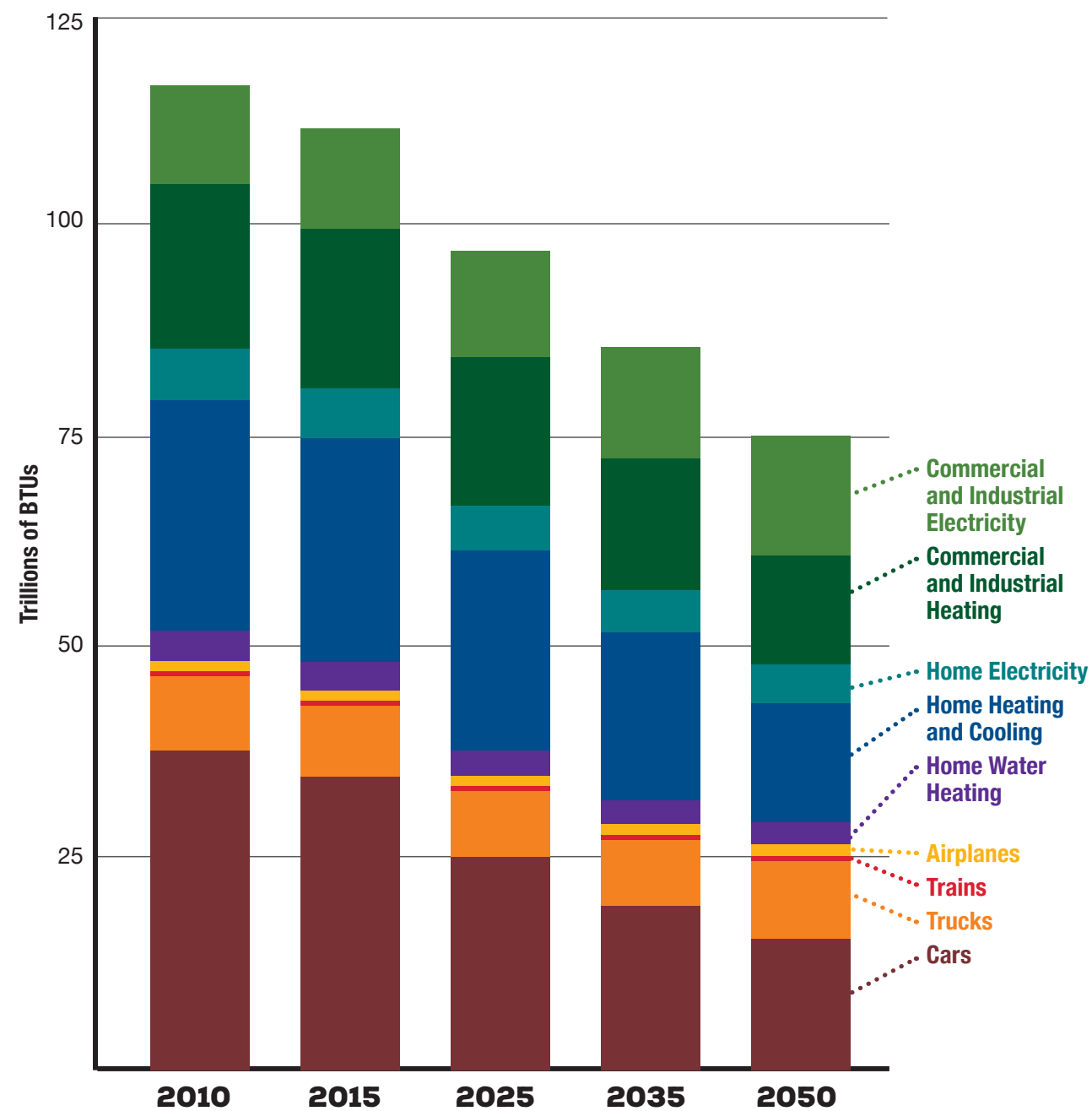


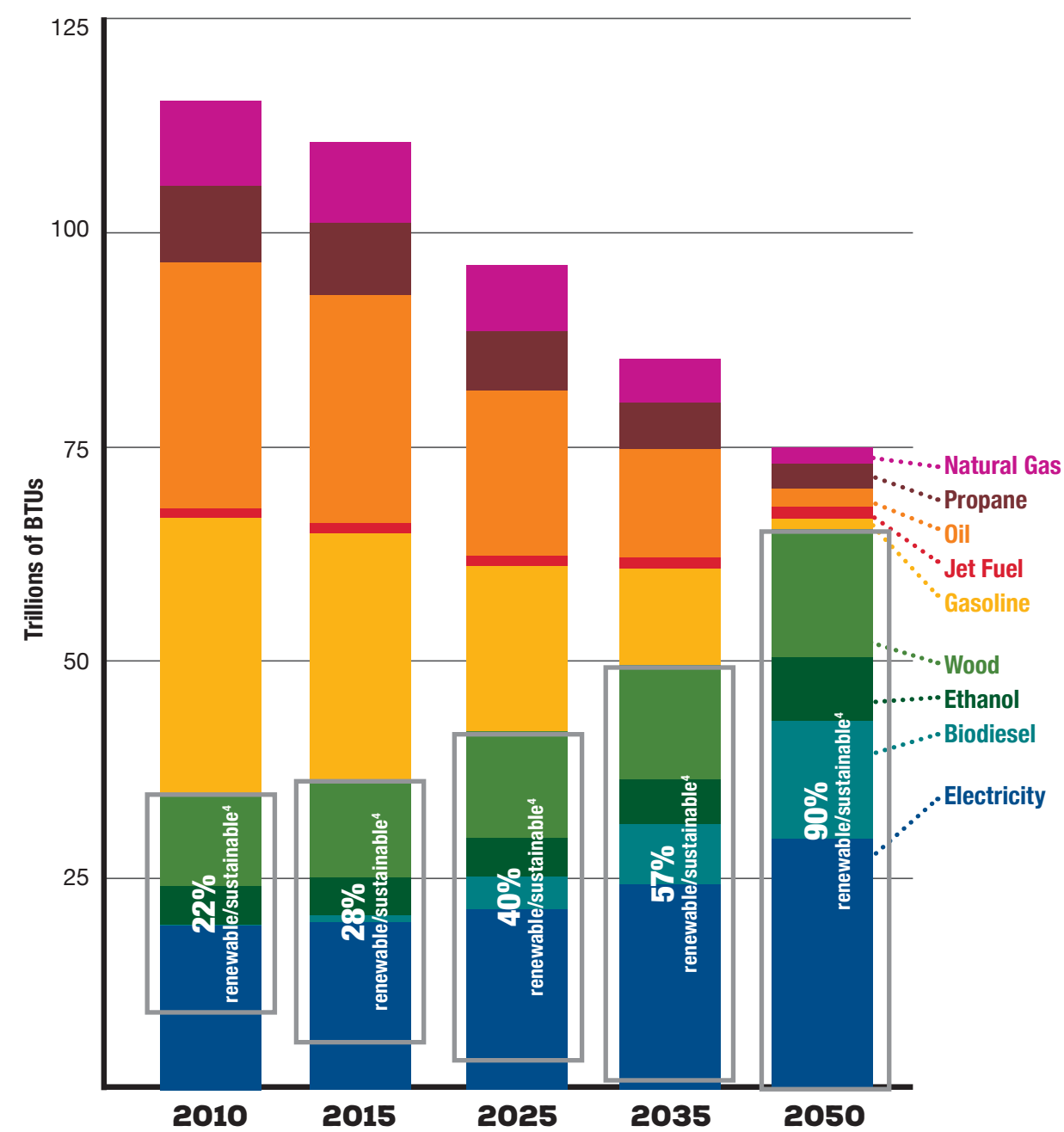
# CHARTING OUR ENERGY FUTURE

## Less Energy, More Renewables: Modeling the Vermont Comprehensive Energy Plan<sup>1</sup>

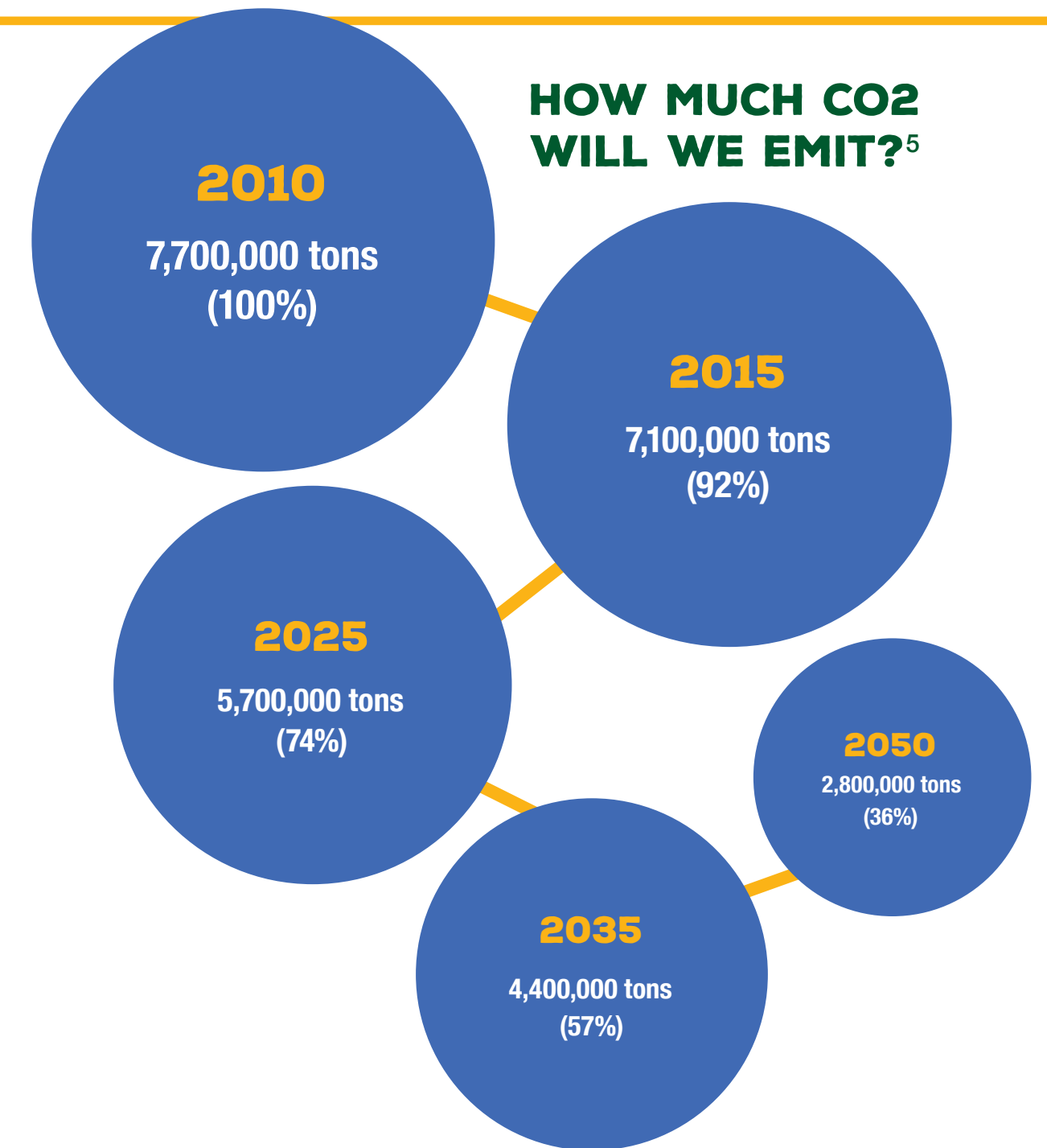
### WHAT WILL WE USE ENERGY FOR?



### WHAT SOURCES OF ENERGY WILL WE USE?<sup>3</sup>



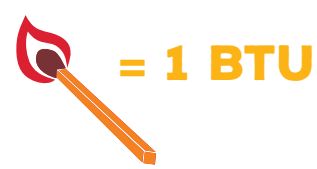
### HOW MUCH CO2 WILL WE EMIT?<sup>5</sup>



#### What is a BTU?

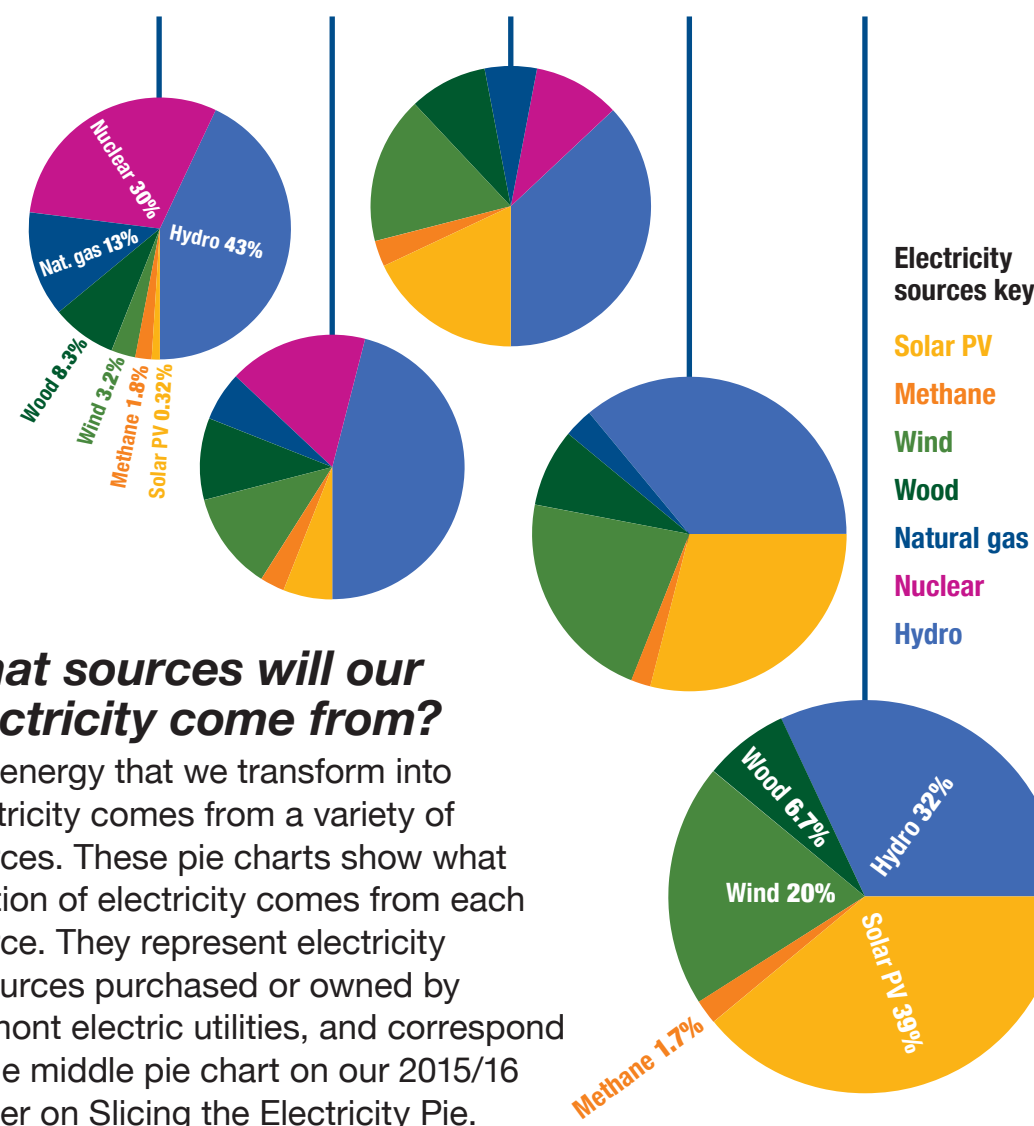
A BTU is a measure of energy.<sup>2</sup> If you completely burn up a standard wooden match, it gives off about 1 BTU of energy.

We typically measure heat in BTUs and electricity in kilowatt hours (kWh). There are 3,412 BTUs in 1 kWh.



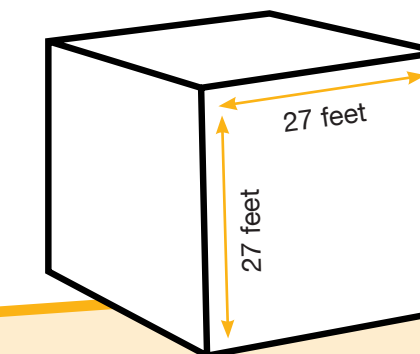
#### How many is a trillion BTUs?

Here is one way to think about how big a trillion is:



#### What sources will our electricity come from?

The energy that we transform into electricity comes from a variety of sources. These pie charts show what fraction of electricity comes from each source. They represent electricity resources purchased or owned by Vermont electric utilities, and correspond to the middle pie chart on our 2015/16 poster on Slicing the Electricity Pie.



#### How much is a ton of CO2?

One ton of CO2 has the volume of a 27-foot cube.<sup>6</sup> That's roughly the size of a small two-story house!

#### NOTES

- The Vermont Comprehensive Energy Plan charts a course to having 90% of all energy use in Vermont come from renewable energy sources by 2050. To view the plan, visit the Vermont Department of Public Service website at [publicservice.vermont.gov](http://publicservice.vermont.gov), then click on Publications & Resources > Publication > Energy Plan.
- The technical definition of a British Thermal Unit or BTU is the amount of heat required to raise one pound of water one degree Fahrenheit. A pound of water is one pint, so a BTU is a small unit of heat! Other ways to measure energy include joules and kilocalories; 1 BTU equals about 1,055 joules and about 0.25 kilocalories.
- Thanks to Energy Action Network ([eanvt.org](http://eanvt.org)) for format and concept for this graph. The data is from projections (modeling) run by Vermont Energy Investment Corporation to chart a plausible path to meet the goal of the Comprehensive Energy Plan: 90% renewables by 2050, or "90 x 2050." This work was coordinated with the Vermont Department of Public Service's Total Energy Study and was funded by the U.S. Department of Energy under the SunShot Initiative's Solar Market Pathways Program (a program to increase the use of solar energy). The data was in draft form as of the creation of this poster in August 2016 and should be treated as a draft. Historical data came from the U.S. Energy Information Agency and the Vermont Department of Public Service, including their 2014 Total Energy Study and 2013 Utility Facts.
- Solar PV, wind and hydro are considered here as renewable sources of energy. Methane, wood, ethanol and bio-diesel are considered sustainable sources — that is, they require proper human intervention to be renewable.
- This graph includes CO2 emissions from wood burning. Many tallies of CO2 emissions discount wood emissions partially or totally because trees will regrow and absorb that CO2 within some period of time, often cited as 30 years, sometimes more. We include the emissions here because 1) Burning wood pellets releases as much or more carbon dioxide per unit of energy as burning coal, 2) We don't know whether the trees are harvested sustainably, 3) We are concerned about near-term CO2 additions to the atmosphere because of the rapid rise of atmospheric CO2, and 4) Perhaps most importantly, to engage you in this important conversation about wood burning.
- If you had a volume that only contained CO2 at 25 degrees Celsius and 1 atmosphere pressure, it would be this big. In reality, when CO2 is released it mixes with all the gases in the atmosphere.



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#### OUR MISSION IS TO PROMOTE ENERGY LITERACY

A deep understanding of what energy is and how to use it efficiently, to enable energy usage choices that will result in a sustainable and vital economy and a healthy environment.