INAUGURATION

Welcome and introductions
Mr. Jan Deman
Director of the Busworld Academy
Worldwide Bus sales 2010 - 2016

2016: A record year for bus sales with 364,000 (+8.1%) units sold.
2017: Policy distortions are likely to negatively impact bus demand.
Worldwide Bus sales 2010 - 2016

- China: 32,000's
- North America: 16,000's
- Europe: 8,000's
- India: 0,000's
- Rest of Asia: -8,000's
- South America: -16,000's
- Rest of Asia: -24,000's
Worldwide Bus & Coach sales in 2015 - 2016

-27.8% 11.1% -7.1% 7.8% 12.5% -30.0% -25.0% -20.0% -15.0% -10.0% -5.0% 0.0% 5.0% 10.0% 15.0%
Europe North America South America Asia World
Mr. Cardona Gutiérrez
Minister for transport in Colombia
Mrs. Jana Zikmundova
Ambassador of Belgium to Colombia
Mr. Didier Ramoudt
President of Busworld International
Keynote:
“The Latin American Market for buses and coaches: facts and figures

Mr. Hernan Cavarra, Industry Analyst, Frost & Sullivan
Brief Insights on the Latin American Bus Market

Despite Headwinds Transformative Trends Expected to Propel LATAM Bus Market to Over 48,000 Units
"A Developed Country is not a place where poor have cars. It's where the rich use Public Transportation"

Enrique Peñalosa, Mayor of Bogota, Colombia
Many times we ask what is happening around us... The Red Queen Effect
Top Transformational Shifts that will shape the Future of Mobility

- Multi-modality: Transit Buses, Urban Rail, and Taxis
- Mobility Integration: Smartphone-enabled Seamless Commuting
- Dedicated Road Lanes: Preference for Shared Mobility Models
- Chinese OEMs Expansion: Growing Market Penetration
- Leveraging Big Data: Fleet-readiness and Meeting Peak Hour Demand
- Electric Mobility: Transit Buses will Pioneer the Zero-emission Drive
- Battery & Charging Tech: OEMs are Entering New Markets and Partnerships
- Megatrends Influencing the Bus Market: Organization, Connectivity, New Business Models, New Fuels of the Future

Source: Frost & Sullivan
Impact of Top Mega Trends on the Bus Market

**Mega Trend**

**Urbanization**

- Development of BRT systems expected to lead to foster Heavy duty over 12m length city transit buses, leading to further polarization of bus classes.
- There will be an increment in demand for natural-gas and hybrid-electric buses by 2023.
- Urban population density growth will influence new bus designs and usher the proliferation of HD transit city buses.

**Connectivity—Mobile Resource Management**

- Telematics will experience rapid proliferation, thereby elevating passenger transport efficiencies and resulting in reduced commuting time and operating costs.
- Applications, such as prognostics, will deliver meaningful total cost of ownership (TCO)-related value, Wi-Fi connection, smartphones apps, track-and-trace systems, fuel cost reduction, and security enhancement-focused applications to deliver value in emerging LATAM markets.

Source: Frost & Sullivan
Impact of Top Mega Trends on the Bus Market


- North America
- Latin America
- China/India

- Existing BRT with expansion plans
- New BRT systems in planning phase

Source: Frost & Sullivan
Key Influencing Trends

Policy Drivers
- LATAM will need at least 2-3 years to recover from the economic crisis.
- Mexico, Chile, and Peru will be the major growth drivers for buses until 2018.
- By 2020, 50,000 old buses are likely to be replaced by new energy buses across LATAM’s major cities.

Green Tech Incentives
- Road tax exemption is in place in only a few countries for plug-in and electric buses. Colombia has earmarked $40 million for 2013 to 2017.
- EV buses are being tested in Sao Paulo, and Mexico City and Argentina have called for an open tender to acquire 400 EV buses for its national BRT corridors.

BRT Status

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cities</td>
<td>67</td>
<td>108</td>
</tr>
<tr>
<td>Number of corridors</td>
<td>209</td>
<td>335</td>
</tr>
<tr>
<td>Length</td>
<td>1,813 km</td>
<td>3,050 km</td>
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Intelligent Mobility Drive
- Being a BRT hub, LATAM will drive innovation and the mass adoption of IT services in transit buses and other mass transit modes.
- Investments will be made in ICT solutions and upgrades to 4G/5G networks to reduce carbon footprint and augment wireless CCTV access.
Impact of Top Mega Trends on the Bus Market

New Fuels of the Future

- Natural gas to gain marginal penetration rate among various powertrain fuels in heavy duty buses, mainly in Mexican and Peruvian bus markets and possibly Colombia as well although with low crude oil prices, NG powertrain is not such an interesting option and H&E gain future penetration.

- Hybrid and electric powertrain technologies to achieve highest CAGR growth until 2022, and at an accelerated pace thereafter thanks to BRT systems development.

- Diesel to continue as the most common fuel, representing 86.1% to 91% of all powertrain fuels in new Bus and Coaches in 2022.
Unit Shipment Forecast by Powertrain and Country

Total Bus Market: Unit Shipment Forecast by Powertrain, LATAM, 2016 – 2022

Optimistic Scenario

5.9% CAGR

~34,310

0.5%

4.5%

8.0%

Diesel

NG

Gasoline

Hybrid

Electric

2022 Regional Sales

~ 48,446

All figures are rounded. Source: Frost & Sullivan analysis
Unit Shipment Forecast by Powertrain - LATAM

Total Bus Market: Percent Unit Shipment Forecast by Powertrain, 2016-2022

- **Diesel**: 97.6% (CAGR 5.9%)
- **NG**: 1.2%
- **Gasoline**: 0.5%
- **Hybrid**: 4.8%
- **Electric**: 0.01%

All figures are rounded. Source: Frost & Sullivan analysis.
Unit Shipment Forecast by Powertrain and Country

Total Bus Market: Unit Shipment Forecast by Powertrain, LATAM, 2016 – 2022

Pessimistic Scenario

~34,310

H&EV 0.22%
1.0%
1.2%

Diesel, 97.6%

2016

2022

5.9% CAGR

2.0%
4.6%
2.0%
1.8%

~ 48,446

All figures are rounded. Source: Frost & Sullivan analysis

2022 Regional Sales

Diesel, 91.2%

Diesel, NG, Gasoline, Hybrid, Electric

Arg
Bra
Mex
Chi
Peru
Colombia
Public transit systems rank as being the most efficient in terms of GHG emission per passenger-km. Transit buses adopting green powertrain technologies is a significant step toward a sustainable public transit system.
## Powertrain Outlook

**Total Bus Market: Powertrain Standard Overview, LATAM, 2016–2022**

<table>
<thead>
<tr>
<th>Region</th>
<th>Powertrain</th>
<th>Diesel/Biodiesel</th>
<th>NG</th>
<th>Gasoline</th>
<th>Hybrid</th>
<th>Electric</th>
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</tr>
</tbody>
</table>

- Market in 2015
- ✓ High demand in 2022
- ✓ Moderate demand in 2022
- ✓ Low demand in 2022

H&E = Hybrid and Electric
Snapshot of LATAM Bus Market in 2022

Total Bus Market: Unit Shipment Forecast, LATAM, 2022

- **Total LATAM Bus Market**:
  - ~34.3 (000) in 2016 [5.9%]
  - ~48.5 (000) in 2022

- **Chile**:
  - ~3,300 [5.0%]

- **Peru**:
  - ~3,676 [1.6%]

- **Brazil**:
  - ~19,070 [9.2%]

- **Mexico**:
  - ~11,000 [2.3%]

- **Argentina**:
  - ~5,000 [7.0%]

- **Colombia**:
  - ~6,400 [6.5%]

**Electric and Hybrids powertrains Sub-segment**

- ~55 Unit in 2016 [0.1%]
- ~115%
- ~5.4 (000) in 2022 [9.3%]

% denotes the 2022 forecast of regional share in the LATAM bus market.

All figures are rounded. Source: Frost & Sullivan analysis.
Partial Matrix of OEMs and Powertrain

**Total Bus Market: OEM Powertrain Standard Overview, LATAM, 2015-2022**

- Most of the major OEMs operating in LATAM sell hybrid and plug-in hybrid buses in their respective domestic markets.
- Product launches and mass adoption will happen post 2020 as limited funding and incentives are likely in the short term due to the economic crunch.

### Manufacturer Logos

- **Current**: 2016-2017
  - *AGRALE*, *GM*, *ISUZU*, *IVECO*, *SCANIA*
  - *BYD*

- **2016-2019**: 2016-2017
  - *AGRALE*, *YUTONG*, *KING LONG*, *HIGER*, *SUNVisitor*, *IVECO*, *MAN*, *KING LONG*

### Powertrain Types
- **Diesel**
- **NG/Biodiesel**
- **Hybrid**
- **Plug-in**
- **Fully Electric**

All figures are rounded. Source: Frost & Sullivan analysis.
Impact of Top Mega Trends on the Bus Market

**New Business Models**

- Platform-based production is a key phenomenon associated with globalization. It provides cost optimization benefits during product development and enables the fulfilment of dynamic end-user preferences.

- OEMs and suppliers to explore opportunities with dedicated “value” bus models to penetrate and expand in emerging markets.

- Greater European OEM focus on creating value bus brands for the mid-segment market while Chinese OEMs will focus on low cost offering and new fuels and powertrains options.

- Soft technologies (e.g., telematics, safety, data analytics) will emerge as major growth strategy model ingredients for OEMs and suppliers.

Source: Frost & Sullivan
SWOT Analysis

**Strengths**
- Expanding BRT Systems fueled by national governments
- New emission regulations being adopted to adapt to developed markets technologies
- Underdeveloped HD market niches in Chile and Peru
- Expanding mega cities needing well developed transport systems
- Low-cost Chinese OEMs focusing on LATAM market and establishing production sites
- New taxation reforms to fuel hybrid and EV bus introduction.

**Opportunities**
- Economic and political crisis characterized by low GDP and lack of governmental investments in public transport
- Lack of well-developed INFRASTRUCTURE In Chile, Peru, and Argentina for EV units introduction
- Energetic crisis in Argentina undermines EV market development
- Development of subway lines in main LATAM cities
- Political and economic crisis in Brazil will push the market down until 2019

**Weaknesses**
- Lack of developed urban and inter city trains and railways
- Expanding mega cities needing well developed transport systems
- Low-cost Chinese OEMs focusing on LATAM market and establishing production sites
- New taxation reforms to fuel hybrid and EV bus introduction.

**Threats**
- Economic and political crisis characterized by low GDP and lack of governmental investments in public transport
- Lack of well-developed INFRASTRUCTURE In Chile, Peru, and Argentina for EV units introduction
- Energetic crisis in Argentina undermines EV market development
- Development of subway lines in main LATAM cities
- Political and economic crisis in Brazil will push the market down until 2019
Frost & Sullivan predicts that Chinese OEMs will experience steep growth in the select LATAM bus market mainly fueled by low cost portfolio offering and Electric powertrain advanced development.
Daimler is expected to increase its portfolio offering with value bus options to compete with the Chinese low-cost offering strategy as well as less than 12 meters buses in Colombia.

While Volvo is expected to lead the electric bus drive, other European OEMs are expected to catch-up quickly with a slew of product launches and alternative powertrain options such as natural gas in Mexico and Peru.

The launch of electric and hybrid buses, the increasing export footprint, and domestic production sites investments in Brazil and Mexico are expected to bolster Chinese OEMs’ brand strength, being BYD the current flagship and Yutong the biggest.
Bus Attribute Focus of OEMs

Total Bus Market: Technology Outlook by Sub-segment, LATAM, 2016–2022

- Electrification and Hybridization
- Next Generation Powertrain Technology
- Safety Systems
- Comfort and Convenience Features
- Vehicle Connectivity
- Vehicle Customization
- Price Sensitivity

Trend in 2016
- Low Trend
- Moderate Trend
- Strong Trend

Trend in 2022
- Low Trend
- Moderate Trend
- Strong Trend

Source: Frost & Sullivan analysis
Case Studies: Colombia - BRT

Before

1:1 Market → Cooperatives → 1 man = 1 bus. Disorganized, no fixed routes, no fixed fares.

Now

Cities are consolidating organized public transport systems. Organized massive transport systems → BRT, «alimentadores», fixed routes and fares.

Challenges for BRT

• Error in passengers estimates
• No government subsidies
• Illegal transport (moto-taxismo)
• Private operators bankruptcy
• Robust regulation regarding safety, certifications, accessibility
• Problems with supply chain (tires, OEMs service and spare parts)
Possible Solutions?

- Strong government measures against illegal transport
- Regulate a well price structures scrapping program for used buses
- Create Government subsidies like in Chile, Argentina or Europe since the system is not self-sustainable with the ticket prices
- Regulate routes so as to avoid cannibalization between BRT and traditional buses lines and create harmonization between BRT and «alimentadores» (feeder buses).
- Invest in INFRASTRUCTURE in those cities where its still deficient or there are lack of covered routes (Ex. Bucaramanga)
Case Studies: Colombia Market

- In Colombia there are 2 types of markets:
  - Traditional (mainly feeders market, Buses of 12 mts and less) that maintains stable in 2,500 to 2,600 units per year (urban and inter-municipal) that has a natural renewal every year and is more stable. Operator can buy up to 10 units and there are growth perspectives.
  - BRT (Sistemas Integrados – Transmilenio, Transcaribe, MIO, etc): Articulated, Bi-articulated, HD buses mainly. They are undergoing a crisis, with private operators in bankruptcy or owing large amounts of money to banks, financial institutions and supply chain. They are in need of fleets renewal and instead of growth, renewal of units is more probable BUT Changes are needed. Cycles of renewal are of 5 years in average and is more volume sale for OEMs.

- Market is often impacted by GDP variations and regulations (such as safety) that determine units sales. Small cities are good market niches for Traditional market while BRT is only possible in big cities with big avenues and infrastructure due to turning radius, bus volumes, etc.
Case Studies: Colombia Market

- Regarding powertrains and fuels future market → Diesel will remain dominant in Colombia although is a regional benchmark in Hybrids and EV buses.
- Colombia demands Euro IV fuels at a national level although Transmilenio demands Euro V and Medellín is moving towards that goal due to emission issues.
- NG was an option 2 years ago and even GM launched a unit with this powertrain but due to NG rising costs and crude oil low prices, its not so attractive. Also NG can only be utilized on fixed routes (due to lower autonomy) and demands big infrastructure investments for recharging. So...Its NG an actionable option?
- Hybrids and EV are also being studied for the BRT systems replacement but again infrastructure for recharging stations and also higher units prices and service are big challenges.
- Long Distance Bus Market is an interesting market niche with good potential due to peace negotiationn with FARC that permits safer journeys → Low Cost flights competition is only a challenge for less than 500 kms distances. → Important: Entertainment systems and comfort.
LATAM

- Stable urban MD (less than 12mts) market (2,800 – 3,000 per year) with natural renewal cycle every 5 to 6 years to maintain low TCO.
- Long distance market in crisis since they lost subsidies to diesel and disabled passengers.
- 2013 and 2014 peak sales are almost impossible to obtain again. It was due to excess of liquidity (FINAME) → Soft credits, low taxes and long payment terms → More parc than demand.
- It needs to solve first its political and economic crisis. → Market will grow by 2018-2019 thanks to fleet renewal needs mainly.
- Between 2019 and 2022 growth will be experienced in Mexican market pushed by units renewal and introduction of NG, Hybrids and Electrical powertrains for BRT lines mainly in main Mexican cities (DF, Monterrey, Guadalajara, etc).
- Worst scenario → Only 1 BRT line in Lima*, but there is a big challenge in terms of informality, lack of regulation in routes and tickets prices.
- Between 2018 and 2019 EURO IV emission standards are going to be implemented in Peru and fleet renewal will push sales.
- Possible EV buses implementation.
The **Bus Market** will experience will account for about 48,500 units by 2022 reaching a 5.9% CAGR growth for the 2016-2023 period. Although BRT systems development across the region will be pushing the market, the MD segment will be of great importance and account for most volume sales due to regional countries cities geographies and topography.

Although **Brazil and Mexico will be leading the market** in terms of units sales, **Colombia, Argentina and Chile will experience the highest growth in the overall market**, growth by 2022. Peru will be LATAM’s second-largest MD market while Chile will be LATAM’s third-largest inter-city market and Argentina the third largest in the transit segment by 2022.

While **European OEMs will continue to dominate the market** with **Mercedes-Benz dominating the overall bus market** in each of the studied countries, **Chinese OEMs could increase their market penetration** (mainly **BYD** and Yutong), pushed by the **development of H&E (BEV and PHEV) transit buses for the growing BRT systems in the region and the establishment of overseas production units, either through subsidiaries or acquisitions. Volvo & GM also could grow thanks to its electric and NG powertrain bus development but AGAIN **INFRASTRUCTURE is the key word**.
The Red Queen effect
That is that for today, thank you for your attention

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Email: hernan.cavarra@frost.com
Programme

11:30 – 12:30 Reception

14:30 – 17:00 Manufacturers Debate: Future trends

Zhengzhou Yuton Bus, Volvo Bus, Yellow Window, Voith Turbo