EVS35
OSL2022

Assessing charging infrastructure needs in Québec

Marie Rajon Bernard – EV Associate Researcher and Charging Infrastructure Cluster coordinator

EVS35, Oslo

icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Goals of the study

- Assess the number, location, and type of chargers needed in Québec by 2035.
- Provide policy recommendations on how to get there.
- Draw useful insights from Québec EV programs, especially on charging infrastructure deployment.

EVS35
OSL2022

Scope and methodology

icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Scope

Vehicle types:

- Passenger cars
  - Private,
  - Company.
- Light commercial vehicles (vans).
- Taxis (including PHVs).

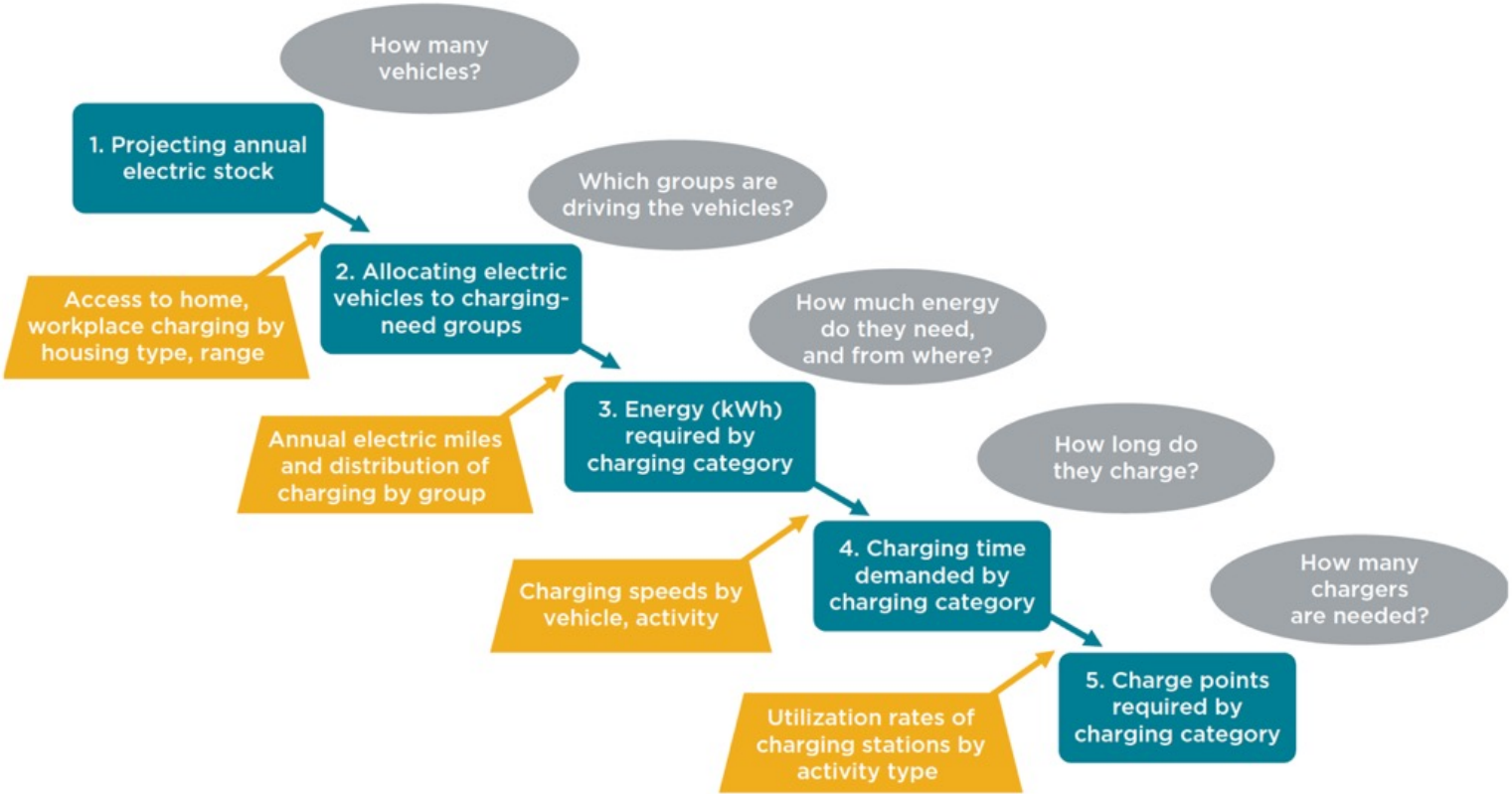
Charger types:

- Private:
  - Home,
  - Depot,
  - Workplace.
- Public:
  - AC normal,
  - Fast urban,
  - Fast highway.

Granularity:

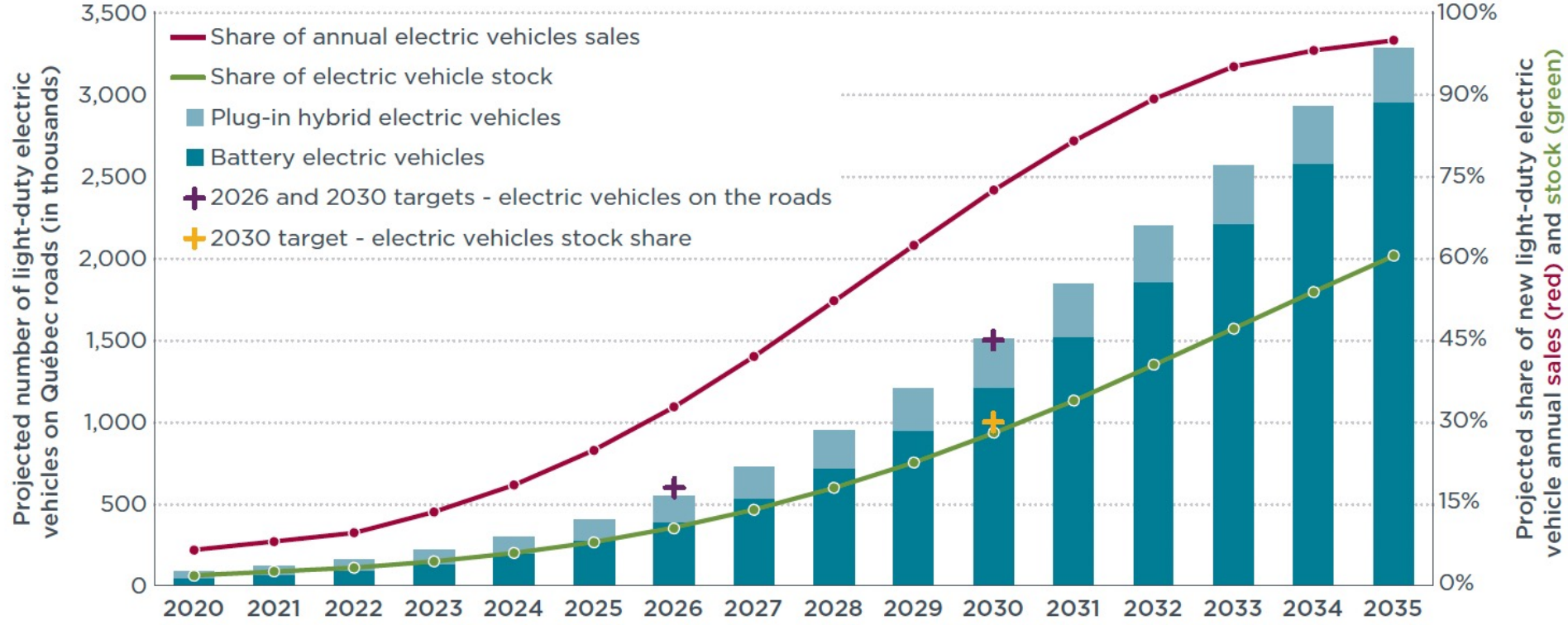
- 17 administrative regions,
- 5 Greater Montreal divisions,
- 33 Montreal sub-divisions.

Methodology



1. Projecting annual electric stock.

EVS35
OSL2022



2. Allocating electric vehicles to charging need groups.

EVS35 OSL2022

In each group EV owners have similar behaviors. Groups vary spatially and temporally.

Example for passenger cars

Vehicle type	Vehicle used for commuting?	Access to workplace charging?	Access to home charging?
Battery electric vehicle	Yes	Yes	Yes
			No
		No	Yes
			No
	No	NA	Yes
			No
Plug-in hybrid electric vehicle	Yes	Yes	Yes
			No
		No	Yes
			No
	No	NA	Yes
			No

icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

3. Energy (kWh) required by charging category.

EVS35 OSL2022

Vehicle type	Vehicle used for commuting ?	Access to workplace charging?	Access to home charging ?	Share of electric kilometers (for PHEVs)	Share of home energy	Share of workplace energy	Share of normal AC energy	Share of fast urban energy	Share of fast highway energy	Percent of vehicle stock in 2025	Percent of vehicle stock in 2030	Percent of vehicle stock in 2035
Battery electric vehicle	Yes	Yes	Yes	100%	70%	20%	1%	4%	5%	13%	14%	16%
			No	100%	0%	70%	5%	20%	5%	3%	4%	5%
		No	Yes	100%	85%	0%	3%	7%	5%	24%	23%	25%
			No	100%	0%	0%	35%	60%	5%	5%	6%	7%
	No	NA	Yes	100%	85%	0%	4%	6%	5%	21%	28%	30%
			No	100%	0%	0%	35%	60%	5%	5%	7%	8%
Plug-in hybrid vehicle	Yes	Yes	Yes	85 %	80%	15%	5%	0%	0%	6%	3%	2%
			No	70 %	0%	85%	15%	0%	0%	1%	1%	0%
		No	Yes	85 %	90%	0%	10%	0%	0%	10%	5%	2%
			No	40 %	0%	0%	100%	0%	0%	2%	1%	1%
	No	NA	Yes	80 %	90%	0%	10%	0%	0%	9%	6%	3%
			No	40 %	0%	0%	100%	0%	0%	2%	2%	1%

icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Assumptions:
- Vehicles drive on average 18,000 km/year in Québec and 14,000 km/year in Montréal.
- BEV efficiency: 4.3km/kWh and PHV efficiency: 4.2 km/kWh (for passenger cars)

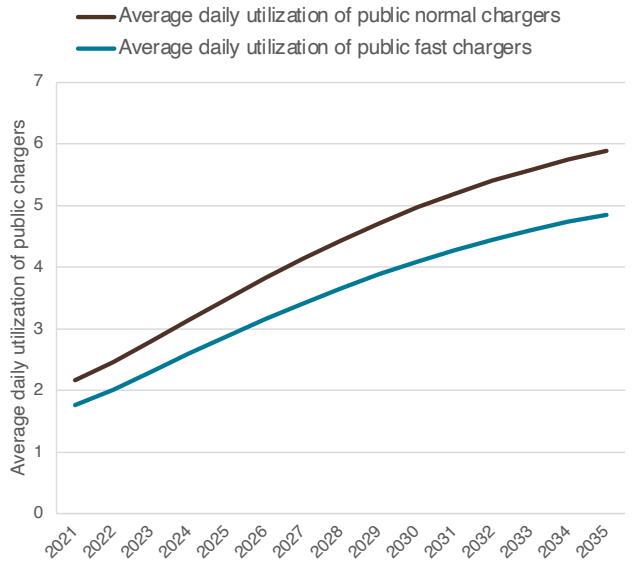
4 and 5. Charging time and speed per charger type.

EVS35 OSL2022

Charging time

$$Average\ public\ normal\ charger\ daily\ utilization\ (in\ hours) = a * \ln(EV\ stock\ share) + b$$

$$Average\ public\ fast\ charger\ daily\ utilization\ (in\ hours) = c * \ln(BEV\ stock\ share) + d$$



Charging speed (in kW).

Charging speed ≠ Rated charger power output

	Charging power			
	BEV charging acceptance rate			PHEV charging acceptance rate
	Normal AC	Fast urban	Fast highway	Normal AC
2021	6.5 kW	30 kW	64 kW	3.4 kW
2022	6.7 kW	36 kW	69 kW	3.5 kW
2023	6.8 kW	41 kW	75 kW	3.7 kW
2024	7.0 kW	47 kW	81 kW	3.8 kW
2025	7.2 kW	53 kW	87 kW	4.0 kW
2026	7.3 kW	59 kW	92 kW	4.1 kW
2027	7.5 kW	64 kW	98 kW	4.2 kW
2028	7.7 kW	70 kW	104 kW	4.4 kW
2029	7.8 kW	76 kW	110 kW	4.5 kW
2030	8.0 kW	82 kW	116 kW	4.6 kW

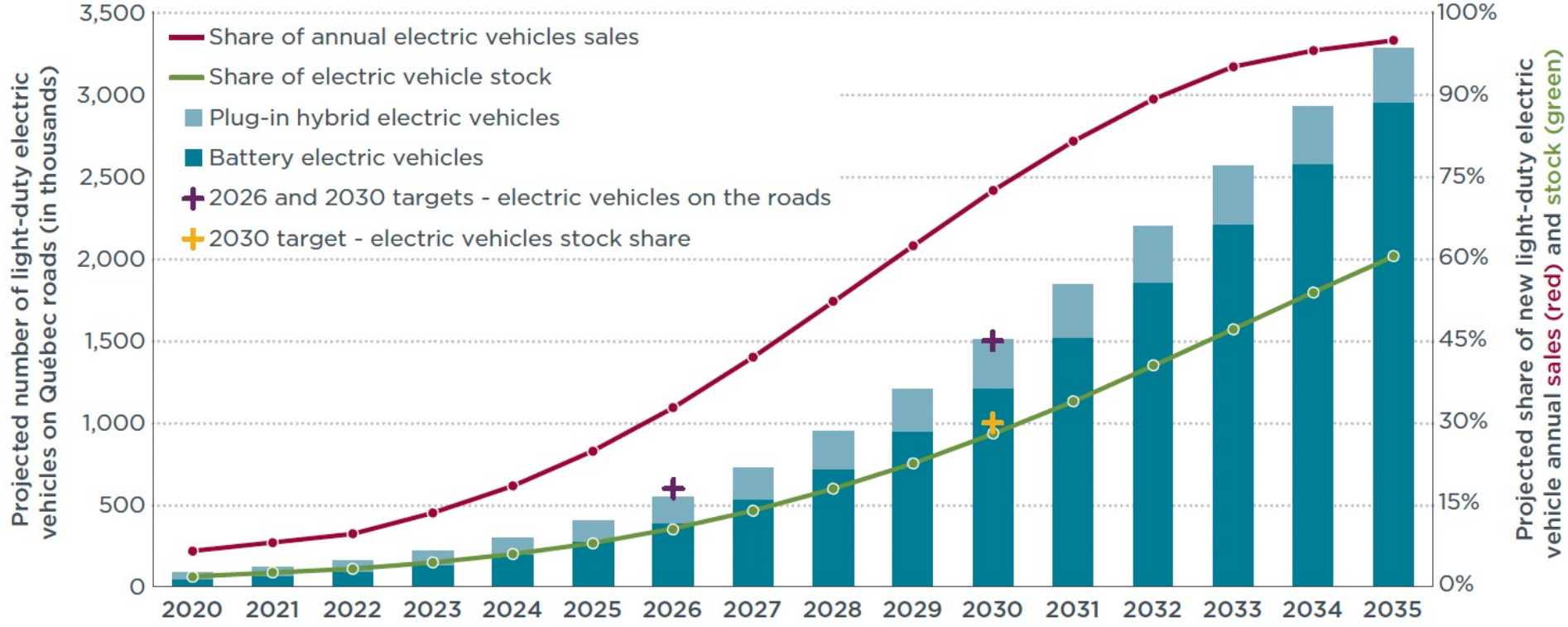
EVS35
OSL2022

Results

icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Québec's goal is to have 1.5 million EVs on its roads in 2030 representing 30% of its LDV stock.

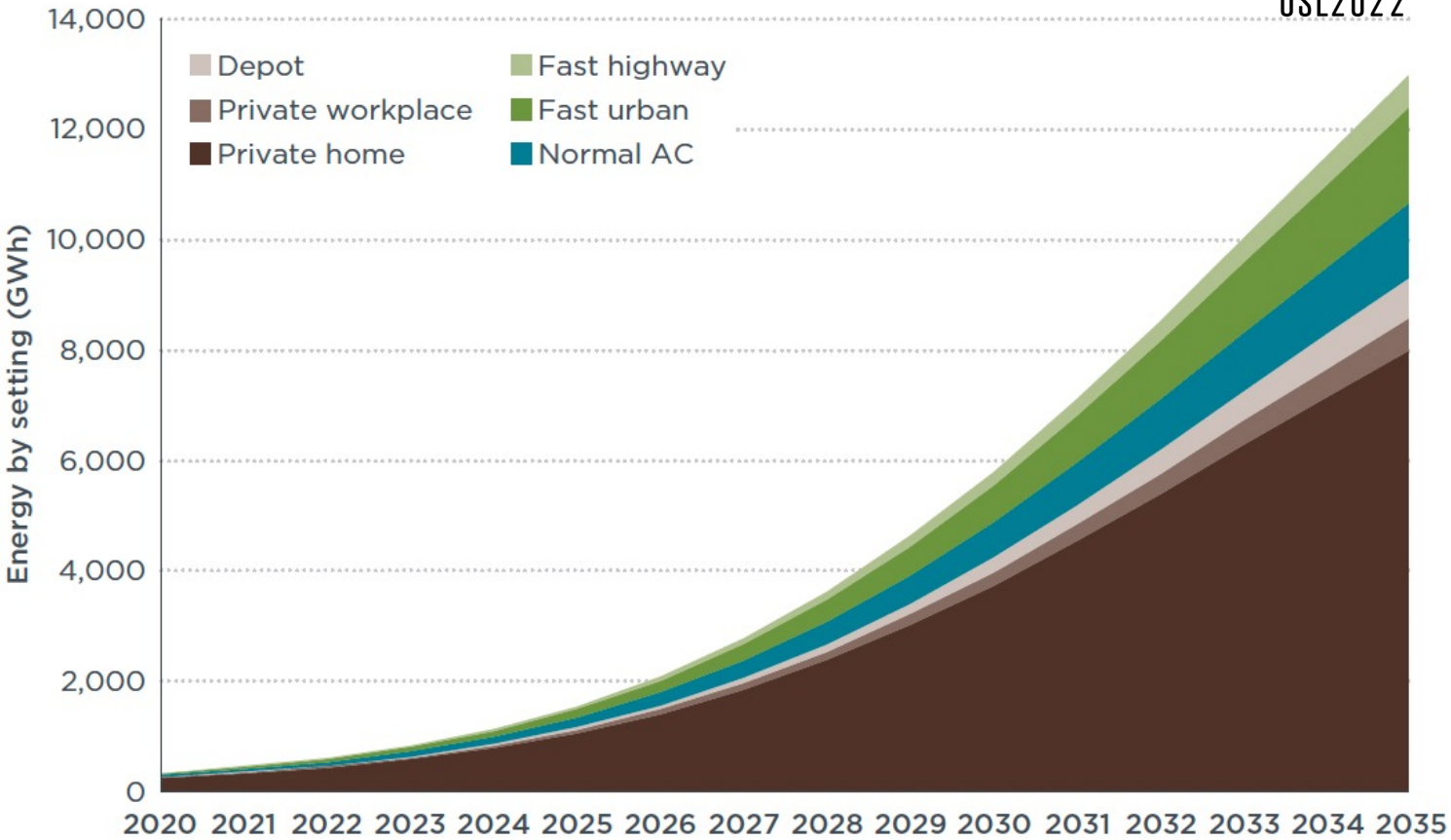
EVS35
OSL2022



Electricity needs reaches 5.8 TWh in 2030 among which 27% is public.

EVS35
OSL2022

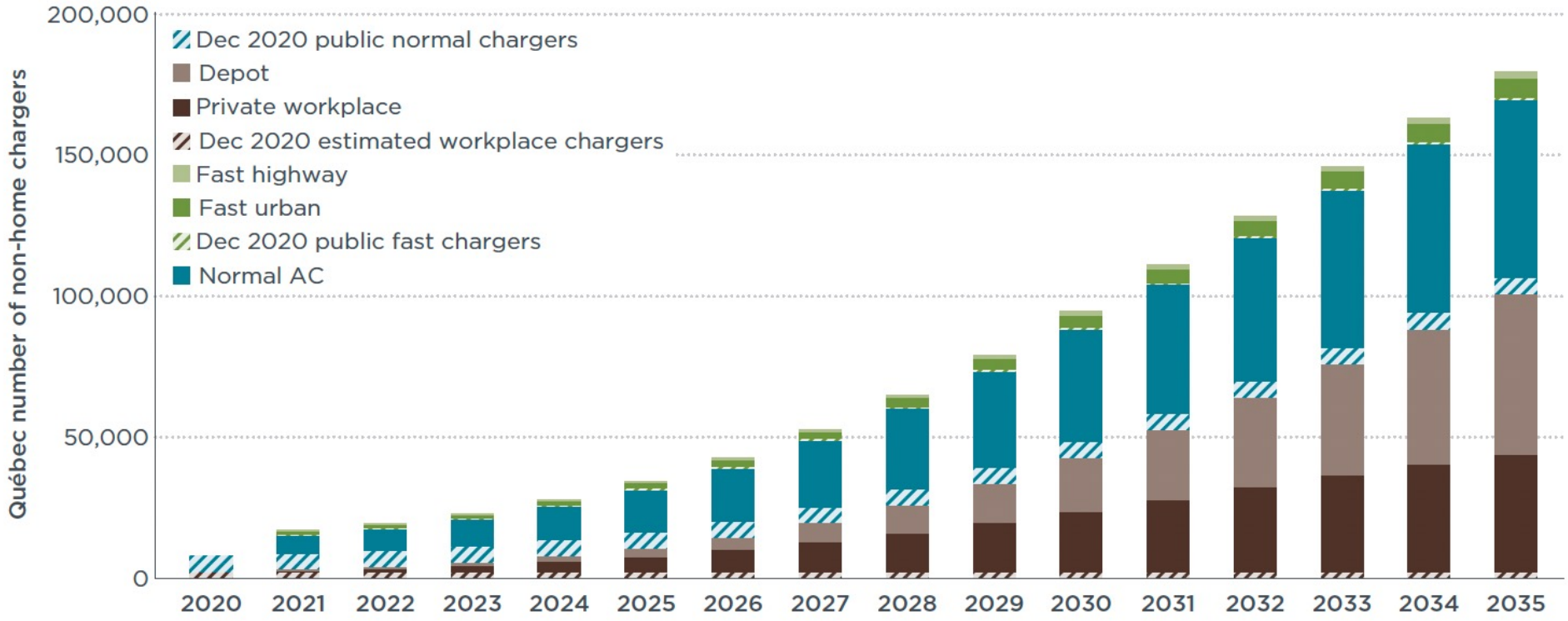
EV charging demand in 2030 and 2035 would amount to only 2.7% and 6.1% (respectively) of the electricity produced by Québec.



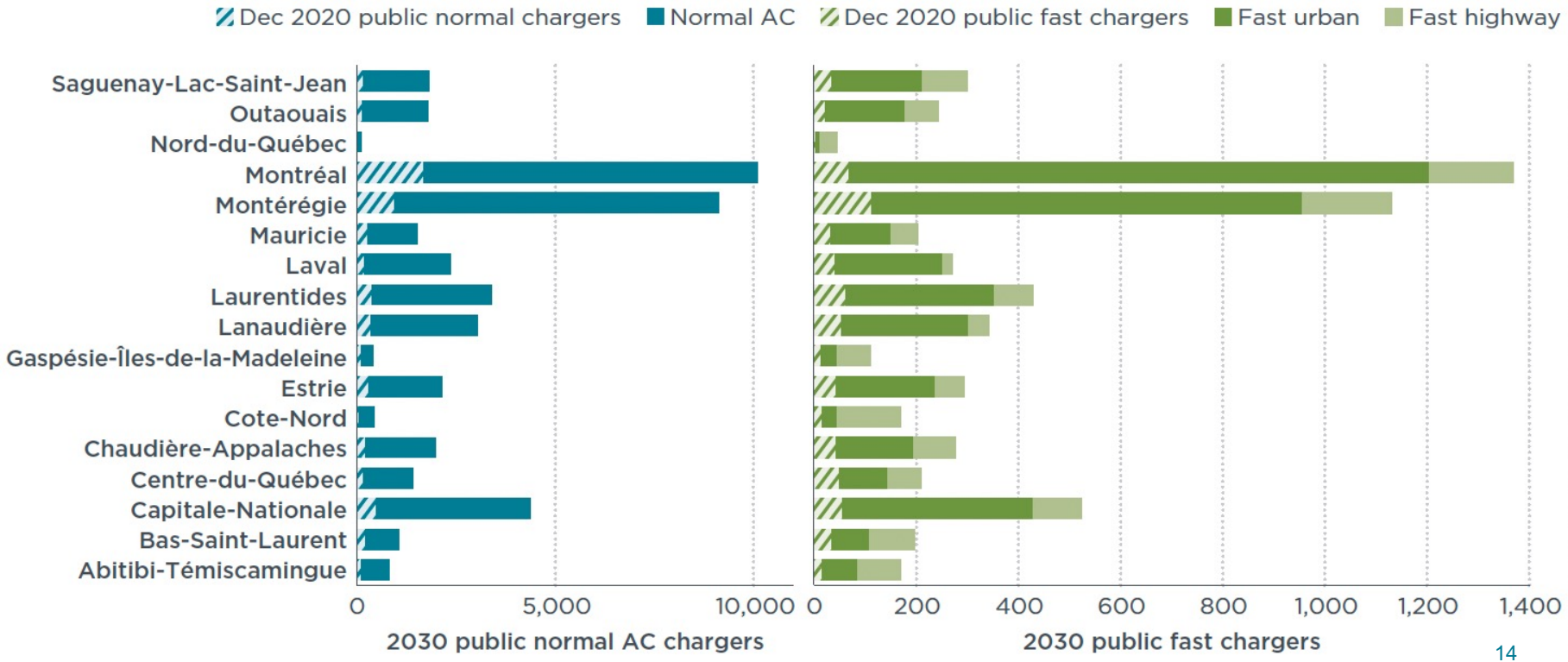
icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

The number of non-home chargers is close to 100,000 in 2030, dominated by public normal AC chargers.

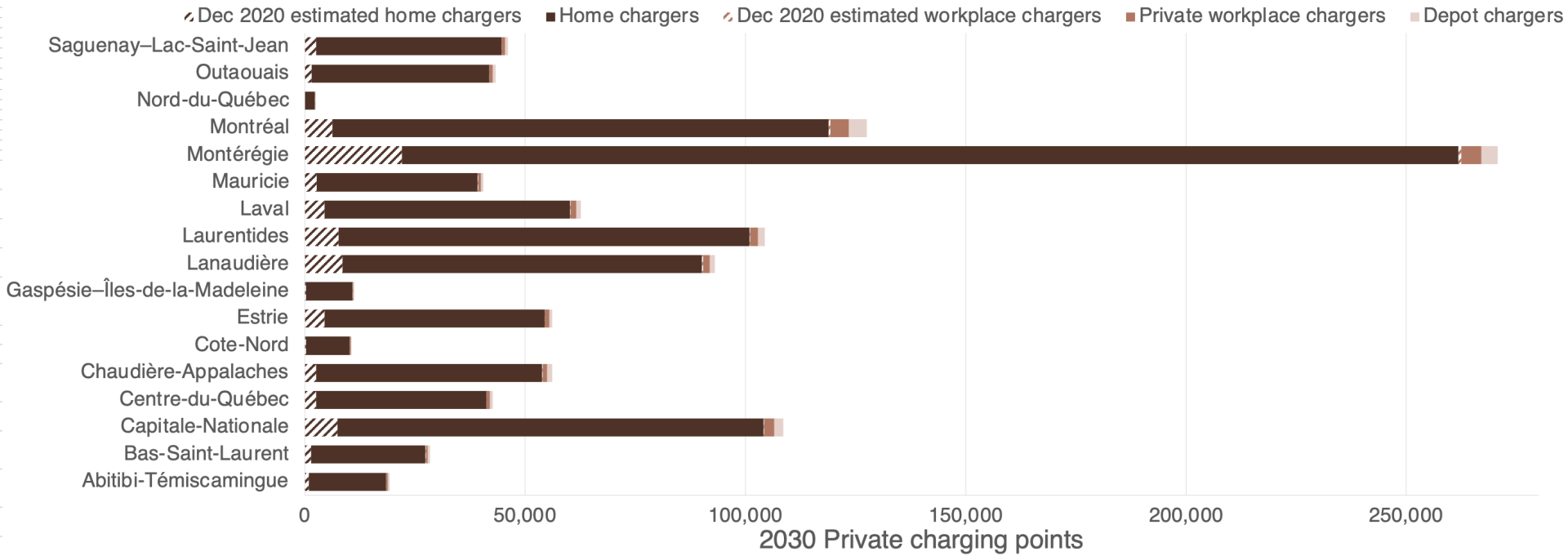
EVS35
OSL2022



Montréal has the highest public charging needs of all regions.

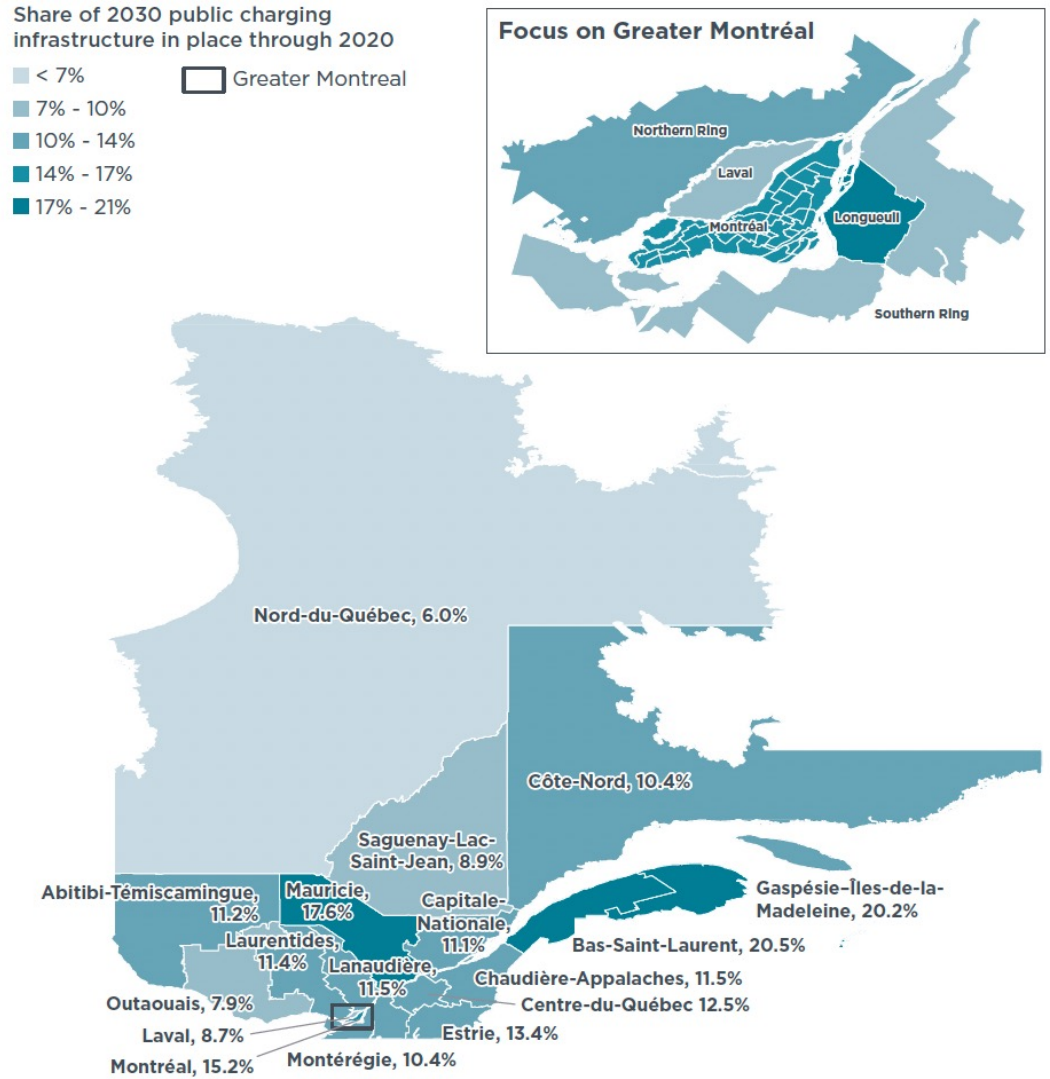


Montérégie has the highest private charging needs of all regions.



EVS35
OSL2022

At the end of 2020, Québec had 27% and 12% of the public charging infrastructure needs by 2025 and 2030.



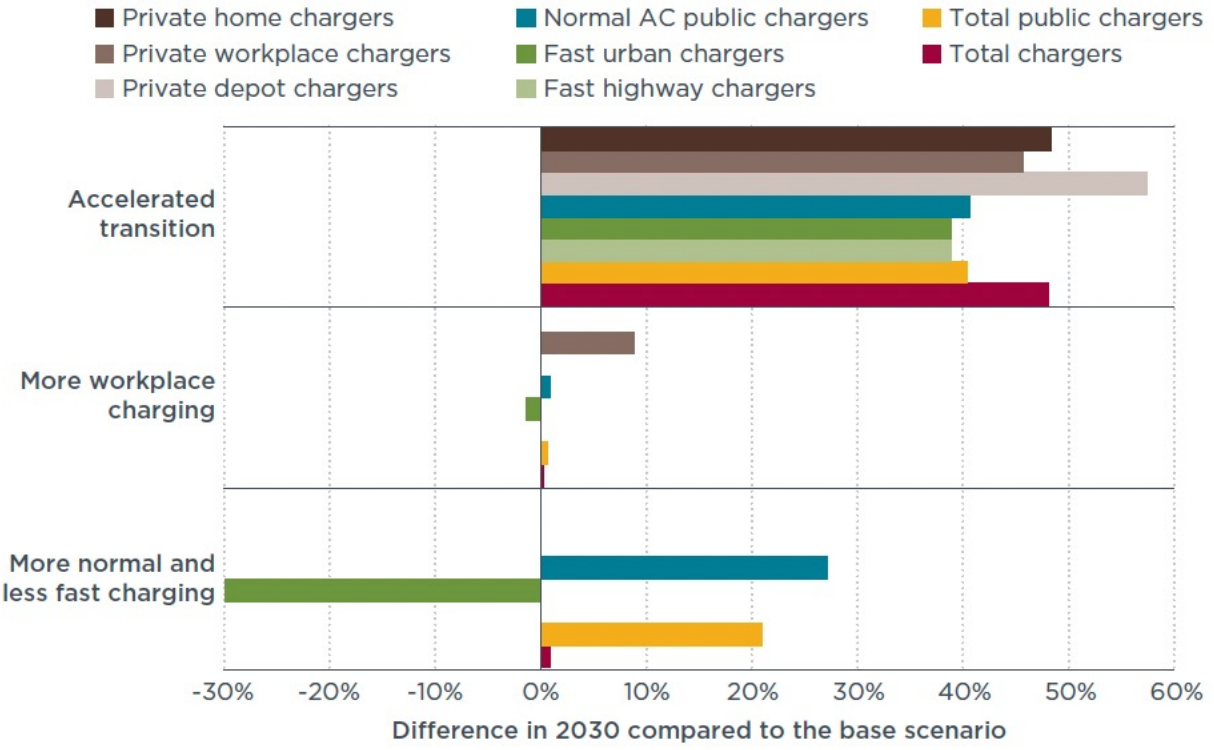
icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

An accelerated transition would increase the total number of public chargers by 40%.

EVS35 OSL2022

Sensitivity analysis

- Accelerated transition
- Increased workplace charging
- Reduced fast charging



icct
THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

EVS35
OSL2022

Policy recommendations

icct
THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

Policy recommendations

Guidance and support to local authorities:

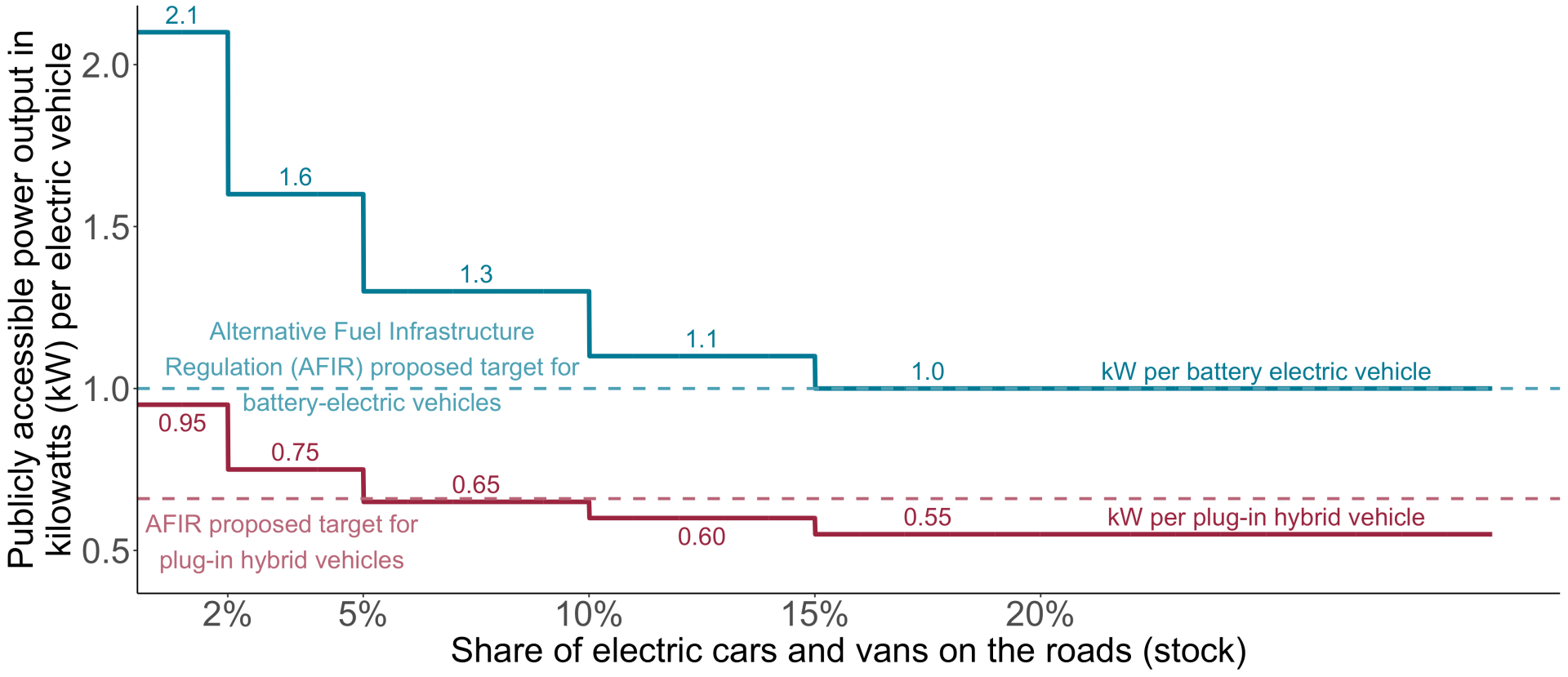
- ✓ Provide charger deployment targets.
- ✓ Develop charging deployment strategies (demand-driven/planning-oriented).
- ✓ Encourage and facilitate the implementation of zero-emission zones.
- ✓ Gather stakeholders to foster private sector involvement.

Fiscal support:

- ✓ Fiscal support with contingencies and/or targeted to specific groups or locations.
- ✓ Smart private charging.

Alternative Fuel Infrastructure Regulation (AFIR) proposal – an EU idea applicable to Canada?

EVS35
OSL2022



Conclusions

- Québec will require 8 times more public chargers in 2030 compared to 2020.
- Growing energy demand for electric vehicles over time can be beneficial if properly planned.
- The most urban and most rural areas alike require the greatest increase in public charging, but local needs vary, with DC fast charging playing a major role in enabling urban access to electromobility.
- A coordinated charging infrastructure deployment approach could galvanize investments.

EVS35
OSL2022

Thank you!

mrajonbernard@theicct.org

icct
THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION