NOVA BUS
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inspiring sustainable change
VANCOUVER 2016
CUTA

Projet Cité Mobilité Montreal
Montreal City Mobility Project

Ebus adoption and impact on operations

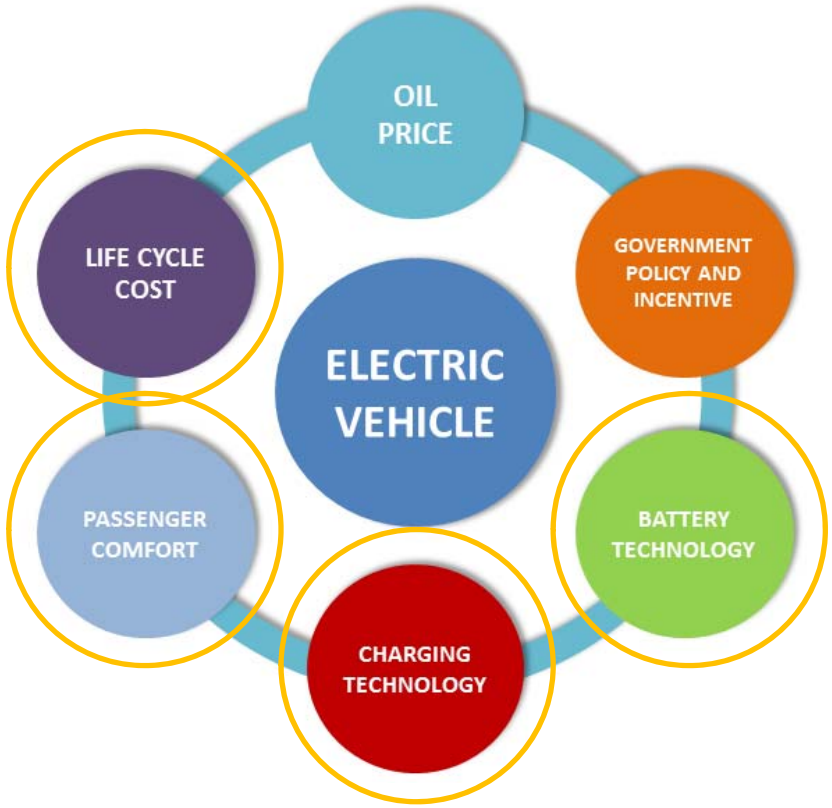
Nov 6th 2016
Frederic Delrieu, Electromobility Product Leader
frederic.delrieu@volvo.com

Montreal City Mobility

- Ebus Demonstration project in Montreal
- Start of service Q2 2017
- Partners:
  - STM (Montreal Transit)
  - Nova Bus
  - Quebec Government,
  - Montreal City,
  - Hydro-Québec

Purpose

Assess the **performance** and the **viability** of the electric solution with **opportunity charging** according to **transit needs**

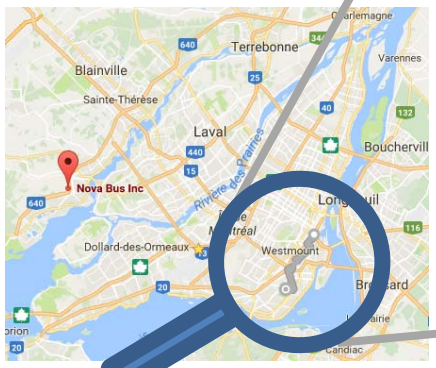


Key enablers for massive bus fleet electrification

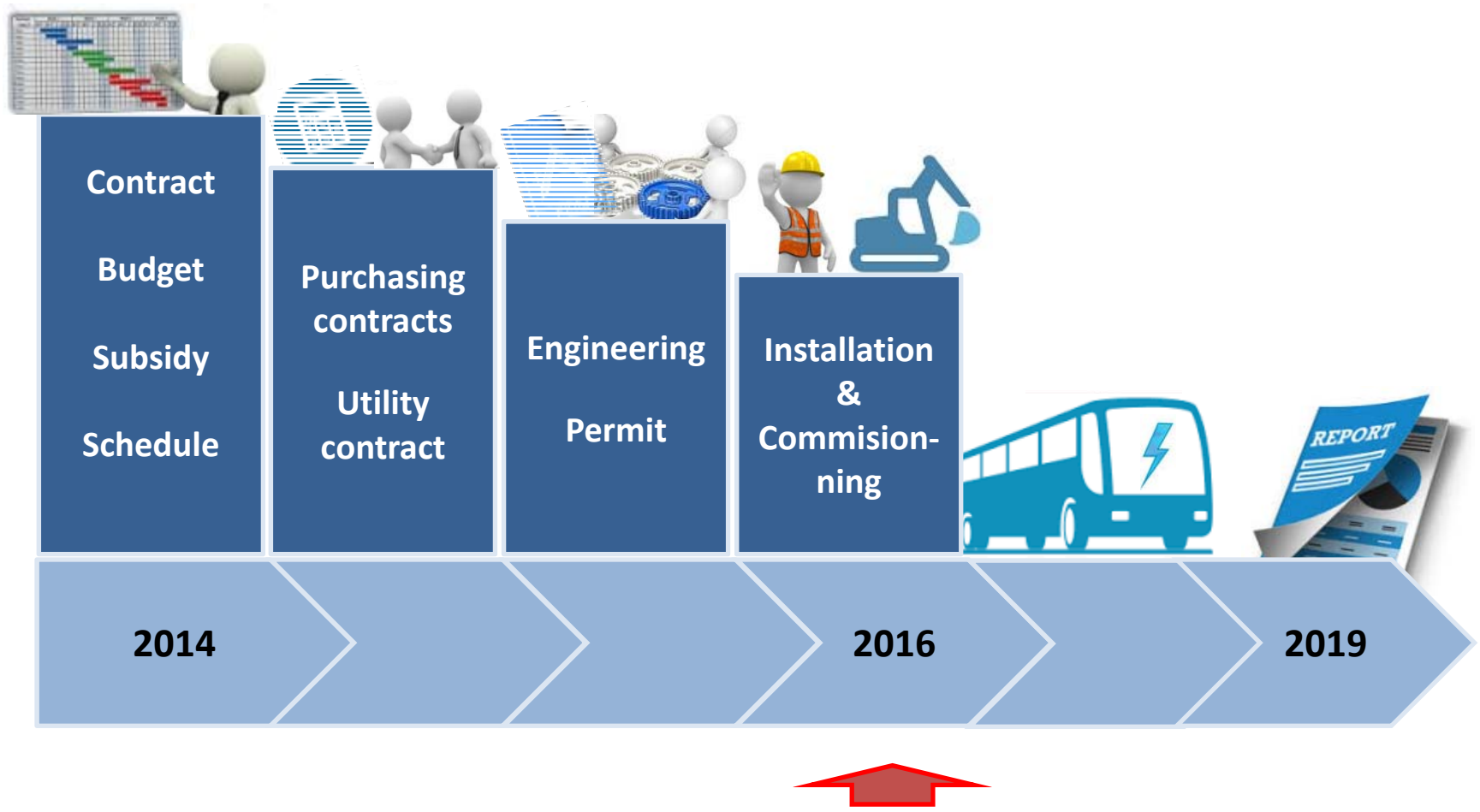
STM Route 36

- **3** LFSe buses
- **2** High power charging stations

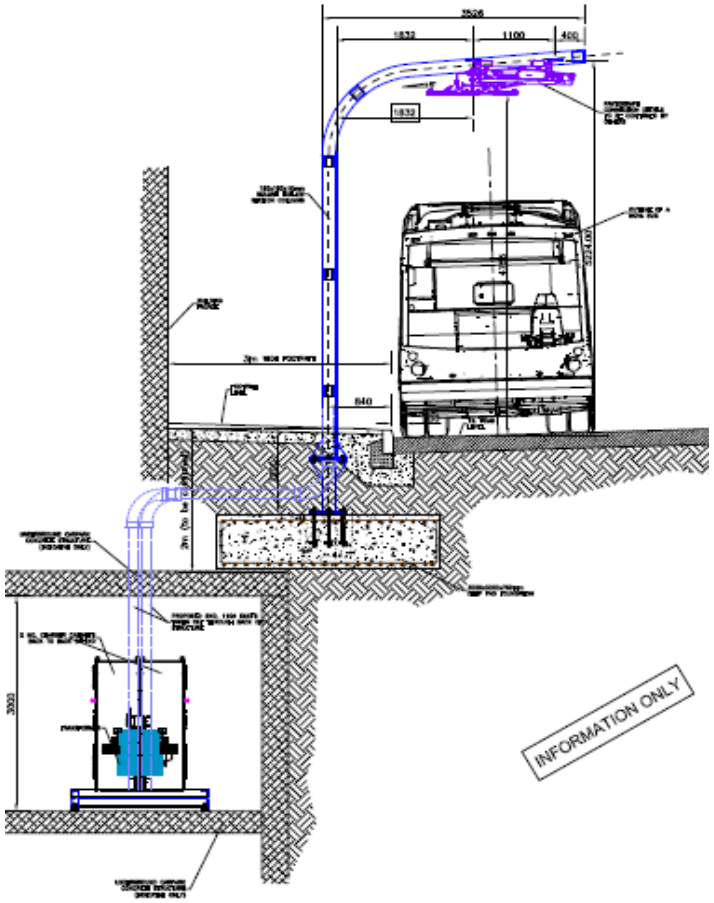
- **10.6** km one-way
- **47** min one way
- 1 bus every **30** min
- **10** to **15** min stop at each end
- **19** hours per day (5am to 12am)
- **38** trips per day on 6 buses
- **45k km/bus/yr**



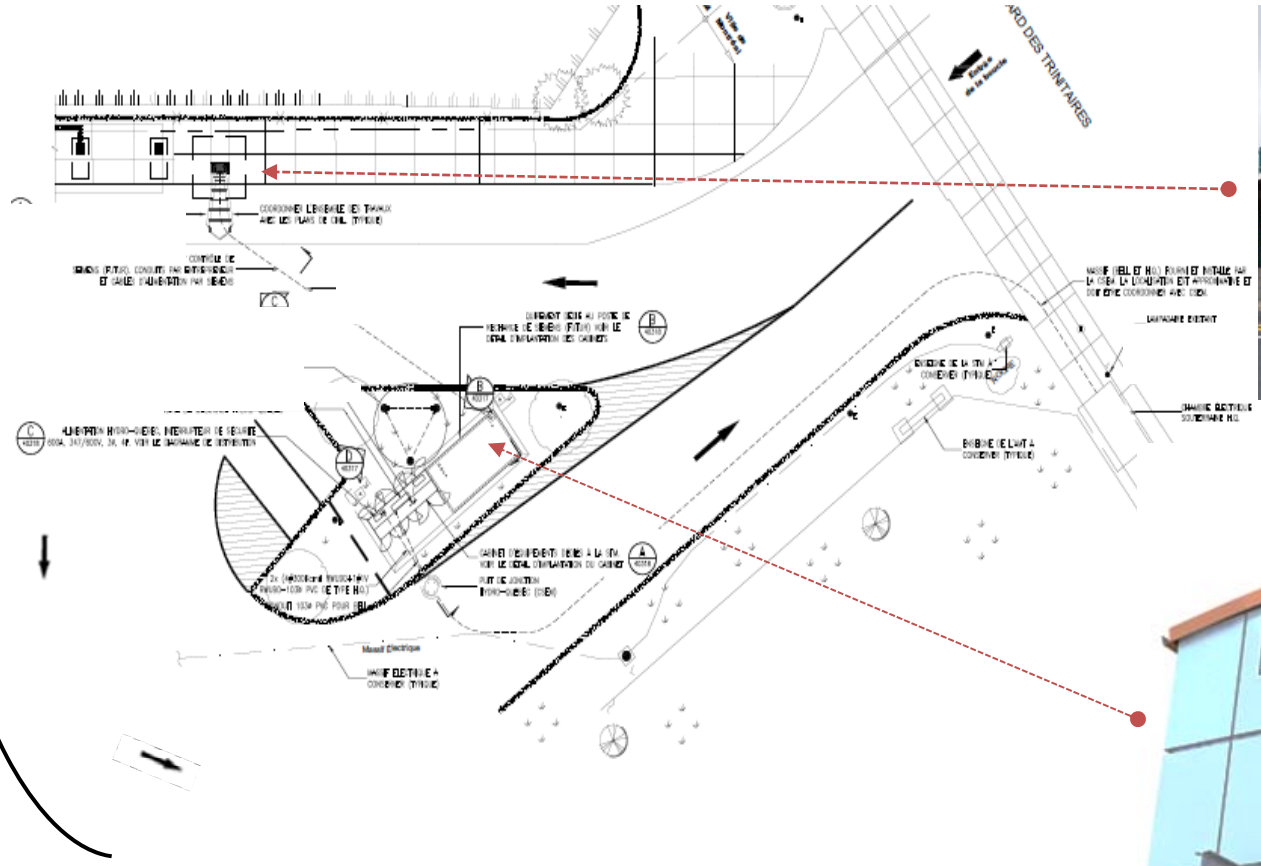
Project timeline



Charging Station installation at Square Victoria



Charging Station installation at Place Angrignon



Charging Station at Place Angrignon (Montreal)

Installation in progress (Nov 2nd 2016)

1. Mast and Pantograph
2. Charging station shelter
3. HQ and STM equipment's shelter
4. Angrignon subway entrance
5. Angrignon Park

Impacts for the stakeholders (Nova Bus forecast)

Fleet Managers :

Compatibility with other buses and charging station suppliers. (Non proprietary system. Open standard.)

Operations :

Continuous operations. High uptime (low charging time)
Safe concept : People can board while charging.

Maintenance :

Lower cost. No transmission, no oil change, no aftertreatment

Drivers :

Better **driving comfort** : Low vibration. Smooth and powerful, progressive acceleration.
Easy docking / leaving, high tolerance on alignment (front positioning of the rails)

Passengers :

More peaceful, less noise, less vibration, no exhaust smell.

Utility :

Grid friendly : Distribution of the power along the day and all over the city. No MW grid connexion.
- Adapted electricity rates and demand charges?

City :

Infrastructure integration in the environment can be customized. High ground clearance.

Next step : Demontration Project STM Test Plan

- Fuel efficiency
- Range (dispersion)

- Winter proof (traction, charging)

- Noise
- Acceleration
- Gradeability

- Charging time
- On board consumption and charger efficiency

- Battery durability

- Regulatory (EMC, safety)

- Maintenance
- Impact on maintenance tooling
- Charging station maintenance
- Bus cleaning

- Payload
- Impact on interior space (accessibility)

- Passenger satisfaction on bus comfort
- Integration of the infrastructure in the environment

- Driver satisfaction
- Driving performance
- Charging operation (docking easiness)

Altoona in progress

Learnings : System design

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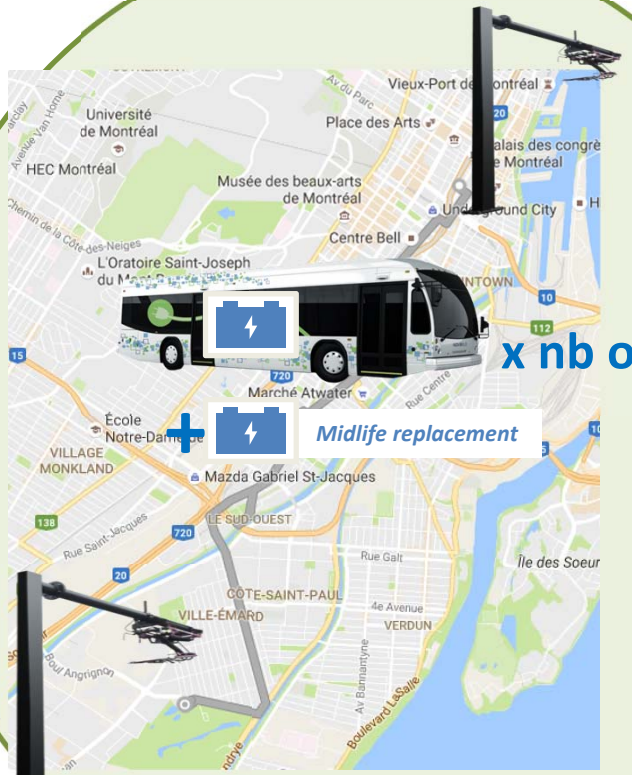
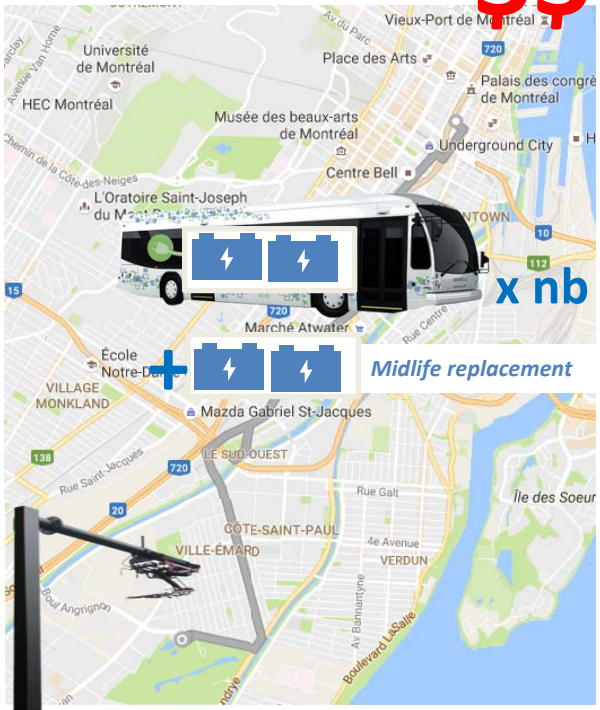


x nb of buses

Midlife replacement

$$(*)



x nb of buses

Midlife replacement

(*) Battery Cost estimation can be found in : California ARB Advanced Clean Transit. Battery Cost for Heavy-Duty Electric Vehicles. Revised Aug 2016.
https://www.arb.ca.gov/msprog/bus/battery_cost.pdf

Learnings : Winterproof solution

Tested last winter :

- Safe driving performance (Traction control, stability)
- Battery heated to get the right performance (and the durability)
- Rails and pantograph heated (no ice)
- Diesel heating for severe winter conditions.

⇒ **No interruption of service in heavy snow conditions**

Learnings : No overweight !

- A lightweight-oriented design
  - Pantograph on infrastructure side
  - Lower amount of battery

⇒ allows to carry the same number of passengers
  - Up to 71 passengers (interior space is the same as Diesel bus)

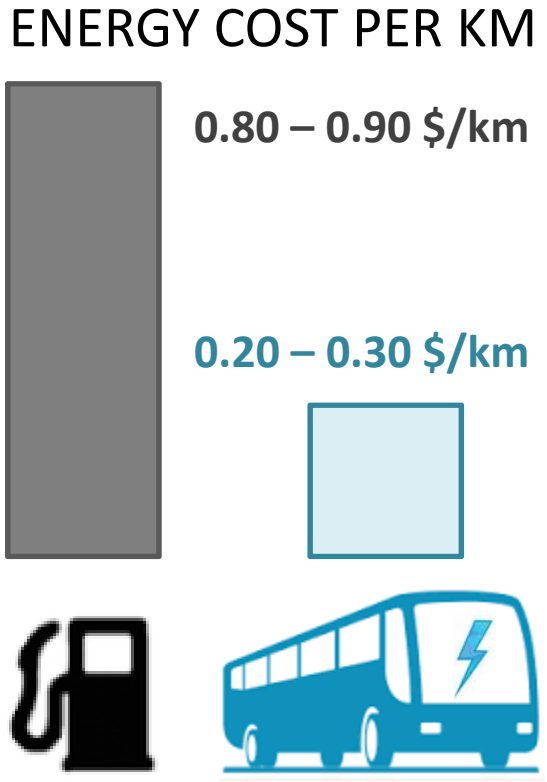
⇒ enables a better fuel efficiency

⇒ prevents road damages !

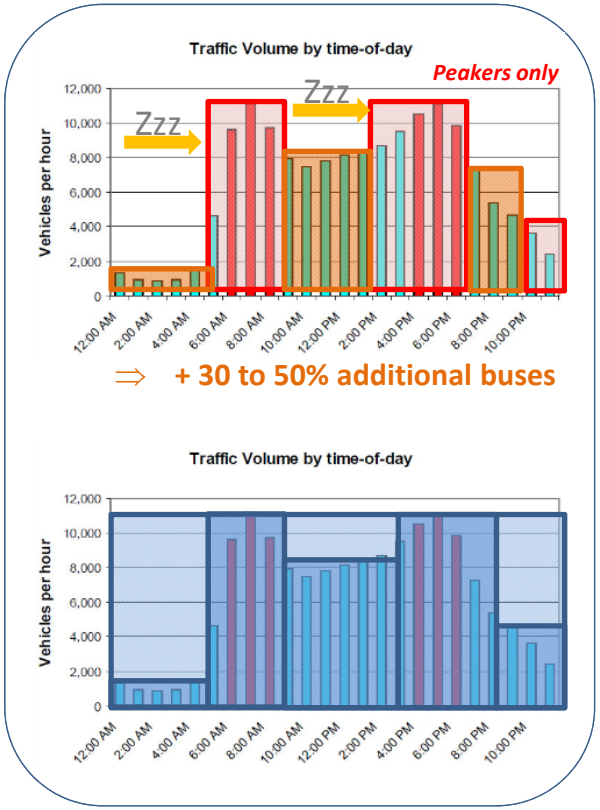
Learnings : Energy cost savings

Electric traction and High Power charger both have a high efficiency

⇒ **Energy cost divided by 3 to 4**



Learnings : Cost-Oriented solution



OPPcharge

High charging power ⇒ Less Batteries

No charging downtime

Less Weight

More passengers

Better fuel efficiency

No need of additional buses

Less spare batteries

Less electricity

LESS COST

CONCLUSION

- Nova Bus and STM reached an important milestone : The buses have been produced and the charging stations will be installed at the end of the month.

- We achieved a successful design phase to propose a solution that is **CUSTOMER-ORIENTED** , **PERFORMANT** and **COST-EFFICIENT.**

- We are starting the next phase (test and evaluation) with a high level of confidence.

THANK YOU !

any question ?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