FROST & SULLIVAN

BUSWORLD TURKEY F&S MARKET PERSPECTIVES

busworld

Presenter

The Growth Pipeline™ Company
Powering clients to a future shaped by growth

GLOBAL MARKET OVERVIEW

SNAPSHOT OF GLOBAL BUS MARKET BY REGION IN 2027

Global Bus Market: Unit Shipment Forecast by Region, Global, 2027

Note: All figures are rounded. The base year is 2021. Source: Frost & Sullivan

Global bus market includes medium- and heavy-duty transit buses and coaches.

GLOBAL BUS POWERTRAIN OUTLOOK

Bus Market Outlook: Powertrain Standard Overview, Global, 2022-2025					
Region	Powertrain				
	Diesel	NG	Hybrid /PHEV	BEV	FCEV
LATAM	✓	✓	✓	✓	*NA*
EUROPE	✓	✓	✓	✓	✓
NORTH AMERICA	✓	✓	✓	✓	✓
CHINA	✓	✓	✓	✓	✓
	✓	✓	NA	✓	NA

Current Market ✓ High Demand in Short Term ✓ Moderate Demand in Short Term ✓ Low Demand in Short Term

Source: Frost & Sullivan

TOP PASSENGER MOBILITY TRENDS

Urbanization – Mass Transit Solutions will Get a Greater Push to Solve Congestion

Electric Mobility – Transit Buses will Pioneer the Zero-emission Drive

Intermodality – Seamless Commuting will Provide Greater Passenger Comfort and Flexibility

New Business Models – Battery Leasing, Separation of ownership and operation of bus

Cost Of Ownership – **A**lternative powertrain offer cost advantage compared to fossil fuel

Connected Mobility – Elevating transport efficiencies and reducing commute time and OPEX

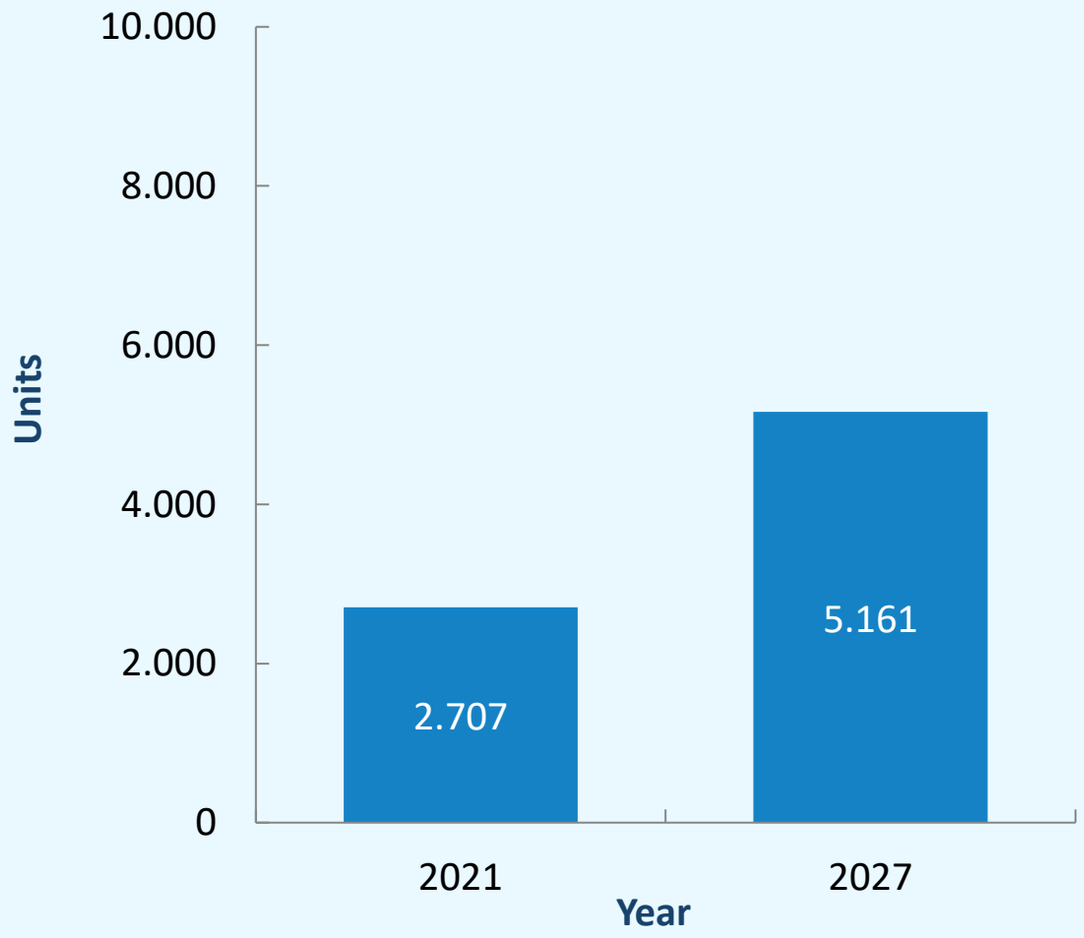
Source: Frost & Sullivan

ELECTRIFICATION

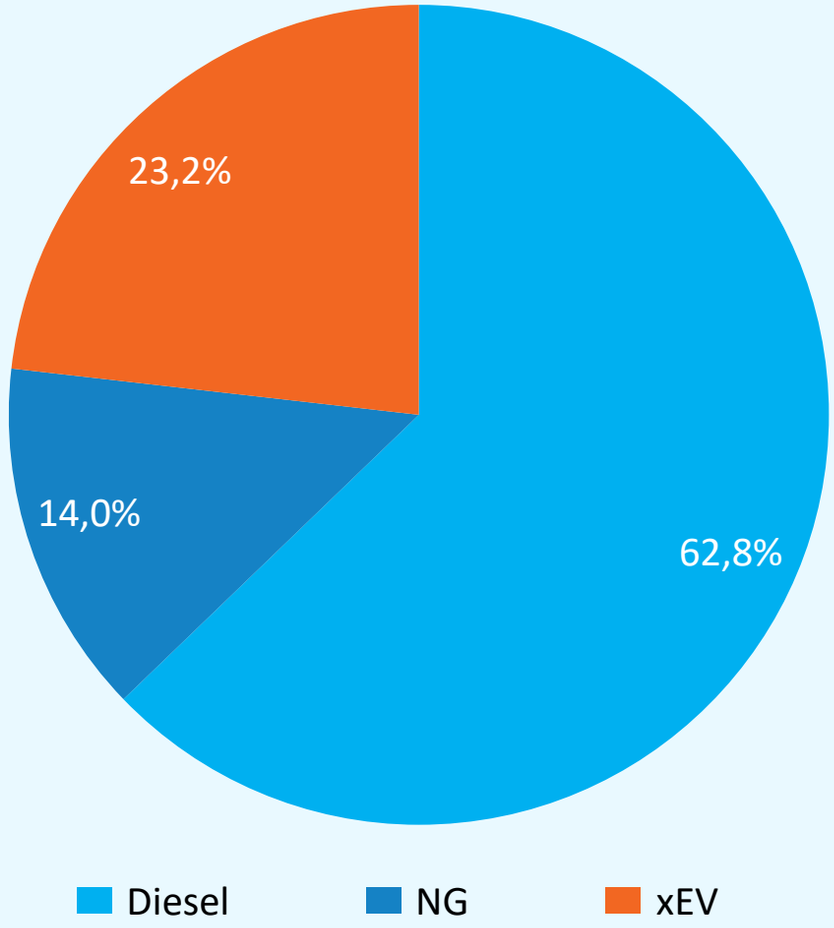
BUS MARKET—POWERTRAIN FORECAST, TURKEY

Turkey Bus Market: Forecast of Bus Powertrain Adoption, Turkey, 2027

Bus Forecast, Turkey, 2021 & 2027



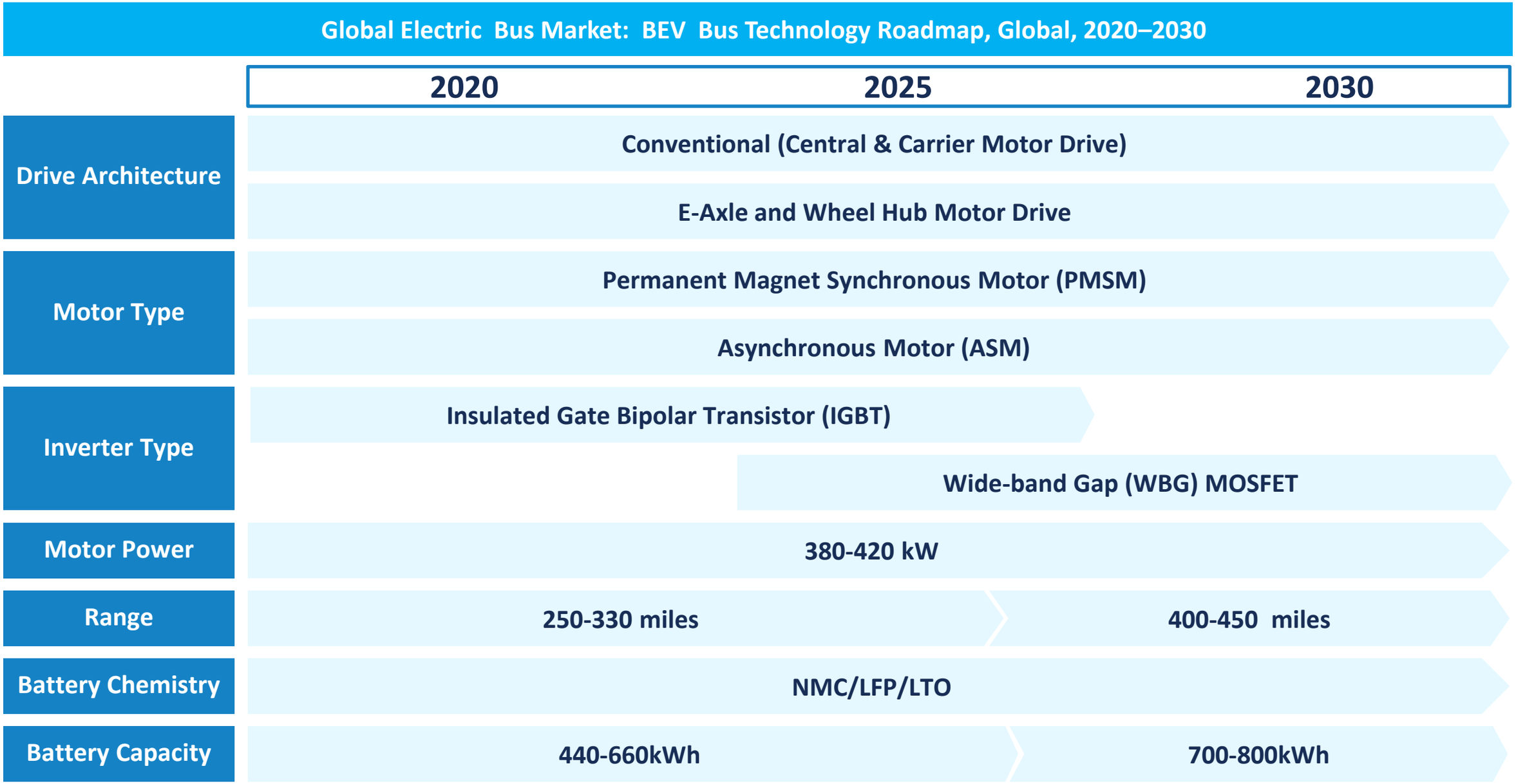
Bus Forecast of Powertrain Adoption, Turkey, 2027



Note: All figures are rounded. Estimated 2021 numbers. Bus includes Midibus and Otobus

Source: Frost & Sullivan

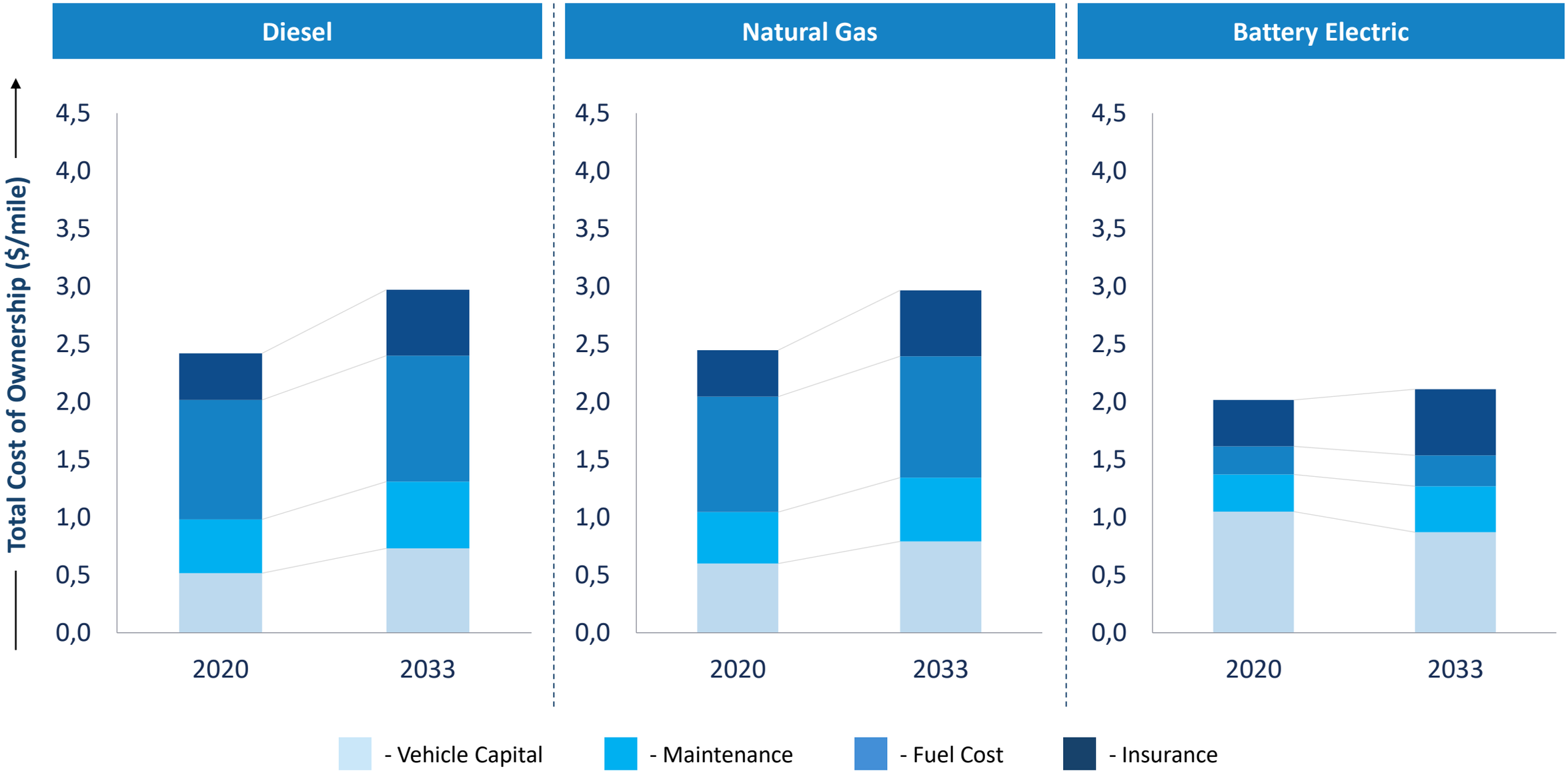
ELECTRIC VEHICLE TECHNOLOGY ROADMAP – BATTERY ELECTRIC BUS



Source: Frost & Sullivan

DIESEL, NG, ELECTRIC TRANSIT BUS OPERATIONAL CPM COMPARISON

Global Bus Outlook : Cost per Mile Comparison of Powertrains , Turkey, 2020-2033



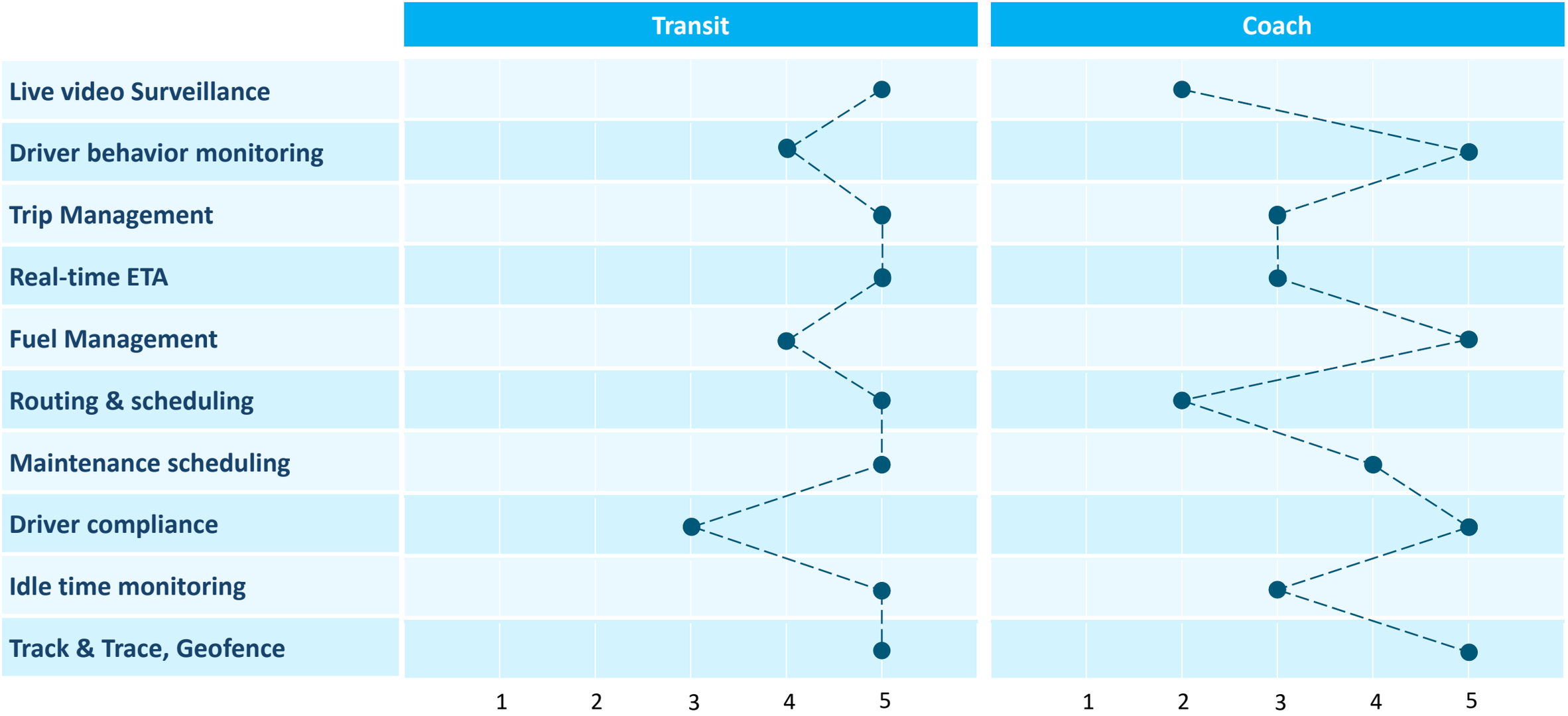
*Fuel/charging cost and average mileage will remain consistent throughout this scenario; engineering and development cost of technology are not considered

Source: Frost & Sullivan

CONNECTIVITY AND ADAS IN BUSES

TRANSIT AND COACHES SEGMENT– FAVOURABILITY BY APPLICATIONS

Global Bus Telematics Market: Telematics Market- Transit and Coach , Global, 2020–2030



Source: Frost & Sullivan

BUS TELEMATICS MARKET IN NA AND EU – SERVICES LADDER

Penetration of entry level service bundles are high in the current market scenario; transit buses telematics vendors provide customization and back-end integration support with the PTA's bus management platforms

Services Ladder

Back office integration, 3rd party integration, Driver behavior, Trip Management dashboard, Real-time Driver coaching, Live video Surveillance

Turn by Turn Navigation, Maintenance scheduling, Real-time ETA, Driver Communication, Fuel management, Eco-Drive, Dispatch, Routing and scheduling

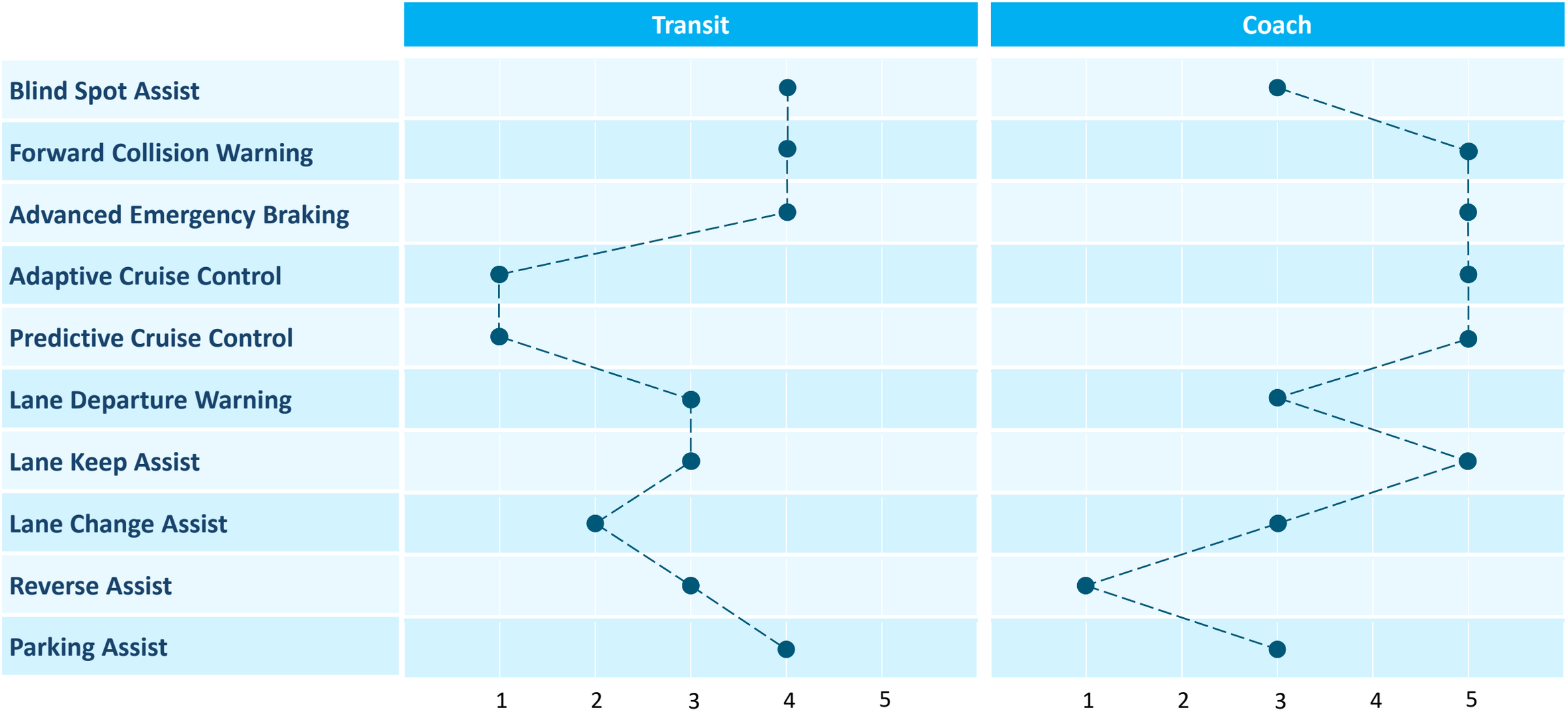
Track and trace, Geo-fencing, Idle time monitoring, Compliance, Driver ID, Door sensor, Panic button

Note: Mid-tier includes entry-level; High-end includes mid-tier

Source: Frost & Sullivan

DRIVER ASSISTANCE SYSTEMS – FAVOURABILITY BY APPLICATIONS

Global Bus ADAS Market: Driver Assistance Systems- Transit and Coach , Global, 2020–2030



Source: Frost & Sullivan

TURKEY – ADVANCED DRIVER ASSISTANCE FEATURES IN BUSES

Turkey – ADAS us Market

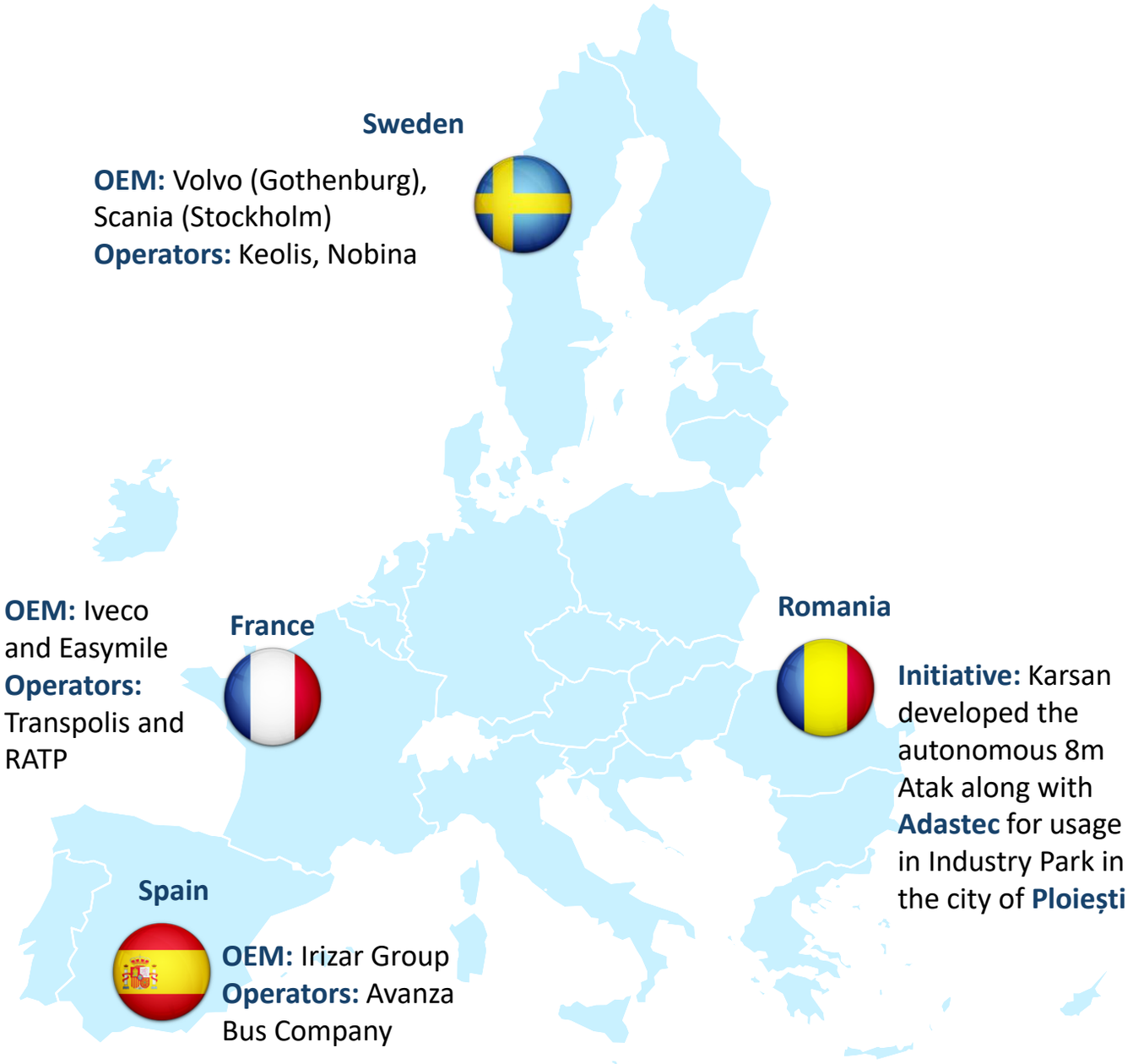
- Turkish Bus market offers wide variety of advanced driver assistance features targeted at relevant segments.
- Major manufacturers are competitive in offering ADAS features to promote safety and security in their products.
- Since Turkey is a major automotive exporter to European markets, their maturity and offering in ADAS is at level with European bus manufacturers which need to be compliant with European regulations

Regulations

- In 2020, Turkey adopted an official gazette similar to the European regulation involving type approval and safety requirements for ADAS systems.
- Adoption of the new law for Turkish manufacturers is expected to follow similar timelines of EU, i.e. starting 2022 implementation

Brand	Driver Assistance Features	Segment Offering
Mercedes Benz	• Blind Spot Assist • Advanced Emergency Braking • Adaptive Cruise Control • Lane Departure Warning	• Active Brake Assist 4 & 5 (AEBS) is offered in Coach variants • Only AEBS and BSD are offered in City variants
TEMSA	• Advanced Emergency Braking • Adaptive Cruise Control • Lane Departure Warning	• No ADAS features are offered in City variants • AEBS, ACC and LDW are offered in coach segment
Otokar	• Advanced Emergency Braking • Lane Departure Warning	• AEBS and LDW are only offered in intercity coach variants.
Ford Otosan	• Blind Spot Assist • Advanced Emergency Braking • Adaptive Cruise Control • Lane Departure Warning	• Extensive range of ADAS and safety features are offered
Karsan	• Lane Departure Warning • Advanced Emergency Braking	• AEBS and LDW are offered in select city variants
MAN	• Advanced Emergency Braking • Adaptive Cruise Control/ Predictive Cruise Control • Lane Departure Warning	• Extensive range of ADAS and safety features are offered in both MAN and Neoplan bus models

AUTONOMOUS BUS OEM INITIATIVES



Sweden

OEM: Volvo (Gothenburg), Scania (Stockholm)
Operators: Keolis, Nobina

France

OEM: Iveco and Easymile
Operators: Transpolis and RATP

Spain

OEM: Irizar Group
Operators: Avanza Bus Company

Romania

Initiative: Karsan developed the autonomous 8m Atak along with **Adastec** for usage in Industry Park in the city of **Ploiești**

Otokar initiatives

- Otokar completed second phase of a four-phase development process. It was carried out in co-operation with Istanbul based Okan University.
- The high-precision continuous position-controlled steering driving algorithm enables the bus to handle four-wheel drift and intersection turns . Emergency brake feature ensures stop in case any pedestrian, animal or bicycle unexpectedly gets in front of the vehicle . Additionally it detects traffic lights and roadside signs

Karsan initiatives

- Karsan built level 4 autonomous vehicle partnering with California-based Adastec and BMWi. The first bus is running in US with permissions granted in partnership with Michigan State University
- Karsan 8m long driverless buses will undergo two year test in Norwegian city of Stavanger from April 2022 .

STRATEGIC TAKEAWAYS

Turkish OEMs leading BEV transition

Stronger ADAS Product Offerings

Otokar and Karsan lead autonomous initiatives

Cost and infrastructure vital for establishment

Source: Frost & Sullivan

BUS CAPABILITY - LIST OF RESEARCH STUDIES ON BUS & E-BUS MARKET

Planned Bus Research Titles-2022
2022 Prediction of Global Coach and Bus Growth Outlook
Turkey Bus Market Growth Opportunities
LATAM Bus Market Growth Opportunities
Indian Bus Market Growth Opportunities
ASEAN Bus Market Growth Opportunities
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,2030
Opportunity analysis of telematics in transit and coaches

Existing Bus Research Titles
2021 Prediction of Global Coach and Bus Growth Outlook
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
HD Transit Bus Market Global Analysis
Global Connected School Bus Market

Source: Frost & Sullivan

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