TRANSJOVAN CAPITAL
STRATEGY | M&A | ADVISORY

EV Charging Infrastructure

Future Market Landscape and Strategic Opportunities

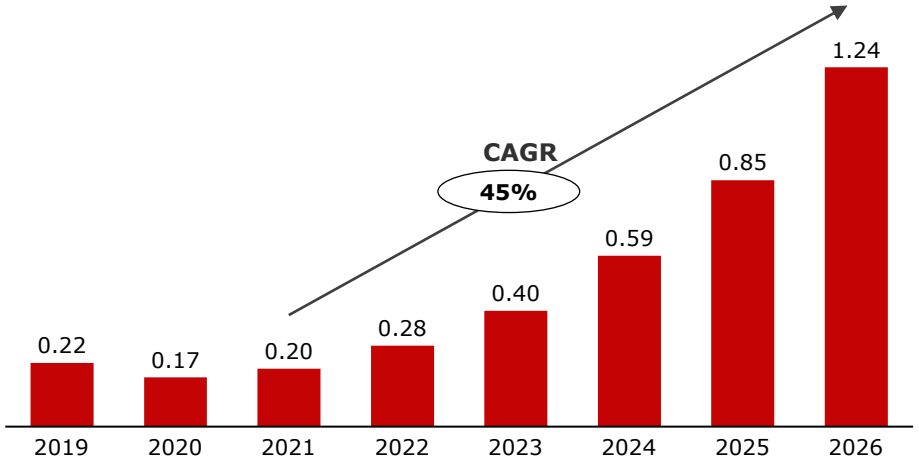
March 2024

Deep Dive: Japanese Market

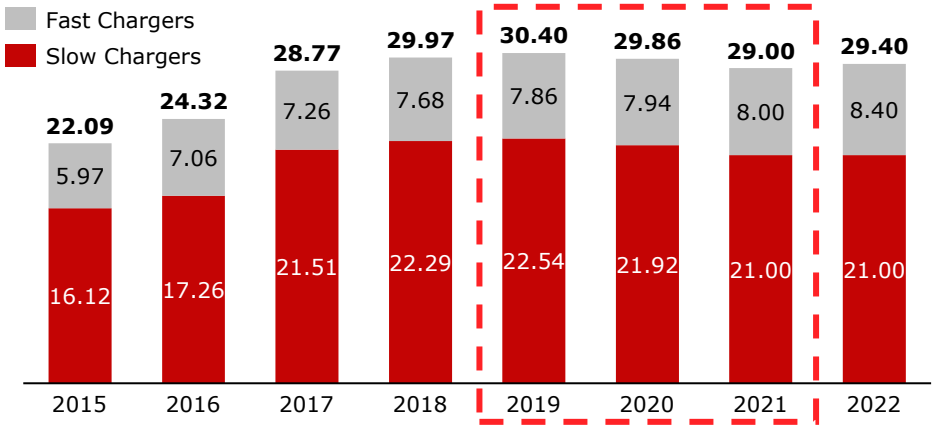
Market Landscape: Japan

The Japanese EVCI market, while currently lagging, presents significant growth potential through infrastructure renewal and government incentives and plans

EV Charging Station Market[1]
(Revenue in $B)



Public EVSE Chargers[2] *(000's)*



Key Insights

EVCI Market Growth

- EVCI market is projected to grow at a CAGR of **~45%** from $0.20B in 2021 to $1.24B by 2026[1]
  - The expansion is driven by a $911M government subsidies to **build EV charging stations** and a commitment to carbon neutrality by 2050[1]
  - Government subsidies of upto ¥600,000 for **EV purchases** to catalyze consumer demand and propel market growth towards price parity with ICE vehicles[1]
- TEPCO's rollout of 1,000 highway chargers by 2025 and Tokyo's **network expansion** to 150,000 by 2030, coupled with Hitachi's innovation in **compact charging technology** reflect a strategic scale-up in Japan's EV infrastructure[2]
- By 2030, METI mandates fast chargers in Japan to **increase output** to 90 kW, aiming to significantly reduce charging times and enhance EV convenience[3]

Potential for EVCI Upgrade and Expansion

- Japan's EV charging network, facing accessibility and aging challenges, offers a significant opportunity for **modern upgrades** and network expansion
- With approximately 29,000 public stations in 2021 and over 40% of the 8,000 fast chargers in less accessible areas, there's a clear potential to **enhance charger accessibility**, particularly on highways and major roads[4]
  - With 2,702 EV charger ports closing in early 2023, a **2.5x** increase from the previous year, underscores the need for **infrastructure renewal** due to chargers' typical 8-10year lifespan[1]
  - **Low density** of charging stations at 1.7 locations per 100km in 2021, compared to South Korea's leading density of 75.2, highlights substantial growth potential[4]

Source: 1. Mordor Intelligence Report, 2. Nikkei Asia, 3. METI, 4. E-Mobility Energy, 5. Statista

Navigating Tailwinds and Headwinds

EVCI players can capitalize on market opportunities through government incentives and EV demand, but should navigate challenges such as regulatory uncertainty with prudence

Tailwinds

Infrastructure and Charger Development

Tokyo requires EV chargers in new residential buildings from 2025, targeting 60,000 installations by 2030, and METI mandates an increase in fast charger output to 90kW by 2030

Financial Incentives for EV Adoption

Japan allocates $3.2B for EV **R&D** and **battery production**, $44.3M for charging infrastructure, plus $193M in subsidies, tax breaks, and a flat road tax for EVs and FCVs from 2024

Market Shift and Sales Projections

Japan's EV market is rapidly evolving with ZEV sales hitting 92,000 units in 2022, a **109% increase**, and BEV sales expected to dominate about 37.8% of market revenue from 2023 to 2032

Governmental Transition Goals and Policies

Japan aims for a full xEV transition by 2050, with METI targeting 100% xEV sales by 2035 and setting sales goals of 20-30% for EVs and PHEVs and 3% for FCVs by 2030

Headwinds

High Cost of Infrastructure Development

Estimated **cost to install** 200 Kw charging equipment in Japan is more than $76,000, with additional costs required each year for operations

Regulatory Uncertainty

Stringent safety regulations for high-powered charging stations, treating them like electrical substations, **elevates capital expenses**, deterring the development of the EVCI sector

Limited Stakeholder Participation

Japan’s expertise in HVs and ICE ironically stalls its EV market entry, as automakers **prioritize existing revenue streams** which dissuades them from investing in new areas

Battery Technology and Range Issues

Rising costs due to a projected **40x increase** in **Lithium demand** by 2040, energy density limitations, and thermal runaway risks hinder Japan's EV adoption and energy storage efforts

Japan's EVCI is poised for growth, leveraging robust government support and market shifts, while strategically navigating challenges in infrastructure and technology

Source: 1. Mordor Intelligence, 2. Green Car Congress, 3. TJC Analysis

Key Players and Strategic Partnerships

Partnerships driven by technological advancements will lead to increased M&A activity and industry consolidation

Key Players in Japanese EVCI

Illustrative purposes only

Auto OEMs

TOYOTA, HONDA, NISSAN, MAZDA, SUZUKI

Conglomerates

MITSUBISHI, MITSUI&CO., Sumitomo Corporation, TOYOTA TSUSHO

Oil and Gas

IDEMITSU, ENEOS

Utilities

TEPCO Tokyo Electric Power Company Holdings, Kansai Electric Power power with heart

Charge Point Operators

Power X, chargepoint, TRITIUM, eMOBILITY POWER, driivz

Foreign OEMs

TESLA, Volkswagen, BMW, PORSCHE, Mercedes-Benz

Key Partnerships

1 Suzuki and Power X MOU Agreement

- Suzuki partners with Power X to explore ultrafast EV charger prospects in Japan and India, prioritizing renewable energy adoption and EV infrastructure
- Power X's Hypercharger is a battery integrated charger that enables Ultrafast EV charging with renewable energy and offers scalable, low-voltage charging
- Plans to deploy 10 charging stations in Tokyo by mid-2023 and extend the network to 7,000 stations throughout Japan by 2030

2 India-Japan Joint EV Charging Standard

- India and Japan partner to establish an EV charging standard, aiming to cut implementation costs by 2/3rd with Japanese protocols

3 eMP Partners with Driivz

- e-Mobility Power (eMP), a leading EV charging provider, partners with Driivz's cloud-based platform for efficient EV charging station management

4 Global players expanding into Japanese EVCI market

- Mercedes-Benz plans to install quick-charge electric vehicle chargers in Japan
- Global charging companies like ChargePoint and Tritium are entering the Japanese market through partnerships

Source: 1. Alphasense, 2. Nikkei Asia, 3. Driivz Website, 4. TJC Analysis

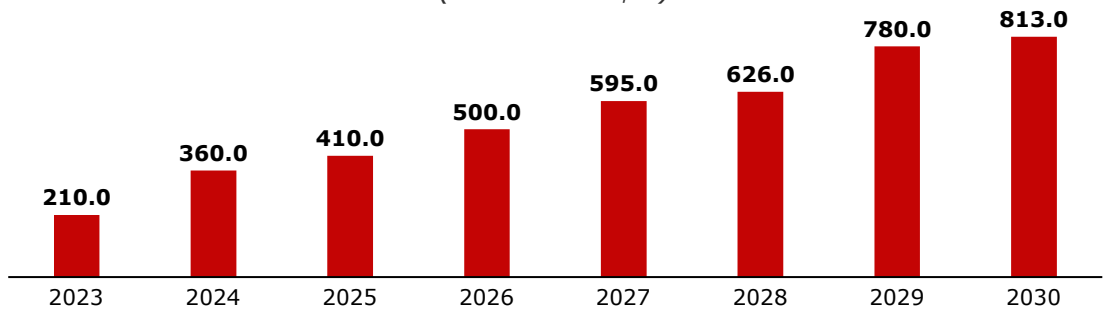
Deep Dive: Australian Market

Market Landscape: Australia

Growth in EV sales and government incentives creates a prime opportunity for the expansion and enhancement of Australia's EVCI network

EV Charging Station Market[1]

(Revenue in $M)



EVCI Landscape[2]

> 967 high power public chargers

> 558 locations in Australia

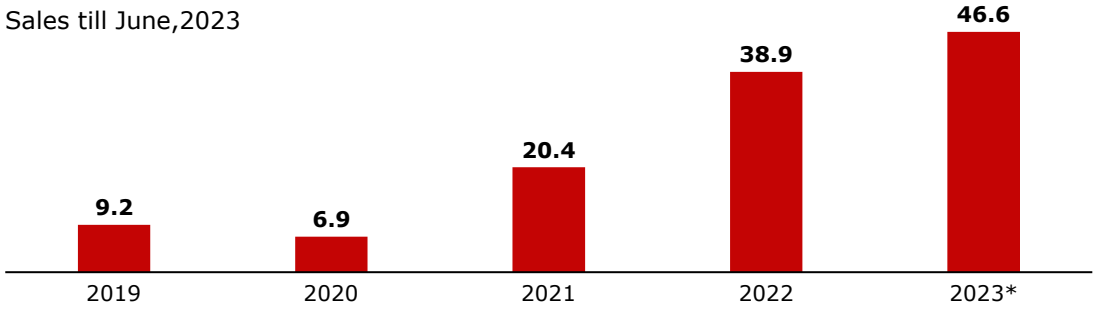
> 438 fast charger locations

> 120 ultra-fast charger locations

57% increase from 2022

EV Sales[3] *(2023, '000)*

* Sales till June,2023



Key Insights

EVCI Market Growth

- Australian EVCI market is **rapidly expanding**, driven by a surge in high-power charging stations and a strong forecasted market growth
  - Australia has 558 high-power public EV charging locations with 967 chargers, a **57% YoY increase** with NSW leading with 174 locations
  - Australian (EV) Charging Market is valued at $210M in 2023 and is forecasted to reach $813M by 2030, growing at a **CAGR of 31.1%** from 2023 to 2030

EV Sales Surge

- Australia's EV market is experiencing a **dynamic growth**, marked by a surge in sales, reflecting a significant shift in consumer preferences and market dynamics
  - EV sales in the first half of 2023 was 46,624 units, reflecting a **269% increase** from the first half of 2022
- In 2023, EVs have captured a significant ~8.4% of Australia's new car sales, marking a substantial growth of ~121% compared to the previous year

Government Investments

- Ministry for Climate Change and Energy committed $40M to a **national EV fast charging network** with 117 new sites along key highway routes across Australia[4]
- The government announced $132M to accelerate the development of hydrogen refueling and EV charging stations across the country in 2021

Source: 1. Alphasense, 2.Australia EV Council, 3. IEA, 4. Department Of Climate Change and Energy, Australia, 5. TJC Analysis

Navigating Tailwinds and Headwinds

EVCI players must adeptly manage challenges like regulatory changes and grid capacity, while capitalizing on opportunities from consumer demand and technological advancements

Tailwinds

Technological Advancements in EVs and Batteries

Energy Vault, backed by Korea Zinc, BHP, and Saudi Aramco, pioneered a long-lasting **gravity ESS** in Australia, offering a sustainable alternative to traditional batteries

Growing Consumer Interest in EVs

Projected **EV market's growth** to $26.21B by 2028 presents a significant opportunity for EVCI players to capitalize on increasing demand and invest in expanding charging networks

Increasing Government Incentives and Support

The Australian government's National Electric Vehicle Strategy, along with **regional tax incentives** and subsidies, is significantly propelling EVCI development

Advancements in Renewable Energy Integration

Integration of renewable energy with EVCI, as seen with Chargefox using 100% renewable energy for its ultra-rapid charging stations, highlights a sustainable path for EVCI development

Headwinds

Regulatory Uncertainty

EVCI market grapples with regulatory uncertainty, such as varying state-level EV policies posing challenges for companies like Chargefox and Jet Charge in planning long-term investments

Supply Chain Challenges

Australia faces **equipment shortages**, grid connection delays, and a mere 0.5kW public charger, versus the 2.4kW global average impacting key players like Tritium in expanding their networks

Grid Capacity Constraints

Grid limitations necessitate enhancement to manage surges at public fast charging stations, despite rooftop solar adoption supporting home and workplace EV charging

High Initial Investment Costs

Development of a widespread and efficient EVCI network in Australia demands substantial initial investment, posing a **financial challenge** for market players

Australia's EVCI market, while navigating regulatory and supply challenges, is set for robust growth driven by technological advances, rising consumer demand, and supportive government policies

Source: 1. Alphasense, 2. TJC Analysis

Key Strategies for *"Building a Lasting Competitive Edge"*

Strategic partnerships and a focus on scalable, sustainable models, emphasizing innovation and customer experience, are key for players to thrive in the EVCI market

1 Market Positioning and Strategic Partnerships

- Capitalize on the EV market's projected growth to $26.61B by 2028 in Australia
- Form strategic partnerships with EV manufacturers, utilities, and local governments
- **Collaborate with Auto OEMs** for exclusive charging technologies

2 Technological Innovation and Efficiency

- Focus on developing fast-charging and smart charging technologies
- Invest in research and development for more efficient charging solutions
- Align with global EVCI trends such as adoption of **V2G (Vehicle-to-Grid) technology** in charging stations

3 Consumer-Centric Approach

- Adapt to consumer preferences such as introduction of affordable EVs in response to demand
- Offer a range of home and public charging solutions to consumers
- Implement **user-friendly interfaces** to enhance customer experience

4 Sustainable and Scalable Business Models

- Deploy new business models with demand-based pricing, **retail co-location**, and public co-financing
- Develop scalable infrastructure such as expanding EVCI in line with EV adoption rate
- Strategically align business strategies, utilizing government grants for EVCI development

Source: 1. Australian EV council, 2.Alphasense, 3. TJC Analysis

Best-in-Class: **Case Studies**

Petro Canada, China and Norway

Petro-Canada Case Study

Petro Canada, a subsidiary of Suncor, launched the Electric Highway in 2019. This marked the inception of the first-ever coast-to-coast network of EV fast chargers in Canada

EV Charging Network

Trends	Highlights
Extensive Network	✓ The Electric Highway covers **6,300 km** from Halifax, NS to Victoria, BC, ensuring nationwide EV travel without range concerns
Strategic Locations	✓ TEV chargers are placed **every 250 km** or less along the Trans-Canada Highway, serving both urban and rural areas[2]
Advanced Charging Technology	✓ Stations have DC fast chargers with CHAdeMO and CCS/SAE connectors, charging most EVs up to **80%** in under **30 minutes** [2]
User-Friendly Mobile App	✓ Petro Canada's app, available on iOS and Android, offers charging session management, payments, and charger location with real-time availability

Key Insights

Charge Pricing

- On the Electric Highway, you're charged at a rate of **$0.50** per minute during charging, with no additional fees for connecting or idling[1]

Contactless Payments

- Charging stations offer seamless contactless payment options using the EV app or directly at the station, including Debit, Credit, Apple Pay, and Google Pay

Mix of charging speeds and levels

- The Electric Highway offers a diverse range of chargers, from slow to fast, catering to various charging requirements of EV drivers

Charging Infrastructure Coverage

- Over **50** strategically placed charging sites along the Trans-Canada Highway guarantee that EV drivers are never too far from a charging point

User-Centric Approach

- Petro Canada actively seeks and incorporates feedback, ensuring the Electric Highway evolves to meet user needs and expectations

Public-Private Partnerships

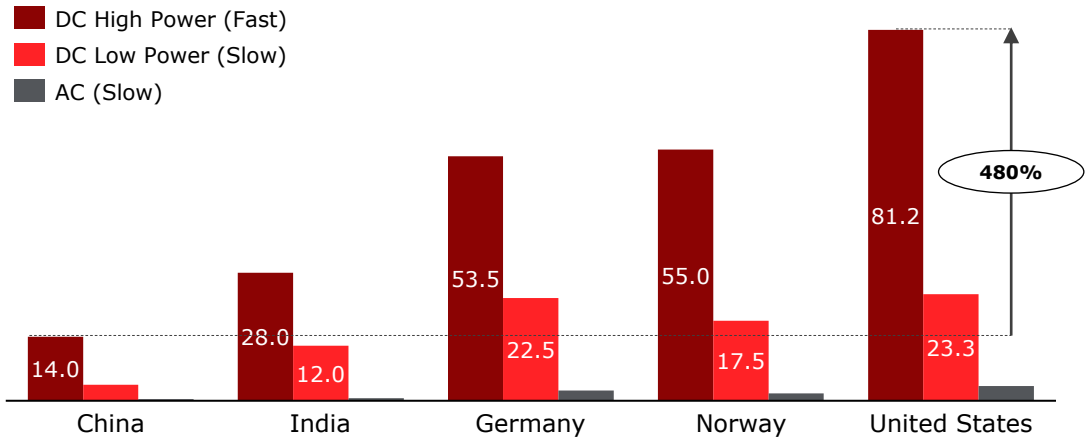
- The Electric Highway was a public-private partnership between the Government of **Canada**, the Government of **Alberta**, and **Petro Canada**; the partnership helped to ensure that project was properly funded and that it met the needs of EV drivers

Source: 1. Petro- Canada Website, 2. Suncor Energy Report (2020), 3.Electric Autonomy Report (2022)

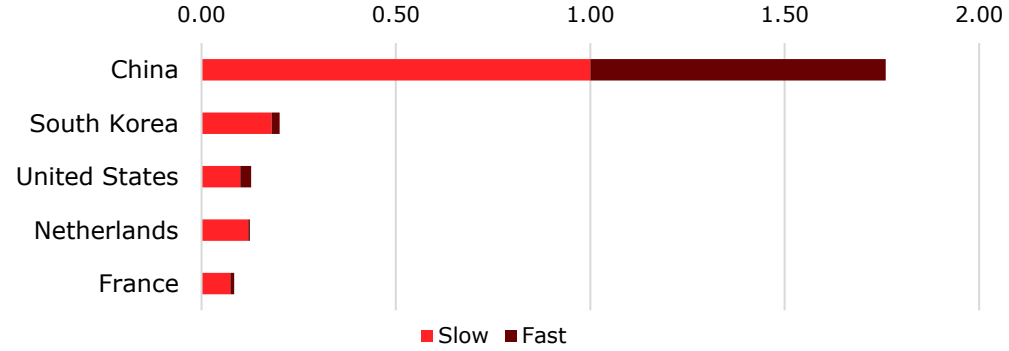
China Case Study

China is at the forefront of the global EV market, not just in terms of sales but also in the rapid deployment of charging infrastructure

EV Charger Price *(2021, $'000)*[1]



Public EVSE Chargers *(2022, Mn)*[1]



Key Insights

Cost Advantage

- China has significantly lower EV charger prices, with AC chargers priced at **9x** discount and DC fast-chargers priced at a **4.8x** discount as compared with US, indicating a cost advantage for China in EVCI

EV Market Growth

- In 2021, China's EV on-board charger market stood at **$427.9M** and is expected to surpass **$1.1B** by 2027, growing at a **17.8%** CAGR, indicating robust growth potential[1]

Infrastructure Penetration

- China's average vehicle-to-charger ratio stands at **3.5** EVs per charger, with some areas even achieving a 1:1 balance[2]
- This favorable ratio, in contrast to the U.S., is due to the high density of apartment living in China, necessitating more communal charging solutions

Infrastructure Expansion

- China is a global leader in EVCI, with 1.8 Mn public charging stations. This represents 65% of all public EV charging stations worldwide
- China has been rapidly installing public chargers, with an increase of **56.7%** from 2021 to 2022[1]

Government Incentives

- Government-backed investments, including state-owned utilities and national and local incentive programs, have been pivotal in infrastructure growth
- Growth in infrastructure providers and investment due to policies encouraging private sector involvement

Source: 1. Statista, 2. Mordor Intelligence Report- China EV Charging Infrastructure Market, 3. NRDC Report

Norway Case Study

Norway firmly establishes its leadership in the EV domain, showcasing unmatched adoption rates, innovative charging solutions, and a commitment to green energy infrastructure

Current Landscape

- **16,000+** charging points represent over **9%** of Europe's total, despite its **0.7%** population share and ~**0.67%** of Europe's habitable land area
- Sets the global standard in EV adoption, with over **20%** of passenger vehicles and **80%** of new car sales being EVs

Accessibility and Experience

- Fast-charging every **50 km** along major roads
- Electric Car Association **Charging Chip** offers nationwide charging access at reduced rates
- Fortum's Charge & Drive chip allows charging at most stations, complemented by an app for location, payment, and support

Incentives for Promoting EV Penetration

- Exemption from purchase tax and VAT for new or used EVs
- Annual road traffic insurance tax is waived for EV owners
- EV owners enjoy 50% reduced tolls on roads and ferries and 50% discount on parking fees

Investments

- Enova, Norway's energy and climate agency, invested **$7.51M**, establishing **1,900** EV charging points by **2011**
- Funding for housing associations to purchase and install chargers, with grants ranging from **20-50%** in various cities

Clean Grid

- Norway's national grid is powered by **99%** renewable energy (wind, solar and hydro-electric)
- Low electricity prices- **$0.091** per Kwh versus around $1.83 per litre for petrol

Best Practices

- ✓ **Proactive Government Incentives:** Norway eliminated taxes for zero-emission vehicles early, coupled with benefits like reduced tolls, free public charging, and no fuel tax, making EVs more affordable
- ✓ **Strategic Infrastructure Investment:** With 16,000+ charging stations, including 3,000 fast chargers, Norway ensures widespread accessibility, even in remote terrains
- ✓ **Promotion of Sustainable Travel:** Through initiatives like Innovation Norway, the government encourages both locals and tourists to use EVs
- ✓ **User-Centric Charging Solutions:** CPOs offer 24/7 support, unified access via RFID cards, QR codes, and SMS-based start/stop charging
- ✓ **Commitment to Renewable Energy:** Norway's grid, powered by 99% renewable energy, ensures green EV charging, further incentivized by low electricity costs

Source: Wallbox Blog

Conclusion– Synergies and Opportunities yet to be tapped in the Future

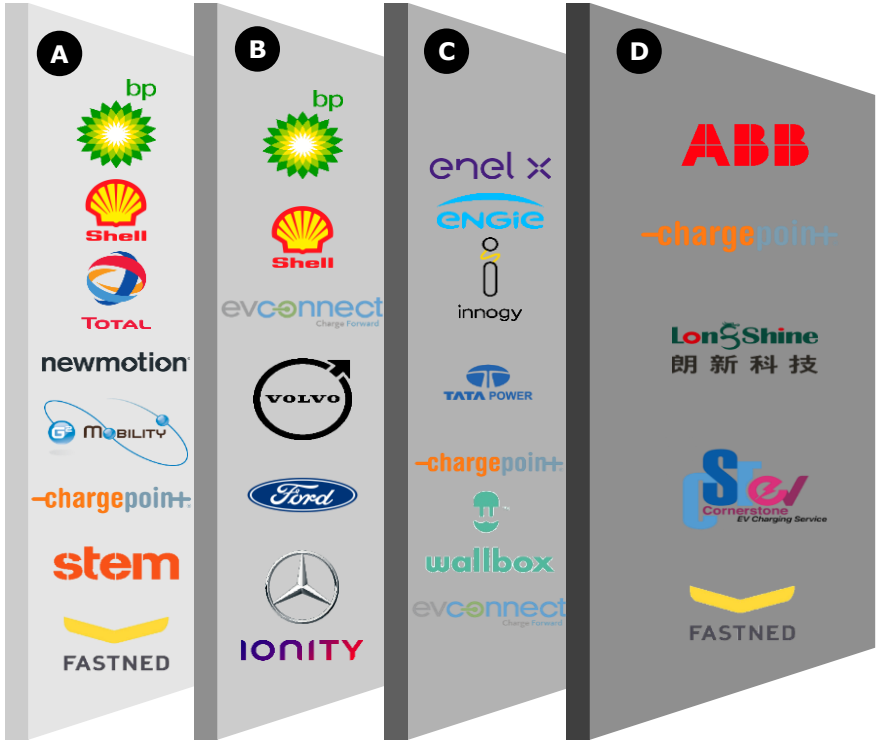
The dynamic shifts in the industry offer distinctive engagement opportunities for all players encompassing existing energy incumbents and new entrants like CPOs

A On-the-go Charging

- ✓ Oil & Gas companies and CPOs can expand their geographical presence and scale of operations
- ✓ Series of partnerships and acquisitions can help players capture the value chain and offer Turnkey solutions
- ✓ CPOs can partner with multiple vendors to offer ancillary services to customers during charging dwell time

B Fleet Charging

- ✓ CPOs can provide specialized solutions for fleet owners with accessibility to both slow and fast chargers
- ✓ Utilities can forge partnerships with CPOs and fleet owners to provide subsidized supply for new revenue opportunities
- ✓ Strategic venture between Oil & Gas companies and Auto OEMs with subscription models for recurring revenue



C Home/ Workplace Charging

- ✓ Local Utility Companies can capture increase in demand for electricity for home/workplace charging
- ✓ Local Utilities can offer time-of-use (TOU) rates and provide energy management services
- ✓ Partnerships between smart charge point providers and utilities for Installation and Maintenance services
- ✓ Smart revenue share agreements between CPOs and local utility companies to maximize revenue across value chain

D Destination Charging

- ✓ Retail and commercial establishments can partner with CPOs for stable rental cashflows and opportunistic locations
- ✓ Hardware co-ownership via partnerships with CPOs can help create a revenue pool on per charge basis
- ✓ CPOs can partner with travel services to offer comprehensive charging services

About Transjovan Capital

Transjovan Capital is an upstream strategy and M&A consulting firm with hubs in New Delhi, Los Angeles, Dubai, and Sydney. We partner with our clients to create exponential value with high-quality analysis and robust recommendations. Our clients span across industries and feature in top Fortune 50 companies of the world.

Transjovan Capital is industry agnostic with a focus on North America, Western Europe, and APJ regions. Our offerings include development of corporate strategy, business wargaming, M&A strategy, commercial due diligence, and market entry strategy. We focus on delivering tangible results by bringing together consulting expertise and global experience for our clients.

The information contained herein is not intended to substitute for competent professional advice