

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.

00:00:24.596 --> 00:00:32.536

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

00:00:34.416 --> 00:00:45.976

<v SPEAKER_2>For today's interview, which Joe and I recorded June 16, 2025, we discussed challenges to the North American electrical grid and considerations for improving electrical security in Canada.

00:00:45.976 --> 00:00:48.916

<v SPEAKER_3>With us to discuss this is Jason Doering.

00:00:48.916 --> 00:00:55.576

<v SPEAKER_3>Jason is the recently retired Vice President of Corporate Operational Services for Enmax Corporation.

00:00:55.576 --> 00:01:12.956

<v SPEAKER_3>Before joining Enmax, Jason gained extensive experience in engineering and electricity system planning alongside many other components of electrical grid maintenance and safety at Manitoba Hydro and the Alberta Electricity System Operator.

00:01:12.956 --> 00:01:15.536

<v SPEAKER_2>Great to have you on the podcast, Jason.

00:01:15.536 --> 00:01:16.556

<v SPEAKER_4>Yeah, thanks for having me.

00:01:17.216 --> 00:01:19.756

<v SPEAKER_4>It's a pleasure to be here.

00:01:19.756 --> 00:01:28.236

<v SPEAKER_2>I'm sure you are looking forward to retirement, but we're going to quiz you a bit here on trying to educate.

00:01:28.236 --> 00:01:31.756

<v SPEAKER_2>Not that people don't know, but I think that people, they don't know what they don't know.

00:01:32.056 --> 00:01:38.896

<v SPEAKER_2>And I think that's what we're trying to do here with the complexities of the grid system.

00:01:38.896 --> 00:01:45.596

<v SPEAKER_2>But before we jump into policy, it might be helpful to give some background information on the North American power setup.

00:01:45.596 --> 00:01:52.096

<v SPEAKER_2>Jason, what is NERC and what are the six regional entities which are part of NERC?

00:01:52.096 --> 00:01:53.676

<v SPEAKER_4>Yeah, Kelly, you're right.

00:01:53.676 --> 00:01:58.656

<v SPEAKER_4>You know, not a lot of people understand the way the industry is structured.

00:01:58.656 --> 00:02:04.196

<v SPEAKER_4>Even people within the industry don't maybe understand some of the nuances, so I think that's a great starting point.

00:02:04.196 --> 00:02:08.896

<v SPEAKER_4>NERC is the North American Electric Reliability Corporation.

00:02:08.896 --> 00:02:30.136

<v SPEAKER_4>It is a US federal entity and its mandate is basically electric system reliability across the US and NERC also sets the standards, the reliability standards for North America that have been adopted in various forms across all the Canadian provinces.

00:02:30.796 --> 00:02:36.216

<v SPEAKER_4>So, the way NERC operates, as I said, it's a US federal entity.

00:02:37.916 --> 00:02:53.176

<v SPEAKER_4>North America is pretty big and so what's happened in North America over time is the grid has evolved into basically four different grids.

00:02:53.796 --> 00:03:04.056

<v SPEAKER_4>And in order to oversee NERC's accountabilities across those grids for reliability, it's created what are called the regional entities.

00:03:04.056 --> 00:03:12.876

<v SPEAKER_4>And so there's six of them and how they, what their role is, is they basically report into NERC and they're kind of like NERC's delegates.

00:03:12.876 --> 00:03:26.876

<v SPEAKER_4>The NERC sets the rules and standards, reliability standards, and the regional entities then monitor and enforce those rules and standards across the various grids in North America.

00:03:26.876 --> 00:03:28.456

<v SPEAKER_4>And then they customize a little bit too.

00:03:28.456 --> 00:03:32.336

<v SPEAKER_4>So each grid has some unique characteristics to it.

00:03:32.336 --> 00:03:45.156

<v SPEAKER_4>So the regional entities have the ability to modify or add reliability standards as it pertains directly to the unique characteristics of their grid.

00:03:45.276 --> 00:03:53.676

<v SPEAKER_4>So the regional entities are kind of starting from, you know, west to east, or the Western Electricity Coordinating Council, WECC.

00:03:53.676 --> 00:03:57.416

<v SPEAKER_4>That's where Alberta sits under WECC.

00:03:57.416 --> 00:04:03.856

<v SPEAKER_4>The Midrest Reliability Organization, MRO, which is kind of the center of North America.

00:04:03.856 --> 00:04:07.636

<v SPEAKER_4>Then there's Texas, often its own, the Texas Reliability Entity.

00:04:08.916 --> 00:04:17.836

<v SPEAKER_4>Then there's CERC, which is the Southeastern Electric Reliability Council, which kind of handles the Florida and that kind of Southeast portion of the country.

00:04:17.836 --> 00:04:23.756

<v SPEAKER_4>Then Reliability First, which is New York and all those areas.

00:04:23.756 --> 00:04:33.236

<v SPEAKER_4>And then the Northwest Power or Northeast Power Coordinating Council, NPCC, which is everything to the east, including Quebec and Ontario and the Maritime Provinces.

00:04:33.236 --> 00:04:38.856

<v SPEAKER_4>So we can, maybe in the show notes, we can link to a document I've posted publicly that kind of gives an overview of all

this.

00:04:40.516 --> 00:04:42.736

<v SPEAKER_2>Great idea.

00:04:42.736 --> 00:04:57.276

<v SPEAKER_2>And I guess, you know, as I'm, as you're explaining that, and I'm kind of visualizing in my, in my mind's eye, all the inner ties between all, like, they don't do, they don't want to operate in, in isolation, like everything's tied together in some form.

00:04:57.276 --> 00:05:06.996

<v SPEAKER_2>And, and like, what's the difference between a regional entity and or an independent system operator and regional system operators?

00:05:07.956 --> 00:05:10.896

<v SPEAKER_2>Like, can you tie it, can you sort of tie them together for us?

00:05:10.896 --> 00:05:12.236

<v SPEAKER_2>Is that possible?

00:05:12.236 --> 00:05:13.916

<v SPEAKER_4>Yeah, yeah, Kelly.

00:05:13.916 --> 00:05:18.656

<v SPEAKER_4>So like you said, the regional entities are really thinking of them as kind of NERC delegates, right?

00:05:18.656 --> 00:05:21.096

<v SPEAKER_4>So they're kind of like a regulator.

00:05:21.096 --> 00:05:28.676

<v SPEAKER_4>The independent system operators and the regional transmission operators, RTOs, so ISOs, RTOs, you'll hear those terms.

00:05:28.676 --> 00:05:34.456

<v SPEAKER_4>They are, they're, they don't, they don't, they're not regulators.

00:05:34.576 --> 00:05:39.976

<v SPEAKER_4>They don't make, well, they do make rules, but they don't make mandatory reliability standards.

00:05:39.976 --> 00:05:49.076

<v SPEAKER_4>Their role, the ISOs and RTOs, is to plan and operate the deregulated power systems across North America.

00:05:49.076 --> 00:05:55.836

<v SPEAKER_4>So when you look across North America, we've got how many ISOs here?

00:05:55.836 --> 00:06:03.796

<v SPEAKER_4>We've got one, two, three, four, five, six, seven, eight, nine ISOs now, and or RTOs.

00:06:03.796 --> 00:06:13.896

<v SPEAKER_4>And so the difference between an ISO and an RT0, or it's more in scope, regional transmission organizations maybe have a little bit broader scope, but they essentially do the same thing.

00:06:13.896 --> 00:06:19.636

<v SPEAKER_4>Plan and operate the power systems and the markets for electricity.

00:06:19.636 --> 00:06:21.656

<v SPEAKER_4>But that doesn't cover all of North America.

00:06:21.656 --> 00:06:36.536

<v SPEAKER_4>So, you know, I don't know, I don't have the current numbers in front of me, but I'd say roughly probably half of North American jurisdictions are deregulated and the other half are still actually vertically integrated.

00:06:36.536 --> 00:06:42.416

<v SPEAKER_4>So, they're either state or provincially planned and owned and they're not deregulated.

00:06:42.416 --> 00:06:49.216

<v SPEAKER_4>So, there's big chunks of the West that are actually still vertically integrated and fully regulated.

00:06:49.216 --> 00:06:57.776

<v SPEAKER_4>But nonetheless, whether they're market structures or they're regulated structures, they're overseen by NERC and the regional entities.

00:06:57.776 --> 00:07:01.976

<v SPEAKER_2>So, again, I'm thinking, like I'm from Saskatchewan all my life.

00:07:01.976 --> 00:07:03.496

<v SPEAKER_2>I grew up with SAS Power, right?

00:07:03.496 --> 00:07:19.076

<v SPEAKER_2>Like that's a fully regulated, vertically integrated electrical system that's also tied to Manitoba and Alberta and or North Dakota or Montana in regards to catching up if you're short, right?

00:07:19.116 --> 00:07:26.436

<v SPEAKER_2>Like or just because they're regulated doesn't mean they don't they aren't involved with deregulated electrical systems.

00:07:26.436 --> 00:07:27.056

<v SPEAKER_4>Correct.

00:07:27.056 --> 00:07:27.376

<v SPEAKER_4>Correct.

00:07:27.376 --> 00:07:38.296

<v SPEAKER_4>So Saskatchewan, let's take Saskatchewan for example, Saskatchewan is actually part of they're overseen by MRO, the Midwest Reliability Organization.

00:07:38.296 --> 00:07:42.196

<v SPEAKER_4>They are now and this is where things get a little bit complicated, right?

00:07:42.196 --> 00:07:45.256

<v SPEAKER_4>There are four interconnections in North America.

00:07:45.916 --> 00:07:58.756

<v SPEAKER_4>And what that means is that if you visualize a map of North America, the grid is basically broken up into four different grids, kind of east to west across North America.

00:07:58.756 --> 00:08:05.616

<v SPEAKER_4>And Saskatchewan sits in the eastern interconnection, and Alberta sits in the western interconnection.

00:08:05.756 --> 00:08:16.996

<v SPEAKER_4>And what the difference is, is even though we all use power at 60 Hertz, and 120 volts, and you can go anywhere in North America and plug in your iPhone, right?

00:08:16.996 --> 00:08:20.356

<v SPEAKER_4>It's not like Europe, you have to have all those adaptive thingies.

00:08:20.356 --> 00:08:34.896

<v SPEAKER_4>So even though we have the same nominal frequency and voltage at the customer level in North America, the grid itself has been broken up into four unique grids that are not actually what we call synchronously connected.

00:08:34.896 --> 00:08:42.136

<v SPEAKER_4>So they operate at the same nominal frequency and voltage, but they're not actually synchronized.

00:08:42.136 --> 00:08:49.396

<v SPEAKER_4>So that means that the connection between those grids has to be through direct current, high voltage direct current lines.

00:08:49.396 --> 00:09:00.556

<v SPEAKER_4>So for example, Saskatchewan and Alberta, they are connected, but they're connected through a high voltage direct current line, an HVDC line, because we're not actually synchronized.

00:09:00.556 --> 00:09:02.756

<v SPEAKER_4>So why did that happen?

00:09:02.756 --> 00:09:09.956

<v SPEAKER_4>Well, it wasn't by design per se, as power grids evolved in North America, you know, over the past 100 years.

00:09:09.956 --> 00:09:12.296

<v SPEAKER_4>Initially, it was thought, you know, the bigger the better, right?

00:09:12.296 --> 00:09:15.996

<v SPEAKER_4>If maybe we can connect all of North America under one grid.

00:09:15.996 --> 00:09:29.976

<v SPEAKER_4>What happened in practice, though, was as the grids grew bigger and bigger and interconnected across North America, what they started to see was at that scale, it was actually getting difficult to control the grids.

00:09:29.976 --> 00:09:40.596

<v SPEAKER_4>So over time, they actually had to break them up into smaller chunks in order to maintain proper frequency and voltage control across North America.

00:09:40.596 --> 00:09:46.036

<v SPEAKER_4>So when you look at the map of the grid, and again, all this will be in the document, we'll link in the notes.

00:09:46.036 --> 00:09:50.596

<v SPEAKER_4>If you look at the map of the grids, it wasn't something that was kind of a grand plan.

00:09:50.596 --> 00:09:54.816

<v SPEAKER_4>It kind of evolved over time through practice and learning.

00:09:54.816 --> 00:10:10.516

<v SPEAKER_4>And it's what we have today now is, like I say, four

grids that, even though they're all at 60 Hz and 120 V at the consumer level, they're actually independent grids that have to be connected through, can't be connected through alternating current lines.

00:10:10.516 --> 00:10:20.376

<v SPEAKER_3>Yeah, so just so I kind of understand, Jason, there's kind of like, you can correct me if I'm wrong, so there's kind of like three different levels here in a way.

00:10:20.376 --> 00:10:29.736

<v SPEAKER_3>You have the regulators, which are, of course, NERC, and these are regulators for the sufficiency of electricity capacity, as far as I can tell.

00:10:31.736 --> 00:10:32.556

<v SPEAKER_4>Reliability.

00:10:32.636 --> 00:10:33.996

<v SPEAKER_3>Reliability, yeah.

00:10:33.996 --> 00:10:39.656

<v SPEAKER_4>So, yeah, so that's actually, you raise a nuance there that you're not aware of very much, so yes.

00:10:39.656 --> 00:10:49.276

<v SPEAKER_4>Yeah, so NERC doesn't actually have jurisdiction over what's called supply adequacy, per se, right?

00:10:49.276 --> 00:10:55.296

<v SPEAKER_4>So that really falls to individual states and provinces to make sure that they have an adequate supply of electricity.

00:10:55.296 --> 00:11:00.036

<v SPEAKER_4>What NERC looks at is, do you have a reliable or reliable supply of electricity?

00:11:00.036 --> 00:11:02.116

<v SPEAKER_4>So are you operating reliably?

00:11:02.116 --> 00:11:07.176

<v SPEAKER_4>Are you planning a grid that's going to be reliable and meet certain reliability standards?

00:11:07.176 --> 00:11:22.816

<v SPEAKER_4>But when it comes to supply adequacy, actually that's a choice that policy makers have to make as to how much or how little they're willing to accept as far as capacity margin versus what they believe their load is going to be their forecast over the long term.

00:11:22.816 --> 00:11:24.356

<v SPEAKER_4>So yeah, it's a nuance.

00:11:25.396 --> 00:11:33.036

<v SPEAKER_4>NERC is really up to states and provinces to determine how they maintain supply adequacy.

00:11:33.036 --> 00:11:37.936

<v SPEAKER_4>And NERC is looking at making sure they operate reliably and plan the systems correctly.

00:11:37.936 --> 00:11:51.536

<v SPEAKER_3>Yeah, but I can imagine that if you don't have enough capacity, if your demand is going to be exceeding supply substantially quite a bit, that's going to cause big issues for all of your neighbours who are connected in with you, right?

00:11:51.536 --> 00:11:52.856

<v SPEAKER_4>Yes, it does.

00:11:53.556 --> 00:12:05.856

<v SPEAKER_4>And, you know, this is one of the benefits of, you know, strong interconnections between different provinces and states, is that you can share resources across those jurisdictions, even though you might be planned differently.

00:12:05.856 --> 00:12:08.476

<v SPEAKER_4>You know, a good example is BC and Alberta, right?

00:12:08.476 --> 00:12:21.536

<v SPEAKER_4>We're synchronously connected because we're both in the Western Electricity Coordinating Council region, and we're both in the Western Interconnect, and we can share resources.

00:12:21.536 --> 00:12:30.956

<v SPEAKER_4>So, you know, we saw that in December earlier this year, or January, I guess, when we had that kind of near-supply shortfall.

00:12:30.956 --> 00:12:39.436

<v SPEAKER_4>You know, we basically were getting power from BC when we ran out of power here in that extreme cold condition.

00:12:39.436 --> 00:12:49.816

<v SPEAKER_4>So, you know, that reciprocity between jurisdictions is really one of the benefits of interconnected grids and one of the benefits of synchronously connected grids because then you can share more than just energy.

00:12:49.816 --> 00:12:56.536

<v SPEAKER_4>You can share all the other reliability benefits of electricity, such as voltage control, frequency support.

00:12:56.536 --> 00:12:57.536

<v SPEAKER_3>Yeah, yeah.

00:12:57.536 --> 00:13:12.076

<v SPEAKER_3>So, I guess, like, sticking with this and, you know, these are all issues that I think we're just really skimming the surface on a lot of this because, you know, like, there's just so many different levels to how this entire thing is planned out.

00:13:12.516 --> 00:13:17.936

<v SPEAKER_3>And, I'm sure, we'll be doing tons of more podcasts on this issue and probably papers as well.

00:13:17.936 --> 00:13:31.596

<v SPEAKER_3>But, I think we should get a little bit into that grid frequency question, Jason, because this is something that we've been working on a little bit and I'd love to talk with you a little bit more about that off the record here.

00:13:31.596 --> 00:13:39.996

<v SPEAKER_3>And, something that's become very relevant, especially with the world news of the Iberian blackout last month.

00:13:39.996 --> 00:13:47.976

<v SPEAKER_3>And, I think that there's also been tons of news recently about frequency issues, although none of them were as dramatic as that blackout.

00:13:47.976 --> 00:13:58.696

<v SPEAKER_3>But, Jason, I'd like to ask you, does Alberta and I guess, if you know Canada more generally, but maybe just Alberta, if that's kind of your wheelhouse.

00:13:58.696 --> 00:14:02.576

<v SPEAKER_3>But, have we been seeing our own problems with grid frequency?

00:14:03.336 --> 00:14:09.716

<v SPEAKER_3>And, what are your thoughts on what kind of is behind these grid frequency issues, if so?

00:14:09.716 --> 00:14:17.756

<v SPEAKER_4>Yeah, Joe, Alberta definitely is having some challenges with maintaining sufficient frequency.

00:14:18.896 --> 00:14:26.136

<v SPEAKER_4>And, you know, and really, the rest of Canada isn't really in the same position as Alberta.

00:14:26.556 --> 00:14:36.296

<v SPEAKER_4>And, the reason in Alberta is, you know, pure and simple, we have too much wind and solar relative to our demand.

00:14:36.296 --> 00:14:44.916

<v SPEAKER_4>And, you know, when I say that, I know some people think I'm being anti-wind and solar, but I'm actually just being pro-physics.

00:14:44.916 --> 00:14:50.096

<v SPEAKER_4>And, you know, and here's how, here's why that's a problem.

00:14:50.096 --> 00:14:55.096

<v SPEAKER_4>Wind and solar generation use what's called inverters.

00:14:55.096 --> 00:14:57.696

<v SPEAKER_4>And these are just fancy power electronics.

00:14:57.936 --> 00:15:00.516

<v SPEAKER_4>You know, just think of them as digital.

00:15:02.256 --> 00:15:18.356

<v SPEAKER_4>And inverters basically convert the electricity that comes out of these wind and solar facilities into, they condition the power to be the right frequency and voltage for the grid.

00:15:18.356 --> 00:15:29.396

<v SPEAKER_4>The problem with inverter-based resources, that's what we generally call wind and solar, is that they don't contribute to frequency and voltage support on the grid.

00:15:29.396 --> 00:15:33.896

<v SPEAKER_4>And the things that do that are spinning resources or synchronous resources.

00:15:33.896 --> 00:15:37.856

<v SPEAKER_4>So think of all the traditional things that make electricity, right?

00:15:37.856 --> 00:15:42.736

<v SPEAKER_4>Steam turbines, water turbines, you know, hydropower, gas turbines.

00:15:42.736 --> 00:15:45.676

<v SPEAKER_4>Those are traditionally how we've made power.

00:15:45.676 --> 00:15:52.796

<v SPEAKER_4>In fact, that's how we made power up until, you know, the last 10 or 15 years was using synchronous resources.

00:15:52.836 --> 00:15:55.096

<v SPEAKER_2>Well, and for 100 years, we did that.

00:15:55.096 --> 00:15:56.216

<v SPEAKER_4>Yeah.

00:15:56.216 --> 00:15:57.076

<v SPEAKER_4>Yeah, exactly.

00:15:57.076 --> 00:15:58.856

<v SPEAKER_4>That's how the grids develop, right?

00:15:58.856 --> 00:16:02.276

<v SPEAKER_4>Grids developed around alternating current.

00:16:02.276 --> 00:16:05.156

<v SPEAKER_4>And, you know, that's a whole nother podcast is how we got there.

00:16:05.156 --> 00:16:20.856

<v SPEAKER_4>But when the decision was made, you know, over 100 years ago that, you know, alternating current was going to be our default, if you will, all the resources that got built, all the generating resources were spinning.

00:16:21.096 --> 00:16:24.216

<v SPEAKER_4>So, you know, you had a water turbine, you had steam turbines initially.

00:16:24.216 --> 00:16:31.016

<v SPEAKER_4>And then, you know, later in the kind of 70s, or I guess maybe late 60s, you started to see gas turbines coming on to the system.

00:16:31.016 --> 00:16:36.996

<v SPEAKER_4>All of these resources spin a generator, but they are all directly, magnetically coupled to the power system.

00:16:36.996 --> 00:16:41.516

<v SPEAKER_4>And so the inertia, you know, of a, think of a large spinning mass, right?

00:16:41.516 --> 00:16:42.756

<v SPEAKER_4>Think of a bike.

00:16:42.756 --> 00:16:46.176

<v SPEAKER_4>The inertia of your bike is what keeps you upright, right?

00:16:46.176 --> 00:17:00.676

<v SPEAKER_4>So once you get up to speed, and especially the faster you go, you know, if once you're at a nice stable speed, and you're on a relatively heavy bike, it doesn't, you know, you can maintain that speed relatively easily, right?

00:17:00.676 --> 00:17:06.776

<v SPEAKER_4>Any kind of disturbance to you, the wind or, you know, you hit a bump or something, you can roll through that pretty easily.

00:17:06.776 --> 00:17:13.836

<v SPEAKER_4>That inertia, that physical inertia is really what the grid relies on to maintain frequency and voltage.

00:17:15.076 --> 00:17:19.816

<v SPEAKER_4>So when you think about power systems, you know, 60 Hz, right?

00:17:20.016 --> 00:17:30.116

<v SPEAKER_4>That's what the power in an alternating system in North America is, it alternates at 60 Hz, 60 cycles every second, the power kind of changes from positive and negative.

00:17:31.796 --> 00:17:35.836

<v SPEAKER_4>In Europe, it's 50 Hz, which is why you need all those converters.

00:17:35.836 --> 00:17:37.496

<v SPEAKER_4>Yeah, the converter thingies, right?

00:17:37.496 --> 00:17:41.176

<v SPEAKER_4>That's why you blow up stuff when you go, you plug the wrong thing in in Europe.

00:17:41.176 --> 00:17:43.296

<v SPEAKER_4>But that 60 Hz is critical.

00:17:43.296 --> 00:17:53.516

<v SPEAKER_4>So from a system operation standpoint, you have to maintain within a very, very fine margin of 60 Hz, or you start to get things go wrong pretty quickly on a power system.

00:17:53.516 --> 00:18:06.996

<v SPEAKER_4>Maintaining that 60 Hz was relatively straightforward, relatively easy when all of the generators were synchronous, because they were all spinning, they were all adding inertia, and they were all giving that kind of strength to the system to ride through any kind of disturbance, right?

00:18:06.996 --> 00:18:09.416

<v SPEAKER_4>A line trips, a generator trips.

00:18:09.416 --> 00:18:15.816

<v SPEAKER_4>When they're all spinning and they're all providing inertia, it gives you lots of, basically, system inertia, right?

00:18:15.816 --> 00:18:25.396

<v SPEAKER_4>Which is what you need to maintain a really strong frequency response, so that anything that tries to disturb your system, it can easily kind of roll over it.

00:18:25.396 --> 00:18:32.416

<v SPEAKER_4>Now, that started to change about 10 years ago, and we saw more and more inverter-based resources, wind and solar, hitting the system.

00:18:32.416 --> 00:18:38.616

<v SPEAKER_4>Because those don't provide that same inertia, they actually, they depend on that inertia.

00:18:38.616 --> 00:18:40.776

<v SPEAKER_4>So they're called grid-following resources.

00:18:41.116 --> 00:18:47.216

<v SPEAKER_4>And so the electronics, the power electronics, were designed to say, hey, we're going to get that support from the system.

00:18:47.216 --> 00:18:54.496

<v SPEAKER_4>And if we don't see adequate support from the system, we'll just turn off, we'll just disconnect to protect our units.

00:18:56.056 --> 00:19:00.096

<v SPEAKER_4>That didn't, that wasn't a problem when you had a system that was dominated by synchronous resources.

00:19:00.096 --> 00:19:09.696

<v SPEAKER_4>But what's happened, and this is what's happened in Alberta specifically is over time, especially with policy incentives and with out of market incentives.

00:19:09.796 --> 00:19:26.836

<v SPEAKER_4>So like power purchase arrangements for green energy, for clean credits, carbon credits, all of those things started to drive the development of inverter based resources, wind and solar in Alberta, because you can build those things here.

00:19:26.836 --> 00:19:28.876

<v SPEAKER_4>And they were decoupled from supply and demand.

00:19:28.876 --> 00:19:42.256

<v SPEAKER_4>So a lot of those built not in response to the need for new supply because of our demand growing, but because Google wanted a PPA for green power, or clean electricity credits.

00:19:42.256 --> 00:19:50.356

<v SPEAKER_4>So what we started to see was a decoupling of supply and demand, and the supply that was being built was largely inverter based.

00:19:50.356 --> 00:20:06.596

<v SPEAKER_4>And so what that has translated to in the operational sense is there are many times when our demand, like our actual in Alberta demand is being met with up to 30 to 50% of inverter based resources.

00:20:06.596 --> 00:20:10.916

<v SPEAKER_4>What that means is now the frequency response of the system drops significantly.

00:20:10.916 --> 00:20:23.496

<v SPEAKER_4>And so the system has a hard time if there's a disturbance trying to maintain adequate frequency and it's exacerbated by if we're not connected to BC.

00:20:23.496 --> 00:20:25.376

<v SPEAKER_4>So we have one large intertie to BC.

00:20:25.376 --> 00:20:36.576

<v SPEAKER_4>We actually have three interties, but there are two very small lines that don't contribute a lot, but we have one large alternating current, 500 kilovolt intertie to BC.

00:20:36.576 --> 00:20:47.656

<v SPEAKER_4>When that intertie is in service, we basically benefit from the frequency response, all that inertia from whack, from the entire region, because it connects us into the entire region.

00:20:47.656 --> 00:21:00.536

<v SPEAKER_4>When that intertie is out of service, we have to kind of fend for ourselves, we're an electrical island, because even though we have a DC connection, HVDC connection to Saskatchewan, it actually doesn't provide that frequency support.

00:21:00.536 --> 00:21:10.116

<v SPEAKER_4>So, we saw this in, we saw a really stark demonstration of this last year, when they had the outage for the intertie, the BC intertie.

00:21:10.116 --> 00:21:12.736

<v SPEAKER_4>Normal maintenance outage usually happens in the fall.

00:21:12.736 --> 00:21:29.236

<v SPEAKER_4>When this happened last year, we had, I want to say, 27 or 28 frequency excursions, because it just shows you, we had some windy, sunny days, and it just shows you how much our frequency response has degraded in Alberta when we're left to our own.

00:21:29.236 --> 00:21:39.536

<v SPEAKER_4>So, yeah, we've got an issue here, and this is really something that hopefully this new market redesign, which I think we're going to talk about later, will help address.

00:21:39.536 --> 00:21:46.936

<v SPEAKER_2>Well, I was going to go there now, and it's about policy, and let's touch on that redesign.

00:21:46.936 --> 00:21:59.276

<v SPEAKER_2>For those who are unaware, the government of Alberta via the Alberta Electrical System Operator, ASO, is currently developing a new system for how the electrical market will operate.

00:21:59.276 --> 00:22:01.596

<v SPEAKER_2>Because it comes down to that, right?

00:22:01.596 --> 00:22:03.596

<v SPEAKER_2>It becomes a market thing.

00:22:04.636 --> 00:22:09.376

<v SPEAKER_2>People only want to pay so much for electricity, which should be reasonably priced.

00:22:09.376 --> 00:22:11.676

<v SPEAKER_2>Jason, what caused the government...

00:22:11.676 --> 00:22:17.456

<v SPEAKER_2>You've kind of started on how the government has to consider these changes, and where are we in that process?

00:22:19.056 --> 00:22:19.416

<v SPEAKER_4>Yeah.

00:22:21.316 --> 00:22:26.456

<v SPEAKER_4>So, let's go back to why we're doing this, right?

00:22:26.456 --> 00:22:28.196

<v SPEAKER_4>So, you look...

00:22:28.196 --> 00:22:29.076

<v SPEAKER_4>And this is really...

00:22:29.316 --> 00:22:32.936

<v SPEAKER_4>This follows beautifully, right, from the discussion we're having about frequency.

00:22:34.396 --> 00:22:47.976

<v SPEAKER_4>When Alberta's market deregulated in the mid-90s, at the time, and it's like we were talking about with frequency, at the time, all the generators kind of looked the same, right?

00:22:47.976 --> 00:22:49.336

<v SPEAKER_4>They're all synchronous.

00:22:50.736 --> 00:23:01.116

<v SPEAKER_4>There weren't all these kind of, let's call them, out-of-market incentives, like, you know, generators weren't selling their power to corporations under PPAs because they could get credits for it or anything.

00:23:01.116 --> 00:23:02.696

<v SPEAKER_4>It was pretty simple, right?

00:23:02.696 --> 00:23:08.716

<v SPEAKER_4>You had supply and demand fundamentals that were driving, you know, the need for electricity and what gets built when.

00:23:10.356 --> 00:23:15.336

<v SPEAKER_4>And the technologies for generating were all pretty homogenous, right?

00:23:15.336 --> 00:23:16.896

<v SPEAKER_4>They all look pretty similar.

00:23:16.896 --> 00:23:29.016

<v SPEAKER_4>And so the rules for the market were written under, you know, predicated on those assumptions that, you know, and it wasn't really stated because, you know, nobody thought that you had to state it back then.

00:23:29.016 --> 00:23:36.516

<v SPEAKER_4>But it was really that, you know, supply and demand or supply and demand fundamentals would drive the market.

00:23:36.516 --> 00:23:37.376

<v SPEAKER_4>Things would be built.

00:23:37.876 --> 00:23:41.436

<v SPEAKER_4>Generators would be built in response to demand signals.

00:23:41.436 --> 00:23:45.476

<v SPEAKER_4>And that the technical characteristics of all these

generators were similar.

00:23:45.476 --> 00:23:55.136

<v SPEAKER_4>And that, you know, long term, like environmental policies and those kind of things, would more or less be a secondary consideration.

00:23:55.136 --> 00:23:59.316

<v SPEAKER_4>So that worked well for about, you know, 25 years.

00:23:59.316 --> 00:24:08.776

<v SPEAKER_4>But then things started to change and you started to see, you know, a shift in public sentiment, political sentiment towards green resources.

00:24:08.776 --> 00:24:14.796

<v SPEAKER_4>That meant a shift in the type of technologies that we use for the grid.

00:24:14.796 --> 00:24:24.436

<v SPEAKER_4>And that then led to the situation we have today, where suddenly now corporations started wanting to buy green power.

00:24:24.436 --> 00:24:27.456

<v SPEAKER_4>They wanted to buy clean credits.

00:24:27.456 --> 00:24:30.116

<v SPEAKER_4>And you had supply and demand decoupled.

00:24:30.716 --> 00:24:40.096

<v SPEAKER_4>You know, so what was being built in Alberta was not now tightly coupled to either the price signal in the market or the supply and demand fundamentals.

00:24:40.096 --> 00:24:44.816

<v SPEAKER_4>It was being built in response to out of market forces.

00:24:44.816 --> 00:24:59.816

<v SPEAKER_4>And that decoupling and the technical change in characteristics of the generating fleet is really what led to our market no longer really incenting the correct generation mix to meet supply and demand in real time.

00:24:59.936 --> 00:25:02.136

<v SPEAKER_4>So, you know, we've seen that in Alberta, right?

00:25:02.136 --> 00:25:07.456

<v SPEAKER_4>We've all seen those of us who live here see all kinds of problems over the last few years.

00:25:07.456 --> 00:25:21.216

<v SPEAKER_4>And that's really been because we were not getting at times, we're not getting the right generation with the right characteristics, incented through our market design to provide power at the right times.

00:25:21.216 --> 00:25:32.976

<v SPEAKER_4>So that really led to a realization a couple of years ago, kind of at the, you know, between the ISO, the AUC, the Market Surveillance Administrator and the government, that we had to do something.

00:25:32.976 --> 00:25:52.796

<v SPEAKER_4>We had to change the rules and we had to think about what is the future going to look like with this new type of generation, with the direction environmental regulations are going, and how are we going to maintain a sustainable market design, not only economically, because there's another effect there and that's prices.

00:25:52.796 --> 00:26:01.896

<v SPEAKER_4>Prices have been relatively low and that's because the energy, the wind power and solar power is actually offered in at \$0.

00:26:01.896 --> 00:26:04.176

<v SPEAKER_4>It's a price taker because you can't really control it.

00:26:04.176 --> 00:26:08.236

<v SPEAKER_4>So they offer it in and say, we'll take whatever price you give us.

00:26:08.236 --> 00:26:10.156

<v SPEAKER_4>How you do that in our market is you offer at zero.

00:26:10.596 --> 00:26:19.796

<v SPEAKER_4>But when you offer at zero and then everybody offers at zero that looks the same as you and we have a whole bunch of wind and a whole bunch of sun, suddenly that price becomes very low.

00:26:19.796 --> 00:26:26.816

<v SPEAKER_4>And those who have operating costs, thermal generators, they're having a hard time being economically competitive.

00:26:26.816 --> 00:26:34.956

<v SPEAKER_4>So how do we create a market that's not only economically sustainable but provides reliability to us as well?

00:26:34.956 --> 00:26:37.736

<v SPEAKER_4>Because none of this matters if we don't have reliability.

00:26:37.836 --> 00:26:41.796

<v SPEAKER_4>If the lights go out, all bets are off and you're not worried about a market anymore.

00:26:41.796 --> 00:26:45.916

<v SPEAKER_4>Now you're just trying to turn things on and keep people safe.

00:26:45.916 --> 00:26:49.596

<v SPEAKER_1>Hi, I'm Dave Perry, the President and CEO of The Canadian Global Affairs Institute.

00:26:49.596 --> 00:26:54.096

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

00:26:54.096 --> 00:27:03.176

<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.

00:27:03.736 --> 00:27:09.316

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

00:27:09.316 --> 00:27:11.796

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

00:27:13.356 --> 00:27:28.316

<v SPEAKER_3>I guess one of the ways you could see it from a traditional economics perspective is that these big thermal generators, the non-inverter resources, the ones that have the big spinning wheels, they're providing a huge positive externality.

00:27:28.316 --> 00:27:39.536

<v SPEAKER_3>So they're providing a huge service to the grid that they're not getting compensation for and so when they get undermined, that huge positive externality goes away.

00:27:41.996 --> 00:27:53.656

<v SPEAKER_3>So you do need to think about market design here to make sure that those services are recognized as important parts of the grid to keep them operating for sure.

00:27:54.716 --> 00:28:16.736

<v SPEAKER_3>Yeah, but I'd like to get a little bit into cross-Canada policy and I think that there's big interactions here for sure in terms of what you were saying a little bit about how there's kind of this political favoritism towards certain types of resources and how

this is kind of causing some unintended consequences in actual energy reliability.

00:28:16.736 --> 00:28:20.956

<v SPEAKER_3>And specifically this about the federal clean electricity regulations.

00:28:21.756 --> 00:28:34.716

<v SPEAKER_3>So we've talked about these regulations on the podcast before, not in any sort of detail, but more talking about how this is kind of in some ways an intrusion into traditional provincial policy and that there's a lot of uncertainties around it.

00:28:34.716 --> 00:28:39.336

<v SPEAKER_3>But I'm really interested in getting your views on these policies, Jason.

00:28:39.336 --> 00:28:44.676

<v SPEAKER_3>So what is the current state of the federal clean electricity regulations?

00:28:44.676 --> 00:28:49.456

<v SPEAKER_3>And what effect do you see them having on Canada's electricity grids?

00:28:50.876 --> 00:28:55.396

<v SPEAKER_4>So, yeah, the clean electricity regulations, they actually went into law.

00:28:55.396 --> 00:29:00.156

<v SPEAKER_4>So they are now, they're gone beyond just a proposal.

00:29:01.256 --> 00:29:04.396

<v SPEAKER_4>They did ascend into law.

00:29:06.076 --> 00:29:23.356

<v SPEAKER_4>So essentially, I guess, to keep it simple, right, they kick in in 2035, and at that point, they start to impose pretty significant restrictions on carbon output from emitting generating resources.

00:29:23.356 --> 00:29:33.116

<v SPEAKER_4>So anything that emits, you know, gas, if there's any coal, we don't have any coal in Alberta anymore, but there are still some jurisdictions that do have coal assets.

00:29:33.116 --> 00:29:45.356

<v SPEAKER_4>Anything that emits, there are going to be significant restrictions beginning in 2035 with the objective of by 2050, having a net zero grid across Canada.

00:29:46.856 --> 00:29:52.076

<v SPEAKER_4>So, you know, what does that mean for thermal jurisdictions like Alberta, Saskatchewan?

00:29:52.076 --> 00:30:01.936

<v SPEAKER_4>Like, you know, I guess when I step back and I think about the CER, I think, you know, again, at a high level, I think it's well-intended, right?

00:30:01.936 --> 00:30:03.556

<v SPEAKER_4>Hey, we should be doing things cleaner.

00:30:03.556 --> 00:30:09.256

<v SPEAKER_4>We should be looking for, you know, better energy efficiency, lower emissions, all those things.

00:30:09.256 --> 00:30:10.076

<v SPEAKER_4>Those are all good things.

00:30:10.076 --> 00:30:21.156

<v SPEAKER_4>Those are things that I think as an industry, the power industry has been doing pretty well over the years, I think, you know, without the need for a federal hand.

00:30:22.396 --> 00:30:26.736

<v SPEAKER_4>But the other problem too is it does start to blur the lines on jurisdiction.

00:30:26.736 --> 00:30:33.596

<v SPEAKER_4>Power planning and power systems have been the jurisdiction of the provinces, you know, that's the way Canada has been structured.

00:30:33.596 --> 00:30:43.256

<v SPEAKER_4>We don't have a NERC per se like we do in the US that has federal jurisdiction over what we do with power systems.

00:30:43.256 --> 00:30:45.896

<v SPEAKER_4>Canada has just said, yeah, we'll adopt NERC.

00:30:45.896 --> 00:30:55.776

<v SPEAKER_4>And really, the feds have kind of stepped out of any kind of electricity industry planning or operations unless you get things crossing provincial borders.

00:30:56.476 --> 00:31:06.936

<v SPEAKER_4>So this now starts to put the federal government into provincial electricity planning and operations, which may or may not be a good thing.

00:31:06.936 --> 00:31:13.076

<v SPEAKER_4>But the reality is that also the CER don't take into account the regional differences.

00:31:13.076 --> 00:31:14.936

<v SPEAKER_4>And that's, I think, where the crux of it is.

00:31:14.936 --> 00:31:26.176

<v SPEAKER_4>So if the CER had just set high level objectives and said, look, each province should work towards these things in a way that makes sense for their context and for the generating resource mix, that might be one thing.

00:31:26.176 --> 00:31:27.956

<v SPEAKER_4>But it's been too prescriptive.

00:31:27.956 --> 00:31:38.296

<v SPEAKER_4>And so thermal jurisdictions like Alberta, like Saskatchewan, that really don't, we're not blessed with the hydro resources that Manitoba, BC, Quebec have.

00:31:39.956 --> 00:31:47.436

<v SPEAKER_4>Sure, we have some wind and solar, but those do not have the same kind of characteristics as we've just discussed as something like hydro.

00:31:49.916 --> 00:32:01.356

<v SPEAKER_4>For us, these clean electricity regulations make it very difficult for us to transition towards something like nuclear because we really don't have any other options other than gas.

00:32:01.356 --> 00:32:18.316

<v SPEAKER_4>I mean, that's really what it's come down to is until we can get economically viable nuclear developed in the west, Alberta and Saskatchewan, it's gas all the time for us for reliability.

00:32:18.316 --> 00:32:21.956

<v SPEAKER_4>Now, there will be, I think, inverter-based resources.

00:32:21.956 --> 00:32:23.856

<v SPEAKER_4>The good thing about power electronics is you can program them.

00:32:24.376 --> 00:32:34.596

<v SPEAKER_4>You can create what are called grid-forming resources that can actually be programmed to provide some reliability services, but that's going to take some time and that's not the listening fleet we have.

00:32:34.596 --> 00:32:47.956

<v SPEAKER_4>So this creates some real reliability challenges for us if the CER go ahead as they are currently written because starting 2035, we're going to have some hard choices to make on are we going to be able to actually do this?

00:32:47.956 --> 00:32:50.676

<v SPEAKER_4>My personal opinion is physically no.

00:32:50.676 --> 00:32:56.956

<v SPEAKER_4>I don't think it's economically or operationally viable to follow those regs in the way they're written right now.

00:32:56.956 --> 00:33:01.816

<v SPEAKER_4>I think we need consideration for the fact that we have different limitations.

00:33:01.916 --> 00:33:06.936

<v SPEAKER_4>If you're Manitoba, if you're BC, if you're Quebec, you don't even care about the CER.

00:33:06.936 --> 00:33:08.896

<v SPEAKER_4>You're basically meeting them already.

00:33:09.916 --> 00:33:15.116

<v SPEAKER_4>I think this puts an undue burden on the provinces that aren't blessed with hydropower.

00:33:16.796 --> 00:33:36.876

<v SPEAKER_4>Hopefully this new Liberal government will rethink that and maybe think a little bit more pragmatically and think about how do we meet these long-term objectives in a way that's economically and operationally viable for provinces that don't have the resource mix or the blessing of resources like Quebec and Manitoba and DC.

00:33:36.876 --> 00:33:41.816

<v SPEAKER_2>I don't know that we could have had a better explanation of where we're at than that, Joe.

00:33:41.816 --> 00:33:45.396

<v SPEAKER_2>It leads to my final question, Jason.

00:33:47.096 --> 00:33:53.136

<v SPEAKER_2>I think it comes from how Joe contacted you.

00:33:53.136 --> 00:34:04.056

<v SPEAKER_2>I'd like to talk about a post you made on LinkedIn arguing that Canada's electrical systems are more synchronized with our American neighbors than with each other.

00:34:04.056 --> 00:34:09.356

<v SPEAKER_2>This makes for the case for Northern interconnections, which are in their infancy.

00:34:09.516 --> 00:34:22.896

<v SPEAKER_2>I guess, when I think about what you've said, that it's sort of like the way fossil fuels are like oil and gas move between the countries.

00:34:22.896 --> 00:34:24.256

<v SPEAKER_2>It's a North-South thing.

00:34:25.236 --> 00:34:30.816

<v SPEAKER_2>Could you unpack your thesis of Northern interconnections for us?

00:34:30.816 --> 00:34:33.196

<v SPEAKER_4>Yeah, I'm glad to, Kelly.

00:34:33.196 --> 00:34:37.816

<v SPEAKER_4>So, this goes back to what we talked about earlier, how the grid kind of evolved over time.

00:34:37.876 --> 00:34:39.256

<v SPEAKER_4>There was no grand plan for the grid.

00:34:40.336 --> 00:34:44.356

<v SPEAKER_4>It was, you know, a lot of engineers and operational people figuring out what didn't work.

00:34:44.676 --> 00:34:55.216

<v SPEAKER_4>And as the grids evolved in all these small jurisdictions and they slowly started interconnecting, we got this bigger and bigger interconnected system.

00:34:55.216 --> 00:35:12.536

<v SPEAKER_4>And so, when decisions were made incrementally over time as to how to break up this big North American behemoth into some bite-sized grids that we could control adequately, nobody really thought around national boundaries.

00:35:12.536 --> 00:35:17.016

<v SPEAKER_4>Nobody thought about energy security and those kind of things.

00:35:17.016 --> 00:35:25.176

<v SPEAKER_4>And it just made sense to break it up into the Western, Eastern, Quebec and Urquhart interconnections.

00:35:26.756 --> 00:35:41.856

<v SPEAKER_4>But when I step back and I look at it and I think, you know, so in my career, you know, I was at Mantevo Hydro for many years, then I came to Alberta, you know, I was in the Eastern interconnect, I was at Manitoba, and, you know, got to kind of see how that interconnect worked.

00:35:41.856 --> 00:36:03.076

<v SPEAKER_4>Then I came to Alberta and, you know, especially doing system planning for the electric system operator here, really got to understand the characteristics of our grid and really got to see what I'd say are some of the limitations of the way, you know, the interconnects in North America, the limitations those interconnects have imposed on Canada.

00:36:03.176 --> 00:36:06.036

<v SPEAKER_4>And I think this maybe goes, ties back nicely to the CER.

00:36:06.036 --> 00:36:15.656

<v SPEAKER_4>So when you think of the clean electricity regs, the government, I think, in its, and again, I'm going to assume this is what they were thinking.

00:36:15.876 --> 00:36:16.796

<v SPEAKER_4>I wasn't in the room.

00:36:16.796 --> 00:36:25.896

<v SPEAKER_4>But I think when you look at the, you read the government's statements around this, you read the way it's written, they're looking at Canada as a whole, right?

00:36:25.896 --> 00:36:32.156

<v SPEAKER_4>They're thinking about Canadian electricity and they want, you know, Canada to be net zero because they're the feds, right?

00:36:32.156 --> 00:36:35.156

<v SPEAKER_4>What they're doing, what they should do is thinking about the big picture.

00:36:35.156 --> 00:36:40.056

<v SPEAKER_4>But what it misses is that Canada has broken up over three interconnects, right?

00:36:40.056 --> 00:36:43.956

<v SPEAKER_4>Between, there's the Quebec Interconnect, the Eastern and the Western Interconnect.

00:36:43.956 --> 00:36:51.436

<v SPEAKER_4>The provinces are fragmented across those interconnects and they can't share all the benefits of their different, you know, diverse power supplies.

00:36:51.436 --> 00:37:03.356

<v SPEAKER_4>So, you know, even though the CER looks at Canada kind of holistically or tries to, it does not take into account the fact that Canada is not electrically a whole.

00:37:03.356 --> 00:37:05.656

<v SPEAKER_4>It is actually very fragmented.

00:37:05.656 --> 00:37:13.076

<v SPEAKER_4>And so, you know, when I think as a system planner, a system operator, and I think about, you know, the benefits.

00:37:13.076 --> 00:37:20.076

<v SPEAKER_4>So, you know, I had the opportunity, the privilege to be a planner in Manitoba Hydro's system.

00:37:20.076 --> 00:37:27.956

<v SPEAKER_4>Seeing, you know, a hydro system and the benefits that hydro provides, hydro synchronous, hydro has storage.

00:37:27.956 --> 00:37:29.436

<v SPEAKER_4>You want to talk about energy storage?

00:37:29.436 --> 00:37:33.776

<v SPEAKER_4>Hydro systems with storage are the world's ultimate battery.

00:37:34.056 --> 00:37:40.216

<v SPEAKER_4>The benefits you get from a hydro system and then blending that with a thermal system are huge.

00:37:40.216 --> 00:37:47.796

<v SPEAKER_4>But we can't really take advantage of those benefits in Canada because, you know, we're separated by the interconnects.

00:37:47.796 --> 00:37:50.016

<v SPEAKER_4>And so, you can't synchronously connect all these things.

00:37:50.016 --> 00:38:07.156

<v SPEAKER_4>So, if you step back and you say, well, if your objective from a federal perspective is actually to create a, you know, a net-zero Canadian electricity system, if your objective is security of supply for Canada, well, then, okay, well, then, let's look at these interconnects and think differently.

00:38:07.156 --> 00:38:10.956

<v SPEAKER_4>And, you know, no, it wouldn't be cheap.

00:38:10.956 --> 00:38:12.196

<v SPEAKER_4>It would take some planning.

00:38:12.196 --> 00:38:13.856

<v SPEAKER_4>It would take some coordination.

00:38:13.856 --> 00:38:16.136

<v SPEAKER_4>But it's technically feasible.

00:38:16.136 --> 00:38:20.376

<v SPEAKER_4>And what you could do is you could say, look, we could create a northern interconnect.

00:38:20.376 --> 00:38:27.436

<v SPEAKER_4>And that northern interconnect could connect BC, Alberta, Saskatchewan, Manitoba, Ontario.

00:38:28.476 --> 00:38:40.476

<v SPEAKER_4>Now, you know, I think once you got beyond that, the maritime provinces in Quebec, I think you might get into the problems they had, like I discussed earlier, where the controllability of a grid that big might be tough.

00:38:40.476 --> 00:39:09.256

<v SPEAKER_4>So, but I do think, you know, if you step back and you look at it, it is feasible, I believe, technically, to interconnect probably at least the, you know, Manitoba West and potentially, you know, Ontario, Manitoba, Saskatchewan, Alberta, DC and maybe interconnect the maritime provinces with Quebec and have a, you know, expand the Quebec interconnection and then create a northern interconnection.

00:39:09.256 --> 00:39:15.436

<v SPEAKER_4>And then I'm not saying you separate from the US., but I'd say you now make those lines into HVDC lines.

00:39:15.436 --> 00:39:19.296

<v SPEAKER_4>And now you're not synchronized to the US., you're synchronized across Canada.

00:39:19.296 --> 00:39:20.036

<v SPEAKER_4>What does that do?

00:39:20.036 --> 00:39:29.116

<v SPEAKER_4>Hey, that allows us to get the full benefits of a synchronized grid and all that it entails across all of the provinces.

00:39:29.116 --> 00:39:45.016

<v SPEAKER_4>And then you do start to get, then you talk about energy security, then you actually, I think, do have a chance to be, let's say, supply secure in Canada, because we do have, if you look across

the provinces, we've got all the resources, right?

00:39:45.016 --> 00:39:53.676

<v SPEAKER_4>The center of Canada, or not the center, but I guess the west with Saskatchewan and Alberta, we've got thermal, we've got gas, there's uranium.

00:39:53.676 --> 00:40:09.136

<v SPEAKER_4>So once we get to a point where we have viable nuclear, you got uranium in Saskatchewan, you've got hydro in BC, you've got hydro in Manitoba, you've got hydro and nuclear in Ontario, right?

00:40:09.136 --> 00:40:12.456

<v SPEAKER_4>So think of the strength you could have there, right?

00:40:12.456 --> 00:40:17.796

<v SPEAKER_4>Now, and this isn't political, I noticed some of the comments in my post, while you're politicizing it.

00:40:17.796 --> 00:40:18.476

<v SPEAKER_4>I don't see it that way.

00:40:18.476 --> 00:40:37.556

<v SPEAKER_4>I see it more as, if we think a little bit more, when you look at the grid and be a little bit more deliberate, maybe than we had been with the interconnects over time, and you think about national energy security, this is where I think a northern interconnect makes a lot of sense, because we've already got a Quebec interconnect.

00:40:38.856 --> 00:40:47.856

<v SPEAKER_4>And I think it's something to give some serious thought to, because like I said, it wouldn't be cheap, but it's not infeasible.

00:40:49.176 --> 00:40:57.276

<v SPEAKER_3>Yeah, I'd say that you understand usually for most countries, the base case is that the entire country is interconnected, right?

00:40:57.276 --> 00:41:03.016

<v SPEAKER_3>So it's not unreasonable for us to say, hey, we want our own kind of interconnection.

00:41:03.016 --> 00:41:10.916

<v SPEAKER_3>And it's not even necessarily for sovereignty's sake with relations to the United States, but it just makes sense.

00:41:10.916 --> 00:41:20.196

<v SPEAKER_3>And I think this is an idea that we've been talking

about, this idea of making these huge HVDC lines across Canada.

00:41:20.196 --> 00:41:27.556

<v SPEAKER_3>But just like, just having this change in our focus, I think, you know, makes quite a bit more sense to me, at least.

00:41:27.556 --> 00:41:28.176

<v SPEAKER_4>It does, right?

00:41:28.176 --> 00:41:31.216

<v SPEAKER_4>Because our power systems are AC systems, right?

00:41:31.216 --> 00:41:32.716

<v SPEAKER_4>Like it or not, they're AC systems.

00:41:32.716 --> 00:41:43.276

<v SPEAKER_4>So, you know, I've been since I started in my career at NINESOBA Hydro, we were talking about, you know, cross Canada lines and they have to be HVDC because of this, because of the interconnects.

00:41:43.696 --> 00:41:53.276

<v SPEAKER_4>And, you know, well, that would allow us to move actually like energy between provinces, it does not provide the same benefits as a synchronized grid.

00:41:53.276 --> 00:42:06.676

<v SPEAKER_4>And so if you're going to spend the billions of dollars to do some kind of big, long cross Canada HVDC, well, why not maybe think a little bit differently and redirect those billions of dollars to basically creating a synchronized Canada?

00:42:06.676 --> 00:42:17.096

<v SPEAKER_4>And I think that to me then really opens the door for fully realizing the benefits of the variety of resources we have.

00:42:17.096 --> 00:42:19.436

<v SPEAKER_4>Because Canada is blessed with all the generating resources.

00:42:19.436 --> 00:42:26.856

<v SPEAKER_4>Like as a former integrated resource planner in Manitoba, you know, like market people, put your earmuffs on.

00:42:26.856 --> 00:42:34.196

<v SPEAKER_4>But you know, if I had my way, like I would love to do, you know, a Western Canada integrated resource plan.

00:42:34.316 --> 00:42:41.516

<v SPEAKER_4>When you think of the hydro resources in BC, you think of

thermal in Saskatchewan and Alberta.

00:42:41.516 --> 00:42:57.196

<v SPEAKER_4>Blending those things in an optimal way, like I mean, putting markets aside, putting regulatory boundaries aside, you know, from a pure planner perspective, we have this richness of resources that we could take advantage of, especially if you brought Manitoba into the mix.

00:42:57.196 --> 00:42:59.236

<v SPEAKER_4>But you know, then reality kicks in, right?

00:42:59.236 --> 00:43:01.096

<v SPEAKER_4>You get a market structure in Alberta.

00:43:01.096 --> 00:43:06.556

<v SPEAKER_4>The provinces make more money selling to the US., quite honestly, than they do selling to each other.

00:43:06.556 --> 00:43:10.516

<v SPEAKER_4>Because, you know, if you want to know where the electrons go, follow the money, right?

00:43:10.516 --> 00:43:11.756

<v SPEAKER_4>And that's, they're all flowing south.

00:43:11.756 --> 00:43:18.876

<v SPEAKER_4>So, you know, there's some big barriers there as far as, you know, regulatory jurisdictions, as far as market structures.

00:43:18.876 --> 00:43:22.876

<v SPEAKER_4>But I do think this is a long term, you know, you have to think long term.

00:43:22.876 --> 00:43:27.236

<v SPEAKER_4>And when I hear Carney talk about nation building projects, I think, well, here's one we should consider.

00:43:27.236 --> 00:43:36.076

<v SPEAKER_4>Here's one that I think, if we turn our minds to this, I think this could set Canada up for a really robust, long term electricity future.

00:43:36.076 --> 00:43:45.196

<v SPEAKER_2>You know, when I talk to think about energy security, and Joe has heard this diatribe so many times, you know, it really isn't all of the above solution.

00:43:45.196 --> 00:43:54.336

<v SPEAKER_2>And when central planning just pushes the most reliable

thermal generating facilities to the side and say, you got to get rid of those.

00:43:54.336 --> 00:43:55.276

<v SPEAKER_2>Really, that's what they said.

00:43:56.356 --> 00:44:02.176

<v SPEAKER_2>Or find a way to uneconomically make them net zero.

00:44:02.556 --> 00:44:14.156

<v SPEAKER_2>It just drives me crazy because there's such an opportunity to facilitate full expansion into a really, really reliable system that uses all of it.

00:44:14.156 --> 00:44:20.856

<v SPEAKER_2>And I can't thank you enough, Jason, for coming on our podcast.

00:44:21.936 --> 00:44:30.016

<v SPEAKER_2>I've learned more this morning, I think, Joe, than we've, or there's been more, better information here than we've had for a long time.

00:44:30.016 --> 00:44:43.596

<v SPEAKER_2>And I think you really helped us and our listeners understand the complexities, but also the opportunities of full integration across the country tied to a system where you can sell power, sell it out.

00:44:43.596 --> 00:44:48.156

<v SPEAKER_2>If it's always prepared to pay for it, let them buy it.

00:44:48.156 --> 00:44:51.516

<v SPEAKER_2>You know, it's been very fulfilling.

00:44:51.516 --> 00:44:52.076

<v SPEAKER_2>Thanks so much.

00:44:52.796 --> 00:44:53.516

<v SPEAKER_4>Oh, yeah.

00:44:53.516 --> 00:44:54.136

<v SPEAKER_4>Glad to be here.

00:44:54.136 --> 00:44:55.716

<v SPEAKER_4>Thanks for the opportunity, guys.

00:44:55.716 --> 00:44:56.336

<v SPEAKER_3>Yeah, for sure.

00:44:56.336 --> 00:44:59.376

<v SPEAKER_3>And one last question before we finish up the podcast here.

00:44:59.376 --> 00:45:01.956

<v SPEAKER_3>And this is something our listeners are always interested in.

00:45:01.956 --> 00:45:04.636

<v SPEAKER_3>Jason, what are you reading these days?

00:45:04.636 --> 00:45:10.036

<v SPEAKER_3>Ideally, for pleasure, but I know that sometimes people can only read technical works.

00:45:11.616 --> 00:45:13.596

<v SPEAKER_4>Well, actually, you know, that's a good question.

00:45:13.596 --> 00:45:19.576

<v SPEAKER_4>So three books come to mind, recent books I've read.

00:45:19.576 --> 00:45:24.396

<v SPEAKER_4>Exorbitant Privilege by Barry Eichengreen.

00:45:24.396 --> 00:45:31.496

<v SPEAKER_4>And it's really about, you know, the dollar being the currency.

00:45:31.496 --> 00:45:32.876

<v SPEAKER_3>Yeah, the world's reserve currency.

00:45:32.876 --> 00:45:34.396

<v SPEAKER_4>The world's reserve currency, yeah.

00:45:34.396 --> 00:45:39.156

<v SPEAKER_4>And, you know, fascinating history of how we got to that point.

00:45:39.156 --> 00:45:42.376

<v SPEAKER_4>And, you know, will that change?

00:45:42.376 --> 00:45:43.316

<v SPEAKER_4>Yeah, what's the alternative?

00:45:43.396 --> 00:45:46.676

<v SPEAKER_4>So anyway, I found that a fascinating book.

00:45:46.676 --> 00:45:50.276

<v SPEAKER_4>Another recent one I thought was fascinating was The Victorian Internet.

00:45:50.276 --> 00:45:54.076

<v SPEAKER_4>And it's by Tom Standage.

00:45:54.076 --> 00:45:58.556

<v SPEAKER_4>And it's really about the development of the telegraph.

00:45:58.556 --> 00:46:16.476

<v SPEAKER_4>And when you look at that and you look at some of the incredible things like subsea cables in the 1800s, it just, you know, it's interesting to see how that developed and some of the parallels to the Internet and communications technologies today.

00:46:16.476 --> 00:46:19.356

<v SPEAKER_4>So the Victorian Internet was a good one.

00:46:19.356 --> 00:46:26.796

<v SPEAKER_4>And one that I really, really enjoyed, I think I'm going to reread this one, was called The Art of Learning by Josh Waitzkin.

00:46:26.796 --> 00:46:34.756

<v SPEAKER_4>So Josh Waitzkin is, you know, the Search for Bobby Fisher movie, the kid that was the chess prodigy.

00:46:34.756 --> 00:46:36.596

<v SPEAKER_4>Well, that's Josh Waitzkin.

00:46:38.636 --> 00:46:47.076

<v SPEAKER_4>He's got this fascinating life where he went from like a world chess master to like a world martial arts master.

00:46:48.176 --> 00:46:53.176

<v SPEAKER_4>And the book is really, it's called The Art of Learning, and it's really his approach to learning.

00:46:53.176 --> 00:47:07.056

<v SPEAKER_4>And I took a lot of really interesting lessons from that, and I would highly recommend that book to anybody who's interested in learning, which I think probably most of the people listening to this podcast are, or they wouldn't be listening, right?

00:47:08.996 --> 00:47:09.776

<v SPEAKER_3>That's fantastic.

00:47:09.996 --> 00:47:10.856

<v SPEAKER_3>Yep.

00:47:10.856 --> 00:47:13.156

<v SPEAKER_3>Thank you so much, Jason, again, for coming on.

00:47:13.156 --> 00:47:22.976

<v SPEAKER_3>I'm sure this won't be the last time, and, you know, really looking forward to more of your thoughts on this, and on this Northern Interconnection idea, which I find very, very interesting.

00:47:22.976 --> 00:47:24.996

<v SPEAKER_3>So thank you again for coming on.

00:47:24.996 --> 00:47:25.256

<v SPEAKER_4>Great.

00:47:25.256 --> 00:47:26.416

<v SPEAKER_4>Thank you.

00:47:28.836 --> 00:47:34.996

<v SPEAKER_2>Thanks, everyone, for listening to this episode of Energy Security Cubed on the Canadian Global Affairs Podcast Network.

00:47:34.996 --> 00:47:38.856

<v SPEAKER_2>You can find the CGAI Network on iTunes, Spotify and Google Play.

00:47:39.576 --> 00:47:41.696

<v SPEAKER_2>If you like the show, give it a rating.

00:47:41.696 --> 00:47:46.936

<v SPEAKER_2>You can also find the Canadian Global Affairs Institute on Facebook, Twitter and LinkedIn.

00:47:46.936 --> 00:47:52.256

<v SPEAKER_2>If you like this episode and want to help us keep creating content, you can support us by donating at cgai.ca.

00:47:54.596 --> 00:47:58.196

<v SPEAKER_2>Energy Security Cubed is brought to you by our team at CGAI.

00:47:58.196 --> 00:48:03.276

<v SPEAKER_2>Thanks go out to our producer, Joe Calnan and Drew Phillips for providing our music.

00:48:03.276 --> 00:48:04.196

<v SPEAKER_2>I'm Kelly Ogle.

00:48:04.196 --> 00:48:06.196

<v SPEAKER_2>Thanks for joining us on Energy Security Cubed.