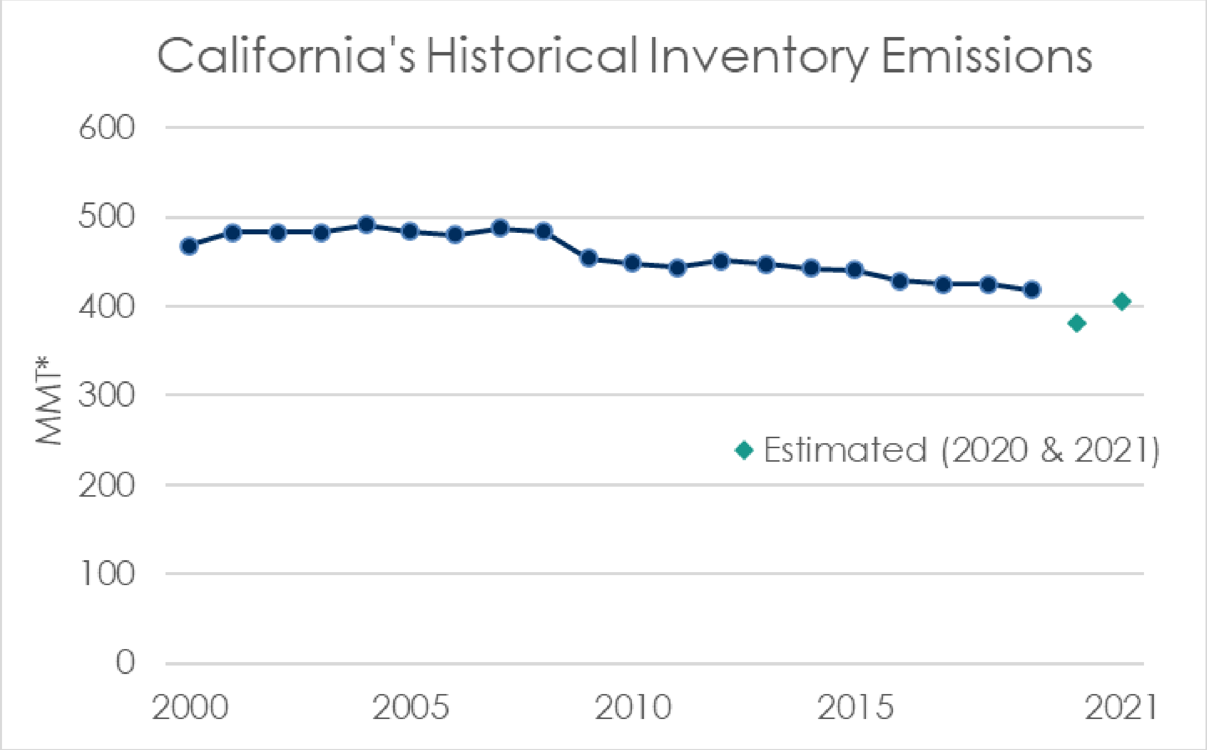
Chris Busch

March 10, 2022

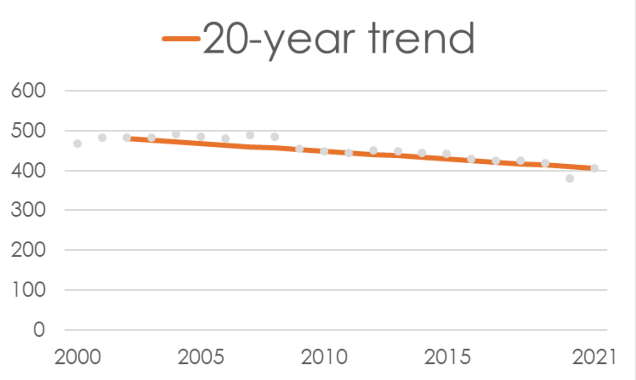
Joint Legislative Committee on Climate Change Policy

ENERGY INNOVATION
POLICY & TECHNOLOGY LLC

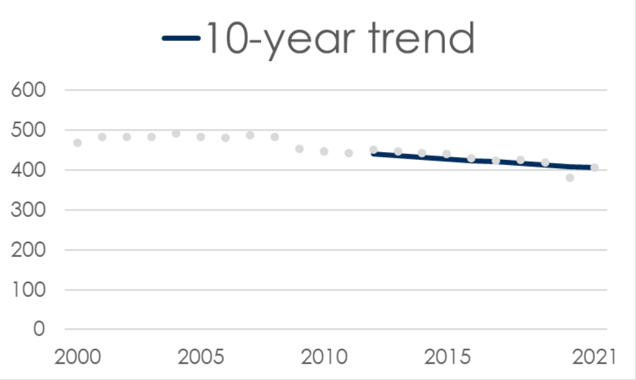
Where California Stands



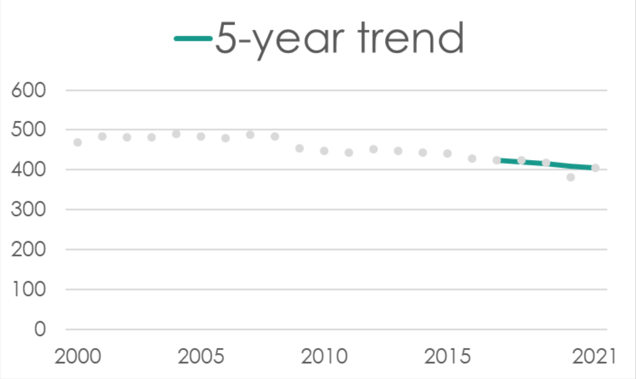
*MMT = million metric tons of carbon dioxide equivalent



Average annual change	
-3.9 MMT	-0.83%

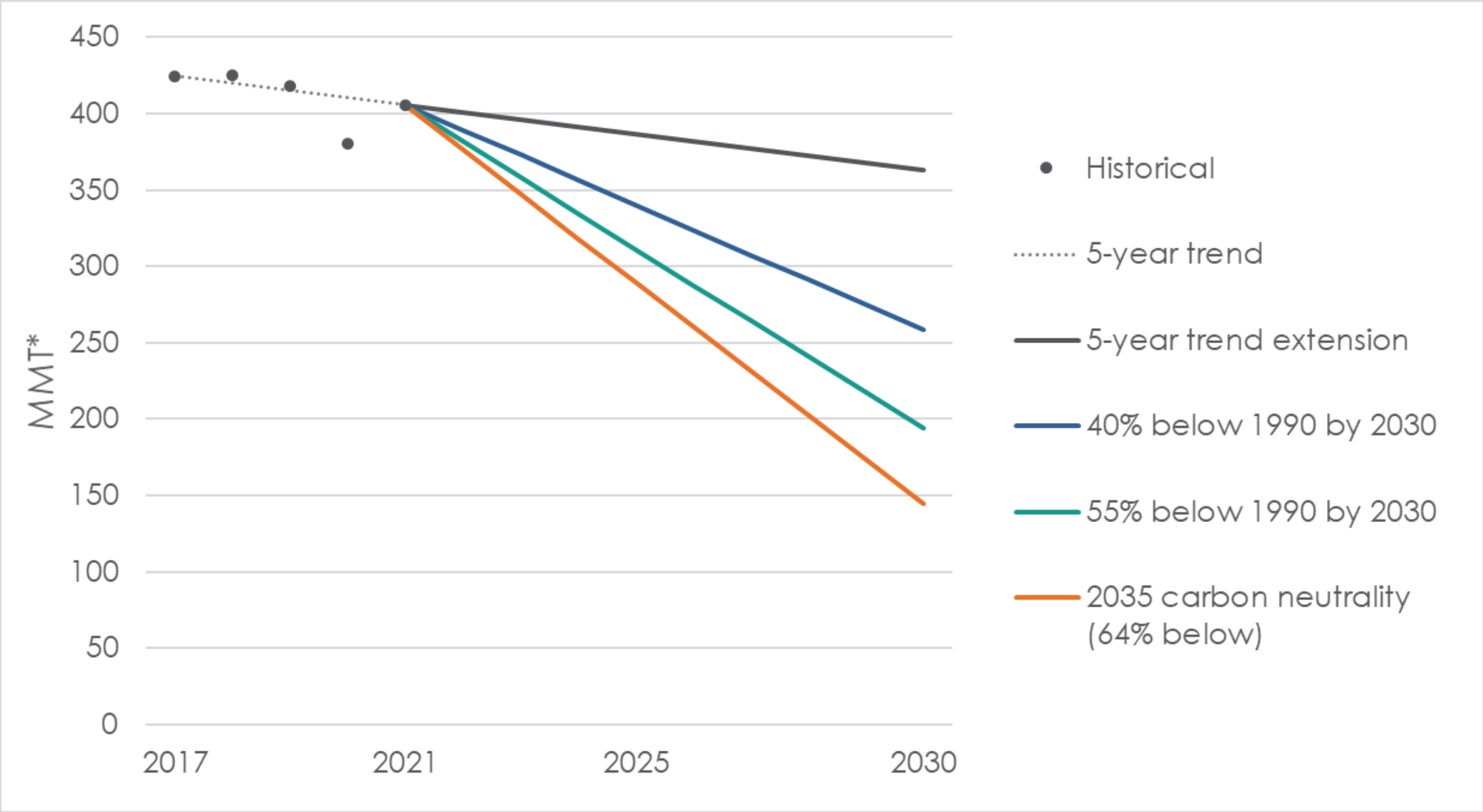


Average annual change	
-3.8 MMT	-0.89%



Average annual change	
-4.7 MMT	-1.0%

Looking Forward: Not on Track

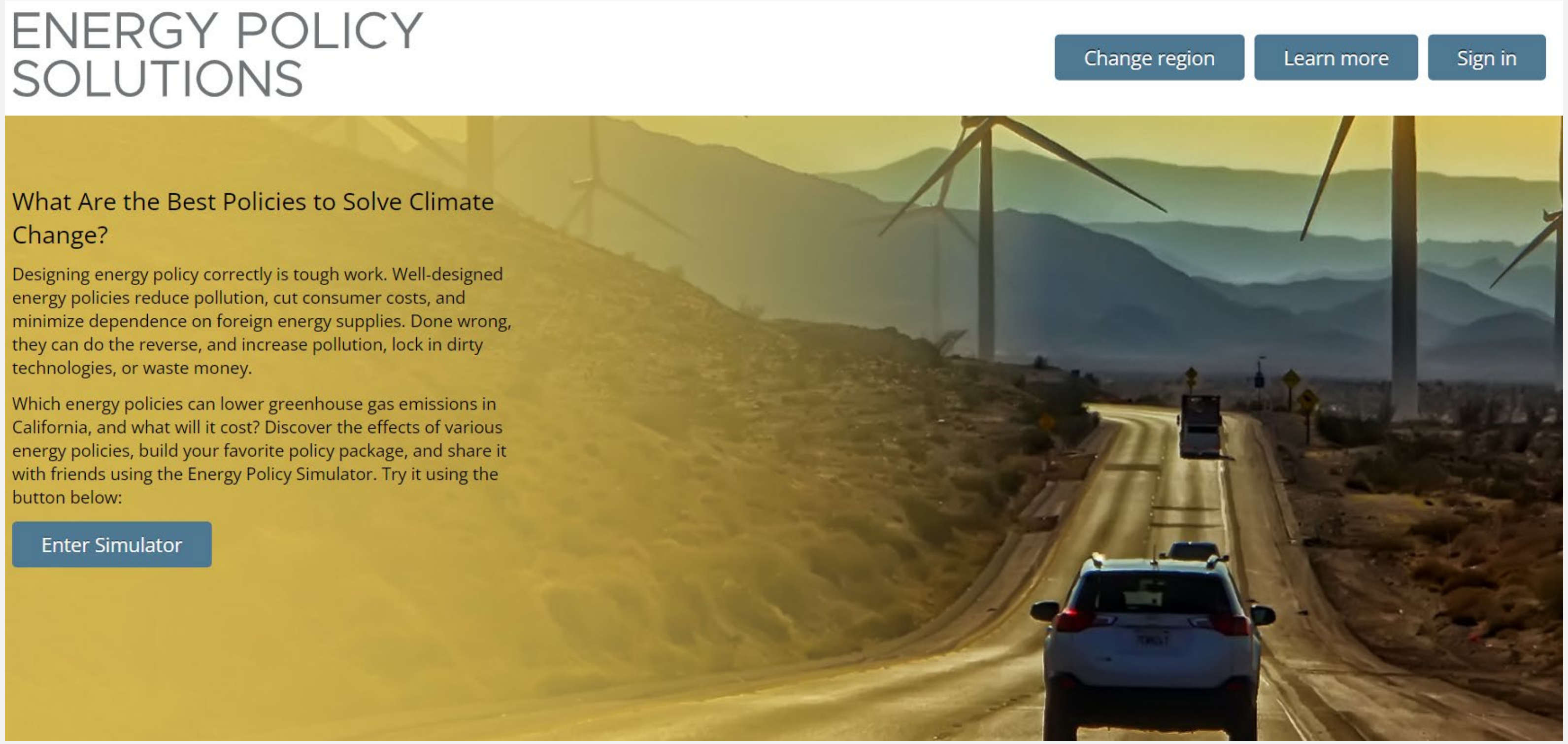


Annual reductions through 2030	
5-year trend	5 MMT/year
40% below 1990	16 MMT/year
55% below 1990	24 MMT/year
64% below 1990	29 MMT/year

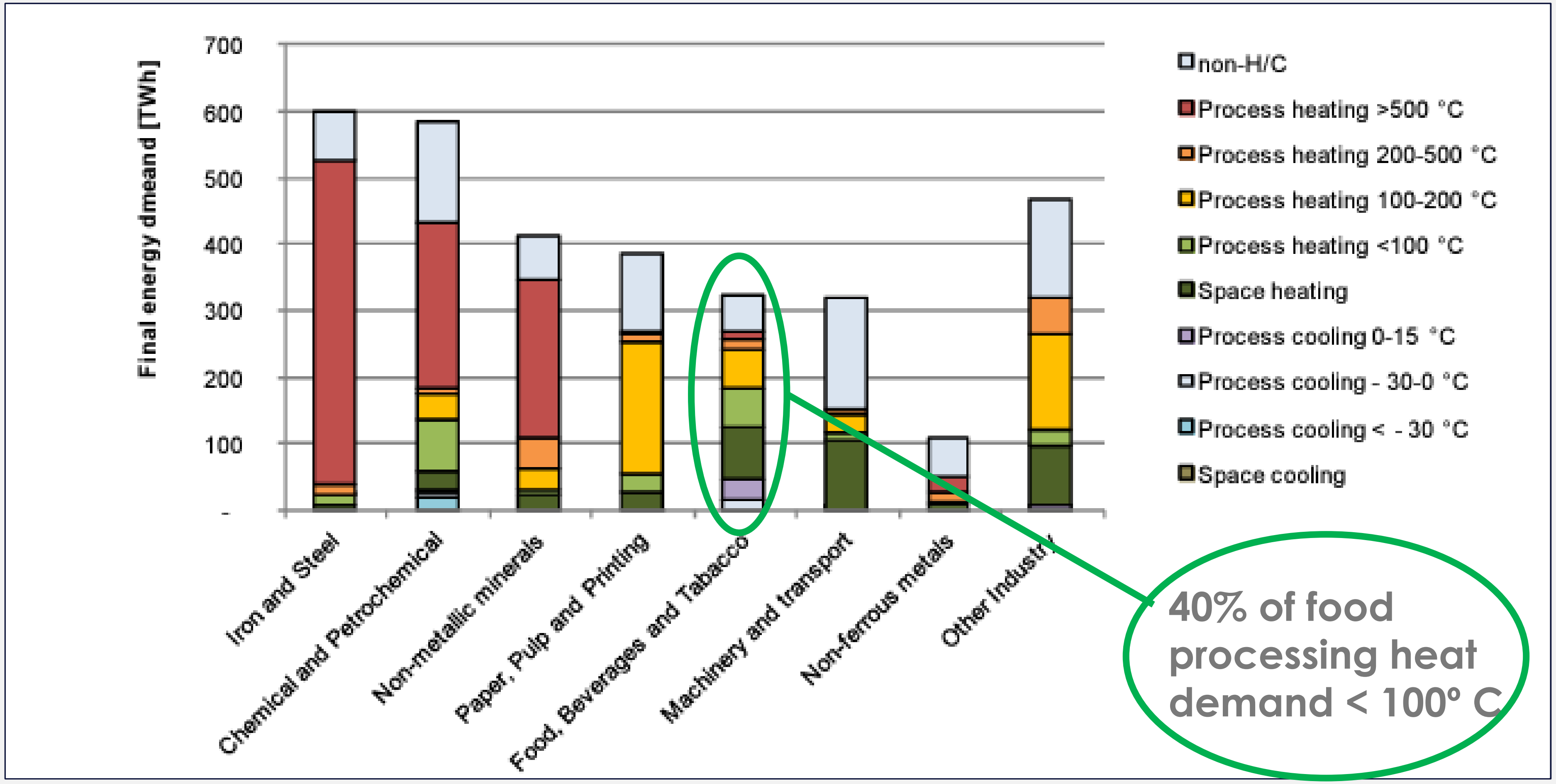
*MMT = million metric tons of carbon dioxide equivalent

The California Energy Policy Simulator

Initial release January 2020



Electrification Opportunity in Food Processing



	Natural gas use 2020 (Mtherms)
Oil and Gas Extraction	3051
Petroleum Refining	864
Food Processing	684
Chemicals	662
Glass	536

(2017 California Pathways model)

Figure 29: Final energy demand for EU28 by temperature and sub-sector for heating and cooling in industry (2012) from *Mapping and analyses of the current and future (2020-2030) heating/cooling fuel deployment (fossil/renewable),* European Commission

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Accelerating the EV transition

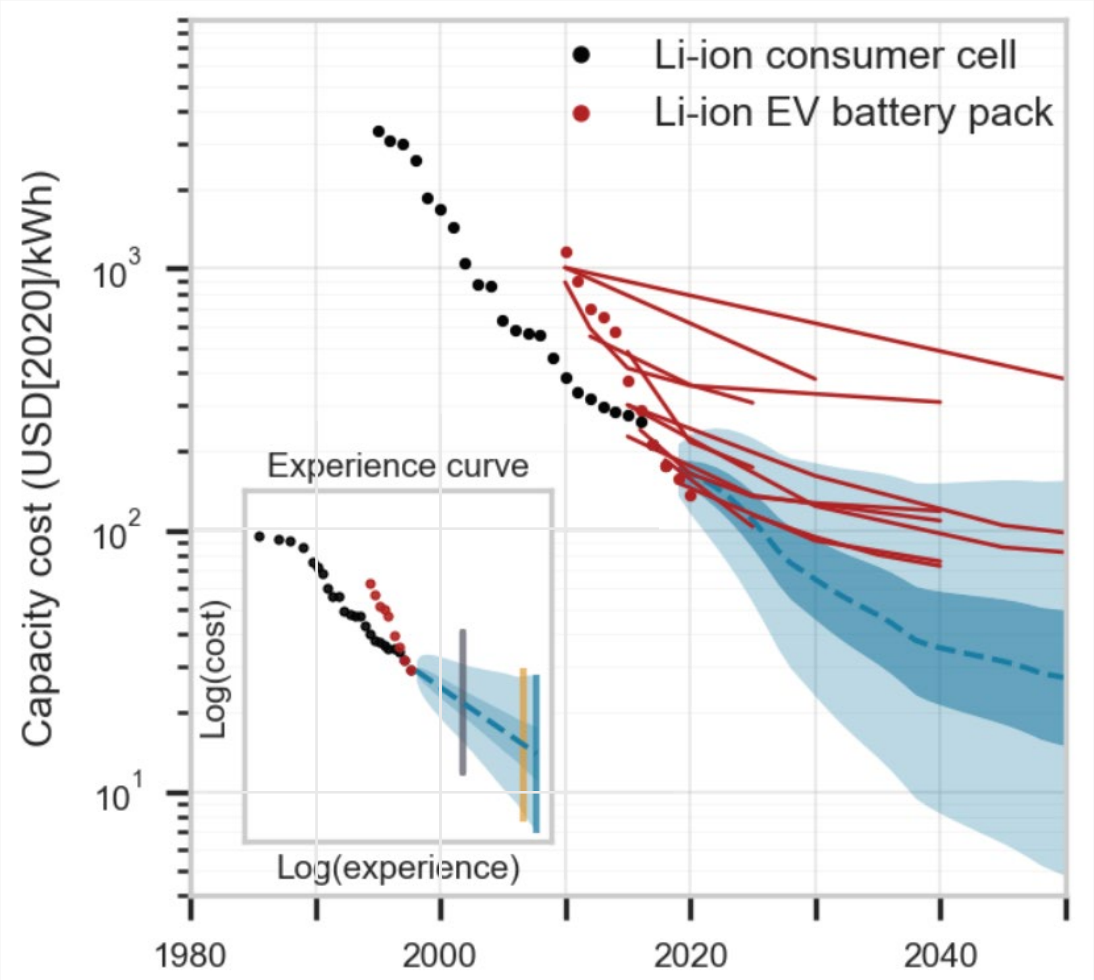
It is essential for policy to leverage new investment momentum.

Otherwise, slow capital stock turnover creates energy system inertia.

	Typical lifetime
Passenger cars	13+ years
Freight trucks	14+ years
Water heaters	14+ years
Heaters-air conditioners	16+ years
Buildings	50+ years
Industrial equipment	12 – 50+ years

Learning Curves and Innovation Opportunities

- Energy policy models consistently underpredict innovation.
- The future promises continued technological progress.

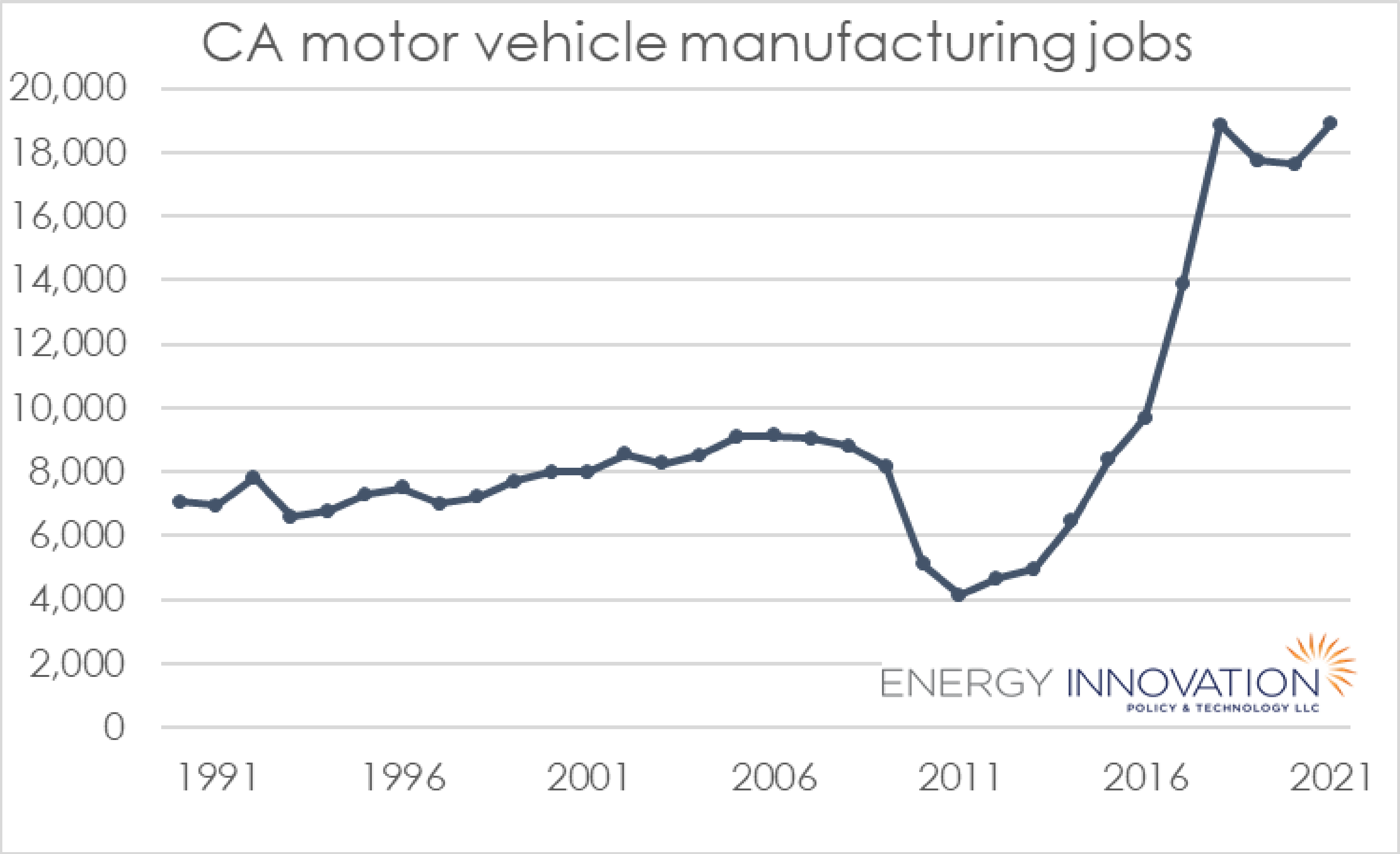


"Empirically grounded technology forecasts and the energy transition" Institute for New Economic Thinking, Oxford University, INET Working Paper No. 2021-01, Sept. 14, 2021

EV Industry: A Case Study in the Economic Upsides

California jobs

- 19,000 motor vehicle manufacturing jobs, 2x pre-EV levels
- 275,000 direct EV industry jobs @ $91,000 per year on average.



Thank you

ENERGY INNOVATION
POLICY & TECHNOLOGY LLC

Chris Busch

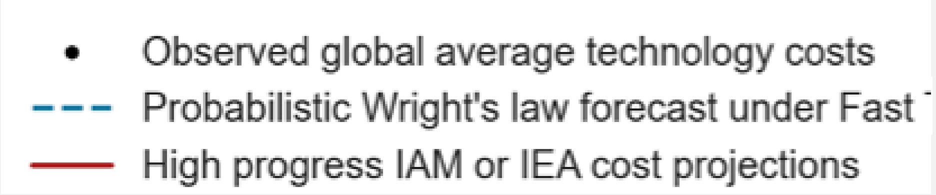
@cbbusch

@EnergyInnovLLC

www.energyinnovation.org

Learning Curves and Innovation Opportunities

Energy policy models consistently underpredict innovation



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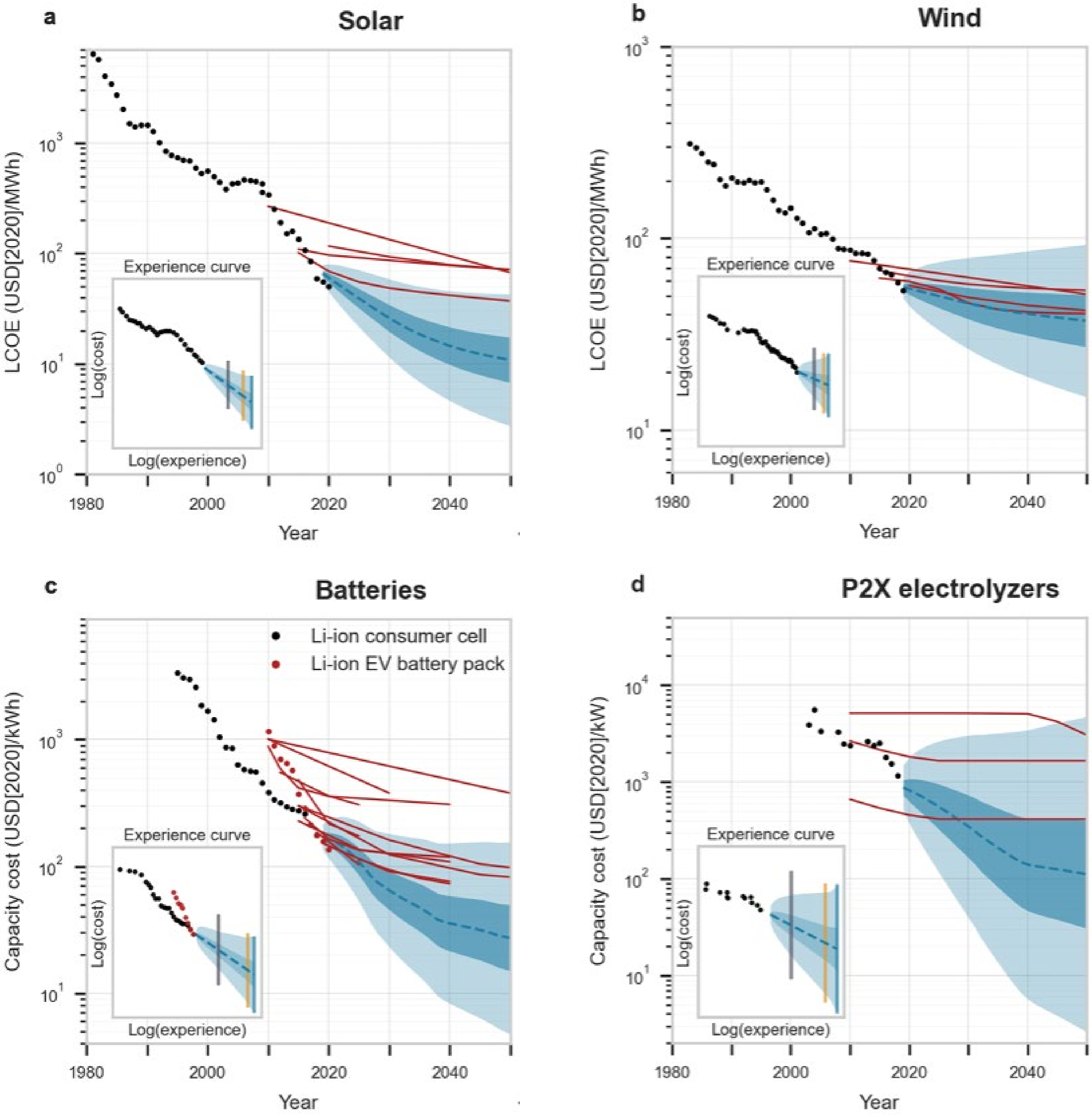
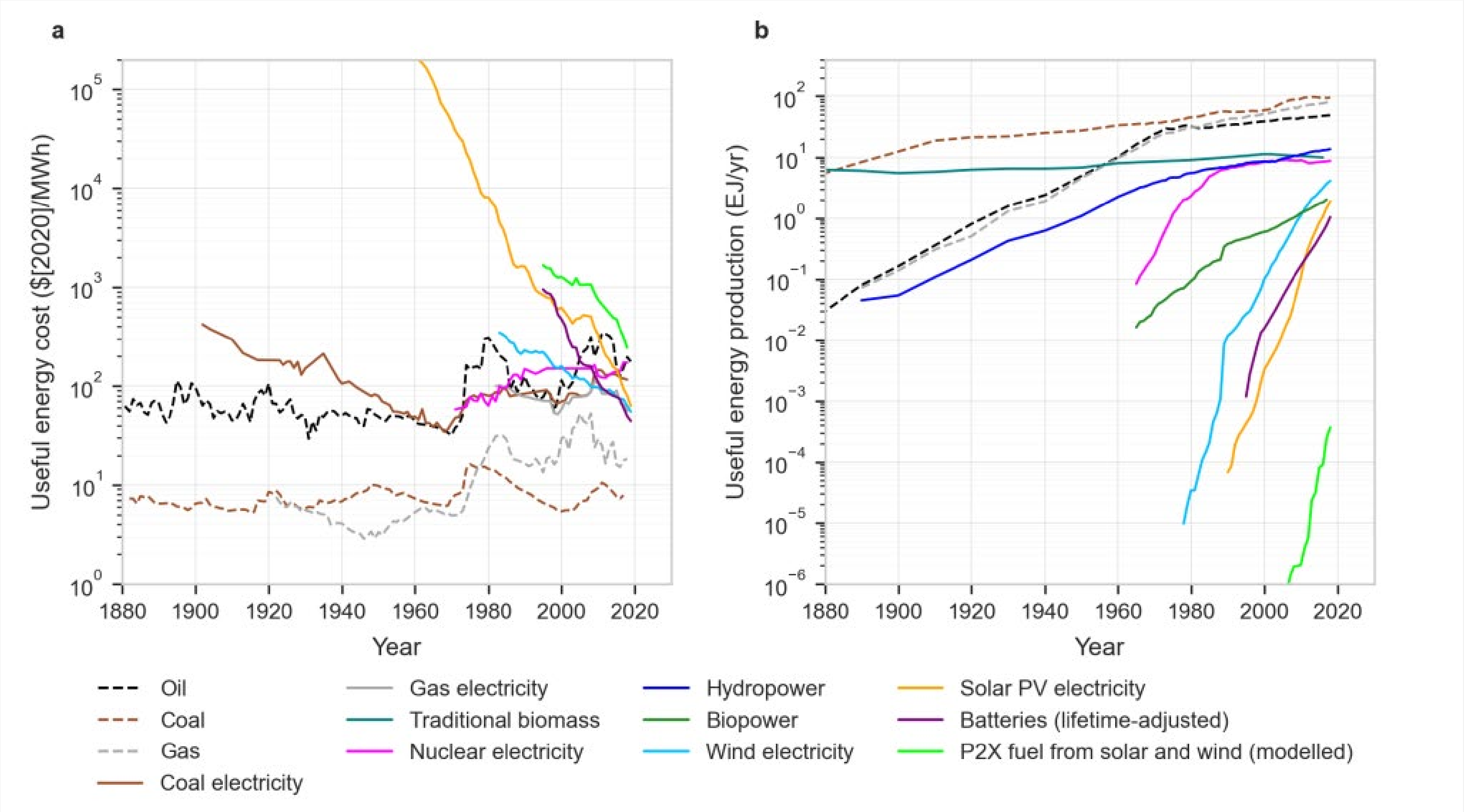


Learning Curves and Innovation Opportunities

Energy cost (left) and deployment (right)

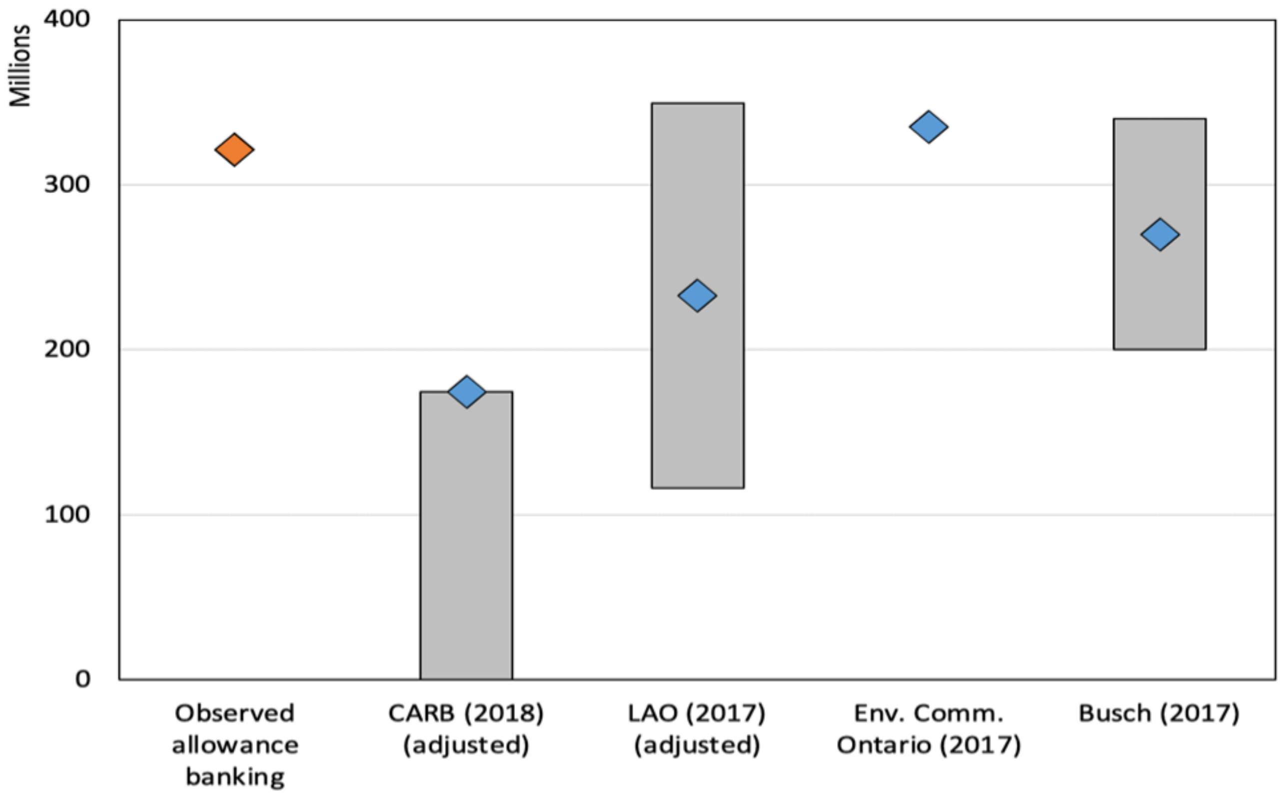
Way et al., "Empirically grounded technology forecasts and the energy transition" INET Oxford Working Paper No. 2021-01, Sept. 14, 2021

UNIVERSITY OF OXFORD
Institute for **New Economic Thinking** AT THE OXFORD MARTIN SCHOOL



Allowances banked compared to earlier forecasts

Figure 1: Comparing Allowance Banking Scenarios [11]



Independent Emissions Market Advisory Committee, Annual Report 2021