Getting the “Beneficial” out of Electrification

Scott Blunk
April 21, 2022

Powering forward.
Together.

SMUD

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We're Community-Owned and Not-For-Profit

SMUD's plan is to supply 100% carbon free electricity by 2030

Electrification at SMUD

CHEAPER | SAFER | HEALTHIER | BETTER

Goal ➔ Support 100% Electrification of Low-income by 2040, all buildings 2045

2018 - Current

Launched Program Offerings in All Sectors

Carbon-based metric for efficiency portfolio created

2,500+ Equivalent electric home conversions

18% All-electric buildings starting in 2018

2021 - 2030

New construction codes

Full-service / turnkey offerings

Financing options + infrastructure for customers

35% All-electric buildings by 2030

2030 - 2040

All new appliance and vehicle sales electric by ~2030

Support 100% of low-income customers electrified by 2040

80% All-electric buildings by 2040

Additional funding must come from external sources to be successful

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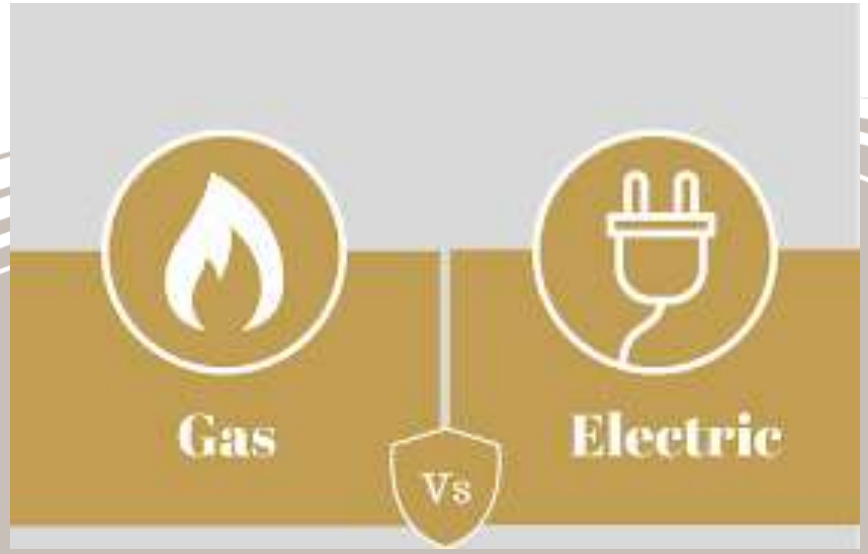
QUESTION: “Will you please share with everyone why gas is not more efficient than electricity anymore due to new heat pump technology?”

- Equipment Efficiency
- Total System Efficiency
- Carbon “Efficiency”
- Price “Efficiency”



https://www.linkedin.com/pulse/gas-vs-electric-efficiency-scott-blunk/

Equipment Efficiency

Gas 80% vs. electric heat pumps 300%

- What is efficiency
- What causes inefficiency
- Heat pumps are more than 100% efficient!?

$$\frac{\text{Output}}{\text{Input}} = \text{Measure of Efficiency}$$

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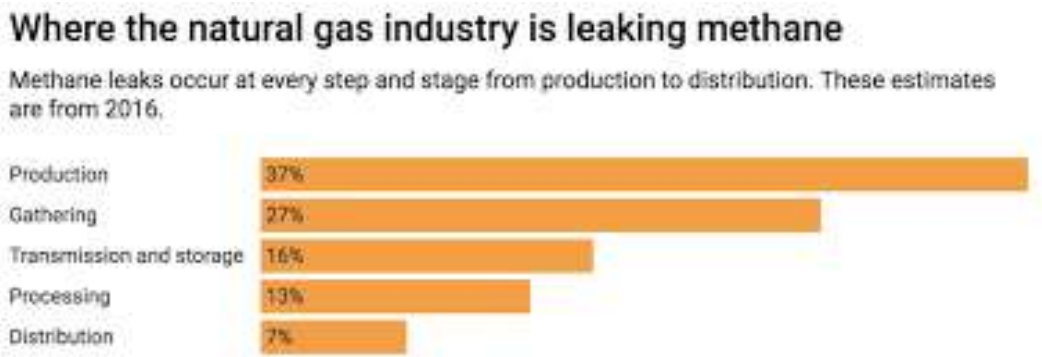
Total System Efficiency



Gas 76% vs. electric with heat pumps 200%

- Assuming 96% of the gas gets delivered on site (4% leakage), 0.5% leaks at the home, and the gas furnace equipment is 80% efficient

➔ gas system efficiency is 76%

- Generation: 50% of our mix is from renewables at 100% efficiency, 50% gas at 45% efficiency. Distribution: 95% efficient → 66% efficient x 300% heat pump efficiency

➔ electric system efficiency is 200%

  - At 33% efficient for generation and distribution (an often cited and wrong system efficiency) → assuming 33% efficiency x 300% efficient heat pumps ➔ the total system is 100% efficient

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Carbon “Efficiency”

Gas 1.9 tonnes per year vs. electric 0.2 tonnes per year

- Analysis was done using hourly marginal electricity emission in CZ 12 using SMUD’s electricity supply
- Gas equipment produces pollution inside/at the building, electric equipment produces much less pollution and does so at a remote power plant with emission control standards

	Gas	Electric
Water Heating	0.7 tonnes	0.09 tonnes
Space Heating	1.2 tonnes	0.09 tonnes

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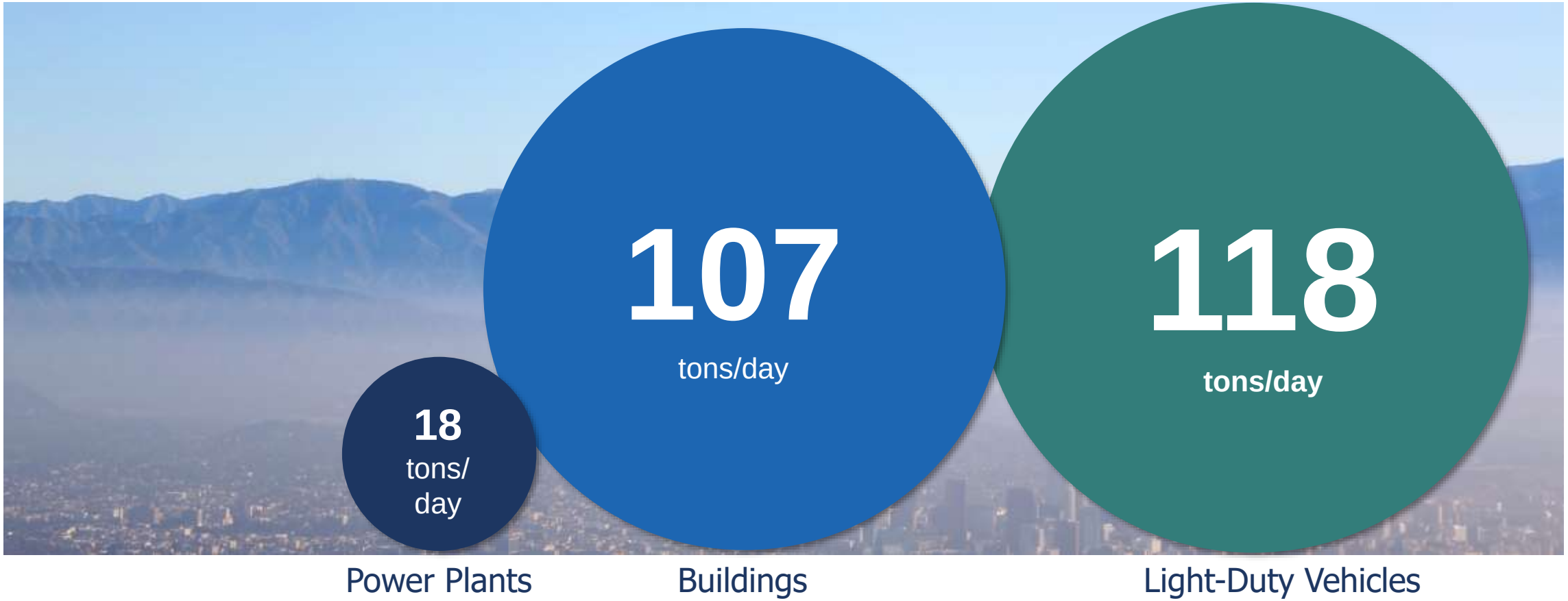
Outdoor Air Quality:
Burning Fossil Fuels in Buildings is a Big Part of California's Ozone/PM2.5 Problem

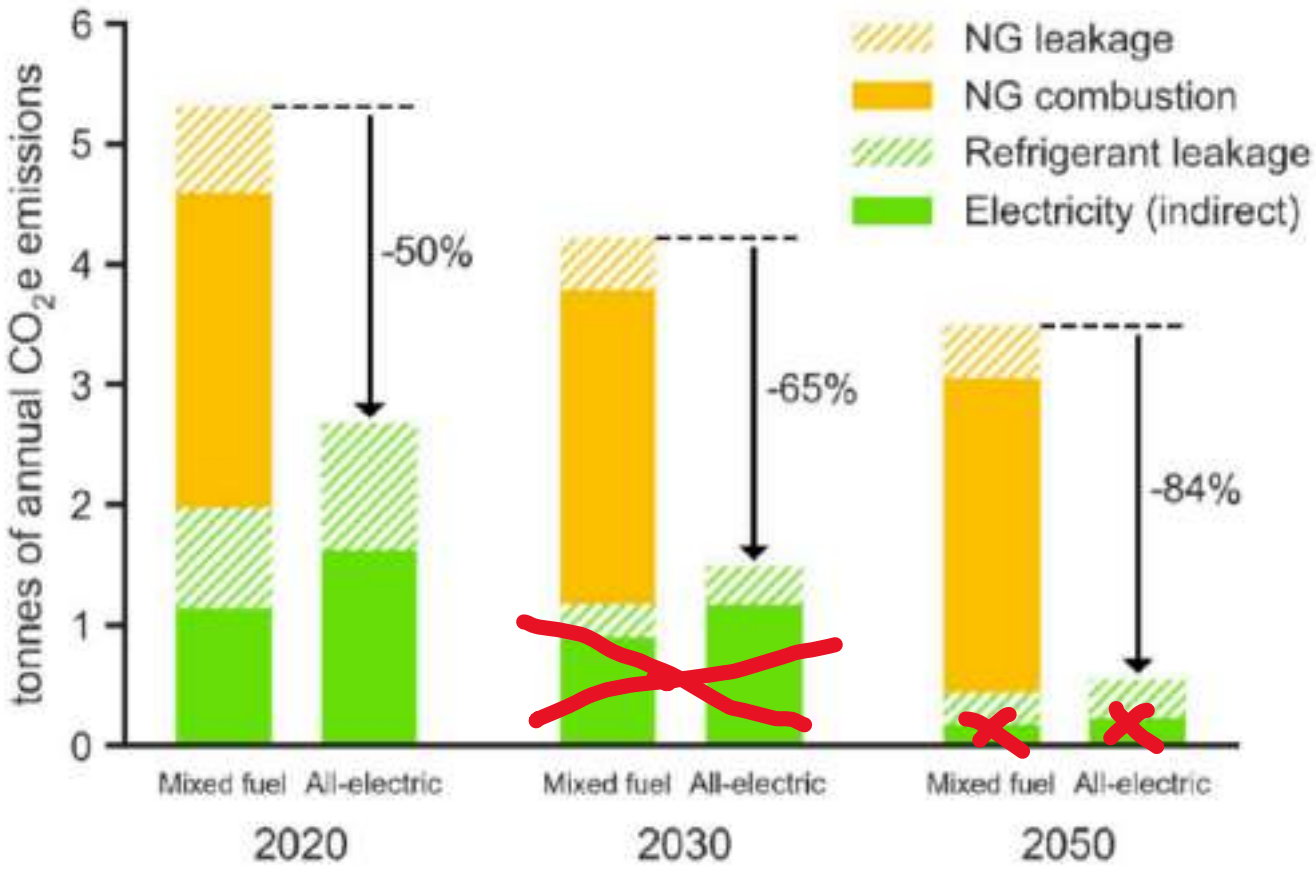
Nitrogen Oxides (NO_X) in California



Source: CARB

Pre-1978 vintage home emissions

Figure 1-1: Annual GHG emissions from a mixed-fuel and all-electric pre-1978, single-family home in Sacramento



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Price “Efficiency” (SMUD Customer)

Gas $1.58/therm vs. electric heat pumps $1.25/”therm”

- Gas costs on average from PG&E $1.58/therm
- Electricity cost on average from SMUD $0.16/kWh
- Converting kWh to Therms (29.3 kWh/therm) would equate electricity to cost $4.68/”therm”
- However, this is delivered energy, useful work out of a heat pump is 300% vs. 80% for gas equipment or 3.75x more efficient than gas.
- Therefore, $4.68/3.75 = $1.25/”therm” for electricity.

Price “Efficiency” *(PG&E scenario)*

Gas $2.11/therm vs. electric heat pumps $2.11/”therm”

- Gas costs on average from PG&E $2.11/ therm over last 6 months
- Electricity cost on average from PG&E $0.27/kWh over the last 6 months
- Converting kWh to Therms would equate electricity to cost $7.91/”therm”
- The 3.75x more useful work out of the system is what makes electricity more “efficient” or cheaper than gas when operating heat pump equipment

- Therefore, $7.91/3.75 = $2.11/”therm” for electricity

** This is using my personal PG&E data*

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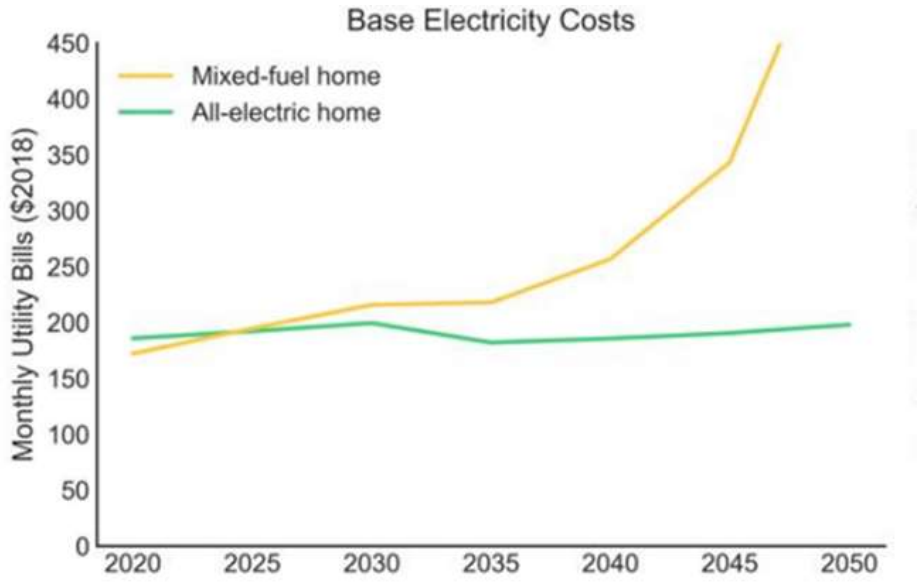
High Electrification Scenario

- Dramatic rise in gas customer bill burden
- Rate of disparity increases dramatically
- Most of the cost of natural gas is infrastructure



Increase in Electrification	$/therm	Annual Gas Bill	% Increase
Today	$1.50	$540	-
10% (2027)	$1.66	$898	66%
25% (2031)	$1.99	$1,077	99%
50% (2037)	$2.99	$1,616	199%
75% (2043)	$5.98	$3,231	498%

Source: E3

Today there are 18% all-electric homes

Myths of “Natural” Gas

- More efficient
  - Heat pumps are 3x more efficient
- More affordable
  - Modern all-electric homes have lower bills
- Better for cooking
  - Induction heats 2x faster, provides better temperature control, is easier to clean, does not dump toxins into the kitchen

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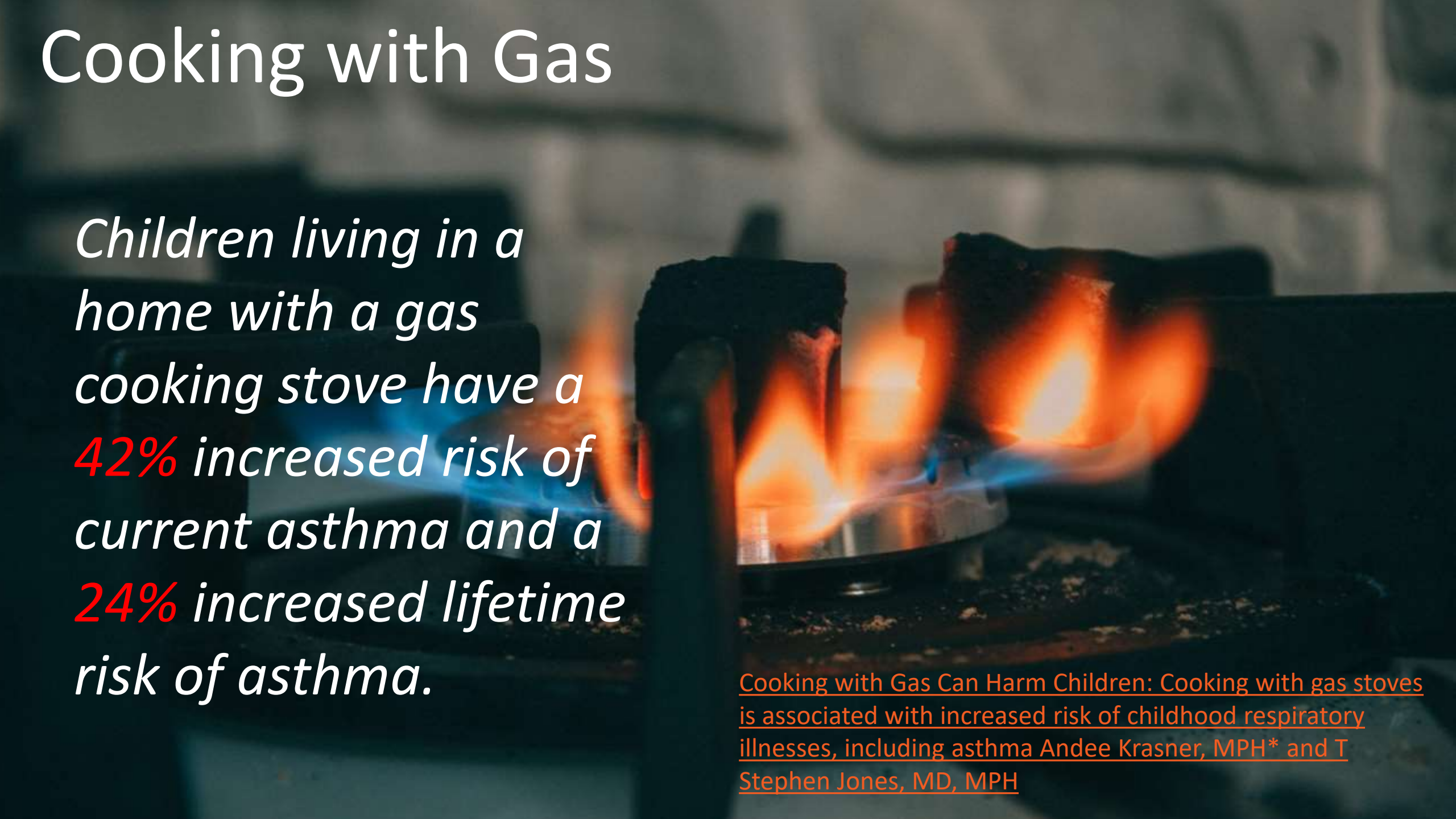
Cooking with Gas

Children living in a home with a gas cooking stove have a 42% increased risk of current asthma and a 24% increased lifetime risk of asthma.

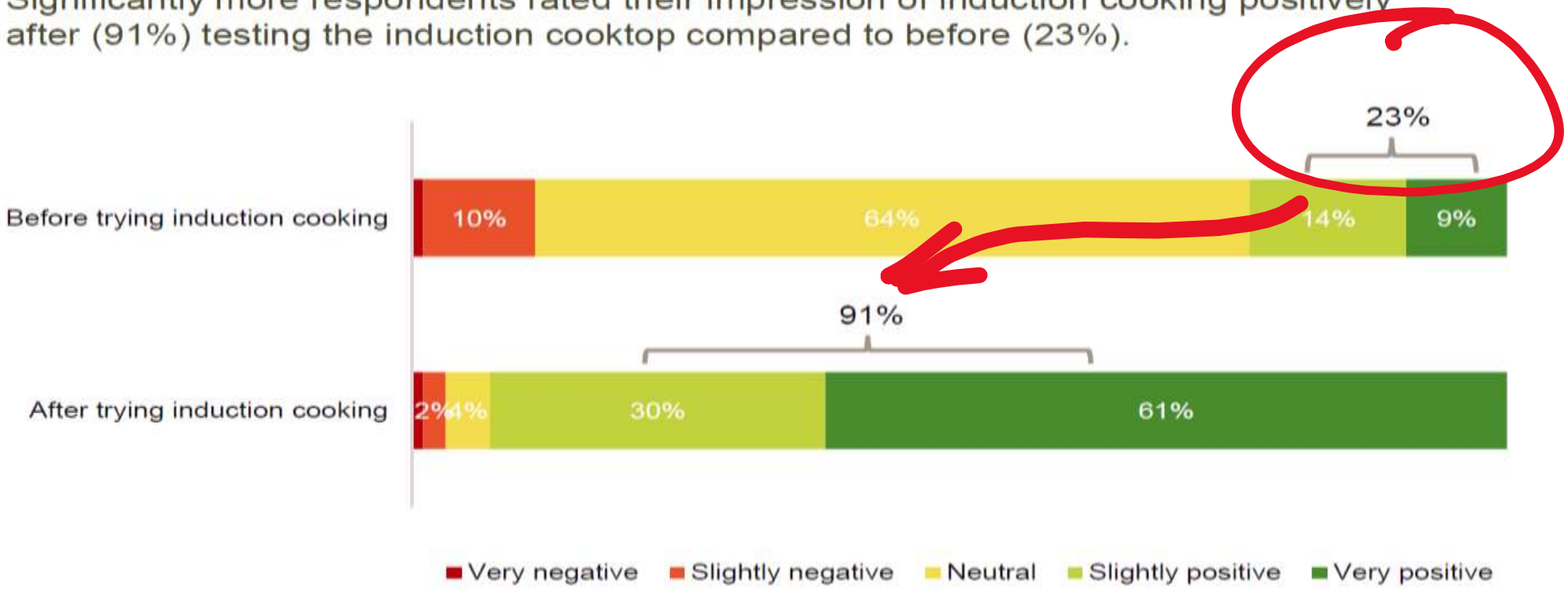


Cooking with Gas Can Harm Children: Cooking with gas stoves is associated with increased risk of childhood respiratory illnesses, including asthma Andee Krasner, MPH* and T Stephen Jones, MD, MPH

Hey Mikey, he likes it!

Induction Cooking Perceptions

Significantly more respondents rated their impression of induction cooking positively after (91%) testing the induction cooktop compared to before (23%).



Los Angeles Times

BUSINESS

L.A. needs clean energy. Hydrogen could be the answer — or gas industry greenwashing

A smokestack at Scattergood Generating Station, one of L.A.'s largest power sources. The gas-fired power plant sits along the coast near El Segundo. (Jay L. Clendenin / Los Angeles Times)

BY SAMMY ROTH | STAFF WRITER

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Thank you

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