Plug-in Vehicle Deployment in California:

An Economic Assessment

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30 October 2012 Clean Air Dialogue (CAD) Working Group, Sacramento

Acknowledgements

- This research was performed at the invitation of the California Electric Transportation Coalition. We wish to thank the CARB and CalEPA staff for their data, Natural Resources Defense Council, Electric Power Research Institute and California Electric Transportation Coalition for their technical review, and Chris Yang, U.C. Davis, for data, insights and advice. We also thank the CARB and CalEPA staff for their data, and Chris Yang, U.C. Davis, for data and insights.

- The author also wishes to thank many research assistants for dedicated support during this project: Drew Behnke, Billie Chow, Melissa Chung, Elliot Deal, Sam Heft-Neal, Shelley Jiang, Fredrick Kahrl, Mehmet Seflek, and Ryan Triolo.

- Financial support from CalETC is gratefully acknowledged.

Objectives

1. Estimate direct and indirect economic impacts of Plug-in Electric Vehicle (PEV) deployment.
2. Inform stakeholders and improve visibility for policy makers.
3. Promote evidence based policy dialogue.

Summary of Findings

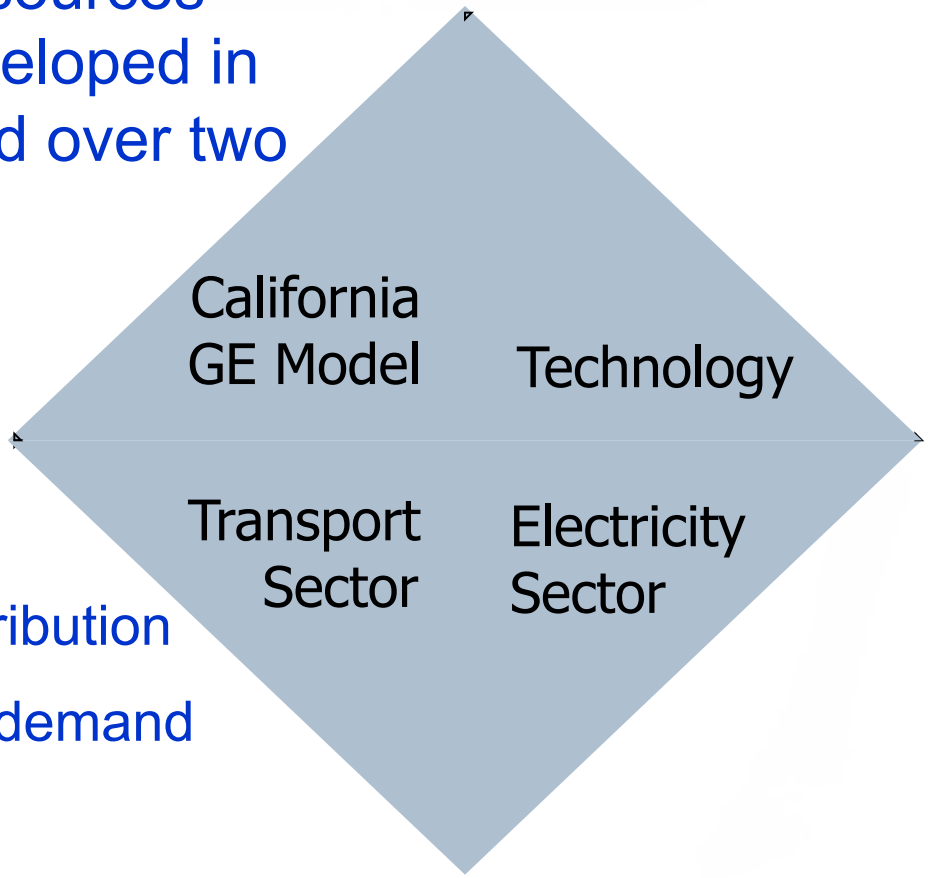
- Light-duty vehicle electrification can be a potent catalyst for economic growth, contributing up to 100,000 additional jobs by 2030.
- On average, a dollar saved at the gas pump and spent on the other goods and services that households want creates 16 times more jobs.
- Unlike the fossil fuel supply chain, the majority of new demand financed by PEV fuel cost savings goes to in-state services, a source of diverse, bedrock jobs that are less likely to be outsourced.
- Individual Californians gain from economic growth associated with fuel cost savings due to vehicle electrification, whether they buy a new car or not. As a result of light-duty vehicle electrification, the average real wages and employment increase across the economy and incomes grow faster for low-income groups than for high-income groups.

How we Forecast

The Berkeley Energy and Resources (BEAR) model is being developed in four areas and implemented over two time horizons.

Components:

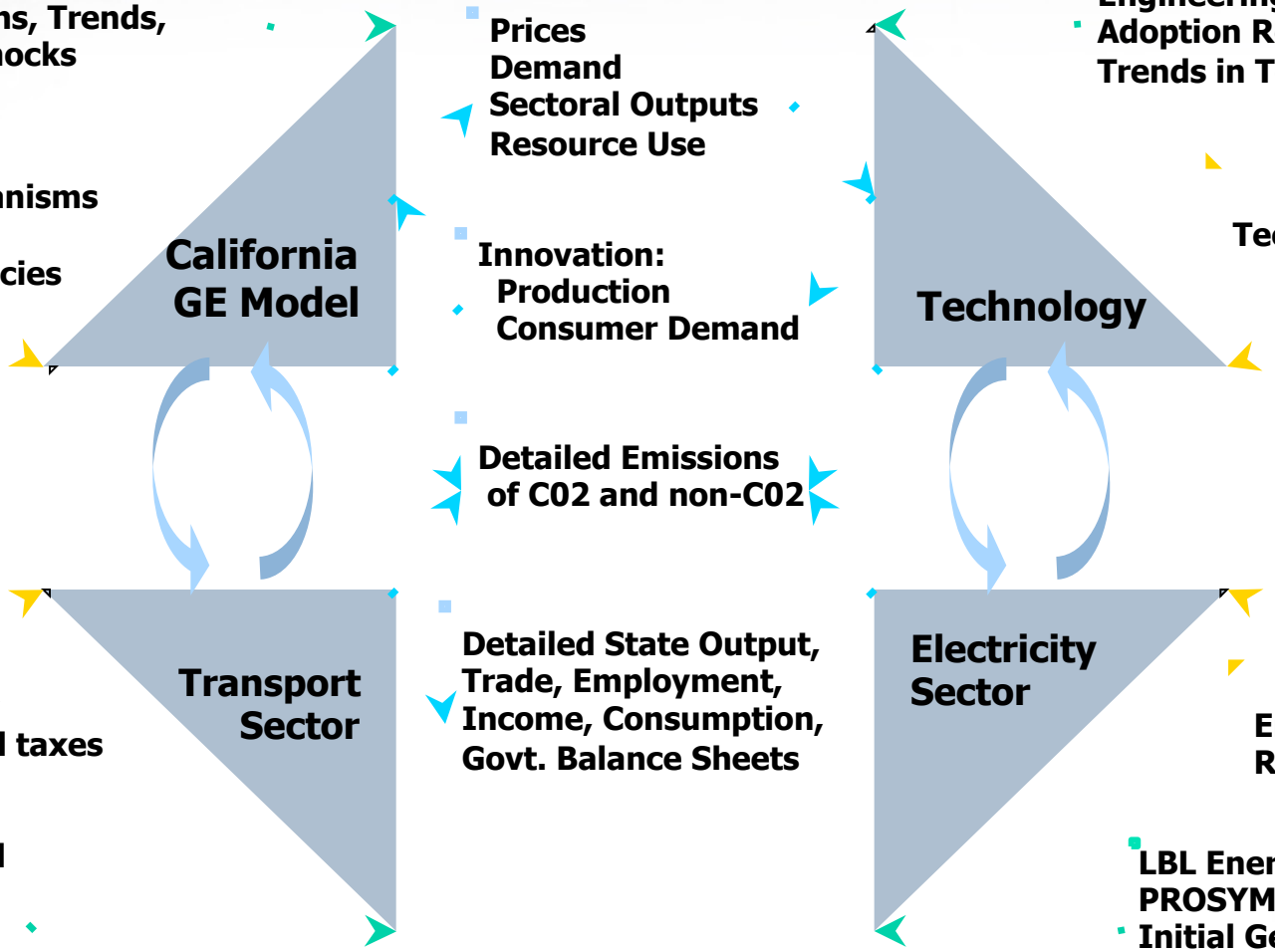
1. Core GE model
2. Technology module
3. Electricity generation/distribution
4. Transportation services/demand



Time frames:

1. Policy Horizon, 2010-2030
2. Strategic Adaptation Horizon, 2010-2050

Detailed Framework



PEV Deployment Scenarios

Scenario	Name	Description
1	Baseline	Assume California implements current commitments to state and post-1990 federal fuel economy standards, but continues growth at levels forecast by the Department of Finance. This is the baseline scenario.
2	PEV15	Including the Baseline scenarios, but assuming 15.4% PEV deployment in the new light-duty vehicle fleet by 2030, this would be consistent with the ZEV regulations being met by PEVs. Tax credits for PEV vehicles are phased out by 2020, and LCFS credits are awarded for pollution reduction (see section 3).
3	PEV45	Same as PEV15, except PEV deployment is accelerated to 45% of the new light-duty vehicle fleet by 2030.

Macroeconomic Impacts

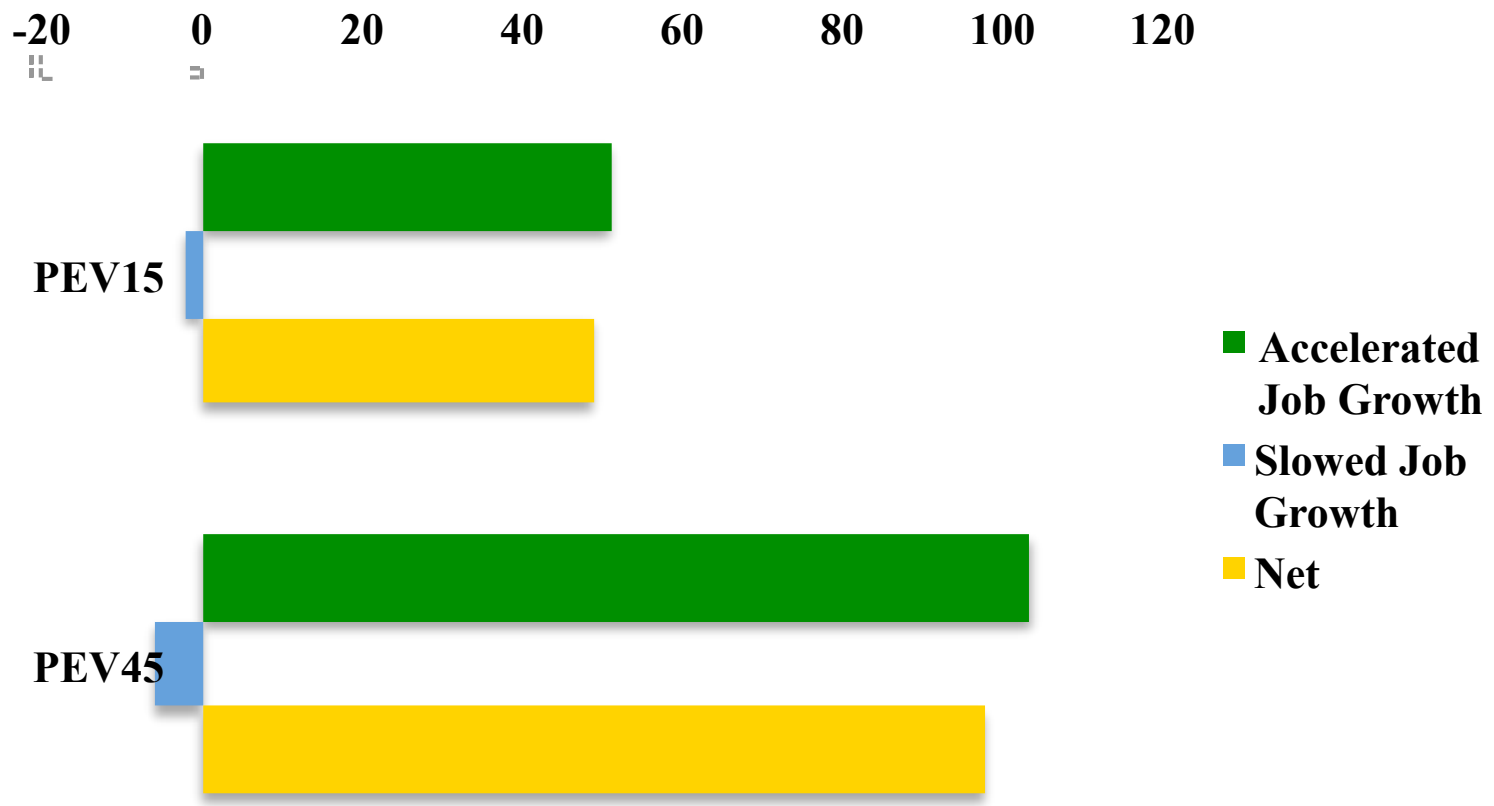
Change from Baseline trend in 2030. Billions of 2012 dollars and FTE jobs.

	PEV15	PEV45
Real GSP	4.954	8.177
Net Job Growth	48,816	97,761

Source: Author estimates.

Employment Effects

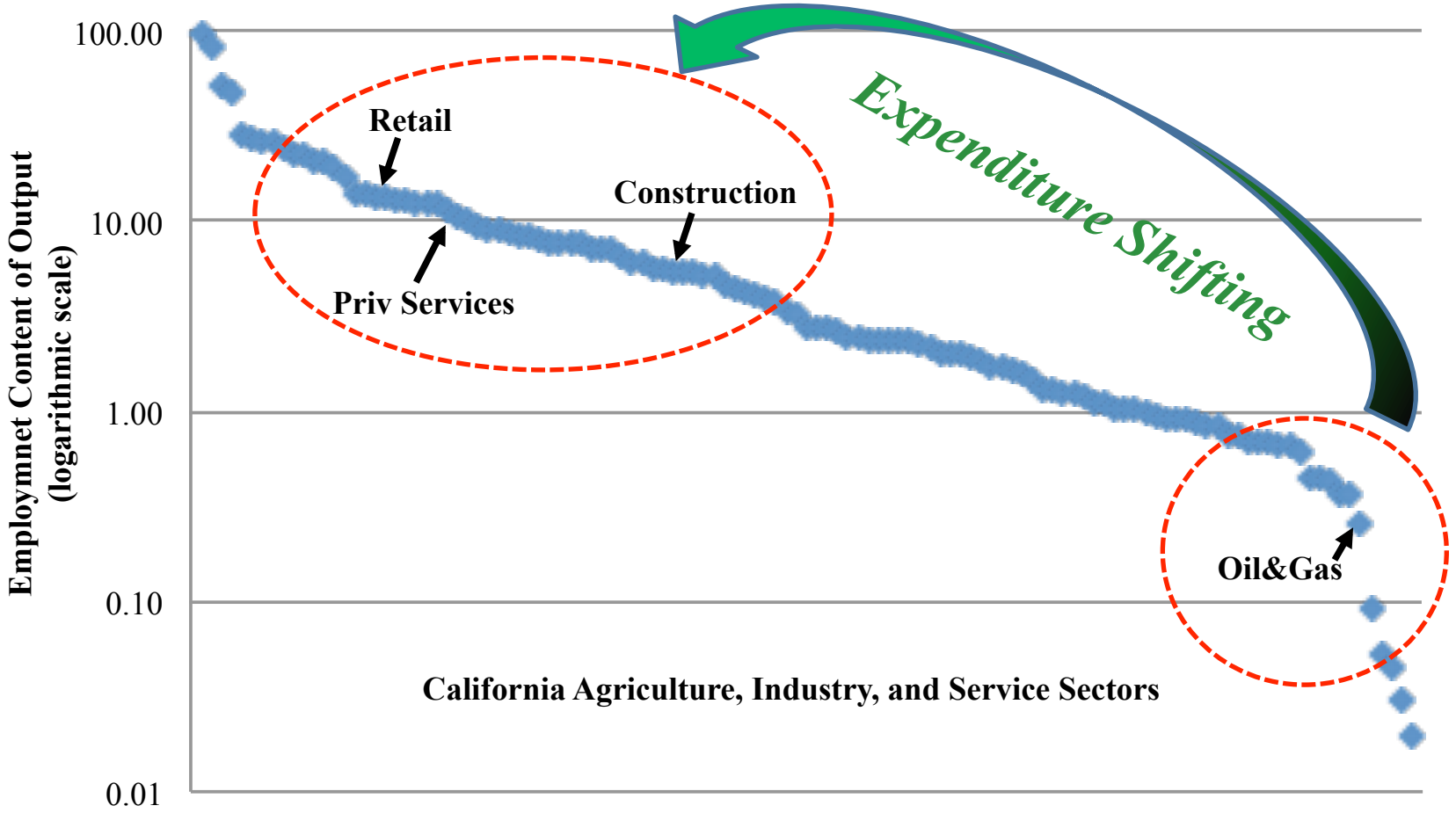
Change from Baseline trend in 2030. FTE thousands.



Source: Author estimates.

Why it works

The carbon fuel supply chain is among the least job-intensive in the economy.



Source: California Dept of Finance and Employment Development Office

Index of Job Intensity by Sector

Sector	Job Index
Agriculture	20
Construction	42
Oil & Gas	1
Vehicle Manufacturing	5
Vehicle Sales & Service	19
Wholesale & Retail Trade	29
Other Service	34

Source: California State Department of Finance and Employment Development Department

Employment Impacts by Sector
(FTE thousands, change in 2030)

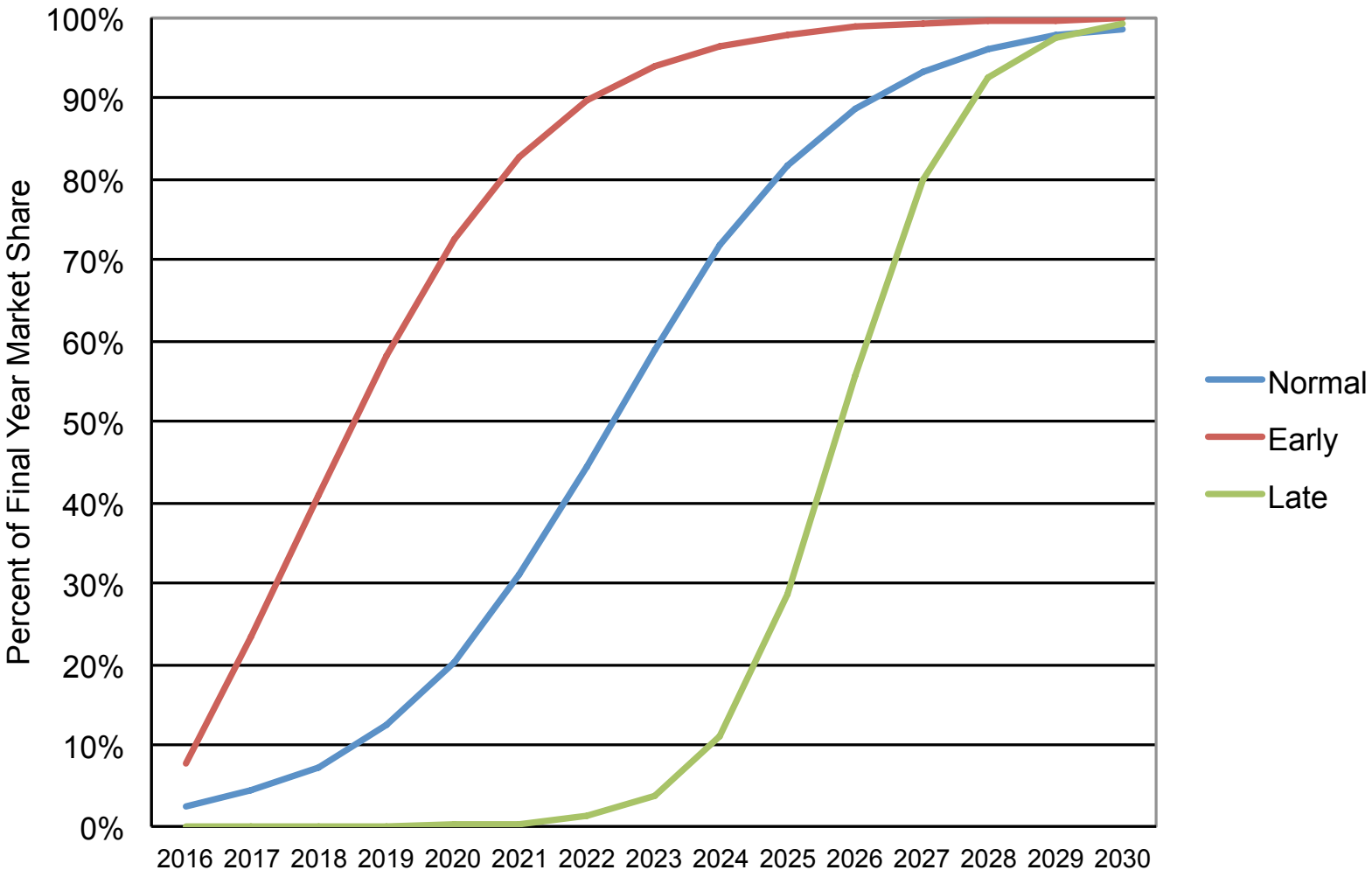
Sector	PEV15	PEV45
Agriculture	0	0
Other Primary	0	0
Oil and Gas	-2	-6
Electric Gen and Dist	1	3
Natural Gas Dist.	0	0
Other Utilities	0	0
Processed Food	0	0
Construction -– Residential	1	2
Construction -– NonRes	2	5
Light Industry	3	6
Heavy Industry	1	3
Machinery	0	0
Technology	2	4
Electronic Appliances	0	0
Automobiles and Parts	1	2
Trucks and Parts	0	0
Other Vehicles	0	1
Wholesale, Retail Trade	15	30
Transport Services	2	4
Other Services	23	45
Total Net Jobs	49	98
New Employment	51	104
Reduced Job Growth	-2	-6

Real Income by Household Tax Bracket

	Household	ZEV15	ZEV45
1	< $12k	0.2%	0.4%
2	$12-28k	0.2%	0.4%
3	$28-40k	0.2%	0.4%
4	$40-60k	0.2%	0.2%
5	$60-80k	0.2%	0.2%
6	$80-200k	0.2%	0.2%
7	$200k+	0.1%	0.2%
	Average	0.2%	0.4%

Source: Author estimates.

Vehicle Adoption



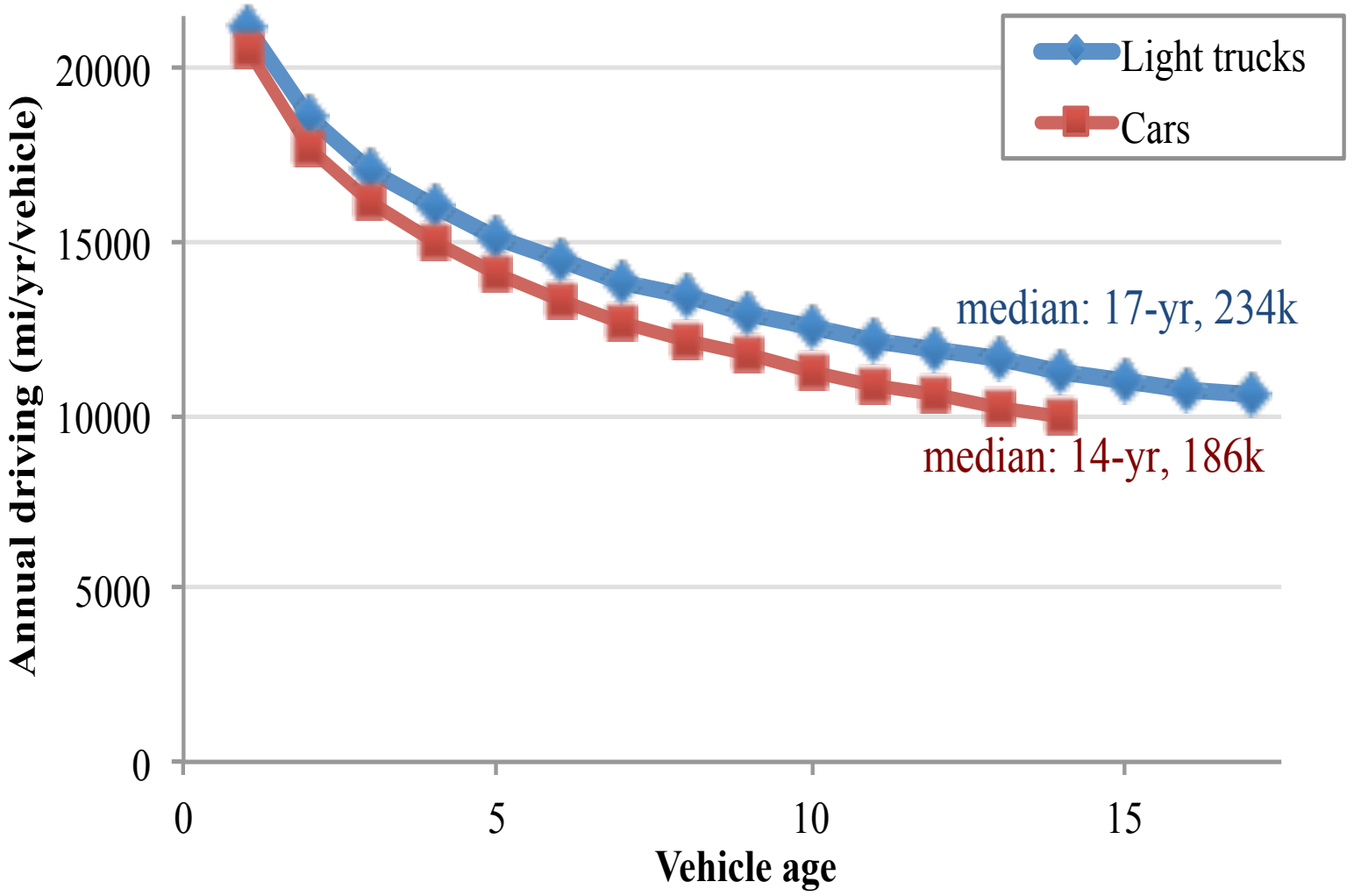
Source: Author assumption

Fleet Composition

PEV Passenger Cars (by tech type)	
PHEV20	33%
PHEV40	33%
BEV100	33%
PEV Light Trucks (by tech type)	
PHEV20	50%
PHEV40	30%
BEV100	20%

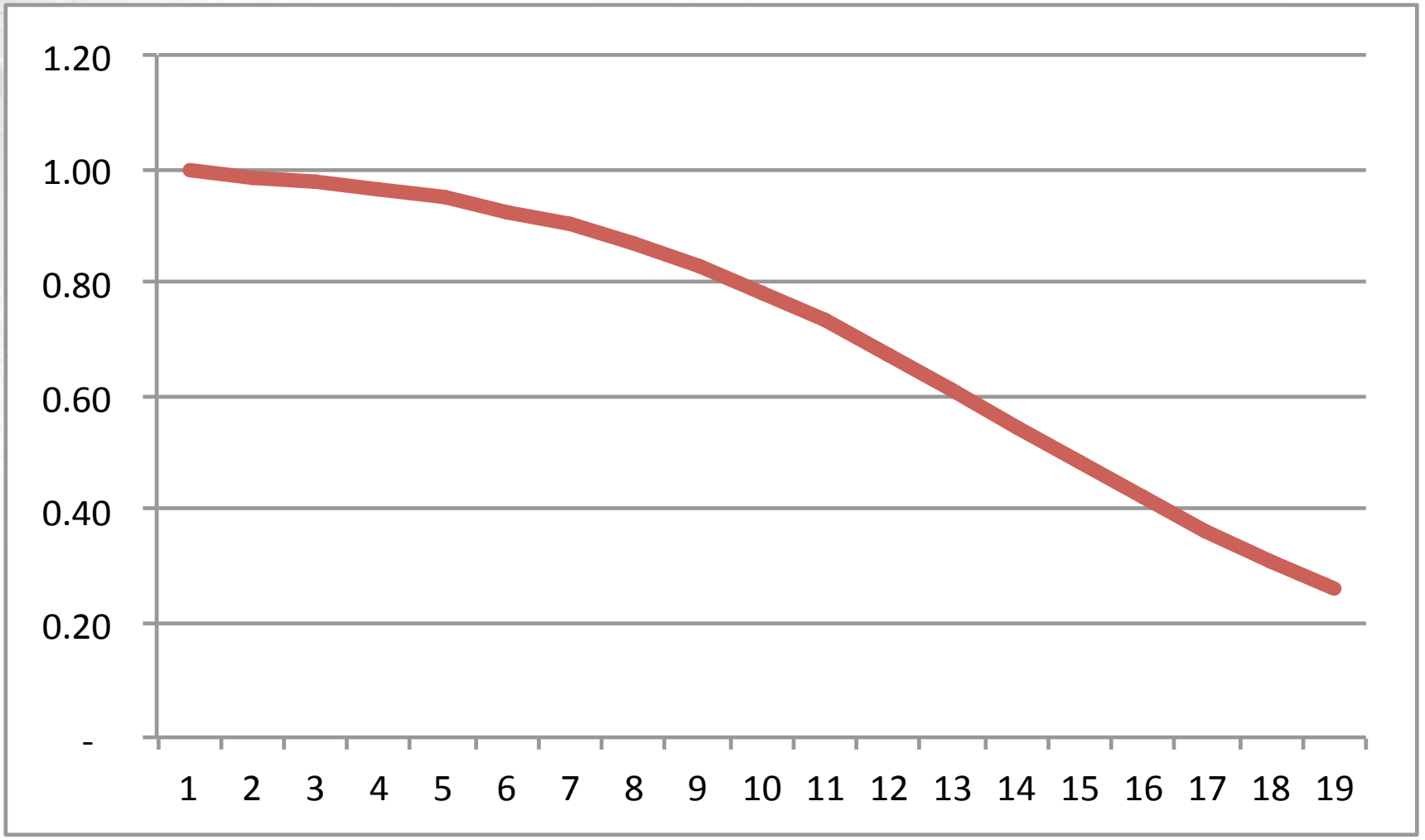
Source: Author

Vehicle Miles Traveled



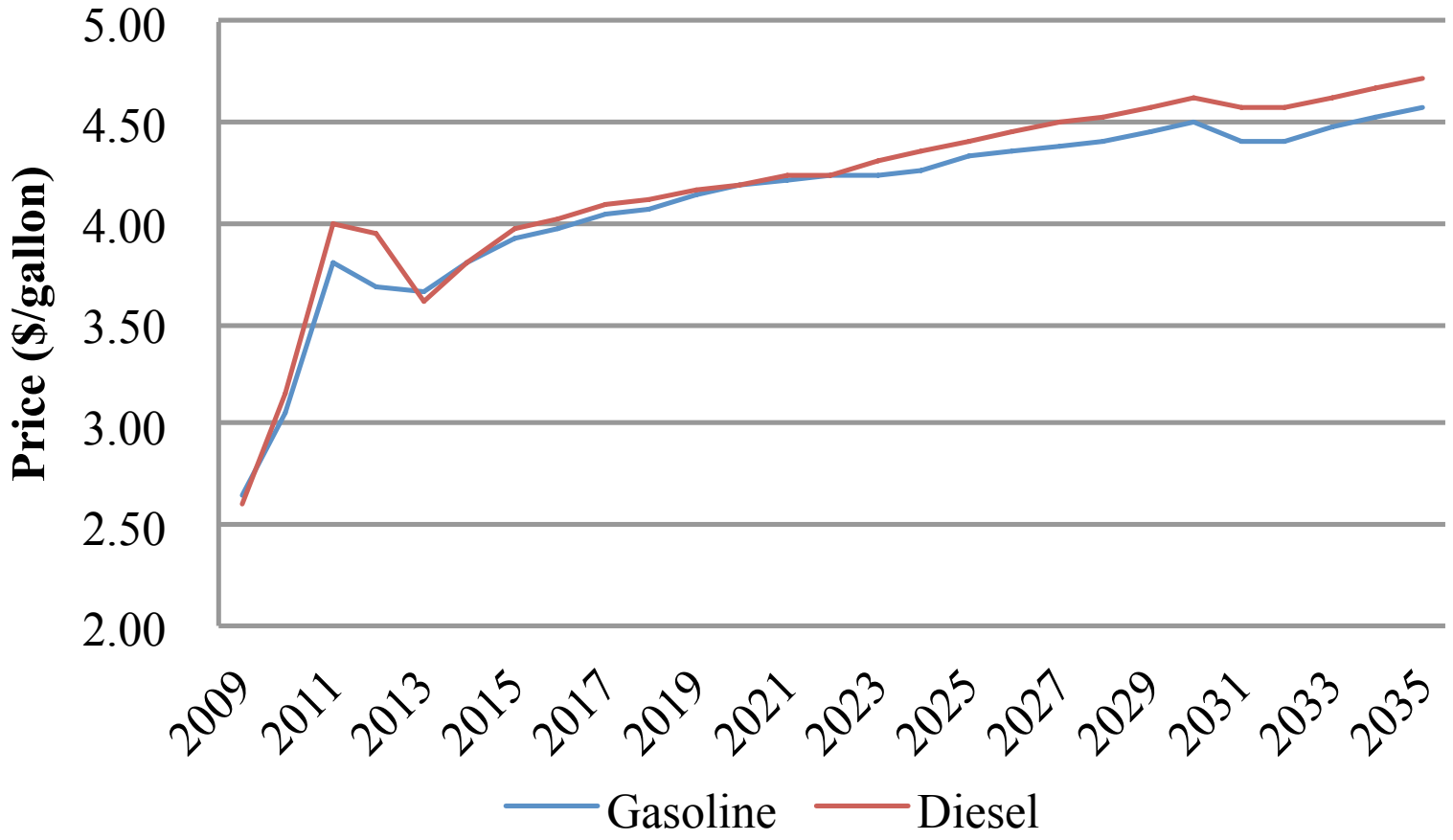
Source: CARB, 2008

Vehicle Survival Rates



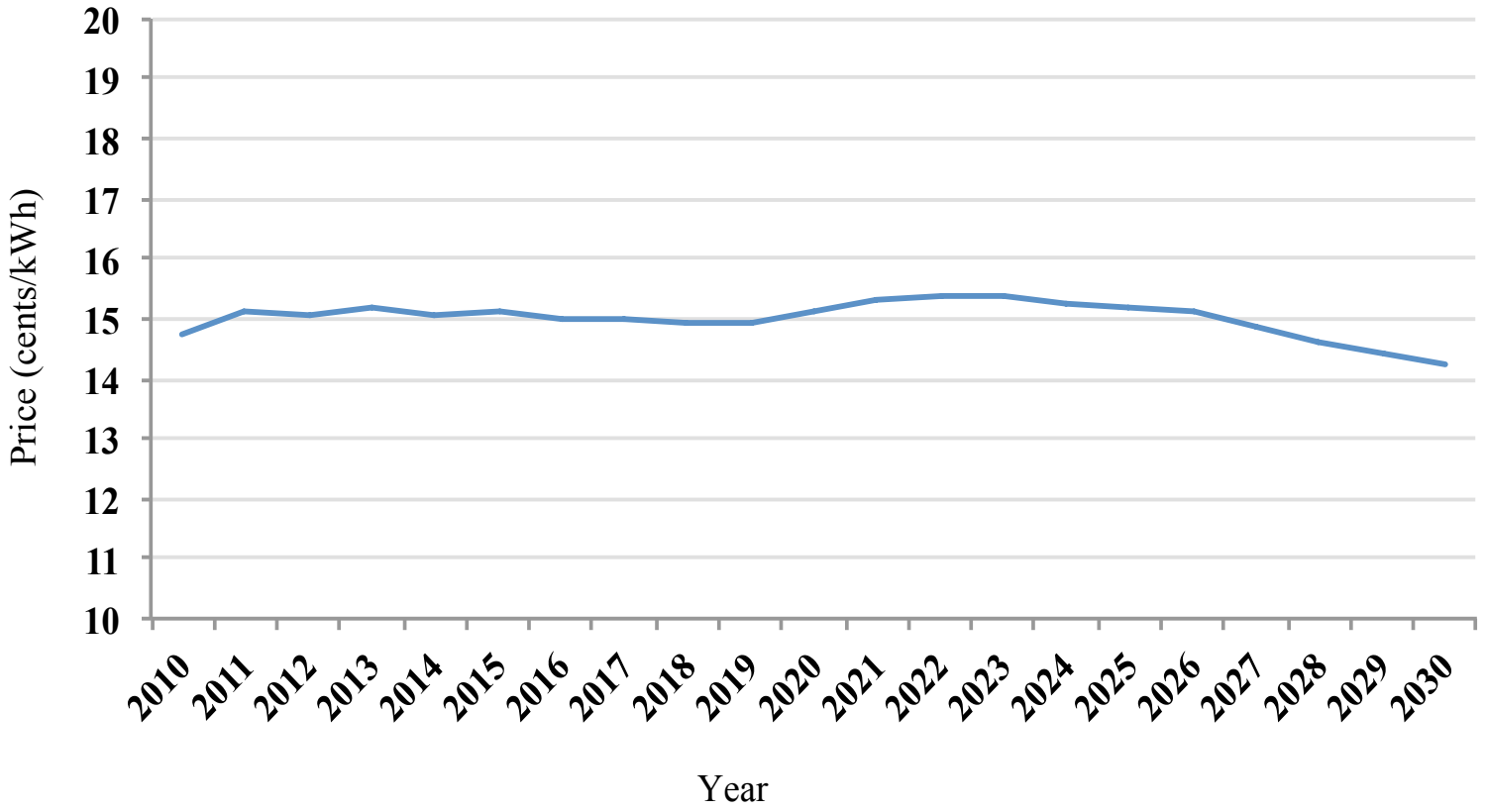
Source: SHTSA, 2006

CA Gasoline and Diesel Prices



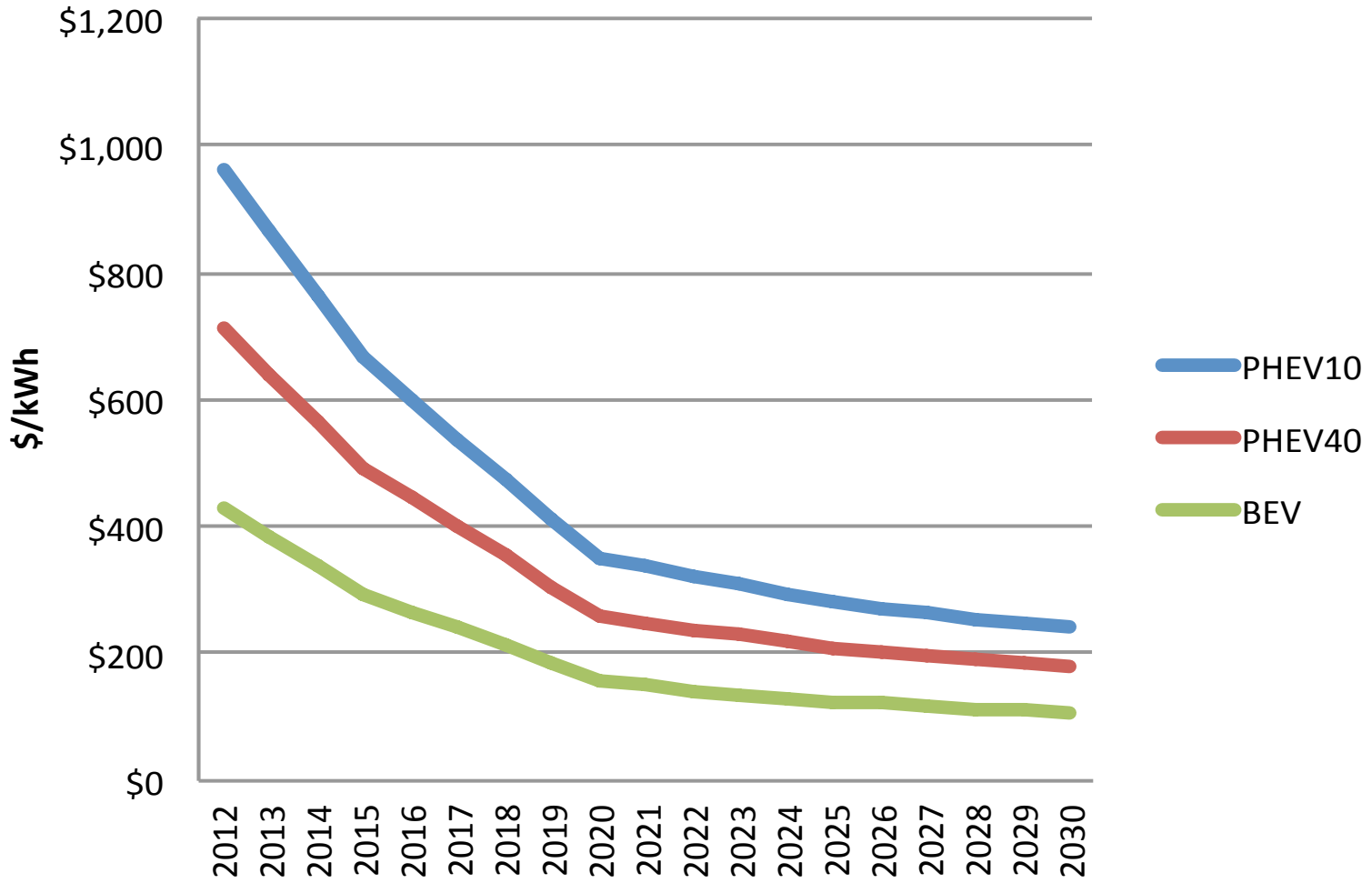
Source: EIA, 2012

Baseline CA Electricity Price



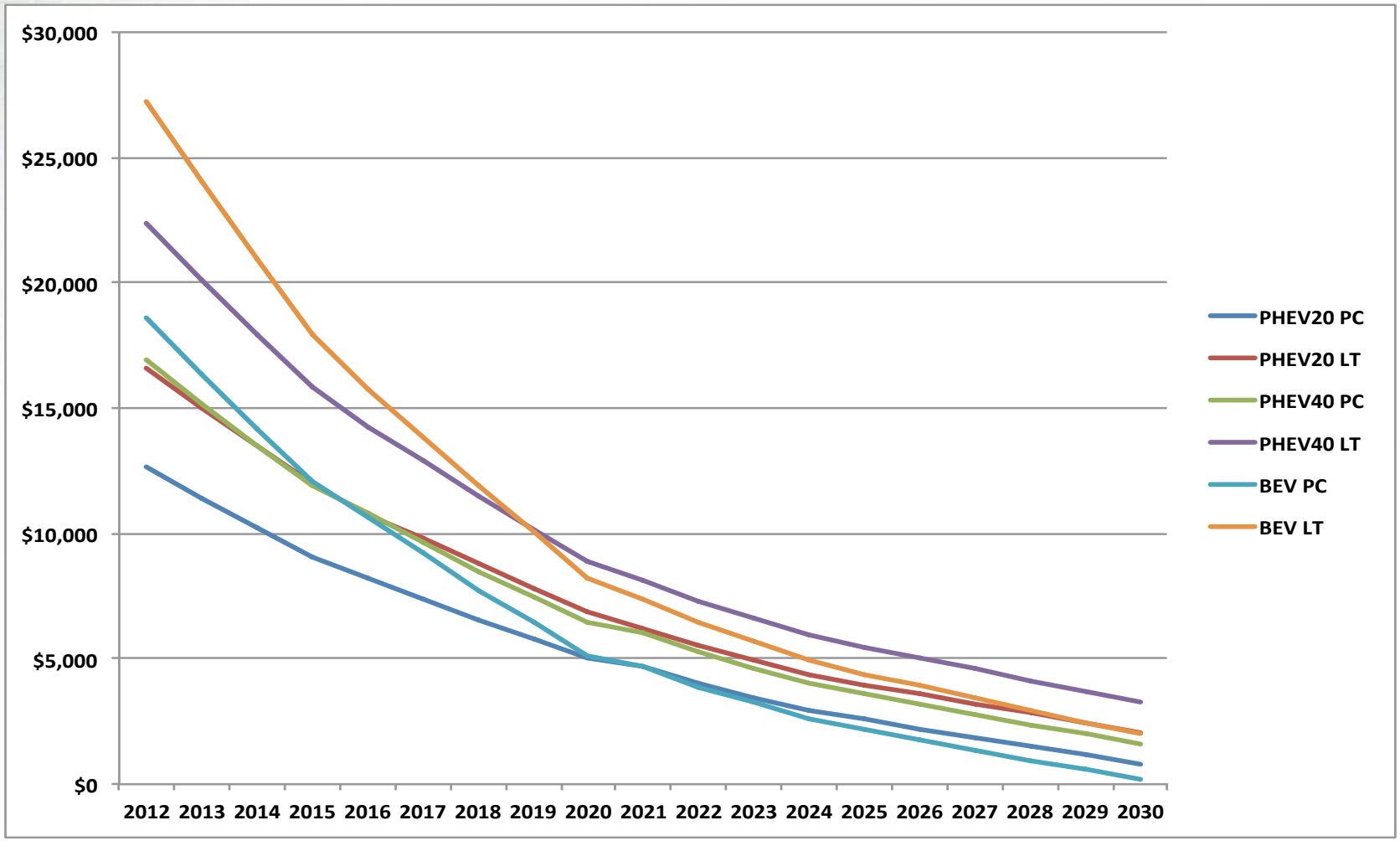
Source: EIA, 2012

Battery Cost Efficiency



Source: McKinsey, 2012

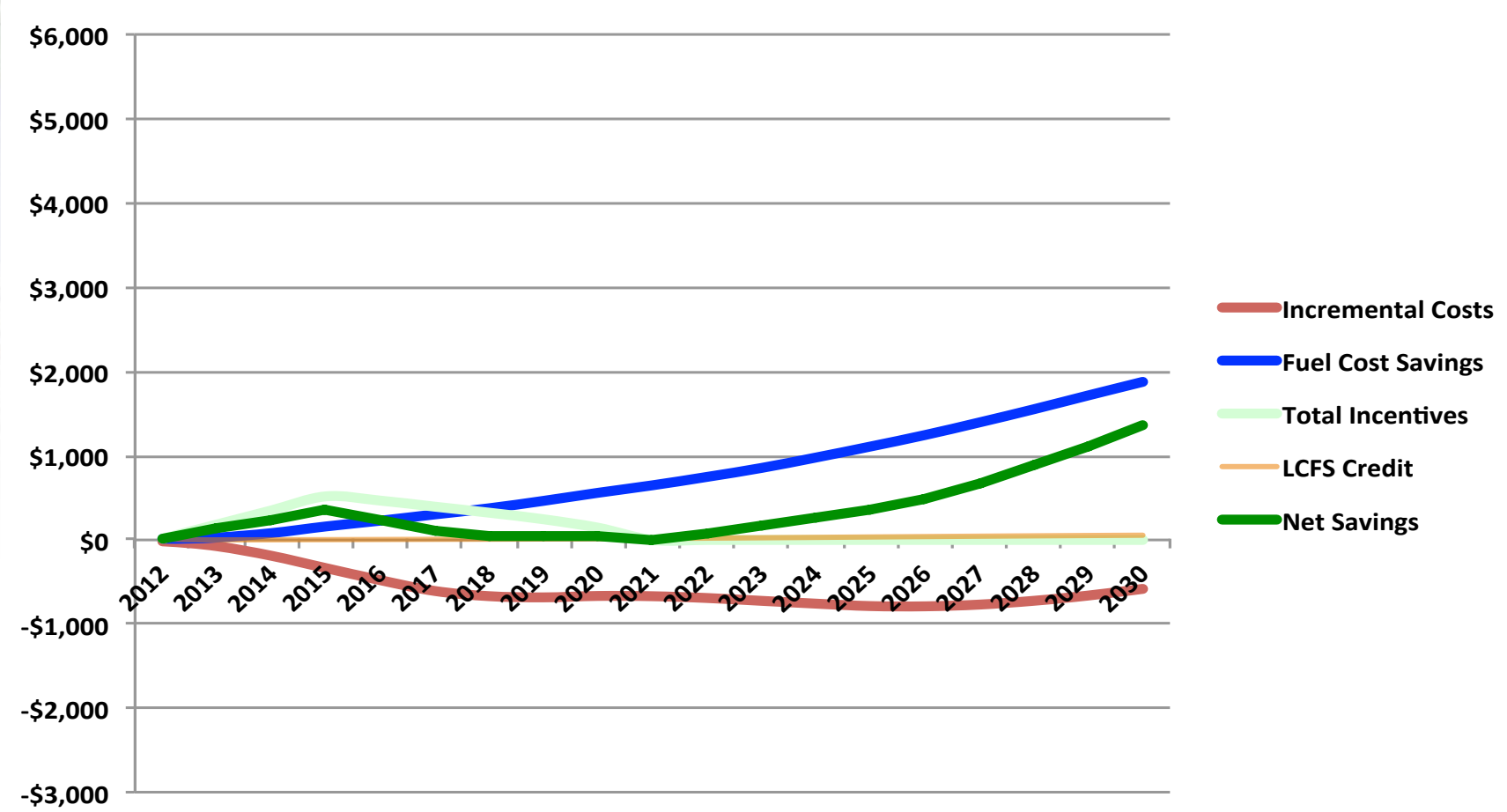
Incremental Vehicle Costs



Source: Author estimates.

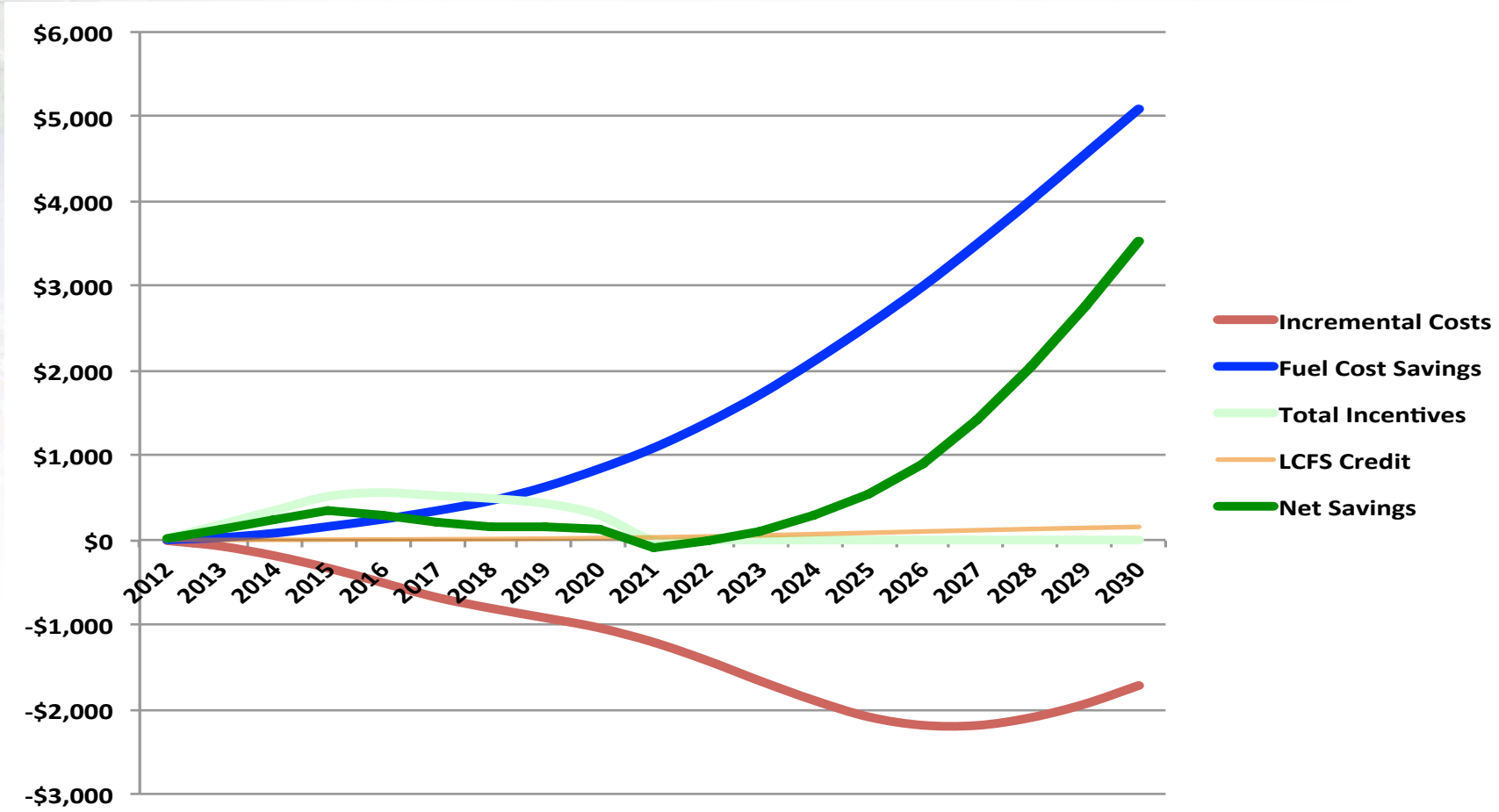
Aggregate Incremental Cost: PEV15

Millions of 2012 dollars)



Source: Author estimates.

Aggregate Incremental Cost: PEV45



Source: Author estimates.

Conclusions

- Vehicle fuel efficiency can be a potent catalyst for economic growth and energy security.
- Households and enterprises spend their fuel savings on new vehicle technology and a broad range of other goods and services, stimulating net employment growth across the state economy.
- By creating a market to incubate the next generation of fuel efficient vehicles, California can promote job growth across it's economy while capturing national and global market opportunities for technology development.

Recommendations

- More extensive analysis of program design: incentive policies, vehicle adoption patterns, and welfare effects
- More intensive analysis of likely market and technology responses
- Assessment of other transport classes

Discussion