#12 - VRTC Electrification Update

March 11, 2025

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Purpose

- This report provides an update on the electrification project in the Victoria Regional Transit system and is presented to the Victoria Regional Transit Commission **FOR INFORMATION**.

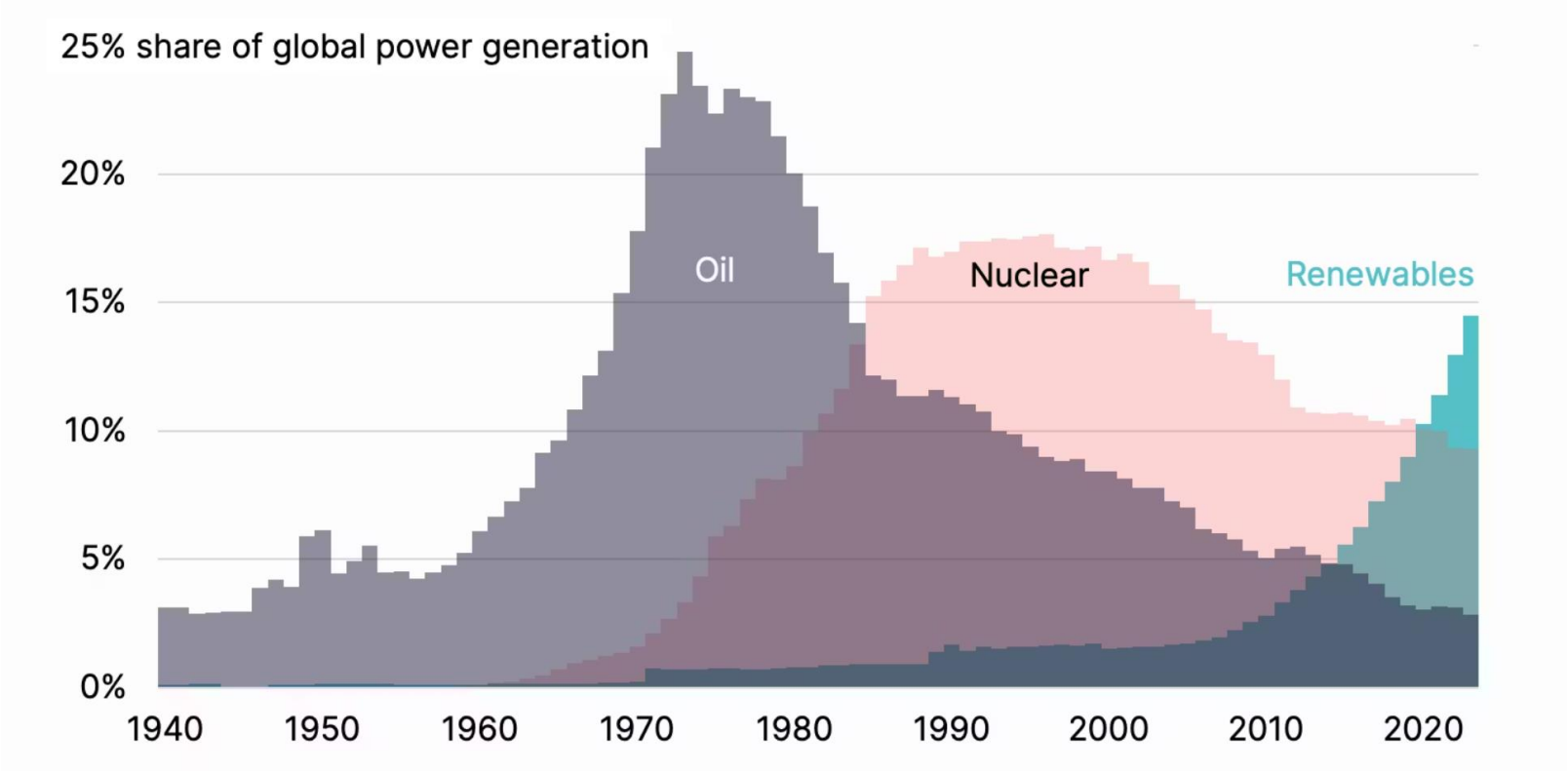
Outline

- Industry Trends
- BC Transit Phase 1 Electrification Update

Industry Trends

The Next Energy Transition

- The next energy transition, in a long history of energy transitions

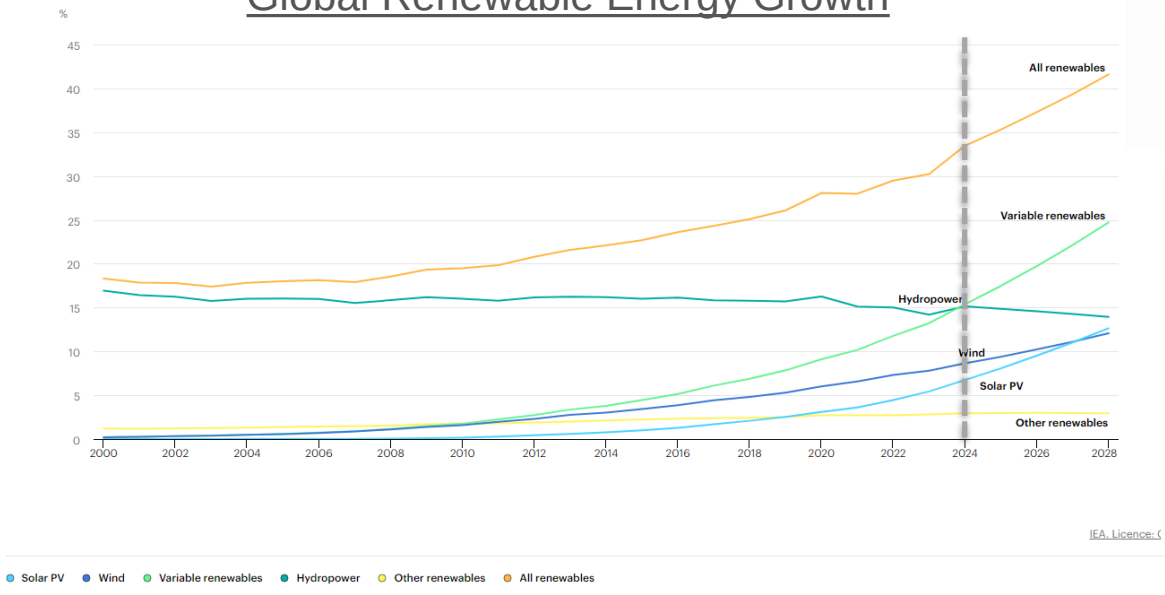


Nat Bullard Consulting (Graphs)
Ember, Pinto et al 2023 (Data)

A Broad Renewable Energy Transition is Underway

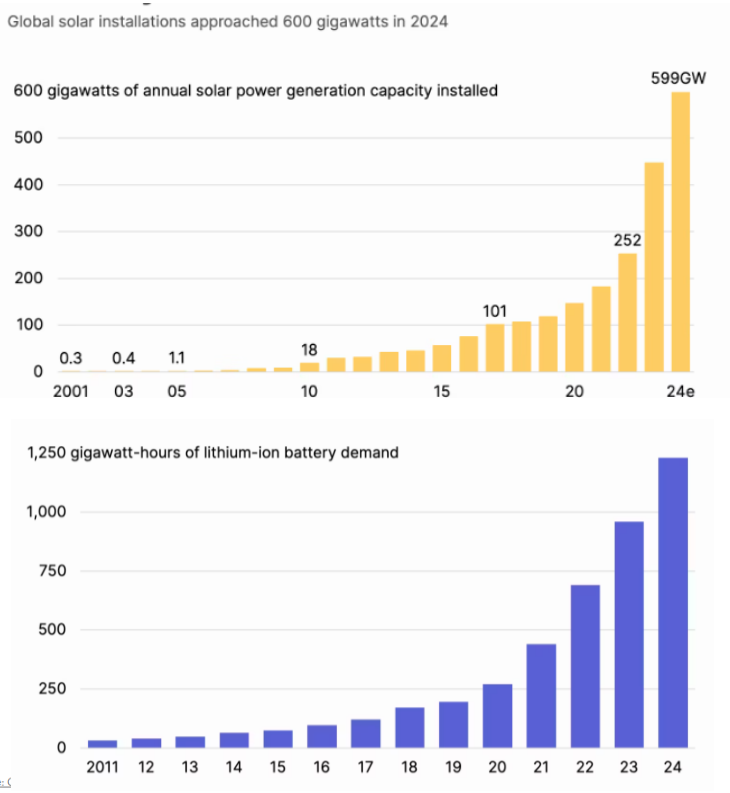
- Renewables made up 85% of new electricity added in 2023, globally (IEA)
- Renewables expected to be 50% to 65% of all electricity by 2030, globally (IEA, UN)

Global Renewable Energy Growth



International Energy Agency

Solar and Batteries

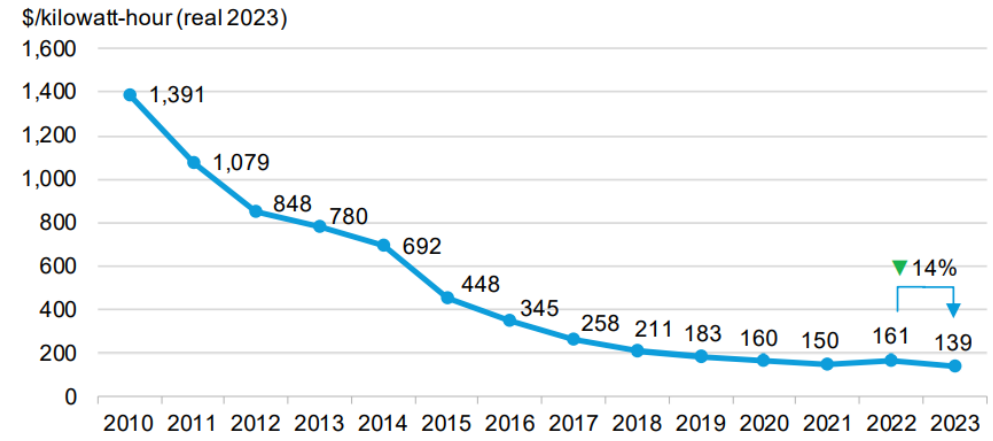


Nat Bullard Consulting (Graphs)

Battery Costs Continue to Fall

- Battery pack costs fell 14% in 2023

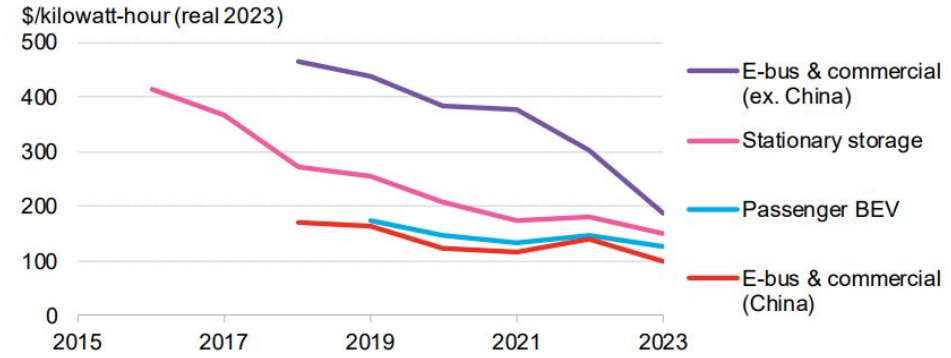
Figure 50: Volume-weighted average lithium-ion pack price



Source: BloombergNEF

- E-bus battery pack costs aligning with other sectors

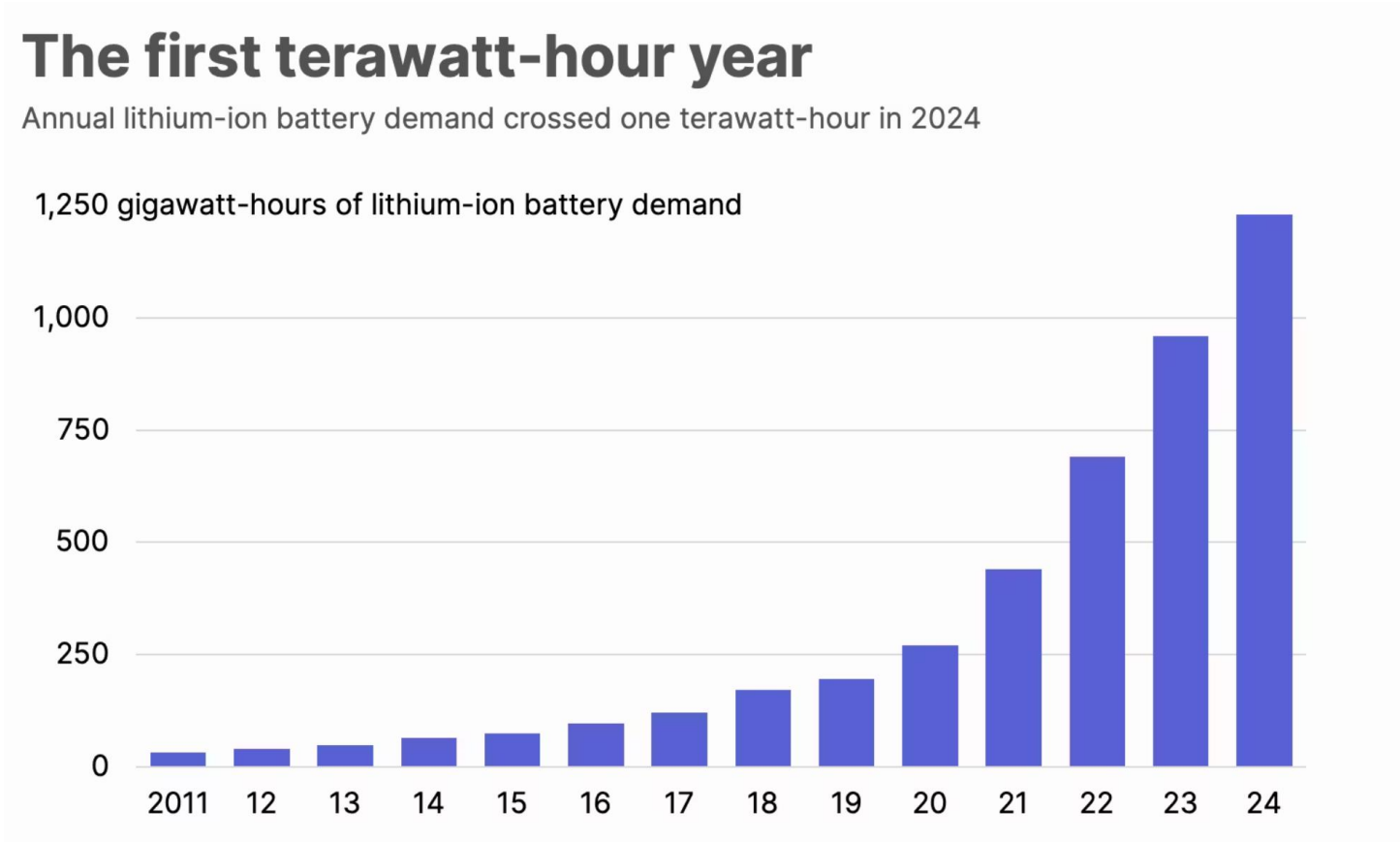
Figure 51: Historical volume-weighted average pack prices by sector



Source: BloombergNEF

Battery Demand Exponential Growth

- Battery demand continues exponential growth with increasing investment



Nat Bullard Consulting (Graphs)
Rho Motion, BNEF (Data)

Broad Electrification of Transportation Modes

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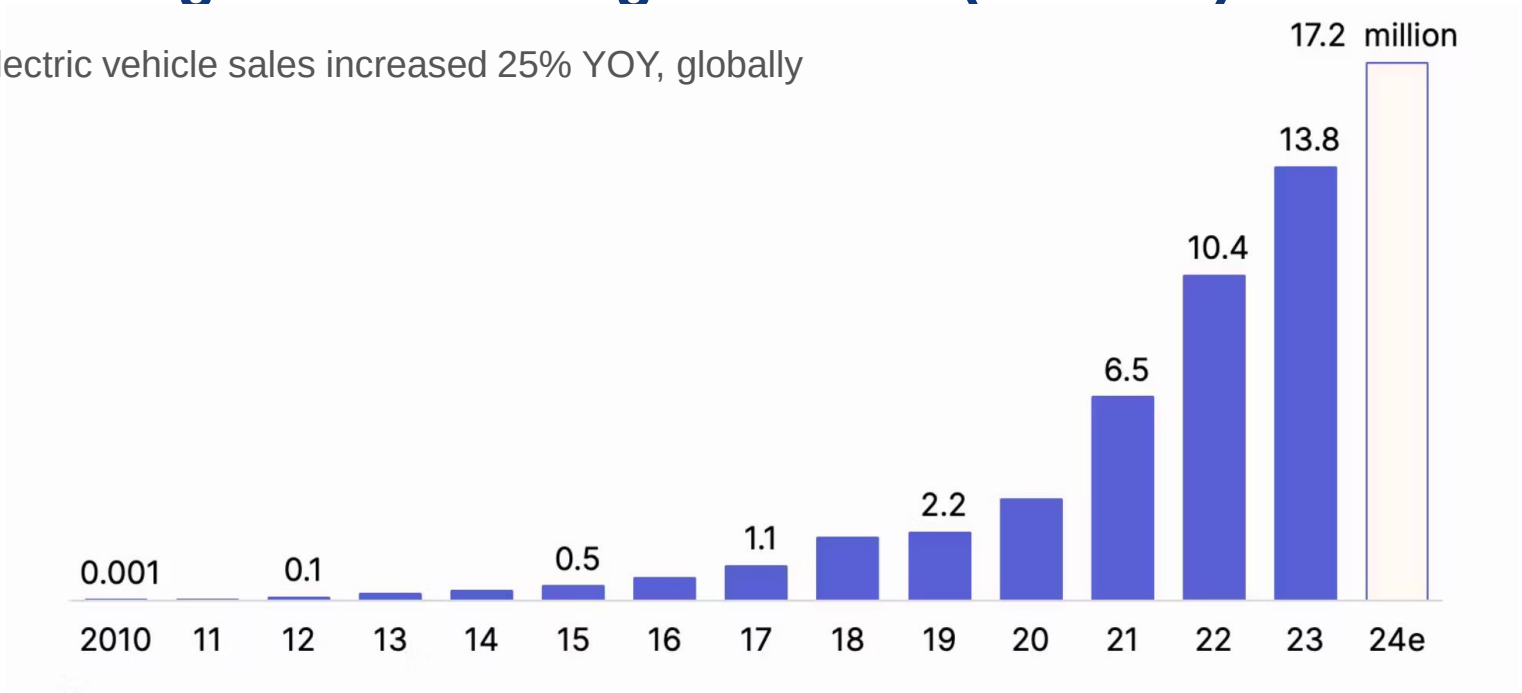
Passenger Vehicle Registrations (Electric)

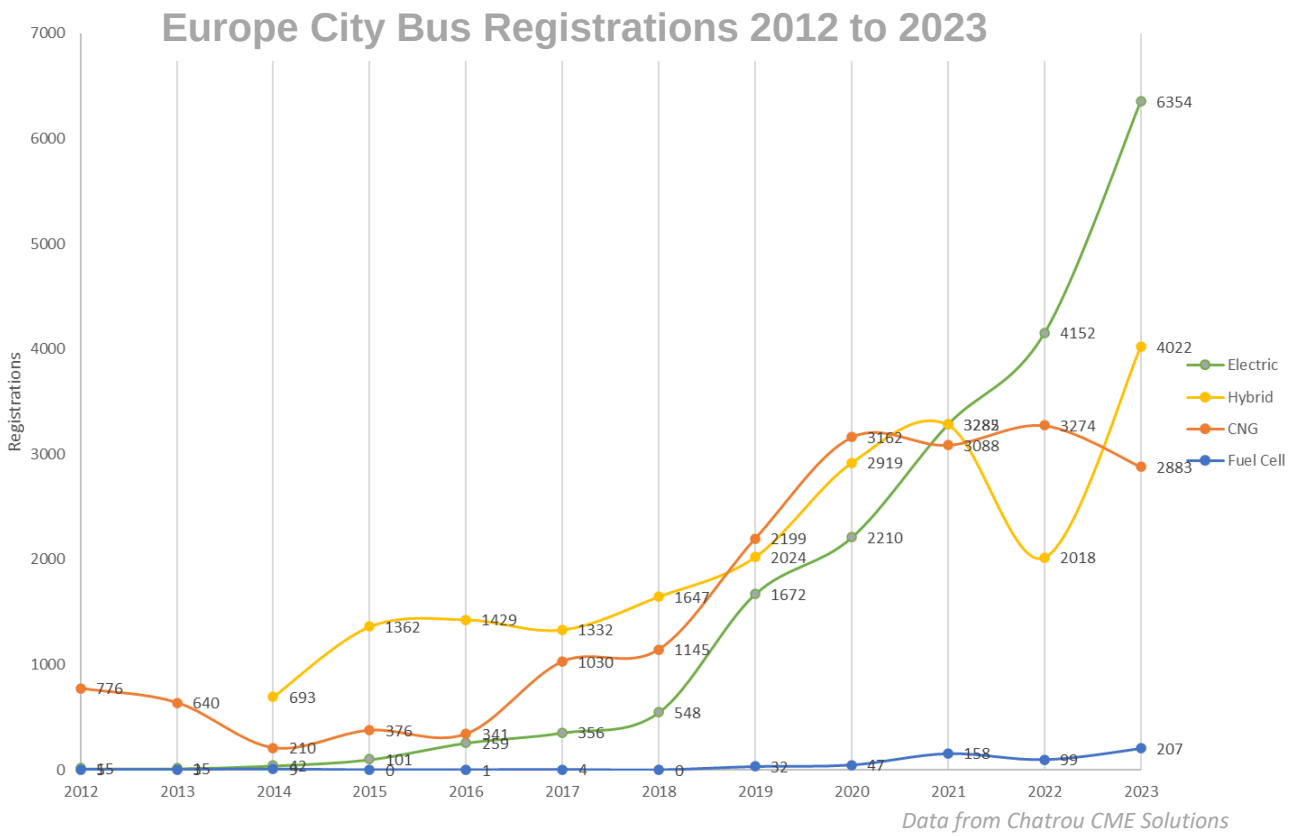
- Electric vehicle sales increased 25% YOY, globally



- Plug-in vehicle sales:
  - 20% of sales globally
  - 20% of sales in USA (8% fully electric)
  - 23% of sales in EU (16% fully electric, 89% in Norway)
  - 48% of sales in China (25% fully electric)

Bus Registrations (Electric)

- Electric Bus Registrations (Latest data 2023*):
  - North America 13%
  - Europe All Buses 18%
  - Europe City Bus 42%

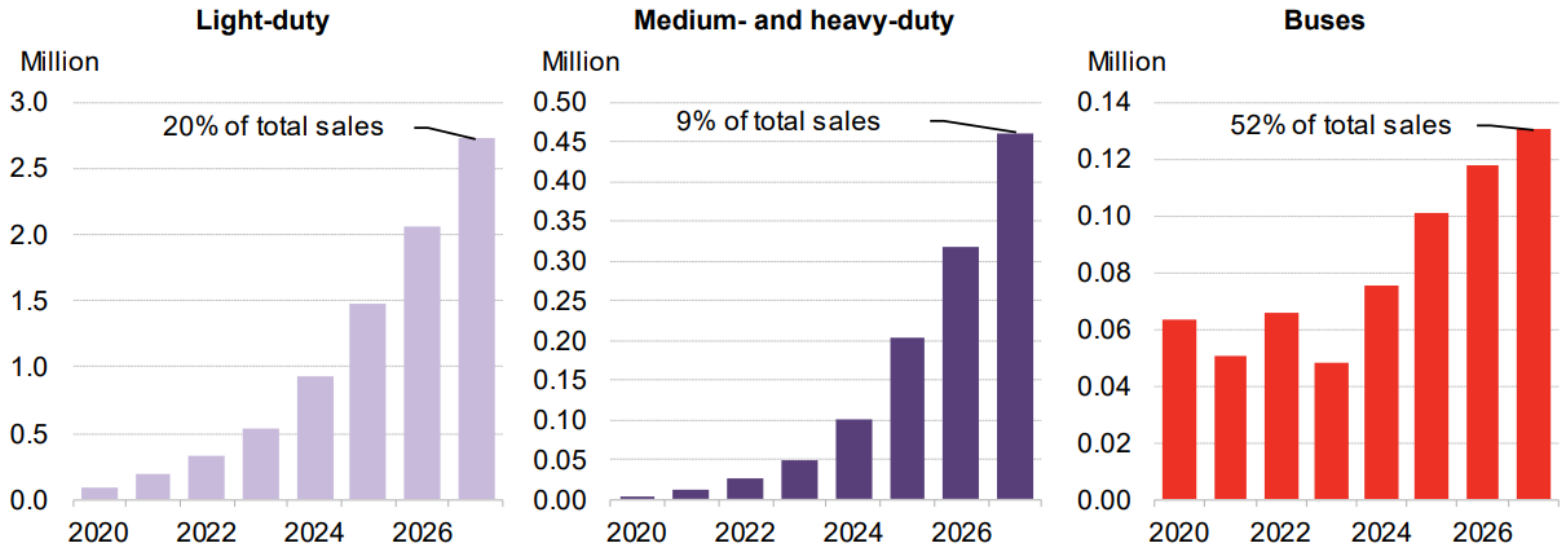


*partial 2024 data indicates this is consistent with 2023

Global Forecasts (near term)

E-buses are set to exceed 60% of sales by 2030 globally, according to BloombergNEF

Figure 147: Global electric and fuel-cell commercial van, truck and bus near-term sales outlook



Source: BloombergNEF, China Automotive Technology and Research Center, European Alternative Fuels Observatory, South Korean Ministry of Trade, Industry and Energy (MOTIE), EV-volumes, Ministry of Road Transport and Highways of India, Australia Bureau of Infrastructure and Transport Research Economics (BITRE), Ministry of Transport (Brazil), Brazilian Association of Automotive Vehicle Manufacturers (ANFAVEA), Japan Automobile Dealers Association (JADA), EV-Volumes. Note: Electric vehicles include battery-electric and plug-in hybrid vehicles.

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Transit Agencies in Canada

Some of the Canadian agencies targeting Zero Emissions by 2040

However, there are challenges in meeting this vision, with several agencies identifying a need to continue purchasing combustion buses as an interim measure.

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Challenges

Several transit agencies have identified they will need a balance of technology over the next few years, announcing they will need to buy more combustion-based transit buses.

This is not unexpected in a technology transition but is reflective of near-term challenges and not the long-term viability.

Some challenges are forcing these decisions to happen:

- Products continue to evolve as new technology progresses for both vehicles and charging
- Costs of electric buses remains high, costs of charging equipment remains high
- Fleet replacement needs cannot wait, maintaining a reliable fleet is critical for public transit
- Fleet expansion is required to support growing populations and increase ride share
- Time is required to deploy new technology, infrastructure, training, and supporting systems, which may not align with transit needs
- Production constraints of zero emission buses

BC Transit Phase 1 Update

Fleet Transition Strategy

Phase 1
"Starting the Transition"

2023-2027

- ❑ Refits for existing aging buses
- ❑ New combustion buses for expansion
- ❑ New electric buses
  - ➢ Large quantity of Heavy Duty BEBs (125)
  - ➢ Trial Light Duty BEBs (6)
- ❑ New Hybrid Electric Heavy Duty Buses
- ❑ Renewable fuels to meet 2025 CleanBC targets

We are here

Phase 2
"Transition and Scale"

2028-2032

- ❑ Transition away from combustion bus purchases where possible to do so
- ❑ Add more charging infrastructure (depots and opportunity charging)
- ❑ Add more electric buses
- ❑ Renewable fuels to meet 2030 CleanBC targets

Phase 3
"Getting to zero emissions"

2033-2040

- ❑ Fulfill replacements and expansions with electric buses
- ❑ Phase out combustion buses from the fleet
- ❑ Phase out compressed natural gas and fuel infrastructure
- ❑ Phase out renewable fuels

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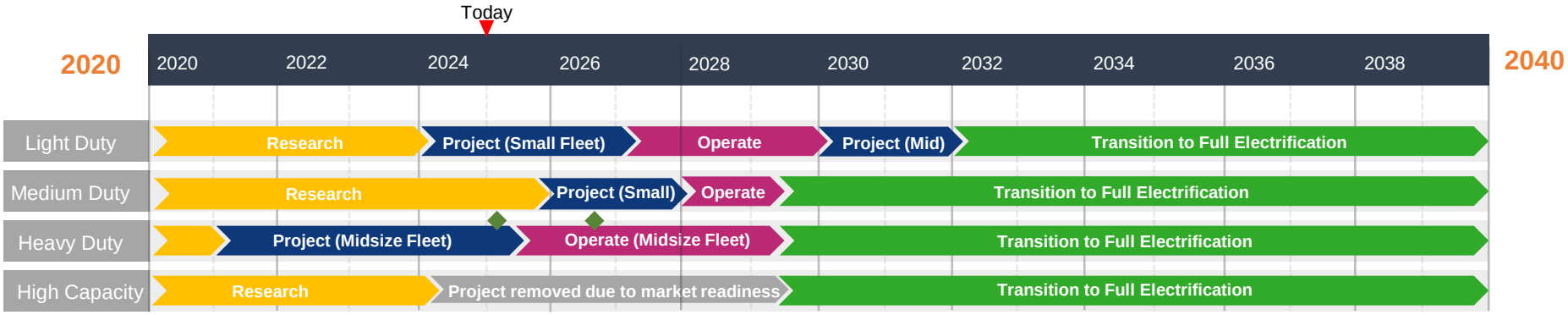
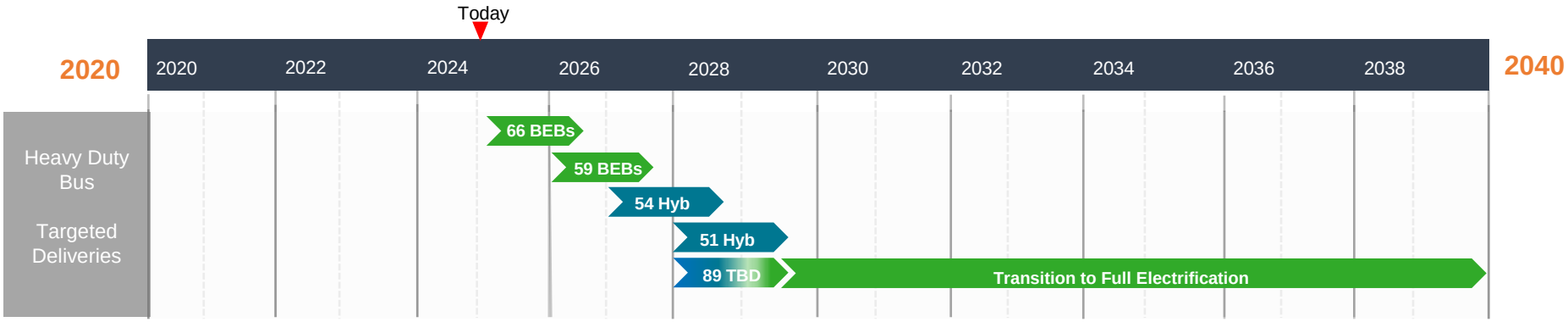
Fleet Transition Plan By Classification



- BEB Delivery – Ordered (Total 125 Heavy Duty electric buses)

Note: Heavy Duty Transition includes BEBs and Hybrid Buses as noted



Heavy Duty BEBs Coming in Phase 1

- 125 HD BEBs have been ordered for deployment across the Province

Nova Bus LFSe+

New Flyer Xcelsior Charge NG

Phase 1 Heavy Duty Deployment Locations

125 HD Electric Buses

- Kamloops
- Chilliwack
- Kelowna
- Nelson
- Nanaimo
- Powell River
- Victoria
- Sunshine Coast
- Whistler

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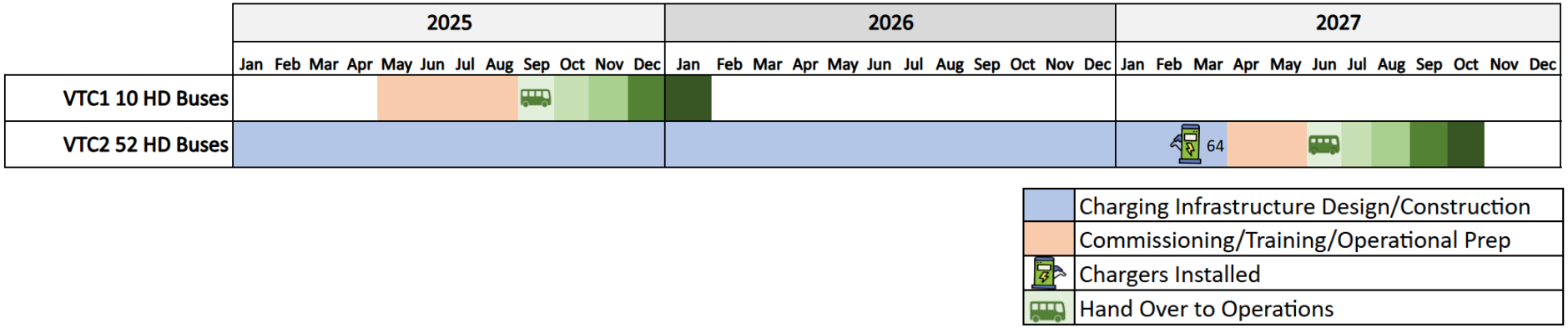
VRTS Projects

Project	Target Scope	Status
Victoria Transit Centre (VTC) 1	**10** Heavy Duty Electric Buses **11** Charging Points	• Charging equipment installed, commissioning awaiting first bus delivery • First buses targeted to arrive by early summer 2025
VTC 2	**52** Heavy Duty Electric Buses ~**62** Charging Points	• Options analysis underway for infrastructure design • Electrical distribution equipment to be procured • Charging equipment procurement underway • Buses ordered
Victoria handyDART 1	~**6** Light Duty Electric Buses ~**TBD** Charging Points	• Site construction incorporates charging equipment distribution and utility power in design • Charging equipment to be procured in future • LD electric buses to be procured in future
Langford Transit Centre (LTC) 1	~**10** High Capacity Electric Buses ~**12** Charging Points	• Project removed from Phase 1 of the program • Will be reevaluated for Phase 2

Schedule for bus deliveries in Victoria

Deployment Timeline

- First 10 HD Buses scheduled to arrive starting in May 2025 from New Flyer, will move into commissioning and training phase. Formal handover will occur to operations to manage the timing of bringing those buses into service.



VTC 1 buses are in production for Victoria

Charging infrastructure at VTC is ready for 10 buses

Utility Power

Distribution Equipment

Transformer

Switchgear

Charging equipment

Power Cabinets

Dispensers

Electric Bus

Preparing for Delivery

- Current activities:
  - Bus production:
    - Factory inspections of lead bus are underway as buses move through production line
  - Operations and Training:
    - Completing training for charging equipment use at VTC
    - Preparing training plans and programs for BEB operations and maintenance
    - Preparing new procedures
  - Data Integration:
    - Preparing systems to receive and integrate data from battery electric buses and charging equipment
  - Commissioning:
    - Preparing for onsite commissioning of bus and charging system

→ There will be a stepped transition to in-service use of the buses as the assets, resources and processes are ready to support an increasing number of buses in regular operations.