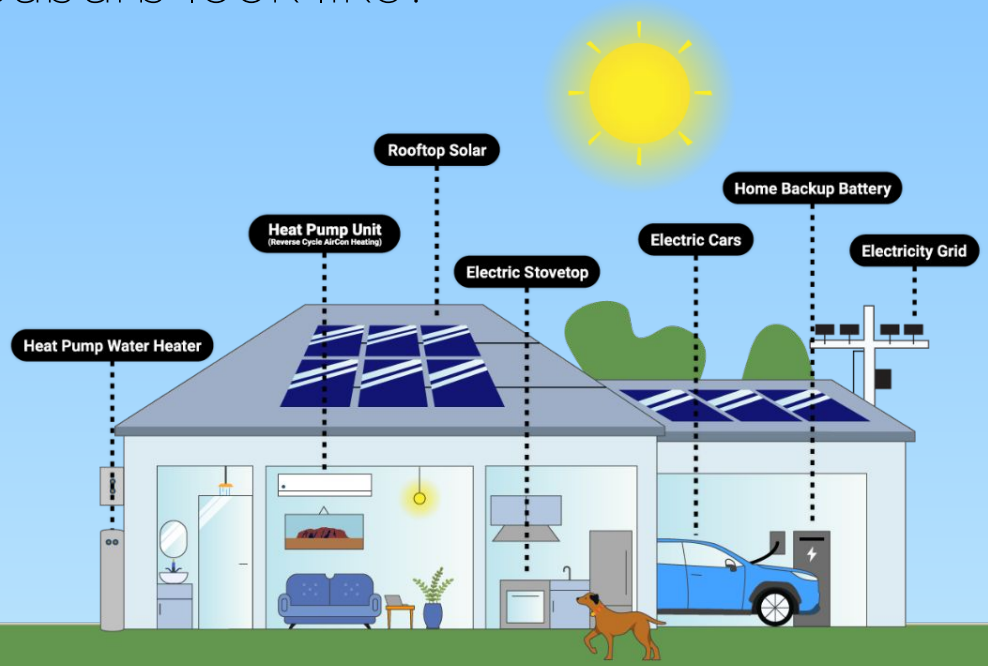
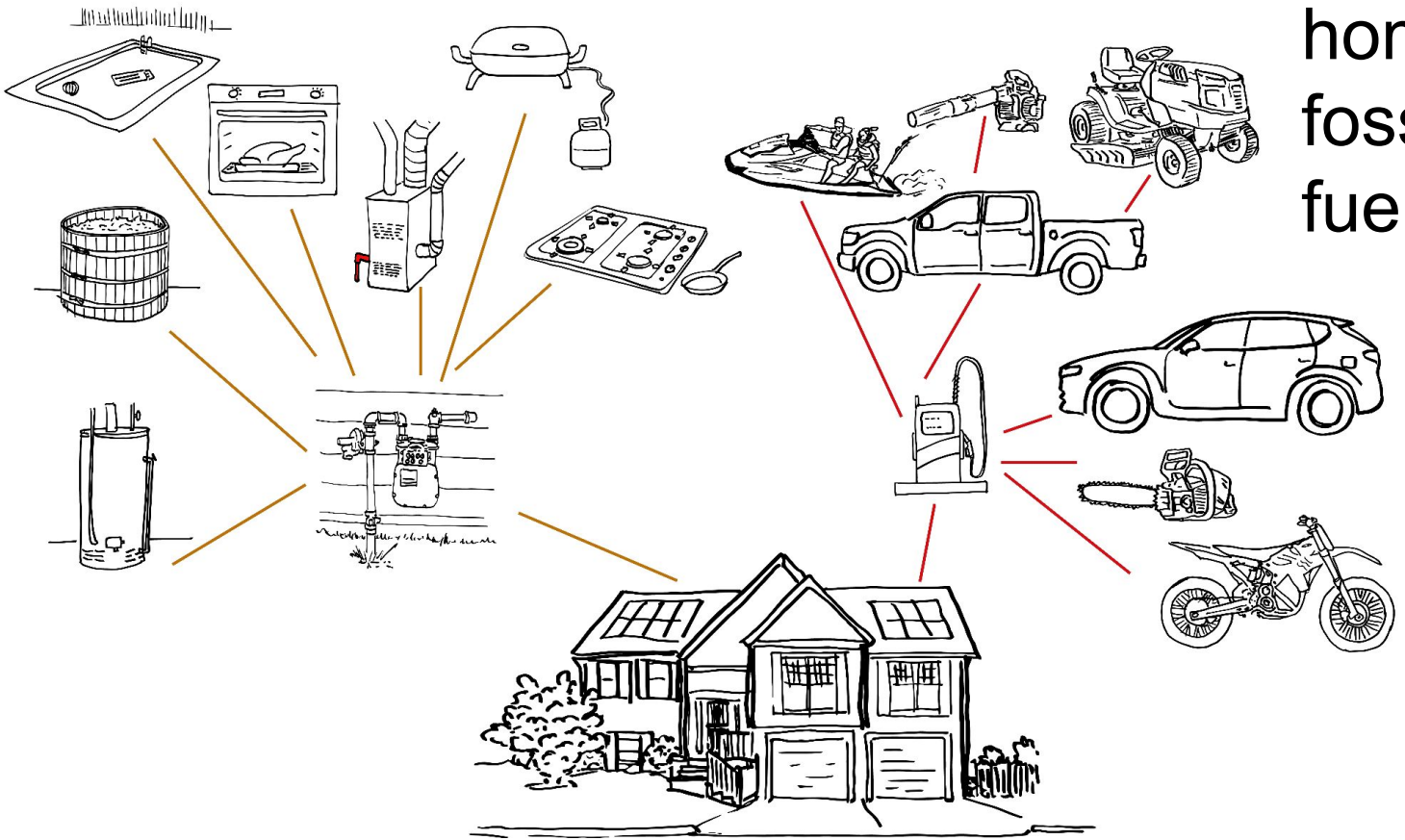
Zero Emission Victorian Households

What does a zero emissions suburb look like?

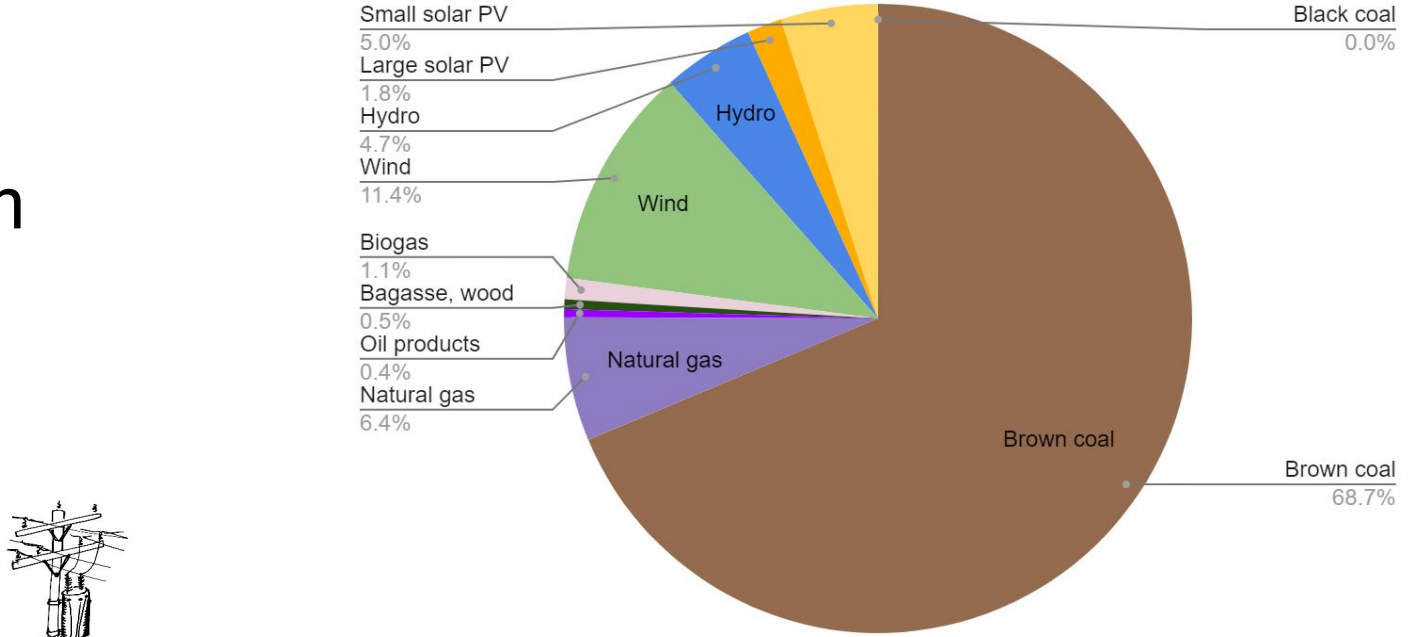


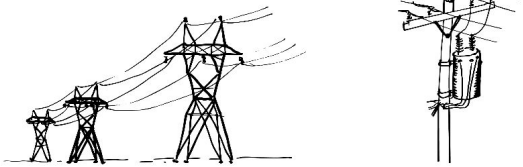
Rewiring Australia

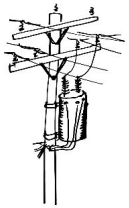
Today most homes are fossil fuelled.



And most electricity comes from coal in VIC



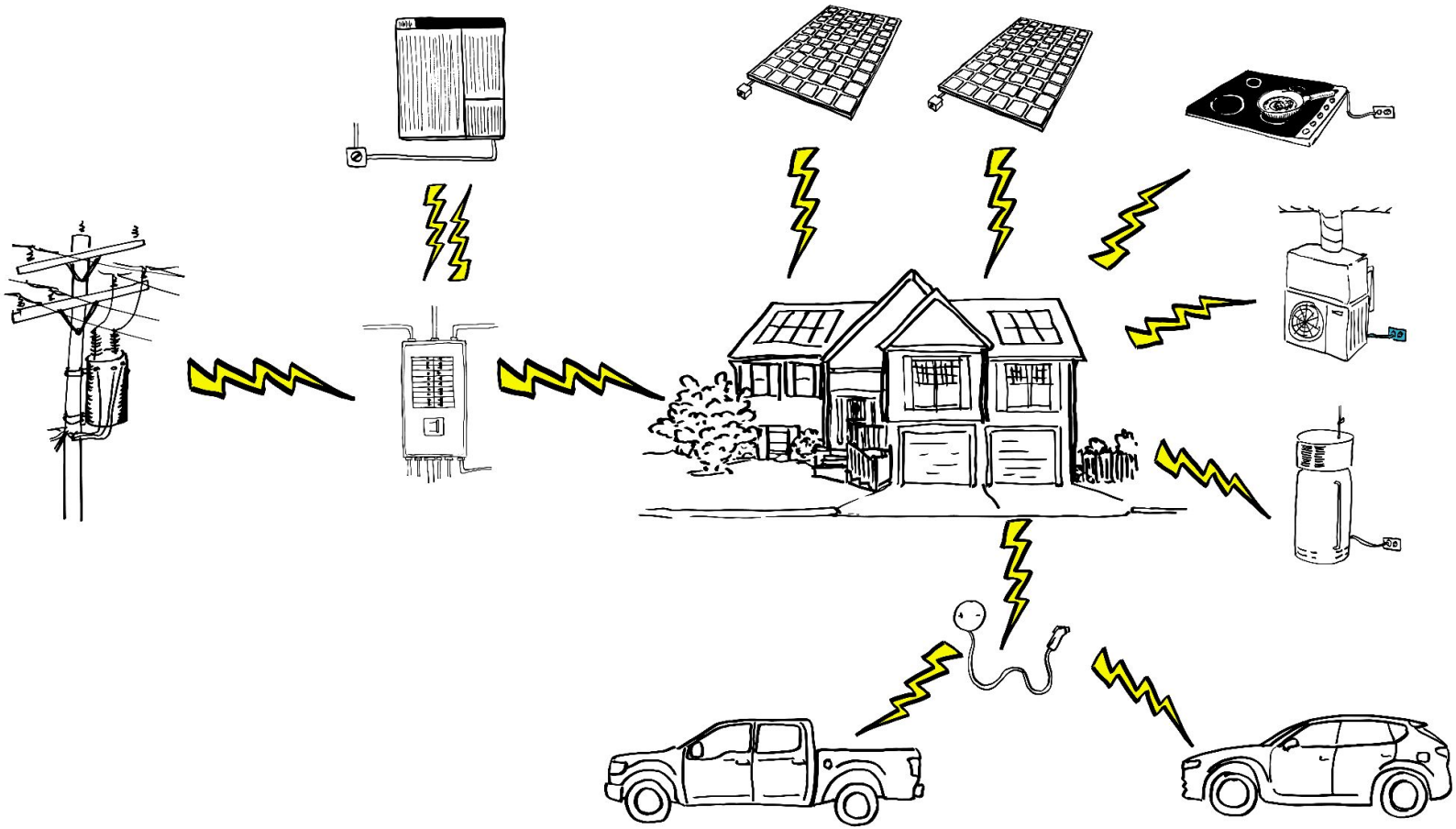




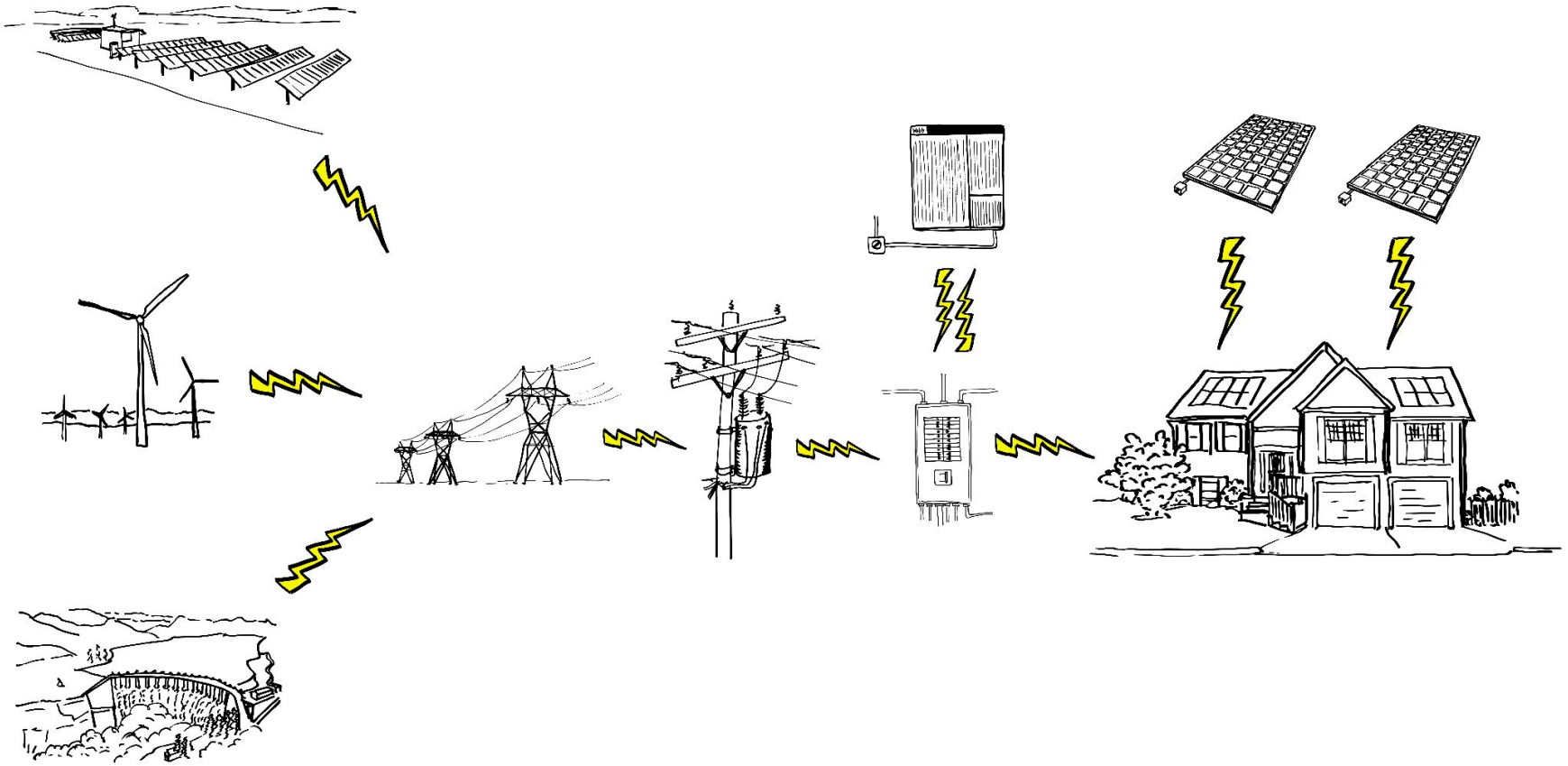
~42% domestic emissions are from households.
~26% from small businesses and commercial.

To get to zero emissions we must electrify these demand side machines and decarbonize the sources of our electricity.

Electrify the households



Clean up the electricity



This is going to transform our energy system.

We will need less than 50% of our current energy, because electrical machines are much more efficient.

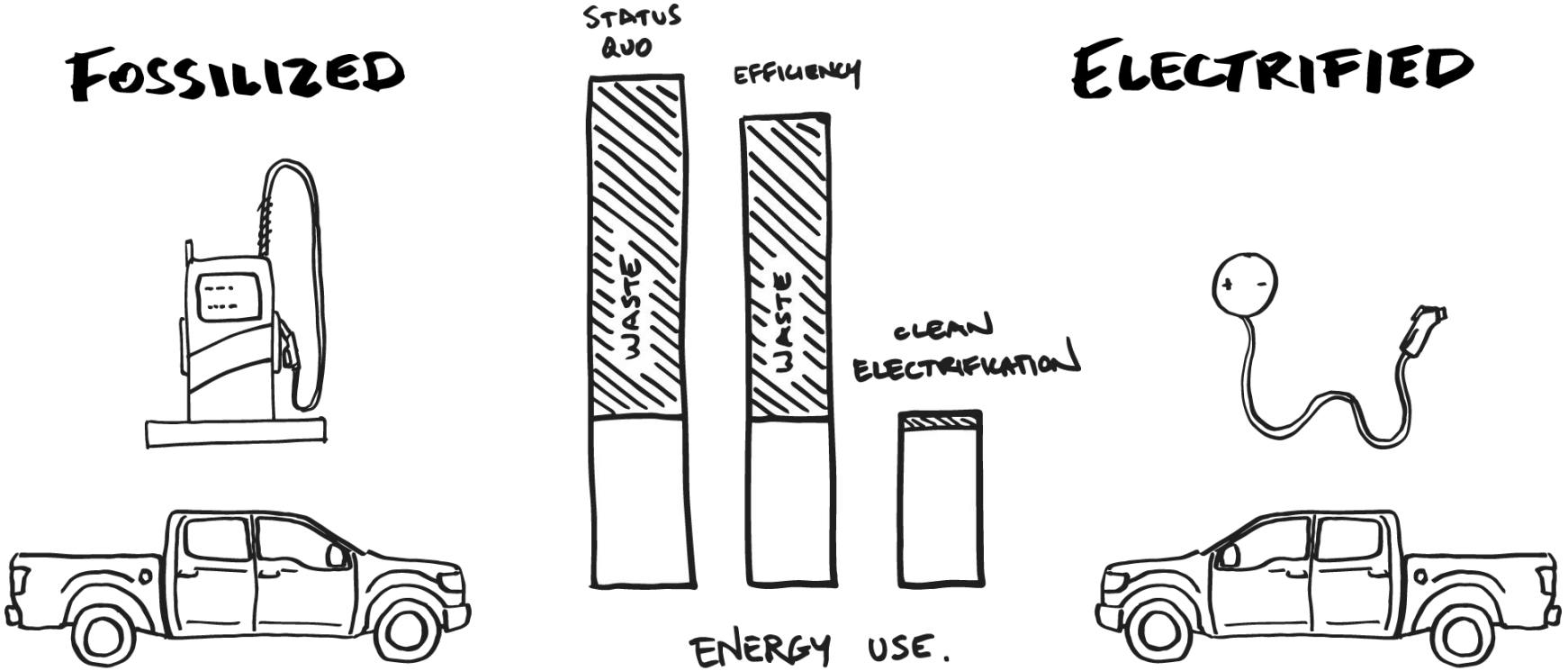
We will need a lot more electricity, because we will be electrifying our transportation.

We will need more electricity still because we will be electrifying our heat (space heat, water heat, kitchen heat, etc…)

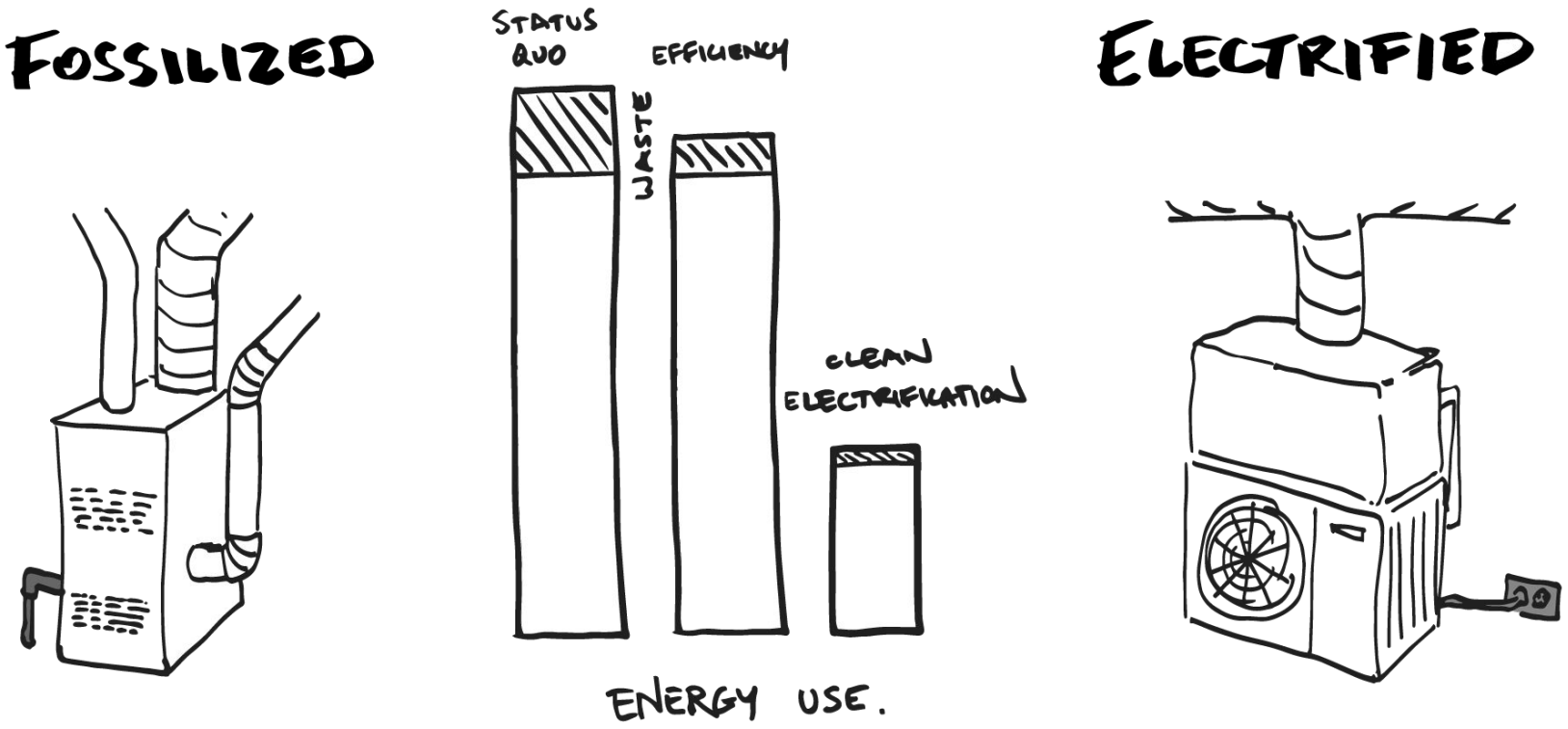
250%-300% current net delivered electricity.

Much of this transition will happen underneath the local electricity “substation” and transform household and community economics.

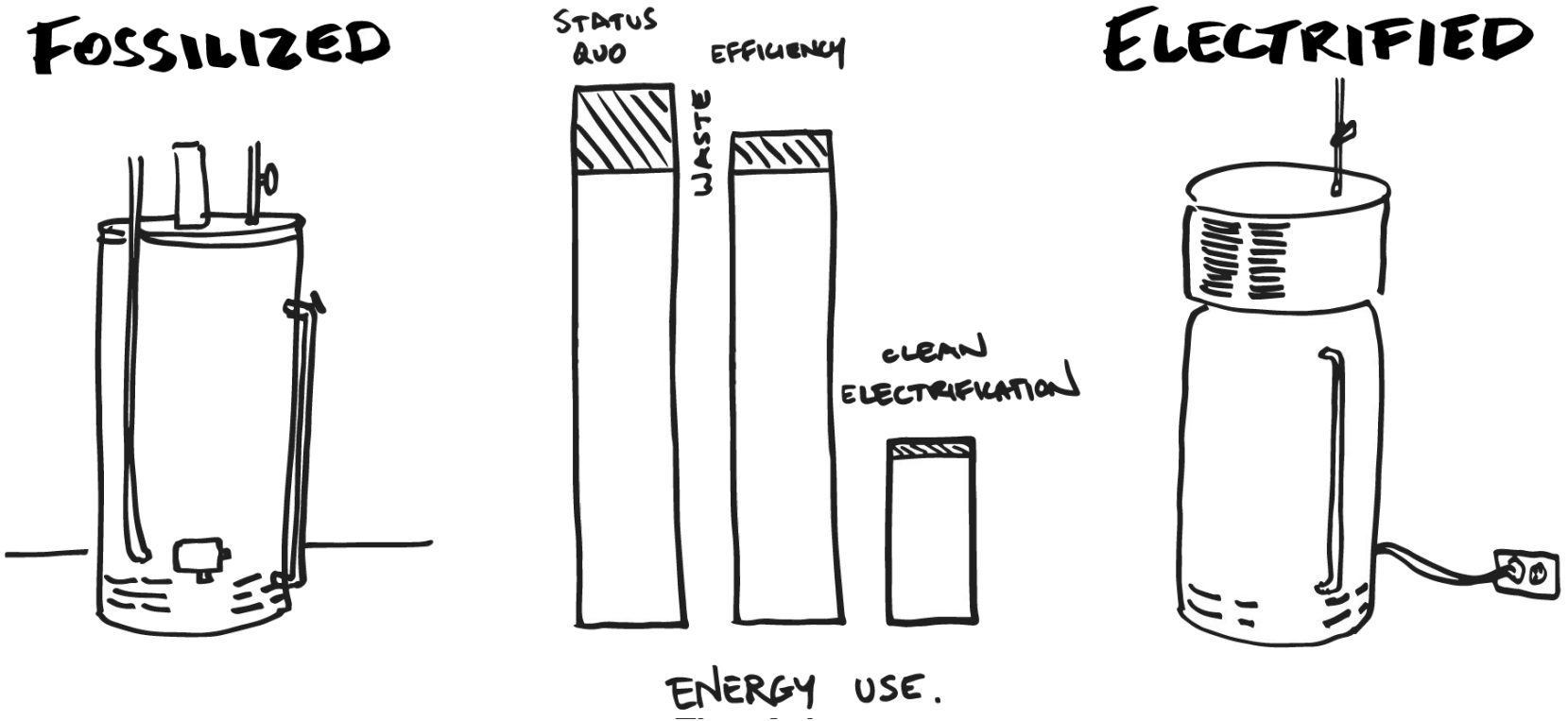
Simple heuristics on the efficacy of electrification can be used to model the future electrical load (and energy use) of the community.



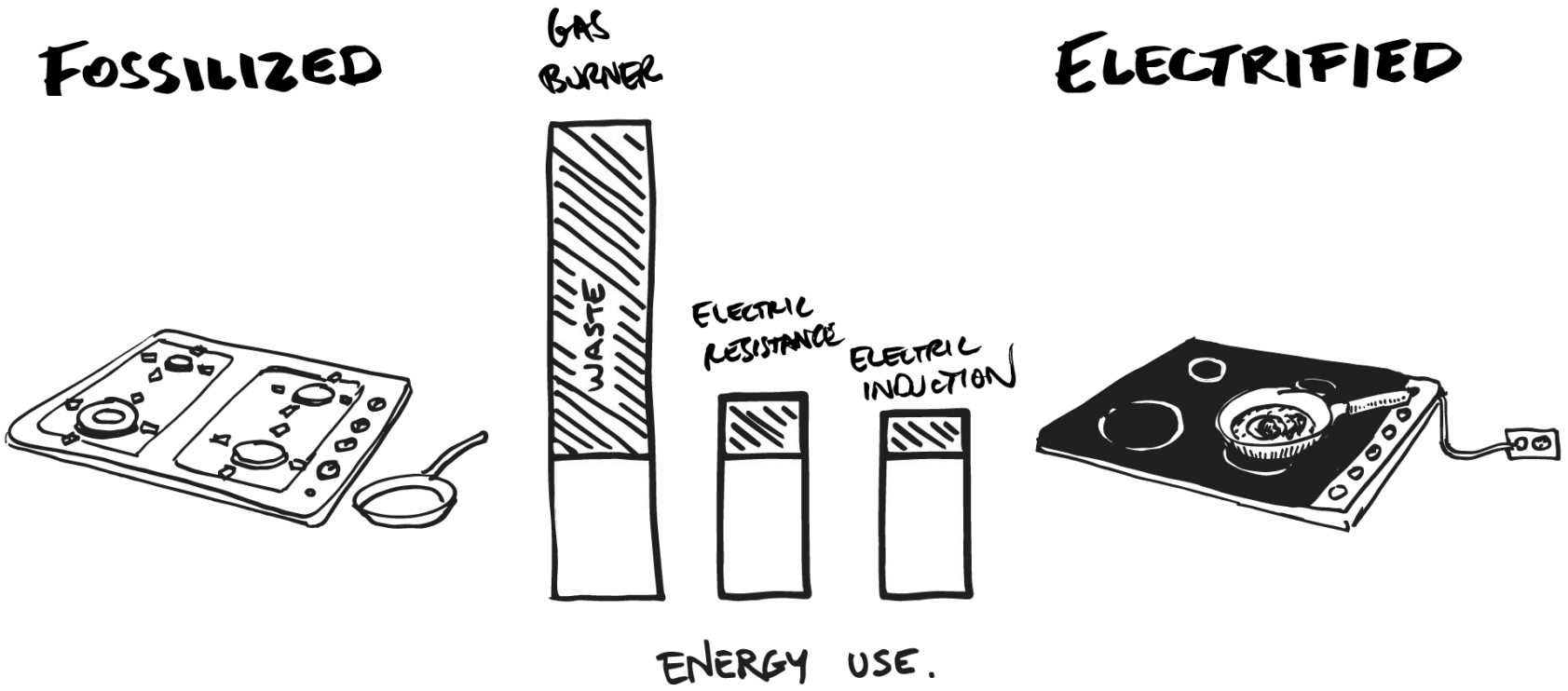
Electrifying our vehicles results in using ⅓ of the energy per km travelled, but increases total electricity that needs to be delivered.



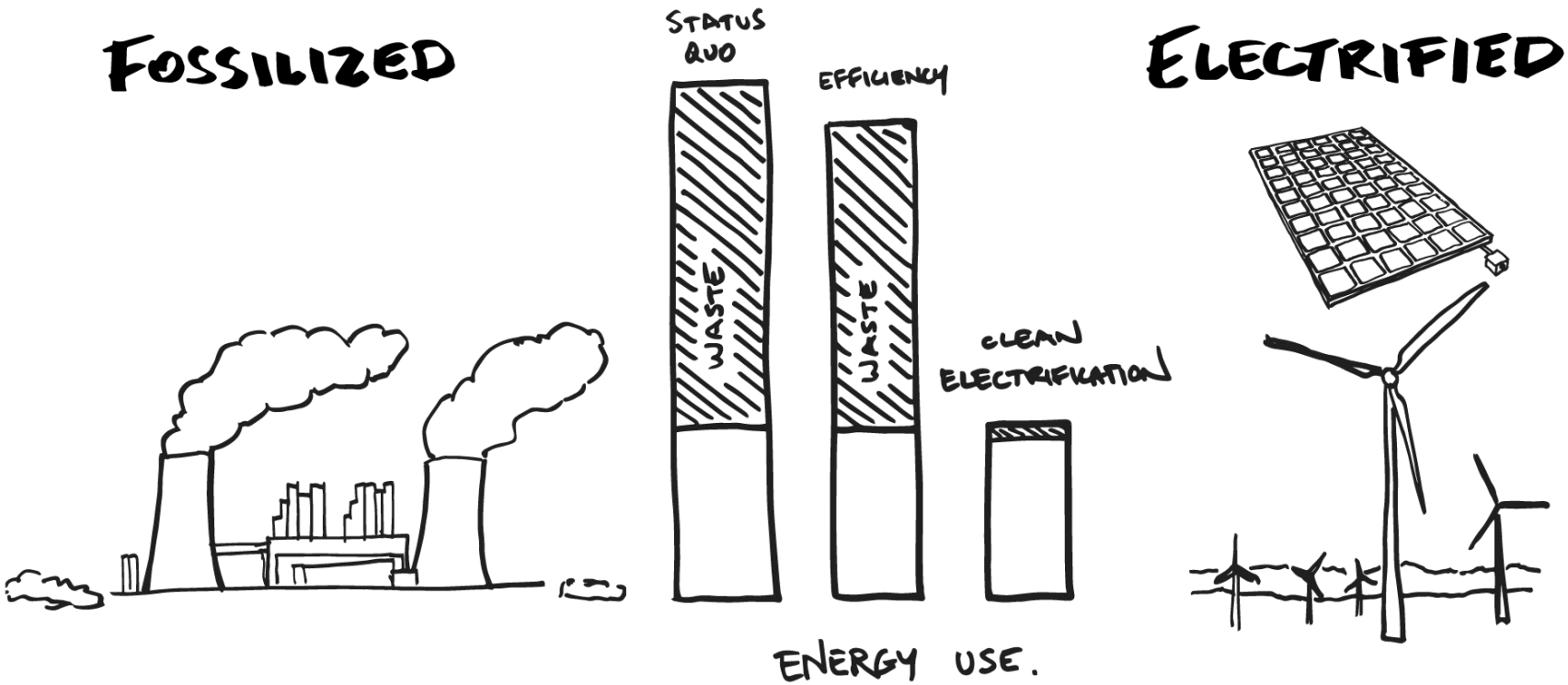
Electrifying our space heaters lowers energy requirements by ⅔ but also increases electricity demand.



Electrifying our water heaters lowers energy requirements by ⅔ but also increases electricity demand.



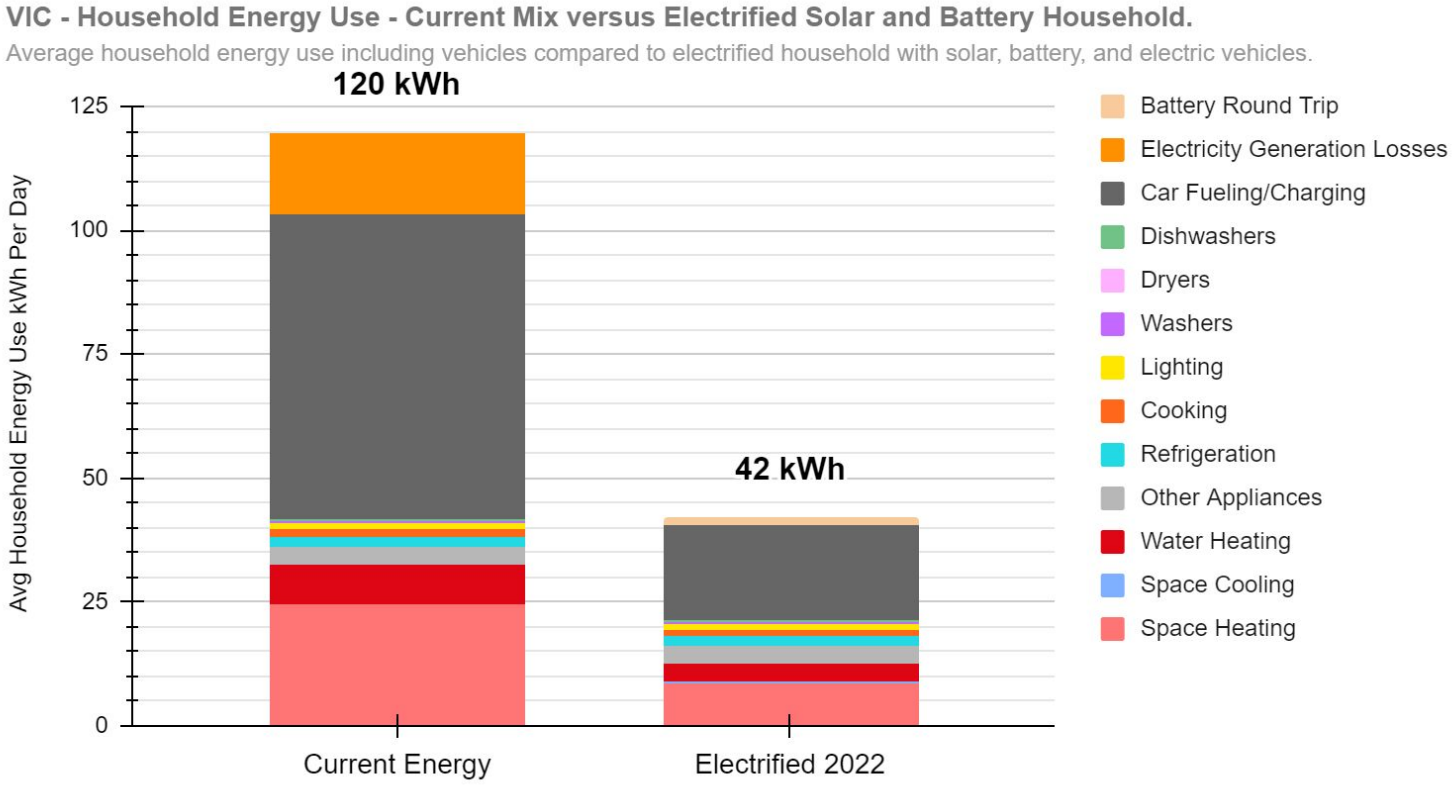
Electrifying our kitchens lowers energy requirements by ½ but also increases electricity demand.

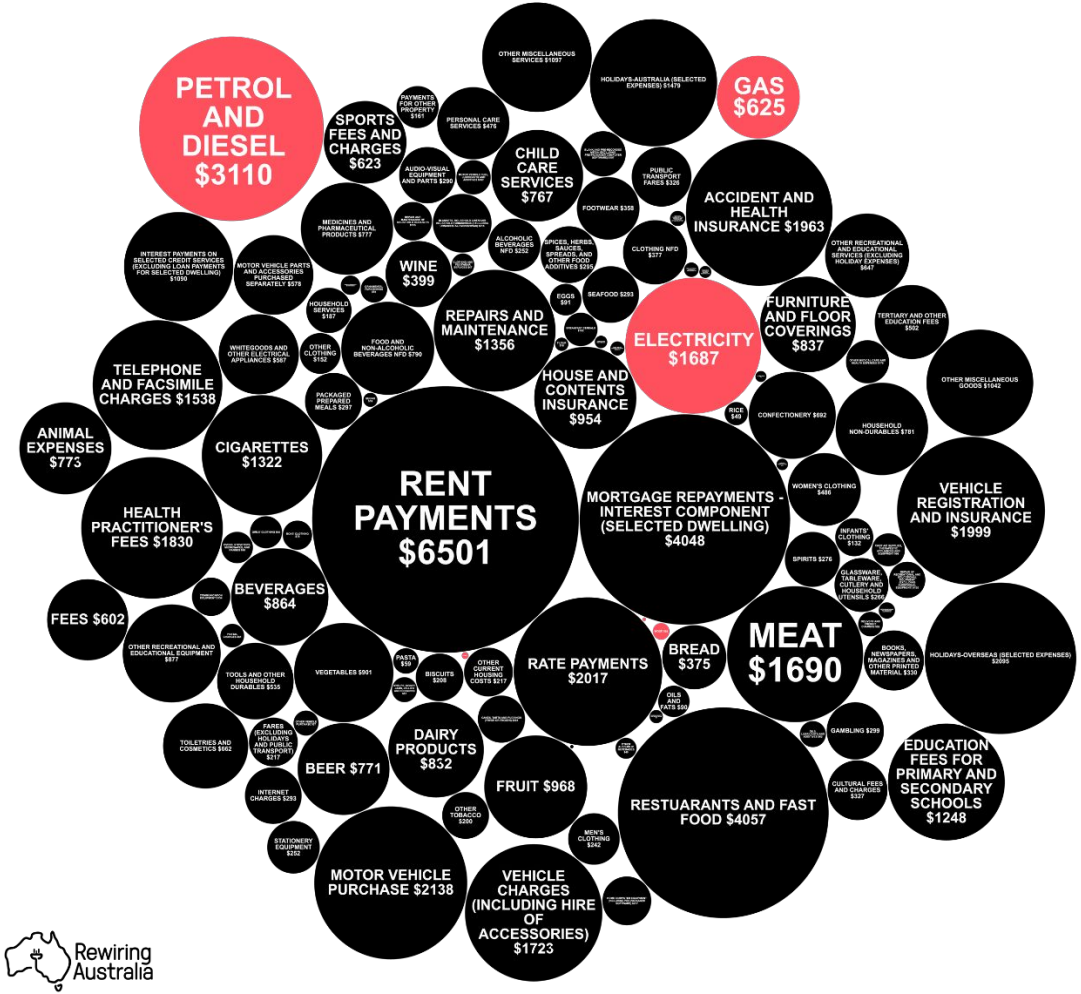


Providing our electricity with renewables eliminates huge quantities of waste heat from electricity generation.

All of those efficiencies really add up. The average Australian household will go from using 97kWh per day of **energy** for all of it's uses to around 35 kWh of **electricity** per day.

VIC typical household today vs electrified household tomorrow





Australian Household Average Yearly Spending

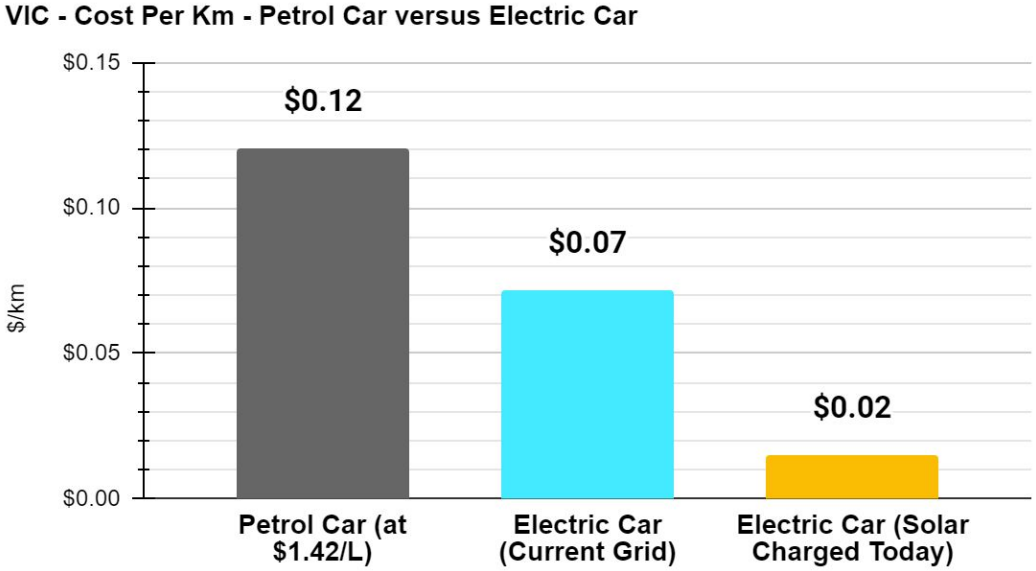
Energy Spending Highlighted in Red

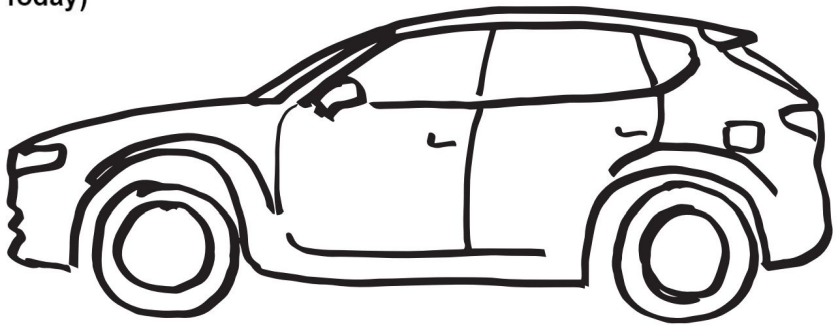
~$73,000 Total Spending

~$5,451 On Energy

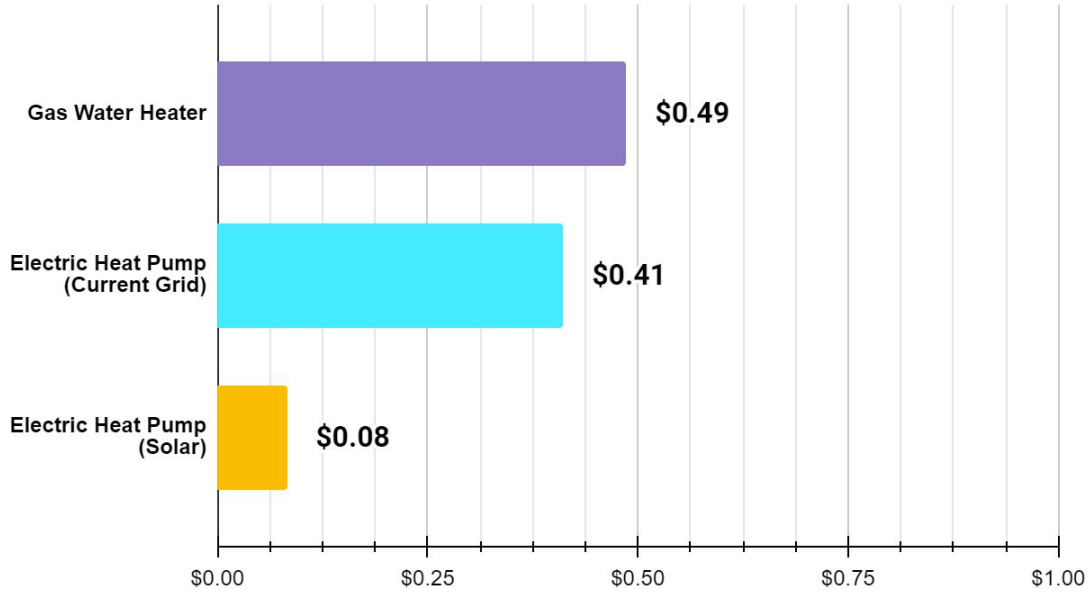
Rewiring Australia

Source: Australian Bureau of Statistics (ABS) Household Expenditure Survey 2015-16, Middle expenditure quintile. Adjusted with ABS Consumer Price Index for June 2021.

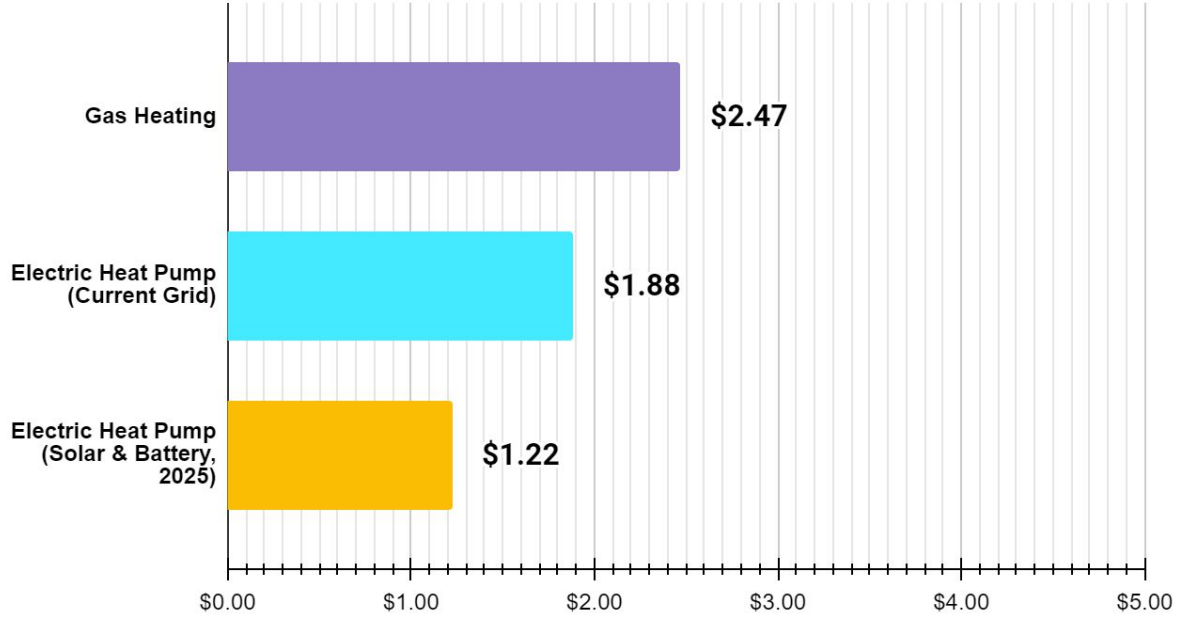

VIC - Cost Per Km - Petrol Car versus Electric Car
$0.15
$0.10
$0.05
$0.00
$/km
$0.12
$0.07
$0.02
Petrol Car (at $1.42/L)
Electric Car (Current Grid)
Electric Car (Solar Charged Today)

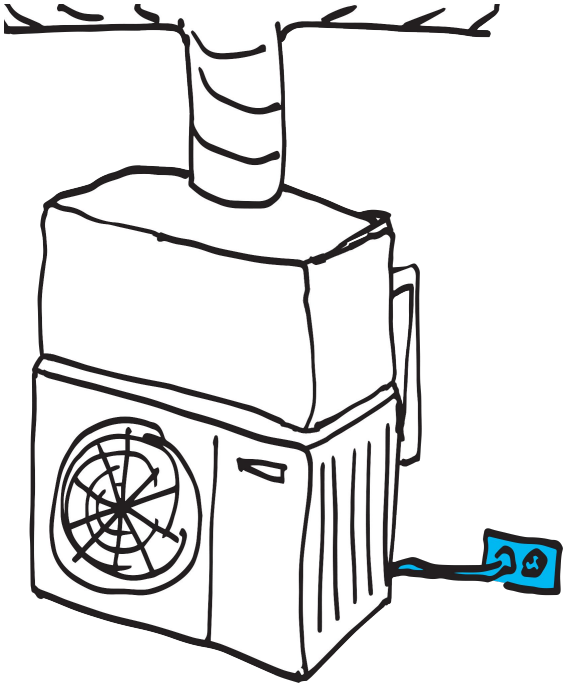


Water Heating Cost for One Luxurious Shower, VIC.

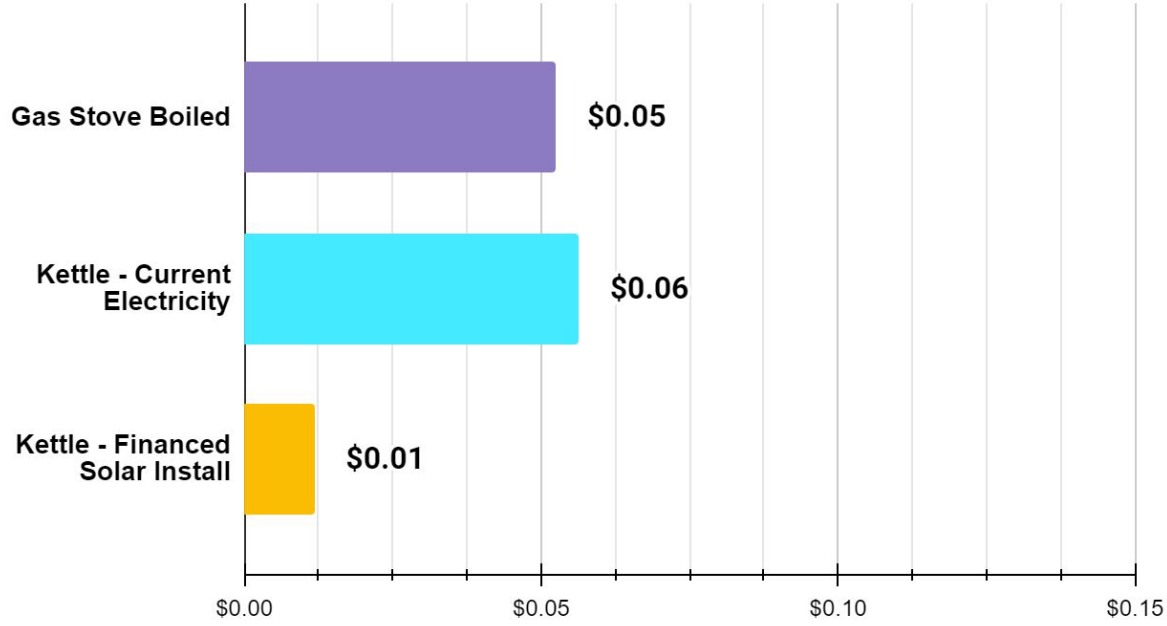


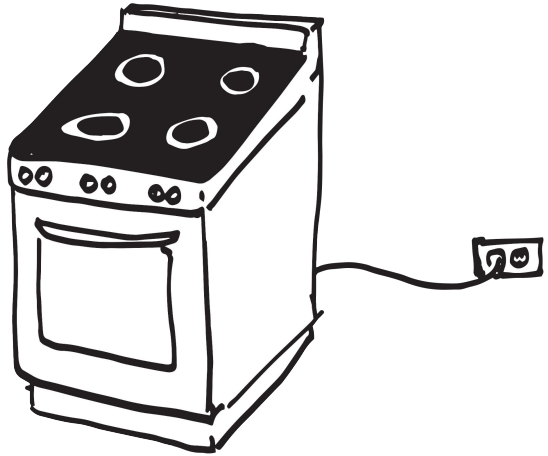
Space Heating Average Cost Comparison Per Day, VIC.



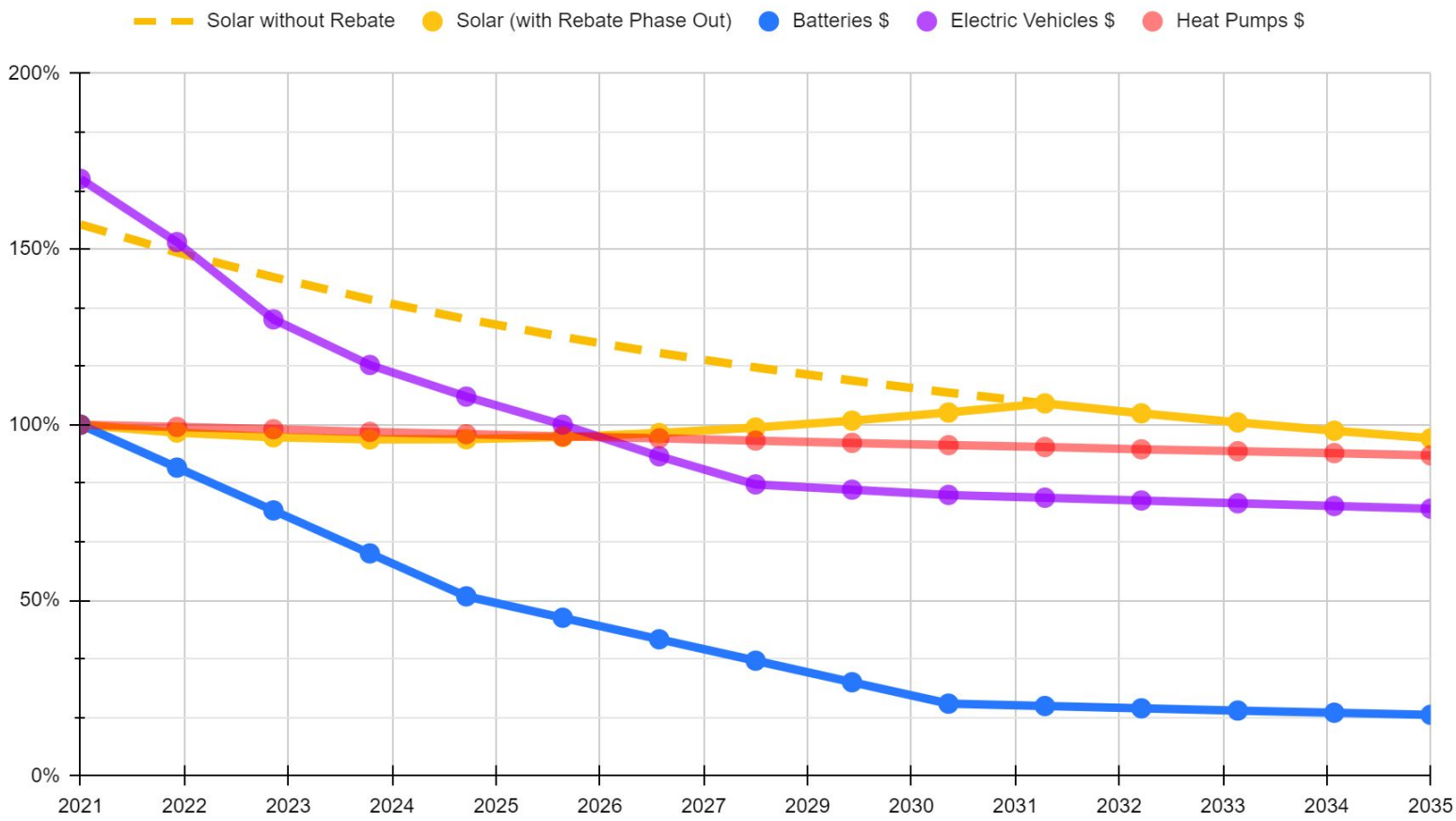


Cost of boiling a Cup of Tea, VIC.

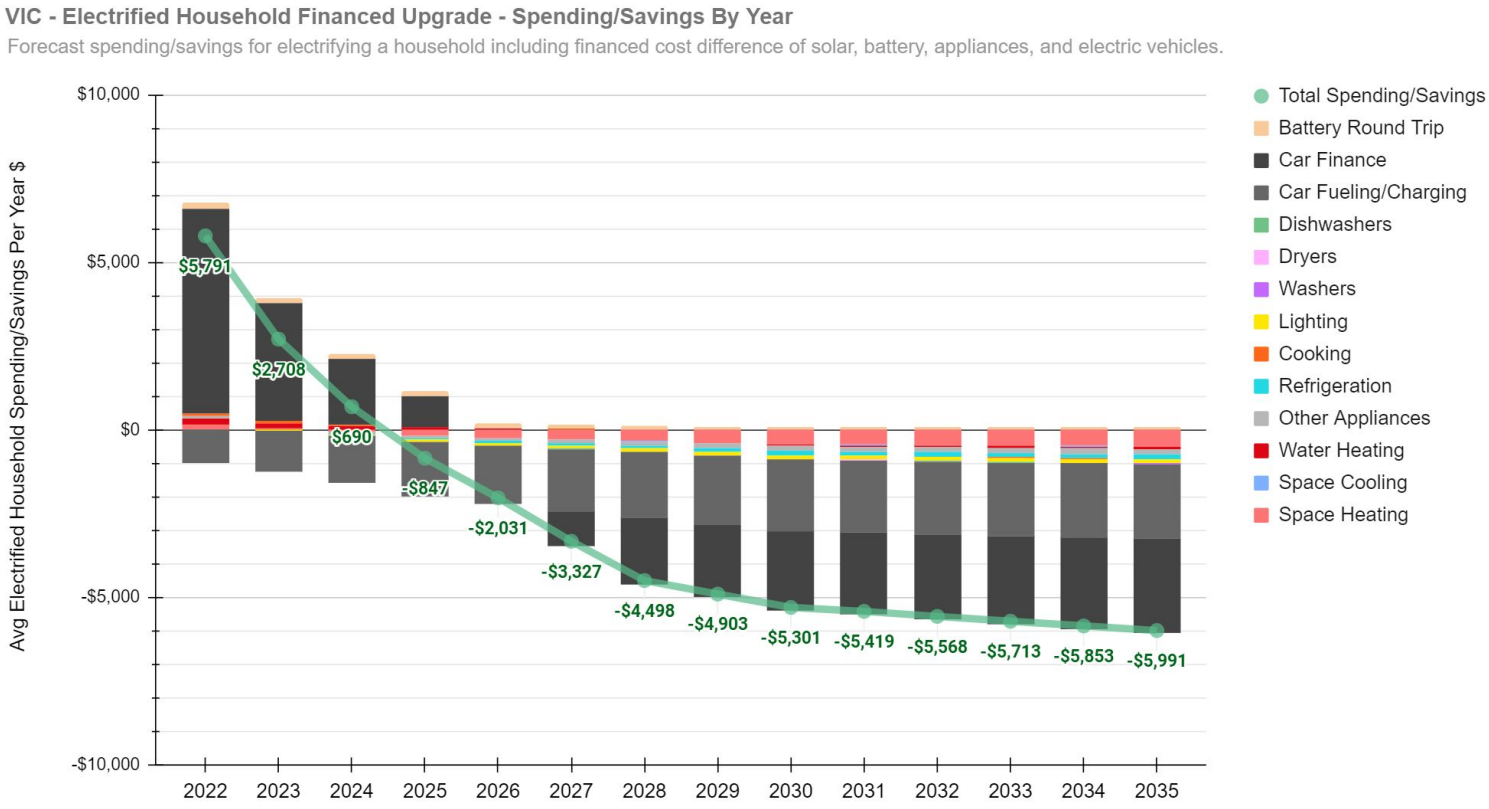




Future Cost Forecast Index



Year by year household electrification savings



Conventional Home

A conventional home uses one or often multiple fossil fuel appliances and vehicles. These are inefficient compared to modern electrified alternatives as seen by the difference in energy use, more expensive to run than electrified options, and they create significantly more greenhouse gas emissions.

Average Energy Usage

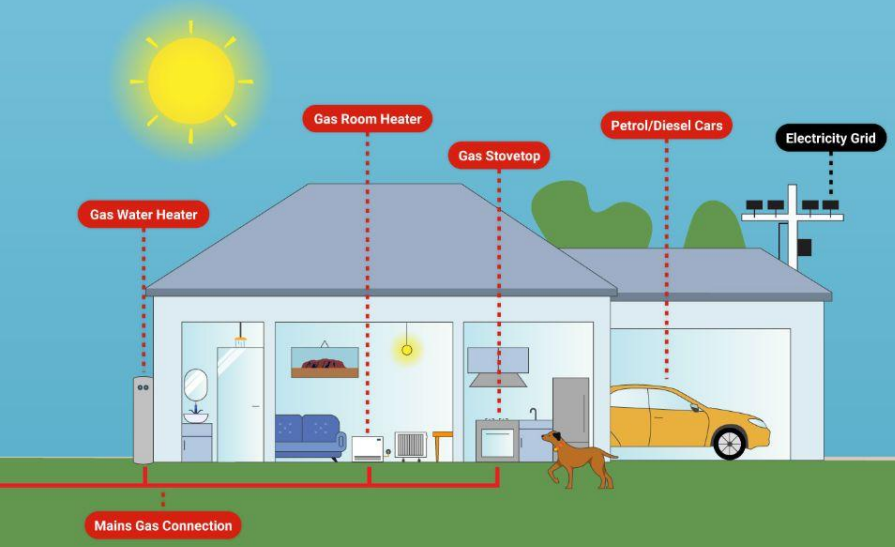
102 kWh

Energy Per Day

Average Energy Emissions

11,000 Kg

CO2-e Per Year



Electrified Home

To upgrade to an electrified home, we replace space heaters with heat pumps (reverse cycle aircon), replace water heaters with heat pump water heaters, replace gas stovetops with electric, and replace petrol/diesel vehicles with electric vehicles. We then add solar to the roof and a home backup battery to the garage.

Average Energy Usage

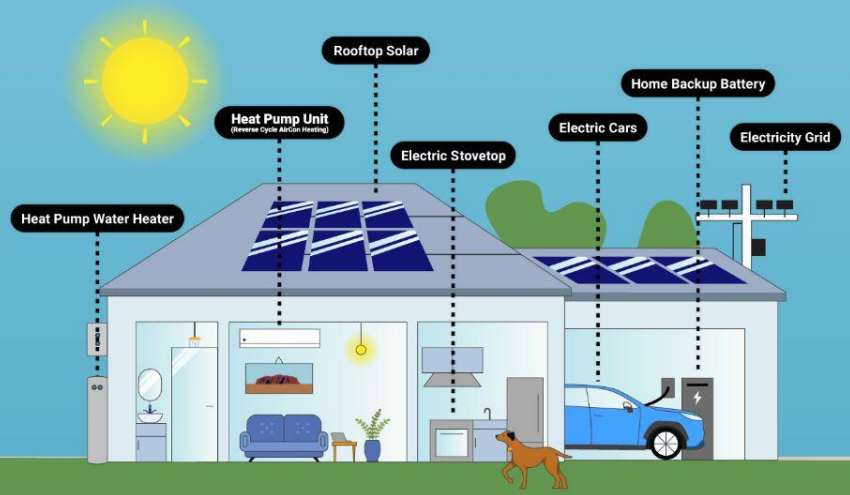
37 kWh

Energy Per Day

Average Energy Emissions

ZERO

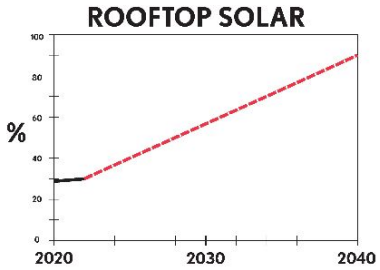
CO2-e Per Year

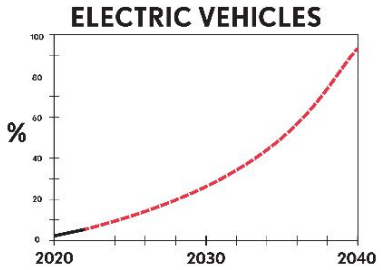


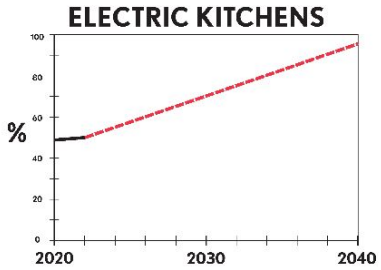
Estimated Savings (2030)

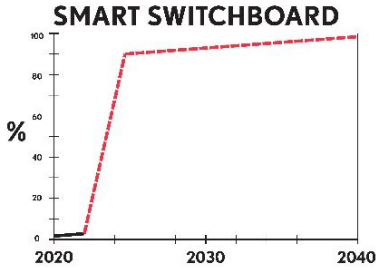
Per Year (Avg Home) **$5,433**

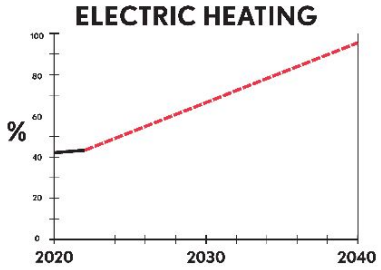
Australia community electrification plan for a better than 2 degree climate target.

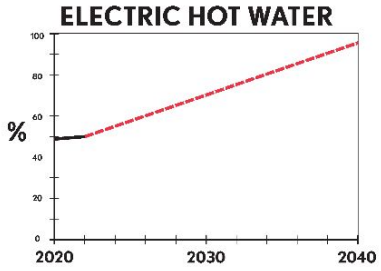


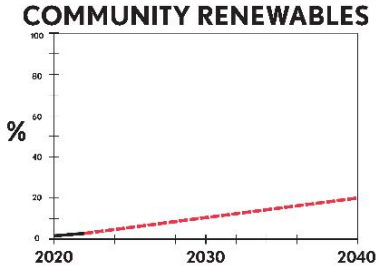


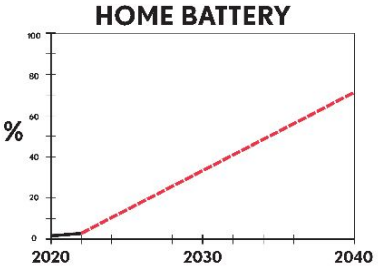


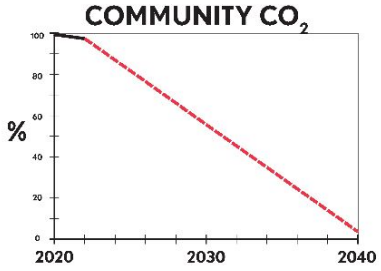












Demand side electrification, powered by renewables…

Will save households thousands / year.

Will repatriate millions of dollars / year to every community.

Creates local, in-community jobs by two mechanisms :

1. Local “tradie” jobs installing and maintaining demand side electrical machines
2. Induced jobs from savings in community being spent in community…

Policy

NEM and AEMO rules are critical.

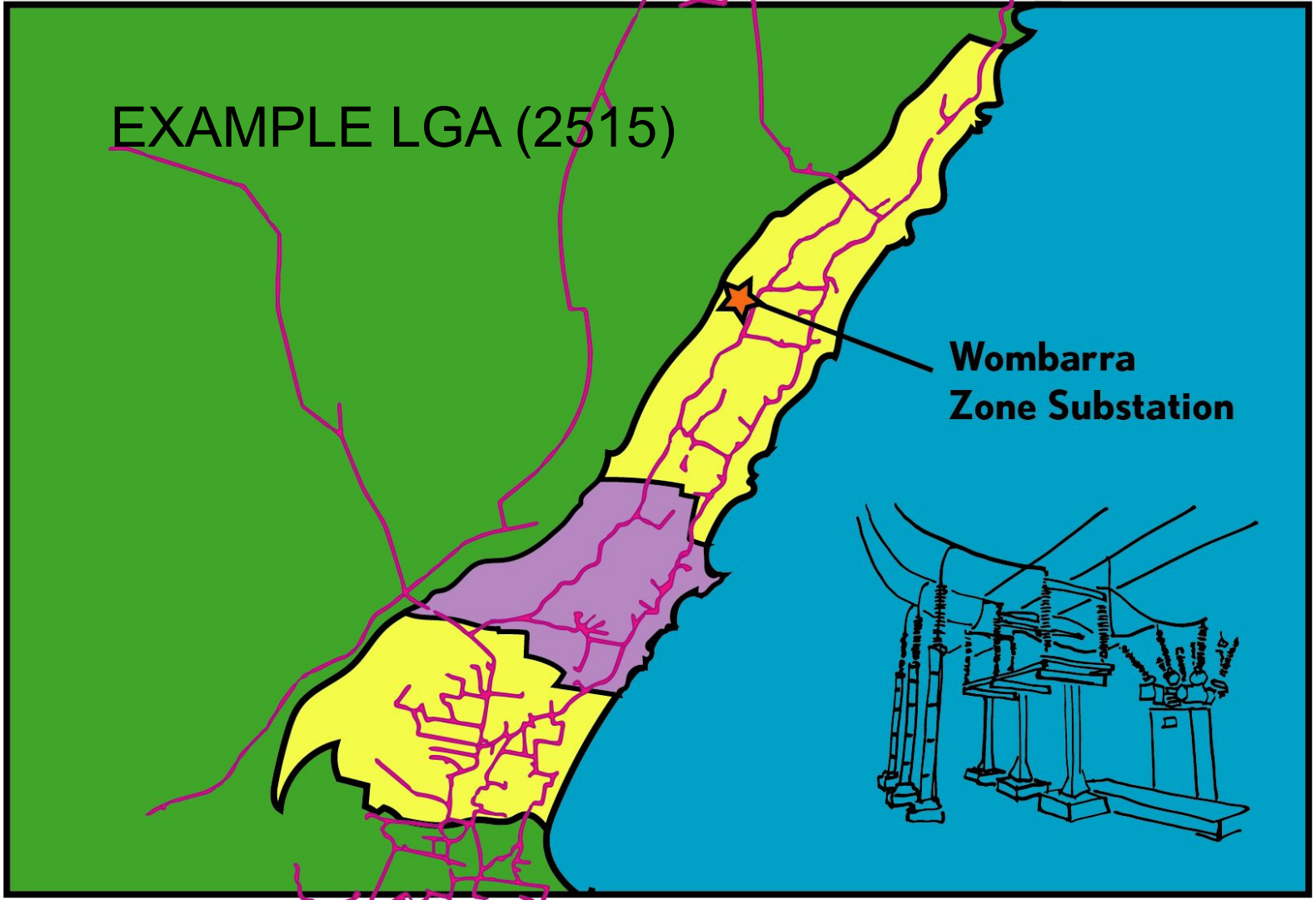
Particularly critical are distribution grid rules.

Finance will be the equity issue.

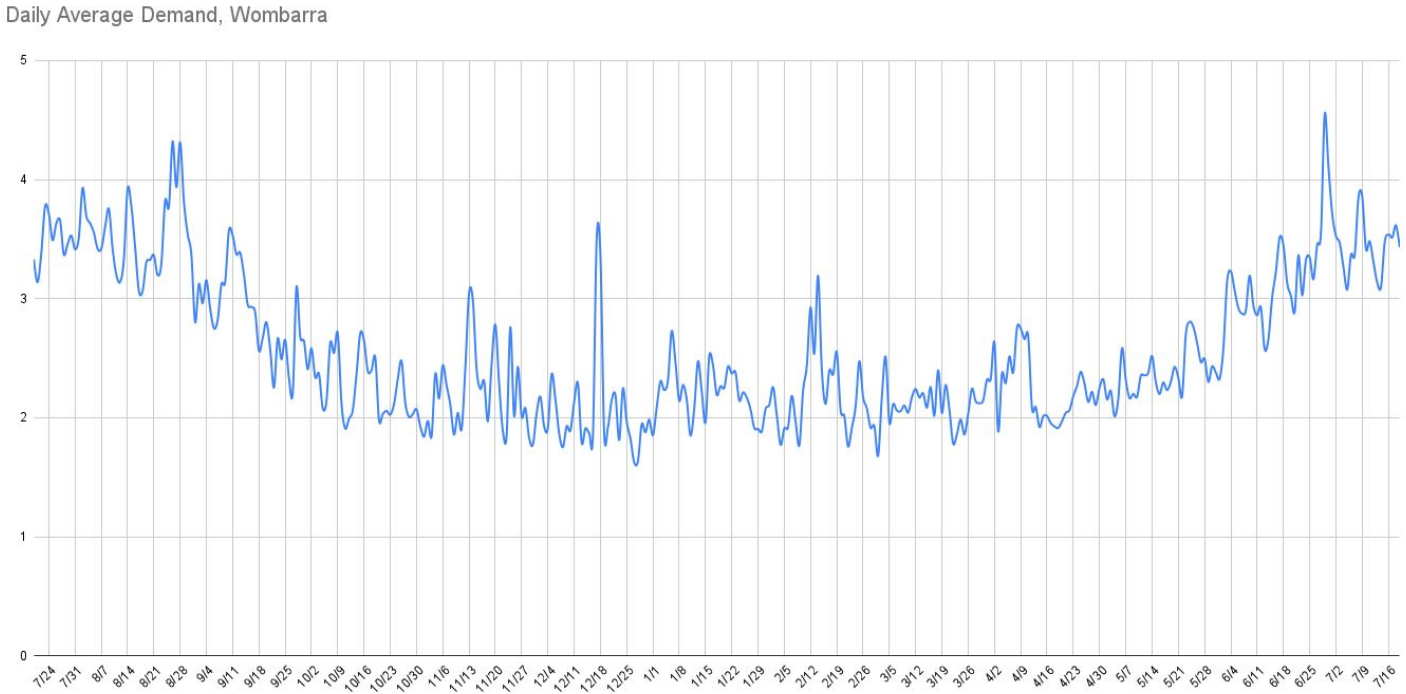
Early subsidy and market formation is necessary.

EXTRA SLIDES

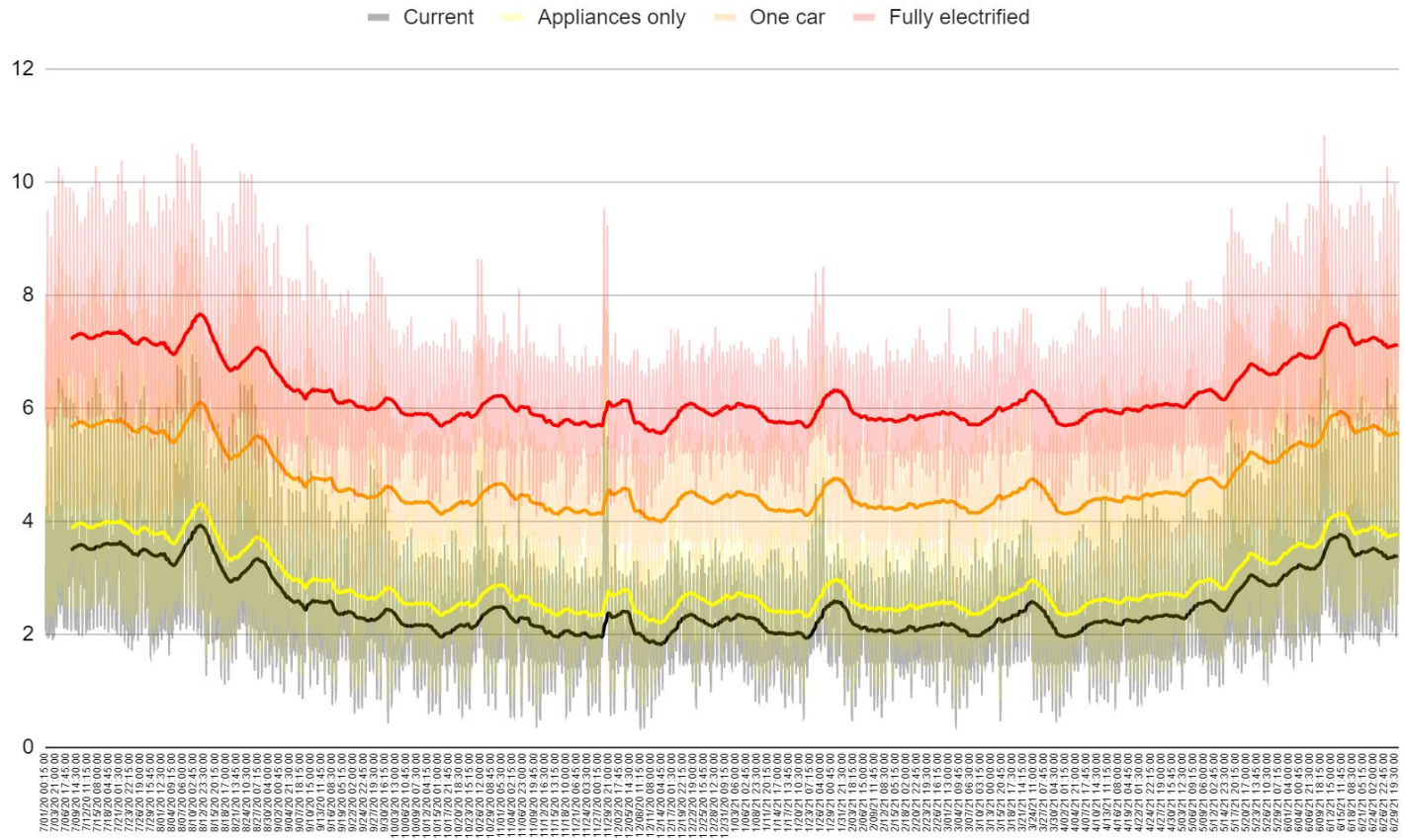
Electricity is delivered to a suburb underneath a “zone substation” at high (11kV) voltages, and converted down by “distribution transformers” to regular household voltages (120 / 240)

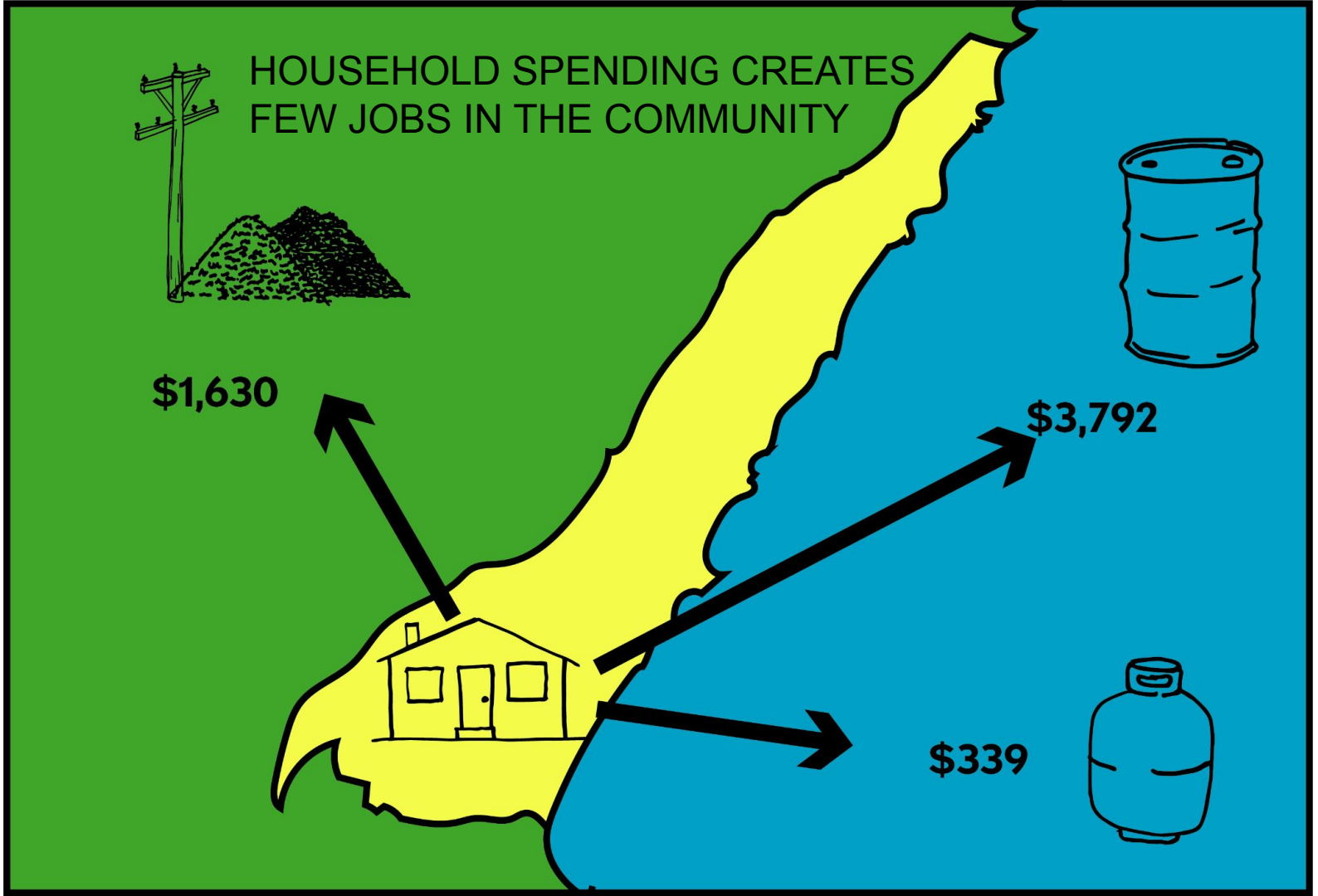

EXAMPLE LGA (2515)
Wombarra
Zone Substation

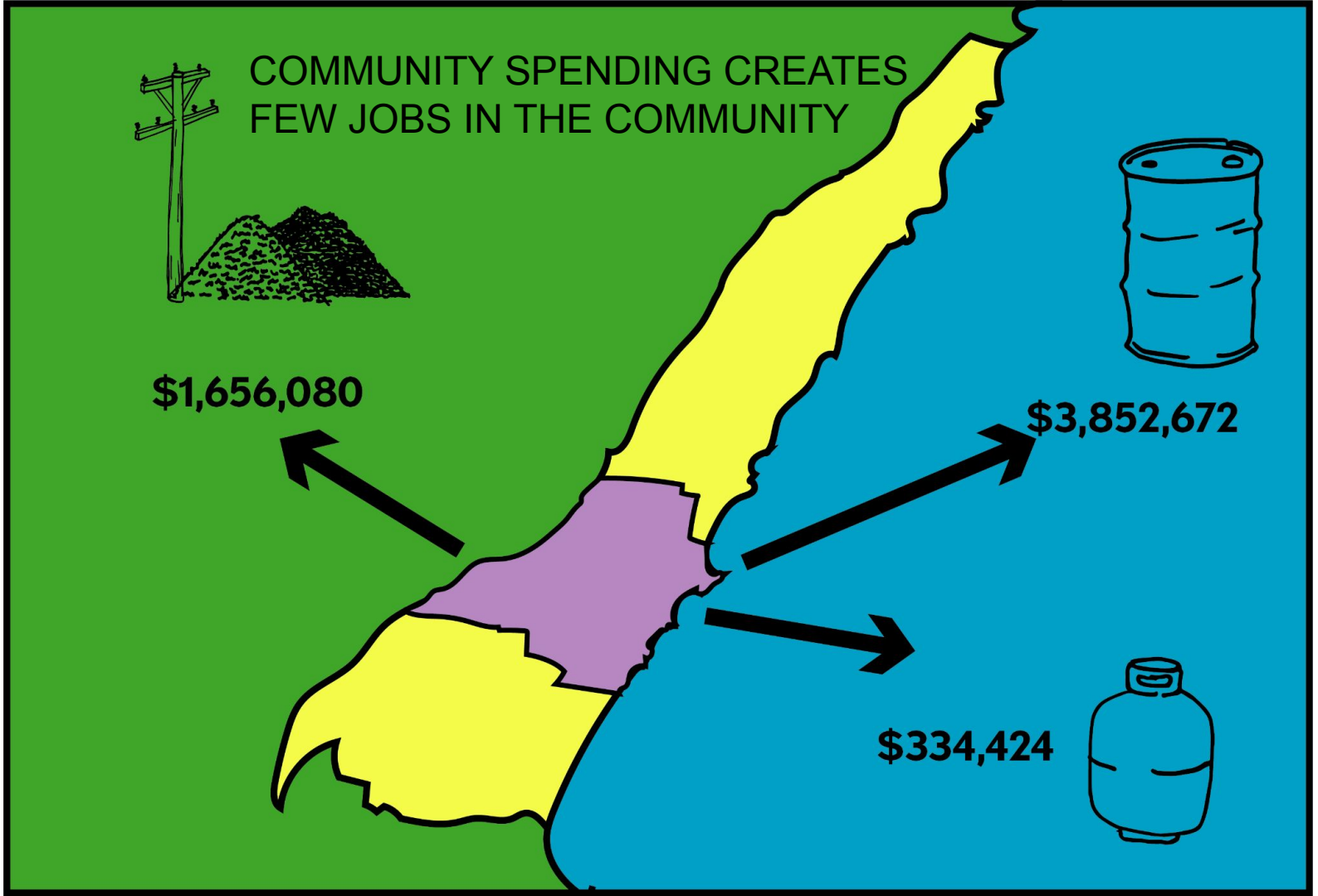
We can infer collective energy usage patterns from historical daily Average demand (MW) for Wombarra

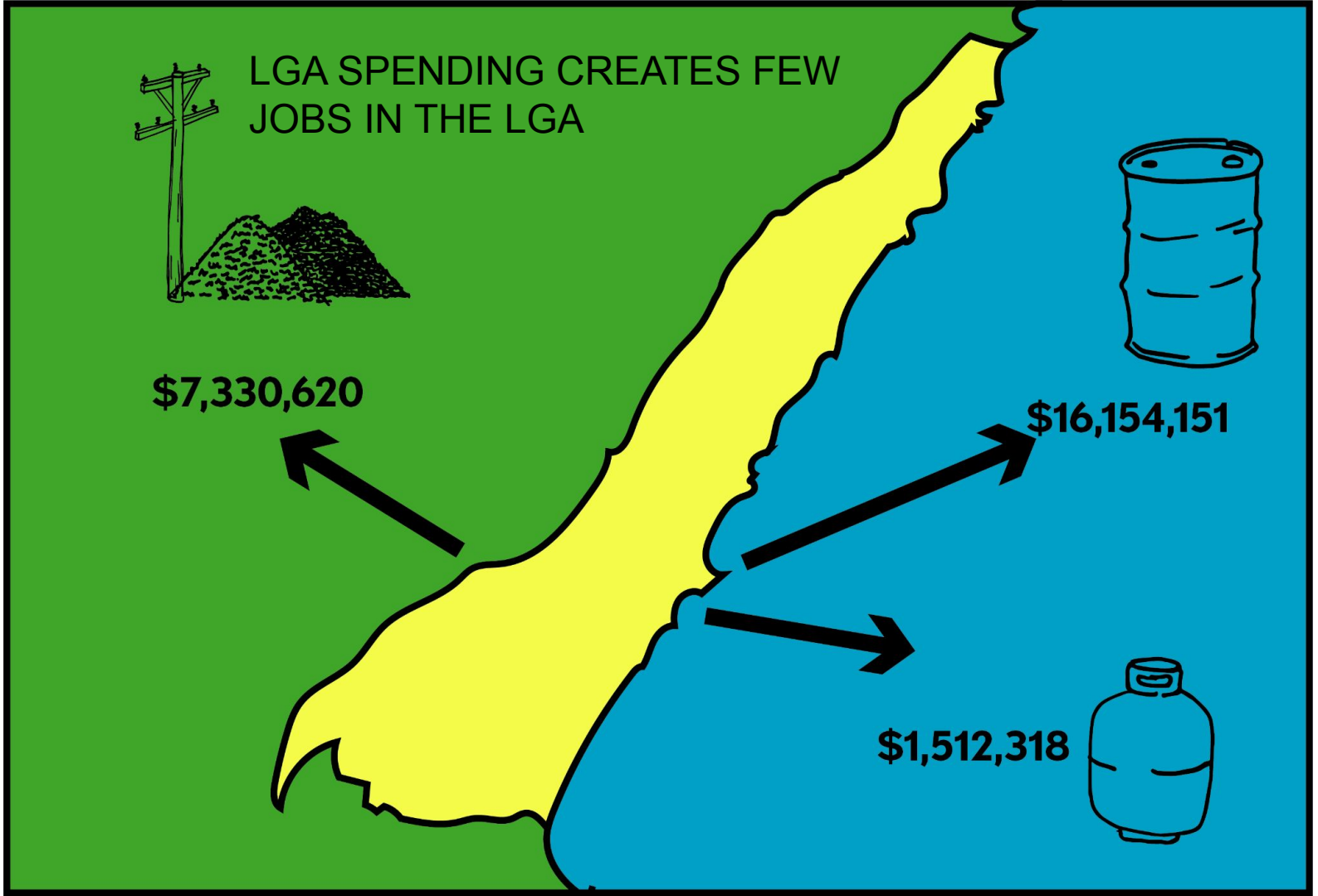


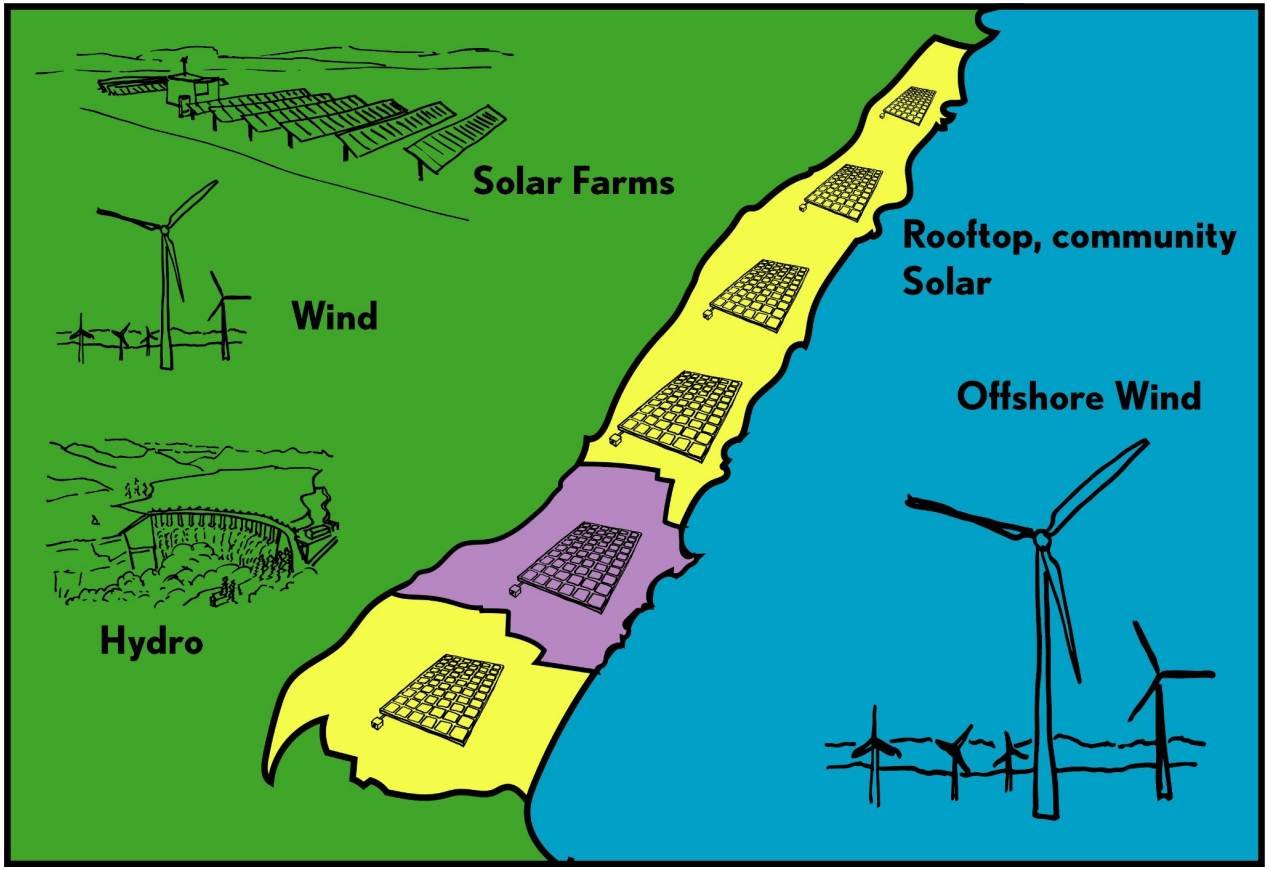
Which allows us to model total demand and seasonal variation for an all electric community




HOUSEHOLD SPENDING CREATES
FEW JOBS IN THE COMMUNITY
$1,630
$3,792
$339


COMMUNITY SPENDING CREATES
FEW JOBS IN THE COMMUNITY
$1,656,080
$3,852,672
$334,424


LGA SPENDING CREATES FEW JOBS IN THE LGA
$7,330,620
$16,154,151
$1,512,318



FUTURE SYSTEM KEEPS MONEY AND JOBS IN COMMUNITY AND IN-STATE