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Setting Course | Episode 6
Nat Bullard, Analyst, Speaker, and Advisor on Decarbonization

This week on Setting Course, we welcome Nat Bullard back into the SmarterMarkets™ studio. Nat is an Analyst, Speaker, and Advisor on Decarbonization. SmarterMarkets™ host David Greely sits down with Nat to discuss the state of decarbonization, as revealed in his recent update to his annual 200-page presentation deck.

Nat Bullard (00s):
So I think the issue is that one of the things is that we have done a lot to tackle 10% of the sectors that are relatively easy, which is service, transportation, and electricity but we have to do all of those. We have to scale them up massively in the case of electricity and then apply that to everything else. So it's sort of the end of the beginning in a sense, more than beginning of the end in terms of how these sectors are going and changing.

Announcer (29s):
Welcome to SmarterMarkets, a weekly podcast featuring the icons and entrepreneurs of technology, commodities, and finance ranting on the inadequacies of our systems and riffing on ideas for how to solve them. Together we examine the questions: are we facing a crisis of information or a crisis of trust, and will building Smarter Markets be the antidote?
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David Greely (01m 10s):
Welcome back to Setting Course on Smarter Markets. I'm Dave Greely, Chief Economist at Abaxx Technologies. Our guest today is Nat Bullard, Analyst Speaker and Advisor on Decarbonization. We'll be discussing the state of decarbonization as revealed in his recent update to his annual 200 page presentation deck. Hello, Nat. Welcome back to Smarter Markets.

Nat Bullard (01m 34s):
Dave, Thank you for having me back. It's great to be here.

David Greely (01m 37s):
Well, it's great to have you back. You know, I look forward to the update of your decarbonization presentation deck each year. I see this year it's grown to about 200 pages or so of really interesting and insightful charts, and I'm glad you're back to be able to discuss some of the highlights of that deck with us today.

Nat Bullard (01m 54s):
Well, thank you. Yes, I decided, I decided why do a sort of oddly non-specific 140 something slides last year and just go for the round 200. So yeah, that's where, that's where I ended up for this year.

David Greely (02m 09s):
Well, maybe for those of us who it'll take a little longer to work their way through all 200. You know, I, you spent many years writing at Bloomberg. If you had to write a headline for the story told about the state of decarbonization today by all the data and charts in your presentation deck, what would that headline be?

Nat Bullard (02m 29s):
You know, I could probably do a one and a half word headline, which is, it's complex. We see a lot of progress happening in the sort of clean side of the ledger, the zero carbon or the active decarbonization side of the technologies being deployed in power and transported industry at the same time that we are at record high levels of emissions record, high consumption of fossil fuels, and at a time when temperatures both through radiative forcing from, from carbon dioxide in the atmosphere, but also some more near term El Nino type of weather behaviors. Temperatures are higher than they've ever been, at least in the last 125,000 years. And we've even had

our first breach of two degrees C above the pre-industrial average on a daily basis. But at the same time we've had $1.8 trillion worth of investment in clean energy and the related supporting infrastructure to deploy to the grid.

Nat Bullard (03m 38s):
14 million electric vehicles sold 440 or so gigawatts of solar installed, which is frankly, even as a former solar analyst, or maybe especially as a former solar analyst, a really extraordinary number. We've made progress on so many fronts at once, but we have yet to really meaningfully tip the ledger over, so to speak, and we're doing a lot of things to move the flows, as I would call them, the inflows in terms of capital and technology and to decarbonization, but we have to use them to attack problems that are more a level of stock, like the amount of carbon dioxide that is in the atmosphere and the levels of consumption that we have in all of our incumbent infrastructure and economy and processes.

David Greely (04m 27s):
There's so much in here and there's so much for us to dig into this morning in this conversation, and I want to come back to the idea of making progress on adding so much lower carbon sources of energy, adding infrastructure, driving investment, but also the difficulty in tipping that balance. But before we get there, you know, I wanted to ask you, updating this deck has become, you know, an annual effort for you and we're glad you're here to share it with us. I've noticed you've added about 60 new pages this year, and I was curious, are you widening the areas and topics you cover or deepening coverage on the existing topics or both?

Nat Bullard (05m 06s):
So I actually really appreciate that question because I don't take a deterministic approach to this at first. The effort of collection is essentially continuous, basically from the moment that I hit publish in any given year and I'm beginning anew with whatever is appearing throughout the course of the year and I'm in a sense letting myself go where the flow takes me in this regard and then beginning to sort of apply some top line structure to it as I get nearer the end of the year to see what I've sort of collected. And if anything, I've gone deeper on certain areas where I think more brain power needs to be devoted, either because the data are richer or because the implications are bigger. And there are certain things that I've spent less time on that, you know, I always sort of wonder if I shouldn't have spent more.

Nat Bullard (05m 56s):
So an example would be there's even more on transportation, but these days or this year rather, it's mostly about road transportation, somewhat to the detriment of things that I looked at in a sort of bitty fashion in 2023, such as very, very lightweight mobility, two and three wheel electric vehicles, but also things in heavier mobility such as shipping. I looked more at aviation this year than I did last year, spent a lot more time on cars, even more time talking about China's role in this sort of global auto complex. But I didn't do very much. For instance, I'm on industrial heat and I've actually received some polite and well-meaning and well well-received notes that you know, I would love to see more about what you're doing on other aspects of industrial decarbonization. I also didn't talk, for instance that much about all of the advancements happening in geothermal power.

Nat Bullard (06m 50):
To some extent that's a matter of data availability, but in others it's just because I've filled very large chunks of narrative already with what's, what's highly dynamic and highly significant. I will tell you one thing that I found somewhat to my surprise come late November of last year was that more than 20 pages are devoted towards aspects of capital markets that are very noisy right now politically, primarily I'm thinking here about anything in sustainability at ESGI spent quite a lot of time, I think, disentangling various trends or highlighting where you have particular skews or particular geographical tilts in all of the discussion that we have around ESG and sustainability and finance. So it's a little bit of all of this, like I've deepened coverage in areas where I thought it was really necessary. I've cast a little bit of a broad brush on some things I didn't really touch upon at all in the tail end.

Nat Bullard (07m 49s):
So I talk about AI energy flowing into and out of ai. I talk about something that I find deeply fascinating, which is the potential implications of mass rollout of the GLP one agonist drugs that are, are really revolutionizing the way that people that people engage with weight and health and what the sort of nth order effects of those might be from an energy systems and a climate perspective. And then finally, something that I feel like sort of flows in and out of vogue, if you will, which is our engagement with Phil land. One of the things that I think is gonna be much more apparent now than it has been in the past is if we are going to sort of make a deep net zero approach, we are going to have to do much more of everything. And at a certain point you do begin to start making decisions about

how, where, and in what way you use land in ways that we used to see way back in the day in the form of like the food versus fuel debate with first generation ethanol.

Nat Bullard (08m 51s):
Now it's going to be about electrification versus seed crops and feed crops, and then it'll be questions about if land is used for certain types of agriculture, what is that feed stock then going on to serve as, you know, where we use 35% of the US corn crop to provide about 10% of our fuel motor gasoline equivalent. What would happen in a world where we're mostly electrified. Where's that gonna go, so I really appreciate that question because it's one that's sort of front of mind for me as I look at it. And as I say, I try not to determine it too much at the front end of it and let the data take me where it might come the end.

David Greely (09m 27s):
Well, and I really like that process because it's so much more than an update, right? It's not adding the last year onto a slide, but I like the, you know, what you've expressed, if I've heard you correctly of kind of going back and you're collecting all these interesting data points and perspectives and ways of looking at what's happening in the world and then kind of curating them end of the year and trying to make sense of it. You know, I'm curious, maybe you've answered this with your increasing interest on the food system and agriculture, but as you were going through this process, was there something that surprised you this year that you weren't expecting to see?

Nat Bullard (10m 00s):
Thank you. There's, there's a number of things that surprised me. One, I think that's very important is on the sort of the grim side of things in, in looking at the climate data in particular is just how much of the warming effect that we're experiencing right now is actually being born by the ocean. You know, it's actually not atmospheric. So much of it is actually going into the water and imp inputting all of that energy to something that then imputes its own energy in the form of like storms in particular warm motions that allow, allow massive storms to move very, very quickly and intensify very quickly. That's one thing that I think I sort of, I think we sort of intuit we have an idea about, but it wasn't something that I was kind of aware of front of mind going in the solar story, as I say, even as a former, so analyst still is sort of mind-boggling.

Nat Bullard (10m 52s):
I mean we almost doubled annual installations of solar. It's a growth rate year on year that we haven't experienced in almost two decades. And it's adding what, like on its own, it is multiple single digit percentages of generation to the total amount of power generation that's outstanding in the world right now. Another couple of things that I, that I think are, are kind of neat is that we are, we're back barely, but we're back on a real dollars terms to an all time high for public r and d and energy. You know, we're back to sort of where we used to be in the 1970s in real dollar terms. I think that's really, really neat I think that's a nifty thing to incorporate. Something I also hadn't paid quite that much attention to was the gain of inefficiency in batteries over time on a very long timeline.

Nat Bullard (11m 41s):
The good folks of RMI and my former colleagues at Bloomberg NEF have pulled together a chart that goes all the way back to the 1900s in terms of battery efficiency. And you can watch what had been a, basically a plateau for like five decades start to slowly creep up as you move from lead acid to nickel zinc into sodium sulfur, then lithium ion, and then eventually the best of the solid state batteries today that take you towards like in four decades really pretty much a quintupling of energy density in batteries. Like a lot of things that, that are either interestingly, either very long dated or very short dated in terms of the, the dataset that I just find in one sense, sort of an aha moment, but in another, when you aggregate them together, important for us to notice like, like these are moments that I think would serve us well to keep front of mind in markets, you know, wherein we've either gotten back to levels that we had been touching before where we're vastly exceeding or breaking out of bound or out of range where we used to be or things that we just need to be aware of on a very, very long time run like such as the ocean heat and, and ocean heat content that I mentioned.

David Greely (12m 53s):
Yeah, and I would love to dig into some of those more specifically with you because you know, when I was working my way through your deck, I was struck by the how strong a year it's been for renewable generation and solar and wind in particular. I was hoping you could walk us through a little bit more about what's happening there. Is it, is it a continuation of a growth path? Has something changed that's shifted into a, a higher gear as one might say, well, what do you think's behind so many of the additions that you're seeing in the chart deck?

Nat Bullard (13m 22s):
Well, the short answer for so much of this is that that China plays an outsized role in the scale of solar deployment. China on its own did more than 200 gigawatts worth of solar you know, China on its own installed in last year, more solar than the US has ever installed. I believe the wind sector has a slightly different dynamic still, again, very strongly Chinese in in terms of where the, the deployment is weighted, but a much lower level in terms of total installations on a, on a capacity basis, only about a hundred gigawatts a year, but still sort of defying in important ways trends in capital markets like this is happening even as money is becoming more expensive, even as commodity prices. Although we seem to have made a little bit of a bull whip move or coming or and coming back down, commodity prices were high supply chains were messed up.

Nat Bullard (14m 13s):
What surprised me was the resilience of these in the face of that. Related to that though is that all this activity seems to be going at a time when it's very challenging for the companies in particular listed companies to make a business out of it. Again, these are cyclical businesses, they come and go. We shouldn't read in a sense too much into event besides they are exposed to broader trends in energy. We also saw quite a lot of deployment that in Europe, like, like one of the things about this that is fascinating to me is because we now sort of skew the scale upwards with a 400 gigawatt year of somewhere, it makes it easy to obscure all of the different places that we're setting records in terms of total deployment. So I think that it's important for us to sort of maintain multiple things true at once.

Nat Bullard (14m 57s):
Like it's, it's simultaneously not great o on the business side for many of the companies that are very active. As we record this right now, worse that it's just announced that it's gonna have to do some layoffs and suspend its dividends, it's gonna have to pull back from some of its offshore wind markets. But at the same time, the markets themselves are growing like the, the, the deployment of assets continues to pace and their eventual impact on an ability to change trajectories in the climate continue re regarding us of whether or not they may be showing an outsized return for shareholders and equity holders.

David Greely (15m 33s):
Yeah, and this comparison between what's happening in the US and Europe versus China I think is really interesting because of course decarbonization, it needs to be a global story and when we look at the its ions on a global basis, there's a lot happening, but as you said, much of it's being driven by China. If you were to look at say, the additions of renewables, solar in particular, some wind, what is that doing if you look at a, a more western region like Europe in terms of its power generation? Are we making inroads there?

Nat Bullard (16m 03s):
Certainly it's making quite a lot of routes. You know, the best data on this was published literally just like a few minutes before we are going live here. So I'm moved to get too deep into that at the moment. But what you're seeing in Europe in particular is wind power. I think now in the EU exceeding gas power generation last year, solar is following a sort of similar logistic curve on its way up in terms of the impact it's making in terms of generation. This is great stuff. Like you want to see these things coming in and needless to say, Europe has not historically been the last decade or so a major growth market for electricity. But there is something to note too that there's a sort of challenge between the proportional they're rising proportional and the absolute, the absolute challenge here is that actually total power generation in the EU declined last year.

Nat Bullard (16m 55s):
Obviously there is some effects with weather. There are, there are some decisions around fuel switching that go on around that. But there's also an inherent challenge, which is that if we, if we are meant to deeply decarbonize largely by electrifying a whole bunch of industrial processes, you would much rather see your electricity demand going way up than falling. What concerns me there is that relatively these things are showing in outperform because in absolute sense, as you're seeing a de-industrialization or a hollowing out of some of these energy intensive capacities, not just the ones that use fossil fuels but that use electricity as well, that's not great in the sense that you really want to have more, you want to have more electricity being consumed because that's going to be in turn shifting demand away from other thermal power sources that are less fundamentally efficient. You would rather have that, you'd rather have a growing total electricity market within which you have a lot of growth in renewables, but instead you have this sort of crowding out, which is not bad from an emissions perspective. It is sort of not great economically, I guess we could say.

David Greely (17m 59s):
Yeah and one of the areas where we expected to see electricity use grow is in transportation with electric vehicles. That's been a big part of the story in the US and Europe, but looking at a lot of the growth in electric vehicles and there has been quite a bit much of it's

being driven once again by China at this point. Can you walk us through a little bit about what you're seeing in terms of electrifying transportation?

Nat Bullard (18m 23s):
Yeah. China has not only become a major force, the major force really in electric passenger vehicles, it is also becoming the biggest exporter of vehicles, passenger vehicles in the world, which is astonishing and I think continues to catch a lot of executives in those incumbent German and Japanese firms by surprise that you now have China being not only the world's largest auto market, which it's been for some time and the world's largest auto manufacturer, ditto, but now the world's largest exporter. I mean, China exported more than 4 million vehicles last year. Passenger vehicles rather, that's more than Japan, it's more than Germany. Of those, it exported more than a million that were purely electric. And it's now in a position where it is like one of the big nevers in determining what's going to happen in the global auto market in the United States. We're relatively immune, I would say from the trend of the Chinese exporters because of tariffs that we have in place.

Nat Bullard (19m 31s):
But this is elemental for the companies in Europe and the companies in Asia that are active manufacturing and selling in other parts of Asia and it's something that we've not seen really to this degree in our professional lifetimes. Unless you Dave, are much, much older than I think you are. This is something that you would need to go back to in small form to think of, of the Korean manufacturers doing in the nineties and two thousands and to the Japanese doing in the sixties, seventies of finding their way into these major export markets and dominating. And I think important to note within that is that there, obviously these are companies that, that look very similar in their roots to any of the auto companies, the big Chinese companies grew out of partnerships or JVs with Western or Japanese OEMs but I think especially for the EV ones, they're coming at it from a sort of new set of principles EV first with a very, very well realized supply chain that is almost entirely domestic within the country and showing a great deal of integration.

Nat Bullard (20m 31s):
Actually, your listeners of all people will probably be familiar with the fact that some of the biggest of the Chinese car companies have now commissioned their own row vessels. They now have auto shipping ship transport that is actually taking their cars to port in other markets. That's something we've really not seen, at least not in my professional lifetime. And it's something that is, that's going to be felt in major markets everywhere. It has major questions for how it competes with how you compete with the incumbents in markets and develop East Asia and in Europe. Really big questions about how you compete with both local manufacturing and other markets, but also what the knock on is going to be for the used auto market. I'm both, to go too deep into analogy here, but it's something that actually we witnessed in mobile telephony, which was that you had the case where there was a large and robust export market for secondhand product coming from the wealthiest developed markets and going into developing markets and it was very quickly supplanted by the lowest end of the capable smartphones being cheaper and better than anything used you could be buying from somewhere else.

Nat Bullard (21m 44s):
So the crowding out effects, the trade balance effects of all of this stuff I think, you know, are really only just emerging now, but are gonna be really, really interesting to see.

David Greely (21m 52s):
It's really fascinating. You know, I think early on there was a lot of concern that even if the US and Europe did a lot of things to try to transform the, our energy system and decarbonize it, the question was, well what about China? What if they don't? And it seems like on a lot of areas they're in the lead to some extent.

Nat Bullard (22m 10s):
So, and this is, this is back to my sort of complexity point. You have to hold both things true at once, both very much in the lead in terms of the flows based stuff when you deploy in somewhere, when you deploy in wind with your manufacturing with batteries, electric vehicles not though necessarily great or to put it another way also in the lead on things like coal consumption and on total emissions and on imports of oil and all, everything like this, like these things are all happening at once, right. We have yet to reach the point where the one has fully tipped over the other. That said, the good folks at carbon brief did have an outlook on China's power consumption growth, which generally grows some little bit under 400 terawatt hours a year, which is also not really necessarily all that far off from the way what big countries generate in a year. That's more than the UK generates significantly more than the UK generates in a year. But we may see the case where the additions of new power generation from zero carbon sources, hydro, nuclear wind, and

solar could top that in 2023. Meaning that now the sector is reaching, reaching a sort of growth plateau with its fossil, mostly coal power and everything that comes thereafter in terms of growth therefore starts to erode that has established base of fossil fuel generation.

David Greely (23m 37s):
And I want to come back to some of the, the challenges and the complications with you, but I wanted to ask you about one other area before we move on and I think this is one that you call the easy wins. think a lot of it's about just improving efficiency of energy use and you know, a lot of the, the early marginal abatement curves always kind of showed there were so many things we could do just to be more efficient in energy use that were fairly low cost things like switching to LED light bulbs, that sort of thing. I was curious as you kind of looked through the numbers, like are we taking the easy wins. How are we doing there?

Nat Bullard (24m 10s):
LEDs are fascinating you know, at the start of the 2010s, 1% of residential lighting sales globally were LEDs and in 2022 is more than 50%. This is a very rapid adoption curve for even a very highly distributed residential technology like this and it's a testament to high volume manufacturing, decreasing costs as you know, total production base goes up, but also to quality to things that people want to have. Light does have a quality all of its own, it's not just a quantity thing and to distribution widely in a bunch of different markets as well. So yeah, you know, when half of all lighting sales are LEDs, it starts to manifestly have a change, albeit small and maybe hard to measure on total electricity consumption. One of the reasons I'd like to highlight this, and we don't really have a great answer for how to think about it further, is we have to kind of think in counterfactuals where would we be without fists?

Nat Bullard (25m 15s):
You know, where would we be without billions of LED light bulbs in terms of total consumption. We can see that with electric vehicles for instance, and we can see that there is almost 2 million barrels a day of sort of avoided or otherwise would've been consumed oil that the world's electric vehicle fleets have created or to put another way, have negated but it's really hard to see that with illumination. A similar, a similar win that we can see is actually looking at the US fueling efficiency and fueling economy standards rather not the fueling efficiency, which is standard, but the fueling economy. What's actually been observed is that we're in this fascinating moment where anybody who drives in the US is very well aware that our cars are gigantic and seem to be keep getting bigger and bigger and bigger, but we're also in a place where our fuel economy is going up despite our whopping the huge cars that we've got.

Nat Bullard (26m 14s):
And that's actually testament in some important ways to the fact that we have a lot of hybridization of cars, we have more electric vehicles on the road, and what you can see is that those technologies are actually the ones that are allowing us to have bigger cars every year, but have our efficiencies continue to improve. Basically, the EPA has done a lovely job of this exact counterfactual of the sort of thing that I would like to see, and it shows that without EVs we would've had almost no improvement with EVs and hybrids, rather in the new vehicle, real world fuel economy from 2015 until today, it would've basically gone from little over 24 and a half miles per gallon to about 24.7. But with EVs and hybrids, it's gone from that same level all the way to almost 27 miles per gallon, same effect happening in terms of the emissions footprint of these vehicles. So really like very significant to see these sorts of things happen. And what I would love to examine in the future, like a place where I would love to be with this in five years time, is in a world where the counterfactuals are much more visible, we're able to much more better measure what we've done in terms of what could have been.

David Greely (27m 40s):
Absolutely because part of what we're seeing, and you've brought this up a number of times, and I wanted to dig into these because there's a lot of reasons for optimism in your deck also a lot of challenges as you've said repeatedly, you know, it's complicated, it's complex and I want to come back to this point that we're adding a lot of renewable electrical generation, but we don't seem to be decreasing demand for coal, oil and gas and with it carbon emissions in a meaningful way yet.

Nat Bullard (28m 10s):
That's right.

David Greely (28m 11s):
What do you think's happening there?

Nat Bullard (28m 13s):
Well, you know, the sort of the simplest answer is that demand is still growing everywhere and we have a lot of incumbency that's still in merit, so to speak. You know, the economics of it still makes sense. You know, an economist would tell you what, you solve this with the giant carbon tax on everything that seems unlikely. So solving it now means kind of just pushing supply of the clean side of the ledger that's without sort of massive interventions that actively start to pull things out of merit, you know, without policies that shut down very emissions intensive assets, processes, industries before their otherwise economic life would be over. So like you have to have massive interventions to make those changes happen that's one reading on it. Another is though is that and this is sort of more kind of technologically minded, I would say, is that we're starting to see places where, where the Overton window, so to speak, this is mixing technology and politics, but the window of what's acceptable and considered possible has moved in a way that people now do talk about, you know, widespread manufactured green hydrogen, but also of zero carbon steel, for instance, or looking at processes to insofar as possible decarbonize cement production, which is challenging because you run into chemistry problems there, not just like electricity and physics problems.

Nat Bullard (29m 48s):
I think aviation is an area where we have real challenges over time. This is another case in which, you know, the data are pretty clear that while we've made a lot of improvements in fuel efficiency of vehicles and things like that, we've made almost no change to the carbon intensity of the fuels that we use because you're, you're, you're running into chemistry problems. So I think the issue is that one of the things is that we've done a lot to tackle 10% of the sectors that are relatively easy, which is service, transportation and electricity. But we have to do all of those. We have to scale them up massively in the case of electricity and then apply that to everything else. So it's, it's sort of end of the beginning in a sense, more than beginning of the end in terms of how these sectors are, are going and changing.

David Greely (30m 42s):
Yeah and I wanted to ask you a question on the, the electric vehicle front as well. We're adding a lot, but the question always remains, are they being added where there'll be powered by low carbon renewables and not things like coal right. So, you know, obviously electricity is, it's not a, a primary source of energy, it's a way to transport energy from one form to another and when you see so many electric vehicles being produced and used in China, I think this becomes a particular concern as it still has a lot of coal in the economy. Are you able to see what's powering these electric vehicles for the most part in the world?

Nat Bullard (31m 20s):
Generally visible and relatively granular as you can analyze the grid and where things are charging? I think that concern is a little over baked for a couple of reasons. One is that you've got a tailwind behind you, which is that power sectors are reducing their emissions intensity over time. Almost every single one of them is as they deploy more renewable power. Two, you have other related benefits such as, you know, air quality, local at a local basis, the tail even down to the tailpipe level. This is something that many economies are very eager to have and three, I always find it interesting that people have sort of suddenly found some kind of zeal about emissions when it comes to vehicles now that they're electric in a way that people have simply not cared about at all when they happen to be an internal combustion engine.

David Greely (32m 08s):
And the other thing I wanted to ask you about is coming back to this piece of how the decarbonization story changes when we look at it by region or country instead of globally, it seems like much of it's happening in China in terms of adding new technology, new renewables, even though it's not tipping the scales over yet and reducing overall fossil fuel use. I'm curious, what do you think is driving China to produce so much more of the electric vehicles, the renewable power generation. It seems like it's really moving its industry in that direction. To what extent is this a decarbonization for the environment story. To what extent is it a another industry for China to establish its dominance in, is it a way to achieve energy security because China's always been kind of oil and natural gas poor and coal rich, how do you see that?

Nat Bullard (33m 05s):
Yes, to all of those Dave. It is absolutely seen as a measure of local environmental improvement in terms of point source emissions, whether that's from a tailpipe or that's from an exhaust flu. It's about global competitiveness and key strategic industries and it's also about developing that capability locally and developing the supply chains that flow into and out of China. It's also about reducing imports insofar as possible for key commodities and it's about creating sort of champion industries. I think what's going to, what's going to be fascinating to me is to see if we have a Chinese global champion auto brand in a way that we have not had, interestingly

even for something like say, apparel or we have some consumer electronic brands that are global, but are we gonna end up with one that has the durability of say a Japanese or a Korean or even a German automaker over the course of decades. The progress that you see would, would certainly suggest that that's possible. I'm here in Singapore, I was in one of our shopping malls over the weekend at the BYD dealership and it's packed and the products are very, are very high quality. They're very well suited model ranges to a number of different use cases and to a number of different markets constantly pushing the capabilities of what batteries can do and constantly pushing prices towards prices that consumers find them attractive.

David Greely (34m 49s):
And you know, when we were talking a little bit about why we, we might not be tipping the balance as quickly as we could be, you know, you mentioned incentives, whether it's market incentives like a carbon tax or a carbon price, whether it's government incentives through regulation or taxes, subsidies. When you look at the decarbonization that's happening so far, the investment in a lot of these newer technologies, how's it being accomplished, is it private sector, investment government programs or both and does it vary quite a bit when you look at, say, China versus the US and Europe?

Nat Bullard (35m 24s):
So government funding tends to be the initiator for many of these programs in many places, right? Whether that's a feed and tariff that pays per unit of power generated or it's some other kind of tax related incentive like we have in the US or whether it's generous policies for manufacturing that helps sort of bring supply to market. But the capital is mostly private capital. It's not being lent directly from the state. Again, China probably has some exceptions because depending on how you view its banks, but in the United States that's flowing almost exclusively through channels of private capital and the same in Europe and at reasonable scale, you know, in the, in the $1.8 trillion range, which is a lot higher than it was certainly when I started doing this in the two thousands. So there's the, there's a combination of these things.

Nat Bullard (36m 08s):
The private sector capital generally needs some impetus and government funding is probably not capable of doing this all on it own and if you were to just unlock the US federal financing bank at treasury, I don't know that it would be able to technically or politically move all of the money that's needed into, into the market. So it's a combination of the two of them. Now, if you, if you ask any of these parties that sort of will always say, we need more government support or we need more private, we need more private capital and then both things are true. I think the most important thing for the government support is durability. Like are, do you have visibility in policies beyond, say, one electoral cycle and I think the thing that's most important for private capital is variety. Do you have what you would call a capital stack. Do you have ample money in all these different phases. Do you have enough people at the, the front end of early stage venture and, you know, lab and demonstration capital? Do you also have the trillions of dollars needed of institutional money to buy and hold assets for years and decades at a time? So you really do need you, you need more of everything. But I think the most important thing, policy perspective, if it's a one line version, is stability and visibility. And the most important thing for private capital is variety and scale.

David Greely (37m 22s):
Well, I want to thank you so much for making your presentation deck available to the public for joining us today to discuss some of the highlights from it. I really recommend people go to your website and check it out for themselves. But I wanted to ask you one more thing before I let you go and that's, you mentioned earlier that in terms of the decarbonization, we're probably getting to be the end of the beginning in terms of where we are and when you take a step back and think about this more holistically and think about where we've come from and where we need to go, what do you think, what's working, what's not and what do you think is the most important thing we need to do next?

Nat Bullard (38m 03s):
What's working is technologies that have learning effects and high volume that's really important to keep doing more of. The lesson from those is that they've kind of achieved some lift off and you should just cram resources at them and they will find their way to market things. I wouldn't be so critical to say what's not working, but where we need to do more work is to find out how things that have a longer capital cycle life that have chemistry and physics problems and that are in industries that aren't immediately addressable by electricity need capital and invention and innovation and I think we need to think very hard about the structures in place to support that in a multi-business cycle timeline and what do we need to do next I think we need to be imaginative in the sense that it's very helpful to kind of work backwards rhetorically, narratively and then by extension from a market planning perspective as if we had managed to make this happen.

Nat Bullard (39m 09s):
Because if you sort of build them up incrementally, you'll, you'll always find along the way that there are oftentimes well-intentioned, technologically informed naysayers that'll tell you that you can't do it. A great example is thinking of the power grid analysis that you would've gotten 15 or 20 years ago, and you could go to continental Europe and have a German grid operator swear up and down that they'd never be able to integrate more than 5% variable renewable energy. Obviously they've blown right past that and the reason is they had to do so. So I feel like working backwards from if you had to do this or even going further in your imagination, it's already occurred how did we do it is the level of kind of thought experiment that I feel like would be worthwhile because otherwise we run another challenge that it is obviously difficult and incumbent businesses have every reason not to do the difficult things over time, but to ask ourselves if there are not gonna be new champion businesses and sectors and industries that arise out of whole cloth from this process and if so, what are going to be the motivating principles behind them, what got them funded, what were the quickening instances within technology or capital or market structure that made them happen, how did we get there and I think some well-intentioned and well-reasoned imagination is a, is a very helpful resource for thinking about how, how, if we're going to do this, we did it.

David Greely (40:48):
Thanks again to Nat Bullard, Analyst Speaker and Advisor on Decarbonization. We hope you enjoyed the episode. We'll be back next week with our next episode of setting course. We hope you'll join us.

Announcer (41m 01s):
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Announcer (41m 50s):
That concludes this week's episode of SmarterMarkets by Abaxx. For episode transcripts and additional episode information, including research, editorial and video content, please visit smartermarkets.media. Please help more people discover the podcast by leaving a review on Apple Podcast, Spotify, YouTube, or your favorite podcast platform. SmarterMarkets is presented for informational and entertainment purposes only. The information presented on SmarterMarkets should not be construed as investment advice. Always consult a licensed investment professional before making investment decisions. The views and opinions expressed on SmarterMarkets are those of the participants and do not necessarily reflect those of the show's hosts or producer. SmarterMarkets, its hosts, guests, employees, and producer, Abaxx Technologies, shall not be held liable for losses resulting from investment decisions based on informational viewpoints presented on SmarterMarkets. Thank you for listening and please join us again next week.