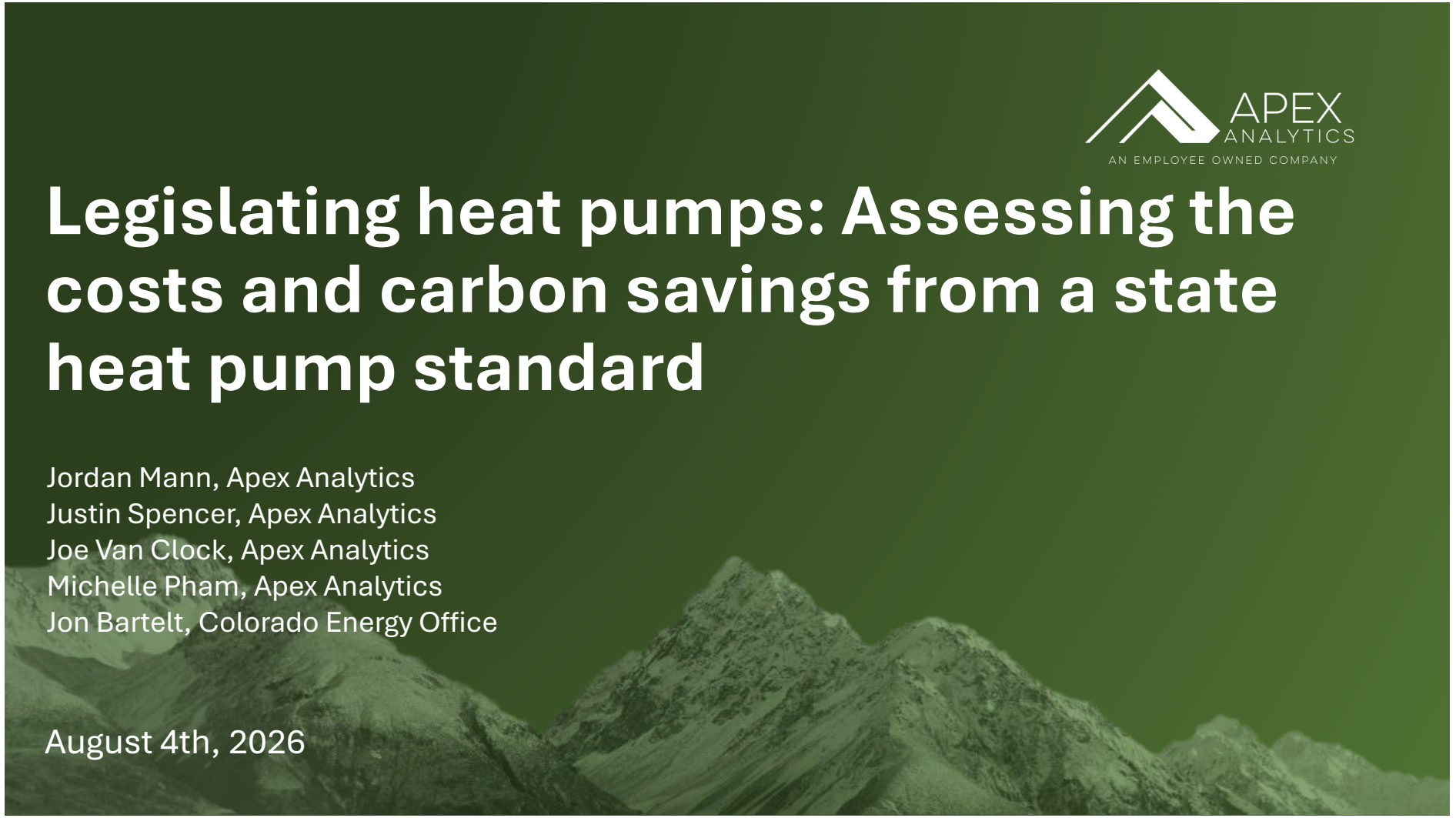


Legislating heat pumps: Assessing the costs and carbon savings from a state heat pump standard

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Background

- The Colorado state legislature requested research on the impact of a statewide point-of-sale standard requiring new residential central air conditioners (CAC) serving one- and two-family dwelling units to be configured as heat pumps.
- Essentially any time a resident would purchase a CAC, they would instead have to purchase a heat pump.
- The standard does not dictate how the heat pump would be used, just that the CAC must be configured as a heat pump.



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Background

- Our Approach To Assessing Impacts Included:
  - Interviewing equipment manufacturers, distributors, contractors, homebuilders, environmental justice groups, and utilities.
  - Conducting engineering and economic analyses to assess heat pump installation costs and operational savings.
- Ultimately the Colorado legislature did not pass this statewide standard (but we still think this type of standard is worth exploring)



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Why Should This Type of Standard Be Pursued?

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- The heat pump that is replacing air conditioning can also provide heat in the shoulder season
- The incremental cost *should* be low
- Massive greenhouse gas savings potential
- This is the easiest way for people to get a heat pump
  - Keep the furnace
  - Minimal comfort impacts
  - Heating and cooling bill savings
  - Less likely to require panel upgrades
  - Less likely to require ductwork

This Type of Standard Could Have Major Impacts

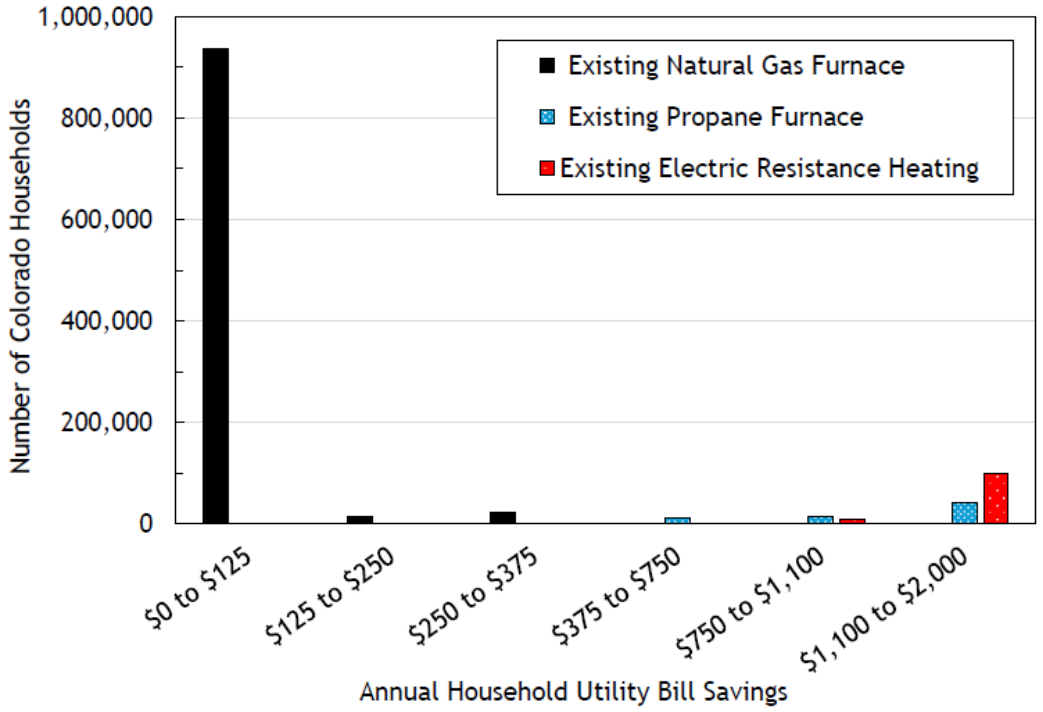
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- Result in installation of 80,000 HPs each year
- Reduce electricity consumption by 7 GWh and gas consumption by 14 million therms each year
- Reduce emissions by 96,000 MT CO2e each year
- Save $9M on heating and cooling costs each year
- Over a period of 20 years nearly all the residential CACs in one- and two-family dwellings units would be replaced by heat pumps, resulting in a reduction of 13% of the residential sector's carbon emissions.

Key Findings: A tale of two outcomes

APEX ANALYTICS

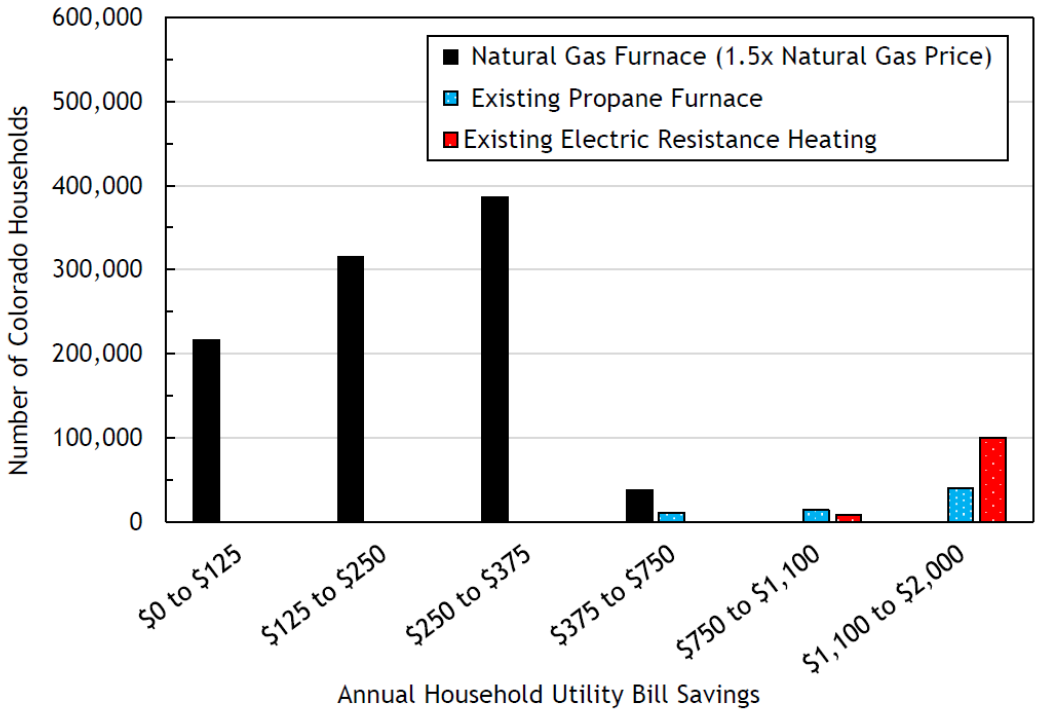
Bill Savings are Clearly Split by Heating System Type



Key Findings: A tale of two outcomes

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The Story Changes if Natural Gas Prices Were to Increase



Cost of New Equipment

- We interviewed HVAC equipment manufacturers and distributors, HVAC contractors, heat pump experts and conducted secondary research to determine cost of new 3-ton equipment.

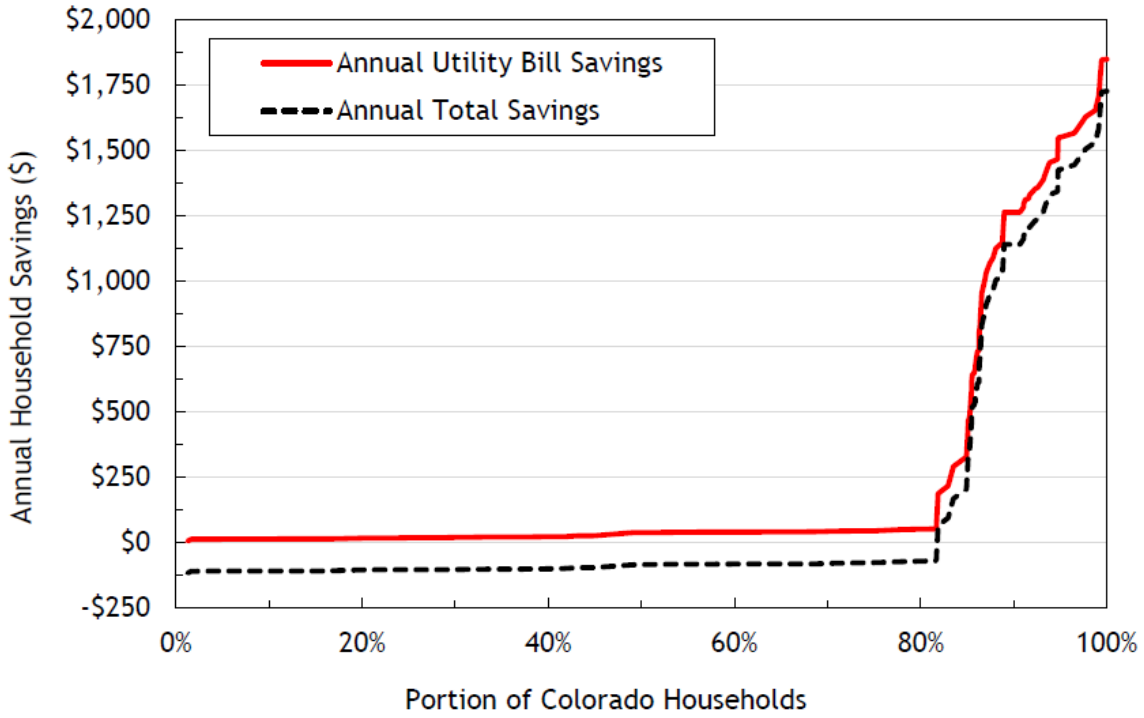
Source	Incremental Cost of Min Efficiency Heat Pump (SEER 2 of 14-15)
1	$3,060
2	$1,424
3	$1,957
4	$2,671
5	$1,673
6	$1,350
7	$1,500
8	$1,443
9	$5,525
10	$1,717
Cost Estimate	**$2,200**

Source	Incremental Cost of High Efficiency Heat Pump (SEER 2 of 15-20)
A	$10,2017
B	$7,009
C	$8,287
D	$7,860
E	$1,630
F	$4,600
Cost Estimate	**$6,600**

Combing the Equipment Cost and Utility Bill Savings

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Unfortunately, for most Coloradans this is a losing proposition



Is This a Cost-Efficient Mechanism to Achieve GHG Reduction?

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- Short Answer is YES!
- But the crux of the problem is cost to the customer.
- The cost of carbon reduction for natural gas households is $99/metric ton for households heating with natural gas. This is lower than most estimates of the social cost of carbon and roughly equal to the cost of carbon reduction achieved through the state's largest efficiency program, implemented through Xcel Energy.
- For homes heating with propane or electric resistance, the homes both realize savings and gain GHG benefits!

But Who Pays for it?

- A major challenge for this initiative is that it raises costs for most households in Colorado
- However, funding to offset the burden placed on households still yields a reasonably cost efficient solution for reducing greenhouse gas emissions
- If you're interested in talking about this more, we have a poster on Tuesday night exploring heat pump economics and policy tools.

Lessons Learned

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Survey the HVAC Contractor Market to Assess Market Readiness and Impacts

"The only thing I'm worried about if this standard passes is how many Lamborghinis I'll be buying."
- Contractor



"Other guys wouldn't go through schooling, they would just install it improperly and we would have to go back and fix it."
-Different Contractor



Lessons Learned

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Identify Opportunities to Fund Minimum Efficiency Heat Pumps

- Minimum efficiency heat pumps provide significant carbon benefits and are much cheaper than their high efficiency counterparts.
- From a cost efficacy standpoint, these heat pumps save more GHG per dollar spent.
- Utility programs should consider incentives for minimum efficiency heat pumps used to replace natural gas, electric resistance, or propane.

Lessons Learned

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Set an Effective Date to Allow the Market to Prepare.

- Many contractors that we spoke with had a core part of their business focused on high efficiency and full electrification projects.
- We still need to figure out ways to move from boutique to mass market solutions.

Lessons Learned

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Watch out for EPCA Preemption Hurdles

- Most advocates and experts that we spoke with raised concerns that requiring air conditioners to operate as heat pumps would be in violation of federal standards for air conditioners.
- States might want to be careful with how they word and propose these types of legislative efforts.

Lessons Learned

Consider Financing Support to Offset High Initial Costs

- The upfront cost burden is significant and could be eased by offering low-cost financing.
- This could potentially be paired with rebates to ease the cost burden, even if the equipment is required by a standard.

Thank You

Follow up questions? Feel free to reach out.

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