



An Analysis of Decarbonization Methods in Vermont

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Montpelier, VT

January 2019

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As requested by the Vermont General Assembly in Act 11 (June 2018), this report provides information on policies to reduce greenhouse gas (GHG) emissions in Vermont

Our study aims to inform the policy dialogue, but it is not intended to address the complete universe of policy options.

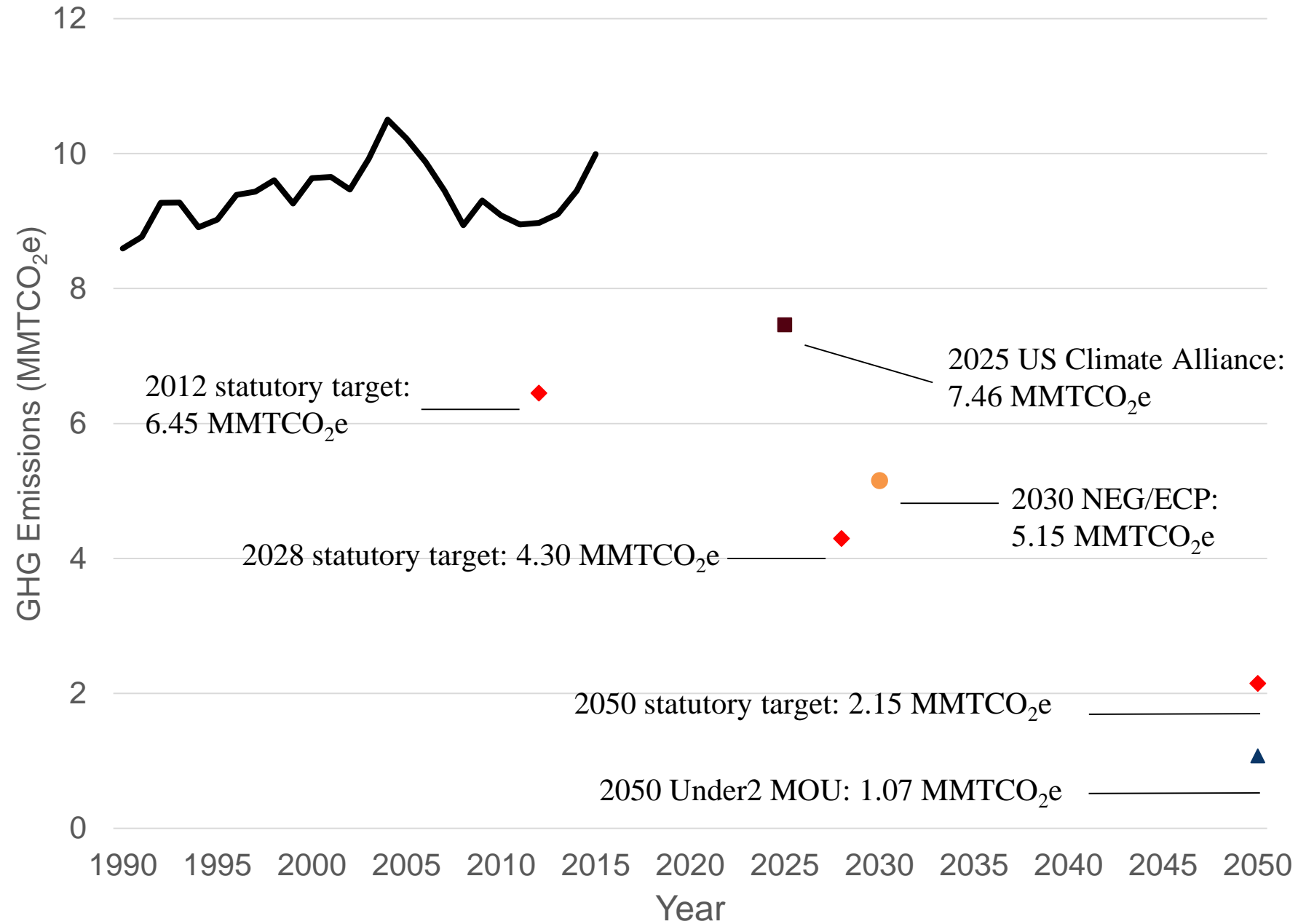
We do not offer specific policy recommendations.

About Resources For the Future (RFF)

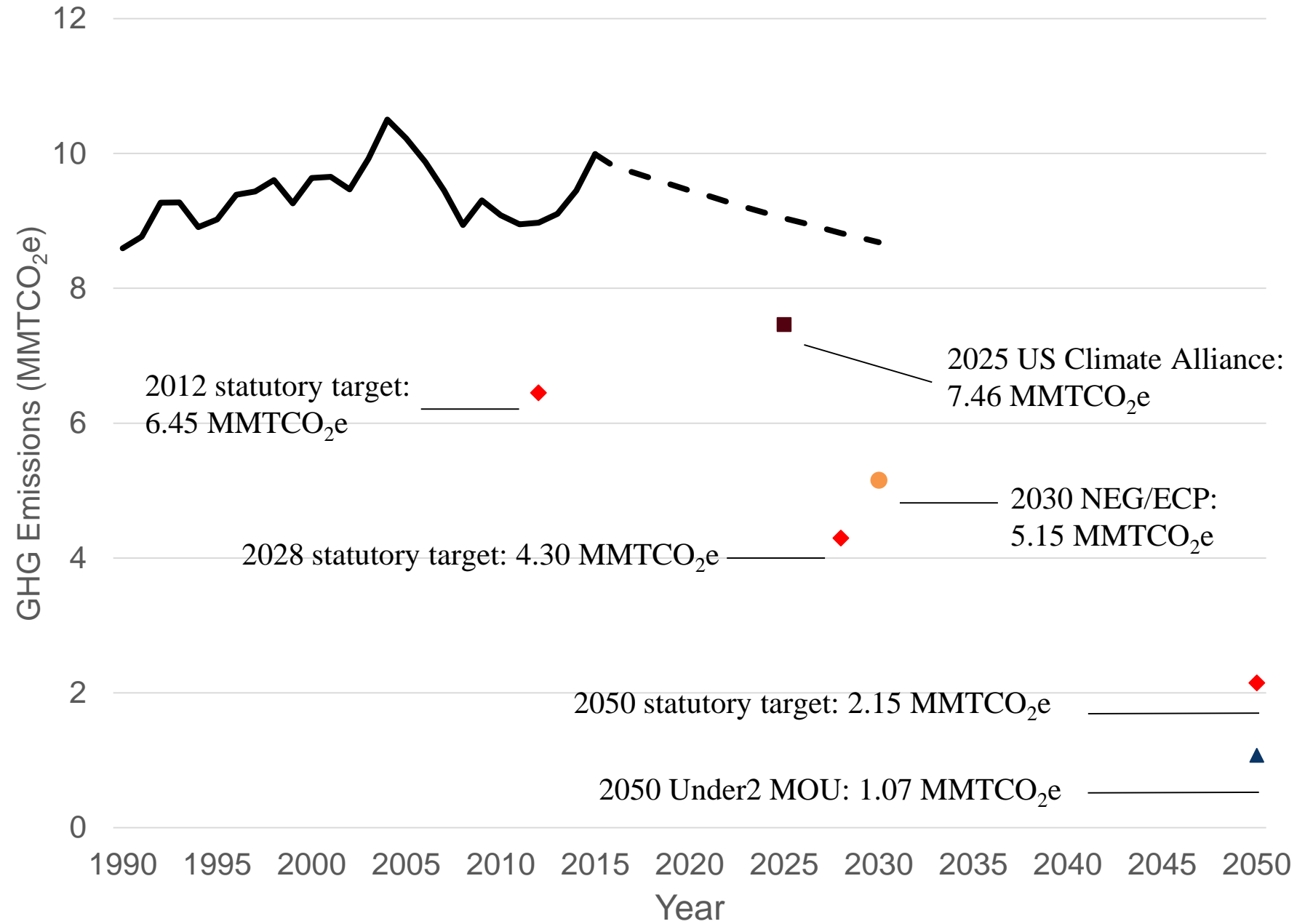


Resources for the Future (RFF) is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy.

VT emissions have been increasing since 2011...

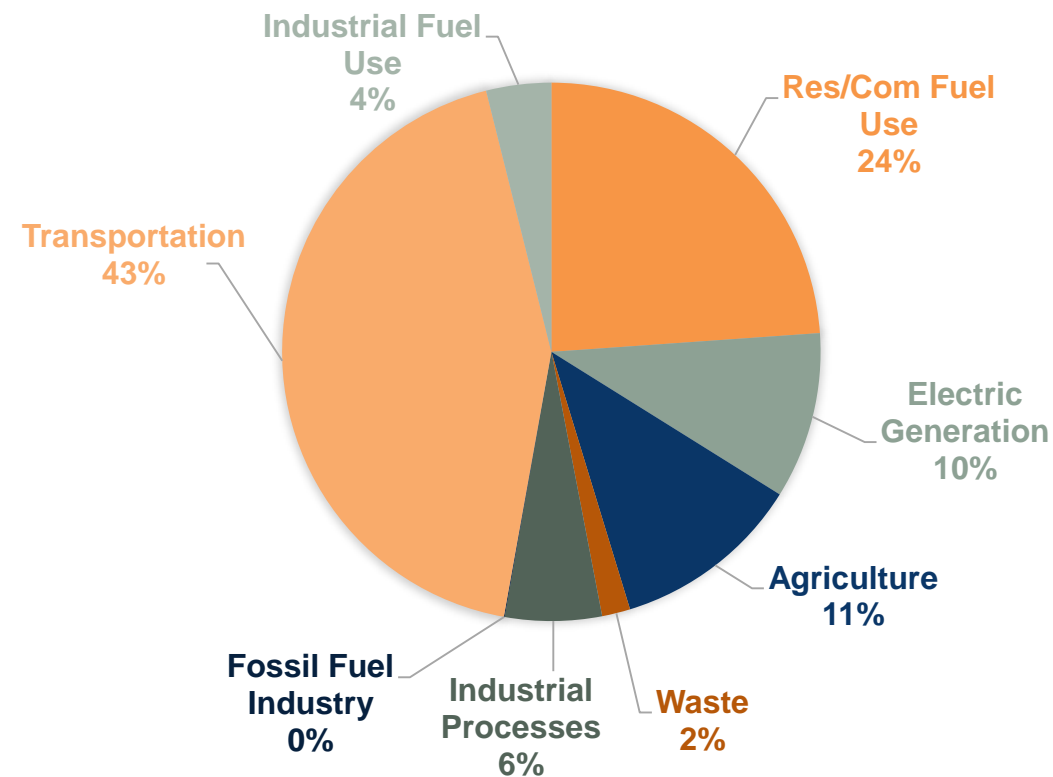


and are not expected to meet any of the state's targets

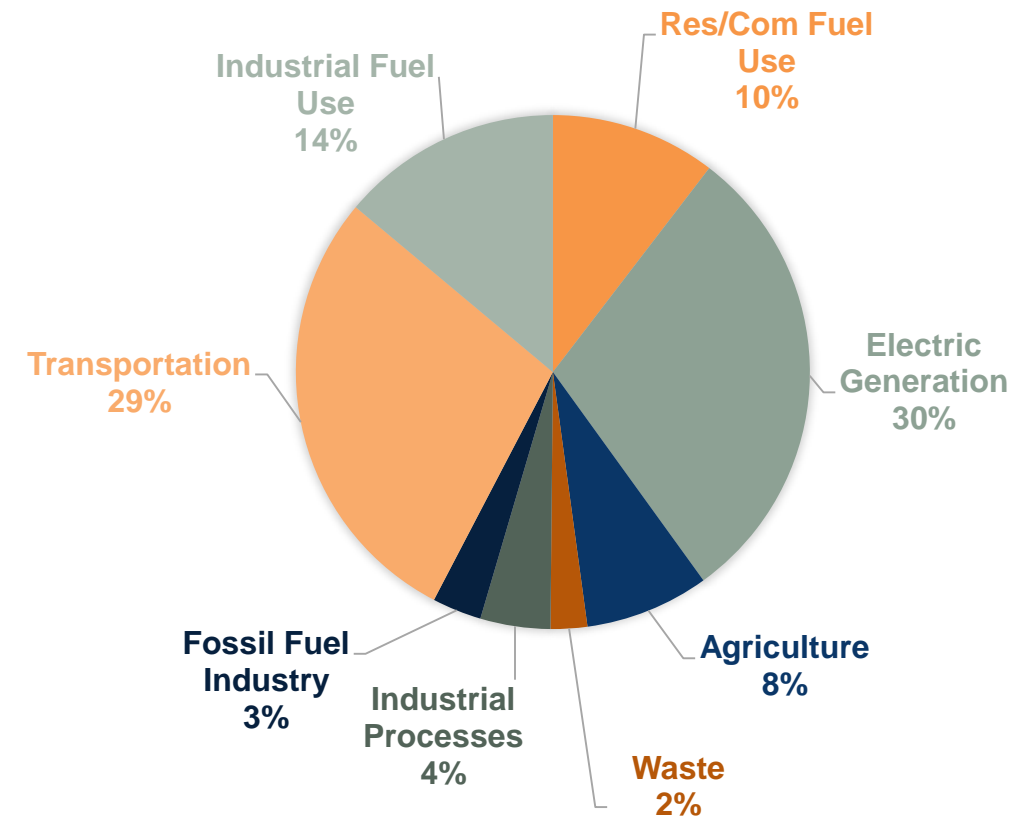


The Vermont context is important

VERMONT GHG EMISSIONS



U.S. GHG EMISSIONS



Transportation and Residential/Commercial Fuel Use for Heating are difficult to decarbonize (because close noncarbon substitutes are very expensive)

Policy Options Considered in this Report

- Carbon Pricing Policies
 - Carbon Tax or Cap-and-Trade Programs
 - A **quantitative** analysis of costs and benefits across a range of policy designs
- Nonpricing Policies
 - Including, but not limited to, Electric vehicle (EV) and energy efficiency incentives, weatherization programs, investments in low-carbon agriculture
 - A **qualitative** review of emission reduction potential of Vermont Climate Action Commission (VCAC) recommendations and 100 percent Renewable Energy Standard

Key Finding: Carbon pricing-only unlikely to meet US Climate Alliance targets (26-28% below 2005)

Projected GHG emissions in 2025 relative to 2005				
	Carbon Price Policy			
	TCI	WCI	ESSEX	High Price
Carbon Pricing-Only	-12.9%	-13.6%	-14.3%	-19.3%

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TCI: Cap-and-Trade Program on Transportation Emissions Only , \$19.42 in 2025 (in 2015\$)

WCI: Cap-and-Trade Program on Transportation and Heating Emissions, \$19.42 in 2025 (in 2015\$)

ESSEX: Economy-wide Carbon Tax (Electricity Exempt), \$30 in 2025 (in 2015\$)

High Price: Economy-wide Carbon Tax (Electricity Exempt), \$76.58 in 2025 (in 2015\$)

Key Finding: Combined approaches consistent with 2025 US Climate Alliance targets (26-28% below 2005)

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Nonpricing: Implementation of all VCAC recommendations; 100% RES; median estimates of reductions

Key Finding: Economic impact of carbon pricing is small

- The combined climate and health benefits of the carbon pricing policies would exceed the economic costs for every carbon pricing scenario considered in this report.

	2025			
	TCI*	WCI*	ESSEX**	High Price*
Change in Economic Welfare per Household (2015\$)	-\$28	-\$47	-\$71	-\$240
Environmental Benefits per Household (2015\$)	\$56	\$78	\$133	\$317
Percentage Change in State GDP	-0.01%	-0.02%	0.05%	-0.08%
Percentage Change in Total Labor Demand	-0.01%	-0.02%	0.05%	-0.05%
Annual Revenue (Millions 2015\$)	\$75	\$121	\$183	\$434

* Revenues rebated to households. ** Revenues rebated to low-income households and electricity subsidies

Key Finding: Economic impact of carbon pricing is small

- Impacts on state GDP and level of employment would be very small, regardless of policy design

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- A carbon pricing policy would generate significant annual revenue for the state, depending on the carbon price level and the number of sectors covered.

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Key Finding: Policies can be designed to offset impacts on low-income and rural households

Economic Welfare Change in 2020 (2015\$ per household)				
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Quintile 1	\$53	\$96	\$37	\$414
Quintile 2	\$18	\$35	\$24	\$171
Quintile 3	-\$18	-\$38	\$5	-\$132
Quintile 4	-\$22	-\$15	-\$46	-\$82
Quintile 5	-\$122	-\$251	-\$51	-\$1,240
Urban (Chittenden County)	-\$13	-\$12	\$0	-\$122
Rural (Weighted average, all other counties)	-\$20	-\$42	-\$8	-\$191

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Key Finding: Revenue use introduces trade-offs

- According to our modeling analysis, **per household rebates** more than offset the costs of increased energy prices for the average low-income household.
- **Reducing taxes on wage income** would lower the overall cost to Vermont's economy relative to other options considered, but these cuts would not fully offset higher energy prices.
- Devoting revenue to **finance nonpricing policies** would reduce emissions further, but would also impose higher costs on Vermonters, because this would reduce funds that could be used to partially or fully offset the economic impacts on households of carbon pricing.



Thank You