main sources of raw biogas are municipal solid waste landfills, wastewater treatment and recovery plants, livestock farms and organic waste management operations. At all of these operations, organic materials are broken down by microorganisms under anaerobic conditions (i.e. the absence of oxygen) to produce raw biogas. The process is called anaerobic digestion (AD) and involves the breakdown of organic waste from plants or animals. These organic wastes include municipal solid waste, sewage sludge, yard and crop wastes, food and food processing waste and animal manure.

Municipal Solid Waste (MSW) landfills: Within MSW landfills, landfill gas (LFG) is generated as the organic wastes decompose anaerobically. This LFG can then be captured through a system of perforated pipes drilled into the landfills, converted, and used as an energy source. According to the EPA, as of March 2020, there were 564 operational LFG projects with 65 of those producing RNG.

Wastewater treatment and recovery plants: Using AD to treat sewage sludge, municipal wastewater treatment and recovery plants produce biogas as one of the byproducts. In 2013, approximately 48% of the total wastewater flow in the U.S. was treated via AD. Wastewater treatment and recovery plants typically generate biogas with high CH_4 content and extremely low O_2 and nitrogen content, making them attractive candidates for RNG projects.

Livestock Farms: Livestock farms use AD to convert dairy cattle, beef cattle, swine and/or poultry manure into biogas and digestate (the nutrient-rich material remaining after the process). Some manure-based digesters have the ability to co-digest other organic waste materials along with the manure, including beverage and distillery waste, fats, oils, grease, industrial food byproducts or wastes from a dairy or slaughterhouse. As of March 2020, approximately 80% of the manure-based digester projects in the U.S. were at dairy farms, while 14% were at swine farms and the remainder was a mix of poultry, beef cattle, and other animal manure effluents.

Organic Waste Management operations: Stand-alone organic waste management operations use AD to break down source separated organic material, including food waste, to generate biogas. These digesters can also co-digest other organic materials including yard waste and it is estimated that in the U.S. a total of 9.2 million tons of food waste was processed at 44 stand-alone digesters in 2016. However, the EPA reports that about 94% of the food that is thrown away in the U.S. is either landfilled or combusted for energy, and of the 40.7 million tons of food waste generated in 2017, 30.6 million tons were landfilled and 7.5 million tons were combusted with energy recovery. Moreover, in 2015 the U.S. Department of Agriculture and the EPA created the U.S. 2030 Food Loss and Waste Reduction Goal, which aims to either reduce food waste going to landfills or increase combustion with energy recovery by 50%.

Source: United States Environmental Protection Agency (EPA)[20]

Conversion of biogas into RNG

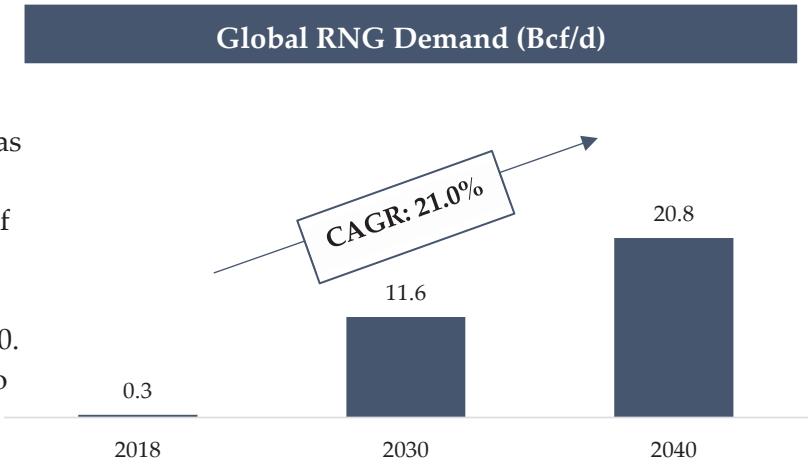
Once again, depending on the source, raw biogas usually has between 45-65% methane (CH_4) content so it needs to be treated before it can be converted into RNG. This process includes i) primary treatment (45-65% methane), which involves moisture and particulate removal; ii) secondary treatment (90% methane), which involves contaminant, sulfur, and carbon dioxide (CO_2) removal; and iii) advanced treatment (96-98% methane), which involves the removal of siloxanes, volatile organic compounds (VOCs), hydrogen sulfide (H_2S) and nitrogen. Once the raw biogas has been fully purified and undergone a series of compression steps, the resulting RNG will have a methane content between 96% and 98% that can then be injected into a natural gas pipeline.[21] ***It is worth noting that due to the high level of nitrogen, oxygen and other impurities, landfill gas (LFG) is much more challenging than biogas to upgrade.***[22]

Uses and End Markets for RNG

With respect to its methane content, RNG is almost chemically identical to fossil fuel natural gas, making it very versatile as a substitute. As a fossil fuel "doppelganger", RNG offers fuel diversity as it can be used as a vehicle fuel or for electricity generation and as a thermal energy source in the industrial, commercial, institutional, or residential sectors (source). More specifically, RNG can be used as a vehicle fuel in the form of compressed natural gas (CNG) or liquefied natural gas (LNG). For electricity production, some biogas projects use partially conditioned biogas to generate electricity, while other projects inject RNG directly into a pipeline for electricity generation. Finally, several biogas energy projects use raw biogas directly in thermal applications including boilers, greenhouses and kilns. It is worth noting that back in 2011, nearly all the RNG projects operating in the U.S. provided RNG to generate electricity; however, by 2017, over 75% of RNG was used in transportation end markets. Today, RNG accounts for only 0.4% of the total natural gas supply and total demand is expected to grow from approximately 0.3 Bcf/d to 20.8 Bcf/d by 2040.[23]

Renewable Natural Gas

- Involves projects that capture gas from wastewater treatment, agriculture and/or biomass resources.
- Gas upgrading services, storage, transportation, and interconnection into a gas LDC's system.
- Canadian gas utilities have an expectation of 10% of blended RNG into systems by 2030, with certain utilities, such as Fortis, having more aggressive expectations of 15% by 2030.
- Global RNG demand is predicted to grow to 20.8 Bcf/d by 2040.



Source: IEA, Company Reports

RNG has its Benefits, and they are Significant…

RNG has lower carbon intensity (CI) than fossil fuel gas, which results in lower GHG emissions. When RNG replaces fossil fuel natural gas there is a significant reduction in Greenhouse Gas (GHG) emissions. In fact, according to estimates, natural gas vehicles operating on RNG-based fuels can yield GHG emission reductions of up to 75% when compared to gasoline or diesel vehicles.[24] Moreover, RNG has even a LOWER carbon footprint when one considers the reduction in methane emissions resulting from the organic waste originally used to produce that fuel.

In addition to reducing GHG emissions, RNG has numerous other benefits including fuel diversity and availability, capital flow toward the local economy, and improvements in air quality.

As mentioned above, Biogas feedstocks come from a variety of sources with high availability, so with more RNG adoption, energy production becomes more diversified and less reliant on traditional gasoline or diesel.

By developing RNG projects, local economies can benefit from the construction of infrastructure. With new projects comes new capital, new jobs, and potentially new corporations looking for ways to increase corporate sustainability. According to a 2017 study conducted for the California Natural Gas Vehicle Coalition, a mix of California RNG production facilities (landfill, wastewater treatment and dairy feedstocks) would generate anywhere from 8.5 to 11.2 jobs per million (diesel gallon equivalent of transportation fuel) versus the petroleum refinery industry which yields 1.6 jobs per million.[25]

Finally, replacing gasoline or diesel with RNG-based vehicle fuels can reduce pollutant emissions such as Nitros Oxide (NO_x), Volatile Organic Compounds (VOC), Particulate Matter (PM_{10} & $PM_{2.5}$), Carbon Monoxide (CO) and sulfur oxides (SO_x) commonly associated with traditional internal combustion engines. Based on the Argonne National Laboratory's Alternative Fuel-Cycle Environmental and Economic Transportation (AFLEET) tool, when comparing the emissions from older gasoline pickup trucks and garbage trucks (2010 and 2012 median age model years respectively) with 2019 model year CNG pickups and garbage trucks, the numbers show a dramatic reduction in emissions including a 99.4% reduction in NO_x, a 93.9% reduction in VOC (exhaust), a 97% reduction in PM_{10}, a 96.9% reduction in $PM_{2.5}$ an 84% reduction in CO and a 43% reduction in SO_x:

Table 1. AFLEET Tool Emission Results for Replacement of Washington, D.C.-Based Older Model Year Gasoline Pickups or Diesel Refuse Trucks with New (Model Year 2019) Dedicated CNG Pickups or Refuse Trucks

Fuel/Vehicle Type	Model Year	Percentage Emission Reductions if Replaced by 2019 Model Year CNG Vehicle						
		NO_x	VOC (Exhaust)	VOC (Evaporative)	PM_{10}	$PM_{2.5}$	CO	SO_x
Gasoline Pickup	2005	87.4%	86.0%	87.5%	73.0%	68.9%	84.3%	38.1%
	2007	80.2%	78.8%	85.4%	73.0%	65.0%	81.9%	38.1%
	2010	66.7%	69.1%	75.6%	66.3%	60.0%	74.6%	38.1%
Diesel Refuse Truck	2006	99.4%	93.9%	7.14%	97.0%	96.9%	-571%	43.0%
	2009	99.2%	43.8%	7.14%	42.2%	41.5%	-2,180%	43.0%
	2012	96.8%	16.9%	7.14%	38.1%	38.5%	-3,025%	43.0%

Source: Argonne National Laboratory. November 2018. AFLEET Tool.

What the Local Cattle Farmer ALREADY knows but isn't telling you…

THE WALL STREET JOURNAL. *"California's Green-Energy Subsidies Spur a Gold Rush in Cow Manure"*

npr *"How dairy farmers are cashing in on California's push for cleaner fuel"*

Forbes *"Manure From California Dairy Farm Powers 17,000 Electric Vehicles"*

The Washington Post *"Turning manure into money"*

Bloomberg *"Add Cow Manure to Your List of Renewable Energy Sources"*

FT *"Methane from manure offers green fuel revenue for US farmers"*

It may surprise some people to learn that, according to the Intergovernmental Panel on Climate Change, methane can be up to 80 times WORSE than Carbon Dioxide (CO_2) in terms of trapping heat in the atmosphere.[26] Therefore, capturing the methane from decomposing manure at livestock farms and converting it to RNG can dramatically affect net carbon emissions. As a result, according to California Air Resource Board (CARB) and California's clean-fuels grading system, gasoline/diesel has a carbon intensity score of 100, while manure can have a carbon intensity score of -372 at the top end:

Table 2. CI Ranges of Fossil and Renewable Vehicle Fuels from CARB LCFS-Certified Pathways[29, 30]

Fuel	Feedstock	Average CI (g CO_2e/MJ)	Range (g CO_2e/MJ)	Number of Pathways	Average Percent Change Relative to Diesel [a]
Diesel	Fossil Crude	100	100	1	-
CNG, Fossil	Fossil Natural Gas	80	78 to 81	6	-21%
LNG, Fossil	Fossil Natural Gas	90	86 to 94	4	-11%
Electricity	California Grid	105	105	1	3.1%
CNG, Renewable	LFG	46	31 to 79	63	-55%
	Manure	-271	-372 to -151	10	-370%
	Wastewater	30	8 to 43	4	-70%
	Food and Green Waste	-11	-23 to 0.34	2	-111%
LNG, Renewable	LFG	54	7 to 83	49	-46%

[a] Negative percentages indicate a net reduction in CI. The CI of diesel is 100.45 grams of CO_2 equivalent per megajoule (g CO_2e/MJ).

Source: CARB. LCFS Pathway Certified Carbon Intensities.

Dairy Farmers are currently "MILKING" their Competitive Advantage

The data above suggests that while CNG and LNG sourced from fossil fuel natural gas have average CIs 10-20% lower per unit of delivered energy versus diesel, RNG-derived CNG and LNG from manure have an average CI over 370% LOWER than diesel! This phenomenon dubbed "Manure Power" by The Wall Street Journal has global energy giants like BP PLC, Total Energies SE and Chevron putting hundreds of millions of dollars into dairy farms in North America. It is also worth noting that due to the California clean-fuels grading system and the associated subsidies, companies like Clean Energy Fuels Corp (CLNE- NYSE) expect to earn an additional tens of millions of dollars simply by switching from landfill gas to manure-based "cow gas" given its better carbon intensity scores.[27] According to estimates from the DOE, nearly 1.5 billion cubic feet of digester gas from farms that could be recovered for energy are flared each year.[28] This remains a significant issue as, once again, methane is much worse than carbon dioxide in terms of trapping heat in the atmosphere. As a result, there is a current "gold rush" for cow manure as corporations scramble to invest millions into dairy farms to access their cattle and this much needed source of feedstock for renewable natural gas.

RNG M&A and Joint Venture Transactions – Strategic

Acquirer	Target / Partner	Date	Commentary
Amp Americas	Generate Vitol	Dec 14, 2021	• Acquired Generate Capital's flagship Indiana dairy RNG assets, as well as a group of dairy RNG assets from Vitol.
Enbridge	Vanguard Renewables	Sep 28, 2021	• Established a partnership to design and build 8 RNG projects across the US; the projects will convert food and farm waste into RNG.
bp	gevo	Aug 9, 2021	• Acquired the production of the Gevo-owned dairy RNG project in Iowa.
Kinder Morgan	Kinetrex Energy	Jul 16, 2021	• Acquired Kinetrex Energy for US$310MM; Kinetrex supplies LNG in the Midwest and is a growing player in landfill-based RNG.
st1	e.on	Apr 26, 2021	• Acquired 100% of the shares of E.ON Biofor, a leading biogas player in Sweden.
bp	Aligned Digesters aria energy	Mar 18, 2021	• Established a project to produce dairy-based RNG at three California diary farms.
bp	Clean Energy	Mar 10, 2021	• Created a JV to develop, own, and operate RNG projects at dairies and other facilities; US$50MM funded by bp and US$30MM funded by Clean Energy Fuels.
SJI	REV	Feb 25, 2021	• Acquired a 35% interest in REV for ~US$40MM; among other operations, REV acquires the rights to build anaerobic digesters on dairy farms to produce RNG.
TotalEnergies	Clean Energy	Mar 4, 2021	• Created a JV to develop dairy-based RNG production facilities in the US; initial firm commitment is US$100MM but can increase to US$400MM.
TotalEnergies	Fonroche Biogaz	Jan 11, 2021	• Acquired Fonroche Biogaz, a French company that designs, builds, and operates anaerobic digestion units.
Chevron	BrightMark	Oct 7, 2020	• Established a JV to own projects across the US to produce and market dairy RNG.
Shell	FORGE Hydrocarbons	Feb 13, 2020	• Shell Ventures provided an equity investment to FORGE, a Canadian biofuel startup that creates renewable fuel from waste fats and oils.

Source: INFOR, Company reports

So, when you say you are Processing Cow Manure, What does that Mean Exactly?

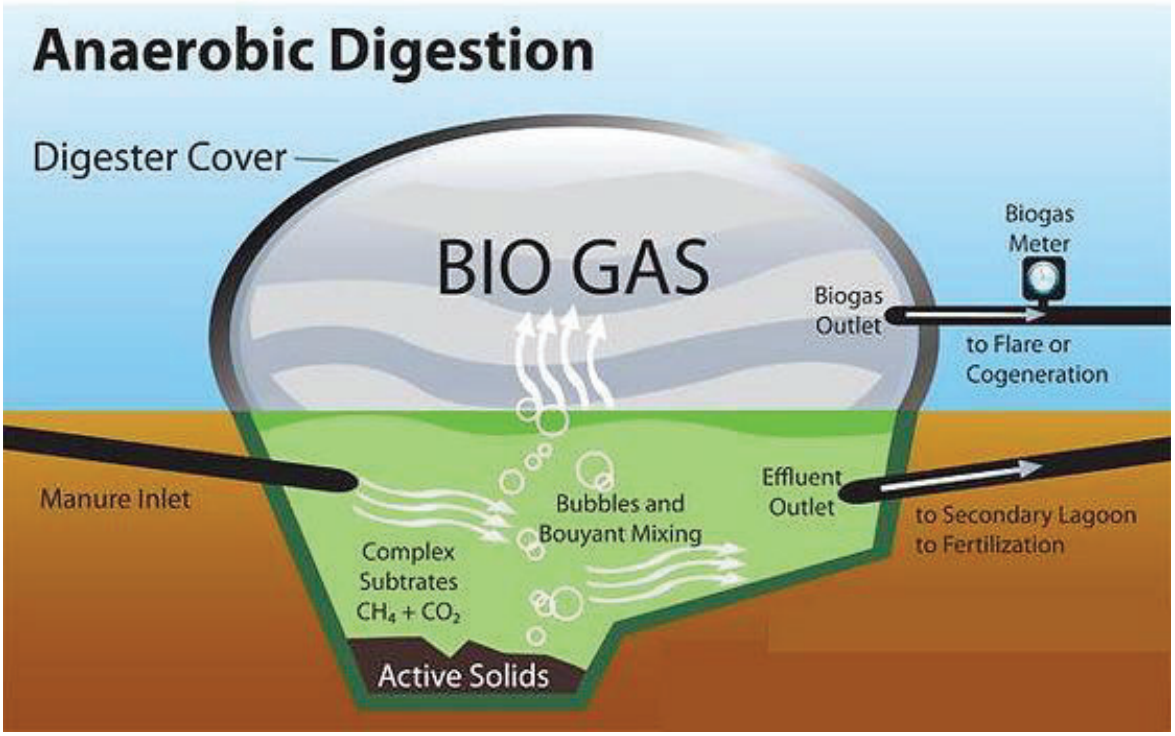
Yes, this is a discussion about cow manure. Chips, dung, muck, droppings, patties, …call it whatever you want, but this sh*t is becoming more and more valuable every day. While the topic of converting cow manure to RNG probably isn't tailor-made for dinner conversation, it is simple and could create billions of dollars of value going forward.

For those of us who do not frequent dairy farms on a regular basis or have not seen an actual beef cattle farm outside of an episode of Yellowstone, a picture is worth a thousand words:

Source: Ontario.ca Dairy housing - layout options

Dairy cows are housed in freestall barns where they are slotted into pens that allow them to be fed at the front of the stall (the trough) while allowing the manure to be collected at the back of the stall. The open trench in the centre of the barn then allows the manure to be collected off the floor by scraping or flushing. The resulting effluent then passes through a separator which channels the liquids into an anaerobic digester:

Source: EPA. [Anaerobic System Design and Technology]



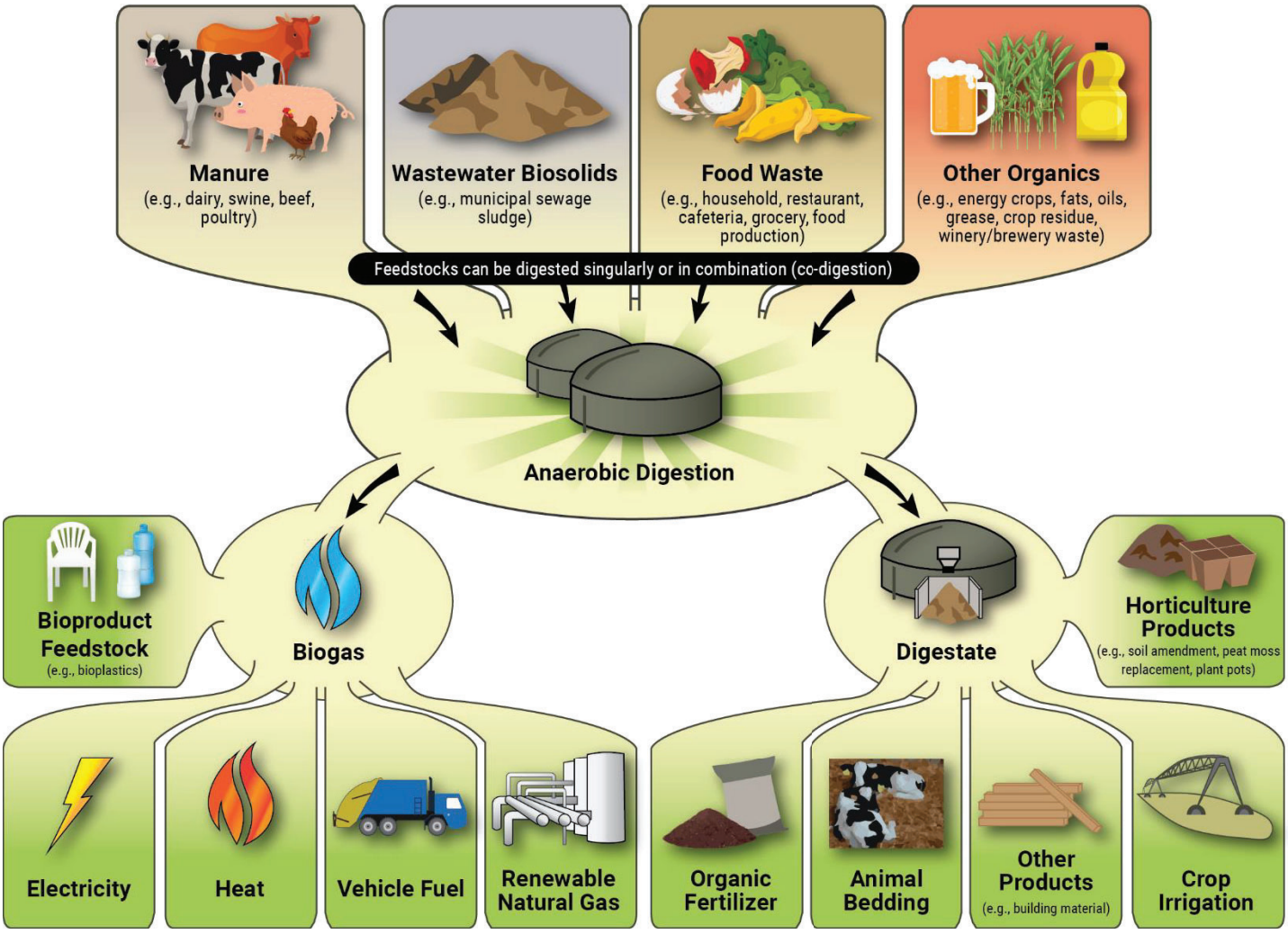
Source: Global methane.org. [Lagoon Cover Anaerobic Digesters. A Cost Effective Solution for Energy Recovery].

Within the anaerobic digester, bacteria break down organic matter including animal manure, wastewater biosolids and food wastes in the absence of oxygen. This sealed vessel allows the bacteria to break down the organic waste and create two valuable outputs: 1) BIOGAS and 2) DIGESTATE.

The digestion process can take between 30 and 40 days and, once again, the raw biogas is composed of 50-75% methane (CH4) as well as carbon dioxide (CO2), hydrogen sulfide (H2S), water vapour and trace amounts of other gases.[29] The raw biogas can be converted into RNG and then injected into the natural gas distribution system, compressed and used as vehicle fuel, or further processed to create alternative fuels, energy products or advanced biochemical products.

Digestate is the residual material left after the digestion process. The digestate is composed of both solid and liquid portions that can subsequently have various uses including nutrient-rich fertilizers, animal bedding, bioplastics or organic-rich compost.

Here is a flow-chart schematic that illustrates the entire process from collection to final product



Source: EPA. How Does Anaerobic Digestion Work?

Dairy or Beef, which Cattle Farms are IDEAL for RNG Production?

So far, this discussion has primarily focused on dairy farms, but it is worth noting that there could be an even bigger opportunity with beef cattle feedlots. California's clean-fuels grading system gives cow-manure gas a much better score and, therefore, much higher subsidies than other feedstocks including landfill. More specifically, California has heavily incentivized ultra-low carbon intensities (-372 to -151) for dairy farms because there are numerous farms in the state that have been around for 50 to 100 years, and these farms have lagoons containing manure that have been emitting methane for DECADES. Numerous studies indicate that agriculture contributes up to 7% of total greenhouse gas emissions in the U.S. and methane from enteric fermentation represents 20% while manure management another 7% of the total CH_4 emitted.[30] When you factor in the fact that the average adult dairy cow can belch 400-500 liters of methane in a single day[31], it makes sense that the California authorities are incentivizing dairy cattle farmers to turn their significant methane emissions into feedstock for RNG. However, it is worth noting that in other jurisdictions, the carbon incentives are not as high when compared to California LCFS (Low Carbon Fuel Standard).

What is a Low Carbon Fuel Standard?

The Low Carbon Fuel Standard was created in 2011 by the California Air Resources Board (CARB). This market-based program focuses on reducing the carbon intensity (CI) of fuels used in California with a goal to reduce greenhouse gas (GHG) emissions by 20% by 2030 and 80% by 2050 throughout the state.[32] More broadly, according to the Smart Prosperity Institute at the University of Ottawa, a LCFS or Clean Fuel Regulations *is a performance-based, technology-neutral regulation that specifies mandatory reduction in GHG intensity of fuels sold within the regulating jurisdiction*.[33] Low carbon fuel standards are applied to fuel suppliers and measure the average GHG intensity of those fuels sold. This generally applies to gasoline and diesel production and any fuel supplier who produces a fuel product that falls BELOW the maximum carbon intensity for that year will generate credits that can be banked by the supplier or sold to another party. Conversely, any fuel supplier whose fuel product EXCEEDS the maximum carbon intensity for that year will be required to acquire credits to offset the carbon production (i.e. "carbon offsets"). A low carbon fuel standard works by incentivizing low-carbon fuel production through technological innovation in areas like biofuels, propane, hydrogen, and electric vehicles (EVs), and by discouraging high carbon fossil fuel production which carry numerous significant costs to the environment and all stakeholders.

"The overall objective of a clean fuel standard would be to achieve annual reductions of 30 megatonnes (MT) of GHG emissions by 2030...This reduction is like removing over 7-million vehicles from the roads for a year." - Government of Canada, November 2016

Here in Canada, British Columbia is the only jurisdiction to commit to a low carbon fuel standard which aims to achieve a 20% reduction in fuel carbon intensity by 2030. Moreover, B.C.'s Renewable and Low Carbon Fuel Requirements Regulation, which mandates a 5% ethanol content in gasoline and 4% in diesel, is credited with 25% of that province's emission reductions from 2007-2012.[34] Across the rest of the country, the Clean Fuel Regulations are part of a group of climate policies designed to encourage investments in clean energy as outlined in Canada's 2030 Emissions Reduction Plan: Clean Air, Strong Economy. Like the Low Carbon Fuel Standard, the Clean Fuel Regulations intend to significantly reduce pollution by lowering the carbon intensity of gasoline and diesel used in Canada by 15% (versus 2016 baseline) by 2030.[35]

For dairy cattle feedlots in Canada, please note that in B.C., the LCFS group does not agree with those extreme negative carbon intensity scores in California for cow gas feedstock, so its carbon intensity scores generally range from negative 150 to negative 200.[36] Moreover, for beef cattle feedlots, which do not have lagoons, those facilities carry carbon intensity scores in the -25 to -50 range.[37]

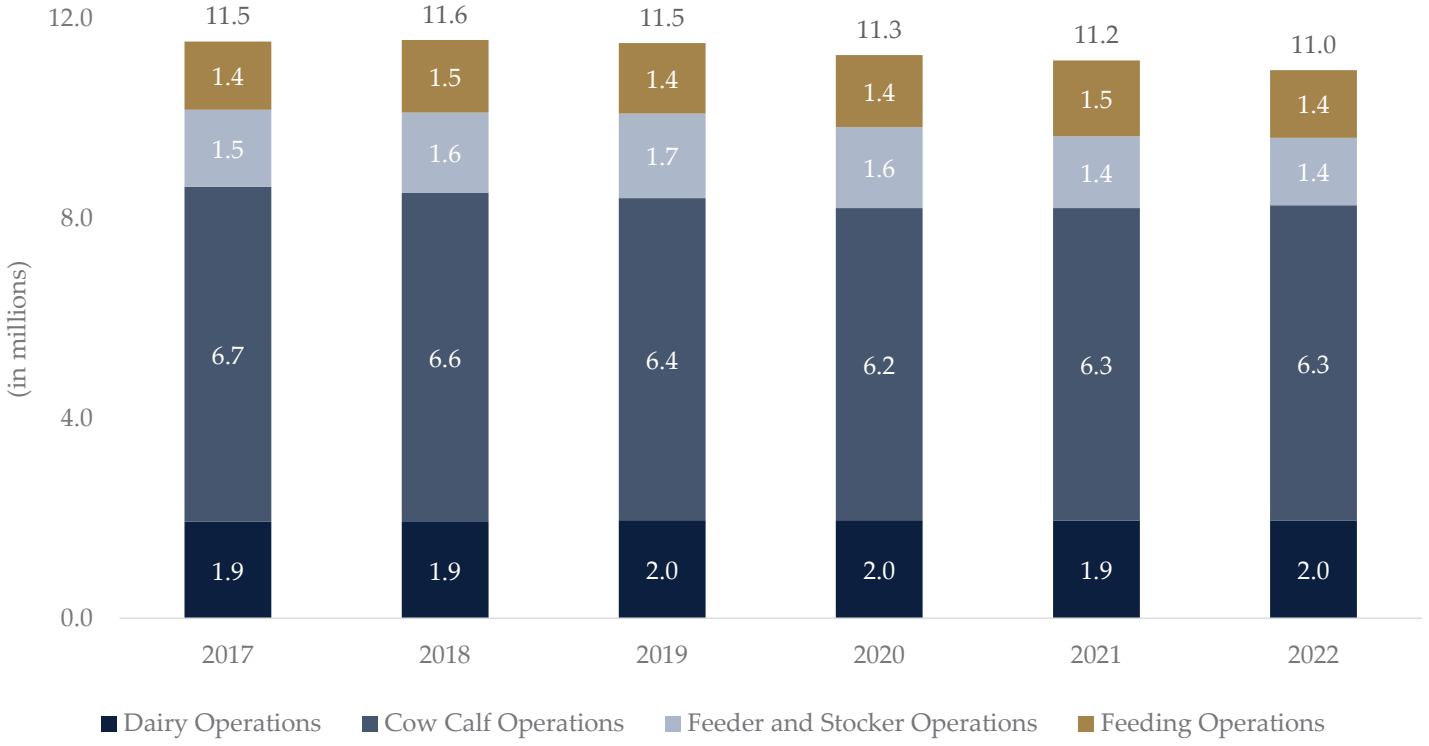
Where's the beef?

According to Statistics Canada, there is approximately 11 million head of cattle in this country with just under 2 million dairy cattle and just over 9.1 million beef cattle on farms across the nation.[38] In addition, there are approximately 39,600 beef cattle farms and about 9,400 dairy cattle and milk production farms in Canada. Therefore, in terms of head of cattle, there is more than FOUR TIMES the number of total beef cattle versus dairy cattle in this country. In the U.S. the numbers are similar. According to the USDA, of the total 92 million head of cattle and calves on U.S. farms as of January 1st, 2022, approximately 30 million of them were beef cows, while 9.4 million were milk cows.[39] Given this discrepancy in size between the total number of beef cattle versus dairy cattle, there is clearly a significant and largely untapped opportunity to harvest manure based RNG feedstock from beef cattle farms across North America.

Canadian Cattle Industry Overview

Number of Cattle by Class in Canada

There are ~11.0 million cattle and calves in Canada as at the beginning of 2022. (1)



(1) Statistics Canada, all years depicted as of January 1

Unlike dairy cattle which have a higher grain-based diet, for most of their lives, beef cattle graze openly during the summer months so their diet consists mostly of pasture grasses and other plants.[40] As a result, beef farms tend to be larger as they usually consist of open pasture, whereas dairy farms require feed storage and handling in addition to a freestall barn and other equipment. With respect to RNG production, historically it has been nearly impossible to collect manure from cow/calf operations because of this open grazing and the structure of the typical beef "cattle ranch". However, beef cattle in Canada also spend 60-200 days in a feedlot which allows them to feed efficiently by reducing the need to forage for food.[41] Feedlots are designed to feed cattle a diet of mostly grain and forages (silage and hay) for them to grow to a target weight of 1400 pounds or 635 kilograms. In addition, those feedlots with paved pens offer numerous ancillary benefits, making them operationally similar to dairy farms and ideal for manure feedstock supply. These benefits include consistent quality manure collection with the ability to gather the product with no mud, improved herd health with reduced slipping, increased feeding efficiencies as less energy is expended versus trudging in mud, as well as long-term cost efficiencies and durability.

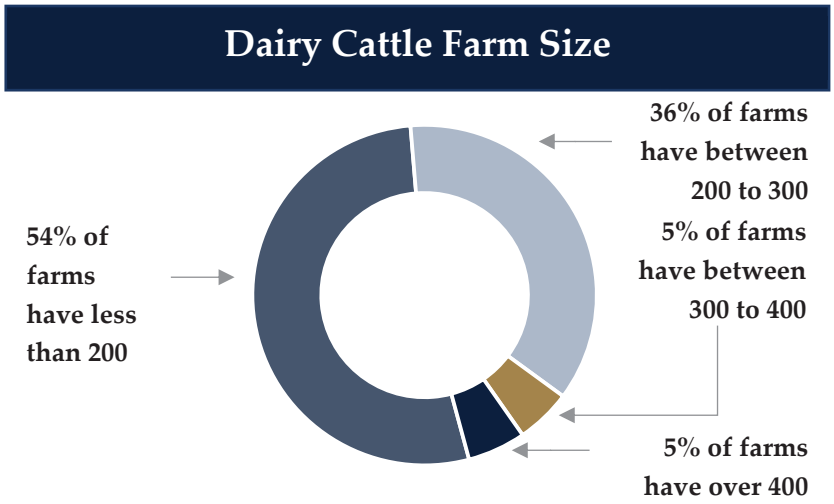
There are also drawbacks to beef cattle feedlots. The animals produce hundreds of thousands of pounds per day of waste that literally pile up into "mountains of manure" before it gets spread. Moreover, depending on the weather, these manure mountains can also emit harmful methane and nitrous oxide (N_2O), another potent greenhouse gas that is 300 times more powerful than carbon dioxide in terms of trapping heat in the atmosphere.[42] For dairy farm operations, the methane emissions from the mixture of water and manure in the lagoons have been heavily studied and scientists have long concluded that this is an environmental problem. However, while most of the methane emissions at beef feedlots come directly from the cattle, under arid conditions dry manure at these feedlots can have a dramatically negative affect on air quality in the form of "brown clouds". Furthermore, when it rains (or when the snow melts), methane and nitrous oxide emissions can spike even further, contributing to GHG emissions.[43] Talk to anyone who grew up on a farm and they know this to be gospel. However, there isn't the same large body of data to corroborate this anecdotal evidence. Whether or not the environmental impact of piled manure at these feedlots has been heavily documented, we believe that lowering methane and nitrous oxide emissions is yet another reason why entities looking lower their carbon intensity should be seriously investigating beef cattle feedlots as a source of feedstock for RNG production.

These mountains of "Brown Gold" could be both extremely valuable and extremely harmful at the same time.

Source: INFOR

Comparing Dairy farms and Beef cattle feedlots "Apples-to-Apples"

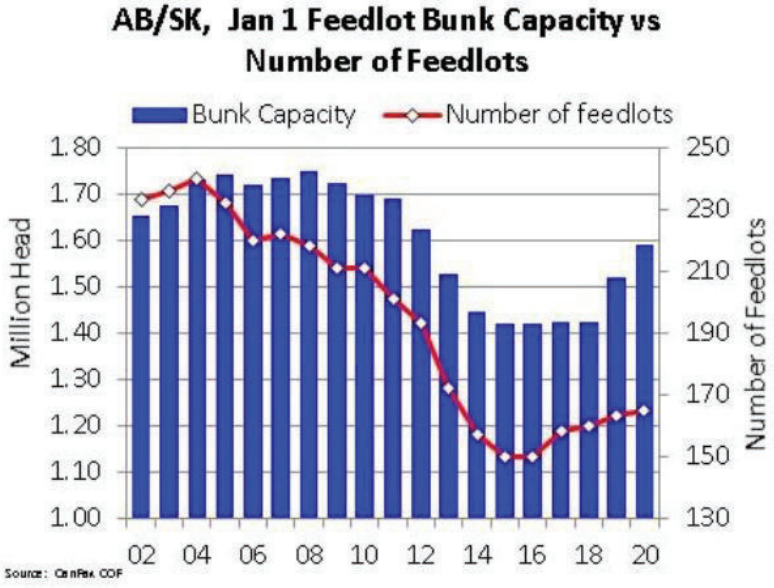
When evaluating livestock farms ideal for RNG production, out of 31,650 dairy farms in the U.S., the EPA has identified over 2,700 locations that have large operations with over 500 head of cattle, a freestall barn and centralized manure processing.[44] Anecdotally, about 15,000-20,000 head in dairy is "ideal" for the absolute best CI score and economies of scale given the amount of manure produced daily. However, in Canada we do not have dairy farms that are even close to that size and scale. According to the data, the average Canadian dairy farm has 96 cows[45] and only 5% of Canadian dairy farms have more than 400 cows.



There are ~9,400 dairy cattle and milk production farms in Canada.

Source: Statistics Canada

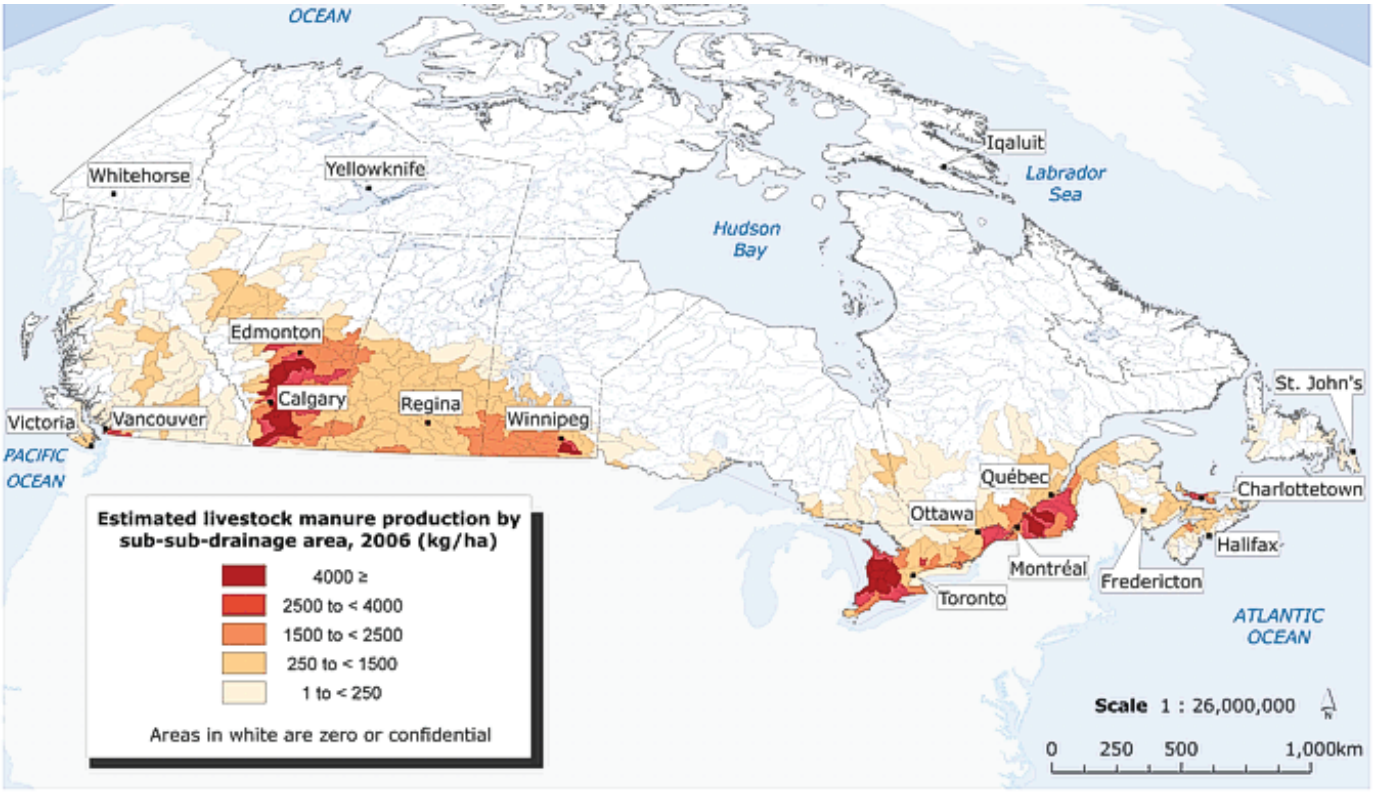
When it comes to beef cattle in Canada, the numbers appear to be quite different. After beef cattle feedlot capacity declined from 2008 to 2015, which mirrored the liquidation of the Canadian cow herd, feeding capacity in finishing feedlots has grown for six consecutive years and is now at its highest level since 2011.[46] It is also interesting to note that there are now fewer smaller feedlots in Canada. Feedlots between 500-1,000 head decreased from 20% of the total in 2008 to 12.7% in 2020, while mid-size feedlots (5,000-10,000 head) are approximately 25% of the total feedlot capacity. More importantly, since 2016, there has been a resurgence of large feedlots with more than 10,000 head. That segment now makes up approximately two-thirds of the total beef cattle feedlot market.[47] Moreover, Alberta now has 156 finishing feedlots and almost 38% have a capacity of 20,000 head or more. It is also worth noting that last year, a feedlot opened near Enchant Alberta with a capacity of 40,000 head.[48]



Source: Canfax Research Services

The numbers suggest that, as opposed to dairy farms, beef cattle feedlots have enough cows to provide the size and scale necessary to supply enough feedstock for an RNG operation. **When further focusing on manure production, due to the large relative number of beef cattle in the country, it is no surprise that beef cattle represent 52% of total livestock manure production in Canada** followed by dairy cows at 19%, 16% by hogs, 7% by calves, 3% by poultry, 3% by horses, and less than 1% by sheep.[49] Therefore, it makes sense that when compared to other livestock farms, given the size, scale and amount of manure produced daily, beef cattle feedlots are much more of an "ideal" feedstock source for consistent RNG production.

Estimated Livestock Manure Production By Sub-Sub Drainage Area



Source: Agriculture and Agri-Food Canada and Statistics Canada, Customized tabulations, Census of Agriculture, Census Geographic Component Base 2006

Another "Shout-Out" to Alberta?

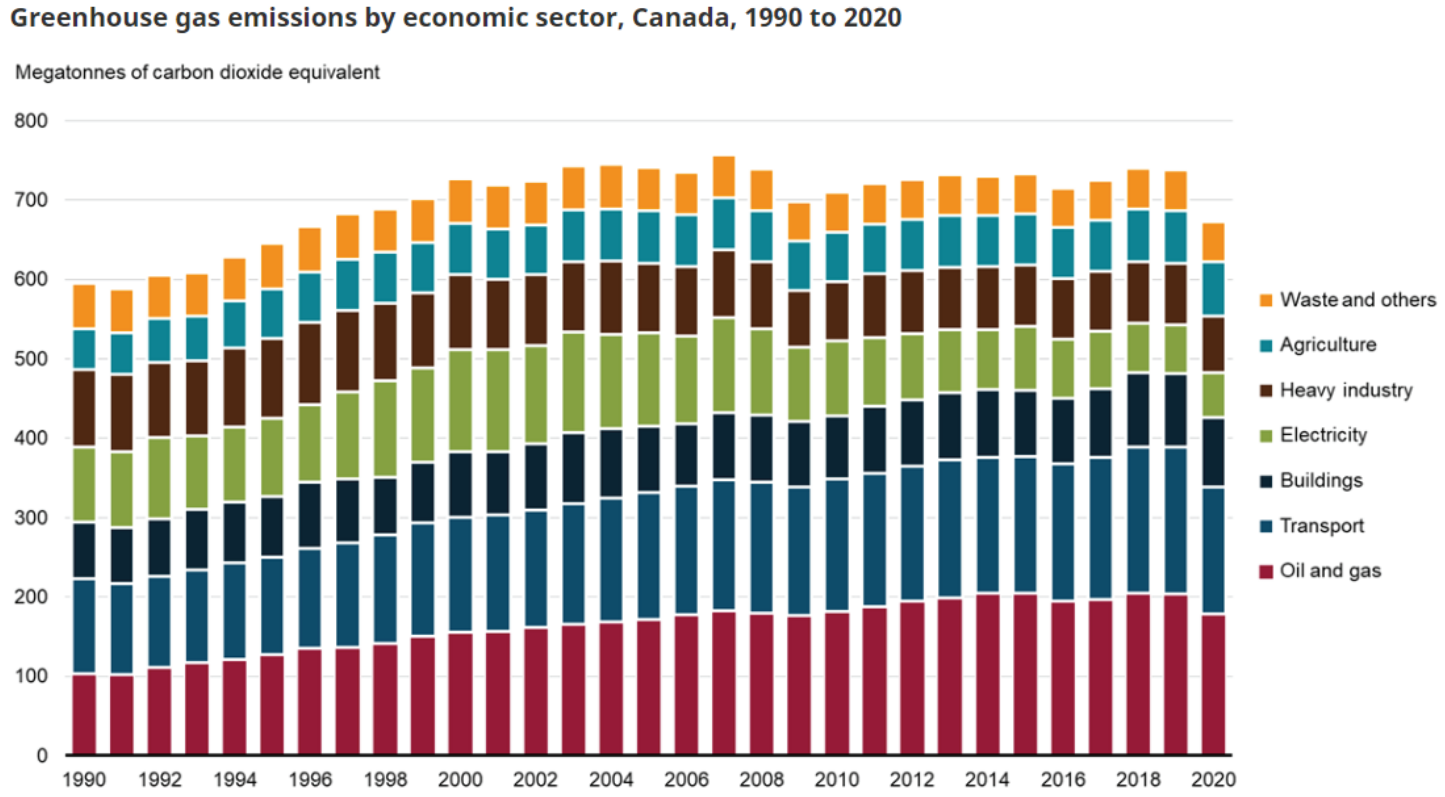
In Canada, Alberta has the highest number of beef cattle feedlots with 4.9 million head or 47.3% of the national herd. Also, according to the Alberta Cattle Feeder's Association, 80% of Canada's processed cattle are located in Alberta and that province produces the most beef nationally.[50] Another historical StatsCan report notes that Alberta accounts for over 37% of live cattle exports and about 75% of bovine meat exports to the U.S.[51] Once again, given the relatively high number of beef cattle in Canada, Alberta represents a unique opportunity for anyone looking to partner with beef cattle feedlot operators in order to secure feedstock supply for RNG production.

Canada is still a LARGE emitter of Greenhouse Gases (GHG), But will More "Brown Gold" lead to another significant Source of Carbon Offset Credits?

In 2020, Canada's greenhouse gas (GHG) emissions were 672 megatonnes (Mt) of carbon dioxide equivalent. While this is a decrease from the 738 megatonnes (Mt) of carbon dioxide equivalent emitted in 2019, this still makes Canada the world's 10th-largest emitter of greenhouse gases.[52]

In 2020, the oil and gas and transportation sectors were the largest GHG emitters in Canada, accounting for 27% and 24% of total emissions, respectively.[53] This is intuitive given that those two sectors are primarily founded on the production and consumption of fossil fuels. The oil and gas sector was the largest source of GHG emissions with 179 megatonnes of carbon dioxide equivalent admitted during the year. However, perhaps more importantly, from 1990 to 2020 the sector's GHG emissions increased by 74%.[54] Clearly, the oil and gas sector needs to lower its carbon intensity, but the transportation industry also has a significant role to play in lowering GHG emissions. In 2020, the transportation sector was the second largest source of GHG emissions with 159 megatonnes of carbon dioxide equivalent and GHG emissions growing 32% from 1990 to 2020. In a bid to tackle this sector, the Canadian government has adopted targets for zero-emissions vehicles to make up 10% of sales by 2025, then 30% by 2030 and 100% by 2040.[55]

The Greenhouse Gas (GHG) Protocol Standard is the most widely used greenhouse gas accounting and reporting standard. More than 9 out of 10 reporting Fortune 500 Companies use the GHG Protocol which categorizes emissions into three scopes: **Scope 1:** Direct emissions from owned or controlled sources (Examples: Fuel combustion and company vehicles); **Scope 2:** Indirect emissions from purchased electricity, steam, heating, and cooling consumed by the reporting company (Examples: Purchased electricity and heating); **Scope 3:** All other indirect emissions that occur in a company's value chain (Examples: Purchased goods and services, business travel, and employee commuting and investments).[56]



Source: Government of Canada

Once again, at the 2021 United Nations Climate Change Conference in Glasgow, Scotland, over 100 countries agreed to reduce methane emissions by 30% by 2030. As a result, these countries are also committing to lowering the carbon intensity of the fuels they produce. However, given the enormity of that commitment, for countries like Canada and corporate entities like RBC to meet their "Net Zero" GHG emission targets by 2030, they will still likely have to purchase large amounts of carbon offset credits to remain compliant with the resulting new rules and regulations.

What are LCFS credits Exactly?

The real force behind the "boom" in dairy farm partnerships is California's Low-Carbon Fuel Standard (LCFS) which requires entities that sell transportation fuels to lower their carbon intensity. This involves lowering the carbon dioxide emitted along the entire value chain from the manufacture, distribution, and consumption of their fuel products. Those entities that generate fuels with a carbon intensity (CI) lower than the target established by the CARB can generate carbon offset credits. However, those companies that exceed the carbon-intensity maximums generate deficits and are required to purchase LCFS offset credits to balance their carbon intensity. Typically, regulated fuel parties (RP) like petroleum refiners, petroleum importers and wholesalers are the entities that generate credits and/or deficits.[57]

Simply stated, one LCFS credit represents exactly one metric ton (MT) of Carbon Dioxide reduced. Since the regulation went into effect, the use of low carbon fuels has increased as fuel producers have been actively decreasing the carbon intensity of their fuels, and the total value of credit transactions was over $2.0 billion in 2018.[58]

According to the regulations, there are three ways to generate credits under the LCFS: i) low carbon fuel pathways, ii) GHG-reducing projects, and iii) ZEV capacity-based crediting. Please note that life-cycle analysis includes the "direct" impacts of producing and using the fuel as well as the "indirect" impacts primarily associated with crop-based biofuels.

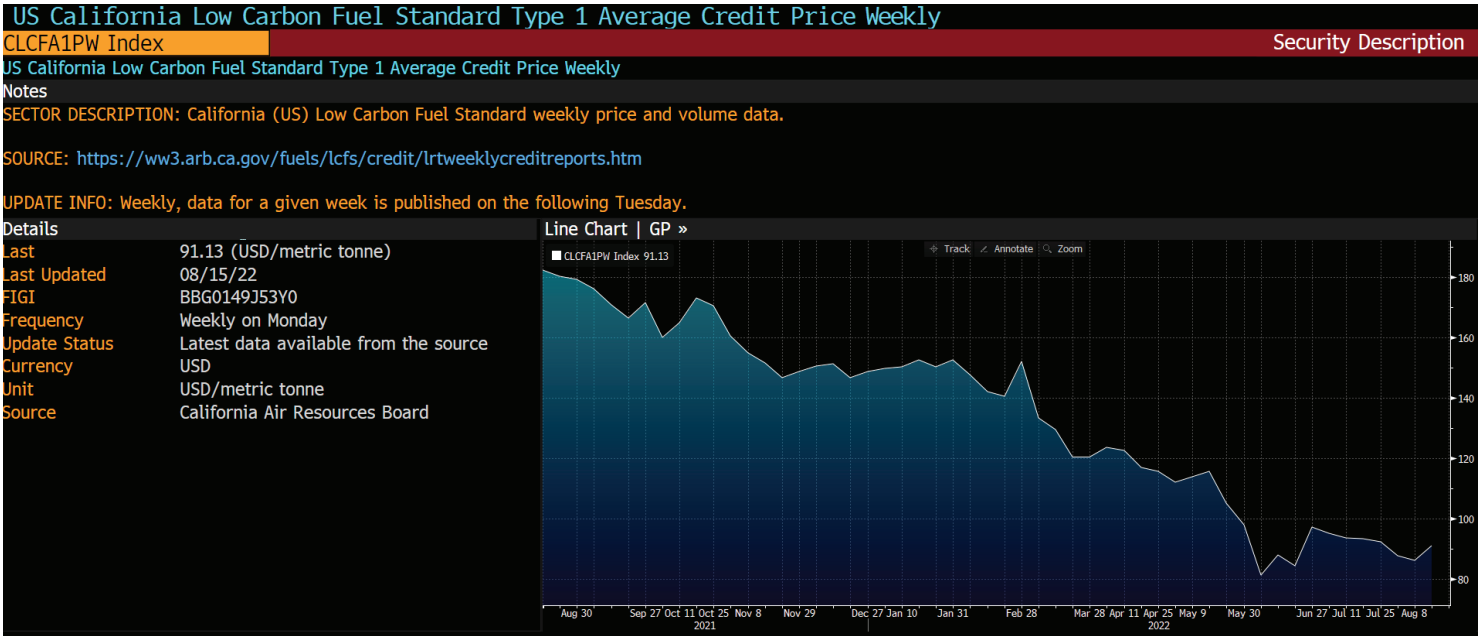
Fuel pathway-based crediting: Providers of low carbon transportation fuels in California generate credits by obtaining a certified CI score and reporting quarterly transaction quantities, which are then calculated relative to the annual CI benchmark.

Project-based crediting: Projects that include actions to reduce GHG emissions in the petroleum supply chain as well as carbon capture sequestration (CCS) projects are eligible for credits based on life-cycle emission reductions.

Capacity-based crediting: Crediting for zero emission vehicle (ZEV) infrastructure is based on the capacity of the EV fast charging site or hydrogen station minus the actual fuel dispensed.

Source: CARB, LCFS Basics

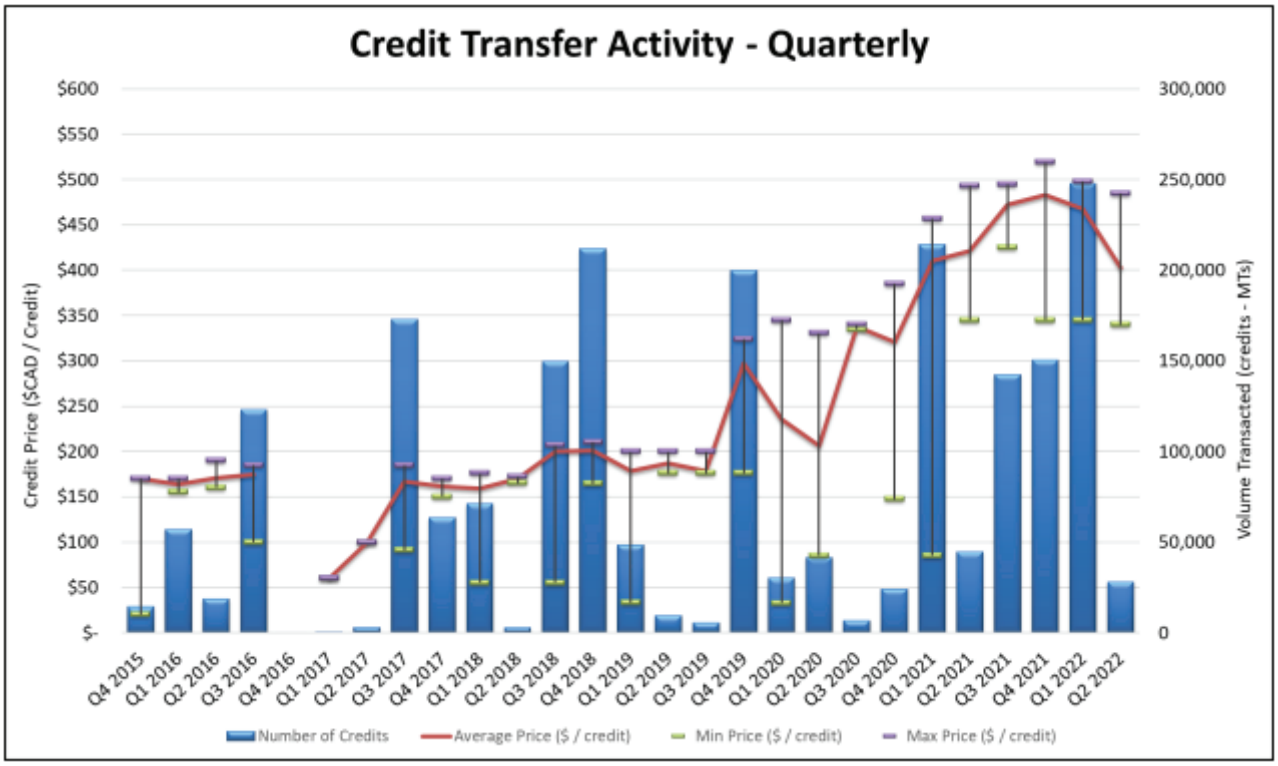
According to the CARB, if a regulated party does not have enough credits to meet its compliance obligation for the year, the LCFS includes a provision for a Credit Clearance Market (CCM). The CCM provides a route for compliance by basically allowing entities to sell excess credits into the market while other entities, which require credits for compliance, to purchase these credits that have been offered into the market. In addition, to strengthen incentives for investment in low-CI fuels, reducing the probability of credit shortfalls and ensuring compliance by providing certainty on maximum compliance costs, the CCM also provides an annual price cap which prevents extreme market volatility. This maximum price for credits acquired, purchased, or transferred into the CCM is adjusted annually by a Consumer Price Index (CPI) deflator and was set at US$239.18 in 2022.[59] According to the latest market pricing, LCFS credits are currently trading at approximately US$90/ton. This is a dramatic drop from US$145/ton at the start of the year and US$180/ton seen 12-months ago. (Please see chart below). It is worth noting that approximately 5.63 million MT of credits were generated in the fourth quarter of 2021 versus 4.64 million MT of deficits.[60] This 0.98 million MT surplus of credits may be the reason for the weakness in U.S. California LCFS credit pricing in the fourth quarter of 2021 and the first half of 2022.



Source: Bloomberg

Here in Canada, British Columbia is the only jurisdiction to commit to a low carbon fuel standard which aims to achieve a 20% reduction in fuel carbon intensity by 2030. The Greenhouse Gas Reduction (Renewable & Low Carbon Fuel Requirements) Act and the Renewable & Low Carbon Fuel Requirements Regulation, known collectively as British Columbia's low carbon fuel standard (BC-LCFS), was introduced to reduce the carbon intensity (CI) of fuels used in the province.[61] According to the BC-LCFS Requirements, any entity that manufactures fuel in British Columbia, or imports fuel into the province, is considered a "fuel supplier" and must comply with the Renewable & Low Carbon Fuel Requirements Regulation. The BC-LCFS was implemented to lower the province's reliance on non-renewable fuels and has two main requirements: 1) reduce the environmental impact of transportation fuels, and 2) spur growth in the clean fuels industry in B.C.[62] Similar to California, entities who supply fuels with CIs below the targets generate credits while entities who supply fuels with CIs above the targets receive debits. The BC-LCFS sets CI targets that decline each year and under the Greenhouse Gas Reduction Act, fuel suppliers may purchase validated credits to comply with the low carbon fuel requirements. According to the most recent credit transfer activity reports, in the second quarter of 2022, the average price per credit was approximately $402.00 with a low of $340.00 and a high of $485.00.[63]

Canada also has the Clean Fuel Standard (CFS) which was implemented by the Canadian government to encourage energy producers to meet federally imposed carbon intensity thresholds by blending renewable fuels with fossil fuels. This Canada-wide clean fuel standard is slated to come into effect in July 2023 and targets a 15% reduction in carbon intensity versus a 2016 baseline.[64] Beginning in June 2022, the CFS offers entities the opportunity to generate credits from low carbon fuels like hydrogen and renewable natural gas.



Source: British Columbia Ministry of Energy, Mines and Low Carbon Innovation

As mentioned earlier, global energy giants like BP, Shell, Chevron, Total Energies, Kinder Morgan, and Enbridge have invested hundreds of millions of dollars into RNG. However, when it comes to feedstock from livestock farms, we still think that there is a largely "untapped resource" with respect to beef cattle feedlots. Going forward, as the value here continues to be unlocked, we believe that manure-based feedstock for RNG production could become a growing and strategic source of these much-needed carbon offset credits going forward.

Governments are MANDATING that Renewable Natural Gas becomes part of the regular Natural Gas stream…

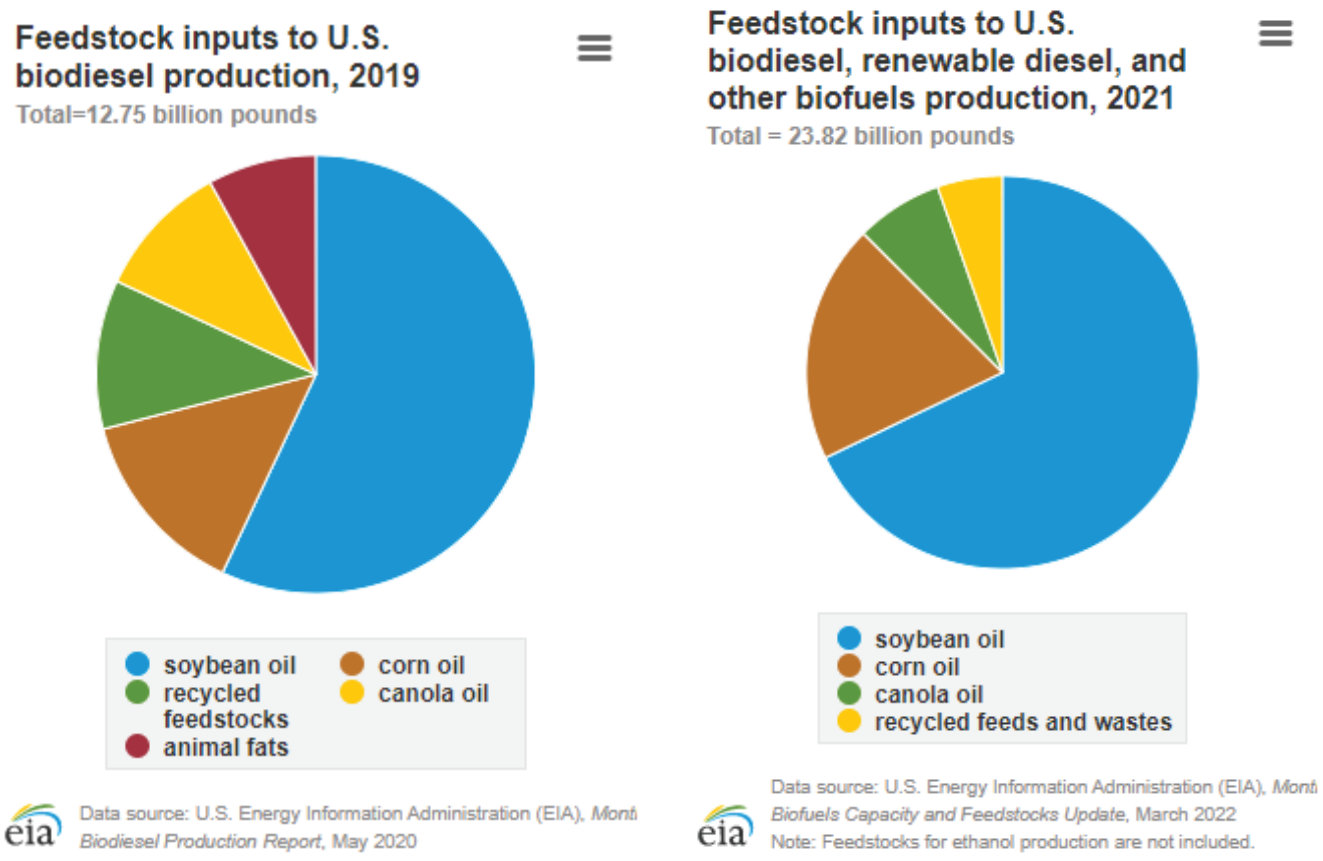
In Canada, provincial governments are now committing to RNG as a part of their regular natural gas streams to households. British Columbia's CleanBC objectives commit to a 15% renewable gas content in the province's natural gas system by 2030.[65] Enbridge in Ontario and FortisBC also have optional programs that allow its customers to reduce their carbon footprint by paying a premium to designate a percentage of their natural gas use as RNG (for example 10% RNG = an extra $5.25 per month on their utility bill). Enbridge's OptUp voluntary RNG program costs participants $2.00/month and intends to add more carbon neutral RNG to the broader natural gas system. This is important because in Ontario, 75% of households heat their homes with conventional natural gas. Enbridge estimates that during its first five years, the program could reduce CO_2 emissions by approximately 8,000 tons.[66] Also, according to regulations in Quebec, it is mandatory that the minimum portion of RNG supplied by a natural gas distributor will be 5% by 2025. This proportion could be increased to 10% by 2030.[67]

Renewable Diesel, Another Key SOLUTION to our energy problem?

The focus has been on the dramatic increase in oil and gasoline prices however, U.S. diesel prices were also up 63% in the first quarter of 2022. Unlike gasoline prices, which plummeted during the first onset of the COVID-19 pandemic in 2020, diesel prices really didn't pull back. As people worked from home and ordered everything from groceries to appliances, the demand for trucking, shipping, and overall transportation increased, keeping diesel prices high. U.S. distillate inventories are currently 120 million barrels or 18% below the pre-pandemic seasonal average and at the lowest level since 2014. If diesel starts to run short, then the industrial and agriculture industries would likely have to slow down which would be a drag on the global economy.[68]

So far, we have discussed Renewable Natural Gas (RNG), but Renewable Diesel is another key component of the overall carbon energy solution. First, as we have already seen, biofuels have physical properties very similar to petroleum distillate or fossil fuels and can, therefore, be used as a replacement in various applications. Products like biodiesel, renewable diesel, renewable aviation fuel, and renewable heating oil can all be used as more carbon efficient substitutes for traditional petroleum products. However, here we should explore the difference between Biodiesel and Renewable diesel.

Biodiesel is one of the very first biofuels developed as Rudolf Diesel himself experimented with the use of vegetable oil in his diesel engines. Today, biodiesel is produced by combining vegetable oils and animal fats with methanol in a chemical process called transesterification. According to the eia, soybean oil is the main feedstock input and represents 57% of biodiesel production in the U.S.[69] When accounting for biodiesel, renewable diesel and all other biofuels, soybean oil represents ~70% of total feedstock inputs in the United States:

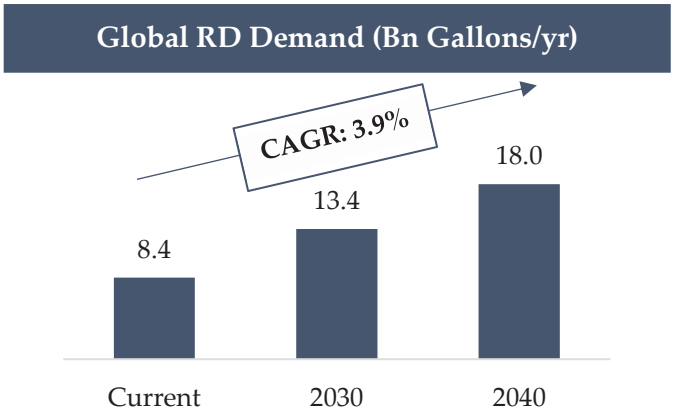


Source: eia, Biofuels explained

Renewable diesel is similar to biodiesel, however, there are two main differences. First, renewable diesel is produced from biomass feedstocks including animal fats (tallow), vegetable oils and waste cooking oils. Second, renewable diesel is a higher quality end-product that is chemically equivalent to petroleum diesel. Therefore, renewable diesel provides greater power and efficiency, produces fewer harmful emissions, and can be used as a "drop-in" biofuel that can be stored and used by existing pipeline infrastructure without the need for blending with petroleum diesel. In 2021, U.S. renewable diesel production equalled about 815 million gallons (0.82 billion gallons) and consumption equalled about 1,163 million gallons (1.16 billion gallons), which included about 392 million gallons of imports. California uses most of U.S. renewable diesel fuel imports.[70]

Renewable Diesel

- Pose an advantage over biofuel and identical properties.
- In 2020, numerous North American refiners announced renewable diesel plants co-located with existing refineries leveraging existing infrastructure to improve project economics.
- Supportive regulatory environment in U.S., Canada and Europe.
- Global renewable diesel demand is predicted to achieve 18.0B gallons per year in 2040.



Source: INFOR, Company Reports

In conclusion, while renewable natural gas using feedstock from dairy farms continues to grab all the headlines, we feel that there is a significantly larger feedstock opportunity in beef cattle feedlots. The data suggest that beef feedlots offer more size, scale, and manure than any other livestock farm operation in the country, making it "ideal" for RNG production. Therefore, not only can manure-based RNG help dramatically lower the carbon intensity for fuel producers, but the associated carbon credits can also help corporate entities, including those in the energy and transportation sectors, remain compliant with clean energy regulations. With that in mind, these entities should be looking to strategically partner with large beef cattle farms to secure a large and growing source of feedstock for RNG production - "Brown Gold".

Where Do We See Upside in the RNG Space?

In conjunction with Adelaide Capital, INFOR Financial recently co-hosted a Biofuels & Renewables Virtual Panel. The session highlighted both private and public companies focused on Renewable Natural Gas (RNG), Renewable Diesel, Renewable Hydrogen, and Energy Transition. Presenting companies included Cowboy Clean Fuels (private), Evergen Infrastructure Corp (EVGN – TSXV) and Tidewater Renewables (LCFS-TSX). Please click here to view the presentations.

Cowboy Clean Fuels (Private) has an innovative technology that utilizes existing Coalbed Methane (CBM) infrastructure and biomass to produce high-quality Renewable Natural Gas (RNG). Cowboy Clean Fuels has a technology that produces scalable, carbon negative, renewable natural gas (RNG) using existing CBM infrastructure and renewable biomass as feedstock. This process yields pipeline spec renewable natural gas with a Carbon Intensity (CI) score of -20 to -100 depending on the feedstock.

What do they do? There is a natural phenomenon in coal seams where methanogens digest coal through an enzymatic process to produce methane and historically, this has been happening underground for decades. The process is lengthy, but it has been demonstrated that this renewable process can be "sped up" and controlled by replacing coal with renewable biomass that the organisms can convert into methane much faster. This patented process is derived from over 15 years of research, US$6M of non-dilutive research funding and over 1,000 laboratory experiments at the University of Wyoming (who is still a significant owner of the Company and the technology). These mini "bioreactors" living in the coal seams can then be used to produce methane at a larger scale, with greater output and lower capex than the cost to build a traditional anaerobic digester (AD). The Company also holds 3 U.S. and 6 international patents on the technology.

Cowboy currently has an inventory of 139 wells in the Powder River Basin (PRB) as a "starting point". Earlier this year, Cowboy acquired 139 shut-in wells in the PRB. These wells were shut-in for approximately two years and would have likely been plugged over the next 2 to 5 years, which could have resulted in fugitive methane emissions. Cowboy is in the process of returning these wells to production this year by rolling out the "Cowboy technology" through groups of approximately 5 wells at a time, over the next 18 months.

Why is this interesting? There have been over 26,000 CBM wells drilled in the PRB and after production peaked in 2009 at 559 Bcf, CBM production collapsed to less than 100 Bcf or 20% of peak rates in 2020 as a result of low gas prices and high depletion rates. Today, the $11 billion of invested capital in CBM infrastructure is largely stranded with very little current value. Cowboy Clean fuels utilizes these non-productive CBM reservoirs and agricultural byproducts from sugar beet refining (molasses and Molasses Desugarized Solubles or MDS) to produce low-carbon renewable natural gas (RNG) through natural biological processes similar to anaerobic digestion. Coal seams operate as natural bioreactors where native microorganisms convert sugar beet refining agricultural byproducts into CH_4 and CO_2. These coal seams ALSO sequester CO_2 longer term as coal's affinity for CO_2 is approximately 4x greater than for CH_4. It is worth noting that not only is their gas production carbon negative with a CI score of -20, but they will also sequester just over 1M tons of CO_2 over the first 10 years of operations for the first project. The use of the agricultural byproducts as the energy source coupled with the capture of the CO_2 in the coal seam makes the whole process both **renewable** and **carbon negative**. Cowboy's renewable solution also addresses the scale and gas quality issues. Their first project will be 4.5x the size of the largest U.S. Dairy farm AD and will produce pipeline quality gas with no processing required versus traditional raw biogas that must be "cleaned up" before it is pipeline ready.

In summary, Cowboy Clean Fuels has an inventory of production assets and contracts for low-cost biomass feedstock that can take it to 10 billion cubic feet (Bcf) of RNG production over the next 10 years. In addition, due to the carbon negative nature of the process, Cowboy is also expected to produce carbon credits for a carbon credit market forecast to reach US$50 billion by 2030. Therefore, when considering current natural gas pricing, as well as the value of the environmental attributes, Cowboy Clean Fuels generates three separate revenue streams including CBM natural gas, RNG credits and Carbon credits for a potential revenue opportunity of $40/mcf. Based on these numbers, the Company expects to generate US$90M in revenues and US$25M in EBITDA once the first project is fully ramped.

Evergen Infrastructure Corp. (EVGN, $40M Mkt Cap) is aggregating a portfolio of infrastructure assets that produce Renewable Natural Gas (RNG) from organic waste. Evergen Infrastructure Corp. is creating a cluster of renewable natural gas facilities to create a low-risk, high-growth, and high margin revenue stream to address the large and growing RNG market here in Canada. By using organic waste as feedstock, Evergen is producing renewable energy through anaerobic digestion (AD) while also reducing greenhouse gas (GHG) emissions to help Canadian entities decarbonize and achieve their goals of net zero emissions.

What do they do? Evergen Infrastructure Corp. currently owns and operates 3 RNG and/or organic processing facilities in B.C. with long-term, fixed price contracts with several offtake partners including FortisBC, Energir, Enbridge, Union Gas and Southern California Gas Company. Evergen also has operating interests in new RNG development projects in Alberta and Ontario and based on their current portfolio, these long-term recurring revenue contracts provide low-risk revenue growth, high EBITDA margins (50-60%), and strong EBITDA growth that could take annual EBITDA from $3M in F2021 to over $30M by 2024. Longer-term, the Company is looking to become an aggregator of RNG assets across Canada. Their "core portfolio" in B.C. includes about a $45M capital spend across two assets which would take current EBITDA from $3M to $8M annually and double their input waste capacity on the "front end" while tripling their RNG output on the "back end". The current portfolio includes:

1) Net Zero Waste Abbotsford (NZWA) in B.C. NZWA processes about 40K tonnes of green bin waste annually that feeds blended feedstock from agricultural, municipal, and commercial organic waste into an AD. This operation generates approximately $2M of EBITDA from multiple revenue sources including tip fees, inputs for organic fertilizer, etc. NZWA has a CI score of 0 in B.C. (management estimates that the CI score would be -50 to -75 in the U.S.) and Evergen announced 20-year offtake with FortisBC last May. This is an expansion project where the Company plans to increase the processing capability to 135K tons per year taking the RNG capacity to 180K GJ/year. The $32M expansion should take operating EBITDA from $2M to $7.5M annually.

2) Fraser Valley Biogas (FVB). FVB has a current processing capacity of 50K tonnes per year for RNG production of 80K GJ/year (2020). There is a planned $10M expansion to 100K tons per year and 160K GJ/year of RNG production respectively. There is an existing FortisBC offtake with a 10-year operating history. The operation has 4 digesters (2 in operation), and the project has a blend of feedstocks including 75% manure and 25% commercial waste. They are sourcing manure from 10 different small family farms and dairies which produces a slightly negative CI score here in Canada but again, management believes that their CI score in the U.S. would range from -50 to -75 largely due to the dairy manure inputs as they receive favourable treatment in the state of California.

3) Sea to Sky Soils (SSS). SSS is an operational organics processing facility located in B.C. This compost facility is operated in partnership with the Lil'wat First Nation, with a current processing capacity of 40K tons of municipal and agricultural waste per year. SSS has applied to expand its permitted capacity to 60K tons per year which would give it the potential to generate about $2M operating CF per year.

4) GrowTEC. Evergen has an LOI to acquire 67% of an operational RNG facility in Lethbridge Alberta for total upfront consideration of $6.6M ($3.3M in cash + 600K shares) plus an additional $4M in milestone payments. This facility is a family owned, farm-scale AD that converts manure into raw biogas. GrowTEC is expected to have Phase 1 RNG capacity of 80K GJ/year with a Phase 2 expansion to 140K GJ/year expected to commence on closing of the transaction. GrowTEC also has a long-term RNG offtake contracted with FortisBC.

5) Project Radius. Evergen also has a 50% interest in Project Radius in Southern Ontario. This is a large scale RNG project expected to produce ~1.7M GJ/year. Through an initial investment of $1.5M, Evergen acquired a 50% interest in three 550K GJ/year projects whose construction will last through 2023 and 2024. Advanced discussions are currently ongoing for 20-year offtakes with investment grade counterparties.

Why is this interesting? Evergen is already cash flow positive as it currently generates $10M in revenues and $3M in EBITDA with $20M in cash to fund its growth plans to build low-risk renewable RNG infrastructure with revenues generated from both contracted feedstock suppliers as well as RNG end-users through long-term contracts. More

specifically, Evergen generates revenues from municipalities and waste haulers in the form of tipping fees (approximately 50% of revenues) for their organic waste, PLUS revenues from their end-product RNG for gas utility customers like FortisBC and Enbridge. Please note that FortisBC has "led the way" as one of the only utilities offering 20-year offtakes for RNG at a premium to spot gas pricing (up to 10x spot) which provides reliable, long-term cash flow streams to Evergen's RNG assets. ***Strategically, through the GrowTEC investment, Evergen will be expanding the use of the biogas from just power generation for the farm locally by adding a RNG upgrading unit so that the raw biogas can then be purified to RNG, put into a pipeline from Lethbridge Alberta, and then tied into a FortisBC pipeline.*** Total acquisition costs, including additional capex, will be approximately $15M for a facility that will generate $3M an area that has the potential to generate over $10M in projects in and around this facility. ***In addition, Project Radius is an agricultural focused project focused on aggregating waste from corn post harvest (corn stover and corn silage) in a partnership with a developer who has already been working on this for two years.*** They have offtake agreements in place and a strong relationship on the feedstock side with a local aggregator. This is a huge scale project that includes a $200M three phase development that should produce 1.7M GJ per year. ***At the current pricing of $30/GJ+ on fixed-price contracts, this represents close to $60M in revenues and $30M in EBITDA, assuming 50% EBITDA margins, from a project with long-term contracts on BOTH the feedstock side and the offtake side.*** As Evergen continues to consolidate assets and scale the business, a typical Evergen project with EBITDA of $5-7M could generate another $1-2M in incremental EBITDA through additional tip fees, $1-2M in incremental EBITDA through facility optimization and increased RNG sales, while maximizing synergies in operating costs across assets throughout the entire portfolio.

In summary, since inception 2 years ago, Evergen has consummated five deals and based on their current portfolio, has "line of sight" to grow annual EBITDA to approximately $30M. Provinces like BC, Alberta, Ontario, and Quebec are the 4 leading jurisdictions looking to divert organics away from landfills so more and more of this organic waste is looking to find a home. Evergen is developing infrastructure to process these organics as well as address both FortisBC's and Energir's mandates for a fixed volume of their gas to be renewable natural gas or to come from renewable sources. Evergen's current portfolio includes five projects across B.C., Alberta, and Ontario that will collectively take them to 2M GJ/year of RNG production by 2024. The Company also has a long-term portfolio of over 25 projects they are looking to aggregate across Canada that could add another 6M GJ of annual RNG production longer-term.

Tidewater Renewables (LCFS-TSXV, $375M Market Cap) is a Canadian Energy Transition leader with a "first mover advantage" in the Production of Low Carbon Intensity Fuels. Tidewater Renewables is an energy transition company focused on the development and production of low carbon intensity (CI) fuels including renewable diesel, renewable hydrogen, and renewable natural gas (RNG). Given the number of governments "net-zero emissions" pledges worldwide, renewable energy is a business with strong government support, strong project economics and reliable, contracted cash flow. Tidewater also has a "first mover advantage" in the renewable energy space given that the Company will have the first renewable diesel and renewable hydrogen plant in Canada.

What do they do? Tidewater Renewables is a multi-faceted "green energy" platform whose business model is underpinned by three renewable energy products: renewable diesel, renewable hydrogen and RNG. Tidewater has an experienced management team led by Joel McLoed who has approximately 20 years of experience in the oil and gas sector as an executive or a director at multiple midstream and E&P oil and gas companies. Tidewater intends to produce low carbon and cleaner fuels at scale by leveraging its existing assets at Prince George B.C., Brazeau River Alberta, Ram River B.C. and Rimrock. Tidewater currently has a C$40-45M of base, contracted run-rate EBITDA at an average term of 10-15 years. Its parent company, Tidewater Midstream (TWM, $510M Mkt Cap), is the largest shareholder of Tidewater Renewables with 23.9 million shares or a 68.85% stake in the business. Tidewater Renewables has assets that are co-located with current assets at Tidewater Midstream, which allows them to benefit from integration with existing operations which lowers both capital and operating costs.

Prince George Refinery – Renewable Diesel. The new Renewable Diesel Refinery is co-located at the Prince George Refinery (PGR) along with existing assets in renewable storage & logistics and hydrogen. This new Renewable Diesel Refinery will produce 3,000 bbl/d of renewable diesel through renewable feedstocks (UCO, DCO, tallow, canola & soybean) and incorporates an over-built renewable hydrogen plant that will produce 10.0Mcf/d of hydrogen as part of refinery operations. The B.C. government supports this project with an executed agreement that will cover 40-50% of the ~$235M of total project funding. Construction on this project began in Q3 2021, and the project has obtained the first four BC LCFS milestone grants from the B.C. government due to the completed work on this project. The project has been further de-risked with a 160,000 BC LCFS credit forward sales agreement valued at $437/credit and this project expects to generate additional renewable credits in Canada (CFS), B.C. (LCFS) and some U.S. states (LCFS, etc.). The renewable diesel and associated hydrogen production is expected to come into service in Q1 2023 and generate 2023E EBITDA of $90-100M. This is Canada's 1st renewable diesel project.

Prince George Refinery – Canola Co-Processing and Fluid Catalytic Cracking (FCC) Co-Processing. The Canola Co-Processing and FCC Co-Processing growth projects are attached the Prince George Refinery in B.C. and have received government support in the form of B.C. LCFS credits which should significantly reduce Tidewater's net capital costs. The canola co-processing project blends canola feedstock to produce renewable diesel and gasoline, while the FCC co-processing project uses various oil feedstocks, including wood waste, and also expects to produce renewable diesel and gasoline. Nameplate capacity for both co-processing projects is 300 bbl/d and the carbon intensity scores for both the renewable diesel and renewable gasoline produced by these co-processing projects should be ~80-90% less than conventional fuels. The canola co-processing operation was commissioned in Q3 2021 with an expected run-rate EBITDA of $5M while the FCC co-processing operation is expected to come online in Q2 2023 with expected run-rate EBITDA of $6M.

Strategic Renewable Natural Gas and Feedstock Partnership. On April 4, 2022, Tidewater announced that it had entered a strategic RNG partnership with Rimrock RNG and a strategic feedstock partnership with Korova Feeders. Rimrock RNG is the largest cattle marketer in Canada, and top 5 in the United States. Through its 51% ownership stake in the partnership, Tidewater will begin development on the High River RNG facility, which management expects to have nameplate capacity of over 500,000 GJ/year. The project has received government support and production will be secured by a 10 to 20-year offtake with an investment grade counterparty. The partnership will also evaluate at least three additional RNG facilities with a goal to reach RNG production of over 2,000,000 GJ/year. As mentioned earlier, this manure based RNG should have

negative CI scores and over a 100% reduction in carbon intensity versus conventional fuels. In addition, the feedstock partnership with Korova will provide Tidewater with feedstock supply for these future RNG facilities, while also granting access to significant tallow rights for its renewable diesel production.

Why is this interesting? Tidewater is one of the few renewable entities with cash flow as the Company has a base business of contracted EBITDA, on 10-15 year long term contracts, of $40-45M. In the first quarter of 2022, due to stronger diesel prices from its canola co-processing operations, lower feedstock prices & hedging, and stronger LCFS credit prices, Tidewater outperformed its "baseline" EBITDA with approximately $50M of run-rate EBITDA. In the second quarter of 2022, this outperformance was repeated, taking run-rate EBITDA closer to $60M. Tidewater also has a fully funded renewable diesel project that is on time, and on budget and expected to come online in only 8 months. The $235M capital cost for this facility is high relative to production of 3,000 bbl/d, but this includes a pre-treatment facility where they will have the flexibility to run used cooking oil, hog grease, chicken grease and distillers corn oil through the plant without the need to use high priced vegetable oils like soybean oil or canola oil as feedstock. Once the renewable diesel facility comes online in the next 8-10 months, this will layer on another $100M in EBITDA on top of the $50-60M base for a total of $150-160M in annualized EBITDA. In addition, unlike other markets, BC-LCFS credit pricing remains strong. This is important given that the value of the B.C. government grant for the renewable diesel project is tied to the value of 275,000 LCFS credits and that value has increased from $100M (or $375/credit) at the time of the IPO to approximately $125M. ***Therefore, as the company continues to monetize these LCFS credits (at $425, $478, and $490, etc.), the portion of the capex on its renewable diesel project has decreased to $120M and continues to go down.*** Governments are also keen to increase renewable fuel supply incentives. Tidewater anticipates ~$120M in government funding (B.C. and Alberta) through numerous agreements for its Renewable Diesel & Renewable Hydrogen and Co-Processing operations. Tidewater's strategic RNG partnership with Rimrock RNG, the top cattle producer in Canada and a "top 5" producer in the U.S., along with their strategic feedstock partnership with Korova Feeders, also accelerates the diversification of the Company's low carbon intensity fuels product portfolio and will substantially increase Tidewater's RNG production capabilities.

In summary, Tidewater Renewables has three pillars for their low carbon intensity fuels business including renewable diesel, renewable natural gas (RNG), and hydrogen. The majority of their $40-50M in EBITDA today comes from Prince George where they are co-processing canola for renewable diesel and sustainable aviation fuel and their margins continue to outperform due to stronger diesel prices, lower feedstock costs, and continued strength in the BC-LCFS credit markets. Its new renewable diesel facility at Prince George will be the first in Canada and is expected to generate $100M in EBITDA when it comes online in 8-10 months. In addition, there is upside in the BC-LCFS credit market as every year the BC government requires an incremental reduction in carbon requirements on fuel, which results in increased demand for renewable diesel and BC-LCFS credits. As such, credit values have gone from approximately $270 in 2019 to nearly $500 today. Given the size of their renewable diesel facility, existing canola co-processing, and LCC co-processing, Tidewater will also be one of the largest generators of BC-LCFS credits and CFS credits in the country.

**Source:* *Adelaide Capital, INFOR Financial Biofuels & Renewables Virtual Panel, Company Presentations, Company Reports.*

Company Highlights

Company Overview

- Cowboy Clean Fuels ("Cowboy" or the "Company") is an emerging energy technology company that utilizes existing Coalbed Methane (CBM) infrastructure and biomass to produce high-quality Renewable Natural Gas (RNG).
  - The Company has developed a patented technology which produces scalable, carbon negative, RNG using existing CBM infrastructure and renewable biomass as feedstock.
  - Cowboy's process yields pipeline spec RNG with a Carbon Intensity (CI) score ranging from -20 to -100.
  - Cowboy's technology is backed by over 15 years of research at the University of Wyoming, with significant investments from state government and other institutions.
  - The Company's inventory of production assets and contracts for low-cost biomass feedstock has the potential to yield 10 billion cubic feet of RNG production over the next 10 years.

Investment Highlights

1

Innovative Business Model that Supports the Shift to Clean Energy.

- The Company's proprietary technology allows for the use of agricultural byproduct feedstock sources to microbially produce carbon negative RNG from depleted CBM reservoirs.
- Cowboy can utilize various agricultural biomass feedstocks, including sugar beet byproducts.
- Not only will Cowboy's gas production be carbon negative, but they will also sequester just over 1M tons of CO_2 over the first 10 years of operations for the first project.

2

Field-Tested Technology Backed by Years of Research and Technical Experts.

- The development of the Company's technology is a result of years-long R&D efforts at the University of Wyoming, during which time over 1,000 laboratory experiments were conducted.
- Cowboy's leadership team includes accomplished industry professionals with critically relevant experience, setting the company up for long-term success.
- The Company's processes are protected by both international and U.S. patents.

3

Strong Financial Profile with Near-Term Profitability.

- Cowboy intends to generate three separate revenue streams from RNG credits, carbon credits, and clean CBM natural gas for a potential diversified revenue opportunity of $40/mcf.
- Cowboy believes that low input costs and limited capex will allow the Company to generate EBITDA margins of ~30% by 2025E.
- Based on these numbers, Cowboy expects to generate $90M in revenues and $25M in EBITDA once their first project is fully-ramped.

Why INFOR Supports Cowboy Clean Fuels

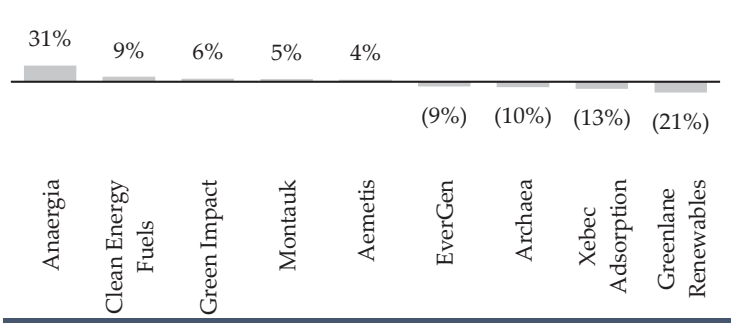
Cowboy Clean Fuels offers investors a compelling opportunity to gain leverage to RNG production, carbon credits and the broader transition to clean energy through an emerging technology that utilizes idle CBM infrastructure and biomass to produce diversified "green energy" revenue streams.

Source: Company disclosure
Note: Figures in US$M, unless otherwise specified

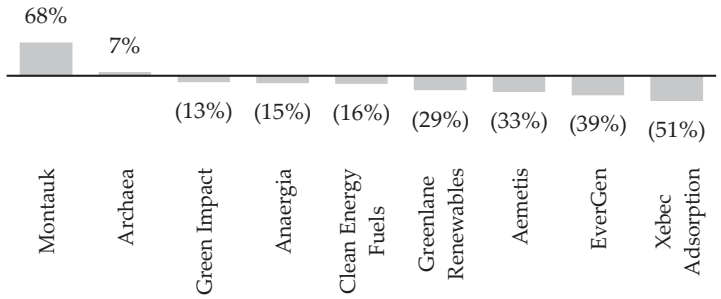
Corporate Snapshot

Relative Performance

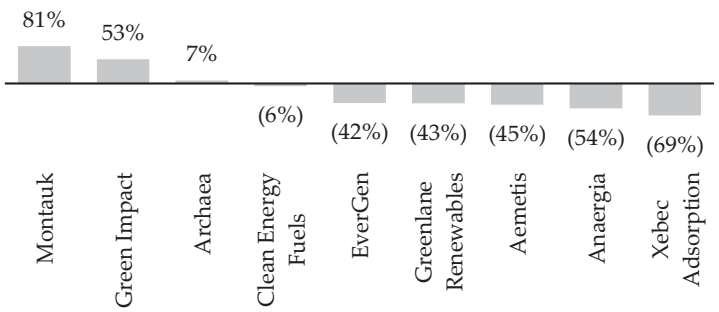
Last 3 Months



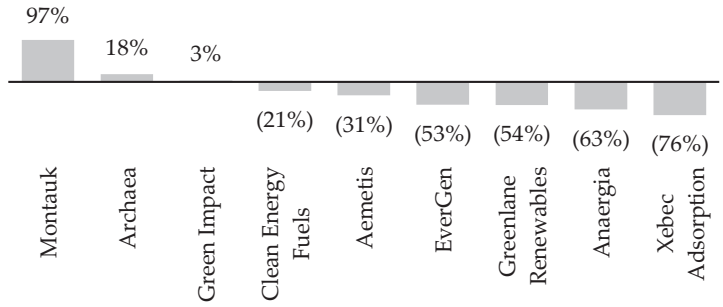
Last 6 Months



Last 9 Months



Last 12 Months



Senior Leadership Team

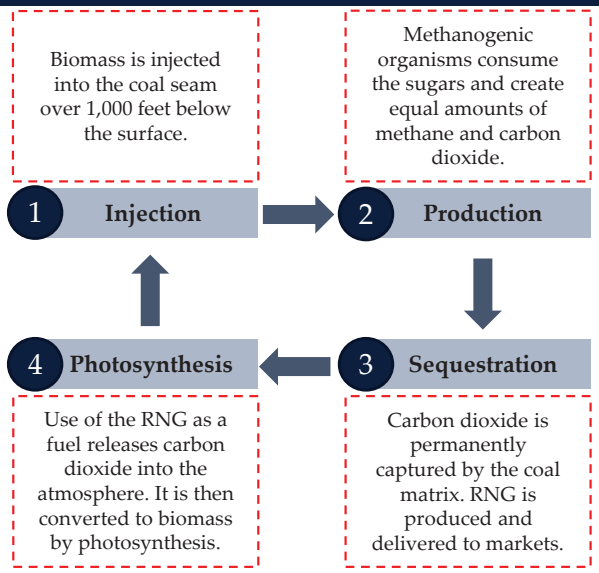
Ryan Waddington *Co-Founder, Chairman and CEO*	▪ 20+ years of investing, operating and consulting in the energy sector. ▪ Co-Founder and Current GP of Huron River Ventures and Former Partner at Arsenal Growth Ventures. ▪ Holds a MS in Engineering from the University of Wisconsin and an MBA from the University of Michigan.
Michael Urynowicz *CO-Founder, President and CTO*	▪ 20+ years of experience in the environmental engineering, energy and manufacturing sectors. ▪ Current Professor of Environmental Engineering and Director at the University of Wyoming. ▪ Holds a MS in Engineering from the University of Wisconsin and a Ph.D. from Colorado School of Mines.
Jason Gaines *Executive VP, Chief Production Operations*	▪ 20+ years of experience in the oil and gas sector. ▪ Former CEO of Pulse Energy Partners and VP of Jagged Peak Energy. ▪ Holds a BS from Montana Tech and is a registered Professional Engineer.
Noah Yates *VP of Finance & Strategy*	▪ 4+ years of experience in finance and strategy; currently serves as a Senior Associate at Huron River Ventures. ▪ Previously held finance- and consulting-related roles at Hatch Data, Pros. Inc., and Spider Management. ▪ Holds a BA from Yale University and an MBA from the University of Richmond.
Casey Korejwo *SVP, Production Operations*	▪ 15+ years of experience in the oil and gas industry. ▪ Previously served as the President and COO of Pulse Energy Partners. ▪ Holds a BS in Petroleum Engineering from Colorado School of Mines and is a registered Professional Engineer.
Preston Anderson *SVP, Finance & Accounting*	▪ 14+ years of experience in accounting, finance and oil & gas. ▪ Previously served as VP, Accounting at Crowheart Energy and Assistant Controller at Ultra Petroleum. ▪ Holds an MBA from the University of Denver and is a Certified Public Accountant.

Source: Company disclosure, Thomson Reuters

Cowboy Clean Fuels Technology Overview

RNG Technology

- Cowboy CF uses non-productive CBM reservoirs and agricultural by-products to create low carbon RNG by means of natural biological processes analogous to anaerobic digestion.
  - Coal seams work as natural geo-bioreactors where native methanogenic microorganisms change sugars obtained from the by-products into methane and carbon dioxide.
  - They also serve as a long-term carbon dioxide sequestration medium.
  - The process is **renewable** due to the energy source deriving from agriculture by-products.
  - The process is **carbon negative** due to the capture of the carbon dioxide by the coal seam.



Intellectual Property

- Cowboy CF has the exclusive license to issued patents created to replicate the natural secondary biogenic methanation process.
  - Two of the patents focus on the conversion of coal to methane directly.
  - Another patent is based on the Company's unique process of biomass conversion.

Patent	Number	Issue Date	Coverage	Description
Method For Converting Coal To Biogenic Methane	7,556,094 B1	July 2009	United States	A method of converting the coal matrix into soluble, coal derived constituents easily metabolized by indigenous microorganisms.
Enzymatic Depolymerization And Solubilization Of Chemically Pretreated Coal And Coal derived Constituents	10,703,981	July 2020 (filed May 2012)	United States, Australia, PCT	A method of using chemical and enzymatic pretreatments to transform the coal into readily available organic carbon.
Biomass-enhanced Natural Gas From Coal Reservoirs	10,151,185 B2	December 2018	United States, Canada, New Zealand, Australia, European, PCT	A method of using coal fields as subsurface bioreactors for producing RNG from terrestrial sources of biomass injections.
Methods for Gas Production and Carbon Sequestration	Patent Pending; Application Number 63/161,336	March 2021 (filed)	United States	A method of using coal reservoirs to simultaneously produce RNG and sequester CO_2 in coal seams, while analyzing isotopic signatures of the produced gas to differentiate and quantify RNG production.

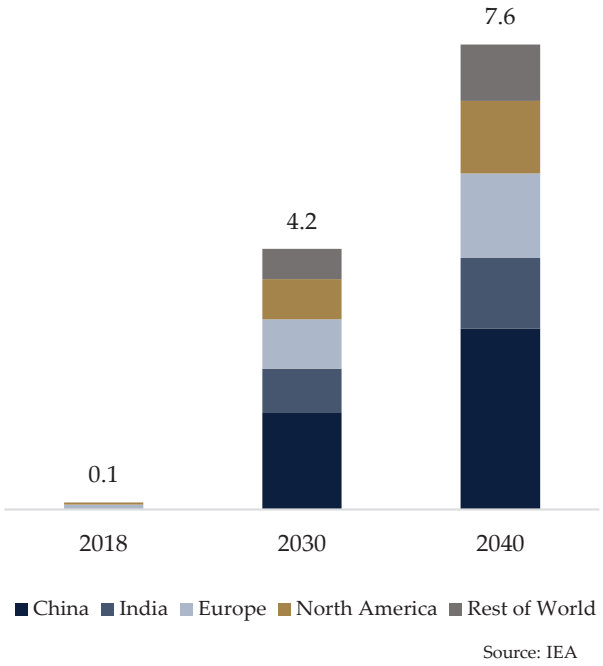
Source: Company disclosure

Renewable Natural Gas Market

Renewable Natural Gas Market Potential

- RNG is a biogenic natural gas usually produced from waste biomass originating from agriculture or human activity.
- Almost all RNG produced today comes from landfills and anaerobic digesters, which have limited scalability versus the Company's novel processes.
- Notably, RNG generates minimal carbon emissions, making it a key resource in fighting climate change.
- RNG demand is growing as global economies transition to clean energy sources.
- Currently, RNG represents only ~0.3% of the total primary energy.
- Under the assumptions of the IEA's Sustainable Development Scenario, which outlines a feasible path to achieve a complement of sustainable development goals, demand for RNG is set to increase significantly in the near to medium term.

Global RNG Consumption (Tcf)



Source: IEA

- By 2040, North America is projected to consume ~1.2 Tcf of RNG.
- The use of RNG across all sectors, such as transportation and power & heat, is expected to grow substantially.

Renewable Fuels and Carbon Credits Overview

- Several national and local government programs focused on transitioning to renewable fuels and decarbonizing the energy system are increasing the possibility for RNG.
- In the private sector, markets for carbon credits have been expanding due to corporate ESG efforts.

Select Primary Credit Markets	
RNG Credits	US EPA's Renewable Fuel Standard (RFS)
Carbon Credits	Carbon Removal Voluntary Markets
Select Secondary Credit Markets	
Carbon Credits	California Low Carbon Fuels Standard (LCFS)
Carbon Credits	British Columbia Low Carbon Fuel Standard (BC-LCFS)
RNG Credits	Canada Clean Fuel Regulations (CFR)

Select Firms with Carbon Neutral Pledges by 2050.

Source: Company disclosure, IEA

Company Highlights

Company Overview

- EverGen Infrastructure Corp. ("EverGen" or "the Company") is aggregating a portfolio of infrastructure assets that produce renewable natural gas ("RNG") from organic waste.
  - EverGen is creating a cluster of RNG facilities to create a low-risk, high-growth and high-margin revenue stream to address the large and growing RNG market in Canada.
  - EverGen owns and operates 3 RNG and/or organic processing facilities in B.C. with long-term, fixed-price contracts with several offtake partners including FortisBC, Énergir, Enbridge and Union Gas. The Company also has operating interests in new RNG development projects in Alberta and Ontario.
  - Longer-term, the Company is looking to become an aggregator of RNG assets across Canada. Based on its current portfolio, the long-term contracts could take annual EBITDA from C$3M in 2021 to over C$30M by 2024.

Investment Highlights

1

Revenue Growth from Feedstock Input Capacity as well as RNG Offtakes Offers Upside.

- EverGen generates revenues from municipalities and waste haulers through tipping fees for organic waste, representing approximately 50% of revenues.
- The Company also generates revenues from gas utility customers through RNG end-products.
- EverGen has 3 core assets in B.C. (NZWA, FVB, SSS) with planned expansions that should double input waste capacity on the "front end" while tripling RNG output on the "back end".

2

Current Assets Offer a Stable Base of Contracted Revenues.

- Net Zero Waste Abbotsford (NZWA) signed a 20-year offtake with FortisBC, and expansion could increase annual EBITDA from C$2M to C$7.5M. Post expansion, both Fraser Valley Biogas (FVB) and Sea to Sky Soils (SSS) could also materially increase annual EBITDA generation.
- EverGen also has a 50% interest in Project Radius, a large scale RNG project in Southern Ontario as well as a 67% interest in GrowTEC, a farm-scale AD biogas operation in Alberta.

3

Already Cash Flow Positive with Meaningful Growth on the Horizon.

- EverGen currently has ~C$15.5M of cash on the balance sheet, is already cash flow positive and, based on the current portfolio, has a "line of sight" to over C$30M of annual EBITDA by 2024.
- EverGen's current portfolio includes 5 projects across B.C., Alberta and Ontario that will collectively take them to 2M GJ/year of RNG production by 2024. Longer-term, the Company is looking to aggregate over 25 projects across Canada that could add another 6M GJ of annual RNG production.

Why INFOR Supports EverGen

EverGen provides an attractive opportunity for investors to gain access to a growing portfolio of RNG assets currently under expansion through an aggregator of multi-faceted RNG assets across Canada.

Source: Company disclosure

Corporate Snapshot

Capitalization & Key Metrics

Capitalization Table

Company Ticker:	TSX-V: EVGN
Share Price (06-Sep-22)	C$2.80
Basic Shares Outstanding (M)	13.9
ITM Dilutive Securities (M)	0.2
FD ITM Shares Outstanding (M)	14.1
FD ITM Market Cap (US$M)	**$29.9**
Add: Debt (US$M)	$8.4
Less: Cash (US$M)	($11.6)
Less: Proceeds from ITM Securities (US$M)	--
Net Debt (US$M)	($3.2)
Enterprise Value (US$M)	**$26.7**

Trading Summary (1)

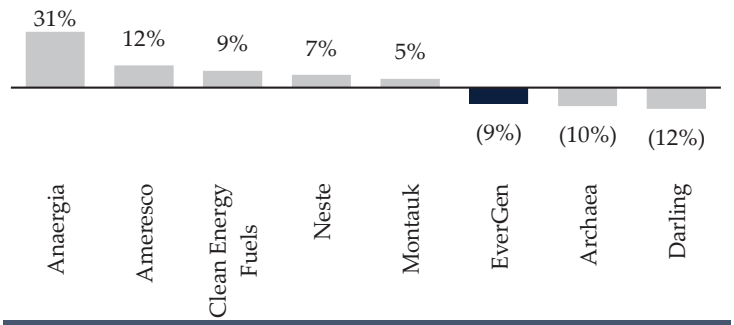
52-Week Low / High Range (C$)	$2.50 / $6.27
20-Day VWAP (C$)	$2.99
30-Day VWAP (C$)	$2.99
LTM Average Daily Volume (000s)	33 (2)
LTM Average Daily Value (C$000s)	$131.9 (2)

Estimated Ownership

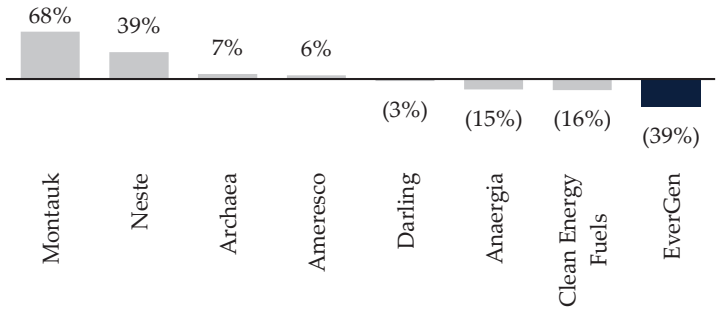
Top Shareholders	(000s)	%
Reddick Wellington	1,163	*8.4%*
Vestcor	1,116	*8.0%*
Ford Nicholson (Director)	513	*3.7%*
Mischa Zajtmann (President & COO)	461	*3.3%*
Chase Edgelow (Co-Founder & CEO)	456	*3.3%*
Starlight Capital	419	*3.0%*
Mackenzie Financial	213	*1.5%*
Power Corp of Canada	136	*1.0%*
Sean Mezei (VP of Operations)	125	*0.9%*
Mary Hemmingsen (Director)	80	*0.6%*
Subtotal	**4,681**	***33.7%***
Other Shareholders	9,193	*66.3%*
Total Basic Shares Outstanding	**13,874**	***100.0%***

Relative Performance

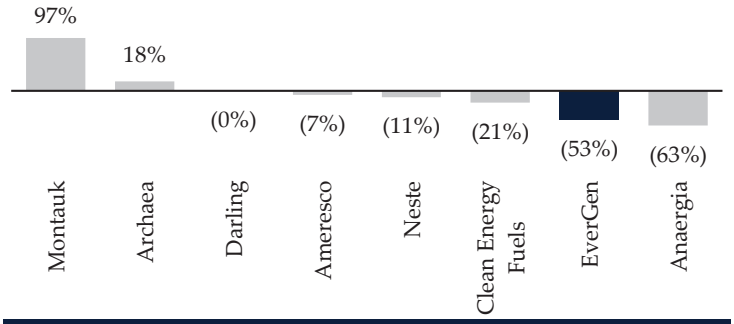
Last 3 Months



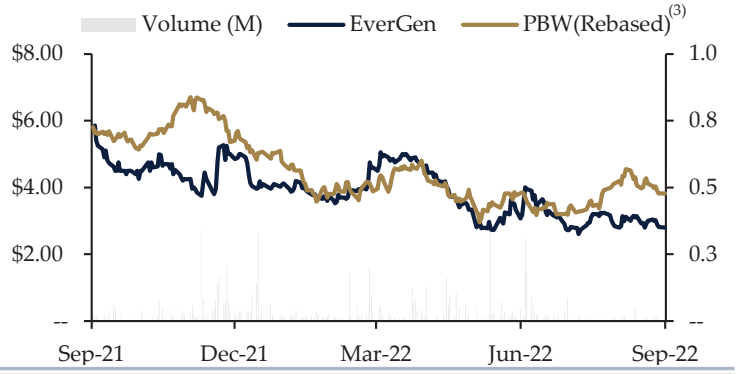
Last 6 Months



Last 12 Months



Share Performance (Last 12 Months)



Source: Company disclosure, Thomson Reuters, Bloomberg, street research, SEDI
Note: Figures in US$M, unless otherwise specified; based on a USD:CAD exchange rate of 1.3154
(1) 52-week low/high and VWAPs are based on trading on the TSX-V only
(2) LTM average daily volume and value include trading on the Canadian and U.S. exchanges
(3) PBW represents the Invesco WilderHill Clean Energy ETF

Senior Leadership Team

A Diverse Management Team with Deep Industry Expertise

Chase Edgelow *Co-Founder and CEO*	▪ 15+ years of private investment and finance experience in the energy and infrastructure sectors. ▪ Founder of Chase Capital and former Associate Director of Macquarie Group. ▪ Holds a B.Eng. from Queen's University, a CFA and a P.Eng. of Alberta Certifications.
Mischa Zajtmann *President & COO*	▪ 15+ years of experience in the natural resources and energy sectors. ▪ Current Partner at Kepis & Pobe and former Associate at Blake, Cassels & Graydon. ▪ Holds a BA and diploma in Accounting from the University of British Columbia and an LLB from the University of Saskatchewan.
Natasha Monk *CFO*	▪ 10+ years of accounting, financial reporting and tax experience. ▪ Current Partner at Affirm LLP. ▪ Holds a BCom from the University of Calgary and is a Chartered Accountant.
Sean Hennessy *VP of Finance*	▪ 15+ years of accounting and financial reporting experience in the energy infrastructure sector. ▪ Current Financial Reporting Consultant at SNH Accounting. ▪ Holds a BCA and BSc from Victoria University and is a Chartered Accountant.
Jamie Betts *VP of Operations*	▪ 35+ years of engineering experience at multinational energy and waste management companies. ▪ Former VP of Engineering at Miller Waste Systems and Project Director at Husky Energy. ▪ Holds a BSc. Engineering from the University of Calgary.
Ford Nicholson *Director*	▪ 25+ years of investing and executive experience with international projects in the industry. ▪ Founder and current Managing Partner at Kepis & Pobe. ▪ Holds a degree in Finance from the British Columbia Institute of Technology.
Mary Hemmingsen *Director*	▪ 30+ years of business development in the energy, infrastructure and cleantech sectors. ▪ Currently Director at InstarAGF Asset Management and the Crossing Group of Companies. ▪ Holds a BBA from Simon Fraser University and is a Chartered Accountant.
Djenane Cameron *Director*	▪ 20+ years of investing experience in real estate, private debt and equities. ▪ Current Director at Peakhill Capital and former Head of M&A at Lynx Equity Investments. ▪ Holds a BA from McGill University and an MBA from Ivey Business School.
Jon Ozturgut *Director*	▪ 35+ years of investing experience in the global energy sector. ▪ Former CCO at InterOil and Executive at Pioneer Natural Resources and CMS Oil and Gas. ▪ Holds a BSc. Engineering from the University of Washington.

Source: Company disclosure

Company Highlights

Company Overview

- Tidewater Renewables Ltd. ("Tidewater" or the "Company") is an energy transition company focused on the production of low carbon intensity fuels.
  - The Company holds existing energy transition assets made up of hydrogen production, renewable fuels storage, and logistics assets.
  - The Company's business model is underpinned by three products: renewable diesel ("RD"), hydrogen, and renewable natural gas ("RNG").
  - On April 4, 2022, Tidewater announced that it had entered into a strategic RNG partnership with Rimrock RNG and a strategic feedstock partnership with Korova Feeders.
    - The partnerships will accelerate the diversification of the Company's low carbon intensity fuels product portfolio and will substantially increase Tidewater's RNG production capabilities.

Investment Highlights

1

Renewables Business with Strong Government Support and Favourable Economics.

- Governments are keen to increase renewable fuel supply incentives, with the Company anticipating ~C$120M in government funding through numerous agreements.
- C$40M of base, contracted run-rate EBITDA at an average term of 10-15 years.
- Significant upside based on co-processing projects, completion of the renewable diesel & hydrogen complex, and the incremental EBITDA from the recently announced Rimrock partnerships.

2

Early Mover Advantage in Canadian Renewable Diesel and Hydrogen.

- Currently building the first Canadian renewable diesel and renewable hydrogen complex; the asset's co-location at Prince George Refinery provides cost advantages and feedstock flexibility.
- Flagship asset expected to contribute ~C$90-C$100M in 2023E run-rate EBITDA; expected to be in service by Q1 2023.
- Ability to build within an existing industrial site with existing permits.

3

Poised for Significant Growth Beyond 2023.

- Tidewater has identified C$2.0B+ of organic and inorganic growth opportunities.
- Growth initiatives have been identified in the Company's renewable diesel business unit (e.g., renewable gasoline projects), its RNG business unit (e.g., future Rimrock RNG facilities) and its hydrogen business unit (e.g., blue hydrogen/blue ammonia with CCS).
- Future long-term feedstock partnerships present another avenue for growth.

Why INFOR Supports Tidewater Renewables

Tidewater Renewables provides an attractive opportunity for investors to participate in the growth of the renewable energy industry, with the added security of significant government support and a proven demand pipeline.

Corporate Snapshot

Capitalization & Key Metrics

Capitalization Table

Company Ticker:	TSX: LCFS
Share Price (06-Sep-22)	C$11.14
Basic Shares Outstanding (M)	34.7
ITM Dilutive Securities (M)	0.3
FD ITM Shares Outstanding (M)	35.0
FD ITM Market Cap (US$M)	**$296.1**
Add: Debt (US$M)	$89.6
Less: Cash (US$M)	($7.7)
Less: Proceeds from ITM Securities (US$M)	--
Net Debt (US$M)	$82.0
Preferred Shares (US$M)	--
Minority Interest (US$M)	$4.9
Enterprise Value (US$M)	**$383.0**

Trading Summary (1)

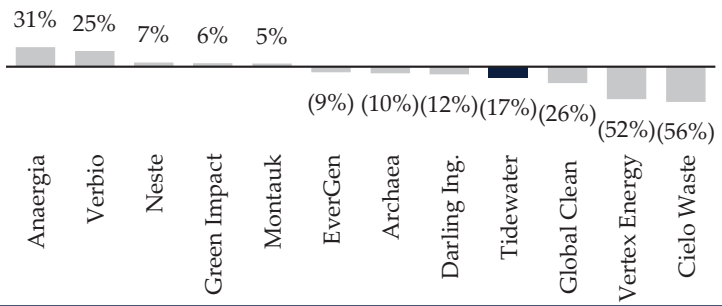
52-Week Low / High Range (C$)	$10.01 / $15.48
20-Day VWAP (C$)	$12.08
30-Day VWAP (C$)	$11.96
LTM Average Daily Volume (000s)	26 (2)
LTM Average Daily Value (C$000s)	$351.4 (2)

Estimated Ownership

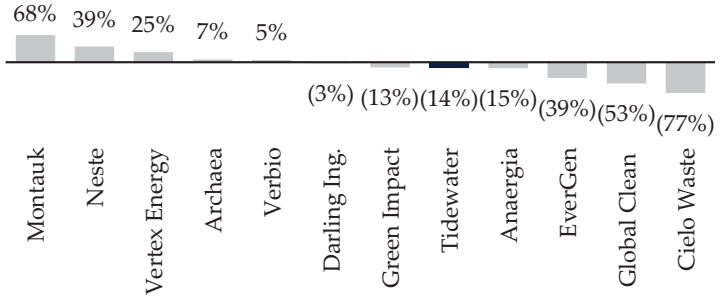
Top Shareholders	(000s)	%
Tidewater Midstream	23,900	*68.9%*
Cohen & Steers	867	*2.5%*
Goldman Sachs	769	*2.2%*
Desjardins	556	*1.6%*
Vestcor	533	*1.5%*
Middlefield Securities	380	*1.1%*
Starlight Capital	275	*0.8%*
Horizons Investment	121	*0.3%*
Driehaus Capital	82	*0.2%*
Joel Macleod (Founder)	80	*0.2%*
Subtotal	**27,564**	***79.4%***
Other Shareholders	7,148	*20.6%*
Total Basic Shares Outstanding	**34,712**	***100.0%***

Relative Performance

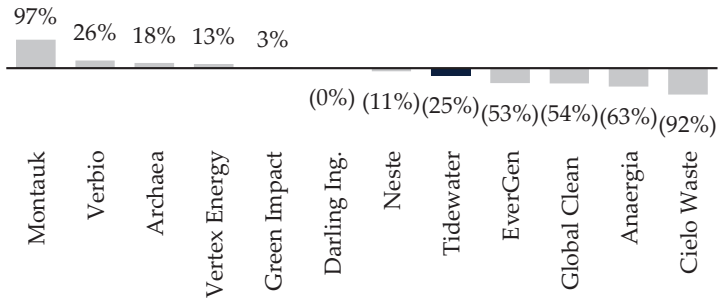
Last 3 Months



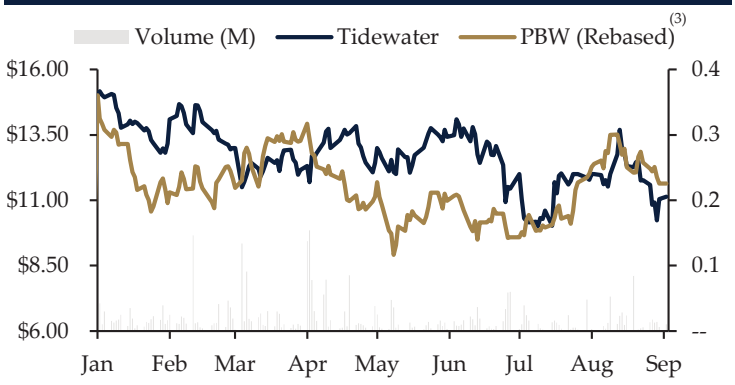
Last 6 Months



Last 12 Months



Share Performance (2022)



Source: Company disclosure, Thomson Reuters, Bloomberg, street research, SEDI
Note: Figures in US$M, unless otherwise specified; based on a USD:CAD exchange rate of 1.3154
(1) 52-week low/high and VWAPs are based on trading on the TSX only
(2) LTM average daily volume and value include trading on the Canadian, U.S., and German exchanges
(3) PBW represents the Invesco WilderHill Clean Energy ETF

Tidewater Renewables Overview

Renewable Diesel Refinery and Associated Renewable Hydrogen

- Renewable Diesel Refinery located at the Prince George Refinery.
  - Produces renewable diesel through renewable feedstocks.
  - Project incorporates an over-built renewable hydrogen plant that will produce 10.0Mcf/d of hydrogen as part of refinery operations.
- B.C. government is expected to support this project with ~C$235M.
  - 40-50% of project funding has been agreed upon with the B.C. government.
  - Funding takes into consideration the cost of the renewable hydrogen plant.
  - Construction on this project began in Q3 2021, and the project has obtained the first four BC LCFS milestone grants from the B.C. government regarding the accomplished work on this project.

Co-Processing Projects

- Co-Processing Projects use existing refinery process units to combine in biogenic feedstocks and create renewable products.
  - **Canola Co-Processing**: The project combines canola oil as feedstock directly into the Unifier at PGR to fabricate renewable diesel and gasoline.
  - **FCC Co-Processing:** Fluid Catalytic Cracking co-processing project at PGR is predicted to result in the production of renewable diesel and gasoline.
  - The two Co-Processing Projects have received material BC government support in the form of BC Low carbon Fuel Standard credits that significantly decrease Tidewater's net capital contribution.
  - The renewable diesel and renewable gasoline created by the projects will have a carbon intensity of ~80-90% less than conventional fuels.

Strategic Renewable Natural Gas and Feedstock Partnership

- On April 4th, 2022, Tidewater joined a strategic renewable natural gas partnership with Rimrock RNG and a strategic feedstock partnership with Korova Feeders.
- RNG Facilities Partnership:
  - Partnership is set to begin development on High River RNG facility, which is presumed to have annual nameplate capacity of >500,000 GJ.
  - Tidewater will manage RNG facilities and retain 51% ownership in the partnership.
- Feedstock Partnership:
  - Tidewater will invest C$30M for 50% interest and account for the investment in the Feedstock partnership utilizing the equity-method.
  - This partnership will grant Tidewater with access to significant tallow rights while simultaneously supplying primary feedstock for future RNG facilities.

Senior Leadership Team

Senior Leadership Team

Joel MacLeod *Founder, Executive Chairman & CEO*	▪ 17+ years of experience in the oil and gas sectors. ▪ Former Director of Highwood Asset Management and Founder and CEO of Predator Midstream. ▪ Holds a BCom from the University of Calgary and is a Chartered Accountant.
Joel Vorra *President & CFO*	▪ 13+ years of accounting and financial experience. ▪ Former Controller of Predator Midstream and Senior Member at Collins Barrow Calgary. ▪ Holds a BCom from the University of Calgary and is a Chartered Accountant.
Krasen Chervenkov *Executive VP*	▪ 13+ years of Corporate and Business Development, Strategy and Capital Markets Experience. ▪ Former VP, Investment Banking of BMO Capital Markets. ▪ Holds a BCom from The University of Calgary and he is a CFA Charterholder.
David Barva *Corporate Secretary*	▪ 20+ years of experience in law. ▪ Former VP of Tidewater Midstream and Associate General Counsel of Trilogy Energy. ▪ Holds a BA from the University of Lethbridge and a JD from the University of Calgary.
Margaret Raymond *Director*	▪ 30+ years of experience in the oil and gas sectors. ▪ Former VP Environment, Safety and Social Responsibility of Petro-Canada. ▪ Holds a BA from Stanford University and an MPH from the University of California.
Brett Gellner *Lead Independent Director*	▪ 11+ years of experience in investment banking with a focus on the energy sector. ▪ Former CDO of TransAlta and Current Director at TransAlta Renewables. ▪ Holds an M.Sc. in Economics from the University of Alberta.
John Adam *Independent Director*	▪ 25+ years of experience in financing, cleantech, energy and venture capital. ▪ Current President and CEO of NGIF Capital and Managing Partner of NGIF Cleantech Ventures. ▪ Holds a BS from the University of Toronto.

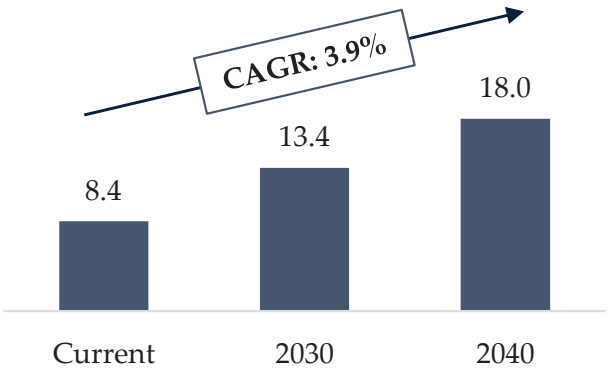
Source: Company disclosure

Renewable Natural Gas Market

Renewable Diesel

- Pose an advantage over biofuel and identical properties.
- In 2020, numerous North American refiners announced renewable diesel plants co-located with existing refineries leveraging existing infrastructure to improve project economics.
- Supportive regulatory environment in U.S., Canada and Europe.
- Global renewable diesel demand is predicted to achieve 18.0B gallons per year in 2040.

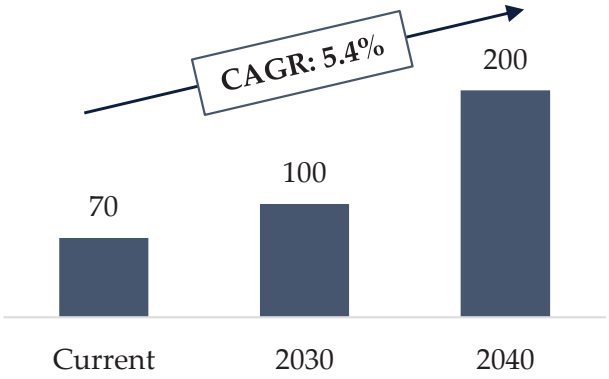
Global RD Demand (Bn Gallons/yr)



Hydrogen

- Involves the processing, storage and/or transportation of hydrogen.
- In December 2020, NRCan released its "Hydrogen Strategy for Canada".
- AB is well-positioned to capitalize on the growing interest in hydrogen development with existing natural gas pipeline infrastructure.
- Global pure hydrogen demand is predicted to achieve 200 million MT per year in 2040.

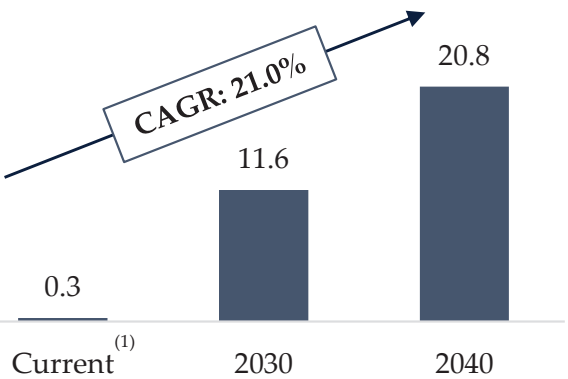
Global Pure Hydrogen Demand (MMT/yr)



Renewable Natural Gas

- Involves projects that capture gas from wastewater treatment, agriculture and/or biomass resources.
- Gas upgrading services, storage, transportation and interconnection into a gas LDC's system.
- Canadian gas utilities have an expectation of 10% of blended RNG into systems by 2030, with certain utilities, such as Fortis, having more aggressive expectations of 15% by 2030.
- Global RNG demand is predicted to grow to 20.8 Bcf/d by 2040.

Global RNG Demand (Bcf/d)



Source: Company disclosure, IEA
Note: MMT/yr represents million metric tonnes per annum; Bcf/d represents billion cubic feet per day
(1) 2018 figure per IEA

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