

Zero Emission Bus Rapid- deployment Accelerator (ZEBRA) Partnership in Mexico City

Leticia Pineda and Oscar Delgado

*Transition to Soot-free Heavy-duty Vehicles and Fuels: Technical
Workshop on Electrification of the Heavy-Duty Vehicles*

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THE ZEBRA PARTNERSHIP

ZEBRA Vision



Shift all new bus procurements in leading Latin American cities to zero-emission technologies



Funder & Facilitator



Lead Partners



ZERO EMISSION BUS RAPID-DEPLOYMENT ACCELERATOR (ZEBRA)

PARTNERSHIP STRUCTURE

Overview of Engaged Partners



ZEBRA Summary of Approach

3,600 e-buses in core and catalytic cities, worth 1.6 bi USD of investment



- Guarantee **political commitment** and develop **fleet-wide deployment strategies** in leading Latin American cities (Medellín, Mexico City, Santiago, São Paulo).
- Support the **establishment of a procurement pipeline of over 3,600 e-buses** in the region.

- Increase **market competition** and **product availability**.
- Establish **ZEBRA industry guidelines**.
- Monitor **real world performance** data.
- Engage **utility sector** to ensure charging infrastructure delivery.

- Secure **public commitments from leading investors** to send clear market signal.
- Establish context-specific **financial mechanisms** for zero emission bus assets worth over \$1.6 bi USD.
- Design streamlined process for **mobilisation of project preparation funding**.

- Host **annual showcase event**.
- Facilitate **knowledge transfer across cities**.
- Showcase **e-bus deployments** in the region.
- Deliver **training on best practices** to utilities and financiers.

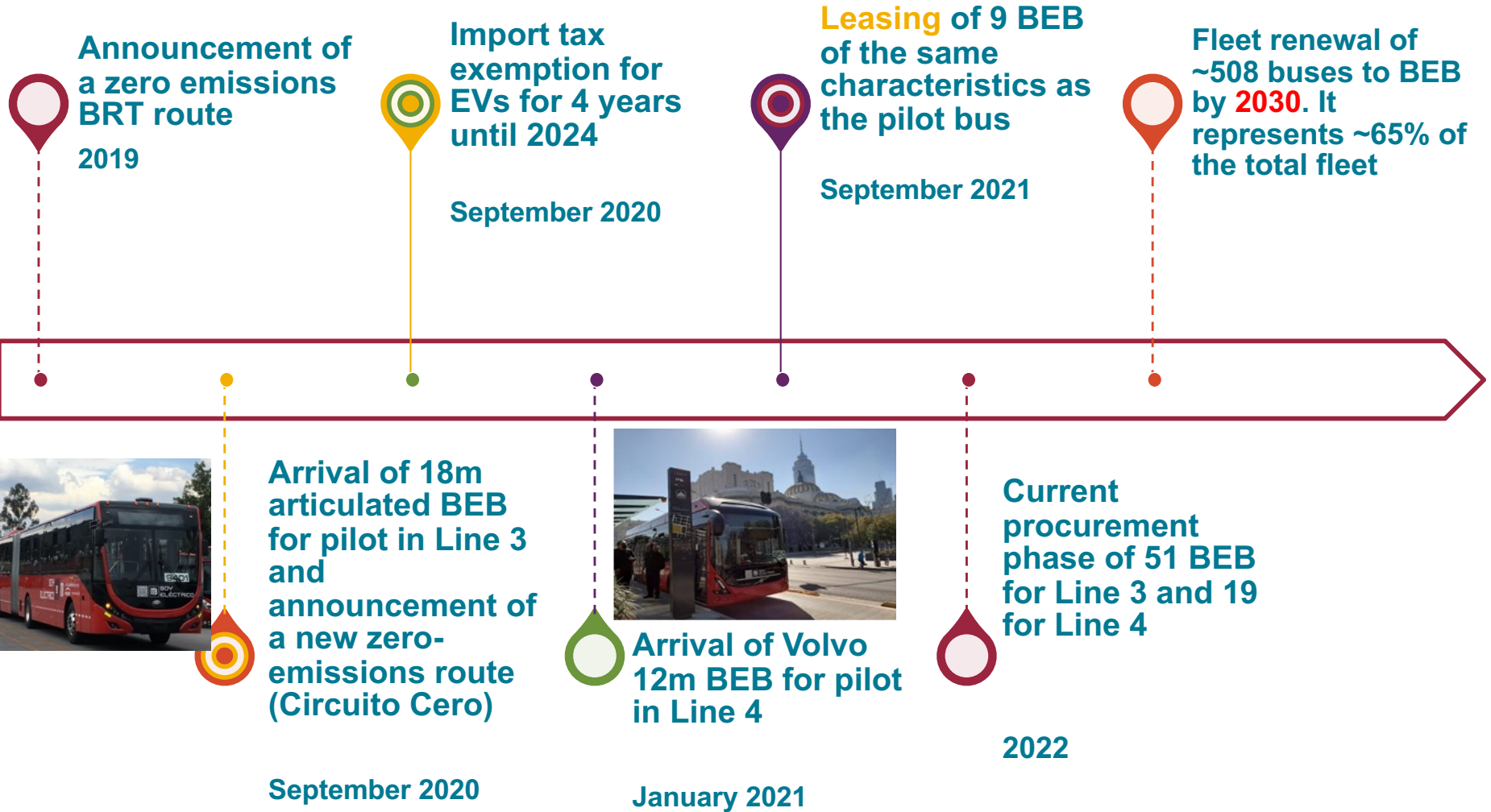


Mexico City commitments and policy landscape

- Mexico City carbon neutrality by 2050
- Mexico City signed C40's "Clean and Healthy Streets Declaration"
 - All new buses to be zero emissions by 2025
 - Zero emission zone by 2030
- Mexico City Climate Change Strategy and Program 2021-2050
 - Ambitious targets rely on electrification of transport
 - The commitment of one fully electric BRT line by 2024 (currently 2 lines are being electrified)
- National tax import exemption for electric vehicles (~20% cost) until 2024

Metrobús BEB timeline

New business model



Methodology

Route level analysis



- GPS data
- Operations and scheduling of routes analysis
- Drive cycle development
 - Regular operation, weight, passengers, traffic, grade, day, events

Total cost of ownership



- Simulation of different vehicle technologies
- Energy consumption analysis
- Route level TCO
 - Vehicle and infrastructure
 - Operations
 - Maintenance
 - Other

Fleet emissions modeling



- Fleet renovation and procurement plan
- Fleet emissions by vehicle technology:
 - Local pollutants
 - GHG

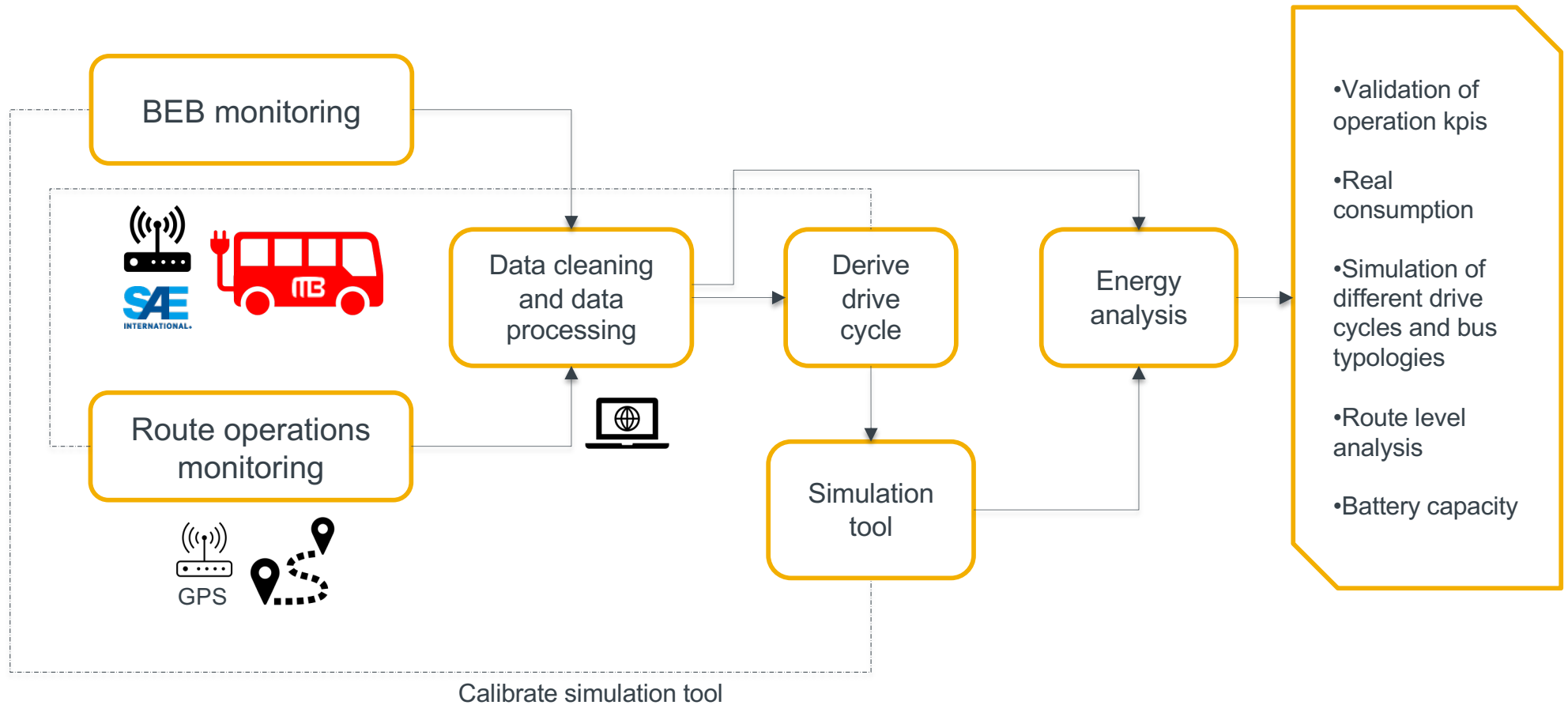
Fleetwide deployment strategy

Medellín

Mexico City

Sao Paulo

Real-world performance and simulation



Metrobús fleet

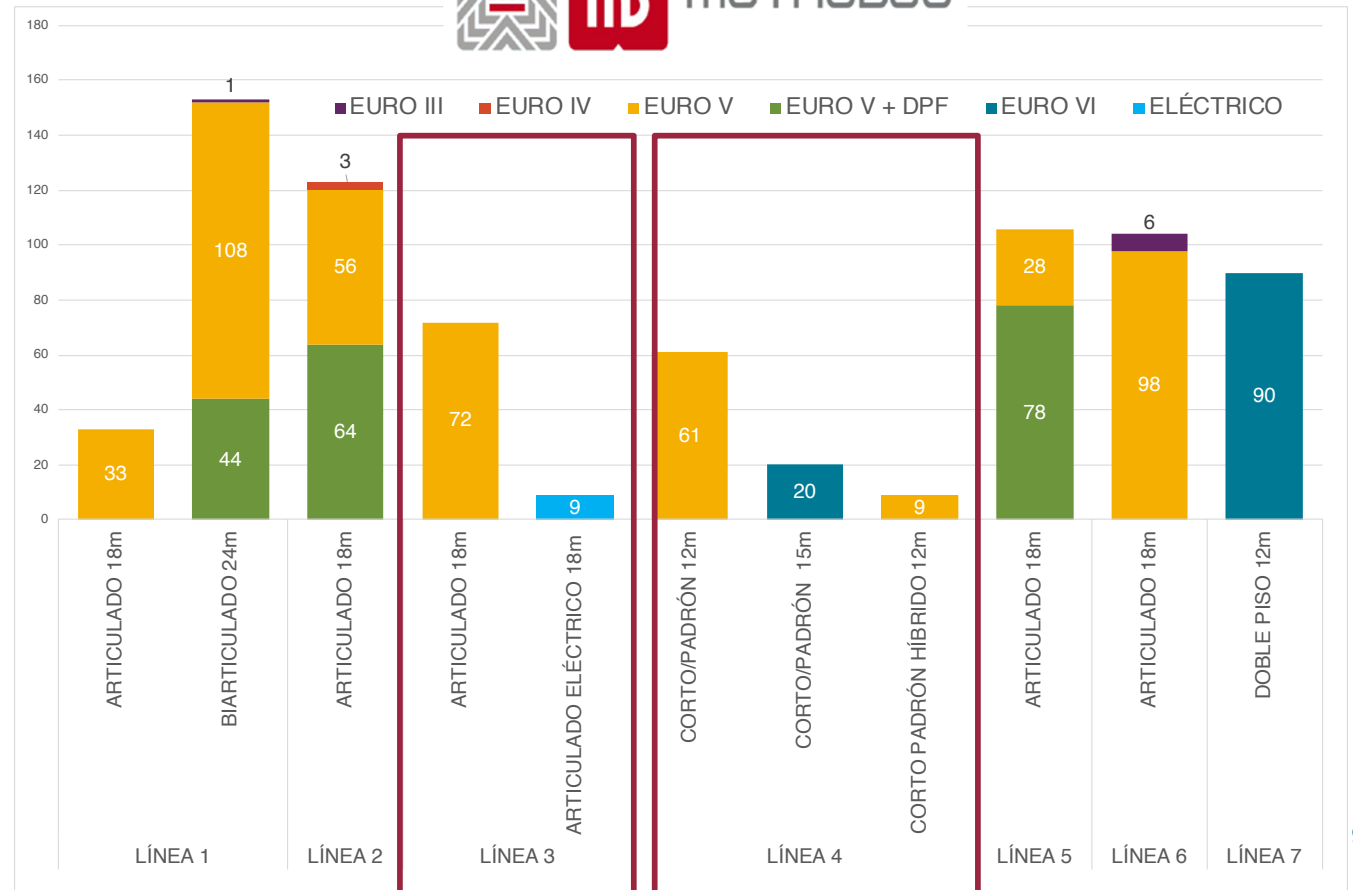


Metrobús is a government-owned fleet and the only BRT system in Mexico City.

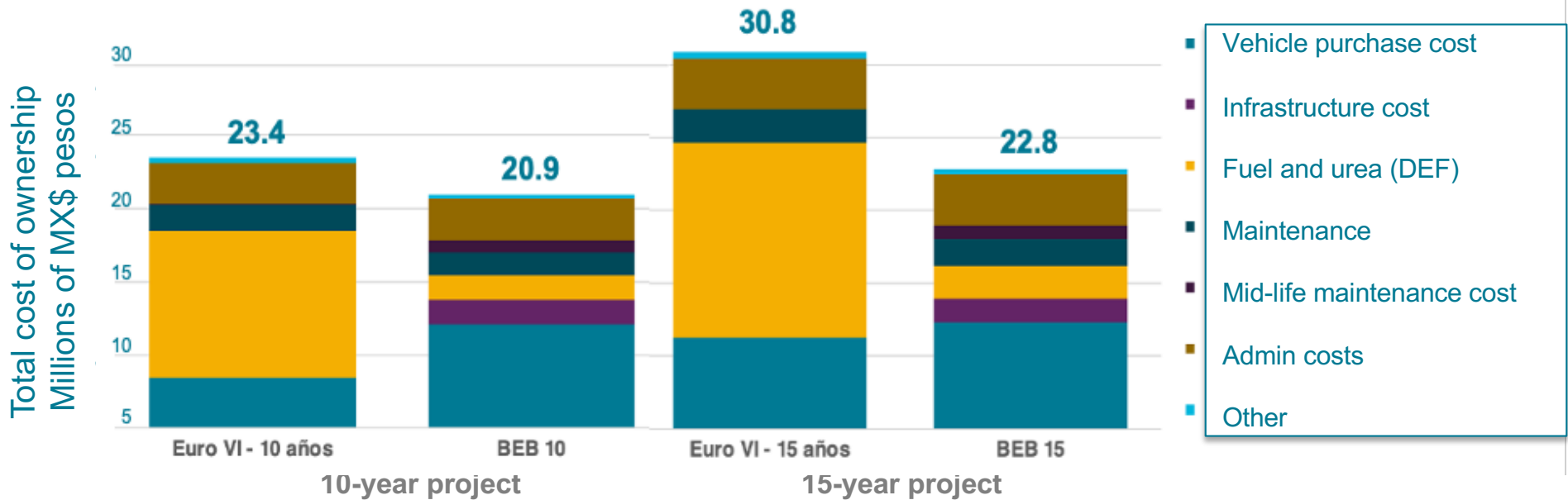
Currently has 7 lines with ~780 buses of different typologies.

Plans to renew 80% of buses in lines 3 and 4 in 2022-2023.

1.4 million pax/day
 ~170+ km
 ~780+ buses



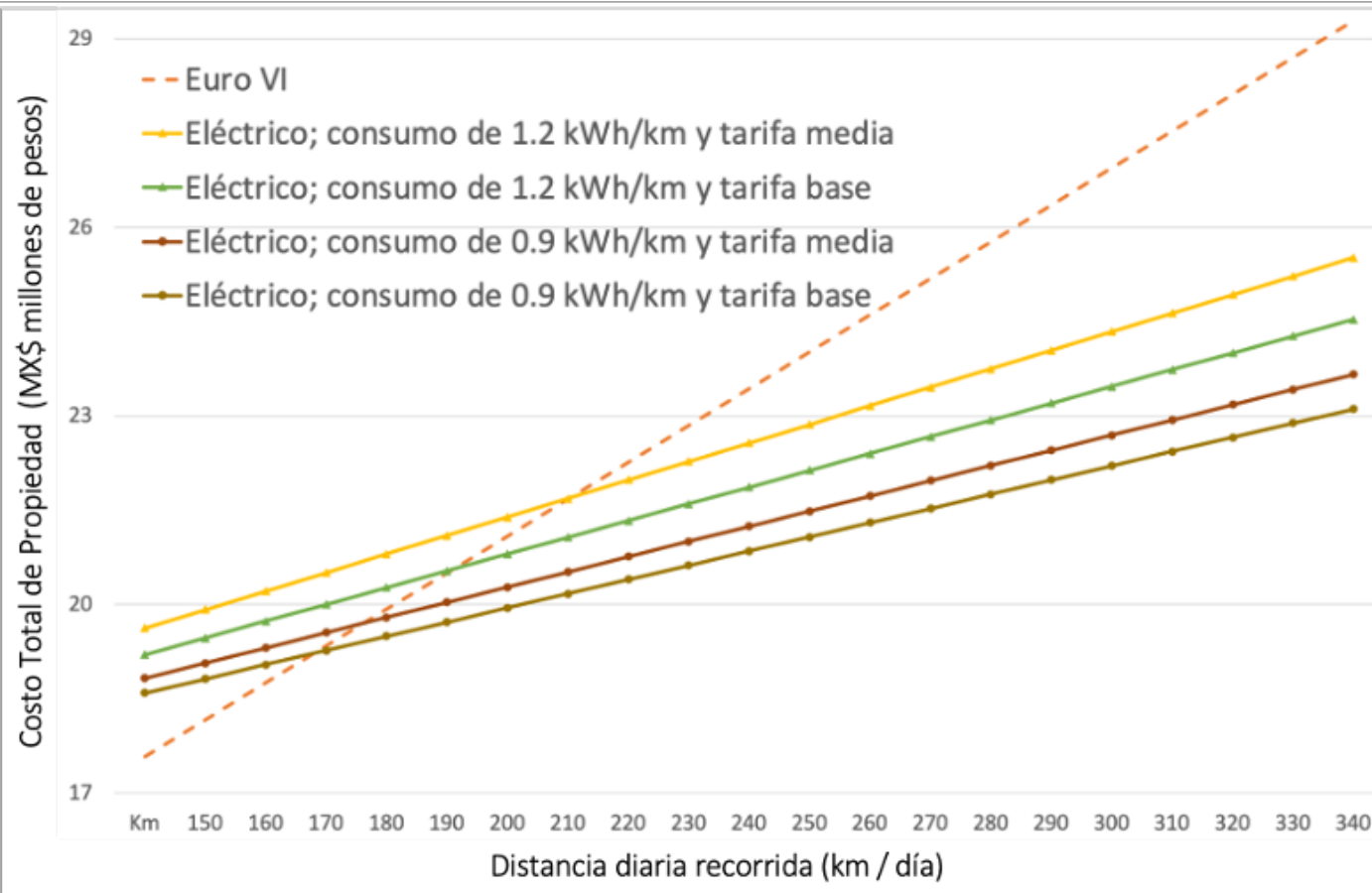
TCO for Line 3



0.9 kWh/km, day-use electricity cost,
250 km

TCO L3 (mill mxn); 10 year contract project

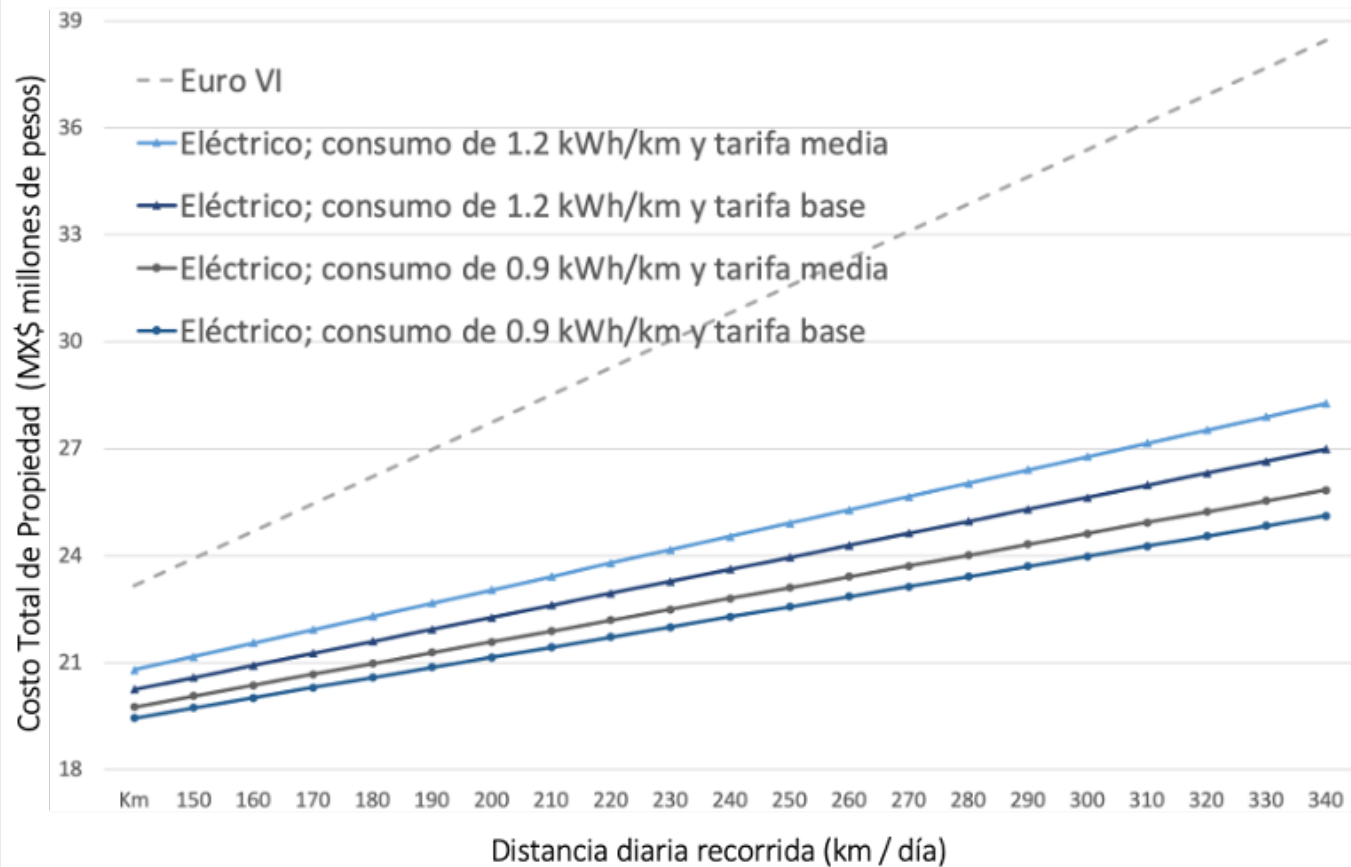
Sensitivity analysis



Infrastructure cost
MX\$1.6 mill

TCO L3 (mill mxn); 15-year contract

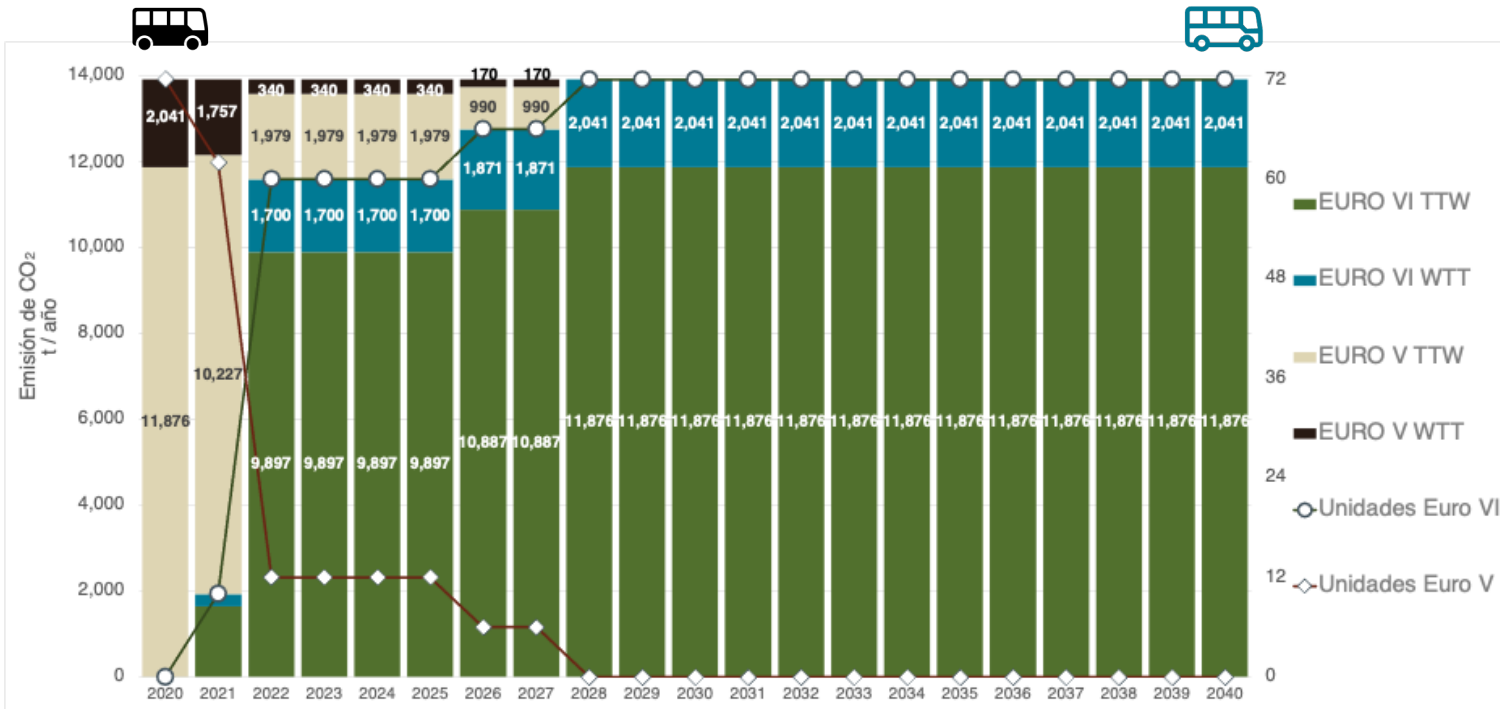
Sensitivity analysis



Infrastructure cost
MX\$1.6 mill

GHG reductions BEB vs Euro V/VI

L3



Conservative assumption of same fuel consumption of Euro V and Euro VI

WTT: Well to Tank
TTW: Tank to Wheel
WTW: Well to Wheel

Key Findings

- 1:1 replacement ratio is possible
- Larger project time better TCO:
 - Timeframe of contracts/projects aligned with the expected lifetime of assets
 - Line 3: -11% in 10-year contract vs. -26% in 15-year (diesel vs. electric)
 - Line 4: -21% in 10-year contract vs. -32% in 15-year (diesel vs. electric)
- Sensitivity analysis to account for uncertainty of infrastructure and electricity costs, energy consumption (kWh/km) and 2 timeframes.
 - In all cases, TCO for BEB was lower, even more when daily km travelled increases the operation requirement of 250 km.
- GHG Emissions:
 - Line 3: -88% CO₂
 - Line 4: -84% CO₂

Thank you!
Questions?
I.pineda@theicct.org

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THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

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