

# Does a region need its own Zero Emission Vehicle mandate, or can it free-ride off another?

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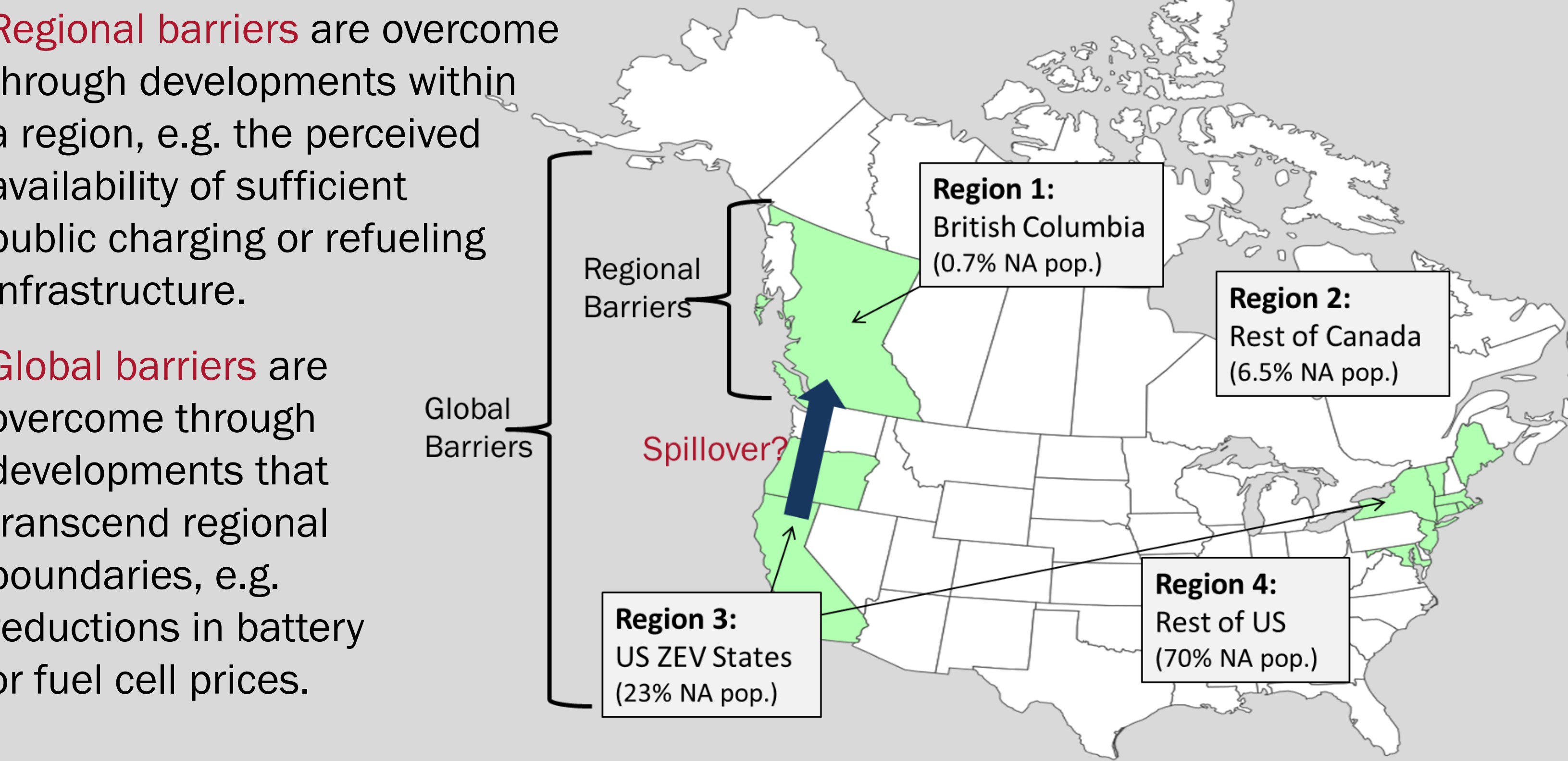


## Background: ZEV-supportive policy & “spillovers”

Zero emission vehicles (ZEVs) are projected to play an important role in achieving deep greenhouse gas reduction (GHG) targets. To achieve widespread ZEV adoption, strong ZEV-specific policies are likely needed to overcome a variety of adoption barriers.

### “Regional” vs. “Global ZEV” Adoption Barriers

Adoption barriers can be categorized as regional or global in nature, and each will be affected uniquely by different policies.



### An Incentive to Free-Ride?

Sometimes ZEV developments in one region can spill over to another, providing an incentive to reduce policy costs by free-riding off policy in other jurisdictions.

### Case study:

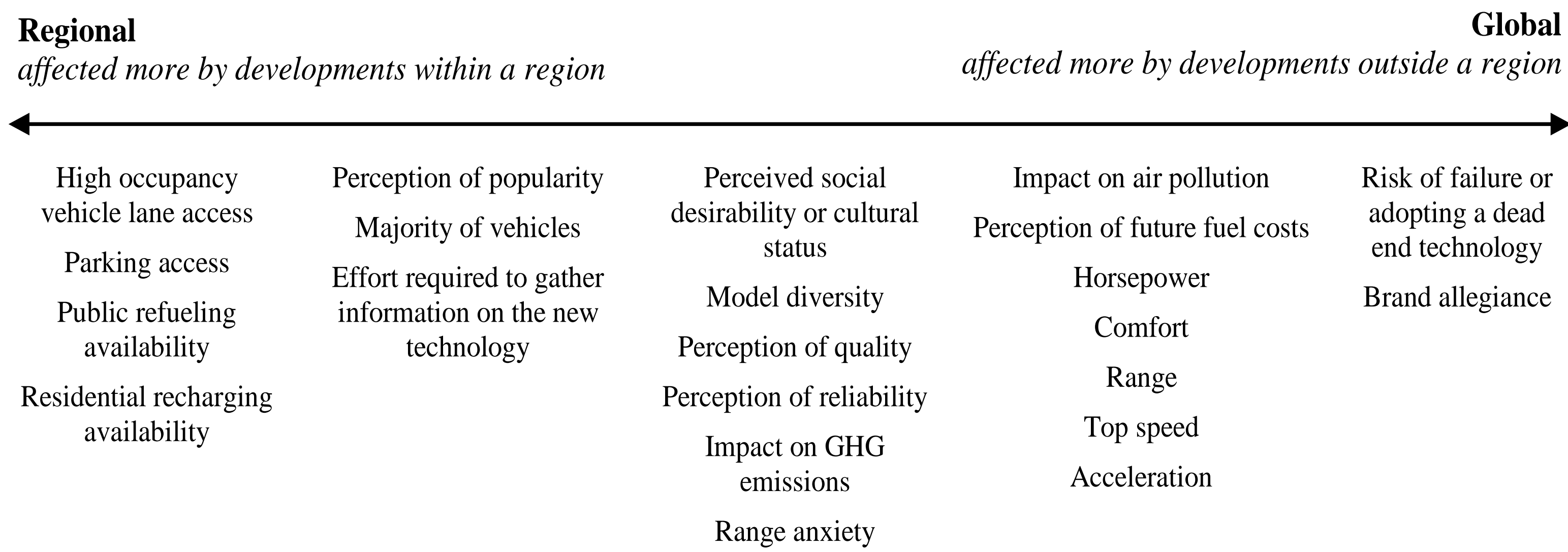
Can the Canadian province of British Columbia free-ride off of California’s (and nine other US states “ZEV States”) ZEV mandate to meet its regional GHG target for passenger vehicles (-80% of 2007 by 2050)?

## The Model: CIMS-ZEV

CIMS-ZEV is a technology adoption model of the North American passenger vehicle sector, adapted from the CIMS energy-economy model that:

- simulates the composition, costs, and GHG impacts of the passenger vehicle sector
- represents a heterogeneous consumer market that determines vehicle market shares, based on financial and intangible costs (i.e. nonmonetary adoption barriers)
- represents vehicle purchase costs (global), fuel costs (region-specific but driven by global forces), endogenous technological change (global learning curves), dynamics in consumer preferences (regional and global), and some market feedback effects (global)

A novelty of CIMS-ZEV is that it distinguishes between regional and global factors that uniquely influence adoption barriers in a given region.



## Research Objective 1: Opportunity for Free-Riding

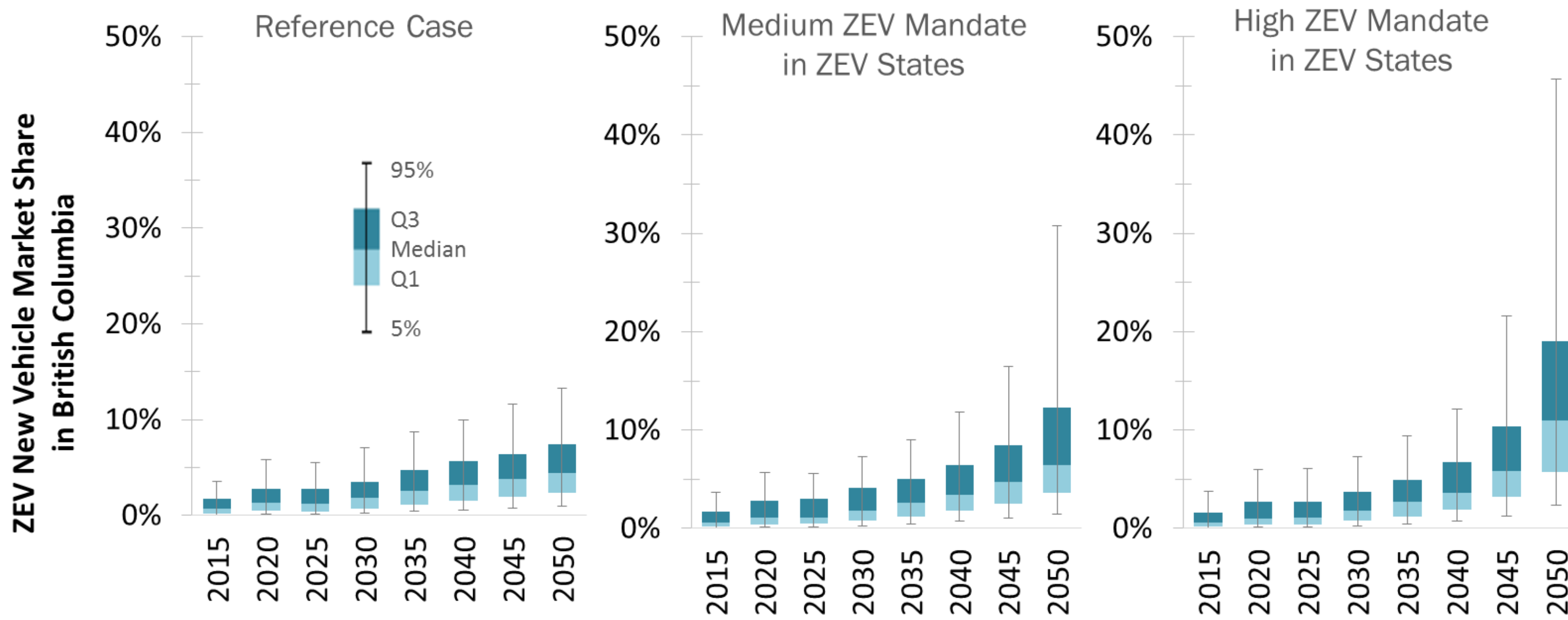
### Can British Columbia free-ride?

Evaluate how ZEV adoption and GHGs in British Columbia change when the ZEV mandate increases in ZEV States (from Reference to High).

### Results

#### ZEV adoption in British Columbia

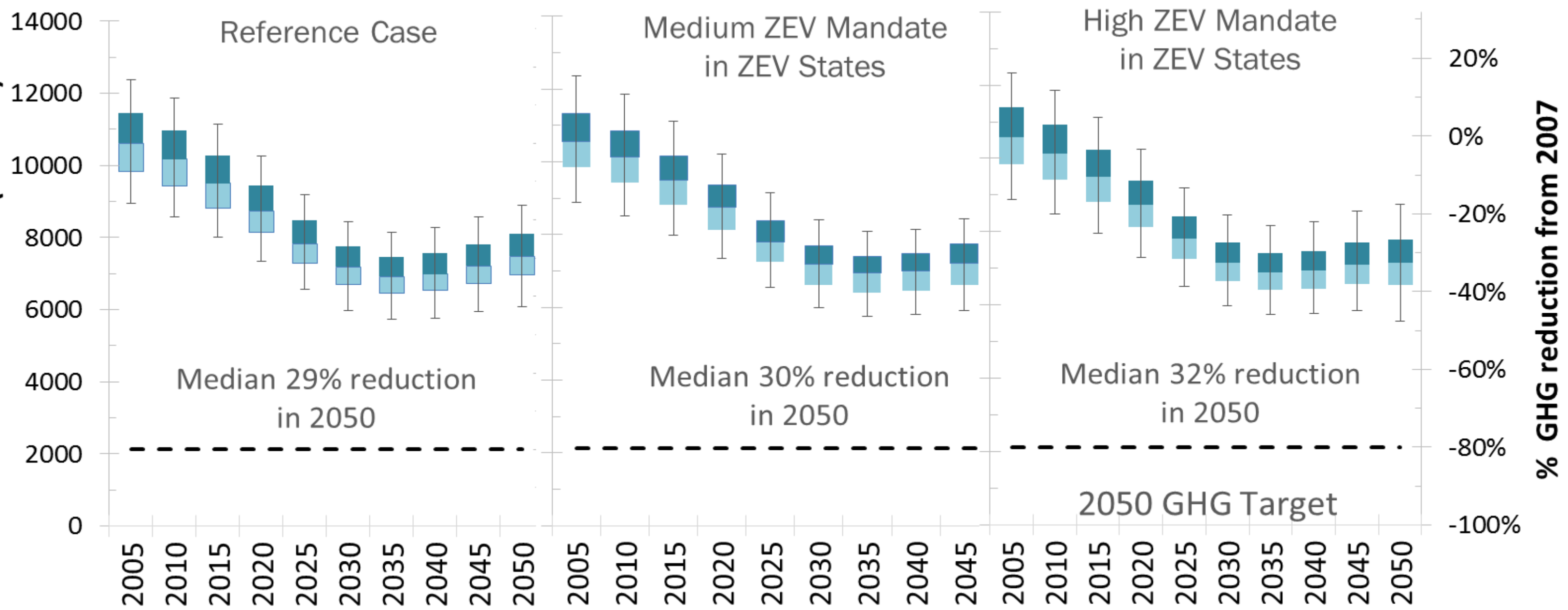
(1) Spillovers are not enough to significantly increase ZEV adoption in British Columbia



#### Well-to-wheel GHG emissions in British Columbia

(2) GHG emissions fall short of the target\* in all scenarios: median GHGs are only 3% lower than Reference with a High ZEV

\*We considered the target “achieved” when 80% of simulation runs reduce GHGs by 80% in 2050



## Research Objective 2: Need for Regional ZEV Mandate

### Does British Columbia need its own ZEV mandate to hit its GHG target?

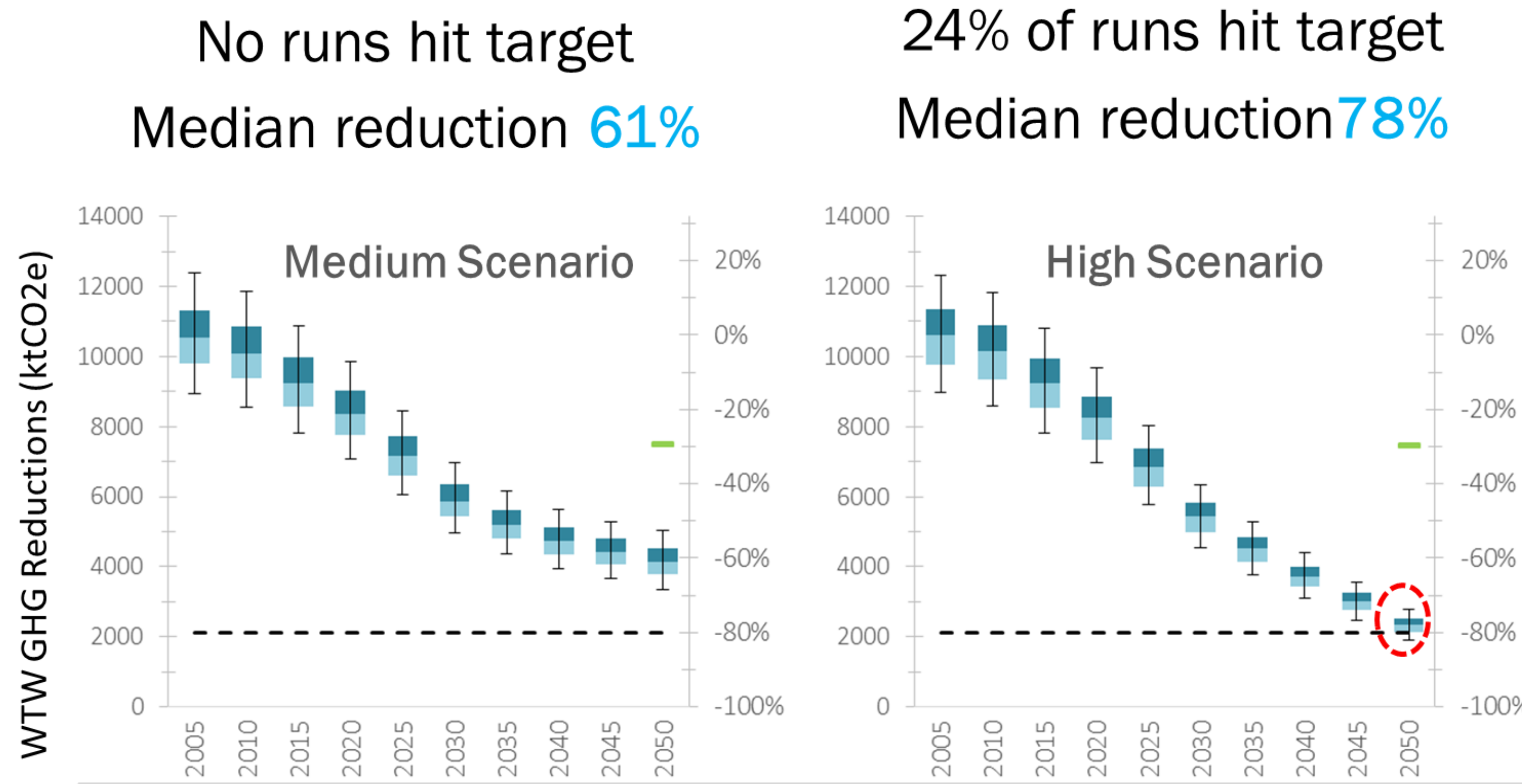
Determine if British Columbia can meet its GHG target with medium and strong climate policies and technology change, or if it needs its own ZEV mandate.

Scenario assumptions for policy and technology change (all dollar values in 2005CAD)						
	“ZEV State” ZEV Mandate	LCFS	CAFE	Carbon Tax (\$/tCO2e)	Technology Change*	ZEV rebate (until 2020)
Medium Scenario	100% ZEV by 2050	20% cut by 2050	59% cut by 2050	\$30- 118 (2015-2050)	“ambitious but reasonable”	\$5000/ZEV
High Scenario		45% cut by 2050	67% cut by 2050		“breakthrough”	

\*Technology change assumptions are based on NRC’s “midrange” and “optimistic” (20% chance of occurring before 2050) projection assumptions in its 2013 Transitions to Alternative Vehicles and Fuels report.

### Results

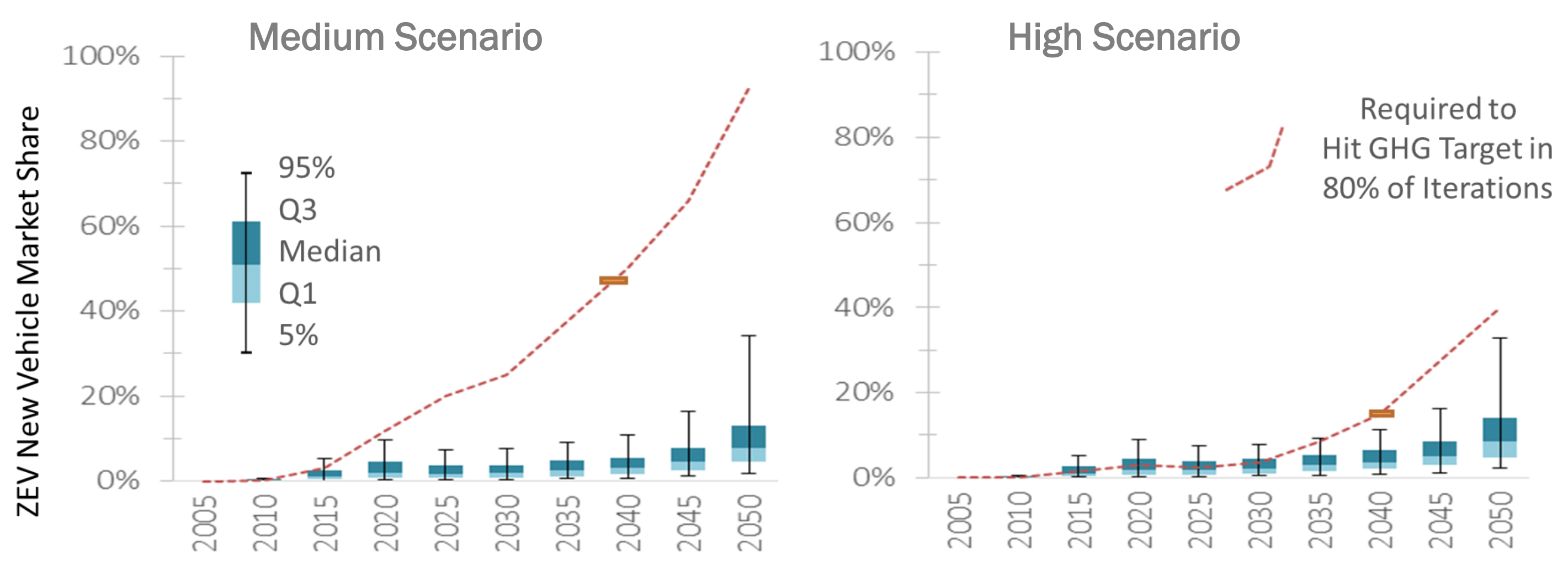
Both scenarios achieve significant GHG reductions, but neither achieves the target (i.e. none shows an 80% chance of reducing GHGs by 80% in 2050)



### A regional ZEV mandate is needed:

In the **Medium Scenario**, a ZEV mandate must ensure that **50% of sales in 2040 and nearly all sales in 2050** are ZEVs to hit the target.

In the **High Scenario**, a ZEV mandate must ensure that **15% of sales in 2040 and 40% of sales in 2050** are ZEVs to hit the target.



## Key Policy Implications

- Small regions cannot free-ride completely off strong ZEV policy in other regions to achieve substantial ZEV adoption.
- Under realistic assumptions about future technology, fuel economy (CAFE) and fuel GHG intensity (LCFS) policies might not be sufficient to achieve 2050 GHG targets.
- To achieve sufficient ZEV adoption, North American regions need their own strong ZEV-focused policies, such as a ZEV mandate.

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