Research @ Citi Podcast, Episode 38 – Renewable Energy: Headwinds and Tailwinds

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Transcript:

Vikram Bagri (00:00)

I think renewables will play a pretty large role in meeting the energy needs across the world. And I use the word renewables and clean tech. I rarely use the word energy transition is because I firmly believe we are living through an era of energy addition and we need all the energy we can get from all the resources we can get.

Robert Rowe (00:10)

Hi, everyone. I'm Rob Rowe, US Regional Director of Citi Research, and welcome to our Research @ Citi podcast. On the podcast with me today is Vikram Bagri and we're going to discuss renewable energy.

And this has been a topic of a lot of scrutiny of late, especially considering all of the change in policies that are going on in Washington, DC. Vikram, thanks for being on the podcast with us today.

Vikram Bagri (00:45)

Thanks for having me.

Robert Rowe (00:47)

Maybe we should start off with a discussion on tariffs because, you know, we've often discussed on this podcast before the effects of tariffs on various industries. But, you know, how do you see that? The tariffs in particular shaping renewables? And, you know, also, of late, we've also discovered a lot more about our reliance on China for various things like rare earths. I don't know if that also affects renewables, but maybe we can start off there.

Vikram Bagri (01:17)

So, tariffs have a very varying impact on the entire solar, wind and nuclear value chain, Rob.

When you look at solar, our direct dependence on China is very minimal. We used to import very large quantities of solar panels from China until 2012, but due to tariffs, due to bans, due to policies, our direct imports from China on solar side have decreased quite materially.

We do indirectly depend on China for polysilicon. About 90% of the polysilicon capacity, material that is used to manufacture the crystalline silicon solar panels is refined in China, and that dependence is very hard to get rid of because about 40% to 50% of cost of refining polysilicon is the cost of electricity, which is, you know, one fourth the cost of electricity in the US. So, China leads the way and has established itself as the dominant player in polysilicon capacity.

So, on solar side, our dependence on China from that perspective, direct dependence on China is minimal. But in storage, there is a very, very sort of, like, heavy dependence on China. About 80% of the cell manufacturing capacity on storage side is located in China. US, Germany, France, UK, India, they're all working on expanding capacity and diversifying their exposure, but we are way away from that happening.

Within the cell storage supply chain, there are components such as node materials that are exclusively essentially made in China at scale and at a consistent quality level. So, the dependence on China for storage is pretty heavy.

Robert Rowe (03:10)

Can you just quickly describe what storage is in this regard?

Vikram Bagri (03:13)

Yeah, storage, Rob, is anything we use to store energy, and it touches lives in so many different ways – sometimes we don't even recognize the cells we use in our watches, the cells we use in our phones, the cells used in the cars and residential and utility scale storage to store energy. So, if you install a battery as a power backup in your home, or you install a larger battery at a utility scale solar farm that meets the requirement power requirements in case of, like, rapidly changing power needs.

Robert Rowe (03:45)

Got it.

Vikram Bagri (03:47)

And then finally, nuclear, not really dependent on China, but China certainly is much ahead in terms of making progress on adopting nuclear as a resource. China is one of the largest enrichers of uranium fuel. It has

one of the only two operating small modular reactors in the world and is working aggressively on new designs. So not really dependent on China, but we are competing with China to win this race.

Robert Rowe (04:14)

In regard to tariffs, Vikram, I mean, you know, aside from China, are tariffs effectively raising the cost of renewables?

Vikram Bagri (04:24)

Yeah, the impact, Rob is quite contained at this point. The Inflation Reduction Act helped onshore a large portion of the manufacturing in solar and other subsectors within renewables. So, the impact until now has been contained primarily because tariffs on all other countries to a large extent is much significantly lower, and our dependence on foreign imports is lower as well. So, we haven't seen any material changes in pricing because of tariffs so far.

Robert Rowe (04:57)

Got it. But maybe that's a good segue talking about the Inflation Reduction Act, and maybe that's a good segue into policy. You know, one, what current policies or in the future that DC is necessarily thinking about that could impact solar, wind, nuclear, and storage? And also, is there the possibility that President Trump and the administration could reverse parts of this Inflation Reduction Act, and what effect would that have on renewables?

Vikram Bagri (05:27)

Yeah, definitely, Rob. The budget reconciliation bill passed by the House was seen as investors, was seen by investors, as a repeal of Inflation Reduction Act without actually repealing it. There are factors and, you know, provisions in the bill that put some of the renewable sub sectors at a severe disadvantage.

In terms of the policies, the ITC credits for solar will go away at the end of this year. So that will have a pretty profound impact on residential solar. Right now, in residential solar, individuals get about 30% ITC, and if you lease a system, this lease providers can capture up to 60% ITC. And those provisions may end at the end of this year. So what that does is, it raises the cost of solar for an individual by about $7,000 on a $25,000 to $30,000 system.

And if you finance that system through loan, it raises the installment of, monthly installment of that loan by about $70 for that customer, which may be a deal breaker, and we might see a significant decline in the demand

for residential solar if the bill goes through in its current shape. Our estimate is that decline could be 75% year on year next year if there are no changes made to the bill.

In the utility scale solar, the nature of industry is such that they can safe harbor these credits, and by safe harbor, I mean they can get grandfathered into the credits that existed at the time the construction of these projects was started. So, utility scale larger projects can grandfathered into the current subsidy and ITC provisions if they've started construction and starting construction is on and meeting the criteria for starting construction is relatively an easier process. So, we think utility scale will be largely protected from these policy changes in Washington.

On nuclear side, there are not many changes in the bill. There are minor changes that don't impact materially nuclear, but there are other policies that, you know, executive orders and so forth that President Trump has signed and bills that have passed that are very, very beneficial and supportive of nuclear energy.

Robert Rowe (07:57)

And Vikram, can other renewables sort of survive without subsidies if it comes down to that?

Vikram Bagri (08:03)

That Rob is a million-dollar question and the most asked question these days. I don't think so.

One of the things I think about is how these renewable resources performed when the credits or ITC wasn't significantly lower, and they were surviving and thriving. The second part is the sector is still going through deflation through innovation. We have seen the panel prices come down materially over the last ten years, more than 50%. We've seen storage prices go down more than 50%, and we're going through this deflation in cost of renewables still. So, the cost should still, keep coming down.

The third part is the competitor of renewables is utility of residential, and for solar, is utility prices. And over the last five years, a state like California has raised utility prices by a CAGR of more than 10%. So, if you take 30% credit away today, it will take a couple of years for utilities to raise prices enough that the economics of solar get back to the same levels as they are today with the credits because of the inflation in utility prices.

And then finally, one of the metrics we look at, Rob, is levelized cost of energy to compare energy resources across the board. How much does it

cost to install, operate, and maintain energy resource? And on LCOE basis, solar and wind are highly competitive even without any subsidies compared to a natural gas power generation.

Robert Rowe (09:44)

That's really interesting. Vikram, maybe we can switch over to two other topics. One is, clearly, there's a proliferation of data centers now. There's a proliferation of AI demand. There's a lot of CAPEX happening in the tech space as a result, and also a lot more demand on the power grid, not just in terms of data centers, but also in terms of EVs, et cetera, where the demand for electricity has really risen.

What's the role that renewables are going to play in that? And I guess a second question there would be what part of the total addressable market is renewables versus other sources of energy?

Vikram Bagri (10:22)

So, Rob, I think renewables will play a pretty large role in meeting the energy needs across the world. And I use the word renewables and clean tech. I rarely use the word energy transition is because I firmly believe we are living through an era of energy addition, and we need all the energy we can get from all the resources we can get.

The primary reason for that is the turbine capacity or the capacity to add a natural gas power generation is very limited. And if you look at commentary from a number of companies, we have sold out on that capacity through 2030. Then you look for renewable resources and alternate resources of power, which in their own way are limited to a certain extent, how much you can install. When you look at solar generation in the US, there is a floor in how much solar will be installed in terms of the power needed to meet the power requirements of data centers in AI, but there is also a hard ceiling. We have a pretty large grid connection queue for new power generation, wherein you apply for a connection you install before you install a power generation unit, you apply for a connection to the grid, and it takes a couple of years. That queue stands at over 2.7 terawatts.

To put that in perspective, that's two times the total power generation capacity in the US currently. So that queue is really long. It takes time to install these projects and connect them to the queue, which is a limiting factor on how much solar and wind that can be installed. When you look at the composition of that queue, about 80% of that queue is solar and storage. And if you look at the power generation being added in the US in

past couple of years, over 80% is renewables, about 85%, and rest is all the other resources.

So, renewables will play, are playing, a large role in meeting the power demand. They will play a large role in meeting the power demand of Data Center NAIs, and it's sort of like can be seen through the grid connection queue that is pending with the ISOs..

Robert Rowe (12:40)

How will renewables sort of provide that power? In other words, are we seeing data centers building large solar panel fields or things like that, or how would that work? And I guess that gets into innovation a bit, which is the other topic I wanted to discuss because we've heard that certain companies want to have their own compact nuclear power sources working? How will that work and maybe we can touch on innovation a bit as well.

Vikram Bagri (13:11)

So, I think the Data Center AI companies, they do not want to be owners and operators of power resources. The way they will source power from renewables is they will enter into long term PPAs, the, what we call power purchase agreements, where they enter into a specified price for purchasing power from a power provider on a long-term basis with annual escalators in how that price changes over time. And these generators will be built by the companies. So, the focus of data center and AI companies who have committed to sourcing renewable power to power all of their data center AI needs, is they will buy enough power from renewables to offset the power consumes in data centers and AI to meet that requirement, to showcase that they are powering these data centers through renewable power.

In terms of innovation, Rob, there is innovations across the board in the renewables space, in all sub sectors. We're seeing innovations in solar where, you know, price of solar is coming down, the quality and capacity of inverters is rising every year. We're seeing the price of storage and energy density of cells price go down and energy density of cells go up over time. So, storage is becoming more efficient, more cycle life for cells. But most innovation is, in my opinion, is happening in nuclear space. We think nuclear may not play a very big role in meeting world's power needs through 2030 because the lead time it requires to build and provide proof of concept for these new technologies very long. But longer term beyond 2030, nuclear will play a pretty meaningful role in providing power to data centers and AI companies.

There are over 100 nuclear technologies being researched around the world, SMR technologies, and we think that we'll have multiple winners among these technologies that will sort of lead the way in providing power to data centers.

Robert Rowe (15:24)

Am I right in saying that you think that the most innovation is happening in the nuclear sector, but the ramp up time is long, either to revive nuclear power plants or to create new ones or to create more compact ones. Is that right? Is that where the innovation is happening and what kind of innovation is happening in that regard?

Vikram Bagri (15:48)

So that's exactly right, Rob. And the innovation is also a function of support, both the monetary support and the regulatory support. I joke with people that if there is one thing under the sun that Republicans and Democrats agree on, that is nuclear power.

Robert Rowe (16:05)

Right.

Vikram Bagri (16:06)

Republicans think it's not traditional renewable energy and it's expensive while Democrats think it's clean power. So, they agree on it, and we saw the evidence of that when the Advance Act was passed last year with overwhelming majority of people in both House and Senate approving the bill. So that is the regulatory support and government support. On the monetary support, we have seen multiple agreements being signed between nuclear companies and data center AI operators in the effort to buy power from nuclear. We also have seen multiple data center companies investing directly into nuclear technology companies to progress these technologies and get them over the finish line. So that's where most of the investment is happening because that's where most of the support is.

Now, in terms of lead time, President Trump signed four executive orders recently to expedite or shorten the lead time to get these technologies tested and get them over the finish line. One of the order’s mandates that the review at the NRC for these new technologies should be 18 months. Historically, these reviews have taken a very long time, over three years. There was no mandate or no clear timeline to when these reviews have to be completed. The fees for these reviews have also been lowered. The department is being encouraged to get rid of old processes that are an

impediment to reviewing these applications quickly. So, we're seeing, you know, efforts on all fronts to make nuclear work, and there is broad support to make nuclear work.

Now, the innovation part, Rob, is on the cost of nuclear. That is one area which has been an impediment to growth. EIA estimates that to install nuclear, it requires $10,000 per kilowatt of capital cost upfront, to install nuclear power. The small modular reactors promise a future where this $10,000 number can be brought down to $5,000 per kilowatt of power added.

And in a few years, they have a path to $2,500 of upfront capital cost to install nuclear. To put that in perspective, natural gas costs around eight to $1,200 per kilowatt hour and requires constant feeding of the fuel and has higher operating cost. If nuclear can get to the cost being promised by these nuclear companies, it will be the power of choice for data centers and AI in the future.

Robert Rowe (18:54)

And Vikram, I didn't realize that nuclear power is technically considered expensive. I suppose it's expensive if you have to build it, or is it just that it's always been considered clean? Like, how expensive is it relative to other alternative sources of energy or renewable energy?

Vikram Bagri (19:11)

There are only two small modular reactors operating across the world, one in Russia, one in China. Both went through a number of cost increases and cost escalations. The fear with nuclear and there are a couple of examples in the US where we tried to build very large nuclear reactors, and the cost escalations were egregious, and one of those projects could never be finished after spending billions of dollars on it. So, the fear of nuclear among the minds of regulators and utilities is that it will end up costing way more, and they are unsure if some of these technologies in the end will work or not.

So, we need more evidence or proof of concept, and we need the cost to come down meaningfully and sort of like execution to be flawless for these technologies to be adopted.

Robert Rowe (20:05)

Got it. So, I guess in closing, it sounds very much that the actual environment for renewable energies right now is actually pretty positive, relative to what we would think, given all the policy change, reconciliation

that's going on, you know, the potential for some reversal of that. It still sounds like a positive market environment.

Vikram Bagri (20:29)

That's a good way to summarize it, Rob. I think the policies a bump in the road. I get this question a lot if renewables are quote/unquote "*dead.*" I think renewables are alive and really well.

We'll see renewables being installed at a similar pace in years to come and we'll see these technologies advance, cut costs, be more competitive, be more efficient. But we think these technologies are going to play a big role in meeting the energy needs of the world.

Robert Rowe (20:57)

Well, fantastic, Vikram. Thanks for being on the podcast today. Very insightful. Thanks very much.

Vikram Bagri (21:04)

Thanks for having me. Thank you.

Robert Rowe (21:08)

This podcast was recorded on June 13th, 2025. Join us for our next episode, which will feature Lucy Baldwin, our Global Head of Research and Luis Costa, our head of EM Strategy to discuss Latin American markets.

Disclaimer (21:22)