WEBVTT

00:00:10.376 --> 00:00:20.916
<v SPEAKER_1>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_1>I'm Kelly Ogle, Managing Director here at CGAI.

00:00:24.596 --> 00:00:32.536
<v SPEAKER_2>And I'm Joe Calnan, Vice President of Energy and Calgary Operations at the Canadian Global Affairs Institute.

00:00:34.996 --> 00:00:47.556
<v SPEAKER_2>For today's interview recorded July 31st, 2025, we discussed some updates to Chinese energy policy, impacts on the ground in China, and some major projects happening in the country.

00:00:47.556 --> 00:00:51.036
<v SPEAKER_2>With us to talk about this is David Fishman.

00:00:51.036 --> 00:00:56.236
<v SPEAKER_2>David is Principal at the Asia Pacific Focused Energy Consultancy at the Lantau Group.

00:00:56.236 --> 00:01:03.796
<v SPEAKER_2>And we also had David on the podcast in the fall of 2023 to talk about Chinese energy policy.

00:01:03.796 --> 00:01:06.676
<v SPEAKER_2>So great to have you on the podcast again, David.

00:01:08.356 --> 00:01:11.536
<v SPEAKER_3>Yeah, thanks for having me back, Joe, good to be here.

00:01:11.536 --> 00:01:22.876
<v SPEAKER_2>So before we get started, I just like to kind of pick your brain a little bit here about kind of an on the ground view of how macro trends are affecting the daily lives of people in China.

00:01:23.056 --> 00:01:28.236
<v SPEAKER_2>So much has been said about the troubles in the Chinese property sector.

00:01:28.236 --> 00:01:30.976
<v SPEAKER_2>Some people also talk about falling birth rates.

00:01:30.976 --> 00:01:37.296
<v SPEAKER_2>On the other hand, we're also seeing some real and nobody

can deny at this point that there's some real economic dynamism coming out of China.

00:01:37.296 --> 00:01:39.356
<v SPEAKER_2>But I just like to get your thoughts.

00:01:39.356 --> 00:01:50.636
<v SPEAKER_2>So where we have this kind of like these macro concerns by the Chinese economy, layered on top of this dynamism that we're seeing, how do you make sense of this seeming contradiction?

00:01:50.636 --> 00:01:54.576
<v SPEAKER_2>And how do you think people in China think about the Chinese economy?

00:01:54.676 --> 00:01:56.816
<v SPEAKER_2>Are they optimistic about it?

00:01:58.236 --> 00:02:02.056
<v SPEAKER_3>Yeah, well, I'll do my best to try to get that one down.

00:02:02.156 --> 00:02:04.096
<v SPEAKER_3>Yeah, I know it's a big question.

00:02:04.116 --> 00:02:05.156
<v SPEAKER_3>Yeah, it's massive.

00:02:05.156 --> 00:02:08.196
<v SPEAKER_3>And there are 1.4 billion Chinese people.

00:02:08.196 --> 00:02:12.536
<v SPEAKER_3>I am never going to try to speak for them or on behalf of all of them.

00:02:12.536 --> 00:02:15.616
<v SPEAKER_3>But what I've noted, I talk to people everywhere, right?

00:02:15.616 --> 00:02:25.776
<v SPEAKER_3>What I've noted is I'm more likely to talk to people who will very overtly say, oh, man, the economy is not where I want it to be right now.

00:02:25.776 --> 00:02:29.436
<v SPEAKER_3>I miss when things were better in some time in the past.

00:02:29.896 --> 00:02:40.956
<v SPEAKER_3>You're more likely to find those types of people in the larger cities, especially the more developed, the larger cities, places where people had a little more wealth and especially real estate wealth.

00:02:40.956 --> 00:02:46.456
<v SPEAKER_3>So this has been really a drag in real estate for the last couple of years.

00:02:46.456 --> 00:02:47.756
<v SPEAKER_3>You could talk about other components.

00:02:47.756 --> 00:02:51.636
<v SPEAKER_3>You could say the trend line has been building in a certain direction for a long time.

00:02:52.356 --> 00:02:58.016
<v SPEAKER_3>But the one where you can really see a break in the trend, a real change is in real estate.

00:02:58.016 --> 00:03:09.596
<v SPEAKER_3>Those with the greatest exposure to real estate are the most likely to be unhappy, and that's in the larger cities for sure, and those who had more real estate, of course, in the first place.

00:03:09.596 --> 00:03:23.936
<v SPEAKER_3>Then when you get out to smaller cities or more rural areas, the conversation tone is a little bit less, the economy is so bad because it's affecting me personally, and a little bit more, oh, I hear things are bad.

00:03:23.936 --> 00:03:32.876
<v SPEAKER_3>I hear that employment is doing something, or I hear that real estate is, they're not real estate investors.

00:03:32.876 --> 00:03:37.236
<v SPEAKER_3>They're not directly impacted necessarily, but they hear things.

00:03:37.236 --> 00:03:41.556
<v SPEAKER_3>So I would say that's how I'd characterize it overall from the people I interact with.

00:03:41.556 --> 00:03:43.836
<v SPEAKER_3>People in first-tier cities, not thrilled.

00:03:44.656 --> 00:03:54.116
<v SPEAKER_3>People in smaller cities or rural areas, more, they're aware, but less perhaps directly affected.

00:03:54.116 --> 00:04:05.496
<v SPEAKER_2>I actually just go off script a little bit here, David, and I can always cut this out if you're, if you feel like you're not completely set to answer this question, but I've often heard about

this kind of tier system in Chinese cities.

00:04:05.496 --> 00:04:12.536
<v SPEAKER_2>Is this just kind of like an informal way of kind of ranking the cities or is this, or is there some actual like policy or law behind that?

00:04:14.076 --> 00:04:33.516
<v SPEAKER_3>Yeah, it's not an official national tier ranking, but it does make sense to try to make sense of the huge population and then huge number of cities and try to understand what is a large medium, small city in the Chinese context, or a well-developed one versus a developing or an underdeveloped one.

00:04:33.516 --> 00:04:38.576
<v SPEAKER_3>The most common tier ranking system is one put out by a financial magazine.

00:04:38.576 --> 00:04:42.176
<v SPEAKER_3>It's kind of like US News and World Report for those college rankings.

00:04:43.056 --> 00:04:46.596
<v SPEAKER_3>It's not official, but it's very influential and everybody pays attention to it.

00:04:46.596 --> 00:04:53.956
<v SPEAKER_3>So there's one from the magazine Yicai, which splits Chinese prefecture-level cities into rankings.

00:04:53.956 --> 00:05:01.956
<v SPEAKER_3>And they have the top tier, then they have the new top tier, the new first tier, just second tier really, and then third, fourth, fifth, all the way down, right?

00:05:01.956 --> 00:05:05.516
<v SPEAKER_3>So yeah, the cities are split up like that.

00:05:05.536 --> 00:05:07.336
<v SPEAKER_3>There are fewer higher-tier cities.

00:05:07.336 --> 00:05:10.296
<v SPEAKER_3>There are more bottom-tier cities, of course.

00:05:10.296 --> 00:05:11.436
<v SPEAKER_3>And it's on a curve.

00:05:11.436 --> 00:05:14.436
<v SPEAKER_3>So there's always a set number of cities in each tier.

00:05:14.436 --> 00:05:20.696
<v SPEAKER_3>So it's not the kind of situation where if you do really well, you'll get upgraded to a higher tier.

00:05:20.696 --> 00:05:24.716
<v SPEAKER_3>It's more of a system to determine how strong they are relative to each other.

00:05:24.716 --> 00:05:26.196
<v SPEAKER_3>And so you can get a sense of trends.

00:05:26.196 --> 00:05:27.476
<v SPEAKER_3>Is a city on the rise?

00:05:27.476 --> 00:05:29.296
<v SPEAKER_3>Is a city stagnating?

00:05:29.296 --> 00:05:30.416
<v SPEAKER_3>Something like that.

00:05:30.416 --> 00:05:34.636
<v SPEAKER_3>And when you do it like that, you can get a strong feeling for, how representative are big cities?

00:05:34.736 --> 00:05:40.456
<v SPEAKER_3>Well, the top 20 cities that are considered the top tier cities, they have about 250 million people.

00:05:40.456 --> 00:05:44.836
<v SPEAKER_3>Okay, so the top cities represent about a fourth to a fifth of the population.

00:05:44.836 --> 00:05:45.896
<v SPEAKER_3>What about the rest?

00:05:46.056 --> 00:05:50.436
<v SPEAKER_3>It's a good tool for understanding demographics like that.

00:05:50.436 --> 00:06:20.016
<v SPEAKER_2>And one of the reasons why I asked that, and this is really going on the script here, but I've heard that one of the ways that China's model for developing these new technologies has gone is that, I've heard that individual Chinese provinces and even individual Chinese cities are often in competition with each other to have their champion in, let's say, auto manufacturing, solar panel manufacturing, maybe even wind turbine, hydrogen, all of these new technologies.

00:06:20.016 --> 00:06:29.776
<v SPEAKER_2>And they compete with each other within China to dominate

the Chinese market and then afterwards to try to dominate the global market with exports.

00:06:30.376 --> 00:06:35.416
<v SPEAKER_2>And so that's kind of how, what I've heard kind of happens in that situation.

00:06:35.416 --> 00:06:46.256
<v SPEAKER_2>And that kind of puts another spin on this, you know, tier list, tier ranking of cities because I'm sure that that's associated with how many resources are available to these different provinces.

00:06:46.256 --> 00:06:50.516
<v SPEAKER_2>But you can correct me if that's a complete misapprehension of how it happens.

00:06:51.076 --> 00:06:58.556
<v SPEAKER_2>Is that in any way similar to what you've kind of seen happening with, let's say, solar panels or batteries?

00:07:00.336 --> 00:07:10.636
<v SPEAKER_3>Well, certainly a city's dynamism or ability to compete into the future will actually be a component for those tier rankings.

00:07:10.636 --> 00:07:25.956
<v SPEAKER_3>So if a city is doing a really good job opening up to encourage high-tech industry to come in, if it has a lot of exposure to, say, electric vehicle manufacturing or solar panels, you would expect that city would be doing well going into the future.

00:07:26.396 --> 00:07:30.256
<v SPEAKER_3>And it would be ranked higher in the tier ranking list on that basis.

00:07:30.256 --> 00:07:32.496
<v SPEAKER_3>And yeah, they're absolutely competing against each other.

00:07:32.496 --> 00:07:38.096
<v SPEAKER_3>They're competing for talent, they're competing for resources, and they are competing for customers.

00:07:38.096 --> 00:07:46.836
<v SPEAKER_3>There's often a misconception that every company in China must be directly orchestrated from all the way at the top, especially if it's a state-owned enterprise.

00:07:46.836 --> 00:07:49.336
<v SPEAKER_3>And that's absolutely not true.

00:07:49.336 --> 00:07:56.056
<v SPEAKER_3>There are many municipal state-owned entities or provincial state-owned entities that are really just doing their own thing.

00:07:56.056 --> 00:08:09.616
<v SPEAKER_3>And they might be competing directly against other state-owned enterprises, again, not national state-owned enterprises, other municipal state-owned enterprises, or private companies for the same customers, the same human talent, the same resources.

00:08:09.616 --> 00:08:14.856
<v SPEAKER_3>And so from this perspective, you could say, you know, it's really not top-down control.

00:08:14.856 --> 00:08:26.016
<v SPEAKER_3>It's more like maybe the national government sketches out the lines of the playing field and sets the rules, and then it's up to the players and the devils to still play the game.

00:08:26.016 --> 00:08:28.836
<v SPEAKER_3>And whoever wins is whoever wins.

00:08:28.836 --> 00:08:34.216
<v SPEAKER_2>Yeah, and I think we'll get into kind of the national level policy in just a moment here.

00:08:34.216 --> 00:08:37.636
<v SPEAKER_2>And this is getting more into the energy side of things.

00:08:37.636 --> 00:08:42.376
<v SPEAKER_2>And we can also talk about the tier levels in terms of your recent visit.

00:08:42.376 --> 00:08:46.696
<v SPEAKER_2>So I'd like to start off with the coal sector in China.

00:08:46.696 --> 00:08:50.256
<v SPEAKER_2>And you recently took a trip to Ordo City in Inner Mongolia.

00:08:50.936 --> 00:09:05.916
<v SPEAKER_2>And this is a city which is involved deeply in the coal industry and of course, Inner Mongolia is a huge producer of coal in China and much of the energy that's needed to power kind of China's industrial system.

00:09:05.916 --> 00:09:09.736
<v SPEAKER_2>So let's start off with the big picture.

00:09:09.736 --> 00:09:14.856
<v SPEAKER_2>What are China's current policies surrounding coal production and consumption?

00:09:14.856 --> 00:09:17.816
<v SPEAKER_2>And what direction do you feel these policies are going in?

00:09:20.256 --> 00:09:22.896
<v SPEAKER_3>Yeah, so coal is being squeezed.

00:09:22.896 --> 00:09:25.756
<v SPEAKER_3>It's been squeezed for a while.

00:09:25.756 --> 00:09:32.876
<v SPEAKER_3>Up until 2023, 2024, coal consumption was still growing across the economy.

00:09:32.876 --> 00:09:43.476
<v SPEAKER_3>It seems to have leveled off now, especially throughout the end of 2024 and so far this year, and that's expected to continue as well, the slow squeeze out of coal.

00:09:43.476 --> 00:09:54.036
<v SPEAKER_3>The coal is so integrated all throughout the economy, so you can squeeze and you can see some reduction, but some reduction means it still plays a very outside role.

00:09:54.036 --> 00:10:08.356
<v SPEAKER_3>Of course, in power generation, but also for steel production, also for petrochemicals, especially coal chemicals where China doesn't have a lot of natural gas, they use coal gasification instead to arrive at the same products.

00:10:08.356 --> 00:10:13.916
<v SPEAKER_3>So there's a huge degree of coal integration all throughout the industrial economy.

00:10:13.916 --> 00:10:17.596
<v SPEAKER_3>So squeezing it a little bit is definitely not the same as a phase down.

00:10:17.596 --> 00:10:20.736
<v SPEAKER_3>I wouldn't use such aggressive phrasing so far.

00:10:20.736 --> 00:10:24.176
<v SPEAKER_3>But certainly in the last few years, there's been a squeeze on coal.

00:10:24.176 --> 00:10:40.416
<v SPEAKER_3>Certainly in the last few years, there were efforts to reduce redundant capacity for mining, reduce redundant capacity for some heavy industrial players that resulted in already in the coal sector shedding some jobs, already resulted in the coal sector winding things down a little bit.

00:10:40.416 --> 00:10:48.556
<v SPEAKER_3>But again, winding things down a little bit versus major decline, we're still looking at two very different narratives there.

00:10:49.896 --> 00:10:54.796
<v SPEAKER_2>And so we'll get a little bit into the employment aspects of this in a moment.

00:10:54.796 --> 00:11:02.456
<v SPEAKER_2>But first of all, I'd like to note that China is continuing to build cold-fired power plants at a fairly fast rate.

00:11:02.456 --> 00:11:11.516
<v SPEAKER_2>For example, China, some data shows China building nearly 100 gigawatts of new coal-fired capacity as of 2024.

00:11:11.616 --> 00:11:18.976
<v SPEAKER_2>You can correct me if any of that data is wrong because I'm not in depth on that set of things.

00:11:18.976 --> 00:11:39.496
<v SPEAKER_2>But last time you came on the podcast, we discussed the shift in Chinese coal power plant designs to be able to accommodate more variability in their production of electricity and therefore their consumption of coal, as with the greater emphasis on flexibility to accommodate renewables.

00:11:40.796 --> 00:11:52.556
<v SPEAKER_2>How do you see this continued growth in coal-fired capacity interacting with the final coal consumption and the real role of coal in the energy system of China?

00:11:54.136 --> 00:12:03.556
<v SPEAKER_3>Yeah, in the interest of fairness, I'll give you two different versions of the future, two visions of the future, and they're a little bit conflicting, right?

00:12:03.556 --> 00:12:15.456
<v SPEAKER_3>So one vision of the future says these new coal plants, it's maybe like 94, maybe some of them gigawatts, maybe some of them get cancelled, a great number of them still get built, right?

00:12:15.456 --> 00:12:19.276

<v SPEAKER_3>And their argument is these are needed in order to integrate the renewables.

00:12:19.636 --> 00:12:30.616
<v SPEAKER_3>So the more renewables we'll build, the less we'll use the coal plants, but also the more necessary it will be to have those coal plants, and it will be impossible to strip them out entirely.

00:12:30.616 --> 00:12:32.876
<v SPEAKER_3>They're there doing load following tasks.

00:12:32.876 --> 00:12:35.336
<v SPEAKER_3>They're there filling in the gaps.

00:12:35.336 --> 00:12:39.976
<v SPEAKER_3>They're designed to be more flexible so they could follow solar, they can follow wind.

00:12:39.976 --> 00:12:41.356
<v SPEAKER_3>You know, that's one version.

00:12:41.356 --> 00:12:51.216
<v SPEAKER_3>And they say, you know, their average capacity factor of the coal fleet keeps dropping, even though the capacity itself, the installed capacity keeps growing.

00:12:51.216 --> 00:13:07.336
<v SPEAKER_3>And thereby, after this year or next year, or certainly by the carbon neutrality, by the carbon peaking deadline of 2030, that it doesn't really matter how much the capacity grows because the consumption of coal and the generation of coal-fired power will keep dropping.

00:13:07.336 --> 00:13:07.556
<v SPEAKER_3>All right.

00:13:07.556 --> 00:13:09.116
<v SPEAKER_3>That's one version of reality.

00:13:09.116 --> 00:13:15.856
<v SPEAKER_3>And that version of the reality we say is that's a reasonable and necessary thing to do to integrate the renewables.

00:13:17.036 --> 00:13:18.536
<v SPEAKER_3>You can't do one without the other.

00:13:18.536 --> 00:13:18.816
<v SPEAKER_3>Okay.

00:13:19.056 --> 00:13:20.616

<v SPEAKER_3>That's one version of it.

00:13:20.616 --> 00:13:28.456
<v SPEAKER_3>A second version of it that someone else might say is, look, we understand that you need to be able to load follow with renewables.

00:13:28.456 --> 00:13:43.616
<v SPEAKER_3>But if you had a more robust transmission and distribution grid, and if you had a more robust market mechanism, you would be able to do all the load following you need to do with the resources you have already because you're already overbuilt enough.

00:13:43.716 --> 00:13:56.556
<v SPEAKER_3>And the reason you're building a coal plant here is because you don't have the market mechanism in place to efficiently allocate some of that unused capacity for that coal plant in that province over there and get it to here to load follow the wind here.

00:13:56.556 --> 00:14:05.896
<v SPEAKER_3>They're saying that the incompleteness of the market mechanism perhaps is incentivizing coal capacity to be built in 2025.

00:14:05.896 --> 00:14:07.856
<v SPEAKER_3>That is just superfluous.

00:14:07.856 --> 00:14:14.456
<v SPEAKER_3>And in a few more years when the market is more mature, or it will be revealed to have been superfluous.

00:14:14.456 --> 00:14:26.356
<v SPEAKER_3>And you're not so concerned about the potential for it to be superfluous because it also has other benefits like, hey, local economic activity, investment in coal plants, right, that it has other benefits.

00:14:26.356 --> 00:14:35.236
<v SPEAKER_3>And so you're incentivized to not worry too much about whether it's superfluous or not, whether it becomes a stranded asset in 10 or 15 years.

00:14:35.236 --> 00:14:37.216
<v SPEAKER_3>So that's the second version of the argument.

00:14:37.416 --> 00:14:54.176
<v SPEAKER_3>And then I will respond finally with a common repartee to that second version of the argument, which is to point out that any coal capacity being built right now is going to be more competitive than existing coal capacity.

00:14:54.176 --> 00:14:55.016
<v SPEAKER_3>It's going to be newer.

00:14:55.016 --> 00:14:56.236
<v SPEAKER_3>It's going to be more flexible.

00:14:56.236 --> 00:14:57.356
<v SPEAKER_3>It's going to be more efficient.

00:14:57.356 --> 00:15:02.816
<v SPEAKER_3>It's going to represent the best of what the technology can offer in 2025.

00:15:02.816 --> 00:15:14.576
<v SPEAKER_3>And so an additional nuance to that is that coal built in 2025 the concern usually is that it's going to be competing with and potentially crowding out renewables.

00:15:14.576 --> 00:15:19.816
<v SPEAKER_3>I see that as a less likely concern, although a little bit, there's a little bit of an issue there.

00:15:19.816 --> 00:15:26.236
<v SPEAKER_3>It's more likely that the new coal spends an awful lot of time competing with and crowding out the old coal.

00:15:26.236 --> 00:15:36.236
<v SPEAKER_3>And that if I were building a coal plant in 2025, my thought is not that I have to outcompete renewables for dispatch, I just have to outcompete the coal plant that was built 15 years ago.

00:15:36.676 --> 00:15:41.036
<v SPEAKER_3>The old, I don't have to run faster than the bear, I just have to run faster than you.

00:15:41.036 --> 00:15:44.496
<v SPEAKER_3>For the coal sector, renewables are coming for our market share.

00:15:44.496 --> 00:15:50.416
<v SPEAKER_3>All I have to do is be better than the other coal plants at providing that load following.

00:15:50.416 --> 00:15:53.676
<v SPEAKER_3>So that's an additional nuance that I think also does play a role here.

00:15:53.676 --> 00:15:59.976
<v SPEAKER_3>And we see a little bit of that logic in who is funding these things in 2025.

00:15:59.976 --> 00:16:05.076
<v SPEAKER_3>Something like 75% of the coal capacity under construction right now is linked to coal miners.

00:16:05.756 --> 00:16:09.496
<v SPEAKER_3>Coal miners are building their own generation capacity.

00:16:09.496 --> 00:16:17.736
<v SPEAKER_3>They're anticipating, number one, they'll still have a market for their coal, but they'll be digging in the future in their own self-generation coal-fired power plant.

00:16:17.736 --> 00:16:23.796
<v SPEAKER_3>And they'll be able to compete incredibly cost-effectively versus everybody else because they secure their own fuel supply.

00:16:23.796 --> 00:16:29.176
<v SPEAKER_3>So I think that's an additional nuance that's also important to imagine is a potential future.

00:16:29.176 --> 00:16:36.396
<v SPEAKER_3>But I'm trying to be honest here and giving you all the different perspectives that people will talk about when they talk about building coal capacity right now.

00:16:36.396 --> 00:16:36.716
<v SPEAKER_2>Yeah.

00:16:36.716 --> 00:16:36.916
<v SPEAKER_2>No.

00:16:36.916 --> 00:16:58.576
<v SPEAKER_2>And having all these perspectives is very important, of course, because I think that, and this is just a facet of the way that we talk about China out here, is that treating it as a monolith of, like you said, just the central government having control over everyone's lives in depth.

00:16:58.576 --> 00:17:03.956
<v SPEAKER_2>But there are a lot of different stakeholders working here, and a lot of different views on all of these things.

00:17:03.956 --> 00:17:07.036
<v SPEAKER_2>So very interesting to get that perspective.

00:17:07.036 --> 00:17:13.516
<v SPEAKER_2>And it's good to know, I was going to have a follow up question there about who's financing these coal-fired power plants.

00:17:13.516 --> 00:17:18.016
<v SPEAKER_2>But if it is these coal production companies, then that does make sense.

00:17:18.136 --> 00:17:25.196
<v SPEAKER_2>The incentives are there for them to maintain their own kind of market for their product.

00:17:25.196 --> 00:17:26.636
<v SPEAKER_2>So that's very interesting.

00:17:28.296 --> 00:17:41.396
<v SPEAKER_2>And I guess, you know, like on the question of who gets crowded out in these sorts of situations, just if you think about, you know, a merit order chart, I hope that most people listen to my podcast and understand what a merit order is.

00:17:41.396 --> 00:17:55.156
<v SPEAKER_2>You know, of course, it's going to be if you put in a new block that's lower cost than the higher cost old coal, it's the things that get shifted off the right side of the chart that end up getting crowded out.

00:17:55.276 --> 00:17:57.996
<v SPEAKER_2>So, very interesting perspective there.

00:17:57.996 --> 00:18:01.576
<v SPEAKER_3>If I can supplement to that a little bit too, right?

00:18:01.576 --> 00:18:16.836
<v SPEAKER_3>So, the merit order is a wonderful tool to understand in a higher level sense, you know, how different types of generation will be treated potentially in the market, then you actually have the reality of a market.

00:18:16.836 --> 00:18:24.256
<v SPEAKER_3>And in an actual market, you have a great big mix of spot market plus medium-term contracts, long-term contracts.

00:18:24.616 --> 00:18:33.836
<v SPEAKER_3>That merit order, as wonderful of a tool as it is, really imagines a world where all generation is available at a spot market situation just all the time, right?

00:18:33.836 --> 00:18:38.156
<v SPEAKER_3>Instantaneously or for the next 15 minute or five minute segment.

00:18:38.156 --> 00:18:44.676

<v SPEAKER_3>What you do get in reality, of course, is that most industrial producers do not want to buy power.

00:18:44.676 --> 00:18:48.096
<v SPEAKER_3>No industrial producer wants to buy power from the spot market.

00:18:48.096 --> 00:18:50.336
<v SPEAKER_3>They want to have a long-term contract for their power.

00:18:50.336 --> 00:18:54.096
<v SPEAKER_3>And incidentally, power generators don't want to sell power into a spot market.

00:18:54.356 --> 00:18:56.736
<v SPEAKER_3>They want to sell power on long-term contracts as well.

00:18:56.736 --> 00:19:03.216
<v SPEAKER_3>Everybody likes stability of the price of electricity, regardless of whether you're on the buying or selling side of it.

00:19:03.216 --> 00:19:10.816
<v SPEAKER_3>Which means you have a lot of incentive to enter into long-term, multi-year or annual power contracts.

00:19:10.816 --> 00:19:24.796
<v SPEAKER_3>When you have long-term contracts and they butt up against the realities of short-term dispatch, you do have the potential for getting into some trouble where a certain type of generation has to happen and it crowds out other types of generation.

00:19:24.796 --> 00:19:36.676
<v SPEAKER_3>I do believe we saw a little bit of that at the end of last year, where long-term contracts for certain types of power, renewables and coal, were all contracted in advance on an annual contract.

00:19:36.676 --> 00:19:41.196
<v SPEAKER_3>They run into the reality of short-term dispatch needs just not being that high.

00:19:41.196 --> 00:19:49.496
<v SPEAKER_3>What happens when you're contracted for all this power on a long-term basis and now you don't need it, you don't need some of it, but you've already signed contracts for it.

00:19:49.796 --> 00:19:53.356
<v SPEAKER_3>Well, you break the contract with somebody is what you do, right?

00:19:53.716 --> 00:20:03.316
<v SPEAKER_3>You have a take or pay situation and you violate whatever contract is cheaper to violate, probably, in order to keep doing your job.

00:20:03.316 --> 00:20:11.816
<v SPEAKER_3>Market purists would argue that as much power as possible should be sold on a spot basis to avoid this kind of thing from happening.

00:20:11.896 --> 00:20:14.896
<v SPEAKER_3>We recognize that some long-term contracting is needed.

00:20:15.776 --> 00:20:28.796
<v SPEAKER_3>Certain types of generators and power buyers need long-term contracting, but the efficiencies of the market will best be realized with as much power in short-term markets as possible.

00:20:28.796 --> 00:20:31.496
<v SPEAKER_3>That's not going to really fly that well in China.

00:20:31.496 --> 00:20:39.156
<v SPEAKER_3>China is going to want stability and reduction of exposure to volatility of power prices and fuel prices as much as possible.

00:20:39.156 --> 00:20:52.456
<v SPEAKER_3>So then you do have a little bit of this political economic market design that is in some cases going to butt up against and butt heads with the desire of the generators.

00:20:52.456 --> 00:21:00.116
<v SPEAKER_3>In a perfect world, the zero marginal dispatch cost wind and solar always get sold and curtailment rates are very low.

00:21:00.116 --> 00:21:03.316
<v SPEAKER_3>In the real world, people like long-term contracts.

00:21:03.316 --> 00:21:04.856
<v SPEAKER_3>Everybody likes long-term contracts.

00:21:04.856 --> 00:21:10.476
<v SPEAKER_3>And when you rely on them a lot, there's the opportunity, the potential to crowd out some of those renewables.

00:21:11.356 --> 00:21:12.896
<v SPEAKER_2>Yeah, that's a very good point, David.

00:21:12.896 --> 00:21:22.336
<v SPEAKER_2>And yeah, that's an important point to make that, you

know, there's a very neoclassical, you know, supply and demand.

00:21:22.336 --> 00:21:26.076
<v SPEAKER_2>You just think about, you know, all-power generation is just a supply curve.

00:21:26.076 --> 00:21:28.636
<v SPEAKER_2>But the reality is much more complicated than that.

00:21:28.636 --> 00:21:42.016
<v SPEAKER_2>And these long-term contracts are really an emblem of the energy security side of things and the not having to worry about where you're going to get your power, not even every day, but every second of every day.

00:21:42.276 --> 00:21:44.956
<v SPEAKER_2>That's some of the people are willing to pay a premium for.

00:21:44.956 --> 00:21:48.776
<v SPEAKER_2>So that's definitely something to integrate here.

00:21:48.776 --> 00:21:58.016
<v SPEAKER_2>But one last question on coal, and we will get a little bit more into power markets in just a second, your Chinese power markets, and the idea is shifting around there.

00:21:58.016 --> 00:22:02.056
<v SPEAKER_2>But one last question on coal before we go to that, and this is on the employment side of things.

00:22:03.356 --> 00:22:14.536
<v SPEAKER_2>There's of course some concern that a rapid phase out of the coal industry in China could result in concentrated risks, risks of unemployment in certain regions and populations.

00:22:14.536 --> 00:22:20.656
<v SPEAKER_2>And I'm sure that you got some sense of this when you were visiting inner Mongolia.

00:22:20.656 --> 00:22:23.276
<v SPEAKER_2>But how are people in China thinking about this shift?

00:22:23.276 --> 00:22:31.316
<v SPEAKER_2>Maybe both people who are directly exposed to the coal sector versus people who are involved in other sectors.

00:22:31.396 --> 00:22:36.656
<v SPEAKER_2>So what's the perspective on the employment side of this?

00:22:36.776 --> 00:22:42.336
<v SPEAKER_3>We've had some small scale, smaller scale pilots already of what this could look like.

00:22:42.336 --> 00:22:51.296
<v SPEAKER_3>There was a phase in the last 2016 to 2020 or so when a lot of surplus capacity in coal and steel was phased out.

00:22:51.296 --> 00:22:54.276
<v SPEAKER_3>And at that time, you had targeted programming.

00:22:54.276 --> 00:23:01.536
<v SPEAKER_3>There was a national fund that could be drawn from to provide re-training support.

00:23:01.536 --> 00:23:14.876
<v SPEAKER_3>Or in some cases, if they were, if the workers were close enough to retirement age, they would just be given bridge, essentially bridge wages until their retirement age was reached.

00:23:14.876 --> 00:23:17.116
<v SPEAKER_3>And that that was sufficient.

00:23:17.116 --> 00:23:21.956
<v SPEAKER_3>And on that smaller scale pilot basis to provide a model for how that could work.

00:23:21.996 --> 00:23:27.976
<v SPEAKER_3>When you're, you're obsoleteing large chunks or good sized chunks of certain industries.

00:23:27.976 --> 00:23:41.776
<v SPEAKER_3>Of course, a lot of the re-training that was done for that specific round was getting out of coal mining and into sectors of the coal supply chain that have more of a future, at least from from this point in 2025.

00:23:41.776 --> 00:23:53.956
<v SPEAKER_3>Things like coal liquids, coal chemicals, which of course are utterly horrible from an environmental perspective, but from an industrial stability perspective, still appear to have a pretty good future in China.

00:23:53.956 --> 00:24:00.296
<v SPEAKER_3>Post 2030 world will indeed be doing more of this, a lot more of this, but it will be getting out of coal entirely.

00:24:00.296 --> 00:24:04.496
<v SPEAKER_3>That re-training can't stay in the greater coal ecosystem.

00:24:04.496 --> 00:24:14.836
<v SPEAKER_3>It would have to be to get over to clean energy generation or installation of some way, and that's going to be more significant re-training, of course.

00:24:14.836 --> 00:24:18.176
<v SPEAKER_3>The Chinese government spends an awful lot of time thinking about this.

00:24:18.556 --> 00:24:37.436
<v SPEAKER_3>If you search for coal, retirement, worker, obsolete, re-training, you search for this in English, you find dozens of articles about it, which means if you search in Chinese, you'll find hundreds of articles about it, from national research laboratories, from industry, from universities.

00:24:37.436 --> 00:24:53.596
<v SPEAKER_3>There's a lot of effort going into preparing for the eventuality and the necessity of re-training large chunks of coal-dependent employment sectors across especially those big provinces, Inter Mongolia, Shanxi and Shanxi.

00:24:54.756 --> 00:25:06.236
<v SPEAKER_3>With these three provinces, you're looking at millions of jobs, perhaps even tens of millions of jobs when you count the indirectly employed via the coal sector.

00:25:06.236 --> 00:25:07.656
<v SPEAKER_3>It's absolutely a main focus.

00:25:07.656 --> 00:25:14.096
<v SPEAKER_3>At this moment, however, from the people I've talked to, there's not that much concern that I had seen yet.

00:25:14.176 --> 00:25:20.716
<v SPEAKER_3>There's an awareness that it's coming, that eventually they will transition to another sector.

00:25:20.716 --> 00:25:24.976
<v SPEAKER_3>You can see surveys out there where they talk about, you know, we think we will be hit hard here.

00:25:24.976 --> 00:25:29.116
<v SPEAKER_3>Yeah, 30 to 50% of people agree that it's going to be rough.

00:25:29.116 --> 00:25:32.676
<v SPEAKER_3>It's going to be difficult for their economic outlook.

00:25:32.676 --> 00:25:37.016
<v SPEAKER_3>But there's also an understanding that we will have the opportunity to retrain.

00:25:37.016 --> 00:25:38.376
<v SPEAKER_3>We just don't know what it is.

00:25:38.376 --> 00:25:39.496
<v SPEAKER_3>It's not clear what it will be.

00:25:40.656 --> 00:25:47.496
<v SPEAKER_3>So, there's a belief that things should turn out OK, but not a lot of clarity on how or what it will be yet.

00:25:47.496 --> 00:25:50.456
<v SPEAKER_3>And I think that's fair because I don't think anybody knows yet.

00:25:51.616 --> 00:25:53.056
<v SPEAKER_2>No, it's very interesting.

00:25:53.216 --> 00:26:04.716
<v SPEAKER_2>It's a shift that, to a certain extent, Alberta also faced kind of this shift where we had a number of cold-fired power plants in Alberta.

00:26:04.716 --> 00:26:08.256
<v SPEAKER_2>And there's a rapid shift from cold-fired power to natural gas-fired power.

00:26:09.236 --> 00:26:16.516
<v SPEAKER_2>But that involved a large number of people who were trained to work in cold-fired power plants having to transition their employment.

00:26:16.516 --> 00:26:19.676
<v SPEAKER_2>So there's some examples of this in Canada as well.

00:26:19.676 --> 00:26:33.556
<v SPEAKER_2>Of course, I'd say overall, Canadian employment shifts, for example, the decline in Canadian manufacturing was handled really poorly and it ended up causing all sorts of political and economic issues for Canada.

00:26:34.116 --> 00:26:41.576
<v SPEAKER_2>So I'd say there's some good examples, but a lot of also not so good examples from Canadian policy.

00:26:41.576 --> 00:26:46.676
<v SPEAKER_2>But I'd like to turn to some shifts in the broader

Chinese power market.

00:26:46.676 --> 00:26:55.556
<v SPEAKER_2>We already touched a bit on this, but I think that it's really important to dig down into what exactly this is and what we can expect from it.

00:26:55.556 --> 00:27:08.956
<v SPEAKER_2>So earlier this year, China's National Development and Reform Commission reformed its power market regulations to move away from a fixed price model for renewable projects to a greater role for the market.

00:27:08.956 --> 00:27:18.136
<v SPEAKER_2>So not a completely free market system, I don't think, but definitely more market oriented, so more free market prices.

00:27:18.136 --> 00:27:32.596
<v SPEAKER_2>But considering the levels of renewables penetration in China, this could have important impacts on Chinese energy systems and on the prospects for continued really rapid renewables adoption.

00:27:32.596 --> 00:27:41.296
<v SPEAKER_2>So David, could you provide a quick explainer on what exactly this change entails in layman's terms for our listeners?

00:27:42.416 --> 00:27:43.016
<v SPEAKER_3>Yeah, sure.

00:27:43.016 --> 00:27:49.636
<v SPEAKER_3>So it was back in February and it was NDRC Document 136.

00:27:49.636 --> 00:27:52.196
<v SPEAKER_3>136 has just been in my head for months now.

00:27:52.196 --> 00:27:54.056
<v SPEAKER_3>All we think about is Document 136.

00:27:54.756 --> 00:28:09.716
<v SPEAKER_3>And Document 136 essentially said that after a certain upcoming cutoff date, and it was June 1st, new build renewables, when they are constructed, they will have to sell their electricity into market channels, into the market.

00:28:09.716 --> 00:28:16.776
<v SPEAKER_3>That could be through long term contracts or if you don't have any through short term, through the spot market, but you are marketized.

00:28:16.776 --> 00:28:20.336

<v SPEAKER_3>Now this contrasted to what they had previously, which was a feed-in tariff.

00:28:20.816 --> 00:28:26.276
<v SPEAKER_3>So when they were constructed previously, there was an agreement on a provincial basis.

00:28:26.276 --> 00:28:29.976
<v SPEAKER_3>It varied across provinces, it varied wind versus solar.

00:28:29.976 --> 00:28:41.596
<v SPEAKER_3>They would say for some fairly high percentage of your generation, at this set price, the local grid company, state grid subsidiary, will buy your electricity.

00:28:41.596 --> 00:28:51.576
<v SPEAKER_3>And maybe it's 80 or 90% of your electricity, and they will do that until your annual lifetime generation hours your quota is met.

00:28:51.576 --> 00:28:53.716
<v SPEAKER_3>We offer a quota over your lifetime.

00:28:53.716 --> 00:28:55.636
<v SPEAKER_3>Once you meet that quota, you sell into the market.

00:28:55.636 --> 00:28:58.776
<v SPEAKER_3>Before that, though, you're good, you're guaranteed.

00:28:58.776 --> 00:29:02.976
<v SPEAKER_3>So when that switched over, the new regime is you sell into markets.

00:29:02.976 --> 00:29:07.616
<v SPEAKER_3>Some of you will be eligible to earn a backstop price.

00:29:07.616 --> 00:29:14.796
<v SPEAKER_3>So you'll be eligible to have a contract for difference signed with the local grid company and whatever you get in the market.

00:29:15.256 --> 00:29:26.836
<v SPEAKER_3>The difference between that and you're agreed upon strike price and your contract for difference will make up the balance, will make you whole on the back end, but you still have to sell into the market.

00:29:26.836 --> 00:29:34.216
<v SPEAKER_3>So this was obviously a very big change for compensation levels, for volume guarantees.

00:29:34.216 --> 00:29:42.836
<v SPEAKER_3>We went from having most of your volume guaranteed to almost none of it or none of it, depending on if you earn some contract for difference volume.

00:29:43.676 --> 00:29:50.296
<v SPEAKER_3>You went from your price, your off-take price being guaranteed, to now your off-take price being guaranteed by the market.

00:29:50.296 --> 00:29:52.776
<v SPEAKER_3>And then we also went in terms of market function.

00:29:52.776 --> 00:30:05.296
<v SPEAKER_3>We introduced all these new market actors who are now behaving in the market and changing what the prices in the market are going to do, because even if you have a contract for difference on the back end, you're still selling into that market.

00:30:05.296 --> 00:30:14.596
<v SPEAKER_3>So in one fell swoop, it really made these huge changes, both for generators, power buyers and market operators.

00:30:14.596 --> 00:30:20.976
<v SPEAKER_3>And so of course, if you had projects in your build pipeline, you tried to pull them forward as much as possible.

00:30:20.976 --> 00:30:23.576
<v SPEAKER_3>You don't want to be exposed to all that marketization.

00:30:23.576 --> 00:30:30.676
<v SPEAKER_3>We saw incredible numbers, especially in April and May, especially in May, trying to get ahead of that June 1st deadline.

00:30:30.676 --> 00:30:35.316
<v SPEAKER_3>You might have seen 93 gigawatts of solar in May, one month alone.

00:30:35.316 --> 00:30:36.256
<v SPEAKER_3>Incredible numbers.

00:30:36.616 --> 00:31:00.516
<v SPEAKER_3>That's all those project developers pulling forward projects that were originally intended to be built in June, July, August, who knows, all just accelerating them forward to May, so they can be categorized as pre-existing projects and be subject to the pre-existing policies and not be categorized as incremental projects that are subject to the new policies.

00:31:01.676 --> 00:31:09.696
<v SPEAKER_2>Just to cut you off, David, I can just imagine the solar

panel manufacturers suddenly having to actually get all these panels out the door all at once.

00:31:10.196 --> 00:31:10.996
<v SPEAKER_3>Absolutely.

00:31:10.996 --> 00:31:12.996
<v SPEAKER_3>They had a very busy couple of months.

00:31:12.996 --> 00:31:17.696
<v SPEAKER_3>Remember, there's a lot of overcapacity on the production side in China.

00:31:17.696 --> 00:31:23.156
<v SPEAKER_3>I think for a couple months, they actually were at capacity, maybe for the first time in a while.

00:31:23.316 --> 00:31:27.936
<v SPEAKER_3>Then EPC capabilities would have been stretched to their absolute limit.

00:31:28.316 --> 00:31:37.056
<v SPEAKER_3>They probably brought on tens of thousands, hundreds of thousands maybe of temporary workers to be installing all those solar panels in the month of May.

00:31:37.156 --> 00:31:43.776
<v SPEAKER_3>I imagine there might have been a million people in China, actually a million people installing solar panels in the month of May.

00:31:43.776 --> 00:31:46.156
<v SPEAKER_3>Then of course, they all go on vacation in June.

00:31:46.156 --> 00:31:49.556
<v SPEAKER_3>The project pipeline is totally exhausted or almost totally exhausted.

00:31:49.556 --> 00:31:52.656
<v SPEAKER_3>Three months of projects were all crammed into one month.

00:31:52.656 --> 00:31:55.616
<v SPEAKER_3>Then June rolls around and we're in a bit of a weird state right now.

00:31:55.736 --> 00:31:59.316
<v SPEAKER_3>We're at the end of July now where we're recording now.

00:31:59.316 --> 00:32:03.536
<v SPEAKER_3>None of the provinces have held their CFD auctions yet.

00:32:03.536 --> 00:32:12.996
<v SPEAKER_3>They're supposed to hold an auction to determine how much volume and at what price they're willing to backstop some of those market sales.

00:32:12.996 --> 00:32:20.996
<v SPEAKER_3>Some provinces came out and said, we're not going to offer any CFD guarantees, we don't need any more.

00:32:20.996 --> 00:32:25.256
<v SPEAKER_3>Those decisions were linked to whether or not they already have curtailment risks in their province.

00:32:25.736 --> 00:32:28.636
<v SPEAKER_3>We have no need to guarantee any more.

00:32:28.636 --> 00:32:35.296
<v SPEAKER_3>If you want to build and sell into the market, you're welcome to, but we're not offering any CFD backstopping.

00:32:35.296 --> 00:32:38.536
<v SPEAKER_3>Some provinces said, we are going to have auctions.

00:32:38.536 --> 00:32:42.556
<v SPEAKER_3>Here are the rules for our auctions, but then they were delayed and they ended up not holding them yet.

00:32:42.776 --> 00:32:50.056
<v SPEAKER_3>I think as of now, they still haven't hold like places like Shandong and Guangdong have not held their capacity auctions yet.

00:32:50.056 --> 00:32:58.896
<v SPEAKER_3>Maybe it will turn out that for 2025, none of the provinces really felt like they needed to offer any policy incentives to build.

00:32:58.896 --> 00:33:00.976
<v SPEAKER_3>If you want to build, it's up to you.

00:33:00.976 --> 00:33:03.016
<v SPEAKER_3>We don't need any more this year.

00:33:03.016 --> 00:33:09.336
<v SPEAKER_3>In theory, how much they are willing to backstop will be linked to the Provincial Renewable Portfolio Standard.

00:33:09.396 --> 00:33:13.356
<v SPEAKER_3>They have a Renewable Consumption Quota, an RPS, in each province.

00:33:13.436 --> 00:33:28.136
<v SPEAKER_3>They'll say, in case we weren't going to build enough to meet the local consumption quota, we will backstop, we will offer the CFD to enough capacity to the extent that we can guarantee we can hit our quota and then no more.

00:33:28.136 --> 00:33:29.616
<v SPEAKER_3>So what do you do if you're a builder, right?

00:33:29.616 --> 00:33:32.436
<v SPEAKER_3>You got to find some semblance of certainty.

00:33:32.436 --> 00:33:34.096
<v SPEAKER_3>How do you get financed, right?

00:33:34.096 --> 00:33:36.796
<v SPEAKER_3>How do financiers look at your project now?

00:33:36.796 --> 00:33:40.076
<v SPEAKER_3>And this is where new offtake models come into play, right?

00:33:40.076 --> 00:33:49.116
<v SPEAKER_3>Now we're actually looking at PPAs as being a potentially mainstream power transaction mechanism, where it was very marginalized previously, very rare.

00:33:49.116 --> 00:33:54.336
<v SPEAKER_3>And we're able to say, if you're a large power buyer, generators are looking for you.

00:33:54.796 --> 00:34:01.196
<v SPEAKER_3>They'd love to secure you as a customer for 3, 5, 10 years, because that's the only way they can get their project financed.

00:34:01.396 --> 00:34:11.276
<v SPEAKER_3>That model of project finance just barely existed in China previously and is now rapidly becoming a very relevant one in 2025, thanks to this policy change.

00:34:12.816 --> 00:34:22.116
<v SPEAKER_2>So even though all those PPAs were set up as a possible framework, very few of the provinces then have actually adopted it.

00:34:22.116 --> 00:34:35.016
<v SPEAKER_2>So it is becoming, that seems like a pretty rapid shift from very much like a not market system where you're guaranteed like a coal-based price your power to just pretty much full-on free market in

a lot of these places.

00:34:35.556 --> 00:34:40.296
<v SPEAKER_2>That seems like a bit of a shock, I assume, for a lot of these companies now.

00:34:41.556 --> 00:34:44.276
<v SPEAKER_2>The product developers.

00:34:44.276 --> 00:34:47.616
<v SPEAKER_3>I don't know any private developers who want to build solar right now.

00:34:47.616 --> 00:34:48.016
<v SPEAKER_2>Oh, really?

00:34:48.016 --> 00:34:50.016
<v SPEAKER_3>There's still capacity coming through the pipeline.

00:34:50.016 --> 00:34:52.716
<v SPEAKER_3>You'll see June, another 14 gigawatts came in.

00:34:52.716 --> 00:34:58.396
<v SPEAKER_3>That's pretty much all large SOEs and their construction is not really tied to project economics.

00:34:58.396 --> 00:35:01.476
<v SPEAKER_3>They just need to hit certain KPIs.

00:35:01.476 --> 00:35:02.436
<v SPEAKER_2>Interesting.

00:35:02.436 --> 00:35:07.176
<v SPEAKER_2>So of course, my follow-up question of that was, what incentives have this changed?

00:35:07.176 --> 00:35:10.476
<v SPEAKER_2>But you've obviously already answered that.

00:35:10.476 --> 00:35:26.096
<v SPEAKER_2>So even though solar panels, even especially domestically produced solar panels in China, it's as far as I can tell, it's pretty much the cheapest, definitely the cheapest electricity generation you can get or anywhere in the world.

00:35:26.136 --> 00:35:33.836
<v SPEAKER_2>But still, the problem, I guess, is, like you said, they kind of compete with each other, right?

00:35:33.836 --> 00:35:46.496

<v SPEAKER_2>Like it's kind of renewables cannibalization, where they lower the price when, in the middle of the day, when all the solar is online, the price is pretty bloody low, I assume.

00:35:46.496 --> 00:35:53.896
<v SPEAKER_3>Yeah, the most severe example is of course Shandong, which has the most egregious duck curve that's ever been seen.

00:35:54.816 --> 00:36:03.056
<v SPEAKER_3>The price is averaging zero or below for seven hours through the middle of the day in the spot market.

00:36:03.056 --> 00:36:04.696
<v SPEAKER_3>That's all the solar in Shandong.

00:36:04.696 --> 00:36:07.936
<v SPEAKER_3>No province wants to replicate what Shandong has done.

00:36:07.936 --> 00:36:12.516
<v SPEAKER_3>And Shandong itself is trying to get itself out of the situation it's gotten into.

00:36:12.716 --> 00:36:20.776
<v SPEAKER_3>You can set certain time of use pricing curves for end users to incentivize them to use electricity differently, and you incentivize storage.

00:36:21.336 --> 00:36:32.036
<v SPEAKER_3>Of course, when the delta between peak and off-peak is like that, economics are incentivizing storage, but you can always try to make it even sweeter, try to make it even more attractive.

00:36:32.036 --> 00:36:33.556
<v SPEAKER_3>Storage is a funny thing though, right?

00:36:33.556 --> 00:36:40.096
<v SPEAKER_3>Because if you build too much of it, it eliminates the delta that was incentivizing its construction in the first place.

00:36:40.096 --> 00:36:41.316
<v SPEAKER_3>So a little bit of game theory going on there, right?

00:36:41.316 --> 00:36:43.836
<v SPEAKER_2>So storage crowds sold out too.

00:36:43.836 --> 00:36:46.236
<v SPEAKER_3>Yeah, it's absolutely true.

00:36:46.236 --> 00:36:51.676
<v SPEAKER_3>So often states will take the approach, will they'll

designate how much storage they think is needed.

00:36:51.676 --> 00:36:57.116
<v SPEAKER_3>If you build more than this amount of storage, you're all risking, none of you being profitable.

00:36:57.116 --> 00:36:59.456
<v SPEAKER_3>So build this much and no more.

00:36:59.456 --> 00:37:03.196
<v SPEAKER_3>And so that's something that Shandong is navigating through right now.

00:37:03.196 --> 00:37:08.016
<v SPEAKER_3>They absolutely have that phenomenon of the cannibalization of pricing through the middle of the day.

00:37:08.116 --> 00:37:12.756
<v SPEAKER_3>And that's for everybody who's generating through the middle of the day, not just solar.

00:37:12.756 --> 00:37:17.336
<v SPEAKER_3>And then other provinces are slowing their role a little bit, as they must.

00:37:17.896 --> 00:37:20.276
<v SPEAKER_3>They say the transmission and distribution grids aren't there yet.

00:37:20.276 --> 00:37:22.876
<v SPEAKER_3>The UHV lines haven't caught up yet.

00:37:22.876 --> 00:37:24.816
<v SPEAKER_3>The storage isn't there yet.

00:37:24.816 --> 00:37:28.476
<v SPEAKER_3>So we just can't see a path forward to building anymore.

00:37:28.476 --> 00:37:31.276
<v SPEAKER_3>We need to put a, you know, we're going to have curtailment.

00:37:31.276 --> 00:37:35.116
<v SPEAKER_3>We're going to have unacceptable levels of curtailment from the state's perspective.

00:37:35.116 --> 00:37:38.376
<v SPEAKER_3>We don't want to improve anymore if we're going to have curtailment.

00:37:38.376 --> 00:37:43.056
<v SPEAKER_3>And from the developer's perspective, they're saying, I'm going to be curtailed and I'm not going to be making money.

00:37:43.056 --> 00:37:44.356
<v SPEAKER_3>Why would I build this?

00:37:44.356 --> 00:37:46.776
<v SPEAKER_3>Or why would I dare to ask a bank to finance me?

00:37:46.856 --> 00:37:49.316
<v SPEAKER_3>They're going to laugh me out the door.

00:37:49.316 --> 00:37:49.996
<v SPEAKER_3>Will it get better?

00:37:49.996 --> 00:37:50.736
<v SPEAKER_3>Yeah, of course.

00:37:50.736 --> 00:37:53.296
<v SPEAKER_3>I mean, China's state capacity is incredible.

00:37:53.296 --> 00:37:58.556
<v SPEAKER_3>They're building storage and they're building UHV lines and they're building everything as fast as they can.

00:37:58.556 --> 00:37:59.856
<v SPEAKER_3>And they'll figure it out.

00:37:59.856 --> 00:38:01.356
<v SPEAKER_3>It'll just take a couple of years.

00:38:01.356 --> 00:38:09.716
<v SPEAKER_3>For the moment, for the next couple of years, I wouldn't expect to see line always going up when it comes to new build capacity in China.

00:38:09.716 --> 00:38:12.356
<v SPEAKER_3>At some point, it's going to flatten off a little bit.

00:38:12.356 --> 00:38:13.656
<v SPEAKER_3>And I believe this is the year.

00:38:15.016 --> 00:38:16.576
<v SPEAKER_2>Yeah, no, that's some great insight.

00:38:16.576 --> 00:38:19.436
<v SPEAKER_2>And I think people will take a lot out of that.

00:38:19.436 --> 00:38:26.156

<v SPEAKER_2>And I guess in this context, just the last thing to talk about is I think that this has been making some waves.

00:38:26.156 --> 00:38:34.436
<v SPEAKER_2>And it probably will be making waves in China's power market too, just because of how big of a project this is.

00:38:34.436 --> 00:38:41.156
<v SPEAKER_2>So I just want to pick your brain on the latest Chinese mega project, which is now under construction actually.

00:38:41.776 --> 00:38:45.456
<v SPEAKER_2>And I'll be really curious to see how this all plays out.

00:38:45.456 --> 00:38:52.056
<v SPEAKER_2>And this is the 60 gigawatt planned, I believe it's pronounced Motuo hydropower station.

00:38:52.056 --> 00:38:55.316
<v SPEAKER_2>You can correct me if there's a better name for it.

00:38:55.316 --> 00:38:59.256
<v SPEAKER_2>So this will be in the Tibetan Himalayas.

00:38:59.256 --> 00:39:06.496
<v SPEAKER_2>And so just north of China's border with India, I believe.

00:39:06.496 --> 00:39:10.436
<v SPEAKER_2>And the sheer scale of this project kind of boggles my mind.

00:39:10.556 --> 00:39:16.456
<v SPEAKER_2>Like this is like 60 gigawatts is not something that's ever been done before in a single power project.

00:39:16.456 --> 00:39:21.016
<v SPEAKER_2>And it opens questions about what role it will play in China's energy system.

00:39:21.016 --> 00:39:25.176
<v SPEAKER_2>Now it'll only come online as far as I know in 2033.

00:39:25.176 --> 00:39:27.276
<v SPEAKER_2>So that's a long ways down the road.

00:39:27.276 --> 00:39:30.376
<v SPEAKER_2>So the issues that are happening currently aren't really relevant for this.

00:39:30.376 --> 00:39:34.836
<v SPEAKER_2>But still, there's going to have to be a hell of a lot of planning to talk about how to integrate this.

00:39:35.816 --> 00:39:49.336
<v SPEAKER_2>So, just to start off, what is your view, David, on how this dam will fit in with China's quick growth in renewables and with all of the issues that we've been talking about throughout the podcast?

00:39:50.516 --> 00:40:02.636
<v SPEAKER_3>Yeah, so this hydroelectric project, it's called the Yajang project, the Yarlung-Cangpo River, or just Ya River, Yajang River.

00:40:02.636 --> 00:40:07.616
<v SPEAKER_3>It does go through that county you mentioned, Muotuo County, which is a fascinating place.

00:40:07.616 --> 00:40:08.616
<v SPEAKER_3>You can go YouTube it.

00:40:08.616 --> 00:40:11.236
<v SPEAKER_3>It's the only, it's tropical.

00:40:11.236 --> 00:40:17.576
<v SPEAKER_3>It's the only tropical place in Tibet, which of course is known for being very far from tropical.

00:40:17.576 --> 00:40:23.156
<v SPEAKER_3>It's a river valley that drops 2,000 feet in elevation, and they grow bananas in the valley.

00:40:23.156 --> 00:40:27.636
<v SPEAKER_3>It's a very tropical place, right on the border with Bhutan, I think it is.

00:40:28.796 --> 00:40:36.816
<v SPEAKER_3>But so this project, yeah, or maybe Nepal, I gotta go look at the map again.

00:40:36.816 --> 00:40:39.096
<v SPEAKER_3>But this project is fascinating.

00:40:39.096 --> 00:40:50.076
<v SPEAKER_3>So this river, it has massive drop in elevation over the period where they're planning to build the facilities, and it is multiple facilities.

00:40:50.076 --> 00:40:57.576

<v SPEAKER_3>The idea is it has about a 2-kilometer drop, I believe, so a 2-kilometer head for a hydropower project.

00:40:58.196 --> 00:41:12.876
<v SPEAKER_3>And it goes winding its way through these valleys and canyons, and I believe the idea is to drill a 40-kilometer borehole that follows parallel to the river and then divert part of the river into this borehole.

00:41:12.876 --> 00:41:18.636
<v SPEAKER_3>And then along the borehole, you have five separate facilities that will be generating.

00:41:18.636 --> 00:41:19.496
<v SPEAKER_3>So it's run-of-river.

00:41:19.496 --> 00:41:20.916
<v SPEAKER_3>It's not a dam project.

00:41:20.936 --> 00:41:25.716
<v SPEAKER_3>It's run-of-river, but kind of also not run-of-river, because they're making their own river channel.

00:41:26.556 --> 00:41:33.696
<v SPEAKER_3>And then they'll have the five separate 12-gigawatt facilities that all add up to 60 gigawatts.

00:41:33.696 --> 00:41:42.656
<v SPEAKER_3>You know, among, if you talk about certain rivers and building facilities on certain rivers or the low-hanging fruit, this has got to be the fruit that's at the very tippy top of the tree, right?

00:41:43.076 --> 00:41:47.756
<v SPEAKER_3>The hardest facility you could possibly build, but then 60 gigawatts.

00:41:47.756 --> 00:41:49.576
<v SPEAKER_3>And of course, none of it will be consumed locally.

00:41:49.576 --> 00:41:58.136
<v SPEAKER_3>There's, you know, nothing close to that kind of need for power in Tibet, or even in Western Sichuan or Yunnan, which is closest.

00:41:58.136 --> 00:42:07.596
<v SPEAKER_3>So it will be ultra-high-voltage lines carrying it probably to multiple provinces, to Guangdong, to Central China, to Eastern China, like Jiangsu or Zhejiang.

00:42:07.756 --> 00:42:12.996
<v SPEAKER_3>I would expect to see UHV taking this far, far away from where it's being generated.

00:42:12.996 --> 00:42:16.036
<v SPEAKER_3>And I will highlight that, you know, I'm being speculative here.

00:42:16.036 --> 00:42:18.296
<v SPEAKER_3>I don't know all the details for sure.

00:42:19.496 --> 00:42:30.236
<v SPEAKER_3>What has been said about it is a lot of the same things said multiple times, instead of presenting new information, because there's not that much novel information about it out there.

00:42:30.236 --> 00:42:40.816
<v SPEAKER_3>But yeah, as you said, you know, probably eight years at least until you see maybe the first part of the generation starting, and maybe 15 or 20 years till all of it is connected, right?

00:42:40.816 --> 00:42:43.596
<v SPEAKER_3>It's going to be just a long, long-term project.

00:42:43.596 --> 00:42:45.456
<v SPEAKER_3>Now, here's the thing about hydropower.

00:42:45.456 --> 00:42:46.916
<v SPEAKER_3>It is a little bit seasonal.

00:42:47.116 --> 00:43:00.356
<v SPEAKER_3>It is a little bit variable, but it's variable across years or across seasons, not across days and weeks and months, unlike wind and solar, especially solar, which is variable across minutes even.

00:43:00.356 --> 00:43:13.396
<v SPEAKER_3>So it is, although you can't treat hydropower as a perfectly firm dispatchable source of power, it is a lot better than the other options we have for wind and solar anyway.

00:43:13.396 --> 00:43:14.516
<v SPEAKER_3>Nuclear, of course, is great.

00:43:14.656 --> 00:43:23.096
<v SPEAKER_3>Nuclear is a wonderful firm dispatchable zero carbon source of power too, but it's going to be just limited.

00:43:23.096 --> 00:43:32.876
<v SPEAKER_3>60 gigawatts in this one hydropower facility, that's 60

nuclear power plants that will take China quite a few years to build, even as good as China isn't building them.

00:43:32.876 --> 00:43:50.516
<v SPEAKER_3>When we say we're going to bring on a 60 gigawatt facility of mostly, basically firm dispatchable power, you're saying I can directly retire 60 gigawatts of my least efficient, least clean coal plants, my oldest, dirtiest coal plants, boom, they're gone.

00:43:50.516 --> 00:43:52.016
<v SPEAKER_3>I don't need them anymore.

00:43:52.016 --> 00:43:54.096
<v SPEAKER_3>You can't do that with wind and solar.

00:43:54.096 --> 00:44:00.916
<v SPEAKER_3>Maybe it's 10 gigawatts of wind and solar and battery might be enough to retire a gigawatt or two of coal.

00:44:00.916 --> 00:44:03.456
<v SPEAKER_3>But with hydro, you can just say it's almost one for one.

00:44:03.456 --> 00:44:06.456
<v SPEAKER_3>It's like nuclear, which is one for one.

00:44:06.456 --> 00:44:12.916
<v SPEAKER_3>You can say whatever you brought online, I can just retire an equivalent amount of coal capacity.

00:44:12.916 --> 00:44:13.396
<v SPEAKER_3>That's great.

00:44:13.396 --> 00:44:17.676
<v SPEAKER_3>So you can clearly see where that fits in, in the 2035 to 2040 time frame.

00:44:17.676 --> 00:44:18.956
<v SPEAKER_3>We've already peed carbon.

00:44:18.956 --> 00:44:24.636
<v SPEAKER_3>Now we're trying to draw it down out to our carbon neutrality deadline for 2050, 2060.

00:44:24.636 --> 00:44:25.276
<v SPEAKER_3>Oh, great.

00:44:25.276 --> 00:44:31.556
<v SPEAKER_3>2035 to 2040, 60 gigawatts of clean capacity is introduced into the system.

00:44:31.556 --> 00:44:32.816
<v SPEAKER_3>What can I retire?

00:44:32.816 --> 00:44:34.176
<v SPEAKER_3>What can I stop using?

00:44:34.176 --> 00:44:41.596
<v SPEAKER_3>How much coal can I just stop using in those years and yield to allow this hydropower to finish?

00:44:41.596 --> 00:44:42.136
<v SPEAKER_2>Yeah.

00:44:42.136 --> 00:44:45.036
<v SPEAKER_2>No, it's a really interesting project.

00:44:45.136 --> 00:44:47.896
<v SPEAKER_2>I wasn't aware there was run of river.

00:44:48.176 --> 00:44:49.536
<v SPEAKER_2>That's definitely interesting.

00:44:50.156 --> 00:45:01.916
<v SPEAKER_2>I'd say that from an environmental empire perspective, I think that that's probably better overall because flooding that entire valley would, let's just say, it might not be ideal.

00:45:01.916 --> 00:45:04.676
<v SPEAKER_2>But the-

00:45:04.716 --> 00:45:10.516
<v SPEAKER_3>To highlight, I see it referred to as a hydroelectric dam a lot.

00:45:10.516 --> 00:45:13.476
<v SPEAKER_3>I haven't seen it referred to as a dam in any Chinese sources.

00:45:13.476 --> 00:45:15.976
<v SPEAKER_3>It's always a hydroelectric station.

00:45:15.976 --> 00:45:25.136
<v SPEAKER_3>The dam phrasing is coming from English media, where it's just common to refer to any type of hydroelectric facility as a hydropower dam.

00:45:25.276 --> 00:45:39.016
<v SPEAKER_3>I really don't believe or I haven't been convinced, I haven't seen something that would convince me to say that it's actually a dam project with a reservoir and that instead, this idea of

this side borehole, it's not really around a river either, is it?

00:45:39.016 --> 00:45:40.716
<v SPEAKER_3>It's a brand new kind of thing.

00:45:41.236 --> 00:45:54.576
<v SPEAKER_3>It's actually interestingly quite similar to one of the oldest hydroelectric facilities in North America, the Niagara Falls Generation Station up on the Canadian side.

00:45:54.576 --> 00:45:57.116
<v SPEAKER_3>If you ever get a chance to visit up there, it's really cool.

00:45:57.336 --> 00:46:06.756
<v SPEAKER_3>What they did back in the day, they drilled this underground tunnel that diverted part of the water at the top of the falls and brought it through the Turban Generation Building.

00:46:06.756 --> 00:46:07.556
<v SPEAKER_3>It's a museum now.

00:46:07.556 --> 00:46:08.596
<v SPEAKER_3>You can check it out.

00:46:08.596 --> 00:46:11.276
<v SPEAKER_3>And then it spits back out at the bottom of the falls.

00:46:11.276 --> 00:46:15.216
<v SPEAKER_3>And that's how they got their head between the top and bottom of the falls.

00:46:15.216 --> 00:46:17.016
<v SPEAKER_3>And so that way the falls could keep going.

00:46:17.016 --> 00:46:22.576
<v SPEAKER_3>You had water going over the falls, but you had this side channel that diverted enough of the water to generate power.

00:46:22.576 --> 00:46:26.316
<v SPEAKER_3>I think I'm imagining something much more similar to that.

00:46:26.356 --> 00:46:27.436
<v SPEAKER_2>Yeah, yeah.

00:46:27.436 --> 00:46:30.356
<v SPEAKER_2>And of course, that would be...

00:46:30.476 --> 00:46:38.976

<v SPEAKER_2>I can just imagine how big of a tunnel that would have to be in order to have that many 12 gigawatt sets of turbines going.

00:46:40.156 --> 00:46:41.776
<v SPEAKER_2>It's crazy.

00:46:41.776 --> 00:46:44.536
<v SPEAKER_2>So that's very interesting.

00:46:44.536 --> 00:46:53.296
<v SPEAKER_2>And definitely something that we're going to be keeping our eyes on out until 2033, how that ends up developing.

00:46:53.296 --> 00:46:55.336
<v SPEAKER_2>So that is really interesting.

00:46:56.316 --> 00:46:59.436
<v SPEAKER_2>So, yeah, this is great, David, a huge amount of insights.

00:46:59.436 --> 00:47:07.256
<v SPEAKER_2>I think very important to really touch base with people who are in depth, every day looking at Chinese energy policy.

00:47:07.256 --> 00:47:09.116
<v SPEAKER_2>So really appreciate that.

00:47:09.116 --> 00:47:16.636
<v SPEAKER_2>But just before we tie things off here, I'd just like to ask you one last question, which our listeners are always interested in.

00:47:16.636 --> 00:47:28.996
<v SPEAKER_2>And this is, you know, ideally something that you do for pleasure, but we'll also take, you know, thick technical tomes if that's all you have time to pay attention to.

00:47:28.996 --> 00:47:32.396
<v SPEAKER_2>But what are you reading these days?

00:47:32.396 --> 00:47:34.036
<v SPEAKER_3>So I remember this from last time.

00:47:34.036 --> 00:47:43.816
<v SPEAKER_3>And after I got asked this last time, I actually started asking people this at my coffee meetups and networking, you know, networking lunches and things like that.

00:47:43.816 --> 00:47:48.216
<v SPEAKER_3>I asked people for a book because I started reading again

in the last couple of years, too.

00:47:48.436 --> 00:48:08.756
<v SPEAKER_3>So I just finished The Divide by Jason Hickel, looking at global poverty and inequality and kind of what has been done and what hasn't been working in terms of addressing global inequality and the growing poverty gap among nations.

00:48:08.756 --> 00:48:15.636
<v SPEAKER_3>And I especially wanted to pay attention to it because I understood that Hickel is a de-groather.

00:48:16.376 --> 00:48:21.176
<v SPEAKER_3>And his last, and I'm not a de-groather, but I wanted to hear what he had to say.

00:48:21.176 --> 00:48:24.276
<v SPEAKER_3>In his last chapter, he makes his case for de-growth.

00:48:24.276 --> 00:48:34.536
<v SPEAKER_3>And why the most effective thing that we could do to close some of the divide in the poverty gap is with de-growth policies.

00:48:34.536 --> 00:48:38.336
<v SPEAKER_3>And I think it was published in 2017.

00:48:38.336 --> 00:48:46.156
<v SPEAKER_3>And so I think it does show a little bit of reflection of, it was just before China's renewable ambitions really took off.

00:48:46.156 --> 00:49:29.056
<v SPEAKER_3>And so in as a rebuttal to his advocacy for de-growth policies in order to advance energy equity and general equity, but in my case, I always refer it back to energy, I would say look at what China has been able to do with renewables in the last few years and tell me that it's impossible to maintain high levels of energy consumption growth, even up to an equitable level of consumption growth for all humans without, I think it's possible to do without adopting de-growth policies if you are able to lean into the type of approach China has done and do it at the scale that China has done.

00:49:29.056 --> 00:49:41.116
<v SPEAKER_3>And so that you can use that as a blueprint for other places in the world to say you can build as much, you can consume as much energy, electricity as you want, and here's the blueprint for how you do it sustainably.

00:49:41.596 --> 00:49:46.876
<v SPEAKER_3>It's possible to do it with wind, water, solar, hydro,

sorry, wind, water, solar, and nuclear.

00:49:46.876 --> 00:49:48.096
<v SPEAKER_3>China is doing it.

00:49:48.096 --> 00:49:49.416
<v SPEAKER_3>It's easier for you to do it.

00:49:49.416 --> 00:49:50.776
<v SPEAKER_3>It's a much smaller scale.

00:49:50.776 --> 00:49:54.976
<v SPEAKER_3>So that's hopefully, I wasn't super convinced in 2017.

00:49:54.976 --> 00:50:03.116
<v SPEAKER_3>Maybe it was more convincing because maybe it was impossible to imagine wind, water, solar, being able to meet the needs of a developing nation.

00:50:03.116 --> 00:50:09.196
<v SPEAKER_3>But now that China is doing it and showing how other countries could do it, I hope if I ever got to meet Mr.

00:50:09.196 --> 00:50:12.816
<v SPEAKER_3>Hickel, I would say, what about China now?

00:50:12.816 --> 00:50:15.136
<v SPEAKER_3>Do you still think degrowth is necessary?

00:50:15.136 --> 00:50:34.296
<v SPEAKER_3>But otherwise, besides his policy is advocating degrowth in the last chapter, overall, it's just a very thoughtful treatment of poverty policy and the failures really of the international community to effectively address what is a widening gap in human wealth and well-being.

00:50:35.716 --> 00:51:12.956
<v SPEAKER_2>Yeah, I feel like, yeah, the sort of zero-sum thinking that's common among kind of degrowth crowd, it feels as though they kind of, sometimes it feels as though they blame the wrong things and they say that rather than saying that we currently have governance structures that don't allow people to have the opportunity that they otherwise would like to have, instead they just say, oh, the world's just zero-sum and we need to act as though there's, it's impossible to have this many people with this level of wealth and consumption, all that sort of stuff.

00:51:12.956 --> 00:51:21.156
<v SPEAKER_2>But like you said, you know, China is a great example of an enormous, enormous, enormous amount of people being brought out of

poverty.

00:51:21.156 --> 00:51:34.196
<v SPEAKER_2>We should treat that as a good thing rather than as a bad thing because I feel like degrowth advocates can sometimes treat poverty, people being brought out of poverty and the consumption that comes with it as a bad thing, which I don't agree with.

00:51:34.196 --> 00:51:49.676
<v SPEAKER_3>Well, you do have to, I mean, they point out correctly that you've got finite resources to work with or a finite budget for carbon, for example, and you say, you know, we do want to allow developing nations to develop, and there's only so much budget left.

00:51:49.676 --> 00:52:01.716
<v SPEAKER_3>And in order to give them a little bit more headspace, perhaps some of the countries who have indulged a little bit too much could rein it in a little bit and give them a little bit more space to develop.

00:52:02.116 --> 00:52:10.316
<v SPEAKER_3>I think that's a fair way to look at it, but you do run into some very difficult practical implications, how much reduction is enough.

00:52:10.316 --> 00:52:23.216
<v SPEAKER_3>If we say countries A, B, and C have consumed too much, well, how much, too much by how much, and what is an appropriate level, and who should actually have to start doing it first, and should it be legally mandated for you to use less?

00:52:23.216 --> 00:52:33.256
<v SPEAKER_3>It's wonderful to talk about it in a book, but once you start trying to implement it, you say, look, Canada and the United States, your per capita energy consumption is just off the charts, and Australia too.

00:52:33.256 --> 00:52:38.016
<v SPEAKER_3>You guys use so much electricity and so much energy for how many people you have.

00:52:38.016 --> 00:52:40.016
<v SPEAKER_3>You need to use less.

00:52:40.016 --> 00:52:40.536
<v SPEAKER_3>How?

00:52:40.736 --> 00:52:42.896
<v SPEAKER_3>How do we enforce that?

00:52:43.396 --> 00:52:45.496
<v SPEAKER_3>It gets tough after that.

00:52:45.496 --> 00:52:46.136
<v SPEAKER_2>Yeah.

00:52:46.556 --> 00:52:56.996
<v SPEAKER_2>I'd say up here in Canada, I'd say if you looked at the seasonality of my own energy consumption, just as a person, it's like during the winter, it goes way, way, way up.

00:52:56.996 --> 00:52:59.136
<v SPEAKER_2>That should be just gets bloody cold here.

00:52:59.136 --> 00:53:00.796
<v SPEAKER_2>I don't use very much air conditioning.

00:53:00.796 --> 00:53:02.996
<v SPEAKER_2>I don't drive around that much.

00:53:02.996 --> 00:53:09.096
<v SPEAKER_2>I don't think I use that much electricity normally, but I sure do use a hell of a lot of heat during the winter.

00:53:09.096 --> 00:53:16.136
<v SPEAKER_2>So I think there's some challenges there that are going to be tougher than others.

00:53:16.136 --> 00:53:19.476
<v SPEAKER_2>But anyways, we're really getting off track here.

00:53:19.476 --> 00:53:19.656
<v SPEAKER_2>Yeah.

00:53:19.656 --> 00:53:22.396
<v SPEAKER_2>Thanks again for coming on the podcast, David.

00:53:23.396 --> 00:53:27.156
<v SPEAKER_2>I really appreciate it and this is a great conversation.

00:53:27.156 --> 00:53:28.796
<v SPEAKER_3>Thank you for having me.

00:53:30.396 --> 00:53:36.556
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00:53:36.556 --> 00:53:41.076
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00:53:41.076 --> 00:53:43.256
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00:53:48.496 --> 00:53:56.156
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00:53:59.756 --> 00:54:04.836
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00:54:04.836 --> 00:54:05.756
<v SPEAKER_1>I'm Kelly Ogle.

00:54:05.756 --> 00:54:07.836
<v SPEAKER_1>Thanks for joining us on Energy Security Cubed.