WEBVTT

00:00:10.376 --> 00:00:20.916
<v SPEAKER_2>Hello, everyone, and welcome to Energy Security Cubed, one of the world's foremost energy security podcasts presented by the CGAI, or Canadian Global Affairs Institute.

00:00:20.916 --> 00:00:24.596
<v SPEAKER_2>I'm Kelly Ogle, Managing Director here at CGAI.

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<v SPEAKER_3>And I'm Joe Calnan, Vice President of Energy and Calgary Operations at the Canadian Global Affairs Institute.

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<v SPEAKER_2>For today's podcast, we're featuring a discussion with Graeme Harrison, Managing Partner and Co-Founder of Augur Energy AI Fund, where we talked about the changes in Canadian energy policy, which could help attract important investments into AI.

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<v SPEAKER_2>I'm certain that folks that listen to this podcast are really going to be informed and highly entertained.

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<v SPEAKER_2>Graeme's an extremely brilliant guy who's going to take us to places where Joe will attest that we've never been in our thinking and in where the whole energy build out is going to happen.

00:01:07.676 --> 00:01:13.436
<v SPEAKER_2>However, before we get into discussions with Graeme, let's get into some of the recent news updates regarding global energy security.

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<v SPEAKER_2>Take it away, Joey.

00:01:15.136 --> 00:01:32.616
<v SPEAKER_3>Well, I'd like to start on a long diatribe about an op-ed which was released in the Hill Times this week from Stephen Wilton, professor of cardiology at University of Calgary and co-chair of the Alberta Committee of the Canadian Association of Physicians for the Environment.

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<v SPEAKER_3>In this op-ed, and this is an op-ed for the Hill Times, Dr.

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<v SPEAKER_3>Wilton expresses his disappointment that the federal

government has not done more to review an expansion of the Vista coal mine just east of Hinton, Alberta.

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<v SPEAKER_3>Now, this is a bit of an old story.

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<v SPEAKER_3>The Impact Assessment Agency made a decision about this mine last December, and the regulatory power is now pretty much completely in the power of the province of Alberta as well as still some federal regulatory authorities, but it's out of the hands of the Impact Assessment Agency.

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<v SPEAKER_3>However, I think this story and this op-ed illustrate some of the disorderly politics around the Federal Impact Assessment Process, which has been happening over the past few years.

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<v SPEAKER_3>So, Vista, owned by Coal Spur Mines Limited, is the largest coal mine in Canada and has a current production of more than 16,000 tons of coal per day, this equivalent to around 6 million tons per year.

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<v SPEAKER_3>On an energy basis, the Vista mine currently produces around 120 million MMBTUs of energy annually.

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<v SPEAKER_3>For reference, the Sonovus Christina Lake Oil Sands Facility produced around 500 million MMBTU of energy last year.

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<v SPEAKER_3>With the expansion, the Vista mine would be within spitting distance of some of the smaller oil sands facilities as one of Canada's largest energy production facilities in general.

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<v SPEAKER_3>So it's a fairly large project and big economic force around Hinton.

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<v SPEAKER_3>As justification for the article, Wilton points out the local health impacts of coal mining, possible impacts on the McLeod River and the McPherson Creek, and the climate impacts of coal when it is eventually burned to produce energy.

00:03:18.696 --> 00:03:19.796
<v SPEAKER_3>Specifically, Dr.

00:03:19.796 --> 00:03:28.736
<v SPEAKER_3>Wilton argues that the mine should have been designated as subject to federal review by the Impact Assessment Agency of Canada.

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<v SPEAKER_3>Now, we should clear up that there's two ways that a project can end up on the designated projects list under the IAAC.

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<v SPEAKER_3>Number one is that Impact Assessment Act regulations could determine that a project will have an adverse impact on the environment.

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<v SPEAKER_3>So there are set regulations that provide the limits as to what project would be automatically considered to be designated on this list.

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<v SPEAKER_3>The other option is that the environment minister can decide, so environment minister right now, it's Julie DeBruycen, but previously Jonathan Wilkinson, Stephen Gui-Bo, but the environment minister can decide to place the project on the list, notwithstanding written regulations.

00:04:18.796 --> 00:04:27.096
<v SPEAKER_3>So this is a decision by the federal government, order and council, by the minister in charge of this, to put a project on the list.

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<v SPEAKER_3>So in December 2019, then Minister of Environment and Climate Change, Jonathan Wilkinson, decided not to designate the coal mine expansion, because, quote, it will be covered under the provincial environmental assessment process, and the issues of the federal jurisdiction will be covered through other regulatory processes unquote.

00:04:48.796 --> 00:04:52.096
<v SPEAKER_3>So this is the decision as of December 2019.

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<v SPEAKER_3>However, the next year in July 2020, the minister reversed his decision, deciding to designate the project for IAAC review.

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<v SPEAKER_3>However, this re-designation may have been too hasty.

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<v SPEAKER_3>The proponent, alongside the Irmineskin Cree Nation, challenged this re-designation in federal court on the basis that the federal government had not consulted Irmineskin.

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<v SPEAKER_3>The federal designation was therefore thrown out, but this wasn't the end of it.

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<v SPEAKER_3>In September 2021, Wilkinson again attempted to put the project on the list with an expanded argument about impacts on the rainbow trout in the rivers and creek, and coal impacts on climate change, leaning heavily on these areas of federal jurisdiction, so jurisdiction over fisheries and air pollution.

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<v SPEAKER_3>This attempted re-designation was also challenged by the proponent, Irmineskin Cree Nation, as well as Whitefish Lake First Nation, number 128.

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<v SPEAKER_3>Both of these challenges by the proponent and the two nations were working their way through the courts when the Supreme Court of Canada found that much of the Impact Assessment Act was unconstitutional.

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<v SPEAKER_3>Importantly, the court found that the environment minister's powers of designation are ultra-virus.

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<v SPEAKER_2>Let's be clear.

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<v SPEAKER_2>The reason why the minister felt the need to step in here is because the Impact Assessment Act, as written, would exclude the expansion unless it was specifically included.

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<v SPEAKER_2>Subsection 19A of the Physical Activities Regulations state clearly that automatic designation only occurs, and I quote, in the case of an existing coal mine, if the expansion would result in an increase in the area of mining operations of 50% or more, and the total coal production capacity would be 5,000 tons per day or more after the expansion, end quote.

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<v SPEAKER_2>Since this mine expansion is less than 50% of the current area, it is not automatically designated.

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<v SPEAKER_2>Further, following the Supreme Court ruling on the constitutionality of project designation in July 2024, the Minister of the Environment delegated this power to the president of the IAAC, Terry Hubbard.

00:07:06.776 --> 00:07:08.116
<v SPEAKER_2>In December last year, Mr.

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<v SPEAKER_2>Hubbard decided not to designate the project, finding that the proponent was actively consulting with indigenous groups and that other legislation regulations, including provincial powers, would address any adverse effects and impacts.

00:07:22.476 --> 00:07:23.556
<v SPEAKER_2>So to engage with Dr.

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<v SPEAKER_2>Wilton's op-ed, I think we take issue with his claim that this mine was excluded from designation on a technicality.

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<v SPEAKER_2>The federal government tried really hard to get this project put on that list, after the Supreme Court of Canada ruling that this designation process is unconstitutional.

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<v SPEAKER_2>I suspect it would have been extremely risky for Mr.

00:07:44.536 --> 00:07:46.936
<v SPEAKER_2>Hubbard to designate the project.

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<v SPEAKER_2>But what this really illustrates is that the way the impact assessment process was weaponized against certain projects.

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<v SPEAKER_2>The history of this project shows a government and a set of angles which are attempting to use the IAA as a cudgel to kill specific projects.

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<v SPEAKER_2>In my view, it is an indictment of Canadian governance that this happened.

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<v SPEAKER_2>It is good that the Supreme Court of Canada took this power out of the hands of political actors.

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<v SPEAKER_2>With the changes to the IA legislation and jurisdiction, I sense that Canada's regulatory landscape has improved massively.

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<v SPEAKER_2>You know, Joe, they're going to burn coal globally forever.

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<v SPEAKER_2>More coal was burned in 2024 than ever in history.

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<v SPEAKER_2>Do you know if this is metallurgical or?

00:08:32.496 --> 00:08:33.856
<v SPEAKER_3>Oh, it's thermal coal.

00:08:33.856 --> 00:08:34.836
<v SPEAKER_3>We should note that.

00:08:34.836 --> 00:08:36.716
<v SPEAKER_2>So yeah, it is important to note that.

00:08:36.716 --> 00:08:37.156
<v SPEAKER_3>Yeah.

00:08:37.156 --> 00:08:46.996
<v SPEAKER_3>And I don't think that like I don't want to, you know, make necessarily make broad statements about the how good or bad it is that the world is burning coal.

00:08:46.996 --> 00:08:48.136
<v SPEAKER_3>The world is burning coal.

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<v SPEAKER_3>I think that it's a major challenge for, you know, local and global climate change and all that sort of stuff.

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<v SPEAKER_3>It's also there's also huge benefits for local energy security for a lot of these countries that burn coal.

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<v SPEAKER_3>So we should be frank about that.

00:09:02.576 --> 00:09:08.736
<v SPEAKER_3>It's a commodity that that still offers very good prices on the world market.

00:09:08.736 --> 00:09:42.576
<v SPEAKER_3>But I think more what I wanted to talk about here is how the process like what should be, you know, a very straightforward regulatory process that engages with projects in an honest way was kind of abused in this circumstance by a government that obviously just didn't want to allow this project to move forward, even though it had already said that it was outside of the bounds of what the federal government would has powers over.

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<v SPEAKER_3>So it's like the decision in 2019 is the exact decision that we've eventually circled back to now.

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<v SPEAKER_3>Right.

00:09:49.456 --> 00:09:53.356
<v SPEAKER_3>And it's taken six years to just get to back where we started.

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<v SPEAKER_3>Like this is not that that's not the way to manage major projects.

00:09:57.376 --> 00:10:02.416
<v SPEAKER_3>And I'm very glad that we're moving in a different direction now under a different government.

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<v SPEAKER_3>And let's just say that it's it was really not a very good situation for a long time there.

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<v SPEAKER_2>Great story, Joe.

00:10:10.876 --> 00:10:12.596
<v SPEAKER_3>Yeah, for sure, Kelly.

00:10:12.596 --> 00:10:25.076
<v SPEAKER_3>To cover one other quick story, I'd like to engage with reports from Reuters that United States President Donald Trump is set to preside over the announcement of 70 billion dollars in AI and energy investments in Pennsylvania.

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<v SPEAKER_3>And I don't think that much of this money is actually coming from the federal government.

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<v SPEAKER_3>I think that Trump is just trying to act as maybe an

enabler here.

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<v SPEAKER_3>I think most of this is going to be private investment.

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<v SPEAKER_3>This announcement is planned as part of the inaugural Pennsylvania Energy and Innovation Summit at Carnegie Mellon University, bringing together leaders of Metta, Microsoft, Alphabet and ExxonMobil.

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<v SPEAKER_3>I'm sure other energy leaders will also be there, but these are the ones that at least are public.

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<v SPEAKER_3>The location for the summit is especially interesting.

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<v SPEAKER_3>Pennsylvania is rich in energy, the second largest natural gas producing state in the US coastline, Texas.

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<v SPEAKER_3>This is mainly owing to the massive Marcellus Shale Formation, which holds 214 trillion cubic feet of natural gas, according to the US.

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<v SPEAKER_3>Geological Survey.

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<v SPEAKER_2>Yeah, it's always important to note, Joe, that the politicians in the US., there's always things going on in Pennsylvania because it's such a critical state in any election whether it's in the middle of like next year or presidential election.

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<v SPEAKER_3>Can't deny that.

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<v SPEAKER_3>Just go look at the walk back of Kamala Harris' pledge to ban fracking.

00:11:37.096 --> 00:11:39.416
<v SPEAKER_2>She gave away Pennsylvania with that statement.

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<v SPEAKER_2>As a result, Pennsylvania is a major electricity exporter to other states in the PJM, demonstrating the surplus electricity production possible in the state.

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<v SPEAKER_2>We should note, however, that while the Marcellus is impressive, it is dwarfed by the Montney Formation in Alberta and British Columbia's 449 trillion cubic feet of recoverable gas.

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<v SPEAKER_2>Let's just say that we're sitting on such an enormous ocean of energy that it boggles the mind.

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<v SPEAKER_2>For scale, we're talking about 465 billion MMBTUs.

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<v SPEAKER_2>Remember back to when Joe was talking about coal, it was in the hundreds of millions of million BTUs.

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<v SPEAKER_2>This is exponentially larger than that in the Montney.

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<v SPEAKER_2>That's enough to meet all of Canada's all energy for 37 years.

00:12:25.356 --> 00:12:30.716
<v SPEAKER_3>Yeah, and to talk about this more extensively, we'll just switch over right over to our conversation.

00:12:30.716 --> 00:12:33.936
<v SPEAKER_2>This podcast we're going to have with Graeme.

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<v SPEAKER_2>It's a hand in glove for this conversation about oceans of gas and AI.

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<v SPEAKER_2>So folks, please stay tuned.

00:12:43.836 --> 00:12:47.516
<v SPEAKER_1>Hi, I'm Dave Perry, the President and CEO of The Canadian Global Affairs Institute.

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<v SPEAKER_1>I hope you're enjoying Energy Security Cubed, Canada's leading podcast on energy issues.

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<v SPEAKER_1>If you're listening and you'd like to help us keep bringing informed discussion of Canadian energy issues to key government decision makers, thought leaders and the business

community, then consider sponsoring the podcast.

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<v SPEAKER_1>Reach out to us at contact at cgai.ca for options and pricing.

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<v SPEAKER_1>That's contact at cgai.ca.

00:13:10.776 --> 00:13:26.376
<v SPEAKER_2>For today's interview recorded July 14, 2025, we discuss how the energy industry is shaping and being shaped by the expansion of artificial intelligence and data centers with consequences for Canadian and global energy security.

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<v SPEAKER_3>With us to discuss this is Graeme Harrison.

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<v SPEAKER_3>Graeme is the managing partner and founder of Augur VC and he has a very interesting career before he founded this as well, which I think we'll get into in just a moment here.

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<v SPEAKER_2>Yeah, delighted to have you on the podcast, Graeme.

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<v SPEAKER_2>Graeme and I met first through my association with as the Chair of Emissions Reduction Alberta and Graeme's been in the venture capital space in and around clean tech and lots of other things too.

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<v SPEAKER_2>But let's start off, Graeme, with try to get an understanding.

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<v SPEAKER_2>Can you talk a bit about your firm, Augur Venture Capital?

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<v SPEAKER_4>Yeah, happy to.

00:14:02.676 --> 00:14:08.336
<v SPEAKER_4>So Augur is a capital platform based here in Calgary and out of San Francisco.

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<v SPEAKER_4>We back companies that sit at the intersection or the seam between energy, on the one hand, you know, electrons, watts, gigajoules, et cetera, and bits, on the other hand.

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<v SPEAKER_4>So, you know, the apparatus of computer chips that, you know, can create value there.

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<v SPEAKER_4>We call that the Watt-Bit Value Chain.

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<v SPEAKER_4>So Augur invests in the Watt-Bit Value Chain.

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<v SPEAKER_4>There's two pieces to that.

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<v SPEAKER_4>Part one, AI for energy.

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<v SPEAKER_4>So pretty easy to understand.

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<v SPEAKER_4>This is software and other systems that allow grids, pipelines, gas turbines, or other things like that to run themselves, to be more efficient than a human could operate them.

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<v SPEAKER_4>The other side of it is energy for AI.

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<v SPEAKER_4>So this is companies, businesses, that provide systems that supply energy for the chips that run AI, which are intensely energy hungry, and other picks and shovels in that value chain.

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<v SPEAKER_4>So we launched Augur after watching not just most Canadian VCs, I'd say, but most global VC dollars retreat.

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<v SPEAKER_4>You know, ever since the clean tech bust retreat from the energy space and flow instead into generic horizontal software as a service plays.

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<v SPEAKER_4>Same time you look at Canada, you look at Alberta, you look at Calgary as ground zero.

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<v SPEAKER_4>The country, province and the cities real unfair advantage, which is what Venture seeks to back is world class energy engineering and, you know, energy systems know how the oil sands, you

know, being a prime example of that.

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<v SPEAKER_4>So that big retreat of capital out of the space, you know, while on the other hand, our view that it's really not just a strategic space in a space that deserves investment, but also going to be incredibly important in the context of this watt-bit value chain.

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<v SPEAKER_4>Our bet is on that specific flywheel.

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<v SPEAKER_4>And we think that, you know, we're looking to take up as much territory in that space as possible because we've seen such a historic retreat from it.

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<v SPEAKER_4>Now of course, the world has changed.

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<v SPEAKER_4>Everybody's become aware of the longer term value of energy.

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<v SPEAKER_4>And so we're seeing a tremendous amount of interest coming back to the intersection of energy and AI infrastructure.

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<v SPEAKER_4>And I think that's what we're here to talk about today.

00:16:38.256 --> 00:16:38.916
<v SPEAKER_3>Yeah, yeah.

00:16:38.916 --> 00:16:42.016
<v SPEAKER_3>So I think we should just lay out some of the challenges here.

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<v SPEAKER_3>Of course, everybody's aware of, I think at this point, of the huge energy requirements of AI data centers, you know, the training of AI, but then also the servers and all that sort of stuff.

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<v SPEAKER_3>But I think we really need to get some understanding, and you're a great person to provide this, of the real infrastructure of these AI data centers and how this contributes to the energy demand.

00:17:04.836 --> 00:17:08.876
<v SPEAKER_3>So it's like, why are they, why do they require so much energy?

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<v SPEAKER_3>So what are the components of a data center?

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<v SPEAKER_3>You know, the huge ones that we're talking about now, and what parts of this require so much electricity specifically, but maybe energy more broadly?

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<v SPEAKER_3>Because I think that there's some distinctions there.

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<v SPEAKER_4>Yeah, great question.

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<v SPEAKER_4>So I'll speak to things that are common across all types of data centers first, and then I'll speak to specifically AI infrastructure as a relatively new entrant into the data center asset category.

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<v SPEAKER_4>So data centers are not, it's not a one-size-fits-all asset class.

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<v SPEAKER_4>There's all sorts of different varieties of what makes up a data center, from, you know, things you hear about, like the big hyperscaler, you know, 500 megawatt massive warehouses full of all sorts of different types of computers, all the way down to small co-location centers right here in downtown Calgary, in the old AGT building in the basement there.

00:18:03.516 --> 00:18:05.676
<v SPEAKER_4>There's a fiber co-location center.

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<v SPEAKER_4>Of course, the telephone company built that back in the day, and that's a micro data center right downtown here.

00:18:10.676 --> 00:18:18.676
<v SPEAKER_4>There's all sorts of different configurations, and the reason you build different types of data centers is to support different types of applications.

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<v SPEAKER_4>So all data centers have really four common pieces that, you know, types of components to your question.

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<v SPEAKER_4>There's the compute plane, which is the most important part, which is the stuff that does the work.

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<v SPEAKER_4>That's the big thing that differs across the asset classes.

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<v SPEAKER_4>There's the cooling loop, which similarly differs across asset classes depending on how much heat the computers are giving off.

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<v SPEAKER_4>There's the networking and storage equipment, which, you know, hard drives and Ethernet cables or, you know, various types of next generation networking equipment to connect everything up and to hold the results in the incoming data.

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<v SPEAKER_4>All of that is, you know, relatively similar.

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<v SPEAKER_4>I mean, you're going to see higher end stuff in the AI and for space, but it's more or less the same across data center asset classes.

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<v SPEAKER_4>And then finally, there's power conditioning equipment.

00:19:13.156 --> 00:19:16.096
<v SPEAKER_4>So this is the unsung hero of the space.

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<v SPEAKER_4>It's like batteries and un-interruptible power supplies and, you know, other stuff that buffers the sometimes not ideal electricity that the power grid or, you know, the off-grid energy source is supplying to the infrastructure so that it doesn't fry anything.

00:19:34.656 --> 00:19:36.976
<v SPEAKER_4>Those are the four main pieces.

00:19:36.976 --> 00:19:51.276
<v SPEAKER_4>The big difference between what I'll call traditional data centers that have been built for, you know, the last 25 years or so to support the cloud rollout and even before that to support mainframe processing.

00:19:52.096 --> 00:19:57.456
<v SPEAKER_4>All of those had a compute plane that focused on traditional computer parts.

00:19:57.456 --> 00:20:14.276
<v SPEAKER_4>So like the central processing unit, the RAM, the things that enabled you to host generic, you know, not compute intensive SaaS software as a service applications somewhere else, not on your home computer.

00:20:14.276 --> 00:20:16.936
<v SPEAKER_4>And that's really what the traditional data center built out.

00:20:16.936 --> 00:20:20.876
<v SPEAKER_4>And so you saw power density that was relatively low.

00:20:21.636 --> 00:20:23.536
<v SPEAKER_4>As a result of that.

00:20:23.536 --> 00:20:29.876
<v SPEAKER_4>And when I say relatively low, you can think of a rack, a rack being like the unit of organization side of a data center.

00:20:29.876 --> 00:20:37.956
<v SPEAKER_4>You know, I mean, a CPU based rack from Dell or something like that is going to use maybe 10, 15 kilowatts.

00:20:39.316 --> 00:20:42.896
<v SPEAKER_4>The total burden is split largely.

00:20:42.896 --> 00:20:46.196
<v SPEAKER_4>Cooling is upward of 50% in that case.

00:20:46.196 --> 00:20:49.736
<v SPEAKER_4>The compute plane is the next largest culprit.

00:20:49.796 --> 00:20:53.436
<v SPEAKER_4>And then UPS comes in at the end there.

00:20:53.436 --> 00:21:07.536
<v SPEAKER_4>But in that traditional data center that's serving these traditional SAS applications, you know, you saw the development of, call it the entire industry for the last 25 years or so, not the last two or three years, around that metaphor.

00:21:07.536 --> 00:21:10.056
<v SPEAKER_4>And so the supply chain exists around that.

00:21:10.056 --> 00:21:12.956
<v SPEAKER_4>You know, the ability to procure energy exists around that.

00:21:12.956 --> 00:21:25.816
<v SPEAKER_4>The teams who are inside of developers for data center infrastructure, you know, inside of hyperscalers, who are inside of co-locators, they're all, you know, building around a certain metaphor of what their business looks like.

00:21:25.816 --> 00:21:34.216
<v SPEAKER_4>In 2017, Google, researchers who are affiliated with Google at least, published a paper called Attention is All You Need.

00:21:34.216 --> 00:21:39.576
<v SPEAKER_4>And Attention is All You Need says, we've cracked something.

00:21:39.576 --> 00:21:40.896
<v SPEAKER_4>It's new insight.

00:21:41.256 --> 00:21:43.196
<v SPEAKER_4>I'll bring it to super high level here.

00:21:44.296 --> 00:21:49.236
<v SPEAKER_4>It's the way that we're going to get to AI, to AGI, Artificial General Intelligence.

00:21:49.236 --> 00:22:02.356
<v SPEAKER_4>It's not going to be by having a lot of really smart people compile their individual intelligence in the form of, you know, answers to questions into an AI system.

00:22:02.356 --> 00:22:10.376
<v SPEAKER_4>Nor is it going to be by structuring different parts of the AI system to, you know, operate in different ways mathematically.

00:22:10.476 --> 00:22:15.676
<v SPEAKER_4>Instead, all you need to throw at it is more compute, more hardware.

00:22:15.676 --> 00:22:16.316
<v SPEAKER_4>That's all you need.

00:22:16.316 --> 00:22:20.296
<v SPEAKER_4>And that's because the attention mechanism is a hardware scaling mechanism.

00:22:20.296 --> 00:22:22.976
<v SPEAKER_4>OK, so 2017 happens.

00:22:22.976 --> 00:22:33.936
<v SPEAKER_4>And this new metaphor for what a data center is, the AI, the dense AI infrastructure, or is it's now being called an AI factory

to normalize the term from a branding lens?

00:22:35.796 --> 00:22:40.336
<v SPEAKER_4>That metaphor starts to percolate into the minds of the market.

00:22:40.336 --> 00:22:45.736
<v SPEAKER_4>Flash forward from 2023 till today.

00:22:45.736 --> 00:22:58.896
<v SPEAKER_4>So in the last two years only, the CAPEX budget for data center infrastructure as a whole has tripled because of this phenomenon.

00:22:58.896 --> 00:23:00.036
<v SPEAKER_4>What are they spending it on?

00:23:01.576 --> 00:23:11.976
<v SPEAKER_4>The difference primarily is in the compute plane where there's a new type of resource that is now the important CAPEX driver.

00:23:11.976 --> 00:23:14.996
<v SPEAKER_4>That resource is the graphics processing unit, the GPU.

00:23:15.236 --> 00:23:20.416
<v SPEAKER_4>It's only because of historical accident that it's called the GPU still.

00:23:20.416 --> 00:23:24.676
<v SPEAKER_4>It'll be called like an industrial AI chip in the future or something like that.

00:23:24.676 --> 00:23:34.496
<v SPEAKER_4>But because GPUs that did graphics for your desktop are good at matrix math, because that's what you require for graphics processing.

00:23:34.496 --> 00:23:37.596
<v SPEAKER_4>You can also use them for the attention mechanism.

00:23:37.596 --> 00:23:47.356
<v SPEAKER_4>So these GPUs, they are very, very different from traditional compute plane stuff like CPUs and RAM.

00:23:47.356 --> 00:23:56.136
<v SPEAKER_4>And the big difference is that one, they cost a lot more per installation, per card.

00:23:57.056 --> 00:24:05.556
<v SPEAKER_4>So an H100, you know, $25,000, $30,000 a card, as opposed

to a CPU, even a very high-end CPU, which is a fraction of that.

00:24:05.556 --> 00:24:14.716
<v SPEAKER_4>And number two, and this is the big thing that's causing this whole, you know, industrial movement to occur, they are tremendously energy dense.

00:24:14.716 --> 00:24:18.776
<v SPEAKER_4>So an H100 card is a 700 watt card.

00:24:19.956 --> 00:24:23.796
<v SPEAKER_4>With a power use efficiency that's, you know, normative, you're looking at close to a kilowatt.

00:24:23.796 --> 00:24:27.996
<v SPEAKER_4>To put that into perspective, that's close to one horsepower.

00:24:27.996 --> 00:24:32.216
<v SPEAKER_4>And it's all being expended as heat, more or less, to do that work.

00:24:32.216 --> 00:24:33.716
<v SPEAKER_4>So this is the big debt.

00:24:33.716 --> 00:24:35.796
<v SPEAKER_3>And that's because they're little resistors, right?

00:24:35.796 --> 00:24:39.696
<v SPEAKER_3>So it's like, you know, it gives off the heat, that's electricity, yeah.

00:24:39.696 --> 00:24:41.516
<v SPEAKER_2>You don't get one without the other.

00:24:41.516 --> 00:24:42.956
<v SPEAKER_3>But keep going, Graeme.

00:24:42.956 --> 00:24:44.276
<v SPEAKER_4>Exactly, you nailed it, guys.

00:24:44.276 --> 00:24:47.856
<v SPEAKER_4>So as you see, the attention is all you need.

00:24:47.856 --> 00:24:51.276
<v SPEAKER_4>Let's put more GPUs into data centers.

00:24:51.276 --> 00:24:59.196
<v SPEAKER_4>What this is causing is now the ratio of, you know, the different four layers I talked about before, how much energy each of

them uses.

00:24:59.196 --> 00:25:07.476
<v SPEAKER_4>And in dense AI infra, what you're seeing is people are trying to drive that as close to one, a power use efficiency of one as possible.

00:25:07.476 --> 00:25:10.916
<v SPEAKER_4>Now nobody's got there yet, but you still need all that other stuff.

00:25:10.916 --> 00:25:26.656
<v SPEAKER_4>But the point is, is we're trying to get to, you know, 70, 80, 90 percent plus of the energy just being used in those little resistive elements, those transistive elements of the GPUs as they change back and forth from zero to one really quickly.

00:25:26.656 --> 00:25:45.836
<v SPEAKER_4>And so that's the big change that's causing this whole thing, is the rise of the GPU to service both model training, one, and number two, the growing use case and the one that's going to dominate future energy usage, model inference, asking the model to do stuff for you.

00:25:45.836 --> 00:25:55.956
<v SPEAKER_4>So that's the overall relationship between the change in the component tree relative to how it existed at one time, how it exists today, and why that's driving energy usage.

00:25:55.956 --> 00:25:57.396
<v SPEAKER_3>Yeah, that's really interesting.

00:25:57.716 --> 00:26:11.536
<v SPEAKER_3>I'd just like to quickly before we keep going with the script, I'd like to quickly zoom in on something you said there, Graeme, about this idea there being not ideal electricity, electricity that doesn't suit the requirements of these components.

00:26:11.536 --> 00:26:15.536
<v SPEAKER_3>So could you just like really quickly dig into that before we get to the next question?

00:26:15.576 --> 00:26:16.496
<v SPEAKER_4>Yes, absolutely.

00:26:16.496 --> 00:26:25.496
<v SPEAKER_4>So one of the things operators have seen is these big AI factory build-outs have started to occur.

00:26:25.496 --> 00:26:30.576

<v SPEAKER_4>Everybody knows computer equipment is already very sensitive to power quality disturbances.

00:26:30.576 --> 00:26:33.236
<v SPEAKER_4>That's why even at your house, you've got the surge protector, right?

00:26:33.236 --> 00:26:36.636
<v SPEAKER_4>You don't need a surge protector for your garage door opener.

00:26:36.636 --> 00:26:40.716
<v SPEAKER_4>Computer equipment is very sensitive to power quality disturbances.

00:26:43.376 --> 00:27:04.316
<v SPEAKER_4>At the GPU level, because these things are so energy dense and so hot and running at the limits of physics, as we're currently able to produce devices at the limits of physics, they break easily and they light on fire and they fry themselves continuously.

00:27:04.316 --> 00:27:08.196
<v SPEAKER_4>Part of that, one of the big drivers behind why that's happening is power quality.

00:27:08.296 --> 00:27:26.936
<v SPEAKER_4>And so the ability to ensure ultra-reliable, ultra-specific power conditions is mandatory to protect the quality, sorry, to protect the value of the investment into these cards, because again, they're so expensive and they have such a short lifespan.

00:27:26.936 --> 00:27:35.976
<v SPEAKER_4>So what you're seeing is data center operators, especially people operating dense AI and fraud, they need very specific power quality conditions.

00:27:35.976 --> 00:27:44.576
<v SPEAKER_4>And if put to the test of like, do you want to try to fry your cards or do you just want to like turn off right now, they'll choose to turn off.

00:27:44.576 --> 00:27:49.016
<v SPEAKER_4>So this is one of the big technical areas for innovation that we're seeing the industry grapple with right now.

00:27:49.016 --> 00:27:51.716
<v SPEAKER_4>But that's the status quo today.

00:27:51.716 --> 00:28:03.596
<v SPEAKER_2>Yeah, well, I think you just set me up for a softball

here because over the last few years, we've highlighted the way that AI is changing the game for that electricity demand.

00:28:03.596 --> 00:28:12.076
<v SPEAKER_2>Plan data centers are reversing nuclear closures, complicating the grid, perhaps even extending the lifespans of coal and natural gas turbines.

00:28:12.076 --> 00:28:14.016
<v SPEAKER_2>It's not hard to understand that.

00:28:14.016 --> 00:28:21.576
<v SPEAKER_2>When I hear you talk about the quality of power required, because intermittent sources of power, you got to be more than...

00:28:21.596 --> 00:28:22.216
<v SPEAKER_2>You have to every...

00:28:22.216 --> 00:28:24.316
<v SPEAKER_2>Okay, let me try to make it clear.

00:28:24.316 --> 00:28:28.216
<v SPEAKER_2>You need real redundancy in the grid or this isn't going to work.

00:28:28.456 --> 00:28:29.736
<v SPEAKER_2>Would that be a fair comment?

00:28:29.736 --> 00:28:36.296
<v SPEAKER_2>So that the power you're providing is going to be at most times really, really efficient.

00:28:36.296 --> 00:28:37.916
<v SPEAKER_2>Is that right?

00:28:37.916 --> 00:28:38.676
<v SPEAKER_4>I'll speak to this.

00:28:38.676 --> 00:28:44.996
<v SPEAKER_4>This is one of the issues that goes to the heart of one of the big policy dilemmas and questions that you're seeing right now.

00:28:45.956 --> 00:28:51.836
<v SPEAKER_4>So variable renewables, the benefit is, of course, everybody knows the benefits of them.

00:28:51.836 --> 00:28:54.436
<v SPEAKER_4>They're cheap and they don't give off any emissions.

00:28:54.776 --> 00:28:58.876

<v SPEAKER_4>The downsides of them are numerous operationally.

00:29:00.156 --> 00:29:22.576
<v SPEAKER_4>One of the big challenges, and people are working on this, and we can talk later about some examples of the work people are doing in the space, but one of the big challenges right now is that, okay, let's say you have a big 500 megawatt data center and it's full of it, dense AI chips that cost $25 million megawatt, so it's really high capex item there.

00:29:24.016 --> 00:29:44.316
<v SPEAKER_4>If it's connected to the power grid and let's say a big cloud unexpectedly rolls in front of the sun, in front of a nearby large scale solar field on the grid, and that causes voltage issues, that 500 megawatt data center, it's in its interests to not try and ride those through.

00:29:44.316 --> 00:29:51.676
<v SPEAKER_4>It's in its interest to disconnect or to island itself using batteries or to island itself using a power plant or whatever.

00:29:51.676 --> 00:29:57.456
<v SPEAKER_4>It's in its interest to not take that disruption because it could cause problems.

00:29:57.456 --> 00:30:00.616
<v SPEAKER_4>It could light stuff on fire that's worth a lot of money.

00:30:02.956 --> 00:30:08.296
<v SPEAKER_4>What happens is the data center then says, uh-oh, power quality issues, I better separate from the grid.

00:30:08.296 --> 00:30:16.416
<v SPEAKER_4>Well, of course, because the grid was running at a steady state, it's a balance, continuously rebalanced of supply and demand at a knife's edge.

00:30:16.416 --> 00:30:19.336
<v SPEAKER_4>That causes further power quality issues.

00:30:19.336 --> 00:30:28.476
<v SPEAKER_4>The neighboring data center, five miles away, that was humming along just fine and it hadn't yet encountered the harmonics from the solar panels.

00:30:28.476 --> 00:30:32.516
<v SPEAKER_4>It now encounters a frequency issue because this other guy disconnected.

00:30:32.716 --> 00:30:34.956

<v SPEAKER_4>It says, uh-oh, my chips are at risk.

00:30:34.956 --> 00:30:37.736
<v SPEAKER_4>I better disconnect too.

00:30:37.736 --> 00:30:39.016
<v SPEAKER_4>You can see what happens then.

00:30:39.016 --> 00:30:54.256
<v SPEAKER_4>If there's a bunch of data centers, these massive point loads that are like single individual points of connection, that all have the same interest of like, I don't want bad power quality, it could cause a cascading failure.

00:30:54.256 --> 00:31:04.416
<v SPEAKER_4>This is to your point about where are people investigating this nexus of, let's call it on one hand, the reliability of the power grid, on the other hand, the unique needs of data centers.

00:31:05.716 --> 00:31:15.436
<v SPEAKER_4>There isn't an easier, obvious solution to that because part of the problem is technical and part of the problem is from a social policy lens.

00:31:15.436 --> 00:31:17.476
<v SPEAKER_4>So it's not an obvious solution.

00:31:17.476 --> 00:31:19.856
<v SPEAKER_4>So there's all sorts of stuff that comes out of that.

00:31:19.856 --> 00:31:46.656
<v SPEAKER_4>But to your point, one of the big things everybody has agreed on now and the market is moving against is we need to secure large sources of inertial power, like spinning mass-based power, to prevent the scenario that I just described from becoming more likely as data centers pile onto the grid.

00:31:46.656 --> 00:31:48.016
<v SPEAKER_3>This is really interesting stuff.

00:31:48.016 --> 00:31:57.236
<v SPEAKER_3>And yeah, I think that we also kind of wanted to get into the actual electricity demand that we're seeing from these AI data centers.

00:31:57.236 --> 00:32:04.996
<v SPEAKER_3>And like, you know, really putting some numbers onto this to give some sense of the scale of this.

00:32:04.996 --> 00:32:14.116
<v SPEAKER_3>And of course, like you said, this is kind of like really the beginning of what could be a huge shift in the way that our economy works in general.

00:32:14.116 --> 00:32:18.316
<v SPEAKER_3>And so, you know, predicting all of these things is difficult.

00:32:18.316 --> 00:32:21.996
<v SPEAKER_3>But could you give us an idea, Graeme, of kind of the scale of this?

00:32:22.196 --> 00:32:29.056
<v SPEAKER_3>Let's say just in the United States, because Canada, you know, we don't have an extensive data center infrastructure yet.

00:32:29.316 --> 00:32:31.596
<v SPEAKER_3>We should be really trying to get this set up.

00:32:31.596 --> 00:32:34.536
<v SPEAKER_3>And we'll talk a little bit more about that later.

00:32:34.536 --> 00:32:38.876
<v SPEAKER_3>But could you give us a sense of the scale of what's going on in the United States?

00:32:38.876 --> 00:32:41.236
<v SPEAKER_4>Yes, happy to.

00:32:41.236 --> 00:32:46.756
<v SPEAKER_4>There's a lot of really great flagship studies that have come out recently about this topic in the US.

00:32:46.756 --> 00:32:49.316
<v SPEAKER_4>And of course, I'm going to start with McKinsey because brand equity.

00:32:50.256 --> 00:33:10.636
<v SPEAKER_4>So from over the next five years, McKinsey's prediction is that there's going to be about 6.7 trillion of CapEx put into data centers in the US, of which 5 trillion will be for dense AI infra.

00:33:10.636 --> 00:33:14.916
<v SPEAKER_4>So 80% approximately is dense AI infra.

00:33:14.916 --> 00:33:43.896
<v SPEAKER_4>To give you a sense of the change in terms of what that means from a power lens, US power demand, if that happens, if we just see the amount of and the types of investment that McKinsey is

predicting in its report there, what we're going to see in terms of US power demand, I've got a few ways of expressing this so people can just understand how staggering this is, we're going to see that in terms of data center power usage in the US., it's going to 30x.

00:33:46.056 --> 00:34:00.016
<v SPEAKER_4>So that means there'll be a need for 125 net new gigawatts of power infra just to supply the net new AI infra.

00:34:02.516 --> 00:34:05.116
<v SPEAKER_4>So this is a fun one to put that into perspective.

00:34:08.496 --> 00:34:20.436
<v SPEAKER_4>Today, the entire global primary aluminum industry uses about 940 terawatt-hours a year.

00:34:20.436 --> 00:34:23.396
<v SPEAKER_4>So it took, you know, the aluminum is being produced since the 19th century.

00:34:23.396 --> 00:34:26.876
<v SPEAKER_4>There's been the buildup industrially on every continent except for Antarctica.

00:34:26.876 --> 00:34:29.856
<v SPEAKER_4>Obviously, it's one of the most important primary industries in the world.

00:34:30.916 --> 00:34:32.496
<v SPEAKER_4>It's heavily energy intense.

00:34:32.556 --> 00:34:43.036
<v SPEAKER_4>It's known for its energy intensity, and it's known for its economics of producing, you know, really, really high value relative to the energy input, particularly in the early days of the process.

00:34:43.036 --> 00:34:47.656
<v SPEAKER_4>It was kind of like the AI infra of the 19th century, which is why I like it as a comparison.

00:34:48.676 --> 00:34:54.316
<v SPEAKER_4>The entirety of the global primary aluminum industry uses 940 terawatt-hours.

00:34:54.336 --> 00:35:09.556
<v SPEAKER_4>Once the AI buildout to 2035 is complete, just dense AI infra in the US alone will use the same amount of energy as all of the global primary aluminum industry.

00:35:10.716 --> 00:35:12.936
<v SPEAKER_4>Here's where that gets crazier.

00:35:14.176 --> 00:35:26.276
<v SPEAKER_4>The global primary aluminum industry had 160 years to build up that demand base, like to build up the capital base that's capable of drawing that much.

00:35:27.336 --> 00:35:30.516
<v SPEAKER_4>We're making two points here, and this is where it gets really crazy.

00:35:30.516 --> 00:35:39.396
<v SPEAKER_4>Point one is that if this is all true and this all pans out, we will be building up the equivalent amount of demand in 10 years, not 160.

00:35:39.396 --> 00:35:46.476
<v SPEAKER_4>And so there'll be some insane multiple in terms of like the, I'll call it like the speed of capital in the ground there.

00:35:47.996 --> 00:36:17.176
<v SPEAKER_4>The second piece that's crazy though, so if we have 100 gigawatts of dense AI data center hosting capacity in the US like to host silicon, as we'll get more into the silicon economic cycle, that implies that every two to three years, there will be in the US a two trillion dollar turnover of the silicon installed in those data centers.

00:36:17.176 --> 00:36:28.536
<v SPEAKER_4>So it implies an additional capital churn of an incremental two trillion per year on top of the cost of just building all of the storage containers and powered shells.

00:36:28.536 --> 00:36:29.636
<v SPEAKER_4>That's at current chip rates.

00:36:29.636 --> 00:36:33.176
<v SPEAKER_4>Now you could say, well, chip economics are going to change, energetics are going to change.

00:36:33.176 --> 00:36:34.316
<v SPEAKER_4>Yeah, they will.

00:36:34.316 --> 00:36:38.096
<v SPEAKER_4>But at the same time, demand is going up, down, down.

00:36:38.096 --> 00:36:45.276
<v SPEAKER_4>So the scale of this capital build out, the speed of it, there's never been anything like it in history.

00:36:45.276 --> 00:36:47.876
<v SPEAKER_4>The density of it, there's never been anything like this in history.

00:36:48.476 --> 00:36:56.316
<v SPEAKER_4>AI infra is about 100 times as capital dense as power infra because it costs 10 times as much and it lasts one-tenth as long.

00:36:56.316 --> 00:37:04.056
<v SPEAKER_4>And we're going to now build more of it in a short period of time than anything else we've ever tried to build in the history of humanity.

00:37:06.256 --> 00:37:25.176
<v SPEAKER_4>When we think about the effect of this in terms of everything upstream of it, it's going to be a reindustrialization of every corner of the earth to service this because it's going to require everything from welds to materials to logistics, everything, power, energy.

00:37:25.176 --> 00:37:31.376
<v SPEAKER_4>Right now we're seeing a bottleneck in power, but as time goes on, this is going to continue to grow.

00:37:31.376 --> 00:37:34.856
<v SPEAKER_4>I'd leave it on this final point of comparison in terms of just how big.

00:37:34.856 --> 00:37:37.056
<v SPEAKER_4>This isn't how capital dense this is.

00:37:37.056 --> 00:37:43.376
<v SPEAKER_4>When I got into looking at the energy business, a big topic that people were interested in was the so-called energy transition.

00:37:45.196 --> 00:38:04.476
<v SPEAKER_4>The big number, the headline number that people used as a scare tactic for years about the impossibility or at least they call it, civilizational challenge of the energy transition, even as recently as like 2022, was like it's going to cost us $5 trillion by 2050.

00:38:04.476 --> 00:38:09.156
<v SPEAKER_4>That's this big impenetrable capital barrier that like how could we achieve that?

00:38:09.996 --> 00:38:15.396

<v SPEAKER_4>And what we're now talking about is like a regular two to three turnover on a status quo basis.

00:38:15.396 --> 00:38:18.176
<v SPEAKER_4>I have for that in America alone.

00:38:18.176 --> 00:38:24.736
<v SPEAKER_4>So when people say that humanity can't do something, never bet against humanity.

00:38:24.736 --> 00:38:26.996
<v SPEAKER_2>What a great narrative that is.

00:38:27.036 --> 00:38:29.596
<v SPEAKER_3>Well, I suppose that AI, you know, there's...

00:38:29.596 --> 00:38:42.976
<v SPEAKER_3>And I mean, you know, we could take this as, you know, a sign that AI is something that really has an incredible future or a sign that there's just not as much money in the energy transition as there is in AI, I suppose.

00:38:42.976 --> 00:38:46.476
<v SPEAKER_3>So that was always the case.

00:38:46.476 --> 00:38:47.996
<v SPEAKER_2>But the narrative never went that way.

00:38:48.256 --> 00:38:50.436
<v SPEAKER_2>We could go down that rabbit hole because I'd love to.

00:38:50.436 --> 00:38:54.556
<v SPEAKER_2>But I think we've got better things to talk about today than the energy challenge.

00:38:55.176 --> 00:38:56.176
<v SPEAKER_3>Absolutely.

00:38:56.876 --> 00:38:59.876
<v SPEAKER_3>Sorry, I just jumped in there, Kelly.

00:38:59.876 --> 00:39:03.456
<v SPEAKER_3>So I got one more question and then you'll go into the Canada side.

00:39:03.456 --> 00:39:08.276
<v SPEAKER_3>So Graeme, and maybe we'll keep this quick because we've already really been covering this.

00:39:08.276 --> 00:39:17.036

<v SPEAKER_3>But last year, Mark Zuckerberg said that electricity supplies were the primary bottlenecks for training and hosting advanced AI models.

00:39:17.036 --> 00:39:19.936
<v SPEAKER_3>You just said that this is the big bottleneck right now.

00:39:21.056 --> 00:39:25.056
<v SPEAKER_3>But I don't think that this is an insurmountable problem.

00:39:25.056 --> 00:39:37.596
<v SPEAKER_3>Like you said, there's just so much capital being invested right now that even a little bit of that being diverted into sorting out all these electricity needs would probably solve a lot of issues.

00:39:37.596 --> 00:39:42.196
<v SPEAKER_3>But let's just dig into kind of what the solutions that are being proposed today.

00:39:42.196 --> 00:39:45.636
<v SPEAKER_3>Is it still true today that electricity is the main bottleneck?

00:39:45.716 --> 00:39:46.476
<v SPEAKER_3>I think that it is.

00:39:48.156 --> 00:39:49.696
<v SPEAKER_3>But is that still true?

00:39:49.696 --> 00:39:53.256
<v SPEAKER_3>And what sort of solutions are right now being considered?

00:39:53.256 --> 00:39:54.116
<v SPEAKER_4>Yeah.

00:39:54.116 --> 00:39:54.336
<v SPEAKER_4>Yeah.

00:39:54.336 --> 00:39:59.876
<v SPEAKER_4>So I'll look at this from the 50,000-foot view because then we're going to get into the Canada part in more detail.

00:39:59.876 --> 00:40:01.636
<v SPEAKER_4>So I'll start just from like a global view.

00:40:01.636 --> 00:40:06.256
<v SPEAKER_4>So Zuckerberg said that I believe it was April or May of last year.

00:40:06.256 --> 00:40:20.076
<v SPEAKER_4>And it's only gotten worse and the problem's only compounded and gotten more intense since then as people have started to use budgets, massive $100 billion budgets to scour the earth for more capacity, right?

00:40:20.076 --> 00:40:22.136
<v SPEAKER_4>So yes, it's gotten more intense.

00:40:22.136 --> 00:40:29.496
<v SPEAKER_4>It is still one of the major drivers in terms of investment decision-making and siting.

00:40:29.496 --> 00:40:31.456
<v SPEAKER_4>I'll use some examples.

00:40:31.456 --> 00:40:39.476
<v SPEAKER_4>I've got a list here of these are all from within the last 12 months, but just to share the lengths people are going to acquire capacity.

00:40:40.096 --> 00:40:41.876
<v SPEAKER_4>So Kelly, you pointed this one out already.

00:40:41.876 --> 00:40:47.896
<v SPEAKER_4>So Microsoft, last year, last fall, made a deal with Constellation.

00:40:47.896 --> 00:40:55.376
<v SPEAKER_4>That was a greater than 1 gigawatt deal to revive Three Mile Island, specifically to power Microsoft's AI in front.

00:40:56.716 --> 00:41:02.116
<v SPEAKER_4>Right around the same time, another one they did, and you'll hear this trend and I'll speak to why this is happening.

00:41:02.116 --> 00:41:07.576
<v SPEAKER_4>They also signed the first ever commercial PPA for Fusion Energy with a company called Helion.

00:41:07.656 --> 00:41:12.156
<v SPEAKER_4>It was a 50-megawatt deal for 2028 delivery, Fusion.

00:41:12.156 --> 00:41:14.136
<v SPEAKER_4>Isn't that technically impossible?

00:41:14.136 --> 00:41:20.256
<v SPEAKER_4>Well, we're going to come back to that topic for 2028 delivery in Washington State.

00:41:20.256 --> 00:41:34.856
<v SPEAKER_4>Similar deal, we saw OpenAI and Oracle, zooming now to Texas, sign a 200-megawatt initial deal with scale up to 1.2 gigawatts for off-grid gas-backed capacity at the Stargate projects.

00:41:34.856 --> 00:41:36.096
<v SPEAKER_4>They just went fully off the grid.

00:41:36.156 --> 00:41:40.276
<v SPEAKER_4>They said the grid is too hard, we're just going to go to the middle of nowhere.

00:41:40.276 --> 00:41:50.916
<v SPEAKER_4>And again, you're going to see if that 1 gigawatt is fully built out, that will be $20 billion of chips flowing through little Abilene, Texas every two to three years for the next decade.

00:41:50.916 --> 00:41:54.816
<v SPEAKER_4>So you think about what that does to the economy of Abilene.

00:41:54.816 --> 00:42:03.996
<v SPEAKER_4>We've seen players like Amazon, they recently did a 1.9 gigawatt deal with Talon out of Talon's Pennsylvania campus.

00:42:04.156 --> 00:42:13.876
<v SPEAKER_4>So they're going to get 2 gigs just about when that deal is fully built out in 2026, both the brownfield component and the greenfield component of net new nuclear from them.

00:42:15.736 --> 00:42:22.416
<v SPEAKER_4>Google, Google recently signed a 2 gigawatt deal with Elemental for greenfield nuclear all across the US.

00:42:23.616 --> 00:42:29.256
<v SPEAKER_4>We've seen another one that I love personally because it just speaks to the audacity of the need for energy sources.

00:42:29.756 --> 00:42:37.356
<v SPEAKER_4>OpenAI signed a 5 gigawatt deal with a consortium led by the government of Abu Dhabi recently for Stargate UAE.

00:42:37.356 --> 00:42:41.236
<v SPEAKER_4>Now, that's the first 200 megawatt chunk, similar to the one in Texas.

00:42:41.236 --> 00:42:49.376
<v SPEAKER_4>But still, if that's fully built out, that's a massive, massive CapEx burden and CapEx installation for the future there.

00:42:49.376 --> 00:42:50.736
<v SPEAKER_4>People are going all over the world.

00:42:50.736 --> 00:42:52.856
<v SPEAKER_4>They're targeting things like nuclear reactors.

00:42:52.856 --> 00:42:55.736
<v SPEAKER_4>They're targeting massive off-grid gas plays.

00:42:55.736 --> 00:42:56.896
<v SPEAKER_4>They're targeting fusion.

00:42:56.896 --> 00:42:58.236
<v SPEAKER_4>Here's the pièce de résistance.

00:42:58.836 --> 00:43:10.836
<v SPEAKER_4>Google a couple weeks ago announced a commercial PPA, 200 megawatts, for 2026 delivery, that's right next year, with Commonwealth Fusion Systems.

00:43:10.836 --> 00:43:17.576
<v SPEAKER_4>Commonwealth has already started construction of the reactor that it claims will supply that first fusion power in the world.

00:43:17.576 --> 00:43:24.336
<v SPEAKER_4>Meanwhile, you see in France, the construction of ITER has been the International Fusion Consortium.

00:43:24.356 --> 00:43:26.216
<v SPEAKER_4>It's 25 years that's been going on.

00:43:26.216 --> 00:43:30.776
<v SPEAKER_4>They've never produced anything like net new energy out of it.

00:43:30.776 --> 00:43:52.356
<v SPEAKER_4>The point I'm making is when Google makes the bet on 200 megawatts of experimental fusion and is willing to sign and make an announcement on that basis, even though I think even the most generous people would say there could be questions about how that's going to be achieved given that the physics haven't really been mastered yet, as far as mainstream academia would share.

00:43:54.336 --> 00:44:07.976
<v SPEAKER_4>We see that they're willing to do almost anything to get capacity, and they're going further and further to not just show their shareholders, but to actually plant their flag in terms of access to energy resources.

00:44:07.976 --> 00:44:10.356
<v SPEAKER_4>I expect this to continue.

00:44:10.356 --> 00:44:18.956
<v SPEAKER_4>I'm going to share a project on this point because I think it's really the leading edge of the next generation of projects that are trying to get around this.

00:44:18.956 --> 00:44:25.896
<v SPEAKER_4>It's a project called Spark by a company called Crusoe, which I think is one of the most interesting companies in the world doing stuff in the space right now.

00:44:27.056 --> 00:44:28.796
<v SPEAKER_4>We haven't invested in them, just so you know.

00:44:28.796 --> 00:44:31.496
<v SPEAKER_4>I'm saying this conflict of interest-free.

00:44:32.556 --> 00:44:35.756
<v SPEAKER_4>Crusoe recently showed off a product called Spark.

00:44:35.756 --> 00:44:47.416
<v SPEAKER_4>Spark is an off-grid one-megawatt GPU cluster that is powered exclusively by solar panels and batteries, so solar plus storage driving compute.

00:44:47.656 --> 00:45:11.656
<v SPEAKER_4>The operating profile of solar, and even when you match that up to batteries, there's not an easy fit there with the load profile of compute, and so the R&D challenge that they've gone and solved by doing this, the technical challenge of taking variable solar, which you're going to have to oversize at a 6 or 7 to 1 ratio to match the compute's energetics need over the whole year.

00:45:11.656 --> 00:45:21.236
<v SPEAKER_4>Batteries, which again, there's not a native sizing that you can just point to in terms of power industry norms and say, oh, that's how you combine batteries with GPUs and solar.

00:45:21.236 --> 00:45:27.056
<v SPEAKER_4>They have to solve all of these engineering challenges, build an operating system for it, and then go out and deploy it.

00:45:27.056 --> 00:45:28.696
<v SPEAKER_4>They did this recently and it's successful.

00:45:29.256 --> 00:45:43.956
<v SPEAKER_4>You're going to see more and more R&D, like fundamental

R&D, that upends traditional power systems engineering principles that are based on great economics, specifically to supply these chips because they're so energy hungry.

00:45:43.956 --> 00:45:49.316
<v SPEAKER_4>So right now, everybody in the world is racing to figure out, how can I get more energy to the chips?

00:45:49.316 --> 00:45:54.076
<v SPEAKER_4>And when we talk about the Canada piece, this is where our advantage lays, but in any event, I'll pause, sorry.

00:45:54.076 --> 00:46:04.876
<v SPEAKER_2>Before we go on to talk about Canada, Graeme, right at the beginning, and I remember this from the conversations we've had, you and I have had in the past, the cost of a bit, one bit.

00:46:04.876 --> 00:46:06.176
<v SPEAKER_2>Can you talk about that a little bit?

00:46:06.176 --> 00:46:10.216
<v SPEAKER_2>Because I don't think people quite understand that every keystroke has a cost.

00:46:10.216 --> 00:46:11.056
<v SPEAKER_4>Yes.

00:46:11.216 --> 00:46:16.736
<v SPEAKER_2>And I think that that's the start, you add them all up and that's how it works.

00:46:16.736 --> 00:46:19.396
<v SPEAKER_2>So could you just explain the bit cost a little bit?

00:46:19.396 --> 00:46:21.436
<v SPEAKER_2>I think people will find this very interesting.

00:46:22.016 --> 00:46:22.556
<v SPEAKER_4>Yes, I will.

00:46:22.556 --> 00:46:30.756
<v SPEAKER_4>So I'll use the metaphor in the framework of the Wattbit spread, which Brian Janice from ex-Microsoft, now Cloverleaf Infrastructure coined.

00:46:30.756 --> 00:46:43.896
<v SPEAKER_4>So when you're talking to the computer, and every little, to your point, every little prompt that you enter has a cost chain associated with it, I'll start from the bottom of it because that's actually more interesting way.

00:46:43.896 --> 00:46:53.956
<v SPEAKER_4>So I'll use gas as an example in terms of how you're looking at unit economics as you go up this chain and then I'll talk to why it's so expensive.

00:46:55.096 --> 00:47:03.336
<v SPEAKER_4>So if you use $4 a gigajoule gas, Henry Hubb pricing down in Texas, let's just say, or $2 a gigajoule if you want like ICO here in Alberta.

00:47:05.456 --> 00:47:11.196
<v SPEAKER_4>You're going to burn that and let's say you burn that first in a combined cycle turbine and you're just going to sell that to the grid.

00:47:11.196 --> 00:47:14.756
<v SPEAKER_4>You're going to get maybe $65, $70 a megawatt hour for that.

00:47:14.816 --> 00:47:23.376
<v SPEAKER_4>If you instead burnt it in like a resip peaker and you were really smart, maybe you're going to get $200 or $250 megawatt hour for that.

00:47:23.376 --> 00:47:32.036
<v SPEAKER_4>If you instead are like, aha, I understand that there's this latent thing called the watt-bit spread where you turn a watt into a bit and it's worth more because of the chip economics.

00:47:32.036 --> 00:47:34.516
<v SPEAKER_4>I don't really understand them well, but I want to get into it.

00:47:34.516 --> 00:47:38.036
<v SPEAKER_4>First thing everybody looks at is Bitcoin mining.

00:47:38.036 --> 00:47:48.676
<v SPEAKER_4>You can upgrade your GJ of gas and suddenly your megawatt hour is now going to be worth maybe $500 a megawatt hour equivalent by mining a Bitcoin, at like $100,000 Bitcoin.

00:47:48.676 --> 00:47:56.036
<v SPEAKER_4>But if you're really smart and you say, well, I've got my box full of H100s here, I'm going to go sell capacity to SF compute.

00:47:57.776 --> 00:48:09.656
<v SPEAKER_4>What you're instead doing because those chips are so energy hungry, but they're also leased for so much, what you're doing is you're upgrading your megawatt hour to something that looks like

about $2,000 to $3,000 per megawatt hour.

00:48:10.456 --> 00:48:15.116
<v SPEAKER_4>That's the end price that the chip owner is willing to pay for everything downstream.

00:48:15.116 --> 00:48:24.796
<v SPEAKER_4>And then in turn, when you translate that to token economics, further yet upstream of that, you can see even further magnification of that value chain.

00:48:26.036 --> 00:48:38.756
<v SPEAKER_4>When you think about what the cost is of this and what this all implies in terms of why is the watt being upgraded so much there and what are the unit economics driving this, the answer is the cost of the chips.

00:48:39.696 --> 00:48:47.716
<v SPEAKER_4>So the chips cost, if power plants cost you about $2 million megawatt, the chips cost you about $25 million megawatts.

00:48:47.716 --> 00:48:53.816
<v SPEAKER_4>They're more than 10x as capital intents, just in terms of a raw turnkey cost as the power plant.

00:48:53.816 --> 00:48:59.796
<v SPEAKER_4>But a power plant lasts you 25 years or more if you baby it.

00:48:59.796 --> 00:49:04.036
<v SPEAKER_4>The chips last two to three years, like 18 to 36 month life cycle.

00:49:04.036 --> 00:49:07.536
<v SPEAKER_4>So not only they cost 10 times as much, but they also last one-tenth of as long.

00:49:08.316 --> 00:49:34.916
<v SPEAKER_4>And so the chip owners need to pay off those chips, and the need to finance and to create financing arrangements that are capable of paying off those chips are what is driving the unit economics that are causing this insane spread between, you know, here's what the energy costs down here, and here's what you're upgrading it to by pumping it through these chips and selling it as tokens to the end users.

00:49:35.756 --> 00:49:51.416
<v SPEAKER_4>And the result of that is when you talk to ChatGPT upstream from that somewhere, there is the most energy dense apparatus ever conceived of in human history, you know, like liquid immersion,

cooled GPUs in a shipping container somewhere.

00:49:51.416 --> 00:50:01.156
<v SPEAKER_4>And they're using a tiny fraction of energy, but at an extremely high rate of use to produce the intelligence that answers that question for you.

00:50:01.156 --> 00:50:04.616
<v SPEAKER_4>And it's really unique in terms of its unit economics of anything we've ever seen.

00:50:04.916 --> 00:50:08.076
<v SPEAKER_4>There's historical parallels, but I won't go into that now.

00:50:08.076 --> 00:50:14.876
<v SPEAKER_2>Well, that takes me into Canada because and I set it up, I kind of set this up.

00:50:15.936 --> 00:50:29.356
<v SPEAKER_2>From what we've talked about and what I can understand, which is not very much, major factors required for the large AI training data centers are access to state-of-the-art chips, you just talked about that, and access to large amounts of training data.

00:50:29.856 --> 00:50:36.536
<v SPEAKER_2>And finally, cheap and abundant energy, ergo, Alberta gas.

00:50:36.536 --> 00:50:44.096
<v SPEAKER_2>Based on these factors and others you think should be included, like we should be getting after this here in Alberta.

00:50:46.956 --> 00:50:50.636
<v SPEAKER_2>There's a sweet spot here and it won't last forever either.

00:50:50.636 --> 00:50:51.456
<v SPEAKER_4>That's correct.

00:50:51.456 --> 00:50:52.976
<v SPEAKER_4>That's correct.

00:50:52.976 --> 00:50:54.316
<v SPEAKER_4>So I'll speak to this.

00:50:54.316 --> 00:51:03.236
<v SPEAKER_4>This is like one of my big things I've been talking to everybody over Stampede about this big topic in Calgary right now is like, how should we view this opportunity?

00:51:03.236 --> 00:51:12.876
<v SPEAKER_4>So from an access to energy resources perspective, something to keep in mind is that the GPUs age like milk.

00:51:12.876 --> 00:51:15.076
<v SPEAKER_4>They go bad really quickly.

00:51:15.076 --> 00:51:21.176
<v SPEAKER_4>And as a result of that, every month they're sitting on the shelf is like totally unacceptable.

00:51:21.176 --> 00:51:22.696
<v SPEAKER_4>I'm going to share a stat with you.

00:51:22.696 --> 00:51:23.696
<v SPEAKER_4>I haven't seen this shared before.

00:51:23.696 --> 00:51:24.736
<v SPEAKER_4>This is from our own internal work.

00:51:25.396 --> 00:51:32.396
<v SPEAKER_4>For every month, that one megawatt of GPUs at today's pricing is not energized.

00:51:32.396 --> 00:51:36.536
<v SPEAKER_4>There is a lost revenue of about one million dollars.

00:51:36.536 --> 00:51:41.116
<v SPEAKER_4>Some a megawatt of GPUs earns you about a million dollars a month.

00:51:41.116 --> 00:51:47.956
<v SPEAKER_4>And if you're sitting waiting for the gas plant to get built for three years, you compound up what you've lost there.

00:51:47.956 --> 00:51:51.156
<v SPEAKER_4>And it's worth way more than the value of the gas plant.

00:51:51.156 --> 00:51:55.776
<v SPEAKER_4>In fact, in only a few months, you're offsetting the value of the gas plant.

00:51:55.776 --> 00:52:04.816
<v SPEAKER_4>So point one here from a Canadian lens, and how to think about our competitive and comparative advantages, and Alberta in particular.

00:52:06.496 --> 00:52:10.936
<v SPEAKER_4>We have something that's very unique in all of the world.

00:52:10.936 --> 00:52:25.516
<v SPEAKER_4>And that's our geology in terms of the amount of really easy to access, close to logistics, close to fiber, close to financial markets, close to smart people, close to energy capabilities, close to workforce in place.

00:52:27.056 --> 00:52:29.056
<v SPEAKER_4>Ocean of stranded gas.

00:52:31.356 --> 00:52:41.816
<v SPEAKER_4>That ocean of stranded gas is, and you see it in both flare gas or just like gas, it's uneconomical to produce, and so there's no takeaway capacity ever built.

00:52:43.536 --> 00:52:48.116
<v SPEAKER_4>There's so much of it here in northern Alberta and northeastern BC.

00:52:51.976 --> 00:53:12.716
<v SPEAKER_4>Relative to the core driver of what the actual end customer cares about, which is speed, not just individual site scale, but speed to get every incremental megawatt on, because again, I'm losing a million dollars a month per megawatt that's not energized.

00:53:12.716 --> 00:53:14.716
<v SPEAKER_4>Our gas has uniquely positioned.

00:53:16.456 --> 00:53:23.736
<v SPEAKER_4>It's also scalable, and as we'll talk about this in a minute here, that's the other thing that people care about, but I'll talk about value prop one first.

00:53:23.736 --> 00:53:33.756
<v SPEAKER_4>Everywhere in the world right now that you look, people are, again, as we've talked about, scouring the earth for this energy, and they're looking and they're prioritizing by how quickly can I get access to the energy.

00:53:33.756 --> 00:53:40.416
<v SPEAKER_4>So of course, the first thing people look for is like, you know, brownfield interconnections that aren't being fully utilized.

00:53:40.416 --> 00:53:43.656
<v SPEAKER_4>Well, all those are getting gobbled up, and now, you know, okay, those are done.

00:53:44.336 --> 00:53:48.076
<v SPEAKER_4>The next thing people look for is like brownfield gas

infra.

00:53:48.076 --> 00:53:52.616
<v SPEAKER_4>That's like, you know, not being utilized to its full economical potential.

00:53:52.616 --> 00:53:56.216
<v SPEAKER_4>That's where we currently are right now, as called the pace of play.

00:53:56.216 --> 00:53:58.156
<v SPEAKER_4>That's going to get gobbled up.

00:53:58.156 --> 00:54:02.876
<v SPEAKER_4>Eventually, we're going to be into the land of greenfield builds.

00:54:02.876 --> 00:54:15.996
<v SPEAKER_4>Power grids, you could either say, okay, well, build this big on-grid gas plant, and I'll tie this, you know, data center to it, and I'll show up, you know, and I won't start operating the data center until the power or the big power plant is fully built.

00:54:15.996 --> 00:54:18.296
<v SPEAKER_4>And it's going to comply with grid specs, grid regs.

00:54:18.296 --> 00:54:22.336
<v SPEAKER_4>We're going to have the government of Canada do a big investigation into the environmental aspects of it.

00:54:22.336 --> 00:54:25.636
<v SPEAKER_4>We're going to have the government of Alberta do a big investigation into the permitting of it.

00:54:25.636 --> 00:54:31.576
<v SPEAKER_4>The AUC is going to ask everybody who doesn't like this, you're going to have to hire lawyers to deal with all of them.

00:54:31.576 --> 00:54:36.596
<v SPEAKER_4>Or you could just build it off in the middle of nowhere where, you know, there isn't anything else yet.

00:54:36.596 --> 00:54:47.096
<v SPEAKER_4>So next thing that we're going to see is the move to greenfield gas, off-grid greenfield gas, not because it's particularly something people want to do, but because of speed.

00:54:47.096 --> 00:54:48.316
<v SPEAKER_4>Speed is the new scale.

00:54:48.316 --> 00:54:51.576
<v SPEAKER_4>Speed is what people are prioritizing for right now.

00:54:51.576 --> 00:54:59.256
<v SPEAKER_4>And that's where Alberta's gas has this really distinct advantage that you could go up there and you could start moving on these plays today.

00:54:59.256 --> 00:55:05.636
<v SPEAKER_4>There's virtually no limit in terms of the amount available relative to the needs that you have.

00:55:05.636 --> 00:55:12.896
<v SPEAKER_4>And relatively speaking today, there's a lot of gas close to the other things that you care about when you're doing your sighting.

00:55:12.896 --> 00:55:16.636
<v SPEAKER_4>So you don't have to put it, you know, you're not putting a gigawatt of chips out in the middle of nowhere.

00:55:16.636 --> 00:55:19.816
<v SPEAKER_4>You're instead looking relatively close to things that already exist.

00:55:19.816 --> 00:55:25.416
<v SPEAKER_4>So Canada's big advantage here, Alberta's big advantage here is our geology.

00:55:28.476 --> 00:55:37.476
<v SPEAKER_4>From that lens, the thing we need to do if we want to win is we need to recognize what advantage our geology offers, which is speed.

00:55:38.136 --> 00:55:44.376
<v SPEAKER_4>And then we need to position our value proposition around that specific need.

00:55:44.376 --> 00:55:51.276
<v SPEAKER_4>We don't need to position it around, Alberta gas will support, you know, 100 gigawatts of on-grid compute.

00:55:51.276 --> 00:55:54.836
<v SPEAKER_4>There's no need for an Alberta grid of 100 gigawatts of scale.

00:55:54.836 --> 00:55:59.036
<v SPEAKER_4>And the time it would take to achieve something like that is not realistic or feasible.

00:55:59.036 --> 00:56:07.876
<v SPEAKER_4>Conversely, Alberta gas could support, you know, sovereign compute of 100 gigawatts of scale for many countries in the world that don't have access to gas.

00:56:09.856 --> 00:56:13.416
<v SPEAKER_4>That could be a historical game changer.

00:56:14.476 --> 00:56:15.636
<v SPEAKER_2>Joe, do you want to expand that?

00:56:15.636 --> 00:56:21.236
<v SPEAKER_2>Like, that it's just, it's like we're, this is like science fiction to me, but it's not.

00:56:21.236 --> 00:56:24.016
<v SPEAKER_2>It's right now, right in the moment.

00:56:24.016 --> 00:56:31.756
<v SPEAKER_2>And the net present value decreases every second that goes by that we don't expound on this and get after it.

00:56:33.716 --> 00:56:59.636
<v SPEAKER_3>Yeah, and to that end, Graeme, I think you've already touched on some of the ways that we can start thinking about policy fixes for some of these issues and ensuring that policy making is aligned with what could be a very strategic sector for the Canadian economy, but also for our security, because AI, let's just say, it could be the foundation for 21st century power and economics.

00:56:59.636 --> 00:57:09.676
<v SPEAKER_3>So what kind of regulations and limitations do you feel are actually limiting the development of AI in the associated energy infrastructure in Canada?

00:57:09.676 --> 00:57:10.776
<v SPEAKER_4>Yeah, excellent question.

00:57:10.776 --> 00:57:16.196
<v SPEAKER_4>I'm going to speak to three categories here, and I'll cover each of them because I think they're each important.

00:57:18.036 --> 00:57:23.576
<v SPEAKER_4>And I'll use examples from Alberta where possible, but also globally to give a bit of a compare and contrast.

00:57:25.836 --> 00:57:44.276
<v SPEAKER_4>So the first one I'm going to speak to, which is probably the hottest topic on everybody's mind who is working these deals today from an ad hoc lens, they don't come at it from our perspective of

being structured capital against it, but they're just trying to get a foot in the door, is grid access.

00:57:44.876 --> 00:57:53.136
<v SPEAKER_4>And how we should have for this current slate of demand that's trying to get on to the grid, as I talked about, that's where the status quo currently is.

00:57:53.136 --> 00:57:57.056
<v SPEAKER_4>It's where the market's currently focusing its development efforts.

00:57:57.056 --> 00:58:29.816
<v SPEAKER_4>How we can enable as much as possible of that capacity in a safe way that doesn't compromise grid reliability to interconnect and to avoid, most importantly, creating any kind of real or perceived barriers to interconnection for projects that could cause capital to view Alberta, Canada, as uncompetitive markets or as less competitive markets, because everyone in the world is competing for these deals right now.

00:58:29.816 --> 00:58:32.016
<v SPEAKER_4>So I'll speak to the ISO thing in particular.

00:58:32.016 --> 00:58:36.956
<v SPEAKER_4>The ISO here in Alberta, the Alberta Electric System Operator, it's our independent system operator, we have a deregulated grid.

00:58:38.236 --> 00:58:51.136
<v SPEAKER_4>They capped the first wave of data center connections at 1.2 gigawatts, which there's real deals and there's real capacity coming down the line from real players that are substantially greater than that.

00:58:51.136 --> 00:58:53.136
<v SPEAKER_4>So this is like an actual problem.

00:58:53.136 --> 00:59:09.876
<v SPEAKER_4>There are 16 gigawatts in the queue, not all of that's going to transact, but like substantial, sophisticated, real people have been working hard and applying the resources globally to win really good deals for Alberta that are going to be grid connected.

00:59:11.176 --> 00:59:23.636
<v SPEAKER_4>And as much as from an investment lens, we're not investing that obviously, but we sell picks and shovels and stuff, so we see it and we see the value of it, and we see more importantly from an economic development lens, the necessity of getting a foot in the door.

00:59:24.956 --> 00:59:43.616
<v SPEAKER_4>We need to do a better job policy-wise of hitting a balance between on the one hand, creating rules that ensure an orderly and safe and reliable interconnection process, and on the other hand, make hay while the sun shines, as we say in Saskatchewan where I'm from.

00:59:43.656 --> 00:59:46.036
<v SPEAKER_4>The demands here, we get to capture the demand.

00:59:47.196 --> 00:59:52.516
<v SPEAKER_4>What the ISO did, you can contrast this with two other jurisdictions globally.

00:59:52.516 --> 00:59:53.856
<v SPEAKER_4>The first one is Texas.

00:59:53.856 --> 01:00:03.356
<v SPEAKER_4>Texas just passed SB6, which is like the better, I think 90 percent, 95 percent of people who are looking at grid-connected deals would say I'd prefer that model.

01:00:03.356 --> 01:00:05.116
<v SPEAKER_4>It's what the ISO just did.

01:00:05.116 --> 01:00:15.496
<v SPEAKER_4>What Texas has said is, you can apply to interconnect as a data center of any size, and we're not going to cap you, but we are going to put operating requirements on to you.

01:00:15.496 --> 01:00:25.236
<v SPEAKER_4>That will effectively mean if you don't show up with your own power plant, you're not going to get connected to the grid, because you're not going to allow us to break your chips.

01:00:25.236 --> 01:00:34.716
<v SPEAKER_4>So it's effectively bring your own power, as Daniel Smith talked about, but it's a regulatory implementation of, here is what bring your own power actually means.

01:00:34.716 --> 01:00:39.076
<v SPEAKER_4>We're not leaving that to the imagination, nor are we saying it's this arbitrary cap.

01:00:40.616 --> 01:00:57.816
<v SPEAKER_4>The worst thing about the ISO cap, while it's a physically sound cap, and there's reasons why it exists that are based in physics and reality, that we can't ignore, they're reliability based, the worst part about the way it was done is that projects of

this scale, they don't pro rata.

01:00:57.816 --> 01:01:09.756
<v SPEAKER_4>They're not going to be like, okay, well, I was building a 500 megawatt play that consisted of two 250 megawatt stages, but since the ISO is only allocated as 250 megawatts, I guess I'll do 125, 125.

01:01:10.236 --> 01:01:11.136
<v SPEAKER_4>They'll just say no.

01:01:11.136 --> 01:01:12.676
<v SPEAKER_4>They'll say I don't want to do this deal anymore.

01:01:12.676 --> 01:01:13.816
<v SPEAKER_4>It's not what I need.

01:01:13.816 --> 01:01:14.876
<v SPEAKER_4>And they'll walk.

01:01:14.876 --> 01:01:21.296
<v SPEAKER_4>So you're going to see this like separation of the wheat from the chaff, not in a good way.

01:01:21.296 --> 01:01:29.036
<v SPEAKER_4>As a result of this, as projects that would have been economical and would have been built, walk due to the pro rata effect that we're going to see.

01:01:29.036 --> 01:01:34.556
<v SPEAKER_4>Or even worse, you're going to see picking winners where the ISO says, okay, well, I like you the most.

01:01:34.556 --> 01:01:36.276
<v SPEAKER_4>You're the one who's going to get all of the cap.

01:01:37.016 --> 01:01:37.676
<v SPEAKER_4>Pick a player.

01:01:37.676 --> 01:01:41.176
<v SPEAKER_4>I'll negotiate a deal with you in the back room to do that.

01:01:41.176 --> 01:01:47.156
<v SPEAKER_4>I don't think the ISO is going to do that, but that's the other option that players are going to see is like, well, I could try and pursue that.

01:01:47.156 --> 01:01:49.396
<v SPEAKER_4>So neither of those are good.

01:01:49.396 --> 01:01:53.256
<v SPEAKER_4>You look at SB6, what it says is there's no change to the status quo.

01:01:53.256 --> 01:01:55.196
<v SPEAKER_4>Loads all interconnect the same way.

01:01:55.196 --> 01:02:05.476
<v SPEAKER_4>But if you're a point load greater than 75 megawatts, which all of these relatively large data centers are going to be, that are grid connected, and you don't have your own power, you're not going to like what I tell you to do.

01:02:05.696 --> 01:02:07.936
<v SPEAKER_4>And so everybody's going to bring their own power.

01:02:07.936 --> 01:02:09.976
<v SPEAKER_4>So that's Texas.

01:02:09.976 --> 01:02:19.816
<v SPEAKER_4>Ireland is another example that has started to, instead of trying to cap, because of transmission system reliability issues, access to the grid.

01:02:19.816 --> 01:02:44.336
<v SPEAKER_4>What Ireland is now doing is they're saying, hey, hyperscaler, or anybody who wants to do this, if you have your own power plant in location A, or you've contracted with a power plant in location A, and you have your data center in location B, and the power grid kind of can't handle that, you're allowed to build your own private transmission lines, even though that would make you an illegal utility under the old monopoly construct.

01:02:44.336 --> 01:02:50.096
<v SPEAKER_4>So this is like the sacred cow of the utility regulatory compact, is like, thou shalt not build wires.

01:02:50.096 --> 01:03:00.356
<v SPEAKER_4>They're saying, well, if the utilities can't build the wires to service you effectively, Ireland doesn't want to miss out on this economic development opportunity, so to hell with the utility.

01:03:00.576 --> 01:03:03.256
<v SPEAKER_4>And now, of course, there's downstream effects that benefit the utility there.

01:03:03.256 --> 01:03:05.836
<v SPEAKER_4>I'm not getting into the entirety of how that works.

01:03:05.836 --> 01:03:21.316
<v SPEAKER_4>But you're going to see this type of rethinking the regulatory compact everywhere on Earth, where it's obvious that the existing model is standing in the way of universally net positive economic development.

01:03:21.316 --> 01:03:28.596
<v SPEAKER_4>And so from that lens, these are two shifts that we've seen that Alberta could become more competitive easily.

01:03:28.596 --> 01:03:30.336
<v SPEAKER_4>And there's lots more ideas in this direction as well.

01:03:30.736 --> 01:03:32.516
<v SPEAKER_4>But reduce regulatory barriers.

01:03:32.516 --> 01:03:34.136
<v SPEAKER_4>Don't put up new ones.

01:03:34.136 --> 01:03:39.436
<v SPEAKER_4>Make it so that people understand how the playing field works, a la Texas, or even better.

01:03:39.436 --> 01:03:42.096
<v SPEAKER_4>You know, capture, like make hay while the sun shines again.

01:03:42.096 --> 01:03:44.716
<v SPEAKER_4>Let's do as much, capture as much of this demand as we can.

01:03:44.716 --> 01:03:46.036
<v SPEAKER_4>What do we care more about?

01:03:46.036 --> 01:03:53.636
<v SPEAKER_4>Do we care more about the idea that 120 years ago, we agreed that people who build wires should get monopolies and have a rate base rate of return business model?

01:03:54.096 --> 01:04:01.036
<v SPEAKER_4>Or do we care more about the future of 100X, the capital intensity locating itself here?

01:04:01.036 --> 01:04:05.256
<v SPEAKER_4>Microsoft, this is a great stat that I'll share with you.

01:04:05.256 --> 01:04:18.576
<v SPEAKER_4>The entire Alberta interconnected electrical system, including all of the wires, all of the power plants, and a capitalized amount for all of the truck roll, all of the HR burden and all of the

command center.

01:04:18.576 --> 01:04:24.496
<v SPEAKER_4>All of that is only roughly equal to Microsoft's CapEx budget for 2025.

01:04:26.476 --> 01:04:28.216
<v SPEAKER_3>Wow.

01:04:28.216 --> 01:04:45.376
<v SPEAKER_3>Yeah, it's really incredible and like you're saying, Graeme, now that so much capital spending is associated with this infrastructure, the capital spending for the rest of the infrastructure that we already have, is starting to look like kind of small in comparison.

01:04:45.376 --> 01:04:55.736
<v SPEAKER_3>If we're talking about 500 or however many trillions of dollars in the next five years, that can just pretty much buy all the rest of the infrastructure in North America.

01:04:55.736 --> 01:04:58.836
<v SPEAKER_3>So yeah, truly, truly incredible.

01:04:58.836 --> 01:05:07.036
<v SPEAKER_4>So I'd share just a couple more of these policy points here to bring this home, because I think the ISO one is the first one.

01:05:07.036 --> 01:05:15.616
<v SPEAKER_4>But I think there's a second piece and a third piece that are, you're seeing them everywhere on Earth and so this is why I want to bring them up, because given who your audience is, I think they're going to find this valuable.

01:05:15.616 --> 01:05:22.836
<v SPEAKER_4>The second question here is, if speed is what matters for Alberta, how do we facilitate speed?

01:05:22.836 --> 01:05:28.016
<v SPEAKER_4>And how do we facilitate CAPEX into off-grade gas?

01:05:28.016 --> 01:05:34.756
<v SPEAKER_4>And how do we facilitate a policy environment that fosters investment into that thesis?

01:05:34.756 --> 01:05:37.736
<v SPEAKER_4>So there's all sorts of individual policy prescriptions I can get into.

01:05:37.736 --> 01:05:39.276

<v SPEAKER_4>I'm not going to do that now.

01:05:39.316 --> 01:05:52.516
<v SPEAKER_4>A really critical one, though, that is a big, big, big asterisk is the clean energy regulation, which is effectively like we're going to try and federally, nationally tone down gas emissions off of plants.

01:05:55.196 --> 01:06:02.436
<v SPEAKER_4>Right now, there is certainly, and whether this has worked or not, I have not done the analysis of it, but I know I talk to people about it a lot.

01:06:02.436 --> 01:06:13.896
<v SPEAKER_4>Capital views that as a barrier to the longevity of the off-grade gas play because it says, well, I'll build the gas plant and I could get a couple of gens of chips through that and great, that pays for everything.

01:06:13.896 --> 01:06:15.496
<v SPEAKER_4>Hey, I'm making a lot of money.

01:06:15.496 --> 01:06:24.876
<v SPEAKER_4>But my concern is that if the gas plant is still there and I still own it and I'm still running it for some future application, you know, it could run afoul of these rules and that's going to cause me issues.

01:06:24.876 --> 01:06:28.536
<v SPEAKER_4>So, you know, I'm not putting a sharp edge on this one.

01:06:28.536 --> 01:06:35.196
<v SPEAKER_4>I just say that I know that this is something that from like a go to market lens, we should be paving the road, not putting up roadblocks.

01:06:35.196 --> 01:06:43.716
<v SPEAKER_4>We should be saying there's no environmental standards that, you know, or we're going to have an expedited standards process for gas plants below this size if they're off grid.

01:06:43.716 --> 01:06:46.756
<v SPEAKER_4>We're going to exempt them from this, that, and the other thing.

01:06:46.876 --> 01:06:49.496
<v SPEAKER_4>And I think that's the key focus there.

01:06:49.496 --> 01:06:57.816
<v SPEAKER_4>The third piece, and this is one that's really new, and

this just, you know, I just found out about this last week, as I think did most of the market.

01:06:59.316 --> 01:07:02.356
<v SPEAKER_4>And this is something you're seeing internationally as well, so it's really critical.

01:07:02.356 --> 01:07:07.656
<v SPEAKER_4>So last week, the data center levy engagement, the tax engagement for data centers.

01:07:07.656 --> 01:07:17.836
<v SPEAKER_4>Alberta, the government of Alberta posted this, Treasury and Finance posted this on its website, saying, we're going around doing consultations about how much we should tax data centers.

01:07:17.836 --> 01:07:19.976
<v SPEAKER_4>And I'll make two points here.

01:07:19.976 --> 01:07:34.956
<v SPEAKER_4>I think that most people agree that at some degree of maturity in this industry, you're going to have to like put a royalty or something on either the GPU or like, you know, a levy on the energy it consumes from the grid, if you're going to target that piece of it or like whatever, because it's hard to tax these things.

01:07:35.036 --> 01:07:37.716
<v SPEAKER_4>And so you could see this massive capital base show up.

01:07:37.716 --> 01:07:40.696
<v SPEAKER_4>It doesn't need that many people to run it.

01:07:40.696 --> 01:07:48.476
<v SPEAKER_4>You know, now, the other side of this is, of course, there's already the natural gas royalty system in place, and perhaps that's the best place to litigate this.

01:07:48.476 --> 01:07:52.396
<v SPEAKER_4>I think everybody agrees there needs to be some kind of taxation of this at maturity.

01:07:52.436 --> 01:07:56.296
<v SPEAKER_4>But a key policy prescription I'd share is this today.

01:07:56.296 --> 01:07:59.236
<v SPEAKER_4>Don't count your check-ins before they hatch.

01:07:59.236 --> 01:08:08.956
<v SPEAKER_4>People will look at tax rates when they are building their financial models of should it come to Alberta or not, and should

it come to Canada or not.

01:08:10.336 --> 01:08:17.216
<v SPEAKER_4>Other states in the world, Georgia, for example, Brian Camp vetoed a law that said we won't give any more tax breaks to data centers.

01:08:17.216 --> 01:08:17.516
<v SPEAKER_4>Why?

01:08:17.516 --> 01:08:20.056
<v SPEAKER_4>Because tax breaks are what's pulling all these data centers to Georgia.

01:08:20.636 --> 01:08:32.296
<v SPEAKER_4>If you look at the tax environment globally, people are trying to be more welcoming and they're trying to use their balance sheet muscle and their tax-based muscle to do that because it's a contest, right?

01:08:32.296 --> 01:08:33.276
<v SPEAKER_4>It's not a gold rush.

01:08:33.276 --> 01:08:34.796
<v SPEAKER_4>A lot of people think this is a gold rush.

01:08:34.796 --> 01:08:35.616
<v SPEAKER_4>It's not a gold rush.

01:08:35.616 --> 01:08:36.936
<v SPEAKER_4>It's an arms race.

01:08:36.936 --> 01:08:40.576
<v SPEAKER_4>That's why people want these things to locate new jurisdictions.

01:08:40.576 --> 01:08:53.736
<v SPEAKER_4>And so from that lens on the tax side, point one, it's a good idea to start developing policy towards how will we tax these at maturity because it's a little bit of a different asset class than like, you know, revenue recovery is used to.

01:08:53.736 --> 01:09:06.436
<v SPEAKER_4>But the flip side of it is, when we do that and how we introduce that, and more importantly, the optics of the way we share with the capital markets and the industry we're doing that, it matters and it's going to have an effect.

01:09:06.436 --> 01:09:26.696
<v SPEAKER_4>A key piece in the government of Alberta's tax document

that they put out was the idea that there would be effectively something like the digital services tax, where if you are willing to give free compute to Alberta users, we'll let you pay less tax.

01:09:26.696 --> 01:09:31.456
<v SPEAKER_4>That kind of trade barrier is the kind of thing that's going to nuke this opportunity for Alberta.

01:09:32.396 --> 01:09:34.136
<v SPEAKER_2>That's the example I was thinking of.

01:09:34.136 --> 01:09:35.816
<v SPEAKER_2>You've just answered my question.

01:09:36.136 --> 01:09:38.956
<v SPEAKER_3>We really need to be careful about how to go about taxing this stuff.

01:09:38.956 --> 01:09:55.676
<v SPEAKER_3>I think it's just as sensitive as the royalty issue with natural resources here, considering how tidied it is with kind of geographical and very specific conditions that Alberta has benefited in.

01:09:55.676 --> 01:09:58.156
<v SPEAKER_2>No, I think we could go on for hours here.

01:09:58.156 --> 01:10:19.956
<v SPEAKER_2>I think this has been a fascinating discussion, but we've probably overwrought our listeners, which is great, because we'll continue to explore this and continue to talk to Graeme and have him on again in the future, Joe, as this builds out and get this into the hands of all of the players best we can.

01:10:19.956 --> 01:10:27.596
<v SPEAKER_3>Yeah, but I think we'll need to wrap up here, but before we do that, Graeme, we have one last question that our listeners are always interested in.

01:10:27.596 --> 01:10:28.856
<v SPEAKER_3>What are you reading these days?

01:10:29.156 --> 01:10:35.596
<v SPEAKER_3>Ideally, for pleasure, but we'll take a technical work on AI as well, if that's all you have time for.

01:10:35.596 --> 01:10:37.056
<v SPEAKER_4>I may give you a double whammy.

01:10:37.056 --> 01:10:39.676

<v SPEAKER_4>I may give you a double whammy, because I love this question too.

01:10:39.676 --> 01:10:43.496
<v SPEAKER_4>And actually, I saw it as like all these guys get it.

01:10:43.496 --> 01:10:45.856
<v SPEAKER_4>Go back, bust out your bookshelf from the 90s.

01:10:45.856 --> 01:10:50.716
<v SPEAKER_4>Go look up author Ray Kurzweil and go dig out The Age of Spiritual Machines.

01:10:50.716 --> 01:10:52.996
<v SPEAKER_4>I just recently finished rereading this.

01:10:52.996 --> 01:10:54.336
<v SPEAKER_4>This is a hitter.

01:10:54.336 --> 01:10:55.916
<v SPEAKER_4>He predicted a lot of this stuff.

01:10:55.916 --> 01:10:58.616
<v SPEAKER_4>He specifically predicted the Energy AI Nexus.

01:10:59.176 --> 01:11:03.976
<v SPEAKER_4>He predicted the rise of the Chatbot as the like method for the implementation of AI.

01:11:03.976 --> 01:11:06.036
<v SPEAKER_4>And you're going to love it.

01:11:06.036 --> 01:11:09.356
<v SPEAKER_4>So go bust this one out, The Age of Spiritual Machines by Ray Kurzweil.

01:11:09.356 --> 01:11:11.056
<v SPEAKER_4>I believe it's from 98 or 99.

01:11:11.336 --> 01:11:12.036
<v SPEAKER_3>That's excellent.

01:11:12.176 --> 01:11:14.436
<v SPEAKER_3>I'll look that book up right away.

01:11:14.436 --> 01:11:19.856
<v SPEAKER_3>Really interesting to know that it's good to review the people who got things right about the history.

01:11:19.856 --> 01:11:21.936

<v SPEAKER_3>That's really interesting.

01:11:21.936 --> 01:11:23.056
<v SPEAKER_4>Exactly.

01:11:23.056 --> 01:11:25.636
<v SPEAKER_2>Graeme, thanks so much for coming on the podcast.

01:11:25.636 --> 01:11:26.456
<v SPEAKER_2>This was a lot of fun.

01:11:27.296 --> 01:11:28.596
<v SPEAKER_4>Oh, thanks for having me, guys.

01:11:28.636 --> 01:11:30.856
<v SPEAKER_4>I really appreciate you inviting me on.

01:11:30.856 --> 01:11:35.196
<v SPEAKER_4>And I'm really excited that this type of content is becoming more and more mainstream.

01:11:35.196 --> 01:11:36.476
<v SPEAKER_4>People are getting more and more interested in it.

01:11:36.476 --> 01:11:37.856
<v SPEAKER_4>So thanks again.

01:11:39.456 --> 01:11:45.616
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01:11:45.616 --> 01:11:50.136
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01:11:50.136 --> 01:11:52.316
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01:11:52.316 --> 01:11:56.236
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01:11:57.616 --> 01:12:05.216
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01:12:08.816 --> 01:12:13.896
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01:12:13.896 --> 01:12:14.816
<v SPEAKER_2>I'm Kelly Ogle.

01:12:14.816 --> 01:12:16.816
<v SPEAKER_2>Thanks for joining us on Energy Security Cubed.