

# Sustainability Leaders podcast

## Episode 26: Canadian Energy and Innovation: Part 2

Michael Torrance: Welcome to "Sustainability Leaders". I'm Michael Torrance, Chief Sustainability Officer with BMO Financial Group. On this show, we will talk with leading sustainability practitioners from the corporate, investor, academic and NGO communities to explore how this rapidly evolving field of sustainability is impacting global investment, business practices and our world.

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Jonathan Hackett: Hi, I'm Jonathan Hackett, Managing Director and Head of BMO Sustainable Finance Group. Today, I'll be hosting part two of our two-part series on Canadian energy and innovation. In the first part of our series, which was episode 24 of our podcast, we talked about carbon capture, utilization and storage, or CCUS for short, in the Alberta Carbon Trunk Line. In this episode, we're going to explore two case studies of companies that have found ways to innovate in order to remove greenhouse gases from the atmosphere. I'll speak with Steve Oldham, the CEO of Carbon Engineering. Carbon Engineering is a Canadian company that has developed a technology for direct air capture, removing carbon dioxide from the air around us. Then I'll speak with Kevin Jabusch, the President and CEO of Enhance Energy, about how his company uses the Alberta Carbon Trunk Line and CCUS in their plans for the future of this industry. First, here's my conversation with Steve. So, Steve, let's start with an overview. What does Carbon Engineering do, and how does it fit into the carbon capture and utilization and storage value chain?

Steve Oldham: Sure. So firstly, thank you for having me, and I'm going to start by talking about direct air capture, and then I'll come to Carbon Engineering specifically. So direct air capture is a technological solution to pull CO<sub>2</sub> directly out of the atmosphere. So we hear a lot about stopping emissions at source. For example, CO<sub>2</sub> capture from a flue stack, from a chemical plant. We hear a lot about eliminating emissions. An example would be an electric vehicle instead of an internal combustion engine. So what direct air capture does? We clean up afterwards. We pull the CO<sub>2</sub> out of the atmosphere. How does this fit into the overall climate change challenge? So I would draw attention to two things. So firstly, to get to net zero, which is what all the scientists tell us we have to do, we have to stop every single emission on the planet. Every single one, and there are many emissions that are just fundamentally hard to stop. I always use the example of aviation. Decarbonizing aviation is really hard. Electric planes are very hard to do. Enough synthetic fuel to power a traditional plane, very hard to do. So instead of stopping every single emission at source, direct air capture gives you a way to clean up the emission afterwards. And

getting to net zero, one plus minus one is also zero. It's okay to have an emission as long as you're eliminating the CO<sub>2</sub> molecule at the same time by pulling it back down. The second advantage of direct air capture is, and this is not widely understood, of the CO<sub>2</sub> that's causing that climate change problem, 95 percent of it is already in the atmosphere. It went up yesterday and the day before and the day before that. So while it's clearly important to stop making the problem worse, we have to deal with the 95 percent that we already put up there. And that's what, again, carbon removal from the atmosphere can do for you. So Carbon Engineering is one of the leading companies in direct air capture. There are only two or three companies with this technology at the moment. We think our technology has a number of advantages, but most importantly, we think direct air capture is going to be critical to address the challenge of climate change.

Jonathan Hackett: So you've talked about technology a fair amount there. Would you describe yourself as more of a technology company, a sustainability company or the intersection of the two?

Steve Oldham: So, I think today we're a technology company, where we've developed this technology. It's not an easy problem to solve. CO<sub>2</sub> in the atmosphere is 400 parts per million, and that's roughly equivalent to taking a single drop of ink and dropping it into an Olympic-sized swimming pool. So if you imagine trying to pull that drop of ink back out of the swimming pool, that's the challenge you have in capturing CO<sub>2</sub> from regular air. So having that technology developed and fully understood and patented by us, I think that makes us a technology company today. Our business plan is that we license that technology to partners. And the reason we have that business plan is because it allows much faster adoption. The climate change problem is so large, it's so critical, if we were going to build the decanter ourselves, we would just be a bottleneck. So, instead, if we can license it to between 20, 50 companies around the world and they're all building these plants at the same time, we'll solve the climate change problem a lot faster. So today a tech company. In the future, I can see us becoming more of a sustainability company as we offer negative emissions as a service. So anybody who wants to offset their carbon footprint, we can do that for them as a service.

Jonathan Hackett: So, Steve, what is driving the economics of this opportunity? As you talk about those different partners you could be working with in different parts of the world, how do they make carbon capture work for them?

Steve Oldham: So fundamentally, you have to start at the very high level, which is, is there a cost to climate change? And if there is a cost to climate change, there is a value in addressing climate change. Of course, it's a little bit like paying an insurance premium. You pay now to try and stop something happening in the future or be able to deal with it in the future. So, we're beginning to see carbon

policies coming into place around the world. <Indistinct> different sections have different policies that are looking at, how do you price carbon today in a way that incentivizes everybody to eliminate their carbon footprint? So for us, we need those policies. We don't have a business unless there is a recognition that there is value in addressing the carbon problem. So, for example in the United States, which is where we're building our first plant, you have two policies that exist. One is a policy at the tax-credit level, tax credit at the Federal level. That pays about \$50 a ton to remove carbon from the atmosphere and bury it underground. And now, in the United States, as well in California, they have a low-carbon fuel standard. And that's a policy that says, "We're going to put a price on transportation carbon, and it will be implemented through the cost of fuel, and does that direct air capture qualify as a way of getting those credits?" In Canada, of course, we're talking about a carbon tax. We're talking about a Canadian fuel standard. The UK has different standards. So you're starting to see these policies come through. And fundamentally, if our cost of capture is less than the cost of eliminating emissions another way, my electric plane example from earlier on, then we are able to close an economic business place and build a plant, and that's what's happening in Texas. Our plant in Texas is a ... will capture a million tons of CO<sub>2</sub> from the atmosphere every year. That's the equivalent of 40 million trees. So the difference for that plant is trees are temporary. Trees do capture CO<sub>2</sub>. But of course, trees are going to eventually die, whereas we primarily <?> capture the CO<sub>2</sub> and store it back underground again.

Jonathan Hackett: So I think that's a great segue into talking about those partnerships. I've seen that you've announced several recently, and I was wondering if you could speak about the different motivations of the companies you're working with as they think about carbon capture.

Steve Oldham: Yeah, so fundamentally as a company we're looking for two types of partnerships, and we think we can offer opportunity to two different classes of partners. So the first will be those companies that want to license that technology and build one of our plants because they see the business opportunity. They see that carbon pricing is going to rise and that there is potentially money to be made in providing carbon removal. And recently, we just announced an agreement with 1PointFive. That is a new company founded by Occidental and Rusheen. Rusheen is a private equity company in the sustainability space, and they are our US partner for construction <?> plants. So they've went off and built many of our plants, and they see great economic opportunity in that. The second type of partner that we're looking for now, frankly, is customers, so companies that recognize they have a carbon footprint, recognize that regulation is coming in place either from government or that see demands from their shareholders, their employees or their customers to eliminate their carbon footprint. And they're looking at the most cost-efficient, least destructive way to do so, and because our technology can eliminate any emissions from anywhere on the planet of any type, sometimes, often using our technology is a cheaper way for those companies to eliminate their carbon footprint than other solutions. So an example of that is Microsoft, where Microsoft are in the process of ... They made a statement that they would become carbon negative by 2030 by looking at technologies like ours as the way to achieve that mandate. In Canada, we announced an agreement with Shopify. So Shopify today

aren't regulated to eliminate that carbon footprint, but they see huge benefits with their customers and their shareholders as being a very environmentally aware company. So they are supporting us in the development of our technology because they see that it's going to have a major role in climate change.

Jonathan Hackett: So going back to Occidental as an example, in that partnership, I assume they're using their capabilities in drilling and actually doing the sequestration. But do you think that for energy companies, as I would traditionally think of Occidental, that there is an opportunity to use these kinds of carbon-capture technology to really achieve the scale of decarbonization that they would need to?

Steve Oldham: So I think it's a wider opportunity than what you just described. So absolutely they can use direct air capture as a way to eliminate their carbon footprints. But I also see this as a way that they can generate an entire new business segment. Around the globe, governments and companies are saying that, "We get to net zero." So we can capture CO<sub>2</sub>, but you need somewhere to bury it, and you need the expertise in burying it. So who best understands how to deal with putting things underground and dealing with all the technological challenges that come from that? What are the locations where you can put CO<sub>2</sub> back underground? It's exactly the same communities, industries and people that are in the extractive industry today. So for example, here in Canada there is an enormous opportunity, Alberta, Saskatchewan, we have a really good geography for storing CO<sub>2</sub> safely underground. The energy companies are already there. The communities are already there. The workers are already there. So as we look at transitioning our economy and our energy business, becoming a world leader in carbonization and offering that service to the rest of the world, "We can bury your CO<sub>2</sub> here in Canada and eliminate your emissions from wherever you are," I think that's a huge business opportunity.

Jonathan Hackett: So it's interesting as you talk about it as a service. It reminds me very much of power-purchase agreements that are done with renewable power companies as corporations think about their consumption of electricity. Do you think there's an opportunity in the future for direct air capture to use a similar mechanism?

Steve Oldham: Yes, and in fact, we're starting to talk to the financial community and public companies. We've seen an initiative south of the heartland where companies are going to be required to put that climate risk in their disclosures. How much is it going to cost you to get to net zero? Because you're in Canada, which is a jurisdiction that says it's going to get to net zero. You're in the United Kingdom. Jurisdiction wants to know how it's going to get to net zero. So you, as a company, how are you going to get there? So with capabilities like ours where we can eliminate any emission at a fixed price, at a known single price, we can also then have a product to where they put on their books a commitment to buy a certain amount of negative emissions from us to eliminate their carbon footprint, and so very

similar to a power purchase agreement where you enter into a long-term agreement to purchase power. A long-term agreement to buy negative emissions allows any company to completely get to net zero. And the real beauty of that solution is using direct air capture is a nondisruptive disruptive technology. What do I mean by that? It's disruptive because it makes a huge difference in the ability to eliminate the emissions and get to net zero, but it's nondisruptive because you don't have to change the way your business executes today. Again, to use the airline example, are you going to replace every single plane you have with an electric jet that nobody invented yet and go through the entire infrastructure changes associated with airports and fuel supply, or do you just buy a service from us to clean up the CO<sub>2</sub> afterwards? So it's truly an ubiquitous solution and one that applies to any industry.

Jonathan Hackett: Fantastic Steve. I really appreciate the conversation today. Next, you'll hear my conversation with Kevin Jabusch of Enhance Energy. Enhance is partnered with Wolf Midstream on the Alberta Carbon Trunk Line, and we had Jeff Pearson of Wolf Midstream on the first part of the series to give us an overview of this project. Here is my conversation with Kevin. So, Kevin, who is Enhance Energy, and what does it do?

Kevin Jabusch: Well, at the highest level, Jonathan, Enhance is a carbon mitigation company. We focus on CO<sub>2</sub> sequestration. We take captured CO<sub>2</sub>, and we return it into our geology. We essentially put it back where it came from, sequester it forever, and by doing that, we eliminate tons of greenhouse gases from being released into the atmosphere. And our vision, really, is to play a key role in enabling the world's transition to a zero-carbon economy, and our mission and our strategy is to be the world leader in carbon capture and sequestration, which will allow us to achieve those goals.

Jonathan Hackett: And so how do you make money today?

Kevin Jabusch: Well, today we have two main revenue sources. We generate carbon emissions offset credits, and we also generate revenue from the sale of oil that we recover from utilizing the CO<sub>2</sub> for enhanced oil recovery.

Jonathan Hackett: And can you run me through those offset credits? Just in a simple term, how do those work?

Kevin Jabusch: Sure. So in Alberta today, large industrial companies who emit CO<sub>2</sub>, pay a tax on emissions above a regulated baseline amount. So these large emitters have a choice. They can either

reduce their emissions through technology or they can pay the tax or they can offset this tax by purchasing an emissions offset from a voluntary offset generator, and that's what we are. So these offsets are regulated by the province, and they can only be generated in an approved operation, which includes activities that permanently sequester CO<sub>2</sub> into our geology. So our operations are approved to generate emissions offset credits, and we sell these credits to large emitters.

Jonathan Hackett: And is that your long-term approach for revenue?

Kevin Jabusch: Well, historically the price in carbon hasn't been at a level that'll justify the cost of capture and sequestration all by itself, so we look for ways to utilize CO<sub>2</sub> to generate additional income that would pay for some of these costs. So early on, we identified CO<sub>2</sub> enhanced oil recovery as a business that can provide an incremental source of cash flow from additional oil recovery, as it's a byproduct of the sequestration. So today, CO<sub>2</sub> enhanced oil recovery provides a financial bridge that supports our efforts to build up critical infrastructure. But at the highest level and in the purest sense, we are a carbon capture and storage company or a carbon mitigation company, but even the oil that we do produce can be net carbon neutral. Really, it is green oil. We expect to put more GHGs into the ground, more CO<sub>2</sub> into the ground than that barrel of oil will emit as it's recovered and processed and transported, refined and consumed. But our future revenue model is based on transitioning over time to pure carbon capture and storage as the price on carbon we expect to continue to increase. So when that happens, a proportion of our revenue from oil will diminish relative to our total revenue stream.

Jonathan Hackett: And how do you see that price on carbon changing over time?

Kevin Jabusch: Well today, the price on carbon in Alberta is based on our provincial large emitters program, referred to as the TIER Program, T-I-E-R, which stands for Technology Innovation and Emissions Reduction regulations. In the future, we expect carbon pricing to continue to increase from its current level of about \$30 per ton. We expect that to go \$50 a ton by 2023 and likely increase past that as the years go by. We also expect other programs to evolve that would provide additional financial incentives. One of these programs is something called the Federal Clean Fuel Standard. This is a program that's being advanced by the federal government that is modeled after similar programs in California and also in the province of BC, and these programs put a limit on the carbon intensity of the fuels consumed which results in the fuel providers. In the case of liquid fossil fuels, it's refiners. These fuel providers have to reduce the carbon intensity of their fuel. The options these refiners would have are to source a lower carbon feedstock, such as a biofuel, say, ethanol instead of a fossil fuel, or they could reduce the energy intensity of their operations, or they can purchase clean fuel credits for people who are approved to generate them, and these credits can be generated by a number of methods in carbon

capture and storage or sequestering CO<sub>2</sub> into our geology using an approved method to generate a credit.

Jonathan Hackett: So this is something that sounds like there's a lot of future potentiality as these prices go up. But how long has Enhance been around, and what progress have you made today?

Kevin Jabusch: Well, Enhance has been around for a while. We were formed over 10 years ago when our founders saw the importance that reducing GHGs would play in our future. And since then, we've been working hard to establish the knowledge, experience and the critical assets to create a commercial carbon sequestration business. We recently reached commercial operation of something called the Alberta Carbon Trunk Line in June of this year, so that project is the largest CO<sub>2</sub>-capacity pipeline in the world that's exclusively dedicated to transport anthropogenic, or man-made, CO<sub>2</sub>. It was a large project. It was over a billion dollars of capital. It involved two levels of government, about three industry partners who either provided CO<sub>2</sub> or capital or services to Enhance. So in the early years, not a lot of people were paying attention to what we were doing. But today, we feel we have a 10-year head start on a business that's important to the world and is at the forefront of many agendas, either personal, corporate or political. And over that period of time, we've worked with regulators to help shape policy that's fair and workable and delivers real results that certainly the public is looking for. And today, we're an operating entity that has delivered real results and can provide a CCS solution. We use proven technology and an established business model, but what's really easy to overlook is the experience we've built over time, over the last decade, in the areas of engineering, geological understanding, construction expertise, operations and the regulatory environment. We really think there's few organizations in the world that have the experience and expertise that we have related to carbon capture, utilization and storage.

Jonathan Hackett: So you mentioned those industry partners. Where do you source your CO<sub>2</sub> from today, and what's the ultimate scale to which you think could grow Enhance?

Kevin Jabusch: Today, our CO<sub>2</sub> comes from an oil refinery and a fertilizer facility, and it's delivered to us through the Alberta Carbon Trunk Line. We currently sequester our CO<sub>2</sub> in a field called Clyde, which is located in Central Alberta, and we put about 4,000 tons of CO<sub>2</sub> into our geology every day. That's equivalent to taking about 350,000 cars off the road. But our growth objectives and our opportunity are much larger as we see it. So if you look at the Alberta Carbon Trunk Line, it originates in the Alberta industrial heartland, which is industrial area northeast of Edmonton where there are many, many large emitters who are in carbon-intensive businesses. So these entities range from the fertilizer and refiners I mentioned to petrochemical manufacturers, hydrogen producers and power producers, and the Alberta

Carbon Trunk Line was designed with excess capacity. It's currently only operating at about 15 percent of its capacity. It's always been our expectation that the next phase of capture would be utilize this excess capacity. So we have the opportunity to scale up our business substantially by securing additional CO<sub>2</sub> supply, and then we'll utilize the Alberta Carbon Trunk Line capacity to transport the CO<sub>2</sub> for additional opportunities along the route for other CO<sub>2</sub>, EOR or pure carbon capture and storage. So in that light, we're in discussions with a number of large emitters in the heartland and elsewhere. All these entities are within reach of the Alberta Carbon Trunk Line with the intent that we'd secure additional CO<sub>2</sub> supplies.

Jonathan Hackett: So we talk a lot about carbon capture. Do you think that's at the point where the technology has proven it can support a commercial business?

Kevin Jabusch: Well, the cost of carbon capture using proven large-scale aiming technology continues to decrease as entities who've completed large projects in Canada and the US expect their cost to come down, some significantly. Some have quoted numbers of 30 to 50 percent cost reduction for the next of a kind project. And as these capture costs come down and carbon pricing continues to escalate, we expect there to be a new demand for CO<sub>2</sub> sequestration, and we have always viewed the additional CO<sub>2</sub> EOR project demand related to the ACTL is only the first step. And ultimately, the need is develop additional EOR demand, as well as alternatives for pure carbon capture and storage. So we view there to be a need to develop large, gigaton-scale capacity for carbon capture and storage in Alberta that's accessible to the Trunk Line, and we're well on our way to doing this. We expect this to be a significant part of our growth in the medium to longer-term.

Jonathan Hackett: Following up on the concept of a gigaton-scale capacity, a recent report from the Institute for Sustainable Finance put the capital needed for Canada to reach our 2030 target of approximately 0.8 gigatons between \$90 billion and \$166 billion. How do you think about the capital Enhance would need to meet that demand?

Kevin Jabusch: So our capital needs over the next couple years are between \$200 and \$250 million, and that will allow us to focus on continuing to expand and develop our Central Alberta EOR reservoirs. But we see a significant potential in the next 5 to 10 years to substantially scale up the company to respond to new carbon policy and increased carbon pricing which will require additional capital to allow us to continue the transition to pure carbon capture and storage. And in that light, the capital will be used to acquire and develop additional fields, additional reservoirs, and develop a large-scale <Indistinct> storage capacity and then construct the infrastructure to extend and complement the ACTL. So this growth opportunity and the need for capital is also mirrored upstream, in the upstream carbon story,

because the large emitters will need to invest capital in carbon capture and in their processing facilities to supply the CO<sub>2</sub>.

Jonathan Hackett: So you've mentioned your work with regulators over time. What role has the government of Alberta or the federal government, played throughout this process?

Kevin Jabusch: So both the Alberta government and the federal government have been partners in the Alberta Carbon Trunk Line with respect to capital grant contributions, and they first signed on with us in 2010. And over the last 10 years, carbon pricing in Alberta has also increased from essentially zero to the current level of \$30 a ton, and we've been deeply engaged with the province to coordinate appropriate regulation to ensure that the CO<sub>2</sub> mitigation resulting from our operations is appropriately quantified and verified for the purpose of generating emissions offsets. And there are other new programs that will be able to piggyback on the work we've done within Alberta, such as the new Federal Clean Fuel Standards, as well as other programs, such as the BC Low Carbon Fuel Standards, and also California has a Low Carbon Fuel Standard as well. So we'll continue to engage with provincial, federal and state regulators to ensure that there's appropriate recognition for the value of our environmental products.

Jonathan Hackett: And what about challenges and headwinds? How do you think about those, and how do you think about competition in your industry?

Kevin Jabusch: Well, our revenue model is based on generating value from the offsetting of carbon emissions, so based on the trends over the last 10 years and trends that recently seem to be accelerating, we don't see this as a short-term need, nor do we see a significant risk of a declining price for carbon. Corporate and government carbon reduction goals seem to be becoming more aggressive, both locally and globally, and almost all scientists and regulators now accept that carbon sequestration is going to serve as a key to help the world achieve its carbon neutrality goals. So from a purely competitive perspective, we think we're in a very good position. In fact, we may well be the only company in the world to sequester CO<sub>2</sub> and produce energy that has a net negative emission under scope one, two and scope three, but more generally, we are currently in operation. We don't have R and D capital in front of us. It's all been spent. Our business model has been proven, and today we're commercially viable. We have in-house expertise in all of the areas of our business, and we're uniquely positioned to develop optionality for sequestration using both CCUS, which is enhanced oil recovery, and pure carbon capture and storage. In addition, we operate one of the very few CCUS projects worldwide and the only one active in Alberta today. We have access to the Alberta Carbon Trunk Line, which is strategically placed to capture CO<sub>2</sub> from the Alberta industrial heartland. So all of those things

that took us the better part of 10 years to put in place are very difficult, costly and time-intensive to replicate.

Jonathan Hackett: Thank you for your time today, Kevin. I'm really looking forward to seeing what Enhance does in the future.

Kevin Jabusch: Thanks for having me, John.

Michael Torrance: Thanks for listening to "Sustainability Leaders". This podcast is presented by BMO Financial Group. To access all the resources we discussed in today's episode and to see our other podcasts, visit us at [bmo.com/sustainabilityleaders](https://bmo.com/sustainabilityleaders). You can listen and subscribe free to our show on Apple Podcast or your favorite podcast provider, and we'll greatly appreciate a rating and review and any feedback that you might have. Our show and resources are produced with support from BMO's marketing team and Puddle Creative. Until next time, I'm Michael Torrance. Have a great week.

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