

CLIMATE 101

STATE OF EV CHARGING

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STATE OF EV CHARGING

PANEL DISCUSSION TRANSCRIPT

Shailesh Vickram Singh:

Thanks, everyone, for joining today. Today, we are releasing the State of EV Report on the state of charging in India.

We have a very diverse panel today, including experts from policy organizations like WRI and CEEW, investment banker Vasudha, and two founders, Akhil and Ameen, who bring expertise in hardware and software design. Before we begin, it would be great if everyone could give a brief two-line introduction about themselves.

Let's start with you, Chaitanya.

Chaitanya Kanuri:

Hi, I'm Chaitanya. I lead the EV mobility work at WRI India. We work on various aspects of sustainability, including urban transport and development. Within urban transport, we focus on electric mobility as a key pathway to decarbonizing India's transport sector.

On the EV charging front, our work spans national policy engagement with organizations like the Ministry of Power and NITI Aayog, as well as collaborations with DISCOMs, state modal authorities, and public utilities on spatial planning and business modeling for charging infrastructure in cities and along highways.

Happy to be here.

Shailesh Vickram Singh:

Thanks, Chaitanya. Let's move to Vasudha.

Vasudha Madhavan:

Hi, everyone. I'm Vasudha, an investment banker with over 22 years of experience. For the last decade, I've been running my independent firm, Ostara Advisors. We were the first to focus on electric mobility back in 2016-17 and have worked on notable deals

in India, such as the acquisition of Ampere Vehicles by Greaves Cotton, India's first M&A in the electric two-wheeler space.

We've helped companies across the EV ecosystem, including OEMs, battery management systems, efficiency devices, and fleets, to raise early- and growth-stage capital. We also work on broader decarbonization projects and have brought several global investors into India. I'm based in Bangalore.

Shailesh Vickram Singh:

Thanks, Vasudha. Moving on, we have Ameen, who runs an interesting startup called Flextron EV. Ameen, over to you.

Ameen (Flextron EV):

Hello, everyone. My name is Ameen, and I'm the co-founder and CEO of Flextron. Flextron is an EV charging technology company manufacturing chargers like 3.3 kW and 7.5 kW models. We have over 15,000 chargers installed across the country through various CPOs.

Our core focus is on rapid charging technology, enabling EVs to charge in about 10 minutes. We bring extensive experience in the charging infrastructure space, particularly in hardware supply chains, and are currently focusing on building charging infrastructure and fast-charging batteries for last-mile delivery and gig workers.

Shailesh Vickram Singh:

Great, Ameen. Next, we have Priyans, who runs a popular blog called "Experience with EVs." He brings a customer-focused perspective. Priyans, over to you.

Priyans M:

Thank you, Shailesh, for inviting me. As mentioned, I run a blog called eXp with EVs, where I document experiences of driving EVs across the country. Beyond that, I've also been tracking infrastructure growth in India, particularly CCS2 and Type 2 chargers, for over two years.

I've been compiling data and insights to inform the public and the industry about what's happening in the EV space.

Shailesh Vickram Singh:

Thanks, Priyans. Now, we have Sheshadri joining us from the US. A quick introduction, please.

Seshadri Raghavan:

Thank you, Shailesh, and thanks to Climate Angels for having me. I'm Sheshadri Raghavan, a program lead at the Council on Energy, Environment, and Water (CEEW). I work on various EV transition topics, ranging from user behavior to broader decarbonization efforts.

I'm excited to be here and to learn from this esteemed panel.

Shailesh Vickram Singh:

Thank you, Shishadri. Finally, we have Sumedh Agarwal, Director at IEEE. Sumedh, over to you.

Sumedh Agarwal:

Good afternoon and good evening, everyone. I'm Sumedh, and I've been working in the development sector for over a decade. At IEEE, a nonprofit research-based organization, I lead the mobility practice, focusing on energy efficiency as a key lever for sustainable development. Decarbonization is central to our mission, and we fully support the electrification of the transport sector as a way to reduce emissions. I'm looking forward to learning from the panel and sharing our experiences.

Shailesh Vickram Singh:

Thanks, Sumedh. Let's jump straight into the discussion.

A bigger question on everyone's mind when it comes to EVs is about charging. Whenever we discuss EVs, the first thing that comes up is charging infrastructure. You approach the government, and they say, "We are working on building it." You speak to CPOs, and the utilization rates are extremely low—barely even in single digits. I met one large company whose utilization rate was only 0.5%.

Sumedh, why do you think this is happening?

Sumedh Agarwal:

Shailesh, there are three key challenges I would summarize as law, land, and legal.

Firstly, land is always an issue when it comes to selecting locations. Rents are typically very high, which makes it difficult to create a viable business model. Secondly, there are legal delays, such as obtaining approvals from utility sectors or accessing subsidies, which can be a significant roadblock. Finally, there are issues related to regulations or policies that sometimes hinder long-term investment and stability for new entrants.

This creates a complex system where the challenges are not just about EVs but also extend to the overall EV infrastructure. These aspects collectively discourage new players from entering the market or staying invested for the long term.

Shailesh Vickram Singh:

So, we've discussed law, land and legal issues—very interesting points. Chaitanya, you've been closely working with governments and are deeply involved in the development and formulation of EV policies. What are your views?

Chaitanya Kanuri (WRI):

Thanks, Shailesh. Honestly, it's hard to know where to start—there are so many factors at play.

First, as you mentioned, land and legal challenges are significant. The absence of a single-window clearance system slows down the setup of chargers.

On the supply side, a lot of players entered the charging infrastructure market because they saw it as a long-term opportunity. They weren't expecting immediate profits; instead, they wanted to establish first-mover dominance in anticipation of the EV market's growth. Additionally, the low entry barriers—thanks to de-licensing—allowed many charging operators to emerge, which was good for proliferation but also led to fragmentation in the ecosystem.

We've seen a mix of small, fly-by-night operators and big players enter the market. Over time, consolidation is happening, but this fragmentation has created challenges for EV users. It's not uncommon to hear complaints about needing multiple apps—sometimes as many as 30—just to complete a long-distance journey by piecing together different charging networks. This inefficiency impacts utilization rates.

On the demand side, India's vast geography and fragmented market mean that rolling out a cohesive charging infrastructure is a significant challenge. Public charging infrastructure has primarily been concentrated in cities, with highway charging only starting to gain traction in the past couple of years. This lack of highway charging facilities, especially for four-wheelers, has been a psychological barrier for potential EV buyers, who are accustomed to the convenience of fuel pumps everywhere.

Another issue is the mismatch between where charging stations are located and where they're needed. Many initial installations were placed where land was readily available—often in peripheral or industrial areas—rather than in high-demand, high-traffic commercial zones where land is scarce. This mismatch further reinforces the perception that charging infrastructure is insufficient.

In essence, the situation is complex and multifaceted, with truth on all sides.

Shailesh Vickram Singh:

Interesting. So, you're saying there's charging infrastructure, but profitability and margins are limited. Let me now bring in Akhil from Pulse Energy, a startup addressing these issues. Akhil, you have a tough position here, considering the paradox where everyone's investing in charging, yet CPOs are struggling. Could you introduce yourself and share your thoughts on this paradox?

Akhil Jayaprakash:

Thank you, Shailesh, and thanks to Clem Tangel for having me here.

I'm Akhil, one of the co-founders of Pulse Energy. Over the past five years, I've had the opportunity to work with many of the panelists here. Our business focuses on helping fleet operators access multiple charging networks through our platform.

Today, fleets and commercial vehicles are the biggest consumers of public chargers in India. As Chaitanya mentioned, the fragmentation of charging networks forces users to juggle multiple apps, which we help solve. It's a small but significant problem, as it impacts utilization, accessibility, and the overall user experience.

When I think about the paradox, I see two key trends. One is that Indians are value seekers—we naturally gravitate toward chargers offering the lowest rates. This behavior is consistent across fleets and retail customers. For instance, we manage charging for BESCOM, which offers rates as low as ₹6.70 per unit.

Shailesh Vickram Singh:

So, what's their decision regarding this?

Akhil Jayaprakash:

The rates are extremely high. I get complaints that, while the utilization is good, the issue is whether they're making money.

The rates are often set at cost—just the electricity cost without any GST. The approach is not profit-driven; these operators are treating it as a government-funded project. They're focused on providing the lowest rates possible, but the problem is, even with high utilization, they're not generating profit. Plus, there are lines at these charging stations, which adds to the frustration.

Shailesh Vickram Singh:

In Malaysia, would you say utilization is above 50% or below 50%?

Akhil Jayaprakash:

I wouldn't be able to answer that. That's best for BESCOM to clarify.

Shailesh Vickram Singh:

I want to understand what is meant by good utilization.

Akhil Jayaprakash:

Think of it as decent utilization. You can actually file an RTI to get the exact data. I'm not authorized to disclose that.

Just to close the loop on this, utilization levels vary. Some public chargers in cities like Mumbai, Delhi, Hyderabad, and Bangalore show good utilization—around 125% for certain chargers. However, on highways, the utilization rates are generally lower.

Shailesh Vickram Singh:

Yes, got it. So, that's happening. You're suggesting that instead of installing a DC charger, we could use a battery charger and deploy it for on-demand charging. Ameen what are your views in this regard?

Ameen Khan:

Right, I think if you're using battery-integrated DC chargers to charge electric vehicles, there are some fundamental challenges. It makes sense if it's integrated with, say, solar or if you're able to store or borrow energy at a lower cost and sell it at a higher cost.

But where it becomes tricky is within the supply chain. As Akhil mentioned earlier, margins are very thin. If a CPO has to install a charger, consider the stakeholders in the supply chain: you have the manufacturer, the financier, the CPO who manages the software, and the landlord. Each of them needs a share of the ₹8–12 per unit you sell.

Breaking even on these chargers becomes extremely difficult if you're investing in the charger and then also need to invest in an additional grid-to-grid connection, which costs ₹2–3 lakhs. However, if you're able to store energy without requiring another grid-to-grid setup and sell the electricity at a higher cost, then breaking even and building a sustainable model becomes more feasible.

That said, we're noticing grid availability becoming a growing challenge as the ecosystem expands. In cities like Bangalore, there's real estate and capital available, but grid availability is often missing, and this is becoming a significant bottleneck.

Shailesh Vickram Singh:

So, Sheshadri, I'm coming to you. Since you've been advising many governments, do you think this grid availability issue is becoming a major problem?

Seshadri Raghavan:

The grid issue is multifaceted. First, there's a lack of data on ground realities, like demand curves and utilization patterns. This black-box scenario complicates effective planning. Second, there's a lack of coordinated planning between supply and demand, as panelists have pointed out, driven by factors like land availability and costs. Currently, the EV transition in India is primarily driven by two-wheelers and three-wheelers. These vehicles operate on AC charging and don't heavily burden the grid. At most, they require minor reinforcements like upgraded MCBs. However, the challenges escalate when we shift to DC fast charging, particularly for four-wheelers and buses.

For four-wheelers, concentrated in metros and premium areas, the bottleneck lies in accessing the required voltage and current levels.

Grid challenges can be divided into two parts: onsite infrastructure, like transformers or substations, and upstream infrastructure, such as high-tension lines. Both involve significant costs and time investments.

In rural or highway settings, the challenges amplify due to sparse demand and the high cost of upgrading grid infrastructure. For instance, even with two-wheelers and three-wheelers, some hotspots are creating strain. Anecdotally, in Delhi, e-bus drivers have been advised to space out their charging, but many still charge during their lunch breaks, causing localized strain.

If we aim to accelerate the EV transition and expand beyond two- and three-wheelers, which currently only make a minor dent in crude oil imports and GHG emissions, we must address these grid constraints systematically. However, moving forward, the focus must shift to higher-impact vehicles like buses, trucks, and four-wheelers, as these segments are the real game changers.

Shailesh Vickram Singh:

The endgame lies in buses, trucks, and cars. We'll circle back to the bus discussion later since that's a different challenge altogether. But let's now explore the core challenges from the perspective of users who rely on public infrastructure. Priyans?

Priyans M:

Let's break down the problem:

1. Two-Wheelers: Most users charge their vehicles at home. These are primarily city-driven vehicles that don't rely heavily on public charging infrastructure.
1. Three-Wheelers & Light Commercial Vehicles (LCVs): These vehicles are typically used for fixed circuits or point-to-point operations, also relying on private or captive charging setups rather than public infrastructure.
2. Four-Wheelers & Buses: This is where public infrastructure becomes critical. Unlike service operators managing their own e-bus charging, four-wheeler users face a fragmented ecosystem with too many players.

There's also a significant data gap. For example, I have over 100 charging apps on my phone, but none of them consolidate information effectively. However, public charging infrastructure is improving. Since September 2022, CCS2 and Type 2 public chargers have grown tenfold in India.

To illustrate, I've driven the Delhi-Mumbai route nine times. Initially, I had to take detours via cities like Ahmedabad and Udaipur due to limited charging options. Now, with improved infrastructure, I can use the Delhi-Mumbai Expressway, albeit with some reliance on off-expressway chargers. This improvement has already cut my travel time by 3–3.5 hours. Once the expressway is fully operational and equipped with reliable chargers, travel times will reduce further.

This gradual evolution of public charging infrastructure shows promise, but we're still far from optimal. We need coordinated efforts to close gaps, especially for high-demand areas and long-haul routes.

Shailesh Vickram Singh:

Understood. I see your point about shifts in infrastructure and demand patterns. Let's move toward discussing this from an investment and growth perspective.

Vasudha Madhavan (Ostara Advisors):

Looking at the EV sector, I want to address two aspects:

1. **Global Trends in EV Investments:** Globally, we've seen a decline in EV sector investments. This has raised concerns about whether India might follow the same trend. However, India's unique market dynamics—dominated by two-wheelers and three-wheelers—differ from markets primarily driven by passenger vehicles or luxury EVs.
2. **Mismatch Between Demand and Supply:** The core of the challenge lies in aligning demand and supply. The EV charging ecosystem's current anxiety stems from the shift in expectations. With ICE vehicles, you never worry about finding fuel stations; they're ubiquitous. Transitioning to EVs introduces the need to plan ahead, find chargers, and manage range anxiety. This mismatch between where demand is concentrated and where charging infrastructure is available exacerbates the problem. Addressing this will be key to alleviating concerns and fostering smoother adoption.

India's EV market has strong growth potential, but ensuring infrastructure development keeps pace with increasing vehicle adoption is critical. This balance will dictate how effectively the sector scales and attracts continued investment.

I think most of the points have been covered about why the infrastructure exists and all that. But essentially, it all comes down to where the demand is and where the supply is. Right now, part of the anxiety is because we're used to having fuel stations available whenever and wherever we need them. That tension doesn't exist with ICE vehicles. The transition to EVs, however, brings this tension because you suddenly have to find where the charging station is.

The way the EV industry has grown in the last several years has been use-case-specific. Two-wheelers used for deliveries have grown at one pace, three-wheelers for last-mile transport at another, and buses at their own cadence. Charging networks also need to integrate with these use cases, but the slower growth of charging infrastructure compared to vehicles has created a mismatch.

Over the next few years, I think this mismatch will start getting ironed out. For instance, more EVs will be in apartment complexes, and societies are already installing local chargers. Each use case will begin to address its own challenges. Right now, the paradox exists because we're in the early stages of adoption.

From an investment perspective, I often have conversations with investors looking at Series A and above. Almost every meeting includes discussions about preferences, trends, and where they're looking to invest. Over the past three years, more than a billion dollars have been raised annually in the EV sector.

In 2021, for example, we saw significant deals like the TPG Rise investment in Tata Motors, which alone accounted for a billion dollars. But, on average, a large share of funding—50-60%—has gone to OEMs. Charging infrastructure, on the other hand, has received only a small portion. For instance, only about 3% of last year's funding went into the charging space. The main issue for equity investors is this paradox of low utilization rates for chargers. Investors question the timeline for higher utilization that would justify returns on their capital, which typically has a 3-7 year horizon. This mismatch between perceived timelines and expectations has held back significant investment in charging infrastructure.

Shailesh Vickram Singh:

You're saying people expect utilization, but it's not happening, so they hesitate to come in. Looking at the EV ecosystem broadly—OEMs, hardware, software, battery swapping, and charging—where do you think the pressure will be in the next 18 months?

Vasudha Madhavan:

Speaking broadly, investors are less focused on hardware unless there's a high level of differentiation, like unique technology developed by the company. OEMs and software solutions generally attract more interest.

In India, purely software-based businesses are rare because there's always some hardware or offline element involved. While software is attractive to investors, the broader ecosystem has challenges due to the offline nature of EV infrastructure, which impacts scalability and funding decisions.

Shailesh Vickram Singh:

In India, you can't really build a purely software business.

Vasudha Madhavan (Ostara Advisors):

I agree. The software aspect might seem attractive to investors, but scalability often becomes a question, right?

Shailesh Vickram Singh:

When you say scalability, do you mean the market isn't large enough for software solutions?

Vasudha Madhavan (Ostara Advisors):

Exactly. The market is not perceived as very large. For instance, consider a company that provides transportation services, not just EVs but a mix of EVs and ICE vehicles. They might have fantastic AI-based software to optimize rides and trips, and they offer it as a SaaS solution to enterprises. While this sounds great, the market for such solutions is much smaller compared to actually operating and filling those trips.

In the Indian market specifically, enterprise customers or the average end consumer aren't typically willing to pay for software solutions. It's very challenging. Akil also mentioned Bescom, which is great work, but in terms of scalability and ROI, it's tough to match investor expectations with what the industry can deliver.

This creates a paradox. Investors want to focus only on software because of its perceived scalability and asset-light nature, but the reality is that the EV ecosystem often requires a mix of software and hardware. Both sides—investors and industry players—need to find a middle ground and be okay with some level of hardware involvement to make things work.

Shailesh Vickram Singh:

Sorry to interrupt here.

Vasudha Madhavan (Ostara Advisors):

Sure, go ahead.

Shailesh Vickram Singh:

Akhil, considering what was just discussed, do you think it's possible to build a hundred-million-dollar revenue company purely through a software play in the EV charging space?

Akhil Jayaprakash:

In India? No, to be very honest. Globally? Yes, it's possible. Here's the thing: investors need to consider the market dynamics. Ultimately, the market size in India is tied to consumption, which in turn depends on vehicle sales.

We've seen government projections of 30 million to 50 million EVs by 2030, but I don't think that's realistic. There's already a slowdown happening. If vehicle sales reduce at a macro level, overall consumption will decline as well.

This impacts hardware charger companies too. There's a limit to how much hardware you can push into the market. At some point, saturation will set in. People aren't going to buy a lakh chargers every year. Eventually, sales will stabilize, and we'll see a stagnant phase.

Shailesh Vickram Singh:

We're already noticing a drop, right? There's a clear decline.

Akhil Jayaprakash:

Exactly. We're not going to hit those 30-50 million EV targets in the next five years. That reduction trickles down to fewer chargers being set up, less energy being consumed, and ultimately less value that can be extracted through software solutions.

So, when looking at the Indian market, it really boils down to the number of vehicles and users. Without that critical mass, a purely software-driven approach struggles to achieve scale.

Shailesh Vickram Singh:

Ameen, you're focusing on hardware, such as batteries and other components. Do you think it's possible to build a 100-million-dollar company in India, or do you agree with Akhil that we need to think about building for the global market? And if that's the case, how do we account for the challenges related to exporting, compliance, and quality standards?

Ameen Khan:

I believe it's possible to build a 100-million-dollar company in hardware within India, especially considering the market growth. For example, electric motor controllers and EV chargers are seeing a significant rise in demand. However, when you look at the hardware supply chain in India, about 80% of it is sourced from China and Taiwan, and there's a lack of innovation in our local supply chains.

One key challenge in the EV charging infrastructure space is that while the external parts of chargers are often made locally, the internal hardware is still largely imported. This has stunted innovation.

If we want to build a successful 100-million-dollar company in this space, I believe it could come from a charging manufacturer or an OEM that not only serves the Indian market but also exports globally.

Shailesh Vickram Singh:

Sumedh, what do you think? We have three policy experts here. Do we always blame the vehicles, the institutions, or manufacturers for not innovating, or is it that the policies themselves are heading in the wrong direction? If you look at the graph on the screen, you can see that after hitting 5%, there's suddenly been a drop to 3.9% for 2024. What's your take on the policy side of things?

Sumedh Agarwal:

That's a good question. There are a few things to consider here. Firstly, the EV market in India has always had low penetration. The heroes of the EV sector have mostly been in tier-2 cities, especially with two-wheelers and three-wheelers, where we have more space. But as urbanization increases, there are new challenges. Personal mobility is rising, and more people are living in nuclear families, which means we're seeing a rise in rented apartments.

This creates issues when it comes to setting up fixed charging stations, especially in rented properties where landlords aren't willing to install charging infrastructure. There's also a lack of designated parking spaces for EVs in many places.

Now, on the policy side, India's approach has been supportive. When compared to China, where the EV market is heavily subsidized, India's policies have been more about driving demand and supply. However, there's still a lot of innovation that needs to happen in terms of creating new ecosystems. For example, battery swapping and developing solutions to increase penetration in the four-wheeler sector, as growth right now is largely in the two-wheeler and three-wheeler markets.

Shailesh Vickram Singh:

I think this point you raised about policy is critical. What I want to ask Seshadri now is, do you think the progress we've made is due to policy or despite it? I've got a chart here, and while the data shows some correlation, we can't assume causation. What do you think – is the current trend happening because of policy or despite it

Seshadri Raghavan:

Okay, I'll play the diplomat here. I'll refer to the previous comment on being bottom-up. Let's say we're not focusing on two-wheelers. We largely don't need much public EV charging infrastructure, as a regular socket with sufficient protection should be enough.

As for policy and the correlation-causation angle, it's a philosophical discussion. Rather than focusing on whether there is correlation or causation, there is enough global evidence to suggest that policies tend to go hand-in-hand with EV adoption. Especially when talking about four-wheelers, there is some association between EVs and EV infrastructure.

Shailesh Vickram Singh:

That makes sense. Let me add two points here. First, most of the adoption in India, especially for two-wheelers, has been driven by affordable batteries, with little reliance on subsidies. Second, once FAME subsidies were phased out, vehicle prices dropped. But now, companies like Hero Electric and Okinawa, which heavily depended on subsidies, have practically disappeared from the market. So, my question is, are the policies really helping, or have they allowed players who weren't necessarily focused on building quality vehicles to enter the space, take advantage of the subsidies, and build up the market? What's your take?

Chaitanya Kanuri (WRI):

I don't think there's any question that subsidies drive EV growth, especially at the beginning, when there was a significant price gap between EVs and ICE vehicles. The market was almost non-existent, and economies of scale hadn't yet come into play. Subsidies were essential for kickstarting the market, and they continue to be important, especially for certain segments like two-wheelers, which remain quite niche. The real question is how to use subsidies judiciously. Yes, if you throw enough money at anything, people will buy it. But the goal is to ensure that the money is spent effectively. As someone pointed out earlier, Okinawa and Hero Electric faced issues with localization, which affected their eligibility for subsidies.

Over time, these players will likely be weeded out if they don't meet the required standards. I don't think this is a policy issue.

Shailesh Vickram Singh:

Great. So, I'll play the devil's advocate here and raise a big question. We're seeing maximum adoption in three-wheelers, but we don't have a standardized approach. We're the only country that uses three different standards as one, right? No other country does that. We have Type 6, Type 7, and other types coming up. So, what are the challenges we're facing here?

Chaitanya Kanuri (WRI):

What is your take? And that's multiple standards.

Shailesh Vickram Singh:

Yes, you can have multiple standards, but the point is that you have Chademo, American standards, and even others, and you don't have one unified standard. If there are five standards, the industry won't come together. So, why are we struggling to have a single standard?

Chaitanya Kanuri (WRI):

It's really a matter of excitement again.

Shailesh Vickram Singh:

The question remains: What we know is fairly clear, it's just one—Type 6, Type 7. Why is it so complicated?

Chaitanya Kanuri (WRI):

Well, I'm sure there are others who could speak to this as well.

Shailesh Vickram Singh:

Okay, I'll let you share your two cents, and then I'll let others weigh in.

Chaitanya Kanuri (WRI):

There are a couple of reasons for this. Firstly, as someone mentioned, most two-wheelers are charged at home. When charging is done at home, there's no pressing need to worry about standardizing connectors to meet international standards. High-quality standards or internationally certified connectors are expensive, and adding them would increase the cost of the vehicle. Two-wheelers are extremely price-sensitive.

And it's not just about charging connectors. For example, consider the batteries—they often don't have high-grade battery management systems (BMS) or advanced thermal cooling systems, especially for two-wheelers. All these are optimized to reduce costs. Moreover, the lack of standardization hasn't really been a pain point for consumers in the two-wheeler space. Most two-wheelers come with a portable charging cable, so as long as the socket on the wall is standardized, it suffices.

Shailesh Vickram Singh:

Yeah, that's a different perspective. We'll come back to that. But I get the point. Let me pause here.

So, Ameen, as a manufacturer, do you think the lack of a standard is a real issue? For example, what Chaitanya is saying suggests it's not a big concern for two-wheelers—it doesn't seem to bother anyone too much.

Ameen:

I agree with Chaitanya that when charging happens at home, standardization doesn't matter much to users. Standardization becomes important, for instance, in four-wheelers—if you have CCS2, you can publicly charge anywhere.

For public charging, standardization is key because it offers a value proposition. For example, I might use a Chigori or an SBS connector with my battery pack, but as long as I can plug it into a socket at home, it's fine. However, when offering fast charging services or building public infrastructure, the customer expects standardization. They want to be able to charge their vehicle at any station, like an Ather or a Tata Power station.

So, for public charging stations, standardization is crucial. But for home charging, it's less of an issue. What Chaitanya is saying is correct—standardization might not be critical for two-wheelers.

Shailesh Vickram Singh:

We're a little short on time, so I'd like to get as many perspectives as possible.

Vasudha, as a banker, do you see any of the companies you work with struggling with standardization issues? Do you think this is a significant challenge?

Vasudha Madhavan (Ostara Advisors):

We've worked selectively in this space, and while we've observed changes, I don't think standardization across vehicle types is a significant issue on a large scale.

The priority should be building scalable businesses within each segment. The Indian market has a unique dynamic—it's possible to create large and attractive full-stack businesses even by focusing on just one or two use cases. That's the main challenge and opportunity here.

Priyans M:

From what I've seen, standards don't seem to be a major challenge. As an end user, my perspective is more focused on four-wheelers. Thankfully, in the four-wheeler space, everyone has adopted CCS2.

Initially, there were a few outliers using different standards, but even fleet operators have now switched to CCS2. So in this segment, OEMs or regulatory bodies deserve credit for bringing in and enforcing standardization.

Priyans M:

From what I've seen, standards don't seem to be a major challenge. As an end user, my perspective is more focused on four-wheelers. Thankfully, in the four-wheeler space, everyone has adopted CCS2.

Initially, there were a few outliers using different standards, but even fleet operators have now switched to CCS2. So in this segment, OEMs or regulatory bodies deserve credit for bringing in and enforcing standardization.

Shailesh Vickram Singh:

Got it. Thanks for sharing your perspectives.

As we're nearing the end of this session, I'd like to pose a slightly different question. Between AC 22 kW fast charging and DC 30 kW fast charging, why haven't we leaned more towards AC 22 kW charging?

It's significantly cheaper—an AC 22 kW charger costs just about ₹56,000. It doesn't require any specialized equipment, there are no significant safety concerns, and it can provide around 150 kilometers of range in an hour. So where are we stuck?

I'll start with you, Ameen—what are your thoughts on this, particularly from the perspective of operational costs?

Ameen Khan:

Right. So, in most buildings today, if you want to provide a 22-kilowatt AC charging option, you'll likely face challenges with the power allotment. For example, in a typical residential or commercial building, you might have a total allotment of just 24 kilowatts.

If you aim to offer 22 kilowatts to your customers, you'll still need to request a grid upgrade to accommodate that load.

Shailesh Vickram Singh:

One second, one second. Why would you need an upgrade?

If you already have three-phase power, the system should provide sufficient capacity. For instance, if I'm getting seven kilowatts per phase, with three phases, I already have 21 kilowatts, right?

In large building complexes with three-phase energy systems, you typically have around 32 kilowatts of power available. Isn't that standard?

Ameen Khan:

Right, that could be true for large buildings. But the key question is: how many of these buildings can consistently provide a dedicated 22 kilowatts for EV charging?

Shailesh Vickram Singh:

That's a fair point.

Ameen Khan:

The second issue is the cost. While a 22-kilowatt charger might cost ₹40,000 to ₹50,000, making it easier for the end consumer, the cost implications for OEMs are significant.

For example, the differential cost of an onboard charger—whether it's a 3.3-kilowatt or a 7.5-kilowatt charger—can be as high as ₹45,000. This cost difference impacts the overall feasibility of deploying higher-capacity chargers.

Shailesh Vickram Singh:

But if you're comparing the costs, for a 7-kilowatt onboard charger, it's ₹45,000. Meanwhile, a 22-kilowatt onboard charger costs ₹1.5 lakh.

Ameen Khan:

Okay, ₹1.2 lakh. Is that the difference?

Shailesh Vickram Singh:

So, everybody is around 7.4 kilowatt chargers now. Let's say we move from 7.4 kilowatts to 22 kilowatts.

Ameen Khan:

What's the delta? For the OEM itself, the hardware cost will increase by about ₹1 lakh, but it will reduce costs for the customer eventually.

However, when an Indian consumer is buying a car, if there's a price difference of ₹75,000, they'll typically opt for the cheaper option.

Shailesh Vickram Singh:

But when someone is buying an MG car priced at ₹27 lakh, the cost difference should be manageable. The real issue lies in the DC charger pricing. DC chargers are around ₹5 lakh, while an AC charger costs just ₹15,000. I'm just playing devil's advocate here.

Ameen Khan:

As a consumer, if I opt for a 22-kilowatt car, my first question would be: how many places actually offer 22-kilowatt AC charging?

As Priyant mentioned, 7.5 kilowatts is widely available. So, if I have only five locations with 22-kilowatt chargers but 30 locations with 7.5-kilowatt chargers, I'd choose 7.5 kilowatts at a lower cost for both the OEM and the vehicle.

Shailesh Vickram Singh:

Let me reframe this. Let's say the government provides a subsidy for 22-kilowatt chargers — ₹50,000 per charger, for example.

Would it make more sense to subsidize AC chargers instead of DC chargers?

Chaitanya and Seshadri, what's your take on this? If subsidies go toward OVC (Onboard Vehicle Chargers) instead of DC chargers, what will drive better adoption?

Chaitanya Kanuri (WRI):

Subsidizing OVC chargers benefits the OEM directly.

Shailesh Vickram Singh:

True, but subsidies for DC chargers also go to the OEM indirectly. Amin, let me simplify the question. If there's no cost increase and both systems cost the same, what's better for the market: a 22-kilowatt AC system or a 30-kilowatt DC system?

Sumedh Agarwal:

I'd like to add something here.

Ameen Khan:

Sure, go ahead.

Sumedh Agarwal:

From the grid's perspective, a sudden bump from high-load grid charging is a significant challenge. Grids aren't designed to handle such spikes, especially with other devices drawing power simultaneously.

This creates a heavy load issue. Additionally, in India, scalability depends on affordability. If there's a substantial cost difference, it won't be practical. Therefore, opting for an AC system over DC is more viable.

AC charging adds value because DC systems cause sudden surges that strain the distribution system, which isn't ideal from a grid perspective.

Ameen Khan:

I agree with Sumedh that for personal use, an AC charger makes more sense. However, when there's no grid availability in a building, spending ₹4–5 lakhs on a grid upgrade to set up 22-kilowatt charging becomes a consideration.

Even with this setup, charging takes about 1.5 hours.

On the other hand, DC charging can significantly reduce charging time.

While we focus on what's best for the grid, consumers prioritize saving time and money. Ultimately, value creation for them revolves around these two factors.

Shailesh Vickram Singh:

Alright. So, coming back to Priyans..

Priyans M:

Honestly, I don't care if it's a 22-kilowatt AC charger or a 30-kilowatt DC charger. The point is that if I can get 150 kilometers of range in one hour, how my car charges doesn't matter to me. From a charging point service perspective, it's often cheaper to deploy 30-kilowatt DC chargers. The key advantage is that they're not dependent on the car's onboard charging capability. Right now, in the market, many cars don't even come with 22-kilowatt onboard chargers (OBCs).

Shailesh Vickram Singh:

Yes, and without 22-kilowatt OBCs, the possibilities for utilizing those chargers are limited.

Priyans M:

Exactly. And another point that's often overlooked is that upgrading the existing charger hardware to support higher capacities adds to the cost.

For example, back in February 2023, I was in Hyderabad and spent nearly four hours charging my MG ZS EV with a 50-kilowatt-hour battery pack at a 15-kilowatt DC charger.

I was charging from 0 to 100%, and it took significant time. This shows that low-capacity DC chargers are still prevalent. The advantage with DC is lower conversion losses because DC power goes directly to the battery.

With AC chargers, you need to convert the current, which results in efficiency losses.

Shailesh Vickram Singh:

Good point. Ameen, would you like to add to the conversion.

Ameen Khan:

Essentially, a DC charger takes AC current, converts it to DC, and supplies it directly to the battery.

If you're using a 22-kilowatt AC charger, the car's onboard charger (OBC) performs the same AC-to-DC conversion.

The efficiency depends on the quality of hardware—whether it's the rectifiers in the OBC or the charger itself.

Shailesh Vickram Singh:

Got it. Chaitanya, do you have anything you'd like to add?

Chaitanya Kanuri (WRI):

I think the comparison between DC 30 and AC 22 kilowatts isn't entirely fair because today we can charge at much faster rates.

Building on what Priyansh said, if you're looking at fast charging for consumers, we need to wait for OEMs to adopt 22-kilowatt AC chargers. Even then, AC is primarily seen as something for home charging.

When charging outside, consumers prefer faster options, and DC chargers can deliver faster and faster rates as battery charging technologies improve.

For home charging, upgrading transformers becomes an issue. For example, a typical 3BHK home has a 10-kilowatt connection. Adding two 22-kilowatt chargers would blow past that limit and require upgrading the home's power connection, which is logistically challenging.

From an OEM perspective, 22-kilowatt AC chargers are viable for community or personal charging in specific use cases, such as large campuses. However, DC charging will remain dominant for public charging due to its speed and scalability. Today, DC chargers are advancing well beyond 30 kilowatts.

Shailesh Vickram Singh:

Understood. We're almost out of time, but this has been an interesting discussion. There's an active chat with many great insights. As we wrap up, does anyone have any final comments on what it takes to start with EV charging? We've prepared a 132-page report on this topic, and we'll share it with everyone after the webinar. Let's start with Chaitanya.

Chaitanya Kanuri (WRI):

For EV charging to take off, we need to better understand utilization patterns and design use-case-specific solutions. One strategy, especially in cities, is to focus on how fleets move. Fleet operators should be the first adopters for charging point operators (CPOs), with residual retail customers being an added bonus. This ensures viability for chargers.

It's also important to right-size charging networks. For example, previous estimates suggested 50% of three-wheelers would use public charging. However, in smaller cities, many three-wheeler drivers charge at home, reducing public charging demand.

We need to account for these patterns to build appropriate public charging infrastructure.

Shailesh Vickram Singh:

Thanks, Chaitanya.

Sumedh Agarwal:

So, I think there are two three things. One is like India is a unique market and it's have its own development challenges. One thing for urban cities, I see we have to focus on first my last mile and the public transport. So whatever the solutions which can help us to reach the public stations, public metro stations and we have very established charging stations there will definitely help urban cities to unclog themselves as well as take things forward. For the urban areas or semi urban sorry for the rural areas or semi urban areas, I see I mean two things. One is we should have fleets which like e-commerce fleets. If we can focus on them, we can focus on the use cases which have food chains, which can be taken care forward with public charging stations or private charging stations, definitely it at value. And the last point I wanted to make was that all the public charging stations, high-grade public charging stations, high-grade public charging stations, there can be DC, that can be AC, but for whom less AC charging stations will definitely be something which we have to promote and take.

Shailesh Vickram Singh:

Yeah. All right. Thank you for any of your view.

Seshadri Raghavan:

On EV, so let me be at some point we have to face out of these subsidy-reliant approach. The only way to make that possible is to also look at the financial sustainability of charging infrastructure, and this requires, I think, I don't want to call it chicken and egg, but I would like to also. At to check in as we as point the right sizing the battery will sort of cascade into searching the how the infrastructure rollout happens. The manifest process we see in terms of fragmentation I don't want to call it fragmentation I would call it somewhere between chaos and a little bit you know very fast very fast to move I would say right sizing the the battery would be a much important angle to look at though we are talking about infrastructure people tend to overestimate their requirements for long distance travel we don't we cannot size the infrastructure for the tail end of the distribution trap is few days a year we have to look at the median and the nominal and some sort of say without the subsidies whether before go we cannot entirely drop the subsidies but the question of AC DC even with the DC there are so many levels possible for the time being we should have the the foresight should be is that what sort of a future infrastructure we want and that should dictate the level pieces we put place today so that we are like you know building up the pieces because we cannot just you know we have to measure twice and cut once that apparently seems to be you know they're learning on the go I would say because you subsidies have to a certain point and let's prioritize the police including the government police as well which includes the public transit those will be that are okay at some point come back to the truck that's when we are let's say and who will is to an extent that's when the full question of what do we do for highway charging infrastructure whether we go the subsidy route or whether we go the you know captive captive consumer role so I think we we have to give another three to five years for this thing to shake out for clear technology.

I also anticipate a lot of consolidation, all these small spot players, think there is going to be a lot of market consolidation, acquisition, the future will be much clearer as to which direction are we going like this question of bigger battery versus more charges. I think this will need some more time to shake out when we have like an inform answer that will be my closing comment on this.

Shailesh Vickram Singh:

Thank you. Okay, thanks. Thank you. Vasudha?

Vasudha Madhavan (Ostara Advisors):

Yeah, sorry, I was on mute. No, I mean, I really feel that we need that consolidation of, you know, from a consumer perspective, we need a one view of the charging station, which I think everyone from Google to players in the industry are working on that. I think that will really be a game changer. Ultimately, whatever we say on policy or funding, everything is dependent on customer utilization, you know, greater customer adoption. So while policy has had its own sort of sent down, you can say that broadly the direction is forward and, you know, upward. So we really need to be able to catalyze more equity into the space. Need to, you know, be sensitive to customer needs and see how we can build solutions aimed directly and specifically on customer needs and then use that to drive in more equity into the space and then kind of grow step by step from there. So yeah, that would be my comment.

Shailesh Vickram Singh:

Okay, thanks. Thanks. Ameen?

Ameen Khan:

I mean, right, I think personal charging, I think this will always AC's AC chargers is going to grow drastically, the 3.3 and the 7.5 for home charging. For DC charging, I believe that the dashboard operators need to realize that a charger, deploying a public charger sounds quite fancy. And you want to give access to a consumer. But on a business standpoint, you know, charger break events today with finances and play take about good two and a half to three years. And these break events only happen based on the amount of electricity a DC charger actually dispenses.

I think like I agree with what's having a single view that'll increase utilization on these chargers and help them break even and bringing this together could become a model where you have normal investors invest into charging infrastructure knowing that they'll get profitable after a point in time and let it all and you know have it organically grow because subsidies can only help you till and it's right.

Shailesh Vickram Singh:

Got it. And so Priyans?

Priyans M:

Yeah. Oh, yeah. I would say that subsidies need not be given CPOs. Subsidies need not be given to OEMs to increase their old basis. If subsidies have to be given, they have to be given to DISCOMs to ensure that power is reliably available

to ensure that there is if for example in the comments there is there is there was one piece where we were like in Gujarat you can get 100 kilowatt It connection very easily other states can't do that very interesting very interesting so if this comms are given that kind of subsidy it means that OEMs or CPOs who already have private money private capital they want to invest in the hardware they want to set up the chargers and if I see 120 kilowatt chargers on the expressway I want to travel more or similarly someone wants to set up a fleet operation that's in Rajasthan or in Jodpur they know that they can get 120 kilowatt chargers very easily so you know that the downtime is lower so that is that is how I think if there is subsidies to be played it should be played out in this way.

Shailesh Vickram Singh:

So that's very interesting comment you made. Now, I would like to invite Sudhir Nayak. Are you there?

Sudhir Nayak:

Yes. I am here.

Shailesh Vickram Singh:

Yeah, I'm here. Yeah, so Sudhir, founder of Sunfuel, they put EV chargers at very particular locations. So thanks, Sudhirya, and you are very, very active. So I said, why not Sudhir give some comment as a CPO and share your experience? Yeah, happy to hear your views.

Sudhir Nayak:

Awesome. So most charging is happening at home. Everyone understands that. Every car comes with that 7 kilowatt wall box, which people have been installing, and eventually humanity has always found ways to augment infrastructure, be it undersea cables for the internet or building stations when we transitioned from horse carts to cars. But we will find ways to augment our grid and have that charger, which comes along with our laptop charger, to get installed somewhere and do home charging, you know, in the near future, I do believe.

But having said that, the DC charging game on the highway, which is the most important piece of this puzzle, needs to be solved. One can't do it without the OEMs, because one, they are the biggest beneficiaries of a good charging infrastructure. Anywhere in the world where there is scaled up and high-quality charging infrastructure, it is OEM-backed, like Tesla chargers or Electrify America, which is a Volkswagen company, or Ionity, which is a conglomerate of Volkswagen, BMW, and Mercedes.

So in India, also, the charging player who wins gets the OEM skin in the game and has a last-mover advantage, which means moving last with the biggest chargers. Yes, so like business, we have the first-mover advantage, but there is the last-mover advantage as well. Think about the last smartphone; Facebook was the last social network. So the player who moves in with the biggest and the best chargers, when the dust has settled, is going to win, especially the one who can, you know, get the OEMs involved. Those are my two cents on this.

Shailesh Vickram Singh:

So, very nice, I think very, very good insights. I totally agree.

Shailesh Vickram Singh:

I think getting a 100 LT connection is the biggest challenge, right, for any CPU you ask, and the same way he said the problem is the market will be decided by the guys who will enter last. So, probably, we'll take a note of that. Thanks a lot to all of you for sparing one and a half hours for this session, really appreciate that, and I hope we all learned a lot from this thing. We'll share the report also by the end of today, and once again, thanks a lot. Have a good day, thank you. Thanks. Bye-bye.

Priyans M:

Bye-bye.

Seshadri Raghavan:

Thank you. Bye-bye.

