Frost & Sullivan’s E-Bus Market Capability Document

Though leadership across e-bus ecosystem integrated through an end-to-end value proposition of consulting services.
GLOBAL BUS MARKET – TRENDS OVERVIEW
Increasing ridership through seamless flexibility in switching between intermodal transport models, improving passenger connectivity, comfort & convenient features, and reducing emissions are key focus.

- Passenger comfort & convenience
- Urbanization
- Global harmonization of regulations
- Intermodal flexibility
- Connectivity & telematics
- New business models
- Driver and passenger safety
- Autonomous driving
- Electrification & advanced powertrains
GLOBAL BUS MARKET FORECAST — TRANSIT, COACH AND SCHOOL BUS

Rapid urbanization, preference for safe transport model to aid school bus growth. Transit bus segment emerge as early adopters of alternate powertrain including natural gas, battery electric and fuel cell with subsidies from government.

Global Bus Market Outlook: Transit Bus and Coach Unit Shipment, Global, 2019-2025

Global Bus Market Outlook: School Bus Unit Shipment, Global, 2019-2025
China contributed 88.2% to the global electric bus unit shipment in 2020, but its share is expected to reduce to about 73% by 2030.
### ELECTRIFICATION DRIVERS ➔ GOVERNMENT SUBSIDIES

Subsidies drive the adoption of alternate powertrain in buses, across North America, Europe and China. F&S constantly track and monitor EV regulation for CV and Bus at country and city level as well as tenders and concessions for public transport.

<table>
<thead>
<tr>
<th>Country</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>China</td>
<td>The Chinese Government updated its subsidy program in 2020; it encapsulates all battery electric vehicles and plug-in hybrid vehicles and is extended until 2022.</td>
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<tr>
<td>India</td>
<td>The government has increased the budget allocation for FAME-II by 8 times, compared to FAME-I. The primary focus is to increase localization and domestic manufacturing. The policy states that to be eligible for the upfront incentives, OEMs have to ensure at least 40% localization for buses.</td>
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<tr>
<td>USA</td>
<td>Under Low or No Emission Vehicle Program – 5339 U.S. Department of Transportation’s ok(USDOT) Federal Transit Administration (FTA) announced $129,956,625 in 2020 for 41 projects in 40 states and District of Columbia. The eligible projects included purchase or lease of hydrogen and battery-electric buses, and charging infrastructure related investments. In 2021</td>
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<tr>
<td>Chile</td>
<td>National Electromobility Strategy’s goal is to electrify 100% of the public transportation fleet in the capital by 2040 and the rest of the country by 2050.</td>
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<tr>
<td>Germany</td>
<td>€1.2 billion for fleet modernization program to switch to alternative drive systems until end of 2021. German ministry for the environment (BMUB) has now allowed bus operator to claim up to 80% of cost of investment provided they acquire 5 or more all electric buses. The investment includes charging infrastructure, training and new service centers.</td>
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<td>UK</td>
<td>UK government all electric bus town scheme will fund 75% of cost differential between a zero-emission bus and a standard conventional diesel bus and 75% of CapEx for charging infrastructure. Initially 50 million pounds budget is allocated for the scheme.</td>
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<tr>
<td>Sweden</td>
<td>Public transportation authorities buying new electric buses can receive a premium of maximum 20% of the purchase price of the electric bus. The premium must not be higher than the difference in price of the electric bus and that of the corresponding diesel bus. Private companies buying new electric buses can receive a premium of 40% on the price differential over diesel bus.</td>
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</tbody>
</table>
OPERATIONAL COST/MILE ($/MILE)—DIESEL, ELECTRIC, NG, FUEL CELL
A lower battery price for the electric and higher fuel price for diesel buses work in favor of electric buses, making them the best alternative fuel in terms of operational cost/mile.

Global Bus Market: Operational Cost Forecast per Mile, NA, 2020–2033

Note: All figures are rounded. The base year is 2020

Source: Frost & Sullivan
E-BUS CHARGING INFRASTRUCTURE & TECHNOLOGIES

Pantograph charging is seeing higher adoption among Transit e-Buses because they allow quicker charging time and the use of smaller batteries that could lower bus acquisition cost.

Note: Dynamic Conductive Charging for trolley buses exists in the market.
FROST & SULLIVAN GLOBAL BUS MARKET CAPABILITIES
# F&S Capability Across Bus Eco-System

Thought leadership across bus ecosystem integrated through an end-to-end engagement offering with increasing focus on electrification.

<table>
<thead>
<tr>
<th>Public Transport Regulatory Bodies</th>
<th>E-Bus Suppliers</th>
<th>E-Bus OEMs</th>
<th>Technology &amp; Charging Companies</th>
<th>Transport Authorities &amp; Operators</th>
<th>Used Bus</th>
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</thead>
<tbody>
<tr>
<td>Business models</td>
<td>Status &amp; Outlook</td>
<td>Market Potential</td>
<td>Vehicle Grid</td>
<td>Infrastructure</td>
<td>Revenue Model</td>
</tr>
<tr>
<td>Recycle vs. Reuse</td>
<td>Business Models</td>
<td>Ecosystem</td>
<td>Recycling Technologies</td>
<td>Strategy</td>
<td>Business Models</td>
</tr>
<tr>
<td>+ Growth Partnership Service (access to &gt;1,000 published studies) – Coverage across all topic areas of Bus and CVs industry</td>
<td>+ Growth Consulting Service (Business Advisory) – Delivered project across all topic areas to Global Bus Players</td>
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</tbody>
</table>

1. Technology Strategy & Roadmap
2. Competitive Profiling & Benchmarking
3. Regulatory Tracker
4. "Innovation Generator" - AI Interactive Platform
5. Market Sizing & Forecasting
6. Voice of Customers
7. Charging Strategy & Infrastructure Network
8. Battery Eco-system
INNOVATION GENERATOR PLATFORM: VISUALISATIONS
Platform Screenshots and Analysis

Electric Commercial Vehicles: Historic Sales by OEM

Electric Commercial Vehicles: Sales by Model

Electric Commercial Vehicles: Power Rating by Motor Type

Electric Commercial Vehicles: Battery Chemistry by OEM

Electric Commercial Vehicles: Forecast by OEM

EV Charging Infrastructure Analysis
## E-BUS CAPABILITY - WHY SHOULD YOU PARTNER WITH FROST & SULLIVAN?

Frost & Sullivan can leverage experience with multiple commercial and electric vehicles related studies & engagements across the value chain.

### Public Transport Market
- Sizing, Forecasting & Opportunities Identification in Europe G5 Countries

#### EUROPEAN COMMERCIAL VEHICLE MANUFACTURER

### European E-Bus Market
- Analysis & Battery-as-a-Service Strategy Development

#### ASIAN INDUSTRIAL CONGLOMERATE

### Analysis of Global OEM
- Electric Bus Strategy and User Feedback on Electric Bus

#### CHINESE COMMERCIAL VEHICLE MANUFACTURER

### Evaluation of the potential EV battery pack in selective transportation including commercial vehicles

#### JAPANESE CONGLOMERATE

### Strategic assessment of the battery electric applications in the material handling equipment market

#### EUROPEAN BATTERY MANUFACTURER

### EV battery recycling opportunities in Europe: Key players and opportunities

#### JAPANESE CV MANUFACTURER

### Global Public Transport Market analysis, Partners Scouting a Go-to-market Strategy Definition

#### GLOBAL INFRASTRUCTURE MANUFACTURER & CHARGING OPERATOR

### Note: Additional case studies in the Appendix

#### TIER 1 SUPPLIER
## BUS CAPABILITY - LIST OF RESEARCH STUDIES ON BUS & E-BUS MARKET

### Existing Bus Research Titles

- 2021 Predictions of Global Transit Bus Growth Outlook
- Global Connected School Bus Market
- Global Electric Transit Bus and Coach Market, 2030
- Global School Bus Market Analysis, Forecast to 2025
- Global Bus Rapid Transit System (BRT)
- Global Hybrid-Electric Trucks and Buses – Technology Uptake Overview
- Strategic Analysis of Global CNG/LNG Truck and Bus Markets
- HD Transit Bus Market Global Analysis

### Planned Bus Research Titles-2022

- 2022 Prediction of Global Coach and Bus Growth Outlook
- Growth Opportunities in ASEAN Bus Market
- Growth Opportunities in LATAM Bus Market
- Growth Opportunities in Russia Bus Market
- Growth Opportunities in Turkey Bus Market
- Growth Opportunities in India Bus Market
- Growth Opportunities of Electric Bus Charging Infrastructure - NA and EU
- Growth Opportunities of Fuel Cell in Buses and Coaches
- Global School Bus Market Growth Opportunities
- Growth Opportunities in Global Connected Transit Bus & Coach Market

Source: Frost & Sullivan