



Vol. 01 | Issue 07 | SEPTEMBER 2025

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*Navigating the Cutting  
Edge of Industry News*

**RESEARCH REPORT**

Smart Meters

**MARKET AND  
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Hi-Tech Radiators  
Pvt. Ltd.

**VOICES OF INDUSTRY**

Statiq

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**Shailendra Goswami**  
Chairman & Managing Director



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**ESTABLISHMENT OF MANUFACTURING BASES  
FOR OVERSEAS PRODUCTS IN INDIA**

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# ***From Factory Floors to Global Value Chains: The India Story***

India's manufacturing sector continued its strong momentum in August, with the PMI climbing to 59.3—a near 18-year high. Despite higher US tariffs slowing export orders, domestic demand kept growth robust, with new orders hitting a 57-month peak and production expanding at the fastest pace since the pandemic.

This month's cover features Shailendra Goswami, CMD of Pushkaraj Group, who reflects on his three-decade journey, India's evolving role in the global value chain, and the future of smart manufacturing and sustainability.

In an exclusive with Kartik Daftari, MD & CEO of Hi-Tech Radiators, we discuss automation that boosts productivity without job loss, sustainability initiatives, and the company's global expansion plans with digital-first manufacturing strategies.

We also present an industry focus on Smart Meters, a feature on workplace safety by Suresh Tanwar of the British Safety Council, and an article on electric tractors—cleaner, cost-efficient alternatives that could transform agriculture, provided rural infrastructure keeps pace.

The underlying theme this month is balance—balancing global challenges with domestic strength, technology with people, and growth with sustainability. Whether it is manufacturers adopting automation without displacing workers, or farmers weighing the promise of electric tractors against infrastructure gaps, Indian industry is navigating a period of rapid transformation with pragmatism and foresight.

At the same time, the conversations we bring you highlight a critical truth: progress is not only about speed, but also about responsibility. Safety, ESG commitments, and proactive innovation are becoming non-negotiable pillars for businesses that want to thrive in today's interconnected world.

At Machine Edge Global, we remain committed to capturing these shifts—bringing you insights, innovations, and stories shaping the future of industry.

*Sanjay Jadhav*

**Sanjay Jadhav**

Founder & Editor

[editor@machineedgeglobal.com](mailto:editor@machineedgeglobal.com)

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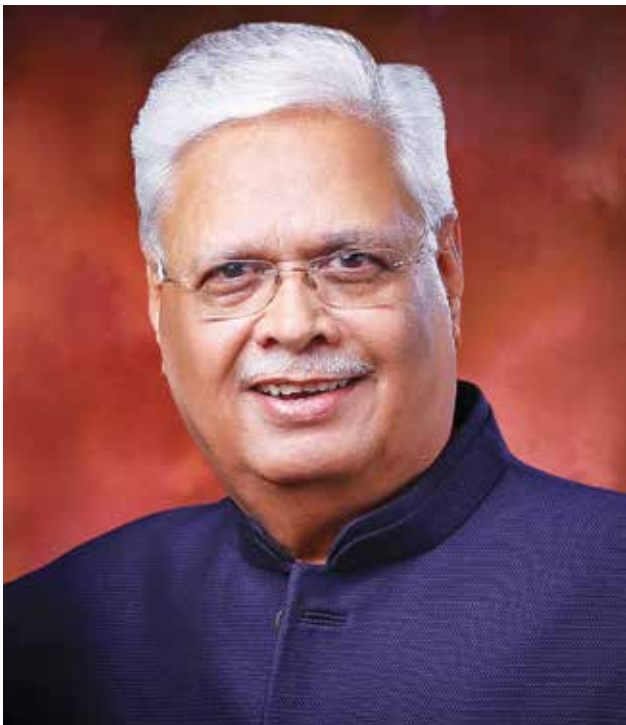
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# Engineering the Future: Pushkaraj Group's Role in India's Industrial Evolution



**SHAIENDRA GOSWAMI,**  
Chairman and Managing  
Director, Pushkaraj Group

With over five decades of industry experience and more than three decades at the helm of **Pushkaraj Group**, **Shailendra Goswami**, **Chairman and Managing Director**, has been a driving force in reshaping India's manufacturing story. From founding the Group in 1992 with a vision to address industry pain points in cost, quality, delivery, and global sourcing, to championing Smart Manufacturing, sustainability, and India's role in the global value chain, he has consistently stayed ahead of the curve. In this conversation with **Sanjay Jadhav**, **Editor, Machine Edge Global**, Mr. Goswami reflects on his entrepreneurial journey, the evolution of Indian manufacturing, the opportunities and challenges of emerging echnologies, and his advice for the next generation of industrial leaders.



# PUSHKARAJ HOUSE

PUSHKARAJ

**Q. You founded Pushkaraj Group in 1992 after 16 years in the industry.**

**How has your vision for the company evolved over the last three decades?**

▶▶ During my corporate journey, I navigated through diverse roles in marketing, product support, and eventually operations, overseeing a business unit. Fuelled by a thirst for knowledge and innovation, I thrived amidst ample resources, yet encountered challenges within a defined product domain. Notably, one significant hurdle was optimising costs, a focal point that sparked my entrepreneurial venture in 1992. I envisioned addressing industry pain points encompassing costs, quality, delivery, and alternative sourcing, leveraging a global network for innovative solutions.

Our foray into global sourcing revolutionised operations, propelling us to excel in problem-solving across sectors like Diesel Engines, Automotive, and Oil & Gas through an Agency Sales Division. The exploration of cutting-edge technologies worldwide led to the establishment of a robust manufacturing base in India, garnering international acclaim. Subsequently, we embarked on an export journey, strategically partnering with Indian manufacturers to meet global demands, particularly in the USA and EU markets.

The advent of the 'Make in India' and 'Atmanirbhar Bharat' initiatives in 2014 bolstered our commitment to enhancing indigenous content in customer systems to over 51%. This feat was realised through the establishment of our indigenous manufacturing facility, surpassing the mandated threshold for local value addition. With nearly five decades of industry expertise under my belt and succession planning underway,

I've transitioned into advisory roles, guiding businesses on strategic initiatives and Go-To-Market strategies to drive sustainable growth.

**Q. Manufacturing is undergoing rapid transformation with Industry 4.0. How has Pushkaraj integrated automation, IoT, and AI into its operations or solutions for clients?**

▶▶ Pushkaraj Group, through its consultancy wing, has been advocating for Smart Manufacturing concepts, particularly Industry 4.0, since 2018. Despite initial industry hesitance, the landscape shifted dramatically with the onset of the Covid pandemic, leading to a re-evaluation of productivity strategies. The industry's focus turned towards embracing Industry 4.0 practices, a shift I have actively supported across various platforms.

Encouraging industries to transition to Industry 4.0 has been pivotal in enhancing productivity, cost efficiency, product quality, and meeting global demands through scalability. The momentum of this migration has surged, especially with the emergence of the "China plus one" strategy, positioning India as a prominent Global Manufacturing Hub.

Building on this progress, we are now spearheading the adoption of Industry 5.0 and AI-enabled Smart Manufacturing solutions. Our role primarily involves providing advisory services to empower industries in achieving these advanced capabilities. This strategic evolution marks a significant step towards fostering innovation and competitiveness in the manufacturing sector.

**Q. As a supplier to sectors like automotive, oil & gas, and power, how**

**do you balance the need for high customisation with the efficiencies of standardization in manufacturing?**

▶▶ At Pushkaraj, our product and system portfolios are tailored to meet the unique needs of each customer. Whether it's configuring safety systems for Diesel Engines of different makes and models or customising wiring harnesses for applications in Engines, Automotive, Medical Devices, or Toys, we ensure a precise fit for every requirement.

While our manufacturing principles uphold standards in SCM, Quality, and more, each application boasts its individualised Process Flow chart and control plan. This tailored approach ensures efficient manufacturing processes specific to each product's demands.

**Q. With your exposure to diverse engineering applications, what technological trends do you believe will most impact manufacturing in the next five years?**

▶▶ Technological advancements are crucial for staying competitive and adapting to the evolving landscape. Key upcoming technologies include:

- Integration of Digital tools like AI, ML, and IoT in Manufacturing
- Adoption of Electric vehicles in the Automotive sector
- Utilization of Hydrogen as an alternative fuel for heavy-duty Trucks and Locomotives
- Implementation of Advanced digital platforms to enhance efficiencies in SCM, Finance, Aftermarket Spare parts Distribution, Marketing, Research and Development, and Quality.

“

*Encouraging industries to transition to Industry 4.0 has been pivotal in enhancing productivity, cost efficiency, product quality, and meeting global demands through scalability.”*

PLANNED

01:29:18

DOWN TIME

00:00:00

SETUP

00:00:00

RUNNING

01:51:33

PLANNED

Time in Planned Downtime

01:29:18

RUNNING

Time in Running

01:51:33

Time in Running Job / Shift

01:51:33 / 01:58:18

## Q. Sustainability is becoming a core expectation. How is Pushkaraj adopting green manufacturing practices or promoting sustainable solutions for clients?

▶▶ At Pushkaraj, sustainability and reducing carbon footprint are at the core of our product and system offerings to customers. We provide alternatives to fossil fuels like CNG and Dual Fuel for propulsion, along with Electric and Hybrid solutions for Automotive needs. Our commitment to energy efficiency is evident in our office practices, where LED lighting is utilised to minimise energy consumption. Additionally, we are exploring solar energy options for future sustainability goals.

## Q. How do you see the role of Indian manufacturing evolving in the global value chain, especially in light of the 'Make in India' and 'Atmanirbhar Bharat' initiatives?

▶▶ In the wake of global supply chain realignments, India is increasingly emerging as a key player in the global manufacturing landscape. Driven by a combination of geopolitical shifts, policy reforms, and competitive advantages, India is well-positioned to capitalise on the global trend of supply chain diversification away from China and other concentrated production centers.

India is viewed as a strategic alternative, offering political stability and alignment with Western economies.

Policies such as 'Make in India', Production Linked Incentive (PLI) schemes, and the National Logistics Policy are aimed at boosting domestic manufacturing and exports. Reforms in taxation (GST), corporate tax cuts, digitization of compliance, infrastructure development, Strengthening of SEZs & industrial corridors to attract FDI and Domestic Consumption have improved India's business environment and Ease of doing business.

While challenges remain—such as land acquisition, regulatory complexity, and infrastructure gaps—momentum is clearly in India's Favor. Realising this

potential will require a coordinated push involving the private sector, central and state governments, and strategic global partnerships. The next decade will be crucial in determining India's position in the global manufacturing order

## Q. What challenges and opportunities do you foresee for Indian manufacturers in tapping into newer markets like electric mobility, renewable energy, or hydrogen fuel technology?

### ▶▶ Electric Mobility -

- **Opportunities:** Strong policy push (PLI, ACC battery), cost advantage in 2W/3W & buses, recycling/EPR rules creating circular-economy plays.
- **Challenges:** Subsidy uncertainty (FAME II/III), delays in local cell manufacturing, strict EU battery regulations.

### Renewable Energy -

- **Opportunities:** Domestic



demand supported by tariffs/ALMM, rapid solar capacity expansion, scope in inverters, trackers, O&M.

- **Challenges:** Dependence on imported wafers/polysilicon, offshore wind project cancellations, tariff risks.

#### Green Hydrogen -

- **Opportunities:** National Hydrogen Mission incentives, SECI auctions proving early demand, export potential via green ammonia/methanol.
- **Challenges:** Tender volatility, high power & water intensity, need for cost-competitive electrolyzers.

#### Cross-cutting Factors -

- Critical minerals access and supply security are essential.
- Trade corridors (e.g., India-EFTA TEPA) open new export channels.
- Compliance-by-design (battery passports, digital product passports, carbon disclosure) is

key for EU market entry.

#### Bottom Line -


- Indian manufacturers have a window to build global relevance by localizing components, designing for export compliance, and securing raw materials early. Success will hinge on moving beyond assembly into higher-value technologies while embedding sustainability and traceability from the start.

**Q. If you were advising young industrial entrepreneurs today, what would you tell them about succeeding in manufacturing in a highly competitive global market?**

▶▶ Following will be my advice to young entrepreneurs:

- Cost advantage helps, but global buyers choose quality, reliability, and compliance.
- Be the best at one product, component, or process before

expanding. Depth creates reputation.

- CE, UL, RoHS, ISO, ESG, Digital Passports—treat these as entry tickets, not afterthoughts.
- Use India's cost edge, but align early with export corridors (EFTA, ASEAN, UAE, Africa).
- License or collaborate for technology/IP; focus on world-class execution and cost engineering.
- Recycling, circularity, low-carbon manufacturing = market access + customer trust.
- Lean, Six Sigma, automation, and data-driven production = scalability and credibility.—Skilled engineers, technicians, and managers are your real differentiator, not machines alone.
- EVs, hydrogen, renewables—policy changes fast. Build phased investments and flexible supply chains.
- Deliver on time, maintain consistency, and be transparent. Trust is the hardest but most valuable currency in global manufacturing. 

**“Automation at Hi-Tech is not about replacing workers—it’s about scaling demand and improving working conditions.”**

In an interview with **Kartik Daftari**, Managing Director & CEO, **Hi-Tech Radiators Pvt. Ltd.**, by Machine Edge Global, he emphasized that automation at Hi-Tech is designed to scale productivity tenfold without displacing workers, while sustainability initiatives such as 1 MW of solar power capacity and zero liquid discharge status reinforce the company’s ESG commitment. Looking ahead, he shared that Hi-Tech aims to sustain its ~30% CAGR by diversifying products, expanding its global footprint, and embedding digital technologies like IoT, ERP integration, and digital twins into its manufacturing ecosystem.



**KARTIK DAFTARI,**  
Managing Director & CEO,  
Hi-Tech Radiators Pvt. Ltd.



**Q. From a family-owned business to a global exporter to 55+ countries—what have been some defining milestones in Hi-Tech’s journey?**

▶▶ We began our manufacturing journey in 2005 by setting up its first plant in Khopoli. In the early years, we focused on building a strong internal culture, recruiting technical and managerial talent, and attracting top professionals from Tier-2 cities as well.

We achieved a significant milestone in 2010 with the commissioning of a second radiator manufacturing facility, marking the beginning of Hi-Tech’s expansion. Between 2017 and 2020, Hi-Tech worked diligently to meet rigorous global quality standards, go through complex approval processes, operational excellence, in-house galvanizing plant and earn a green status with leading transformer manufacturers and utilities worldwide. The period following 2020 saw a substantial surge

in global exports, propelled by our efforts on value driven systems and Hi-Tech’s commitment to supply reliability, and continuous improvement.

**Q. What are the core growth strategies that have helped Hi-Tech maintain a competitive edge in global markets?**

▶▶ Sustained global competitiveness of Hi-Tech is the result of an integrated growth strategy, combining process discipline, a value-driven culture, capable teams, and strategic investments. A backward integration significantly reduced reliance on external sources, strengthened supply chain resilience, and improved cost and quality controls, key differentiators in export markets with high entry barriers and stringent regulatory requirements.

We have focused more on operational excellence through lean manufacturing, engineering optimization, and continuous improvement has ensured process

stability, cost efficiency, and scalability. Our ability to maintain consistency in quality and delivery timelines has further reinforced customer trust, particularly in mission-critical industries like energy and infrastructure where delays or defects are unacceptable.

**Q. Could you share some insights on your plans for capacity expansion and entry into new sectors?**

▶▶ We are actively expanding our manufacturing footprint to meet rising demand and explore new growth avenues. We are currently investing in a Greenfield project that will add 12,000 MT of annual radiator production capacity to the existing 24,000 MT, thereby scaling total capacity to 36,000 MT per annum. This expansion will ensure that Hi-Tech is well-positioned to meet global demand while maintaining delivery commitments and quality benchmarks.

Parallely we are entering the



*Ultimately, our focus on building strong, motivated teams across APAC is the cornerstone of our success. It empowers us to deliver innovative solutions, remain competitive in dynamic markets, and continuously push the boundaries of what we can achieve together.*

power tank segment, which caters to the transmission and power generation categories of the transformer industry. Unlike distribution tanks, power tanks are complex, high-capacity components that require a high degree of engineering precision and process control. Given Hi-Tech's proven capability in managing high-volume, high-variety tank production, the company is confident of bridging the gap in this underserved market.

To facilitate this entry, Hi-Tech is evaluating both Greenfield investments and potential acquisitions. The goal is to establish operations in this new segment within a year, backed by the company's expertise in manufacturing, quality systems, and customer integration.

**Q. Hi-Tech has a dedicated New Product Development (NPD) team. How integral is R&D to your product pipeline and overall competitiveness?**

▶▶ Research and Development is deeply embedded in Hi-Tech's strategy, both as a means of driving innovation and sustaining long-term competitiveness. The New Product Development (NPD) team is crucial to launch new products such as power tanks and continuously optimizing existing processes to stay ahead of technological shifts.

We are in the process of establishing a dedicated R&D vertical, independent of operational leadership, to bring greater focus and strategic depth to innovation. This team will include senior R&D professionals and will be tasked with scouting, adopting, and implementing advancements in areas like IoT integration, cloud-based systems, and digital manufacturing.

We have already begun integrating advanced tools such as SolidWorks and RADAN for digital twin simulation and direct-to-machine fabrication. Combined with investments in laser-cutting and ERP-integrated automation, these technologies enhance precision,

reduce waste, and speed up product development cycles.

**Q. With an annual operational capacity of 24,000 MT for radiators and 7,200 MT for tanks, what operational efficiencies have helped you scale while maintaining quality?**

▶▶ To scale our operations while maintaining high-quality standards we are driven by a commitment to process-centric manufacturing and operational excellence.

Three key differentiators stand out in this approach: Process Integrity, Uncompromised Quality, and Detailed Engineering.

We place immense emphasis on doing the job right the first time, even if it means pausing production to recalibrate processes. This approach ensures consistency and minimizes downstream



rework or quality failures. We have institutionalized lean manufacturing practices, and employees undergo regular training on waste identification and elimination.

Additionally, a highly active continuous improvement culture exists across departments, where teams are encouraged to propose and implement incremental improvements via the Kaizen initiative. The integration of engineering excellence and shop floor discipline ensures that the company can achieve higher output per square foot compared to industry peers, often outperforming competitors with decades more experience. In effect, Hi-Tech has made quality and efficiency inseparable pillars of its operations.

**Q. How is automation being leveraged at Hi-Tech to boost productivity and precision?**

▶ Automation is a strategic enabler for us at Hi-Tech, particularly as the company scales up and diversifies its offerings. In our upcoming radiator manufacturing line, the fifth such line, we have deployed full automation. This is expected to deliver a tenfold increase in monthly output per worker, significantly enhancing productivity while ensuring process repeatability and product consistency.

Beyond output gains, Automation has improved precision by minimizing human error in fabrication processes. Hi-Tech leverages software-driven optimization for raw material usage, automated design-to-manufacturing workflows, and laser cutting for structural components. These systems communicate directly with the company's ERP, enabling data-driven decision-making and optimal resource utilization.

At the same time, we are mindful of maintaining workforce harmony. Automation is deployed not to displace workers, but to absorb growing demand and improve working conditions. We continue to hire and reskill employees, ensuring that automation uplifts both efficiency and workforce engagement.

**Q. Sustainability is becoming a critical factor in manufacturing. What steps has Hi-Tech taken to make its processes more eco-friendly?**


▶ We recognize sustainability as a compliance requirement and a business imperative and societal responsibility. The company has undertaken multiple initiatives across environmental, social, and governance (ESG) dimensions to minimize our ecological footprint and enhance social impact.

On the environmental front, Hi-Tech has installed 440 kW and 700 kW solar power systems, bringing its total renewable energy capacity to 1 MW. Plans are underway to source up to 100%

of daytime energy through solar Power Purchase Agreements. Additionally, we have achieved zero liquid discharge status through advanced effluent treatment systems. Socially, we have invested in worker welfare through well-ventilated plants, hygienic lunchrooms, 24/7 on-site medical facilities, and dedicated cooling systems to maintain a conducive work environment. On the governance front, we maintain full statutory compliance, fair wage practices, and a culture of transparency.

**Q. What does the future look like for Hi-Tech in the next five years in terms of product innovation, market expansion, and global footprint?**

▶ Looking ahead, Hi-Tech envisions a future marked by aggressive product diversification, geographic expansion, and continuous innovation. We aim to strengthen our presence in the power tank segment and expand the radiator manufacturing footprint to be closer to key customers globally.

From a market perspective, we anticipate a growing demand for transformer components as countries invest in upgrading their energy infrastructure. Hi-Tech is well-positioned to capitalize on this opportunity, leveraging its strong global relationships and reputation for quality. While specific geographies remain confidential, we have a clear roadmap for entering new markets and forging deeper customer engagements. Innovation will remain a cornerstone of this vision. The R&D vertical will continue to drive advancements in manufacturing technologies, digital integration, and product design, ensuring that Hi-Tech stays ahead of the curve. With a current CAGR of approximately 30%, we expect to sustain this growth trajectory by combining engineering excellence with strategic foresight. 

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KNOW MORE

# Smart Meters

Reducing losses, modernizing infrastructure and empowering consumers

An Industry Report



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India's smart meter industry is expanding rapidly, driving digital transformation in energy management

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Efficient operating model with well defined payment mechanism and installation deliverables

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# Indian Market Overview

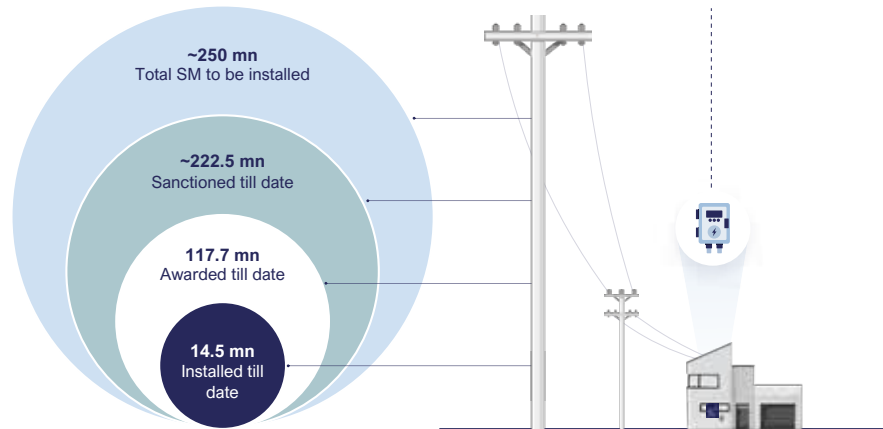
India's smart meter industry is expanding rapidly, driving digital transformation in energy management



# The Opportunity

There is tremendous potential to participate in and capitalize on the nationwide drive to install **250 mn smart meters, supporting India's transition to a Digital Economy**

Smart meters present close to a **\$20 bn** opportunity with AMISP project awards expected to grow at a **CAGR of ~25%** over 3-4 years



\*Data as of 2nd October 2024



# Rationalising The Government Push Towards Smart Meters

## Importance of Smart Meters



Reduction of AT&C losses, ACS-ARR gap, theft and meter tampering



Provides real-time data for quick decisions and energy forecasting



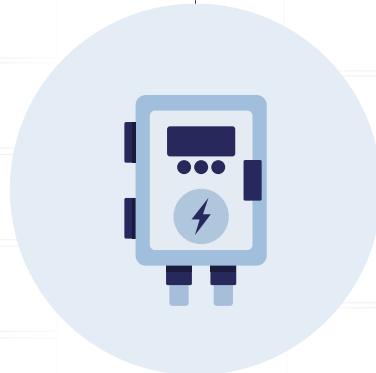
Enhance peak load management and improve tariff structure planning



Empowers consumers to monitor and manage their electricity usage more effectively



Quicker fault identification via remote diagnostics leading to quicker issue resolution



## Smart Meter National Programme of Government of India (2017)

Aims to replace 250 mn conventional meters with smart meters and upgrade distribution infrastructure



The scheme seeks to enhance the financial health of Discoms, addressing issues that affect their power purchasing, infrastructure upgrades and customer service



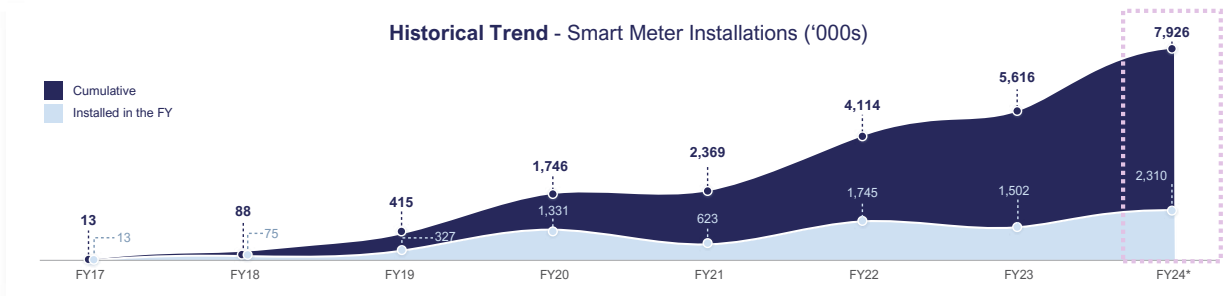
Implemented by Energy Efficiency Services Limited, a JV of NTPC Limited, PFC, REC and PowerGrid under the Ministry of Power



Targets to eliminate manual errors, leading to more accurate and timely bills for consumers via automated data collection and billing



## RDSS Yielding Positive Impact On Smart Meter Installations



### Revamped Distribution Sector Scheme - The Guiding Force Of The Industry

Launched by GOI in July 2021 to rollout smart metering projects under the DFBOOT model

**Planned outlay**  
INR 3,03,758 cr

2022 ————— 2026

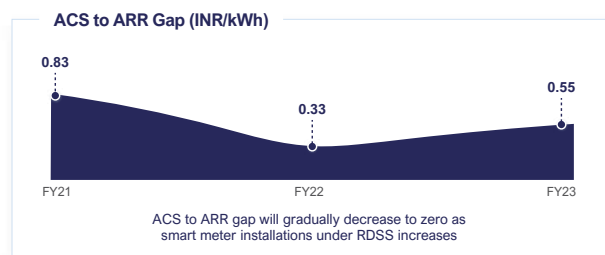
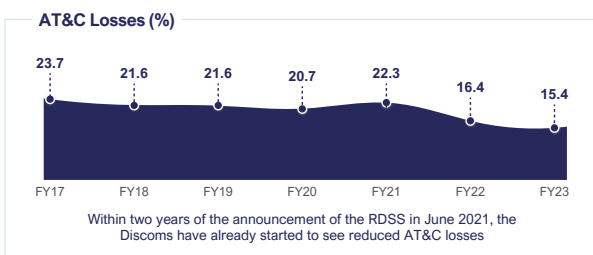
**INR 97,631 cr** of estimated Government Budgetary Support is included

Reduction in AT&C losses from 22% to 12-15%

ACS-ARR gap to zero

Improvement in the quality, reliability and affordability of power supply to consumers

## Further Deep Dive Into AT&C Losses And ACS To ARR Gap



### State Wise Break-up (FY23)

	Uttar Pradesh	Maharashtra	Madhya Pradesh	Rajasthan	Telangana	Gujarat	Tamil Nadu	Bihar	Haryana	Assam	West Bengal
AT&C Losses (%)	22	18	21	16	19	10	10	25	12	16	17
Billing Efficiency (%)	84	86	79	85	92	91	91	81	89	84	84
Collection Efficiency (%)	93	96	100	99	89	99	99	93	99	100	99
National Share of AT&C Losses (%)	14.5	14.3	8.6	7.4	6.6	6.2	4.9	4.4	3.5	0.9	3.8
ACS to ARR Gap (INR/kWh)	1.58	1.48	-0.46	0.15	1.11	-0.01	0.96	0.18	-0.04	0.61	0.35

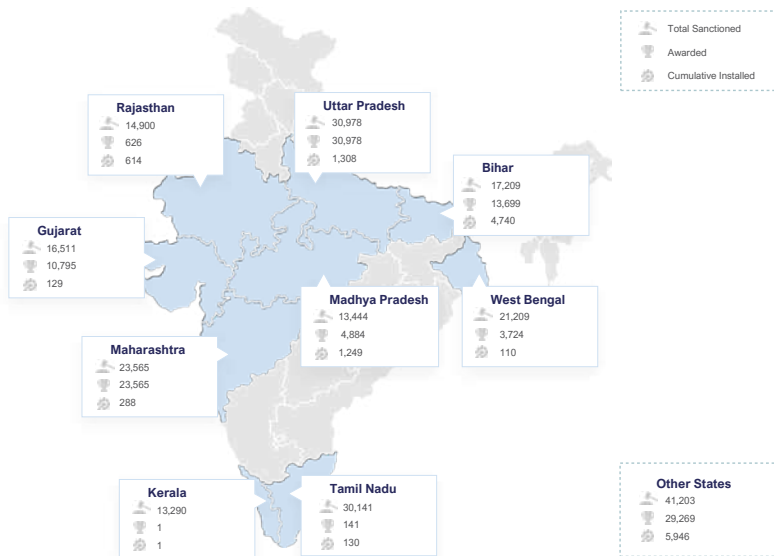
# Allocation Of RDSS Across India

	Sanctioned Cost of Metering	Sanctioned Cost of LR	Sanctioned Total Outlay	Sanctioned GBS of Metering Works	Sanctioned GBS of LR Infrastructure	Sanctioned Total GBS
Maharashtra	15,215	14,158	29,373	2,840	8,495	11,334
Uttar Pradesh	18,956	17,090	36,046	3,501	10,254	13,754
Gujarat	10,642	6,021	16,663	1,885	3,613	5,497
Kerala	8,231	2,347	10,578	1,413	1,408	2,821
Rajasthan	9,715	9,371	19,086	1,686	5,623	7,309
Tamil Nadu	19,235	9,066	28,302	3,398	5,440	8,838
Punjab	5,769	3,873	9,642	960	2,324	3,284
Bihar	2,021	7,081	9,102	412	4,249	4,661
West Bengal	12,670	7,223	19,893	2,089	4,334	6,423
Andhra Pradesh	4,128	9,293	13,421	815	5,576	6,391
Madhya Pradesh	8,769	9,403	18,172	1,482	5,642	7,124
Chhattisgarh	4,105	3,598	7,703	804	2,159	2,963
Haryana	-	3,158	3,158	-	1,895	1,895
Others	11,018	20,096	31,113	2,854	16,908	19,765
<b>Total</b>	<b>1,30,474</b>	<b>1,21,778</b>	<b>2,52,252</b>	<b>24,139</b>	<b>77,920</b>	<b>1,02,059</b>

\*data as of December 2023 | \*LR is loss reduction works | \*GBS is government budget support | \*all figures in INR cr

# Implementation Snapshot Across States

Over 50% of the planned meter replacements are yet to be awarded



\*data as of 2nd October 2024 | \*numbers in ('000s)






## Inferences From State Wise Implementation:

- **Uttar Pradesh** is a major focus area owing to its proportion of AT&C losses, but there seems to be limited opportunity to capitalize since all sanctioned meters have been awarded
- **Maharashtra** has a significant allocation of the RDSS outlay, but the sanctioned meters have already been awarded to players such as Adani, NCC and Montecarlo
- **Tamil Nadu** presents opportunities for smart meter AMISP developers since it is a recipient of a large proportion of RDSS outlay where as only a few of the sanctioned meters have been awarded
- **Madhya Pradesh, Gujarat, Rajasthan, and West Bengal** are states where sanctioned vs awarded meters haven't been fully saturated and have reasonable RDSS outlay allocations
- Existing players as well as new bidders will need to identify gaps between sanctioned vs awarded bids, demonstrate local know-how and develop robust implementation SOPs for a successful rollout





## Sector Strengths And Uncertainties

A well-defined payment mechanism and robust central support are the key factors driving the sector narrative

### Strengths

-  **Strong government budgetary support** of ~INR 97k cr towards the RDSS initiative
-  **Healthy implementation pipeline** with an objective to replace 250 mn conventional meters pan India
-  **Efficient power demand and supply management** stemming from continuous, real-time data
-  **Reduction in AT&C losses** owing to accurate billing, reduced operational inefficiencies and prevention of theft & meter tampering
-  **Robust payment mechanism** via DDF, thus ensuring timely payments to AMISP from end users

### Risks

-  **Limited track record of DDF** brings in an element of counterparty risk, though 5x monthly AMISP payment is to be routed in the account
-  **Slow implementation** has resulted in only ~1 cr of the 11 cr smart meters awarded to be installed but this hasn't deterred the overarching objective
-  **Poor technology strategy** could risk program success, but processes can be thoroughly validated and designed for seamless integration
-  **Customer resistance** can be managed with effective customer training and implementation of a clear communication plan

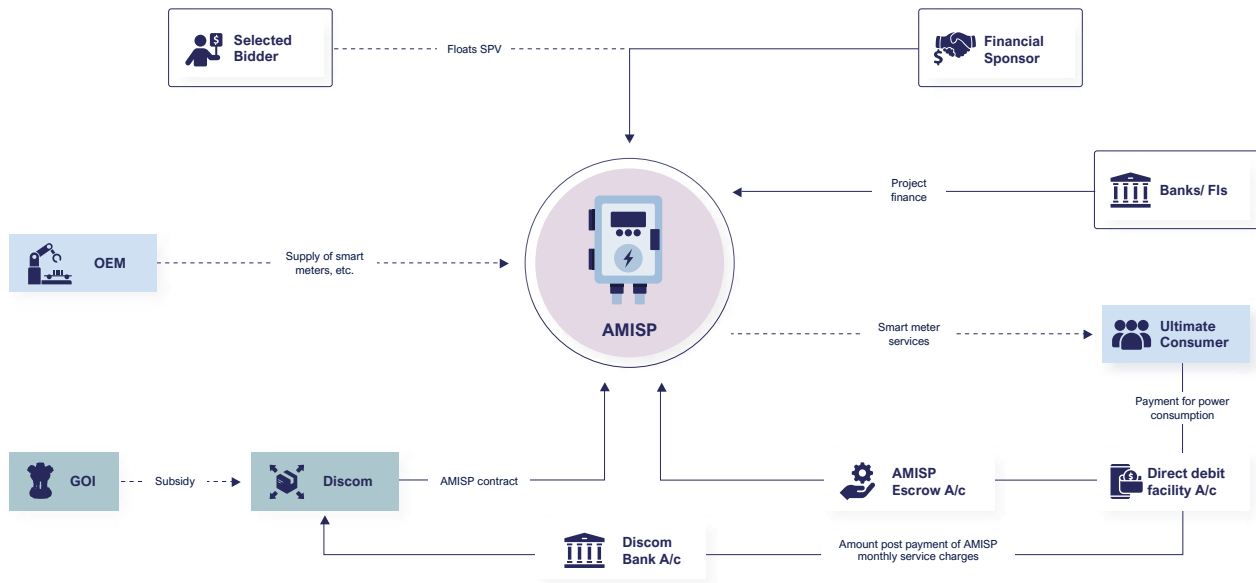
# Operating Model

Efficient operating model with well defined payment mechanism and installation deliverables

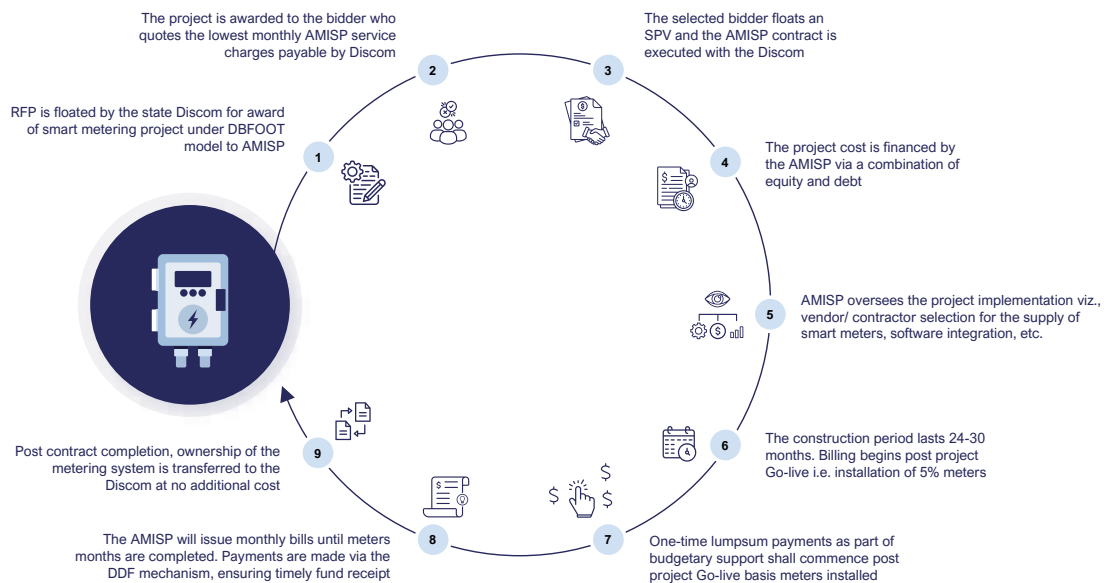


# Operating Model Snapshot

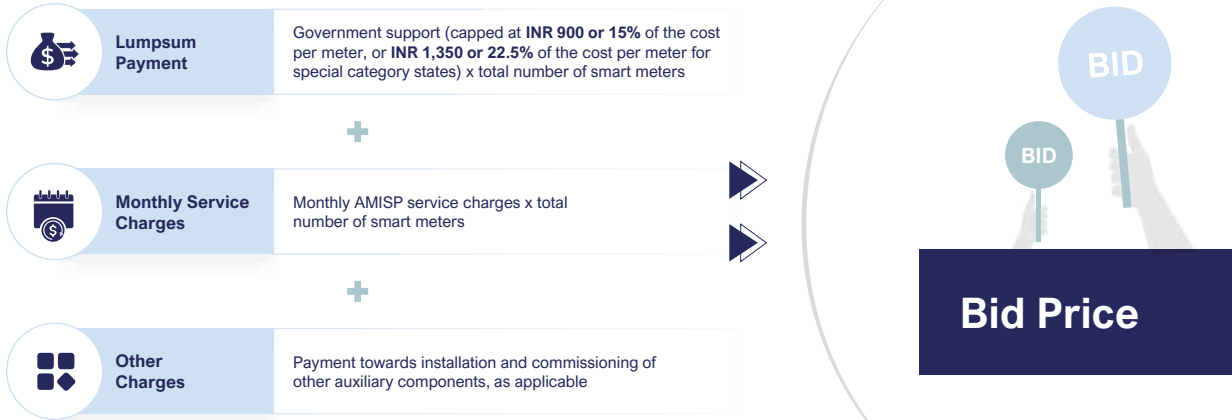
Robust operating model ensuring timely payments to AMISP



# Project Life Cycle

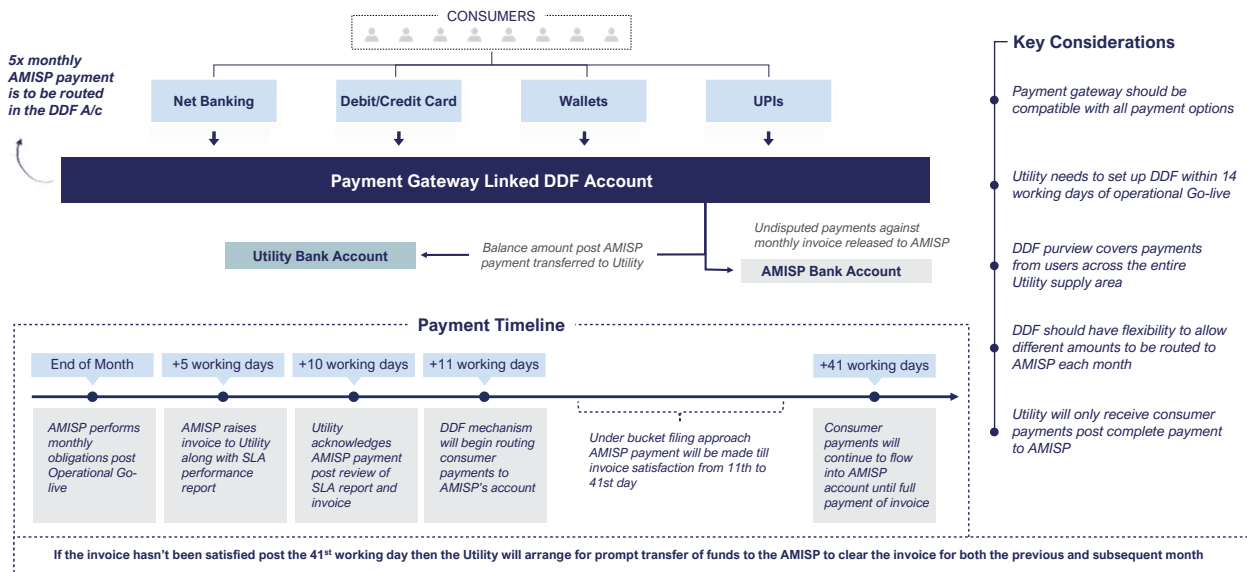


## Bid Considerations



## Direct Debit Facility Mechanism

A new approach to invoice payments provides enhanced comfort for revenue visibility to AMISP and Investors



# Salient Features Of The AMISP Contract

Fixed monthly payments along with a strong contractual payment framework (DDF) provides sufficient comfort to all stakeholders

Features	AMISP Contract Terms				
Contract Period	Minimum of 10 years from date of contract execution or expiration of total meter months post operational Go-live				
Contract Price	No. of meters x Per month meter rate x No. of operating months	+	No. of meters x Lumpsum payment per meter (Government Budgetary Support)	+	Auxiliary works, if any (paid on a quarterly basis)
Performance Security	During installation period: <b>10%</b> of Contract Price until complete installation		During operational period: <b>5%</b> of Contract Price until <b>6 months</b> post Contract Period		
Project Implementation Schedule	Installation of <b>5%</b> of total meters: Within <b>7-9 months</b> from date of contract execution	Installation of <b>50%</b> of total meters: Within <b>18-21 months</b> from date of contract execution	Installation of <b>100%</b> of total meters: Within <b>27-30 months</b> from date of contract execution	Certificate of project implementation: Within <b>15 days</b> from date of complete implementation	
Direct Debit Facility	<b>Authority to set up a Direct Debit Facility (DDF)</b> account which will route all online consumer payments	Authority should ensure DDF has an average monthly inflow of at least <b>5 times</b> the estimated monthly payment to the AMISP	<b>DDF mandated to distribute all proceeds into escrow account</b> , which is charged to the lenders, until the invoice has been cleared		
Termination Payment	Termination is applicable if either party is unable to remedy an Event of Default (EOD) or Force Majeure within 90 days of notice issuance			where $TPV = NPV$ of Future Contract Payments discounted at 12% + Outstanding Receivables – Outstanding Payables – Any Insurance Proceeds	
	AMISP EOD	Pre-Installation Milestone	Post- Installation Milestone		
Utility EOD	<b>60%</b> of asset value to be handed over to the Authority, certified by an independent valuer	<b>60%</b> of Termination Payment Value	<b>100%</b> of Termination Payment Value		
	<b>100%</b> of asset value to be handed over to the Authority, certified by an independent valuer	<b>100%</b> of Termination Payment Value			
Penalties and Incentives	<b>Liquidated damages:</b> 50% service charge for each delayed meter for each completed month of delay for a maximum of <b>12 months</b>		<b>Incentive:</b> Provided AMISP achieves complete implementation at least one month in advance of timeline, AMISP shall receive an incentive of <b>1% of Contract Price</b>		

## Funding Dynamics

Improved returns with debt optimization upon elimination of installation risk

Project Cost		During Installation		Post Installation	
Particulars	Value	Particulars	Value	Particulars	Value
Meter Cost	80-90%	Loan to Value	70-75%	Loan to Value	80-85%
Software Integration & Installation Charges	10-20%	Rate of Interest	8.60-9.00%	Rate of Interest	8.10-8.75%
Contingency & Other Costs	1-3%	DSCR	1.25-1.30x	DSCR	1.15-1.20x
<b>Total</b>	<b>100%</b>	Working Capital Facility	Can be availed		



The projects are funded at an LTV of 70-75% at the time of FC. The same can be further optimized by ~10% upon completion of installation



Interest rates typically ranges from 8.60%-9.00% during installation. As the credit profile improves post installation completion, interest rate compression of 0.25%-0.50% can be achieved



Considering the fixed nature of revenue and DDF mechanism comfort, DSCR can be optimized to 1.15-1.20x post entire installation



Lenders are open to providing working capital limits during installation period to mitigate any execution risk caused by delays in lumpsum payments

# Value Chain

A well-integrated smart meter value chain ensures seamless collaboration amongst service providers and OEMs



## Value Chain Components And Suppliers

An efficient smart meter operating system comprises of wholistic integration amongst hardware, software and communication service providers

Components	Description	Major OEM Players
Meter Manufacturer	Real time recording of power consumption and communication of data to back-end networks for efficient load management	Schneider, ZEW, Kimbali, ITC, ZenMeter, Sagemcom, NPL, SECURE, Genus
Communication Provider	Providing reliable and efficient infrastructure for smooth data transmission amongst various components	Airtel, Jio, VI, BSNL
Meter Data Management Provider	Ensure precise data storage, processing, analysis and seamless integration with other systems	FLUENTGRID, esyasoft, SAP, Tech Mahindra, SIEMENS, HCLTech, ORACLE
Head End System Provider	Serves as the central communication hub, ensuring accurate data collection without human intervention	FLUENTGRID, Trilliant, CUMMINS, Infosys, Kimbali, EDMI, Tech Mahindra
Cloud Service Provider	Enable efficient data management, real-time processing, remote control and enhanced security	aws, cyfuture, Infosys, aws, Google Cloud, IBM Cloud
RF Technology Provider	Providing wireless communication solutions to transmit and receive consumption and other related data	RENESAS, SILICON LABS, CUMMINS, CISCO, Kimbali, Radisys, Landis+Gyr







## Key Raw Material

Raw Material	Description
Measurement Sensor	Captures the consumption of electricity through Current Transformer and Voltage Transformer
Microcontroller/ Microprocessor	Acts as the focal point of the smart meter for processing data, executing the software and managing communication between components
Communication Module	Allows communication of data with external systems using RF, PLC, Cellular Network and Wi-Fi or Ethernet
Display Unit	Shows real-time data to the user (current consumption/ historical usage) through LCD/ LED screen
Memory Unit	Stores data collected from various components necessary for the meter's operation
Power Supply	Provides power to the meter's components. It may include a battery backup to ensure operation during power outages
Communication Ports	For external connections, such as interfacing with other devices or for maintenance and upgrades
Housing/ Casing	Protects the internal components from environmental factors, tampering and physical damage
Security Module	Ensures the integrity and confidentiality of the data being transmitted and stored, including encryption and authentication mechanisms
Sensors and Additional Modules	Smart meters may include additional sensors/ modules to measure factors like temperature, humidity or even detect tampering

## Key Developers

							
Key Stakeholders	NIIF and EESL	Adani	L&T	Shirdi Sai	GMR Group	CDPQ and CLP Group	Genus Power Infrastructures Ltd and GIC
Market Cap (in INR cr)	Private Company	1,15,653	53,676	Private Company	10,452	Private Company	Private Company
Smart Meters Awarded ('000s)	26,998	22,800	5,183	5,690	7,580	4,768	6,528
Location	Assam, Uttar Pradesh, Gujarat	Maharashtra, Assam, Andhra Pradesh, Bihar, Uttarakhand	Delhi, Haryana, Uttar Pradesh	Andhra Pradesh	Uttar Pradesh	Gujarat, Assam, West Bengal, Himachal Pradesh	Uttar Pradesh, Gujarat, Rajasthan, Tamil Nadu, Assam, Chhattisgarh, Bihar
Operational ('000s)	4,658	268	2,218	188	40	32	1,278
Under Installation ('000s)	22,340	22,532	2,965	5,502	7,540	4,737	5,250
Revenue (in INR cr)	85	17,218	8,679	2,420	-	6,291	-
EBITDA (in INR cr)	2	6,782	1,829	517	-	2,228	-
Debt (in INR cr)	40	37,009	627	1,404	-	6,987	-
Credit Rating	A+ (by India Ratings)	AA+ (by Crisil)	AAA (by Crisil)	BBB- (by ICRA Ratings)	-	AA+ (by India Ratings)	-

## Key Smart Meter Manufacturers

						
Key Stakeholders	Agarwal and Todi families, Nippon Life, GIC	Ramesh Kunhikannan	Lalit Seth with major investments from HPL India & Havells	I Squared Capital	Ashutosh Goel	Enzen Group
Market Cap (in INR cr)	11,592	32,315	3,553	Private Company	Private Company	Private Company
Manufacturing Capacity (mn pa)	10	4	11	N/A	7	3
Location	Jaipur	Mysore	Sonipat	Jaipur	Delhi	Bengaluru
Revenue (in INR cr)	822	1,805	1,465	-	170	34
EBITDA (in INR cr)	92	257	196	-	11	12
Debt (in INR cr)	347	323	623	-	165	-
Credit Rating	AA- (by India Ratings)	BBB+ (by ICRA Ratings)	A- (by Crisil)	-	BBB- (by Care Ratings)	-
Orderbook	Over INR 32,500 cr as of August 2024	INR 5,039 cr as of Sep 2023	Over INR 3,700 cr as of July 2024	-	Order book of INR 1,777 cr as of December 2023	-

# Industry Developments

Sector has witnessed participation from domestic and foreign players alike



## Domestic Transaction Details

	Sep-18	Oct-19	Jul-22	Feb-23	Jul-23	Jul-23	Dec-23	Mar-24
Target								
Deal Type	M&A	Joint Venture	M&A	M&A	Primary	Joint Venture	Joint Venture	PE Growth
Deal Size	\$368mn	-	INR 660 cr	\$100mn	INR 519 cr	\$2bn	-	\$5mn
Investors	60% 40%	51% 49%	50% 50%			74% 26%	51% 49%	NIVESH ANJAL Other Angel Investors
Remarks	CDPO acquired a 40% stake in Apraava Energy from CLP Group, valuing the business at \$920mn	NIIF and EESL have come together to form a JV for implementation of smart meter concessions	CDPO increased its stake in Apraava Energy to 50%, acquiring an additional 10% from CLP Group	I Squared Capital acquired a controlling stake in Polaris, a company that develops, installs and operates smart metering infrastructure	GIC will invest up to INR 519 cr by way of preferential allotment which will constitute up to 15% of the paid up capital on a fully diluted basis	GIC & Genus have agreed to set up a platform with an initial capital commitment of \$2bn to undertake AMISP concessions	Adani Energy Solutions and Esyasoft Technologies have come together to set up a venture to implement smart meter projects in India and across the globe	Kimbal raised \$5mn in its first round of institutional funding to scale up existing operations

## Recent AMISP Contract Awards

With smart meter awards accelerating, now is the time to engage in the sector and seize the benefits that are forthcoming over the next few years

	Sep-23	Sep-23	Sep-23	Sep-23	Sep-23	Sep-23	Oct-23	Nov-23	Nov-23	Dec-23	Dec-23
Parent Company Name											
State	Maharashtra	Andhra Pradesh	Maharashtra	Maharashtra	Uttar Pradesh	Uttar Pradesh	Gujarat	Uttar Pradesh	Andhra Pradesh	Jammu & Kashmir	Uttarakhand
Discom	MSEDCL	APSPDCL	MSEDCL	MSEDCL	DVNL	PUVVNL	PGVCL	MVVNL	APCPDCL	RECPDCL	UPCL
No. of Meters (in 000s)	3,030	1,300	2,777	2,886	2,552	5,017	2,366	2,800	1,700	727	700
Contract Size (in INR cr)	-	1,800	3,330	3,461	2,470	5,123	-	-	2,080	1,041	810

## Recent AMISP Contract Awards

With smart meter awards accelerating, now is the time to engage in the sector and seize the benefits that are forthcoming over the next few years

	Dec-23	2024	Jan-24	Jan-24	Mar-24	May-24	May-24	Jul-24	Aug-24	Aug-24	Aug-24
Parent Company Name											
State	Andhra Pradesh	Himachal Pradesh	West Bengal	Uttar Pradesh	Maharashtra	Manipur	West Bengal	Madhya Pradesh	-	-	-
Discom	UPCL	APEPDCL	HPSEBL	WBSEDCL	MSEDCL	MSPDCL	WBSEDCL	MP-Central	-	-	-
No. of Meters (in 000s)	1,100	934	778	5,100	8,100	160	2,200	1,916	3,750	4,260	5,590
Contract Size (in INR cr)	1,300	-	-	5,200	9,670	206	2,246	-	2,926	3,609	4,469

# Global Industry Overview

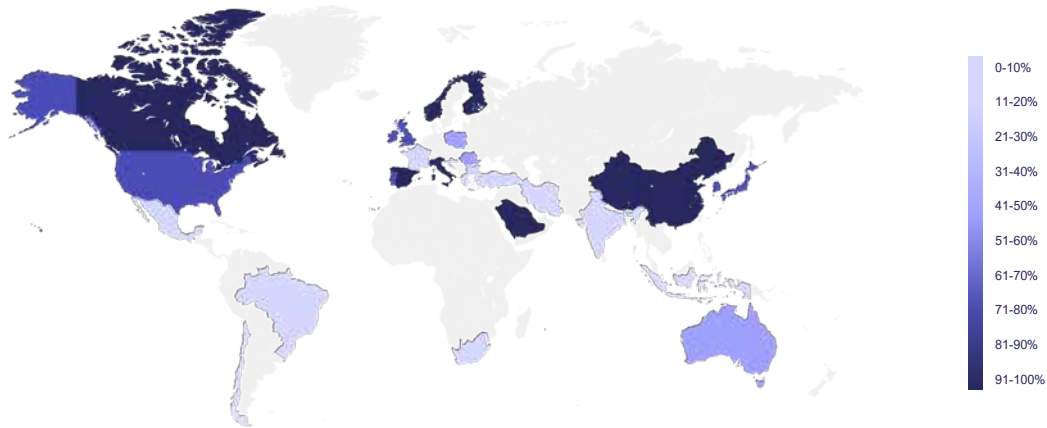
Indian industry can learn from precedents of global rollouts and develop its own plan for success



# Global Implementation Of Smart Meters

Smart meters present a remarkable prospect not just in India but also across many of the developing and frontier markets

Smart Meter Adoption Rate



**>1 Bn** smart meters were installed by the end of 2023

**77%** smart meter installations achieved in North America

**~50%** penetration rates achieved in both APAC and Europe



## Global Players

Energy distribution companies tied up with meter manufacturers for mass rollouts

United States of America	China	Canada	Italy
<b>Distributor</b>	<b>Distributor</b>	<b>Distributor</b>	<b>Distributor</b>
<b>Manufacturer</b>	<b>Manufacturer</b>	<b>Manufacturer</b>	<b>Manufacturer</b>

## Global Investors



## Global Transactions

Numerous \$bn+ deals globally give credence to the potential in the Indian smart meter market

Deal Date	Target	Deal Size	Investors	Geography
Dec 2023	SMS	\$1.7 bn	<b>KKR</b>	UK
Sep 2017	Silver Spring Networks	~\$ 830 mn	<b>Itron</b>	USA
Aug 2017	ENERNOC	~\$ 250 mn	<b>enel</b>	USA
Jun 2017	CONVERGE	~\$100 mn	<b>Itron</b>	USA
Dec 2016	calvin	-	<b>KKR</b>	UK
Aug 2016	SENSUS	\$1.7 bn	<b>xylem</b>	USA
Jul 2015	elster	\$5.1 bn	<b>Honeywell</b>	Germany
Dec 2011	eMeter	-	<b>SIEMENS</b>	USA
Jun 2011	<b>TELVENT</b>	\$ 2.0 bn	<b>Schneider Electric</b>	Spain
May 2011	Landis+Gyr	\$ 2.3 bn	<b>TOSHIBA</b>	Switzerland

# Country Case Study - Netherlands

1



## Background

- As part of the 2009 Third Energy Package, EU member states were asked to roll out smart meters to at least 80% of households by 2020
- In 2012, the Netherlands piloted smart meters across 600,000 households to assess the program's effectiveness
- After a successful pilot, the Dutch government in 2014 decided to expand the rollout to all households

2



## Objectives and Timelines

- By 2020, the Netherlands aimed to install 7.5 million smart electricity meters, achieving full coverage in the national rollout
- By the end of 2016, nearly 3 million Dutch households had smart meters installed
- National regulations required energy companies to ensure smart meters were installed in all Dutch households by 2021

3



## Program Successes

- By the 2020 deadline, 85% of Dutch households had smart meters installed

4



## Implementation Challenges

- Public resistance arose due to potential privacy concerns, as network and distribution companies could continuously track consumption data
- Apart from privacy issues, one in five people refused smart meters due to negative press reports about their accuracy
- Another concern raised was that the added meter software could increase vulnerability to cybersecurity attacks

5



## Program Setbacks

- In 2017, around 10% of consumers refused installation of a smart meters and 2% had them turned off administratively
- Envisaged savings of €1.47bn was based on 3.7% natural gas and 3.2% electricity savings, however, recent numbers show that the actual energy savings fell short of this
- Data leaks have occurred due to fraudulent access or misuse of consumer data by energy suppliers

6



## Key Takeaways

- Having a pre-set framework is necessary to avoid technical and logistical challenges with respect to implementation
- Consumers should be clearly informed about the potential opportunities to save energy
- Meters should include an in-house display to provide consumers with constant feedback of their energy usage

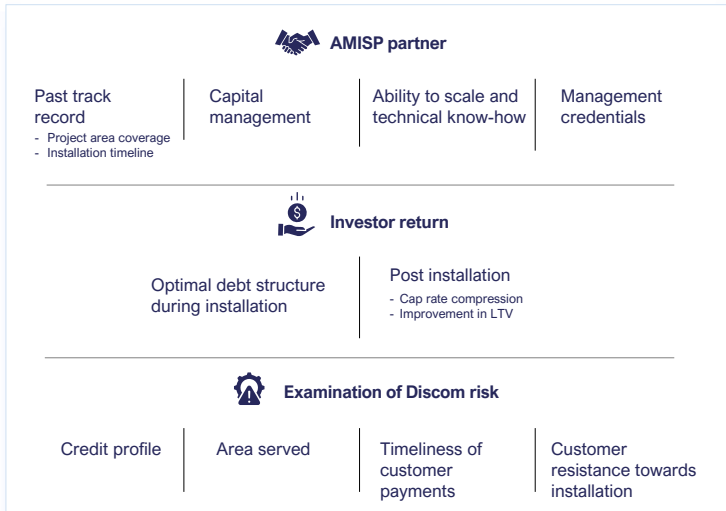
# Investment Strategy

Sustainability beyond AMISP projects will ensure committed participation from both investors and developers

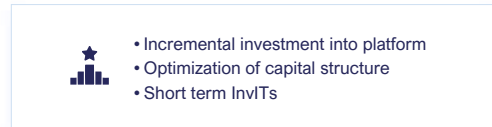


## Investor Considerations

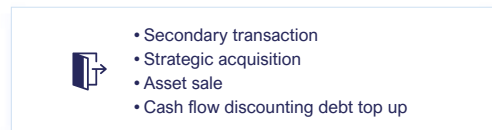
### Factors Affecting Investment Decision



### Methods to Achieve Scale



### Exit Avenues



## Developer Considerations





*Kiran Enterprises*

**Manufacturers Of Sheet Metal  
Press Parts & Assemblies.**



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# Why Safety Audits Are Central to Every Organisation's Risk Strategy



Workplace safety is more than a regulatory obligation—it is a fundamental part of protecting people, sustaining operations, and building resilient organizations. Yet, despite stronger laws and rising awareness, workplace incidents continue to claim millions of lives globally each year. This highlights a pressing reality: compliance alone is not enough. What organisations need is a structured, proactive approach—and safety audits stand at the heart of that strategy.

**SURESH TANWAR**, Senior Head,  
Audit and Consultancy, British Safety Council



***Safety audits benefit organisations even more when they treat audit findings not as criticism but as insight.***



**W**orkplace safety remains one of the most critical concerns across industries, particularly in high-risk sectors such as construction, manufacturing, chemicals, oil and gas, and pharmaceuticals.

Although there has been an increase in awareness and improved regulations in recent years, the number of workplace incidents continues to rise globally.

According to the International Labour Organization (ILO), nearly three million workers die each year due to work-related accidents and diseases. In India, as per some sources, there have been over 6,500 fatalities in the last five years across factories, construction sites, ports, and mines. While these figures are extremely alarming, they also highlight a deeper issue: that many of these incidents could have been prevented through structured,

proactive safety management.

Health and safety audits are a key element of such proactive management. These audits provide organisations with a solid framework to assess, benchmark, and strengthen their occupational health and safety (OHS) systems. Rather than reacting to incidents after they occur, safety audits encourage a preventive approach by identifying weak links before they result in harm.

### **Understanding Health and Safety Audits**

A health and safety audit is a comprehensive, systematic review of an organisation's OHS policies, procedures, and practices. The objective is not just to meet regulatory requirements but to examine whether safety processes are

thoroughly and effectively embedded across all levels, from leadership to the shop floor.

A typical safety audit involves several layers of evaluation. It begins with planning and stakeholder engagement, followed by an in-depth review of documentation, physical inspections, interviews with employees and supervisors, and an analysis of the organisation's leadership commitment to safety. Among the many aspects examined are those involving high-risk activities, such as confined space entry, work at height, electrical and fire safety, machine guarding, and contractor safety management.

A crucial aspect of the audit process is evaluating existing policies, as well as their implementation and effectiveness. How well are safety protocols communicated? Do workers understand and follow



them? Is leadership involved in setting the tone for a safe workplace? These qualitative insights are as important as the quantitative data.

These steps are then followed by a detailed report that includes a summary of strengths, comprehensive observations, and recommendations for improvement. In some frameworks, this may be accompanied by ratings or benchmarking scores, which help the organisation understand where it stands in relation to best-in-class safety standards.

### Why Safety Audits Matter

It is not uncommon for organisations to treat health and safety as simply a compliance function to meet legal obligations. However, the actual value of safety audits lies in moving beyond a compliance-based outlook to cultivating an overall culture of safety.

Audits are an independent, objective review that highlights both latent risks and operational blind spots. Many incidents, including fire outbreaks,

chemical exposures, or falls, can often be traced back to procedural gaps, a lack of training, or failure to enforce controls. A safety audit helps discover such issues systematically, before they escalate into accidents.

Moreover, audits also provide an opportunity for self-assessment. For companies seeking to align with global safety standards or enhance their ESG performance, audit findings can serve as the foundation for future strategy. They help quantify risk, guide



provide a fresh, expert-led perspective on safety management.

### Benefits of Safety Audits that Extend Across the Organisation

The impact of a well-executed safety audit is experienced at multiple levels. For starters, it reduces the likelihood of accidents, injuries, and near misses. But the benefits go much deeper.

It enhances hazard awareness by enabling employees to better understand risks and the importance of safe practices. Audits provide a structured roadmap for addressing safety gaps, offering practical and targeted recommendations. They also foster stronger leadership commitment, as they give senior management clearer visibility into safety performance and areas that require attention.

Gaps identified can even help develop more effective training and onboarding programs. Organisations with regular audit cycles tend to be better prepared for regulatory inspections and demonstrate higher levels of compliance.

By preventing downtime due to incidents, audits also support operational continuity and business performance. For organisations undergoing changes in terms of scaling operations, adopting automation, or diversifying into new product lines, safety audits become a critical checkpoint to reassess safety readiness.

### A Continuous Improvement Mindset

The workplace is a dynamic environment. New technologies, changing regulations, and shifting workforce demographics mean that health and safety systems must continuously adapt. This means safety audits cannot be a one-time exercise. They have to be an essential part of a continuous risk management cycle.

Safety audits benefit organisations


even more when they treat audit findings not as criticism but as insight. They can use these insights to refine their safety strategies, invest in improved controls, train their personnel, and foster a stronger safety culture.

The value of an audit is also heavily influenced by the quality of its execution. Experienced auditors bring industry-specific knowledge, objectivity, and the ability to interpret findings within a practical operational context. A well-documented audit report, supported by data, observations, and actionable recommendations, becomes a highly strategic asset for leadership.

In a time of such high-stakes business environments, health and safety are non-negotiable. The cost of getting it wrong, whether in human, financial, or reputational terms, is too high.

Safety audits help organisations transition from a reactive to a preventive mindset, establish robust safety systems, and ultimately, safeguard their most valuable asset: their people. As global and local standards evolve, health and safety audits remain a key part of how organisations benchmark their performance, build accountability, and embed safety into every layer of their operations.

### Conclusion

In today's fast-changing work environments, safety audits are no longer optional checkboxes but essential tools for risk management. They help organisations shift from reacting to incidents to preventing them, while also strengthening culture, compliance, and confidence. By embedding safety audits into their long-term strategy, leaders can not only safeguard employees but also ensure operational continuity, protect reputation, and align with global best practices. Ultimately, audits are not just about finding gaps—they are about building safer, smarter, and more sustainable organisations. 

investment in safety infrastructure, and build confidence among stakeholders (employees, regulators, clients, and so on).

Unfortunately, in countries like India, cultural and operational challenges such as high contractor reliance, low safety awareness among unskilled workers, or a lack of proper documentation often hamper the effectiveness of safety management within the organisation. At such times, independent audits conducted by professional firms

# Beyond Automation: The ML Advantage

Automation laid the foundation for business efficiency, but today's competitive and data-rich environment demands more. Machine Learning (ML) is enabling organizations to move beyond repetitive execution and into real-time, intelligent decision-making. From predicting outcomes and optimizing operations to enhancing customer experience and ensuring responsible AI practices, ML-driven intelligence is becoming the cornerstone of modern enterprises.



**SHASHI BHUSHAN,**  
Chairman of the Board,  
Stellar Innovations



**F**or years, automation has been the cornerstone of business transformation. By streamlining processes, reducing errors, and cutting costs, automation enabled enterprises to do more with less. But in today's hyper-competitive and data-driven landscape, efficiency alone is no longer enough. Businesses now need systems that can not only execute tasks but also learn, adapt, and make decisions in real time. This is where Machine Learning (ML)-driven decision-making becomes indispensable.

### Beyond Automation: The Intelligence Imperative

Traditional automation follows a rule-based approach—machines execute pre-defined tasks with consistency. While this delivers efficiency, it struggles with ambiguity, unpredictability, and the ever-growing scale of business data. ML, on the other hand, empowers systems to identify patterns, predict outcomes, and

continuously improve.

For instance, instead of just automating invoice processing, an ML system can detect anomalies, forecast cash flow, and recommend optimal payment cycles. This leap from execution to intelligence-driven action is transforming industries across the board.

### Real-Time Insights for Real-World Complexity

Businesses today operate in an environment marked by volatility—shifting consumer demands, supply chain disruptions, and global uncertainties. Static decision models can no longer keep pace. ML-driven platforms analyze structured and unstructured data streams in real time, enabling organizations to make faster, more accurate decisions.

In sectors like logistics, ML algorithms optimize routes dynamically based on weather, traffic, and demand fluctuations. In retail, ML refines personalization by analyzing consumer preferences across

millions of touchpoints, improving both customer satisfaction and revenue. This ability to sense, analyze, and respond instantly is redefining competitiveness.

### Unlocking Value Across Functions

**ML's potential spans every layer of business:**

- **Customer Experience:** Personalized recommendations, intelligent chatbots, and sentiment analysis create deeper engagement.
- **Operations:** Predictive maintenance, demand forecasting, and workflow optimization reduce downtime and costs.
- **Finance:** Fraud detection, credit risk assessment, and algorithmic trading enhance resilience.
- **Human Resources:** Talent analytics helps identify skill gaps, improve retention, and optimize workforce planning.



“

*Businesses today operate in an environment marked by volatility—shifting consumer demands, supply chain disruptions, and global uncertainties.*

The result is a holistic intelligence layer embedded across the enterprise, driving smarter decisions at scale.

### **The Role of Explainable and Responsible AI**

As ML becomes central to decision-making, transparency is crucial. Black-box models can undermine trust if stakeholders cannot understand how decisions are made. The rise of explainable AI (XAI) ensures that ML outputs are interpretable, fostering confidence among decision-makers and regulators alike.

Equally important is responsible AI—ensuring fairness, accountability, and data privacy in ML systems. Businesses that prioritize ethical AI adoption will

not only mitigate risks but also earn long-term trust from customers and partners.

### **Building the ML-Driven Enterprise**


Transitioning from automation to intelligence requires more than technology—it demands a shift in mindset. Leaders must champion data-driven cultures, invest in scalable ML infrastructure, and upskill teams to work alongside intelligent systems. Cloud platforms, edge computing, and democratized ML tools are making adoption more accessible, allowing businesses of all sizes to embrace intelligent decision-making.

Crucially, ML adoption should be viewed as a strategic enabler, not just a technological upgrade. Companies that

embed ML into core strategy stand to unlock new business models, anticipate market shifts, and create sustained competitive advantage.

### **Conclusion**

Automation was the first step in business transformation. Today, the real differentiator lies in machine learning-driven intelligence systems that adapt, predict, and decide with speed and accuracy. In an era where data is the new currency, businesses that harness ML for decision-making are not just surviving disruption, they are shaping the future.

The shift is clear: it's no longer about machines that follow instructions, but about intelligent systems that help chart the course ahead. 



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# Are Rural Areas Ready for EV Tractors?

Electric tractors are poised to revolutionize farming by offering a cleaner, cost-efficient alternative to diesel engines. But while the technology holds immense promise, its adoption in rural India hinges on a crucial factor—charging infrastructure. The big question is: are villages truly ready to support the EV tractor wave, or does the road ahead demand stronger planning, innovation, and investment?



**PANKAJ GOYAL,**  
Co-founder and COO, AutoNxt Automation



**T**he rise of electric tractors marks a transformative shift in agricultural practices, offering a cleaner, more cost-efficient alternative to traditional diesel-powered machinery. However, the potential of this technology hinges on a critical factor: charging infrastructure. In rural areas, where agricultural activities are most prevalent, the readiness of charging networks remains a pressing concern. The question is not just whether villages are prepared but how they can be equipped to support the growing adoption of EV tractors.

### The Rural Grid Problem

Rural areas present unique challenges in building charging infrastructure. Villages often face inconsistent electricity supply, with frequent outages and limited grid capacity. This lack of reliability can deter farmers from transitioning to electric

tractors, as they depend on uninterrupted access to energy for timely agricultural operations. Even where power supply is consistent, many rural grids are not designed to handle the additional load that widespread EV adoption would demand. Upgrading these grids is essential but requires substantial investment and long-term planning.

### Accessibility Hurdles in Villages

Accessibility is another significant issue. Unlike urban centers, rural areas are characterized by scattered populations and vast distances. Installing charging stations in every village is neither practical nor cost-effective. Farmers may have to travel considerable distances to access a charging point, reducing the convenience and efficiency that electric

tractors promise. This logistical challenge calls for innovative solutions tailored to rural needs.

### Decentralized and Renewable Solutions

One such solution is decentralized energy systems. Solar-powered charging stations, for instance, offer a sustainable and self-reliant option for rural areas. These stations can be set up in key farming hubs, allowing multiple farmers to access charging facilities without overburdening the local grid. Moreover, integrating renewable energy sources aligns with the environmental goals of electrification, creating a win-win scenario for sustainability and practicality.

Mobile charging units are another promising innovation. These portable solutions can be transported to remote farming areas, ensuring that even farmers in isolated locations have access to

charging facilities. While still in the early stages of development, mobile chargers hold significant potential for bridging the infrastructure gap in villages.

### The Role of Government and Partnerships

Government intervention plays a pivotal role in addressing these challenges. Subsidies and incentives for setting up rural charging stations can encourage private players to invest in these areas. Public-private partnerships are especially effective in leveraging resources and expertise to build a robust charging network. Additionally, governments can prioritize the electrification of rural grids, ensuring they are capable of supporting EV adoption without compromising the existing energy needs of the community.

Education and awareness campaigns are equally important. Many farmers remain skeptical about the feasibility of EV tractors due to misconceptions about charging requirements and costs. Providing clear, accessible information about the benefits of electrification and the solutions available for charging infrastructure can build trust and confidence among rural communities.

Despite the challenges, there are reasons for optimism. The growing adoption of solar energy in rural areas provides a strong foundation for integrating charging infrastructure. Many villages already use solar panels for irrigation and lighting, demonstrating an openness to renewable

energy solutions. Expanding these systems to include EV charging is a logical next step that builds on existing capabilities.


### Signs of Progress: Pilot Projects and Solar Adoption

Pilot projects in some regions have already shown promising results. For instance, community-based charging stations, where multiple farmers share the costs and benefits, have emerged as a practical model. These stations not only reduce individual investment but also foster a sense of collective ownership, ensuring better maintenance and utilization.

The readiness of rural areas for EV tractors depends on a concerted effort to address both infrastructure and education. While challenges persist, the solutions are within reach. By investing in sustainable energy systems, fostering innovation, and building trust within rural communities, we can create an ecosystem

where electric tractors thrive. This transformation not only benefits farmers but also contributes to a greener, more sustainable future for agriculture.

### Conclusion

The readiness of rural areas for EV tractors is not just about infrastructure—it's about vision, collaboration, and trust. While challenges like weak grids, accessibility, and awareness remain, innovative solutions such as solar hubs, mobile chargers, and community-based stations are showing the way forward. With the right mix of technology, policy support, and farmer engagement, villages can indeed become the backbone of India's EV tractor revolution—paving the path for a greener and more sustainable future in agriculture. 



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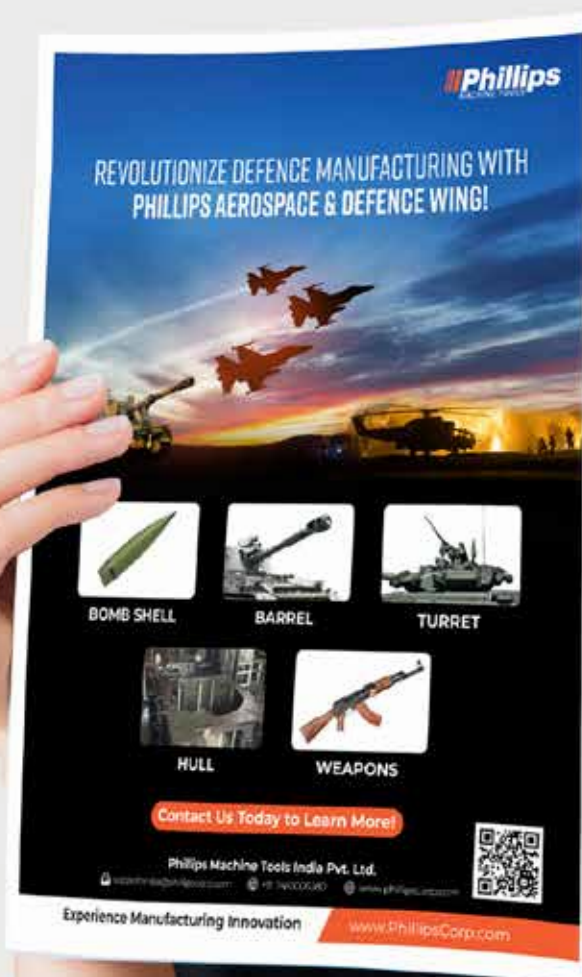
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# Home Charging: The Silent EV Game-Changer

India's electric vehicle market is growing at an unprecedented pace, with two-wheelers and passenger EVs leading the charge. But beyond policies, incentives, and public charging infrastructure, one element is quietly redefining the EV experience—home charging. By offering convenience, cost savings, and peace of mind, home chargers are not only addressing consumer concerns like range anxiety but also shaping how people perceive and adopt EVs.

**AKSHIT BANSAL,**  
Founder & CEO, Statiq





India's Electric Vehicle (EV) market is accelerating rapidly, backed by strong government policies, rising environmental awareness, and improved technology. In FY22 alone, EV sales surged over threefold to 4.29 lakh units from just 1.34 lakh units in FY21, according to data from the Federation of Automobile Dealers Associations of India (FADAI). Notably, electric two-wheelers accounted for more than half of these sales, highlighting a major shift in consumer preference. As the government targets 30% EV penetration in the passenger vehicle segment by FY2030, a robust and accessible charging ecosystem—especially home charging solutions—has emerged as a critical enabler of this transition.

While public charging infrastructure plays a vital role in supporting long-distance travel and commercial EV usage, home charging is quietly transforming how consumers perceive

and adopt electric mobility. Offering unmatched convenience, cost-effectiveness, and peace of mind, home chargers are helping to address some of the most common consumer concerns—chief among them, range anxiety and inconsistent charging access.

### The Convenience Factor: Charging Where You Live

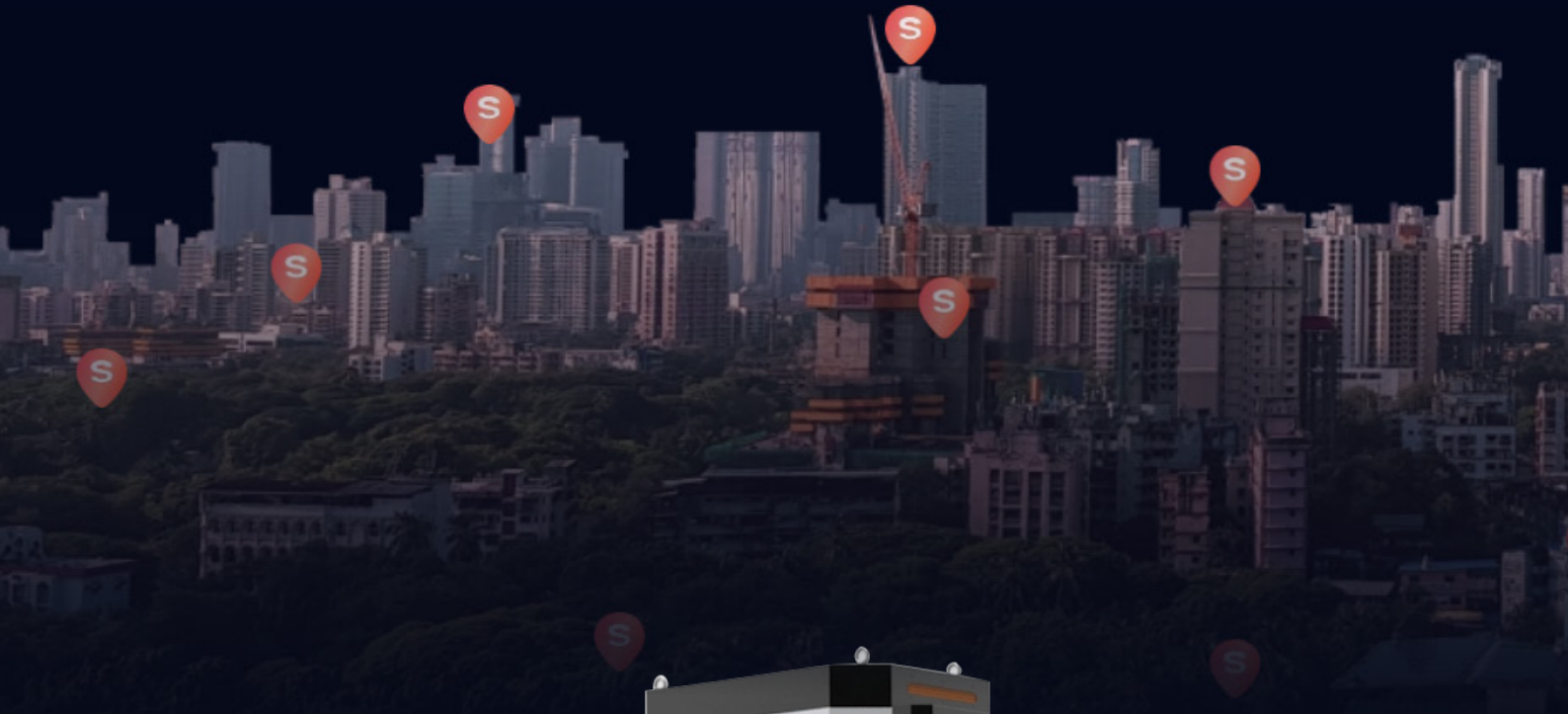
Charging at home eliminates the need for frequent visits to public charging stations, especially for users with predictable daily commutes. Just like plugging in a smartphone at night, EV owners can plug in their vehicles and wake up to a fully charged battery—no queues, no waiting. This consistent and stress-free charging experience adds immense value to EV ownership and simplifies the transition from internal combustion engines to electric mobility.

### Cost-Efficiency and Smart Energy Management

Home charging is not only more convenient but also more affordable in many cases. Residential electricity tariffs are typically lower than public fast-charging rates, and users can take advantage of off-peak electricity rates to optimize costs. Furthermore, with the integration of smart energy management systems, users can schedule charging during low-demand hours, track electricity usage, and manage costs more effectively.

Some forward-looking households are also bundling their EV chargers with solar panels or energy storage systems. This not only reduces the carbon footprint of EV ownership but also turns the home into a self-sustaining energy hub—a major draw for environmentally conscious consumers.

# EV Charging



## Building Confidence and Reducing Range Anxiety

One of the primary psychological barriers to EV adoption has been range anxiety—the fear of running out of battery power mid-journey. Home chargers offer a powerful antidote. The assurance of a fully charged vehicle every morning significantly reduces anxiety and boosts consumer confidence. It reframes EVs not as futuristic novelties but as practical, reliable vehicles for everyday use.

## Supporting the Government's EV Push

India's proactive stance on EVs—through initiatives like FAME II, the Production Linked Incentive (PLI) scheme, import duty reductions, and support for local battery manufacturing—is laying the foundation for large-scale

# g Stations



adoption. However, infrastructure remains a key challenge. Expanding access to home chargers can help bridge the infrastructure gap, particularly in semi-urban and residential areas where public charging networks are still maturing.

By enabling every EV user to become a self-reliant participant in the charging ecosystem, home charging complements broader efforts to build public infrastructure. It also plays a role in decentralizing the grid load and promoting energy efficiency.

## Transforming the EV Experience

Home chargers do more than power vehicles—they enhance the overall EV ownership experience. Consumers who enjoy seamless, at-home charging are more likely to become vocal advocates of EVs,

influencing others through positive word-of-mouth and social proof. OEMs and EV solution providers can amplify this effect by offering long-term test drives bundled with temporary home charging setups, allowing potential buyers to experience the day-to-day benefits firsthand.


## A Key Catalyst in India's EV Journey

While India hurtles towards a cleaner, greener tomorrow, the EV industry is ready to be in the limelight. Home charging solutions form the backbone of this revolution—not as a luxury but as an integral part of the EV system. By becoming more accessible, affordable, and reliable, home chargers are reshaping consumer perceptions and accelerating their adoption across the country.

As public charging networks continue to grow, the beauty of home charging is

its simplicity. It brings EV ownership into the comfort zone of daily life, enabling consumers to adopt electric mobility with confidence and convenience. In the larger mission of driving mass EV adoption, home chargers are not merely an option—they are a game-changer.

## Conclusion

Home charging solutions go beyond powering vehicles—they reshape consumer confidence and make EVs a practical choice for everyday life. By ensuring that every EV owner has reliable, affordable, and accessible charging at home, India can accelerate its shift towards cleaner mobility. As public networks expand, the real catalyst lies in the simplicity and assurance of charging where you live. For millions of potential EV buyers, the journey to electric mobility may just begin at home. 

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