Comparison of promotion programs for new energy vehicles
新能源汽车激励政策比较

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国际清洁交通委员会

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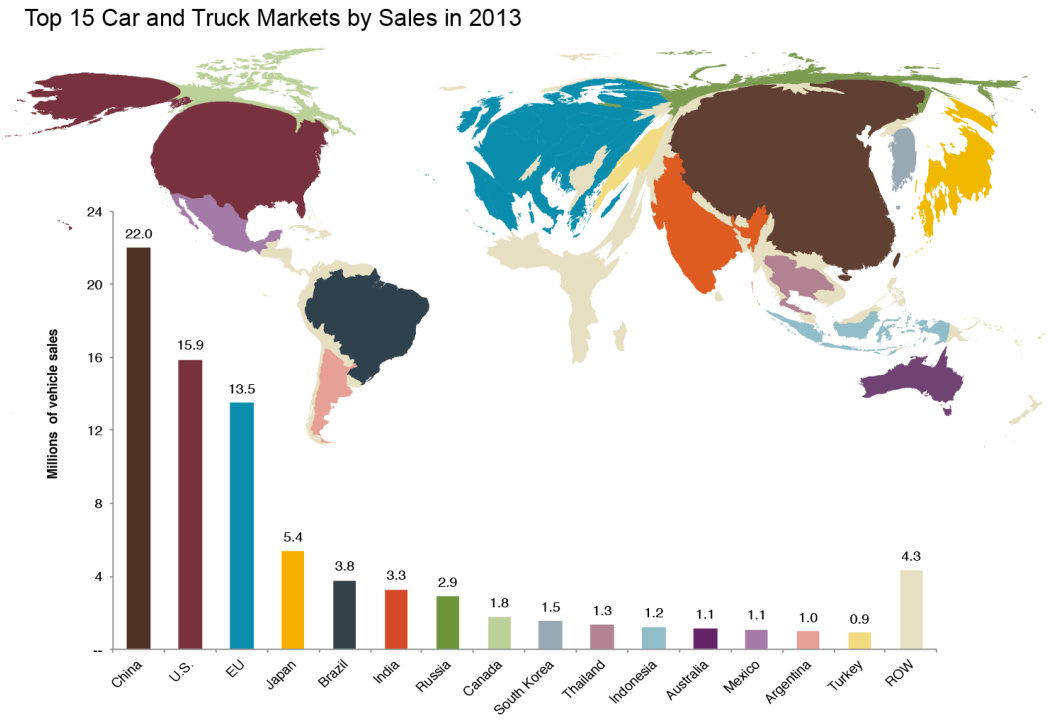
We are a nonprofit independent international research institute
ICCT简介

International Council Composed of top government regulators (~25) in major markets founded in 2001.

Non-profit Organization
ICCT incorporated to serve International Council, staff of 35 technical experts on vehicles and fuels, half with background / nationality outside US founded in 2005. Offices in DC, San Francisco and Berlin. China office coming later this year.

Board of Directors
Dan Greenbaum, head of Health Effects Institute, chair of ICCT board.

Funding
California philanthropies plus government grants and contracts.



Mission: To dramatically improve environmental performance and efficiency of motor vehicles (cars, trucks, marine, aviation) and fuels by supporting government regulatory agencies in world's top vehicle markets.

Geographic scope: China, US, EU, Japan, Brazil, India, Canada, Korea, Indonesia, Australia, Mexico plus smaller markets by request.

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- Global trend of NEVs
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  - Phase I: Global consumer incentive policy comparison
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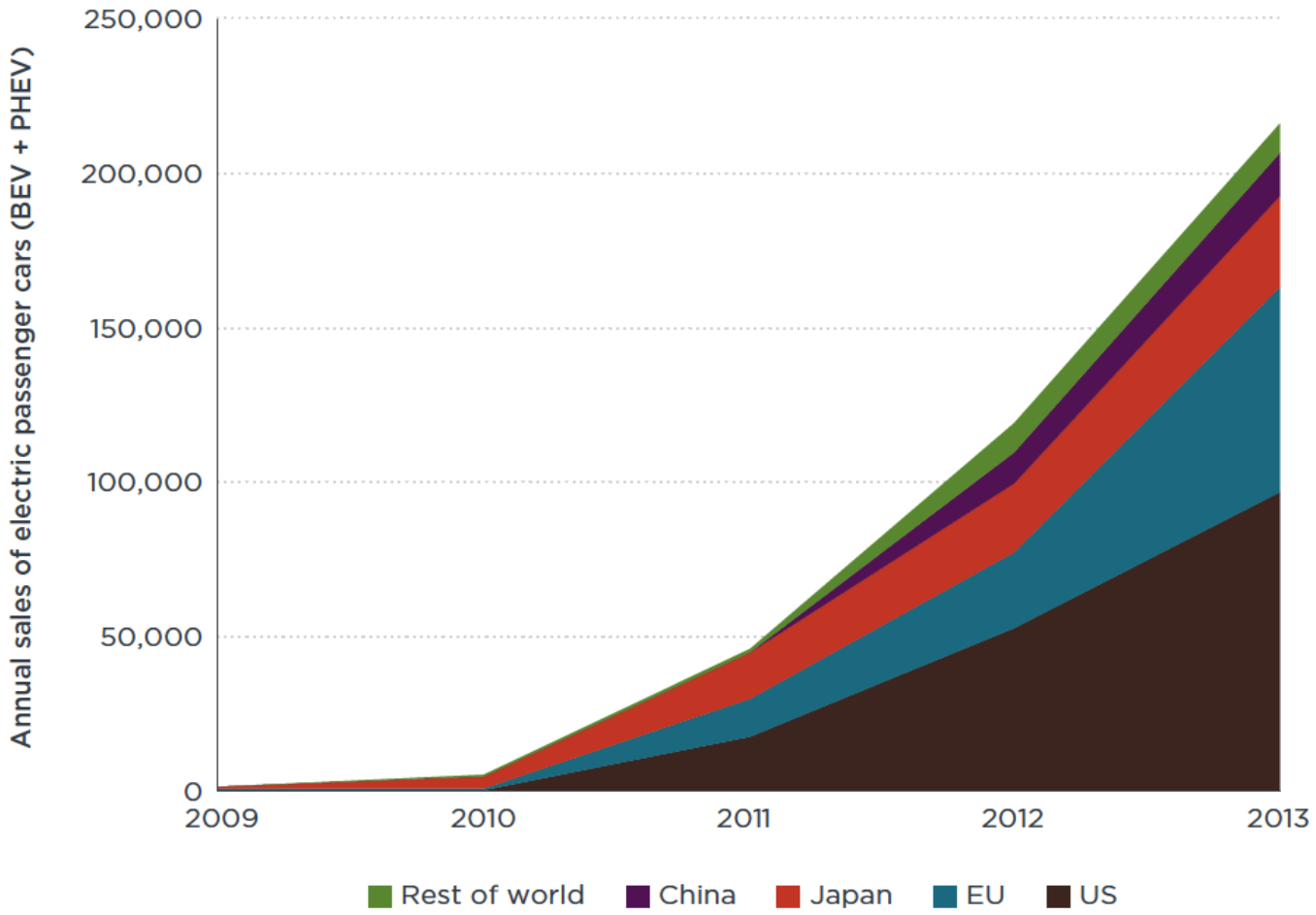
NEV on the rise, globally
新能源车在全球销量增长迅速

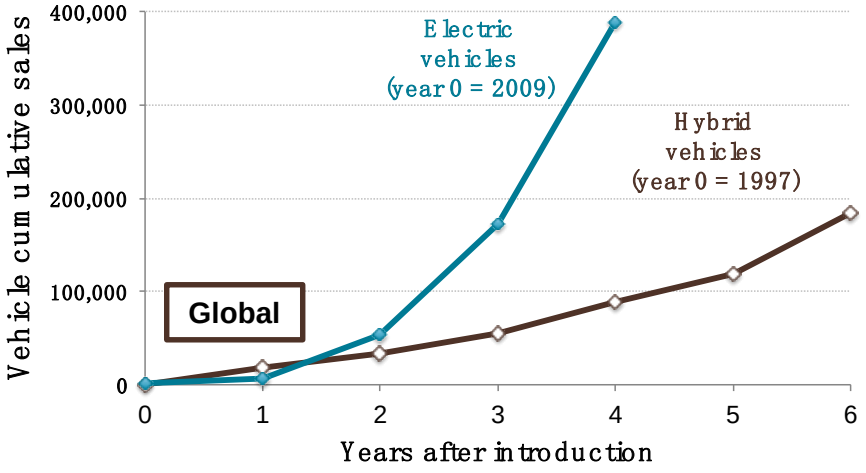
- Global NEV sales doubled in each of the past three years
  - US, EU and Japan China are major EV markets, China is following…



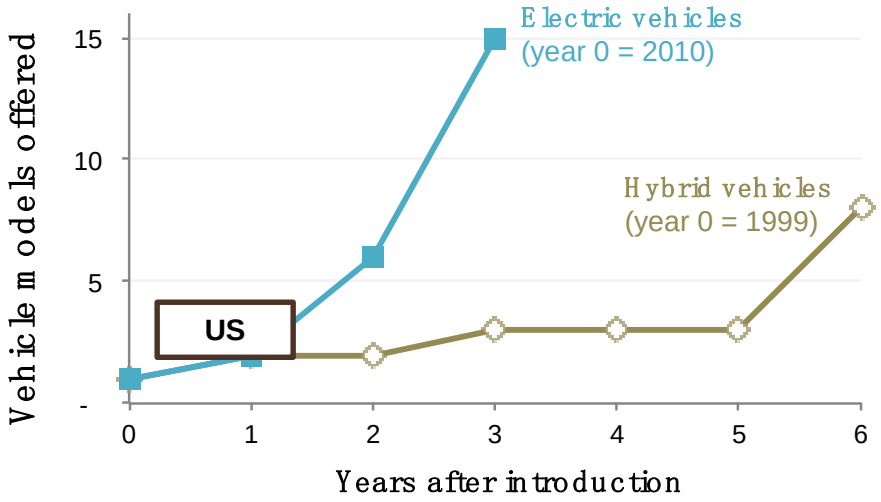
ICCT EV report: http://www.theicct.org/driving-electrification-global-comparison-fiscal-policy-electric-vehicles

NEV sales outperform hybrids
新能源车的发展势头超过当初混合动力车的情况

- EVs are still <1% of auto sales in most markets, but the EV market is growing quicker than hybrids
- More model offerings (US example)



Source: ICCT internal analysis



Source: Nic Lutsey, Actions in the US to accelerate electric vehicle deployment. June 4, 2014. GFEI/ICCT workshop

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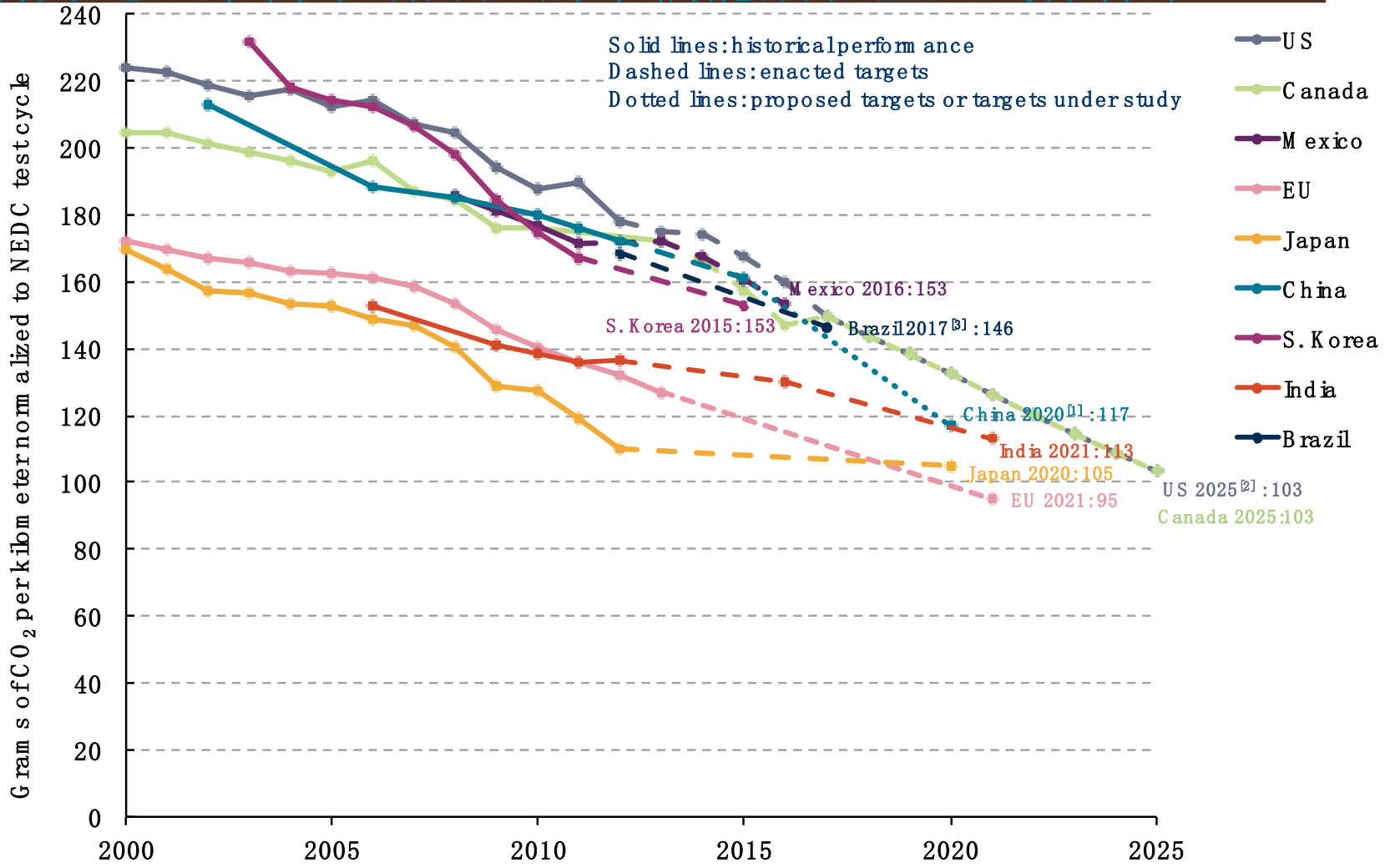
One strong motivation is the increasingly tightened vehicle efficiency standard

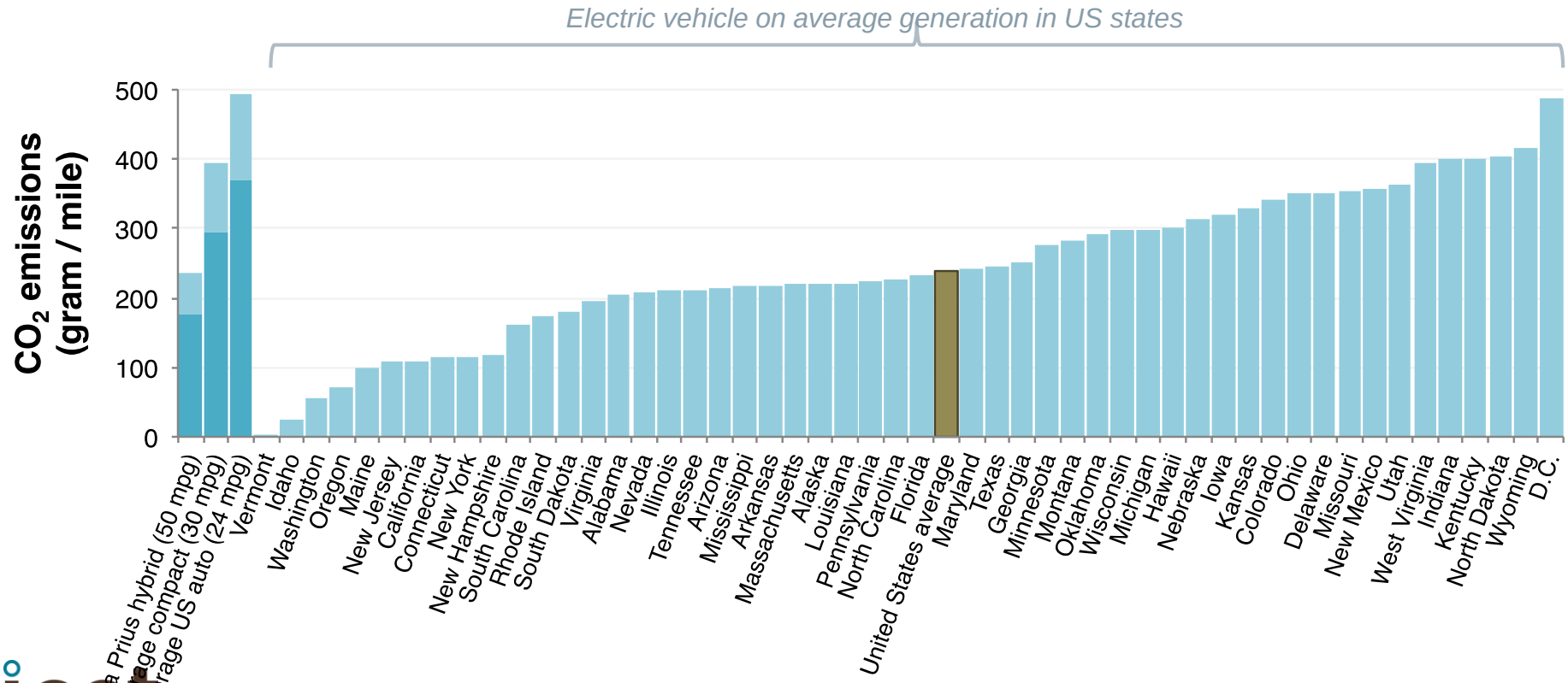
动力之一来自不断加严的车辆能效和温室气体标准



[1] China's target reflects gasoline vehicles only. The target may be higher after new energy vehicles are considered.
[2] US standards GHG standards set by EPA, which is slightly different from fuel economy stadards due to low-GWP refrigerant credits.
[3] Gasoline in Brazil contains 22% of ethanol (E22), all data in the chart have been converted to gasoline (E00) equivalent
[4] Supporting data can be found at: http://www.theicct.org/info-tools/global-passenger-vehicle-standards.

Help the US achieve GHG reduction goals
帮助美国达到其温室气体减排目标

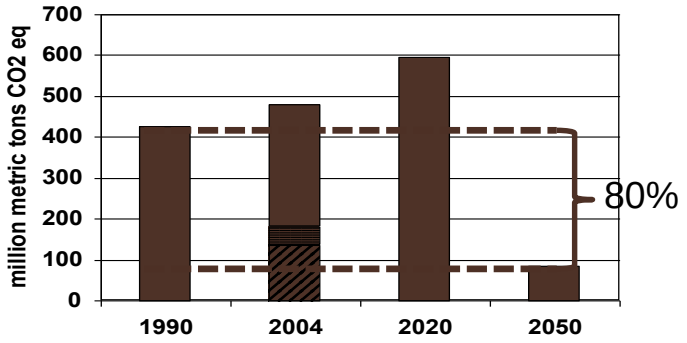
- Electric vehicles compare favorably to efficient ICE vehicles, and in many cases to efficiency hybrid vehicles on lifecycle carbon emissions
  - Even against average US electric grid (44% coal, 23% NG, 20% nuclear, 10% renew)
  - Especially on electric grids in East and West coasts with low coal, high renewable content

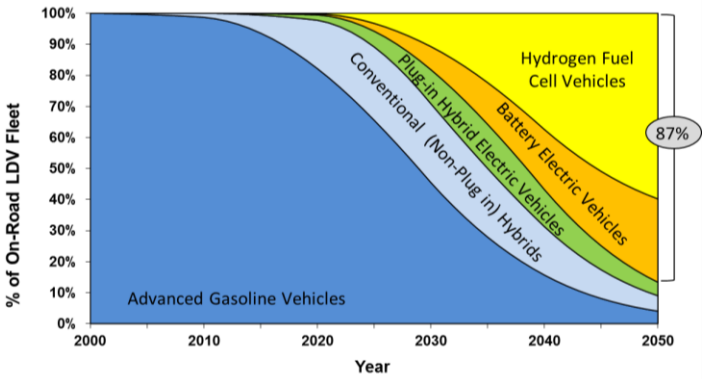


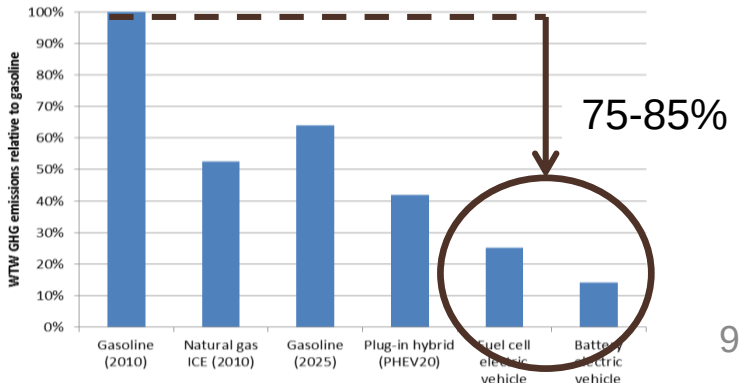
Sources: US EPA "Trends" report (http://www.epa.gov/otaq/fetrends.htm); US EPA eGRID (http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html); Includes upstream energy extraction, transmission and distribution, charging losses

GHG reduction is one major driver in California
加州的主要动力来自温室气体减排

- Reduce GHG emissions
  - 1990 levels by 2020
  - 80% below 1990 levels by 2050
  - Transport sector represents 38% today
- Strategies
  - Fuel: Clean electricity and H_2 focus
  - Vehicles: Advanced Technologies, virtually all ZEVs by 2050
  - Transportation: Improved Efficiency
    - Reduce vehicle usage
    - City planning
- ZEV program







Source: Mike McCarthy, CARB

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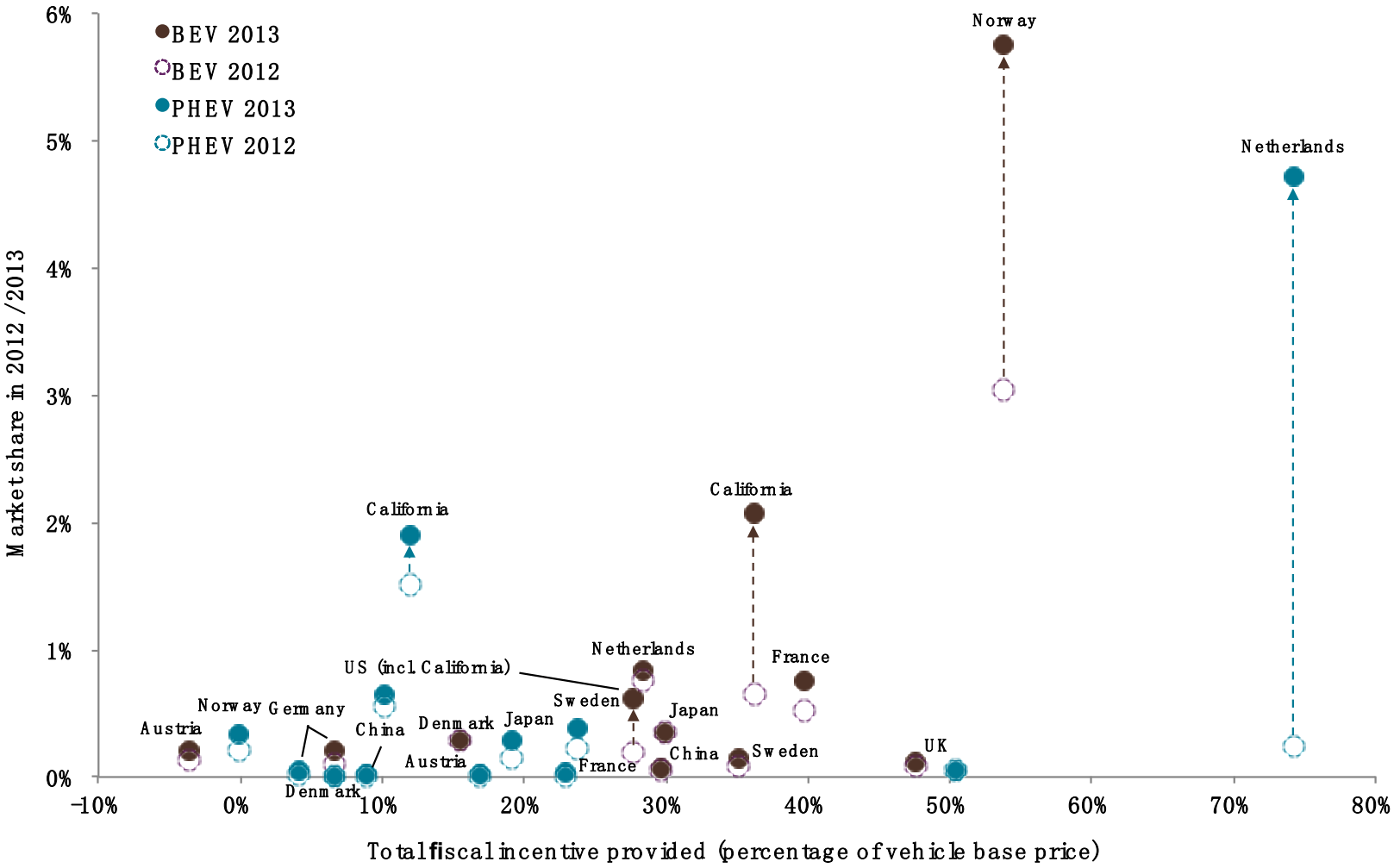
Fiscal incentives driving penetration levels
财税激励拉动新能源车市场



ICCT EV report: http://www.theicct.org/driving-electrification-global-comparison-fiscal-policy-electric-vehicles

ICCT research on NEV fiscal incentives and market penetration
ICCT第一项研究着眼于国家层面财政激励和市场占有率的关系

Comparison of two pairs of passenger vehicles – a BEV and its counterpart, and a plug-in hybrid and its counterpart – in major vehicle markets in 2012 and 2013

Vehicle type	Renault Zoe	Renault Clio	Volvo V60	
	BEV	gasoline	diesel-PHEV	diesel
Engine power [kW]	65	66	206	158
Engine displacement [cm³]	n/a	898	2,400	2,400
Acceleration time 0-100 km/h [s]	13.5	13.0	6.1	7.7
Empty weight vehicle [kg]	1,428	1,009	1,955	1,821
Transmission type	automatic	manual	automatic	automatic
CO_2 emission [g/km NEDC]	0	99	48	169
Fuel consumption [l/100km NEDC]	0	4.3	1.8	6.4
Electricity consumption [kWh/100km]	14.6	n/a	21.7	n/a
Battery range [km]	210	n/a	50	n/a
Vehicle base price (Germany) excl. VAT [EUR]*	21,422	13,277	51,571	43,412

* Vehicle prices are adjusted for optional equipment and, for EV, include costs for battery (four-year rent cost if the battery is not purchased)

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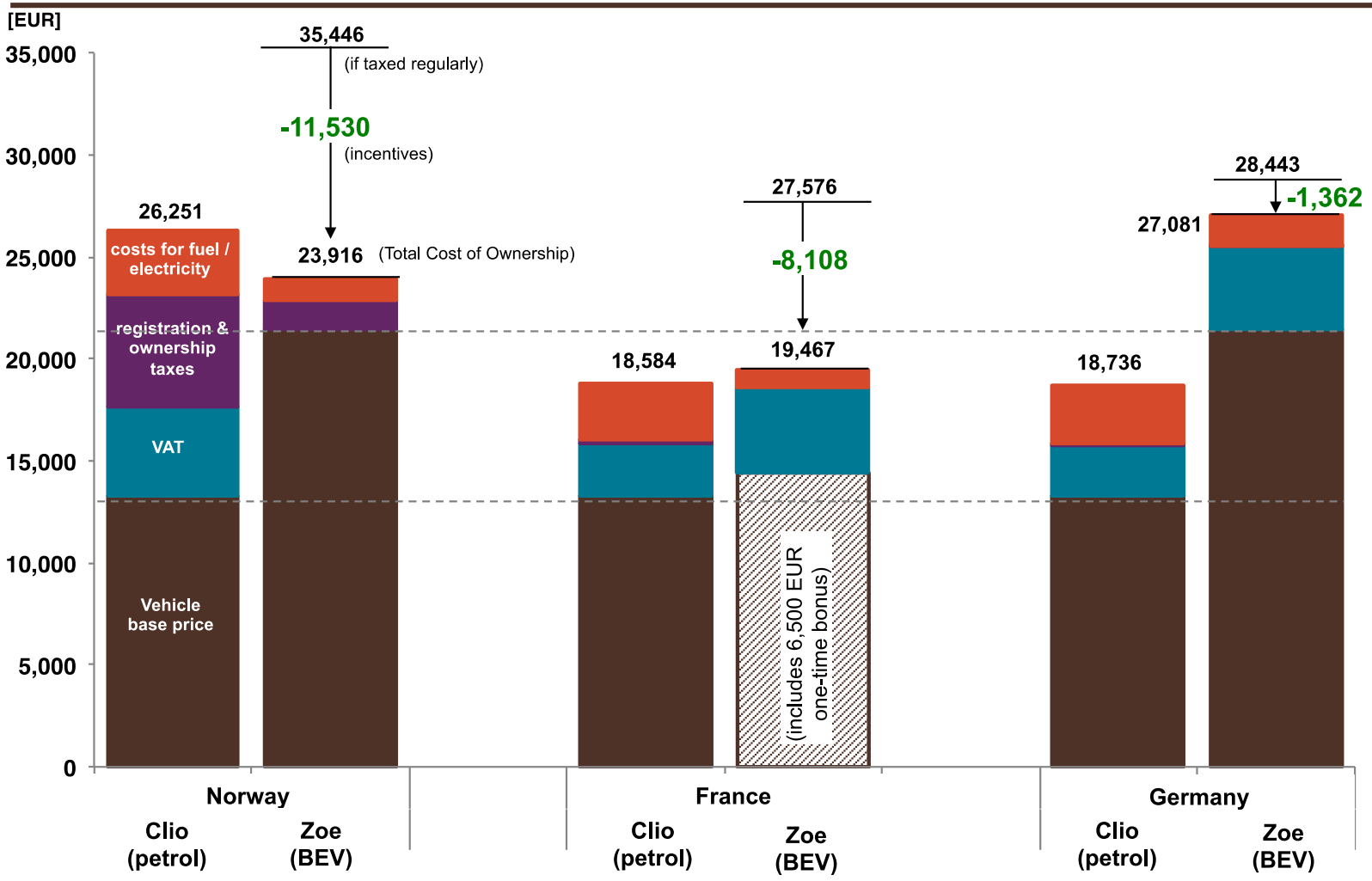
Source: Mock and Yang, Driving Electrification: A Global Comparison of Fiscal Incentive Policy For Electric Vehicles, ICCT, 2014.

Total cost of ownership (TOC)
评估使用周期财税激励的总影响



Total Cost of Ownership includes vehicle purchase and registration costs, as well as ownership taxes and fuel / electricity costs for 4 years. All data estimates for tax year 2013. Vehicle base prices are assumed to the identical in all countries

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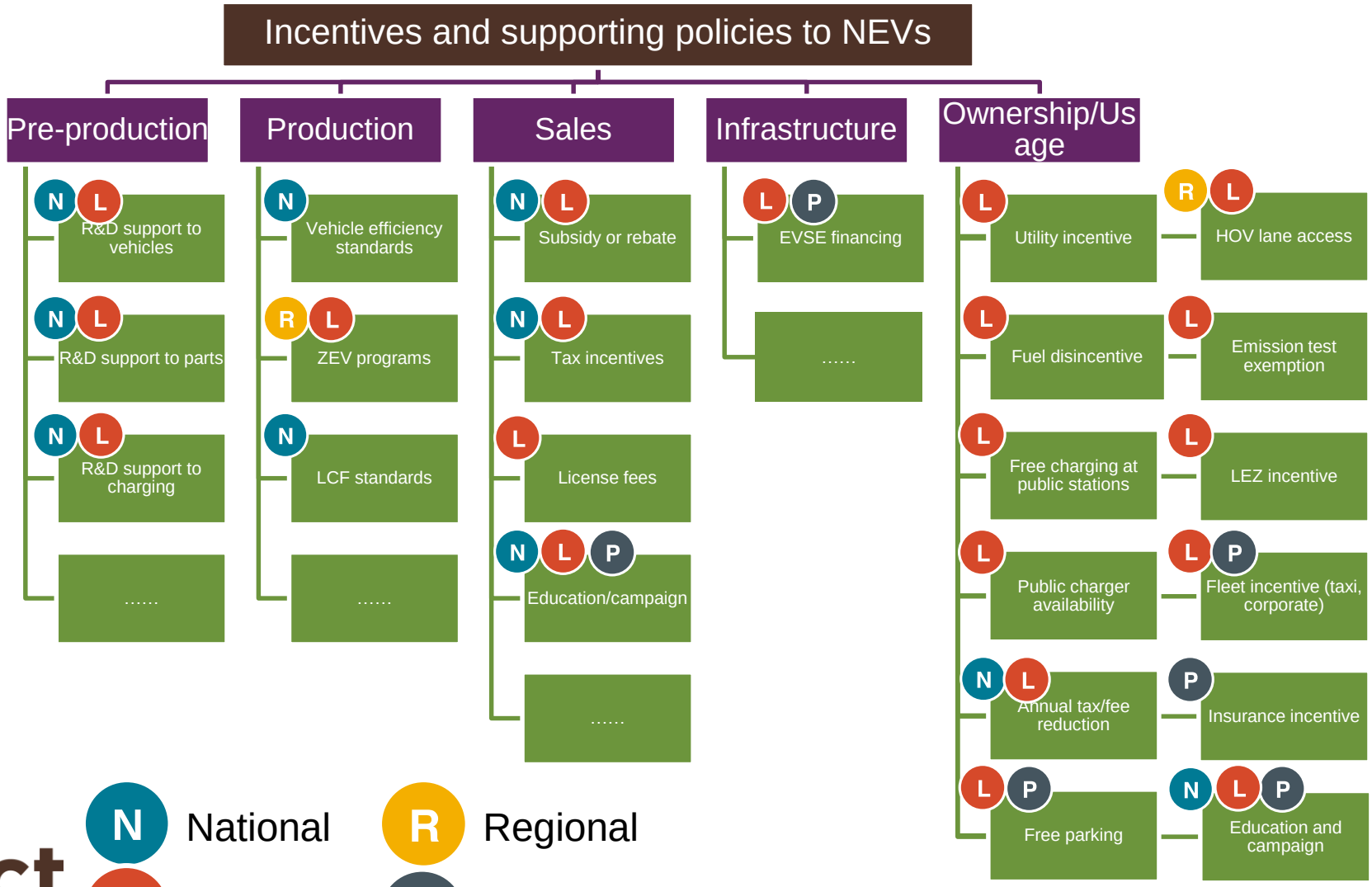
Many policy options from various stage at different levels
电动汽车推广政策在不同阶段不同层面有多种选择



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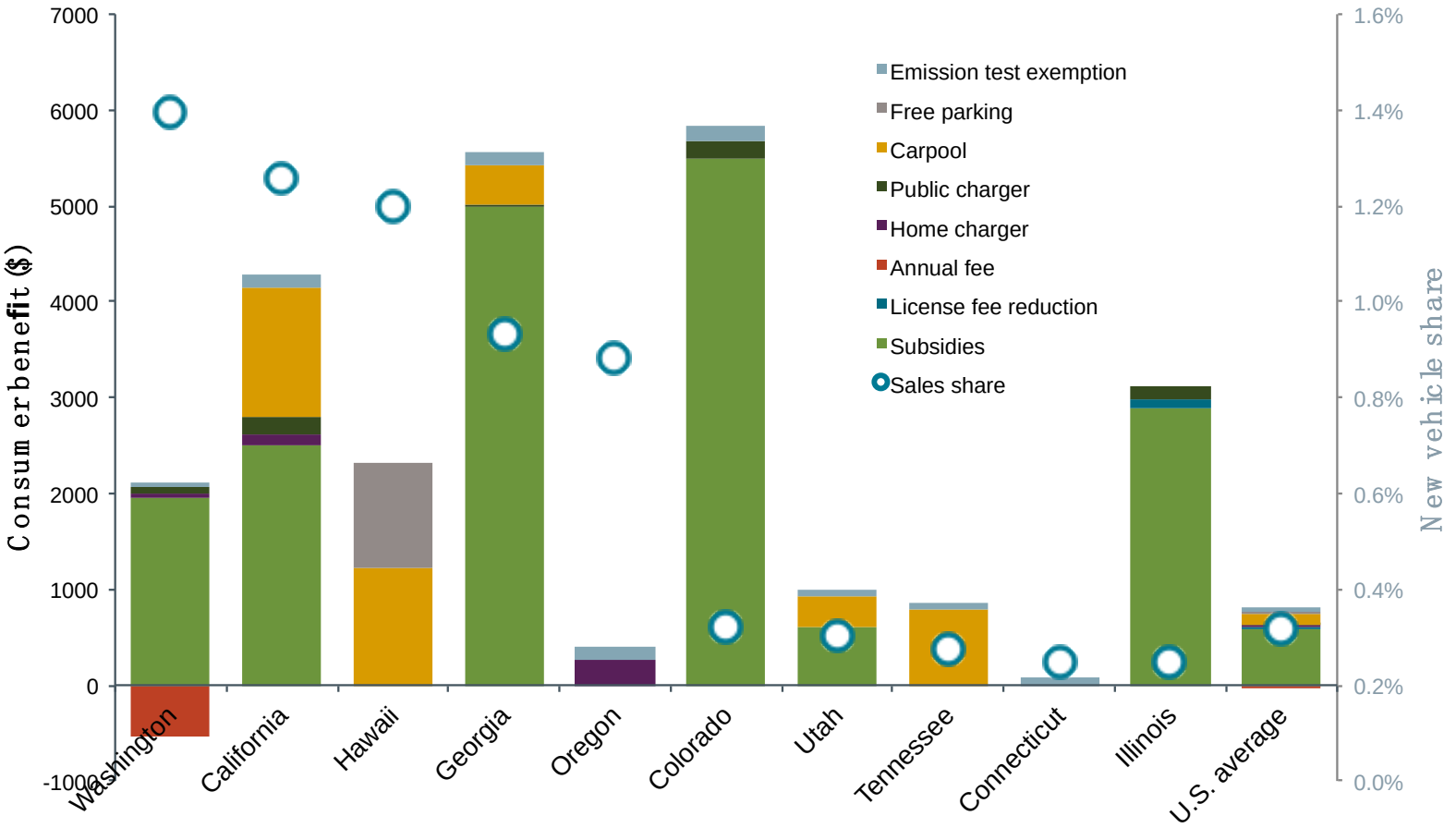
Total state benefit available to consumers for BEVs
州政府可量化的消费者激励（纯电动车）



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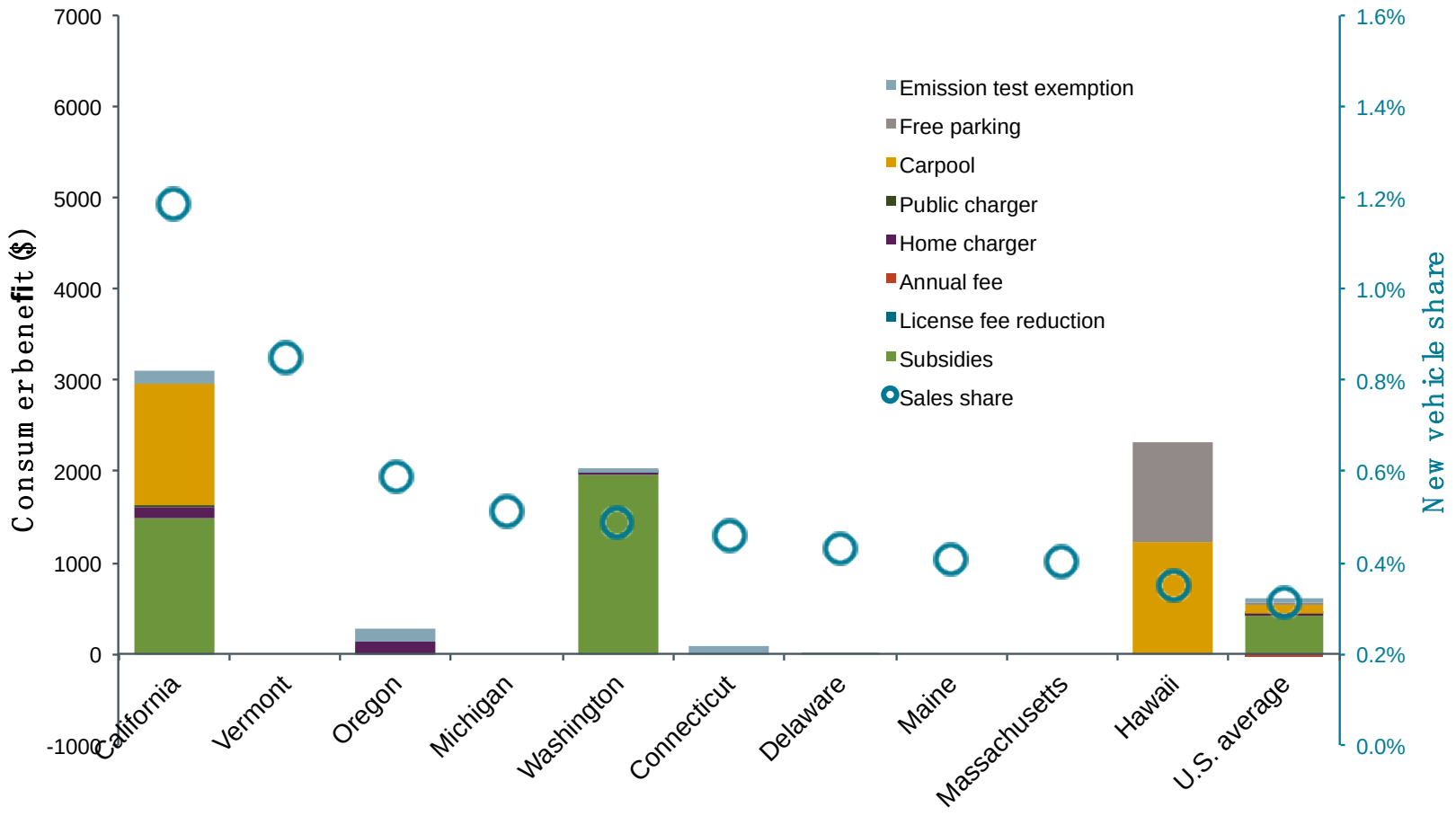
State benefit available to consumers for PHEVs
州政府可量化的消费者激励（PHEV）



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The impact and cost-benefit of various policy measures
各种激励政策的影响和成本收益

- Total monetary benefit available to BEV owners is significantly positively correlated with BEV sales

Variables	P-value
Log(total benefit)	0.044
Log (vehicle sales)	<0.0001
Log(% income>$100k)	<0.0001

- Return value for public charger investment is large for BEVs but small for PHEVs due to range confidence difference
- Our cost-benefit analysis did not account for environmental, public health and climate benefits. If these are included, return values would be higher

Benefit-cost ratios	BEVs	PHEVs
Direct subsidies	1	1
HOV lanes	1.19	1.17
Public chargers	2.45	0.41
Home chargers	1	1

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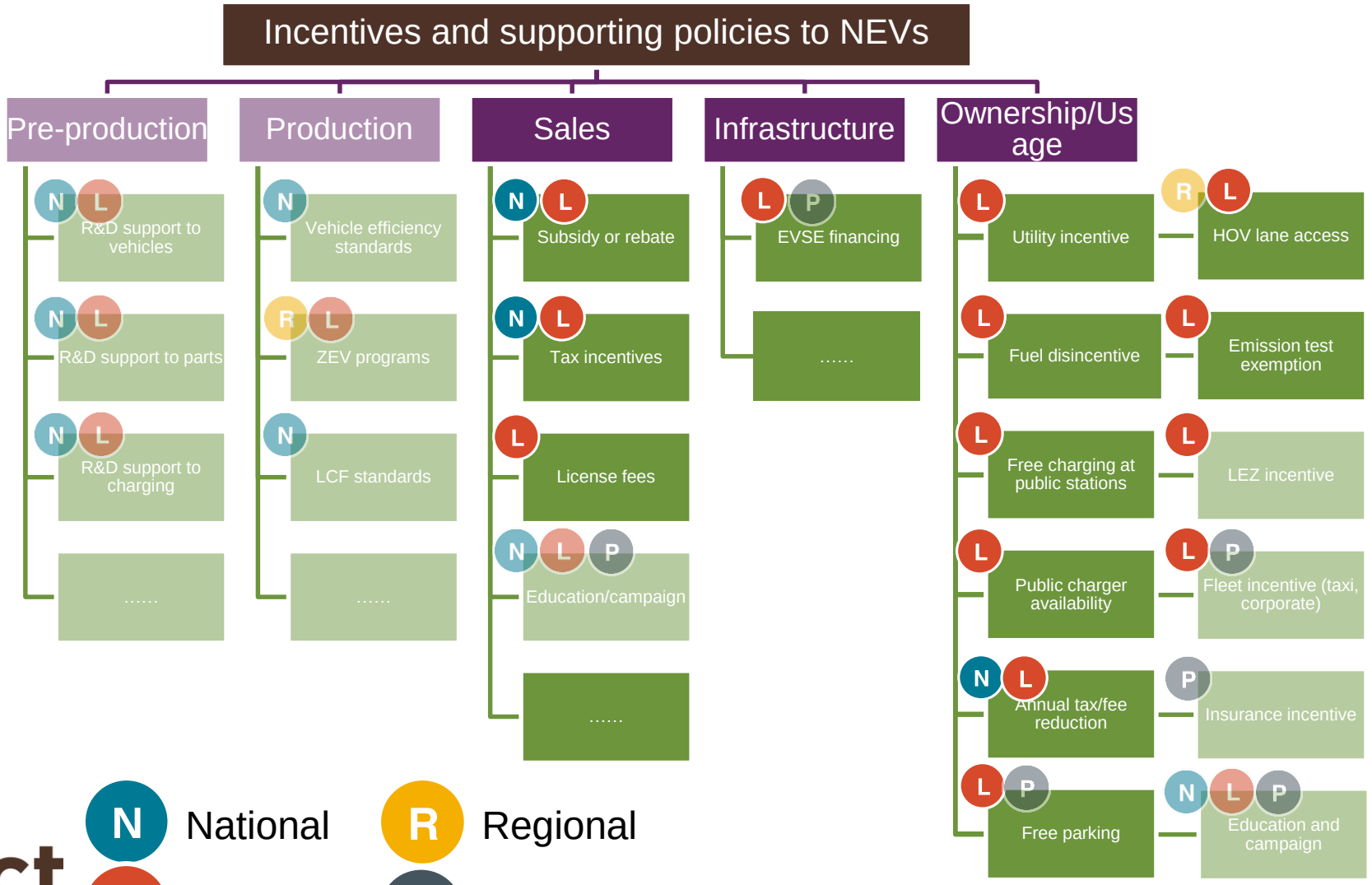

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Some untouched but important policies
研究中未涉及的重要政策

- Zero Emission Vehicle program
  - Requires ~15% electric vehicle share (BEV, PHEV, FCV) by 2025
  - Other states following California, 8 States' goal: 3.3 million EVs by 2025
- Credit benefit from ZEV or fuel economy standards
  - Tesla made $130 million by selling ZEV credits in 2013
- US—about $7.5 billion investment to promote EVs from 2009-2019
  - Congressional Budget Office estimates, including tax credits, technology, electrification, and manufacturing

Federal Incentives Available to Buyers or Producers of Electric Vehicles

Incentive	Description	Budgetary Cost (Billions of dollars)
Tax Credits for New Plug-in Electric Drive Motor Vehicles	Tax credits of up to $7,500 for buyers of new electric vehicles	2.0[a]
Electric Drive Vehicle Battery and Component Manufacturing Initiative	Grants to manufacturers of batteries and other parts for electric vehicles	2.0[b]
Transportation Electrification Initiative	Grants to establish development, demonstration, evaluation, and education projects to accelerate the introduction and use of electric vehicles	0.4[b]
Advanced Technology Vehicles Manufacturing Program	Up to $25 billion in direct loans to manufacturers of automobiles and automobile parts to promote the production of high-fuel-efficiency vehicles	3.1[c]

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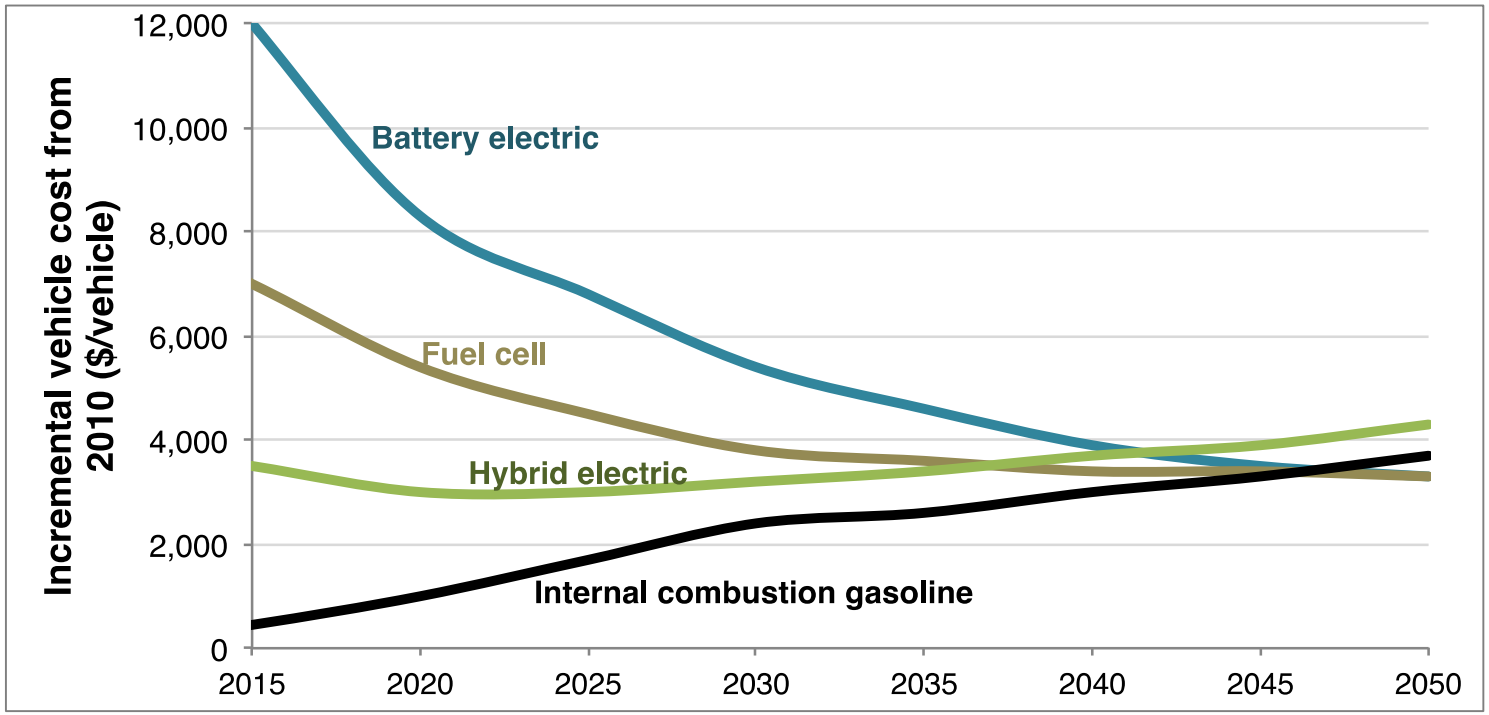
ZEV program: http://www.arb.ca.gov/msprog/zevprog/zevprog.htm;
California PEVC: http://www.pevcollaborative.org; C2ES: http://www.c2es.org/us-states-regions/policy-maps/zev-program
Tesla ZEV credits: http://cleantechnica.com/2014/04/23/california-ruling-means-tesla-will-get-less-eco-credits/
CBO: http://www.cbo.gov/sites/default/files/cbofiles/attachments/09-20-12-ElectricVehicles_0.pdf

Forecast: NEV price parity by 2050

先进机动车技术成本在长期会有所下降

- Affordable NEVs in the future
  - ICE cost goes up due to stricter requirements to emission and efficiency;
  - NEV cost drops due to economy of scale, learning curve, and infrastructure readiness, with aggressive NEV promotion policies in place



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Greene et al (2014) *Transitioning to Electric Drive Vehicles*. http://www.theicct.org/transitioning-electric-drive-vehicles

National Research Council (2013) *Transitions to Alternative Vehicles and Fuels* http://www.nap.edu/catalog.php?record_id=18264

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US city-level policy research project
下一步美国城市层面政策研究

- Deeper dive to review and analyze city-level policies in the US
- Extend the existing methodology to monetize non-fiscal policies
- Continue to explore the “unknown” type of policies
- Summary best local policy practices to accelerate NEV deployment

	Fiscal incentives					Non-fiscal benefits			EV penalty
	EV sales rebate or tax credit	Vehicle sales tax exemption	Exemption from annual registration fee	Subsidized installation of residential charging equipment	Exemption from emission testing	Carpool lane access	Public EV charger availability	Free parking availability	Annual fee for EVs
City A	X			X	X	X	X		
City B	X				X		X		
City C	X				X	X	X		
City D						X		X	
City E	X		X				X		
City F		X		X	X		X		X

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Conclusions
总结

- At present, national level policies such as stringent vehicle fuel economy standards are necessary but not sufficient to drive NEVs into marketplace in significant numbers
- State-level incentives are playing a significant early role in reducing the effective cost of ownership and driving electric vehicle sales
- Both fiscal and non-fiscal measures (HOV lanes, charging stations, etc) are playing important roles in driving NEV sales; sometimes the latter can be more effective
- Cost-benefit of various incentive policies is valuable information for policy making
- Our understanding of international best practices for NEV policies is evolving; more research needed.
- Consideration of upstream emissions must eventually be taken into account to address local air pollution and climate change
- In the long-term, we can expect BEVs (and FCVs) to become cost competitive with internal combustion engines, thus eliminating the need for fiscal subsidies

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Other resources
相关资源

- Two reports
  - http://www.theicct.org/driving-electrification-global-comparison-fiscal-policy-electric-vehicles
  - http://www.theicct.org/evaluation-state-level-us-electric-vehicle-incentives
- Global EV grid emissions
  - http://www.theicct.org/calculating-electric-drive-vehicle-ghg-emissions
- Comparison of companies, technology, CO_2 emissions in EU countries
  - http://eupocketbook.theicct.org
- US EV grid emissions and long-term vehicle policy
  - http://www.sciencedirect.com/science/article/pii/S0301421512001553
- EV grid integration in US, China, Europe (MJ Bradley)
  - http://www.theicct.org/electric-vehicle-grid-integration-us-europe-and-china
- Japan hybrid vehicle market breakthrough
  - http://www.theicct.org/blogs/staff/hybrids-break-through-japan-auto-market
- Long-term light-duty vehicle fleet transition modeling to electric vehicles (Greene/ORNL)
  - http://www.theicct.org/analyzing-transition-electric-drive-california
- Electric heavy-duty vehicles (DLR, CE-Delft)
  - http://www.theicct.org/zero-emission-trucks
- Associated blogs, webinars
  - http://www.theicct.org/blogs/staff/if-subsidies-are-no-panacea-how-incentivize-electric-vehicles-china-cn
  - http://www.theicct.org/blogs/staff/if-subsidies-are-no-panacea-how-incentivize-electric-vehicles-china
  - http://www.theicct.org/blogs/staff/show-vehicles-or-all-differing-electric-vehicle-strategies-emerge
  - http://about.bgov.com/events/the-state-of-the-u-s-electric-vehicle-market-webinar/
  - http://www.theicct.org/blogs/staff/dont-count-out-hydrogen-fuel-cell-electric-vehicles
  - http://www.theicct.org/blogs/staff/electric-vehicles-rise-california

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