



A Carbon-Free Energy Future

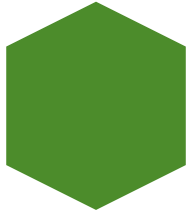
The Health Safety and Environmental
Benefits of Electrification

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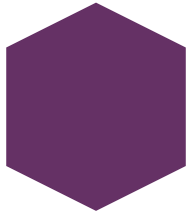
Agenda



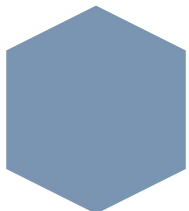
Keys to Decarbonization



On-Site Combustion: *It's Not What It Used to Be*



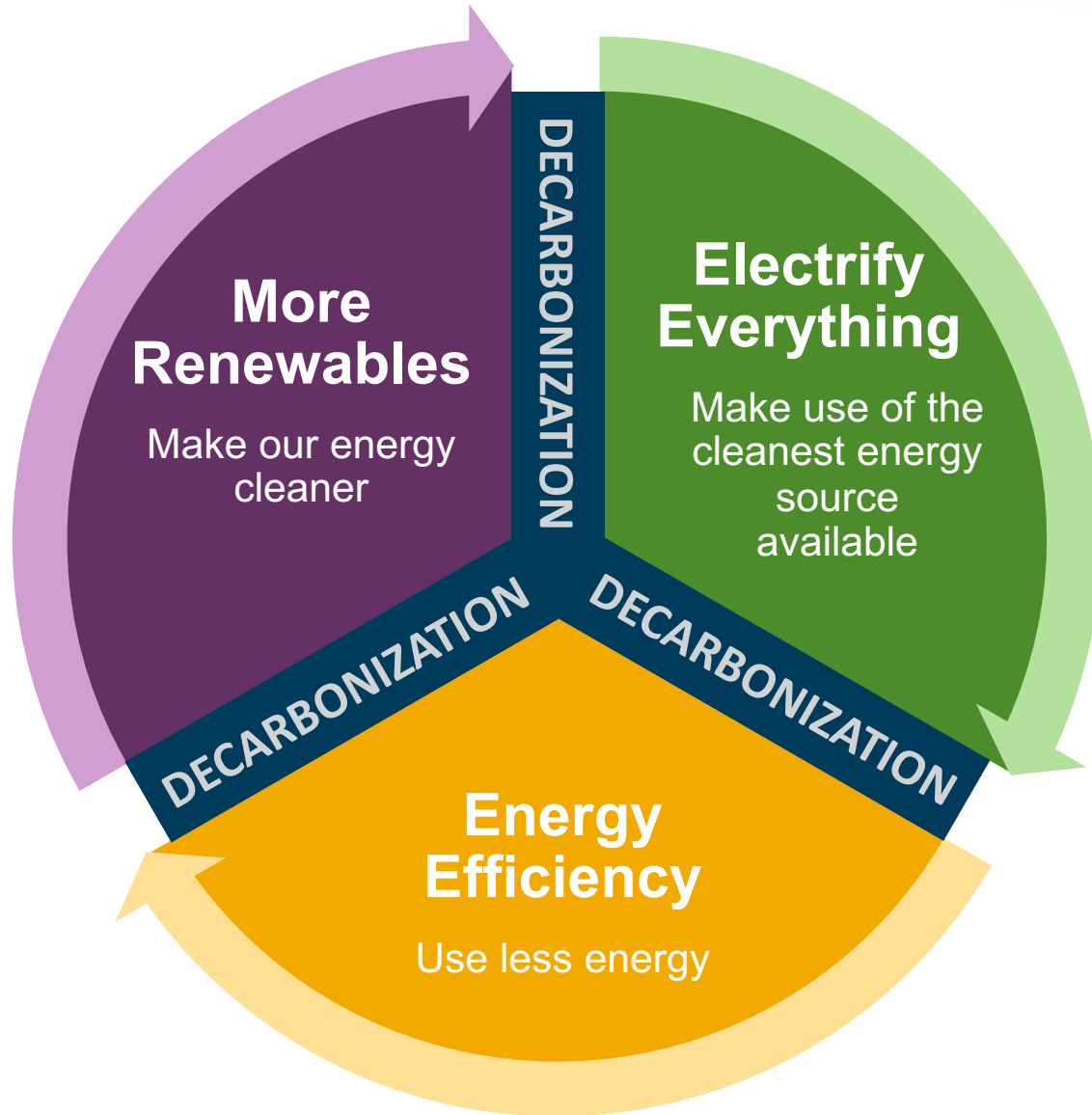
Renewable Portfolio Standards: *The Future of the Grid*



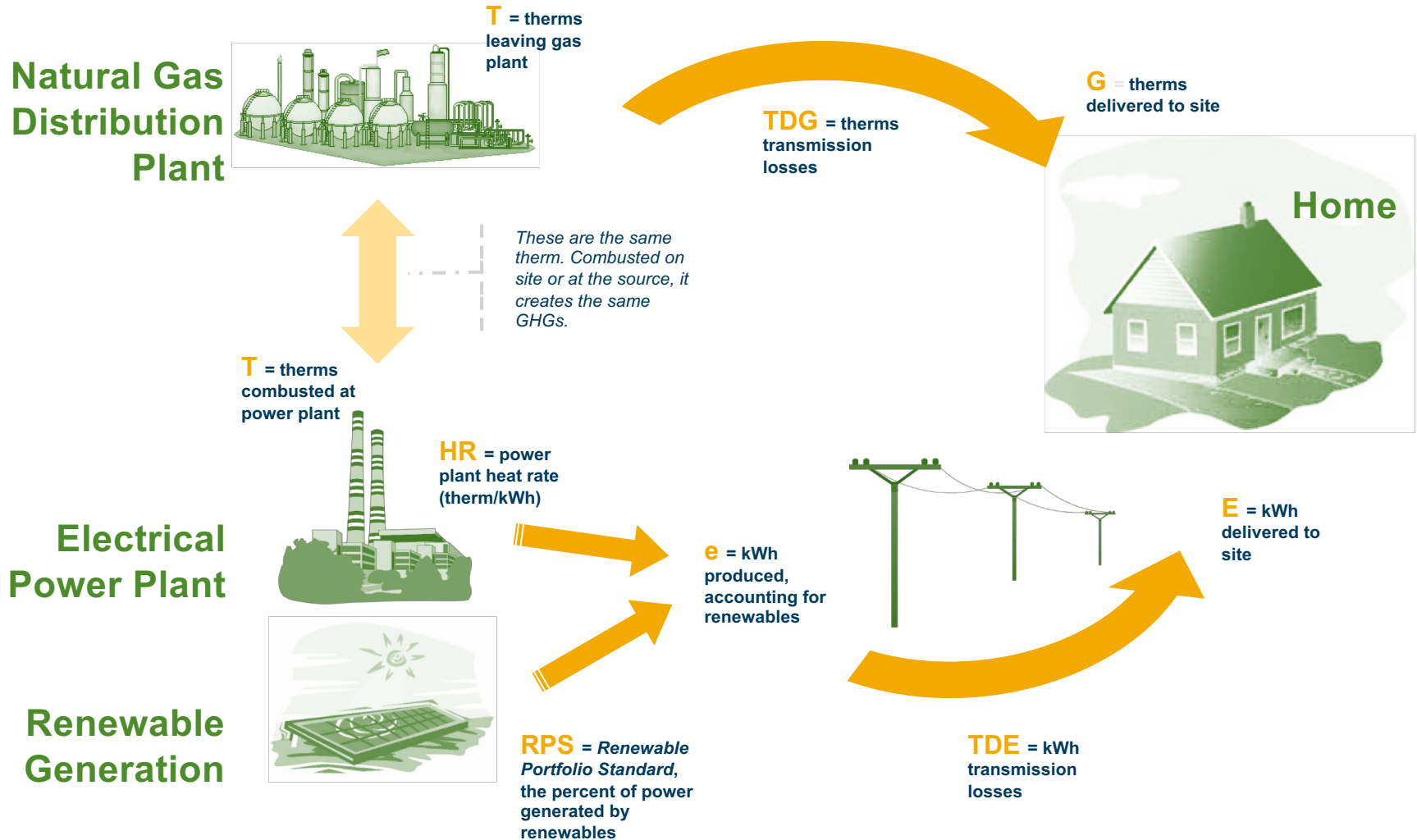
Electrification in the Home



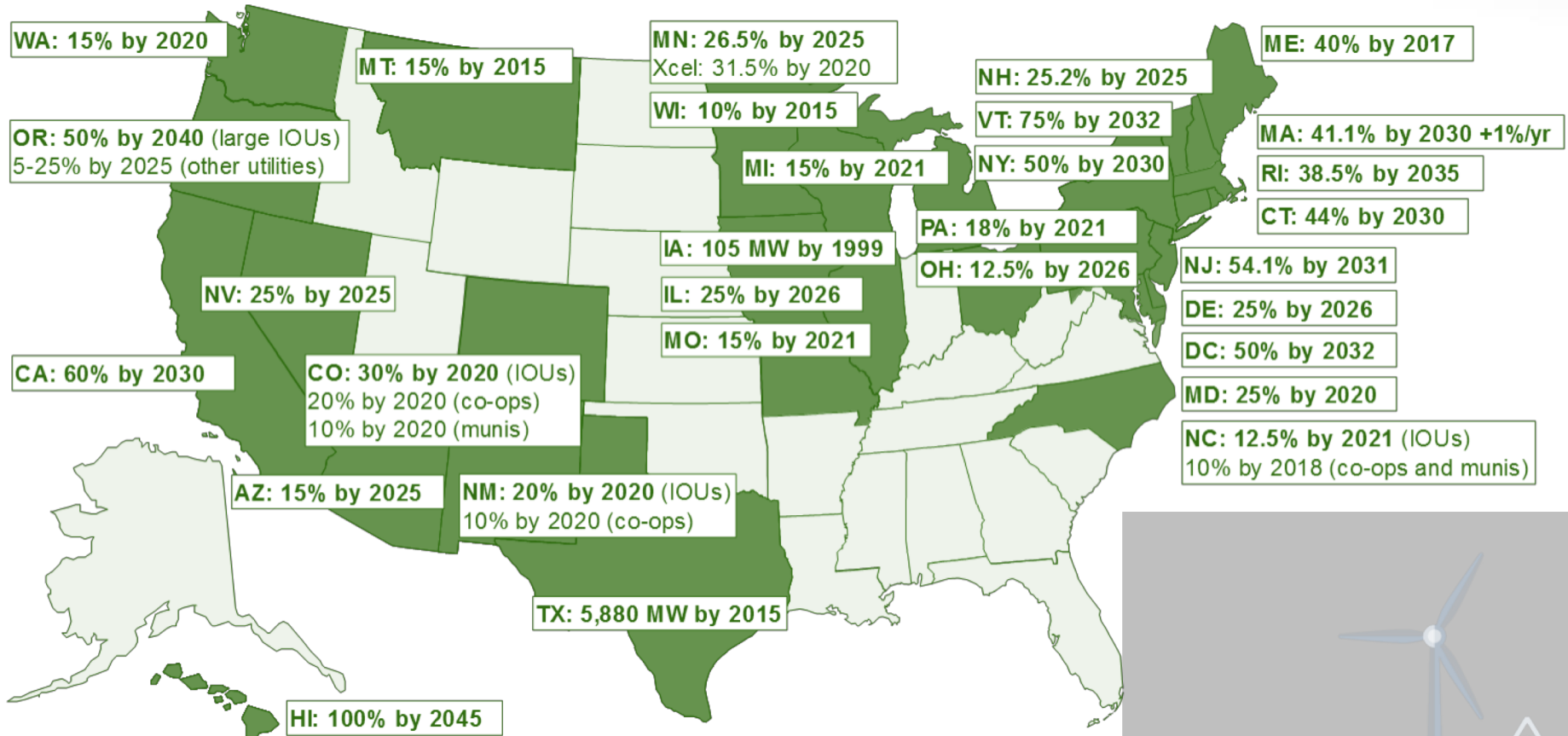
Three Keys to Decarbonization



On-Site Combustion: It's Not What It Used to Be



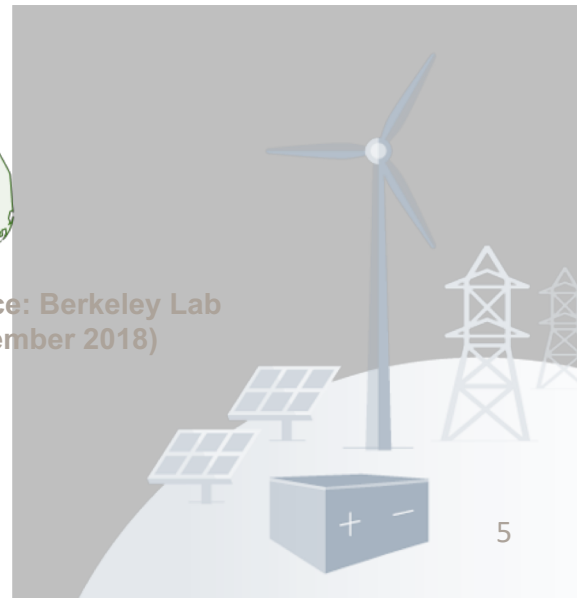
Renewable Portfolio Standards



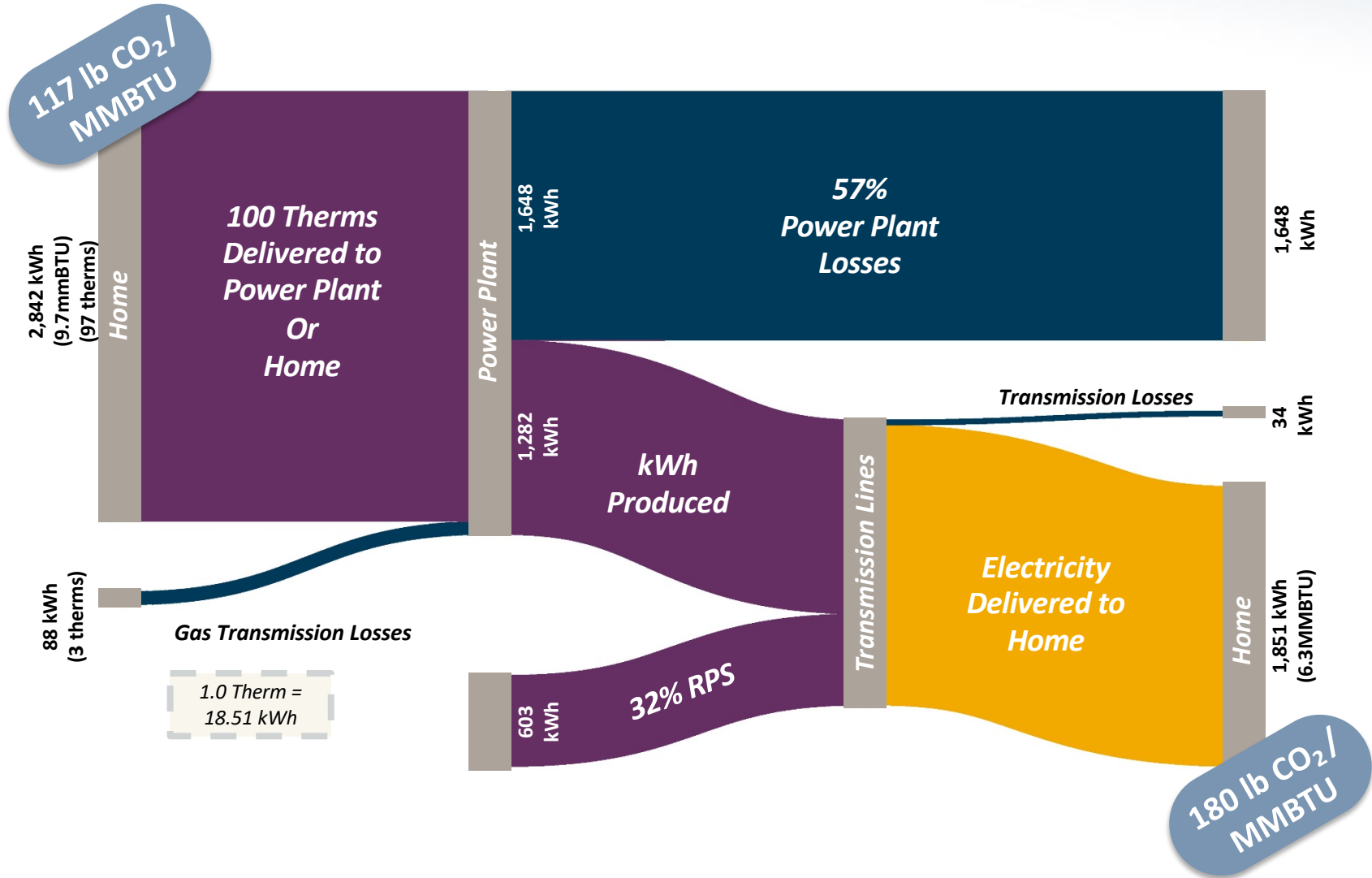
29 states

currently have RPS regulations or mandates

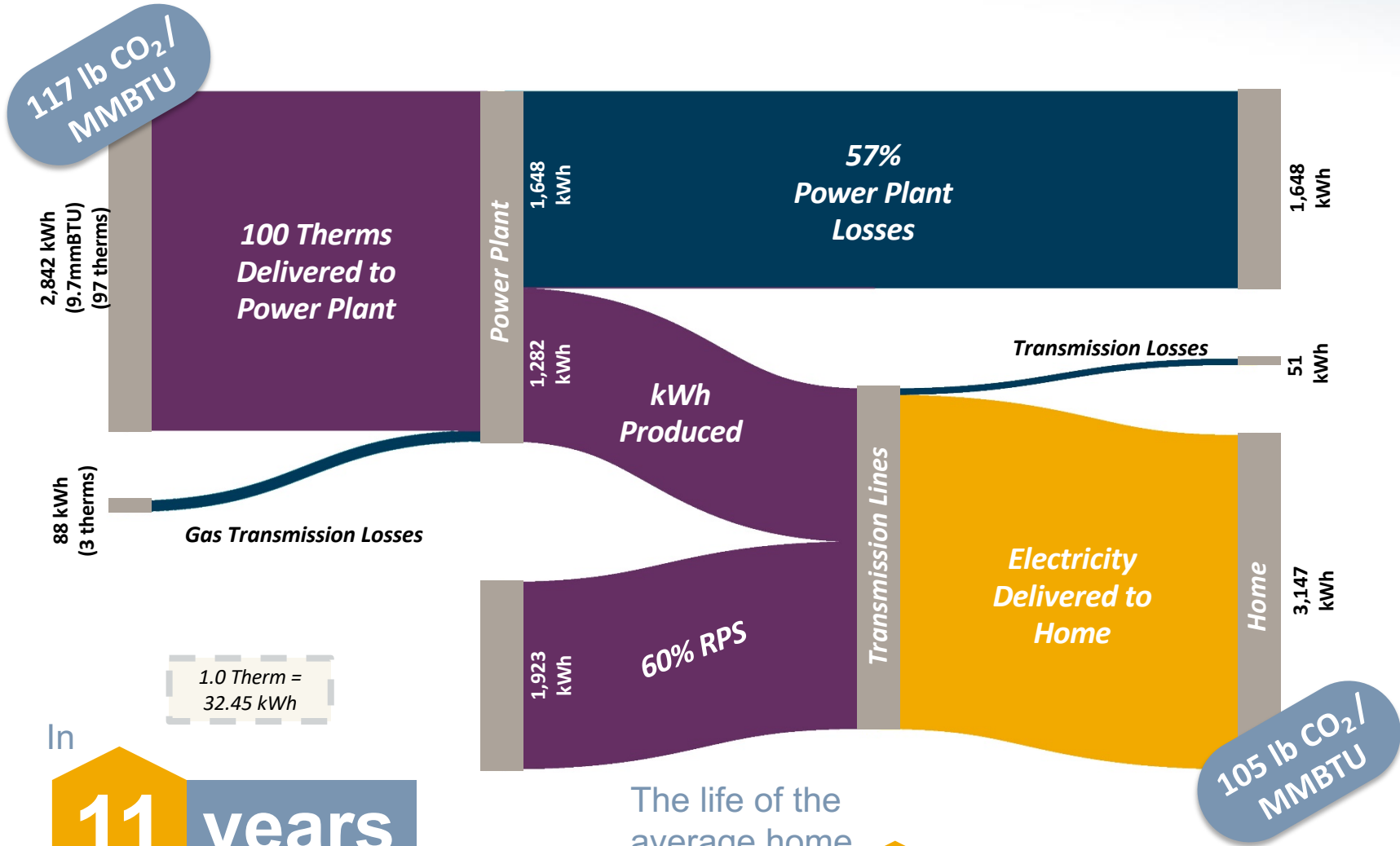
Source: Berkeley Lab (November 2018)



Source Carbon Content: 2018



Source Carbon Content: 2030



In

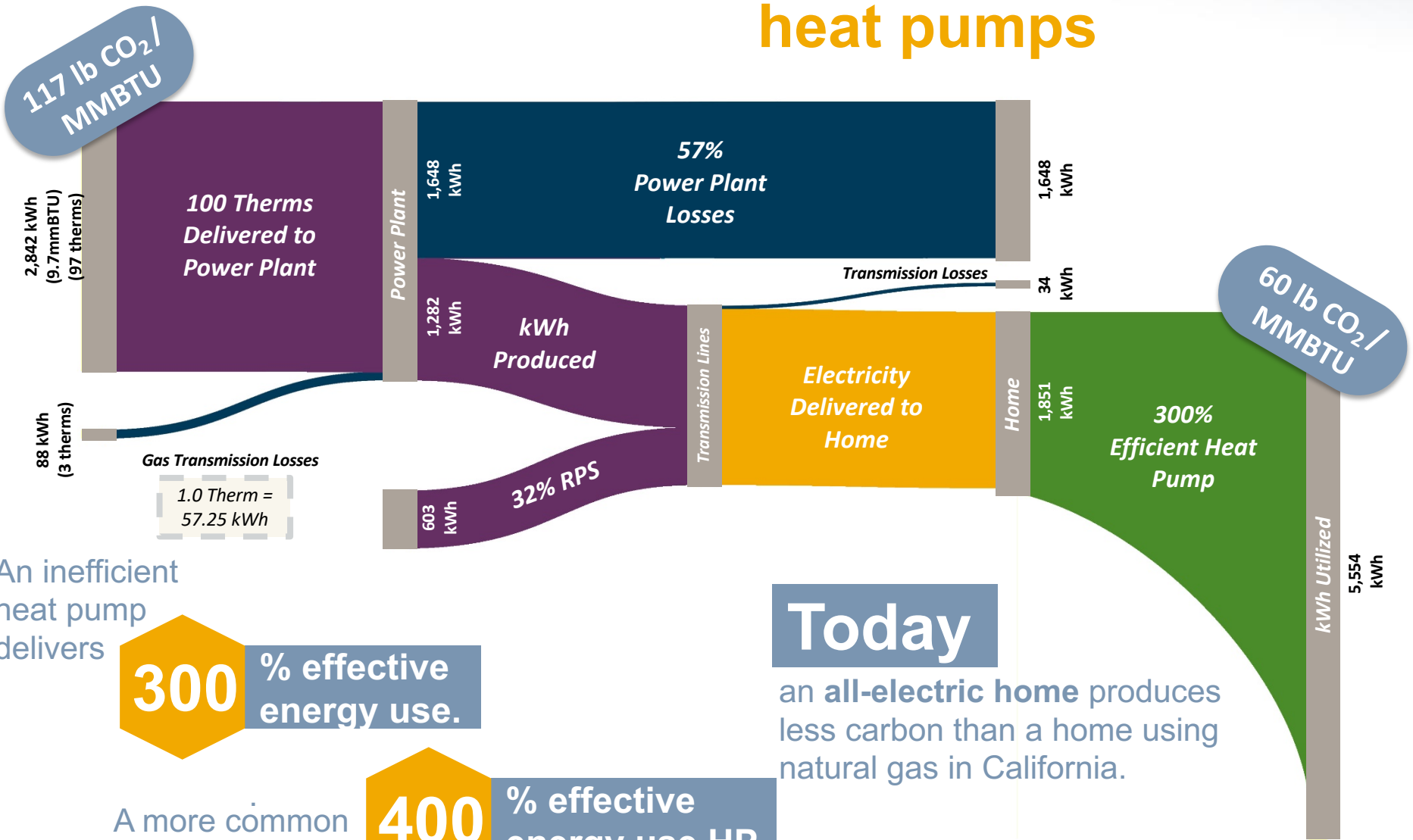
11 years

the electric grid will be cleaner than using natural gas in California.

The life of the average home is well over

100 years

Source Carbon Content: 2018 with heat pumps



An inefficient heat pump delivers

300 % effective energy use.

A more common

400 % effective energy use HP
= 44 lb CO₂ / MMBTU

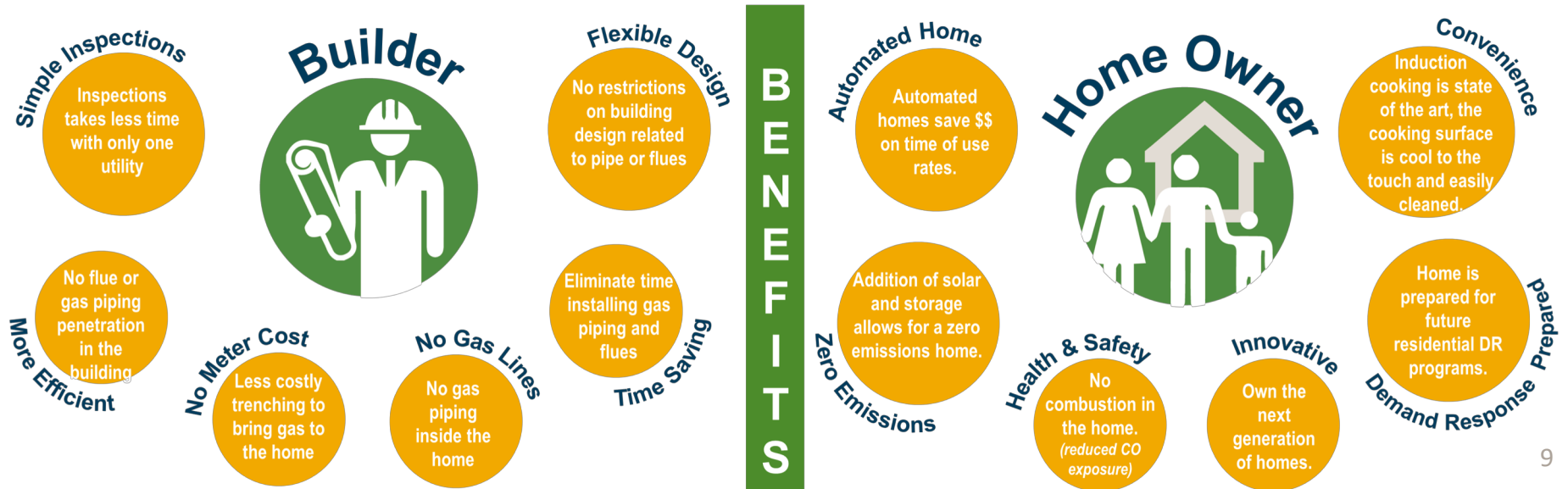
Today

an all-electric home produces less carbon than a home using natural gas in California.

All-Electric Home Comparison

	Electric & Gas Home	All-Electric Home
Electricity Consumption	4,530 kWh/yr	7,670 kWh/yr
Natural Gas Consumption	370 Therm/yr	0 Therm/yr
GHG Emissions (source)	6700 lb CO ₂ /yr	4100 lb CO ₂ /yr
Total 2016 kTDV ¹	80 kTDV/yr	71 kTDV/yr
Total 2016 Energy Bill	\$1,070/yr	\$1,040/yr

¹ Does not include lighting or miscellaneous plug loads. Based on energy modeling of a typical 2,100 sf single-story home. GHG emissions averaged over first 15 years. Individual energy use may vary based on individual lifestyle and behavior.



What About in the Home?



On-site combustion releases carbon monoxide into the home.

1,555

accidental
CO related
deaths per
year.

Source: CDC

64%

of all CO
exposure
cases occur
in the home.

Source: National
Institute of Health
(2016)

”
Based on these modeling results, the investigators estimated that, during a typical winter week, 1.7 million Californians could be exposed to CO levels that exceed standards for ambient air, and 12 million could be exposed to excessive NO₂ levels, if they do not use venting range hoods during cooking

LBNL

“

The Hardest Habits to Break



The only place most people interact with their fuel source is cooking – it is the hardest for them to give up.



People care that they are comfortable and have hot water, they don't care what fuel source makes these happen

“ Gas burners were estimated to add 25–33% to the week-averaged indoor NO₂ concentrations during summer and 35–39% in winter... For CO, gas stoves were estimated to contribute 30% and 21% to the indoor air concentration in summer and winter, respectively.

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“ Carbon monoxide is a deadly toxin. In one study, 51 percent of kitchen ranges tested raised CO concentrations in the room above the EPA standard of 9 parts per million. Five percent had carbon monoxide levels above 200 parts per million
Iowa State



The Hardest Habits to Break



Induction cooking is the future!

- No combustion
- Cooking surface is not directly heated
- Better temperature
- Faster cooking
(95% effective; natural gas only 35% effective)
- Easy to clean

Thank You



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