

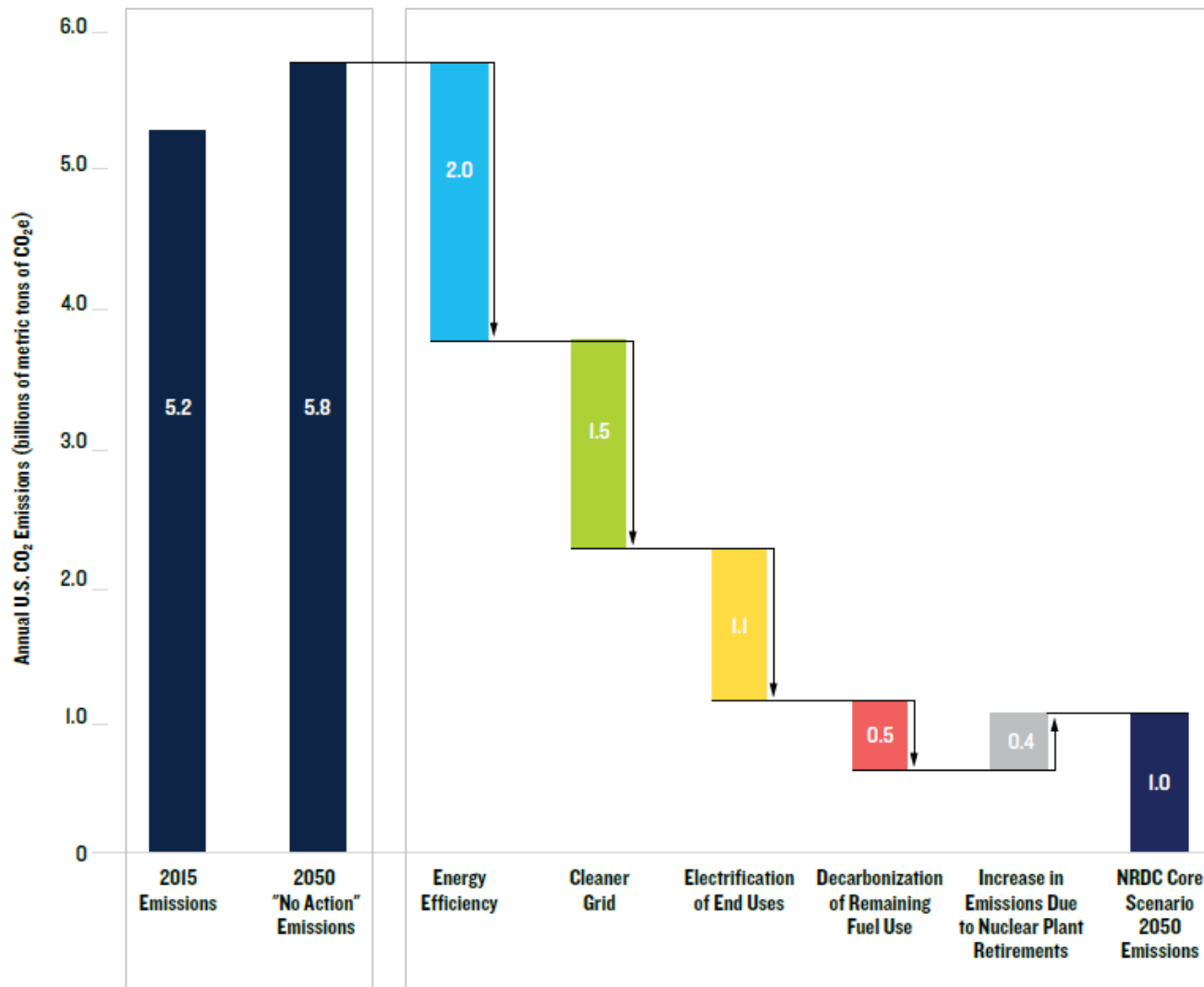
Energy Efficiency, Decarbonization, and Electrification

Energy Efficiency as Resource

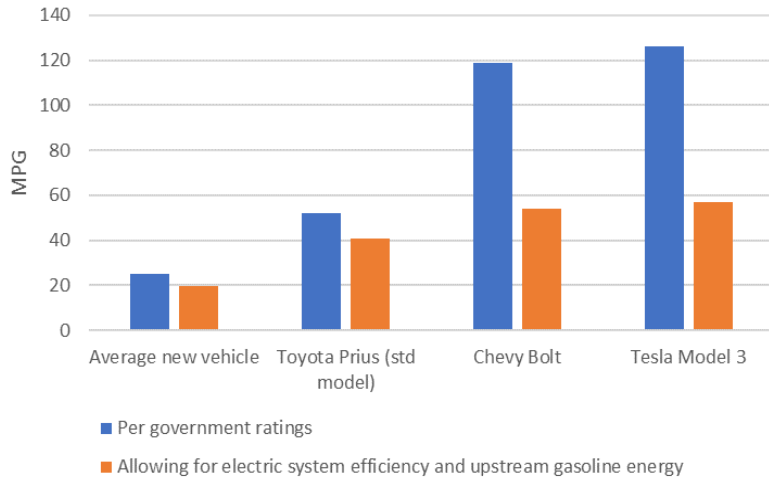
Oct. 17, 2019



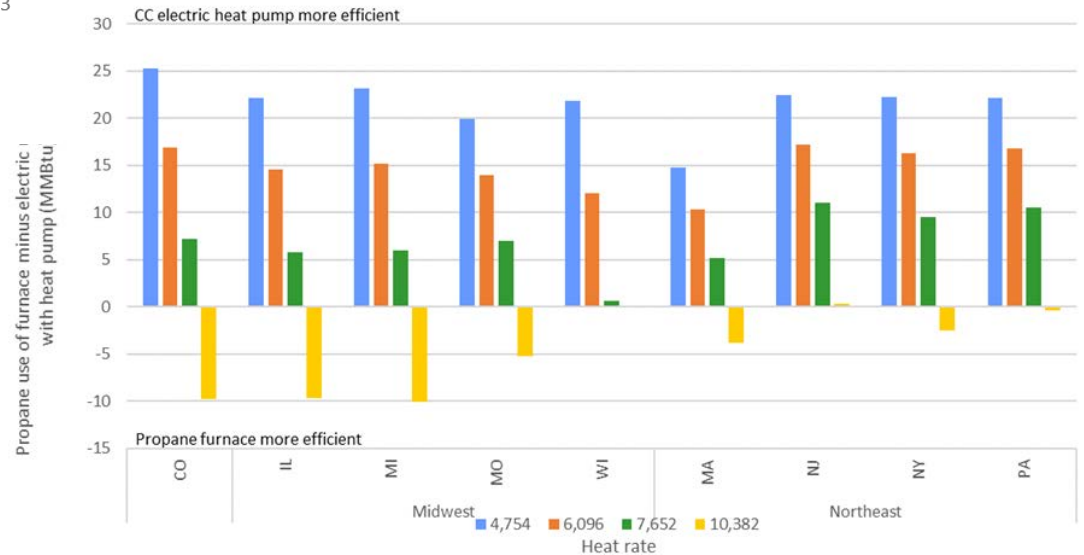
America's Clean Energy Frontier



Electrification Can Often Save Energy



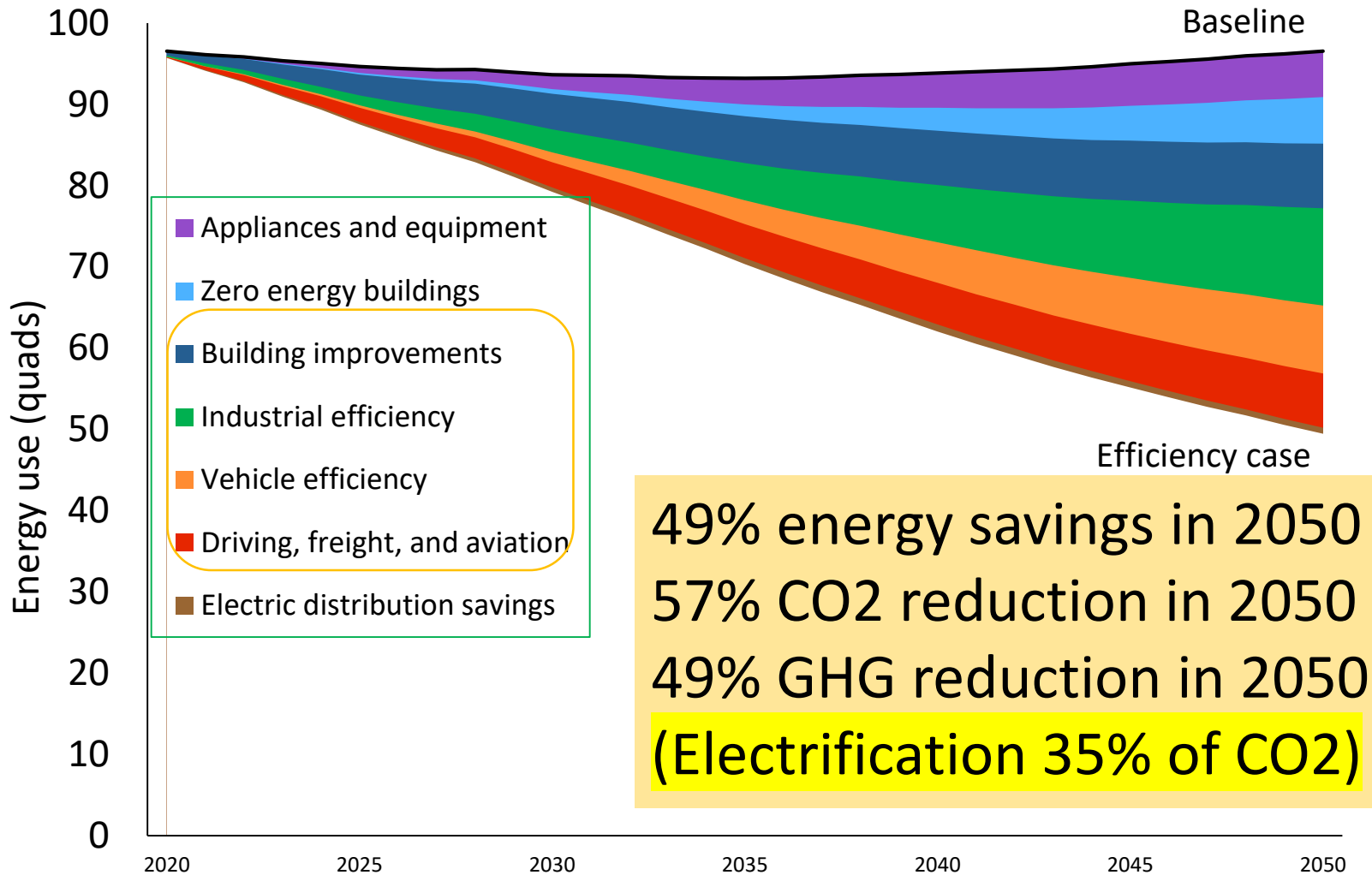
Source: ACEEE calculations based on government data and models



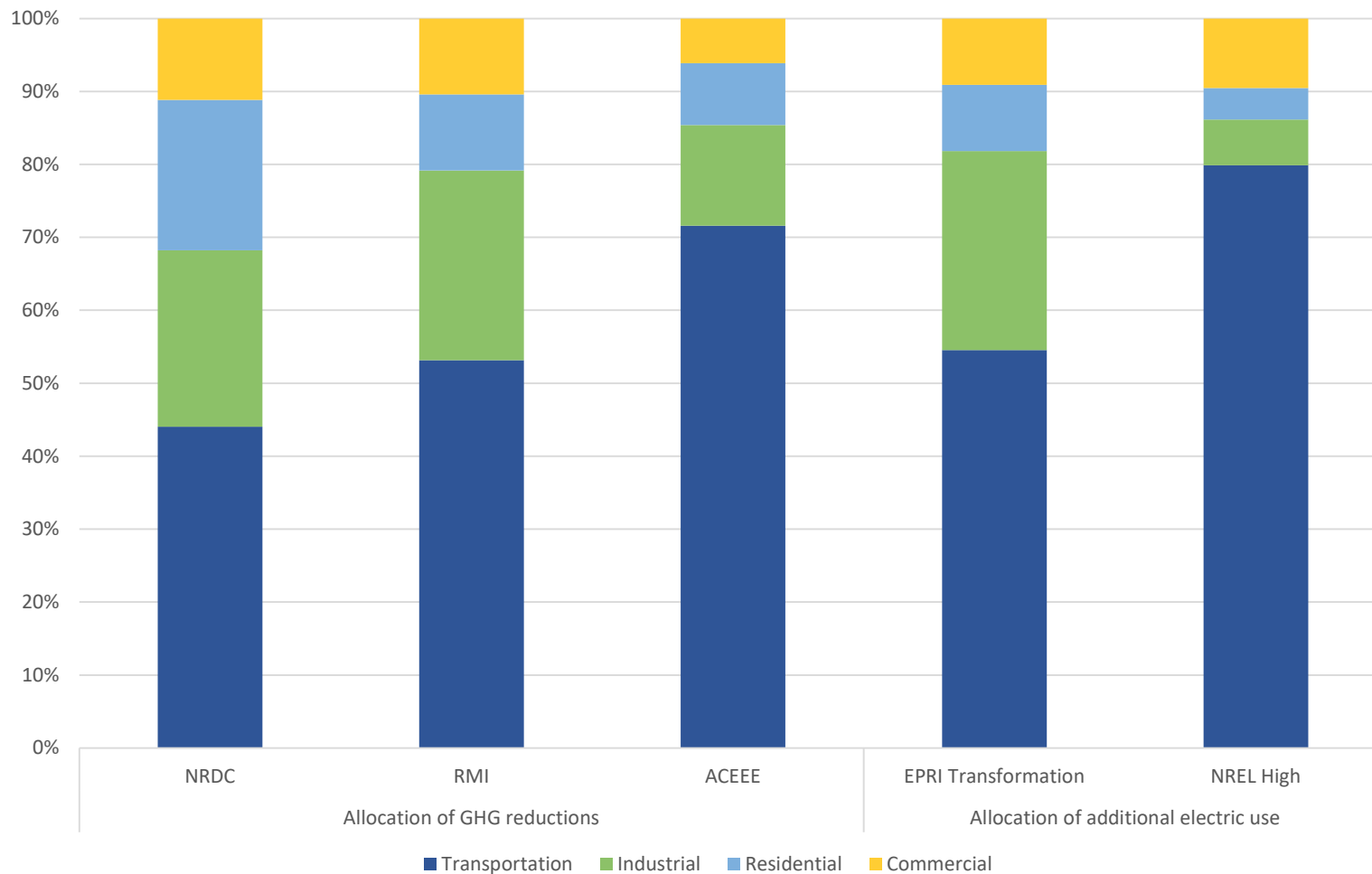
Comparison of annual energy use of a 95% AFUE propane furnace and a cold-climate HSPF heat pump

Source: Nadel 2018, *Savings from Replacing Oil and Propane Heating with Heat Pumps*, ACEEE

Halfway There: Energy Savings



Allocation of Electrification Potential



Source: Nadel, ACEEE, Oct. 2019 blog looking at studies by NRDC, NREL, EPRI, RMI and ACEEE

Consumer Paybacks – Oil & Propane at Time of Equipment Replacement

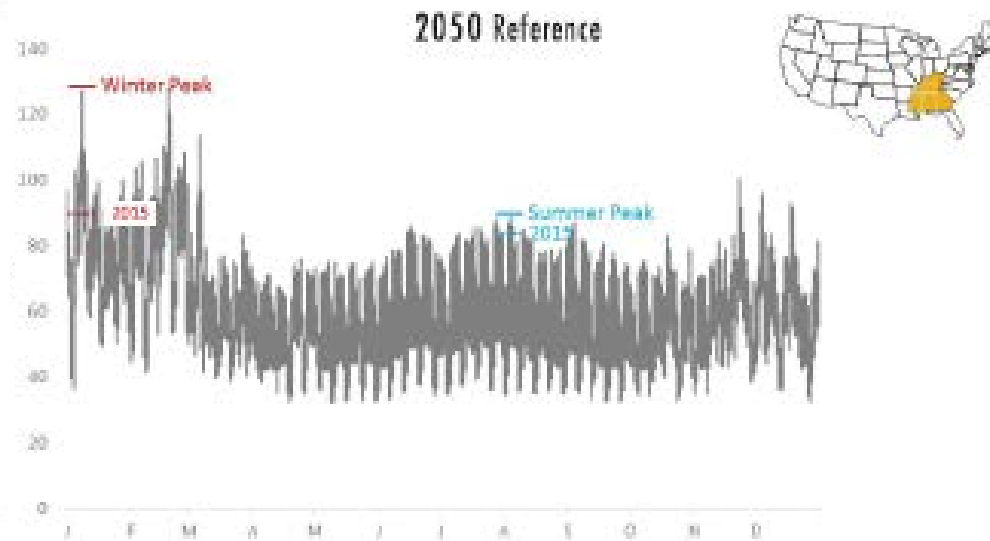
Comparison	Average simple payback period (years)				
	US	West	Midwest	Northeast	Southeast
Oil furnace (83% AFUE) vs. HP (8.5 HSPF), includes AC savings	0.9	1.4	1.3 in MO; no savings in Upper MW	1.9	0.8
Propane furnace (80% AFUE) vs. HP (8.5 HSPF), includes AC savings	1.5	1.7	3.4 in MO; no savings in Upper MW	2.0	1.3
Oil boiler (86% AFUE) vs. ductless HP, without AC	4.4	7.3	18.8	6.2	5.1
Propane boiler (84% AFUE) vs. ductless HP, without AC	16.1	12.1	19.8	8.5	9.1
Std. oil water heater to HPWH (2.0 rated EF)	Immediate		Examined only at a national level		
Std. propane water heater to HPWH (2.0 rated EF)	3.9				

Note: Payback periods are typically longer relative to natural gas systems.

Markets for Electrification

Sector	Good Markets Today/Soon	Very Challenging
Transportation	Many passenger vehicles; delivery trucks and buses emerging	Long-distance trucking and aviation
Residential	New construction, homes with oil and propane heat, homes with natural gas in warm climates, homes adding AC	Supplemental heat in very cold regions, such as Minnesota
Industrial	High-value process applications such as UV and IR coatings; induction melting	High temperature bulk processes such as chemical and petroleum

Peak Loads in 2050 in Electrification Scenarios



For Southeast

Sources: Mai et al., NREL, 2018 (left) and EPRI 2018 (right)

Today's Panelists

- Ken Colburn, Principal and Director, US Programs, Regulatory Assistance Project
- Scott Blunt, Strategic Business Planner, Sacramento Municipal Utility District
- Ryan Bracken, Principal Economist, NW Natural
- Abigail Anthony, Commissioner, Rhode Island Public Utilities Commission



NW Natural



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