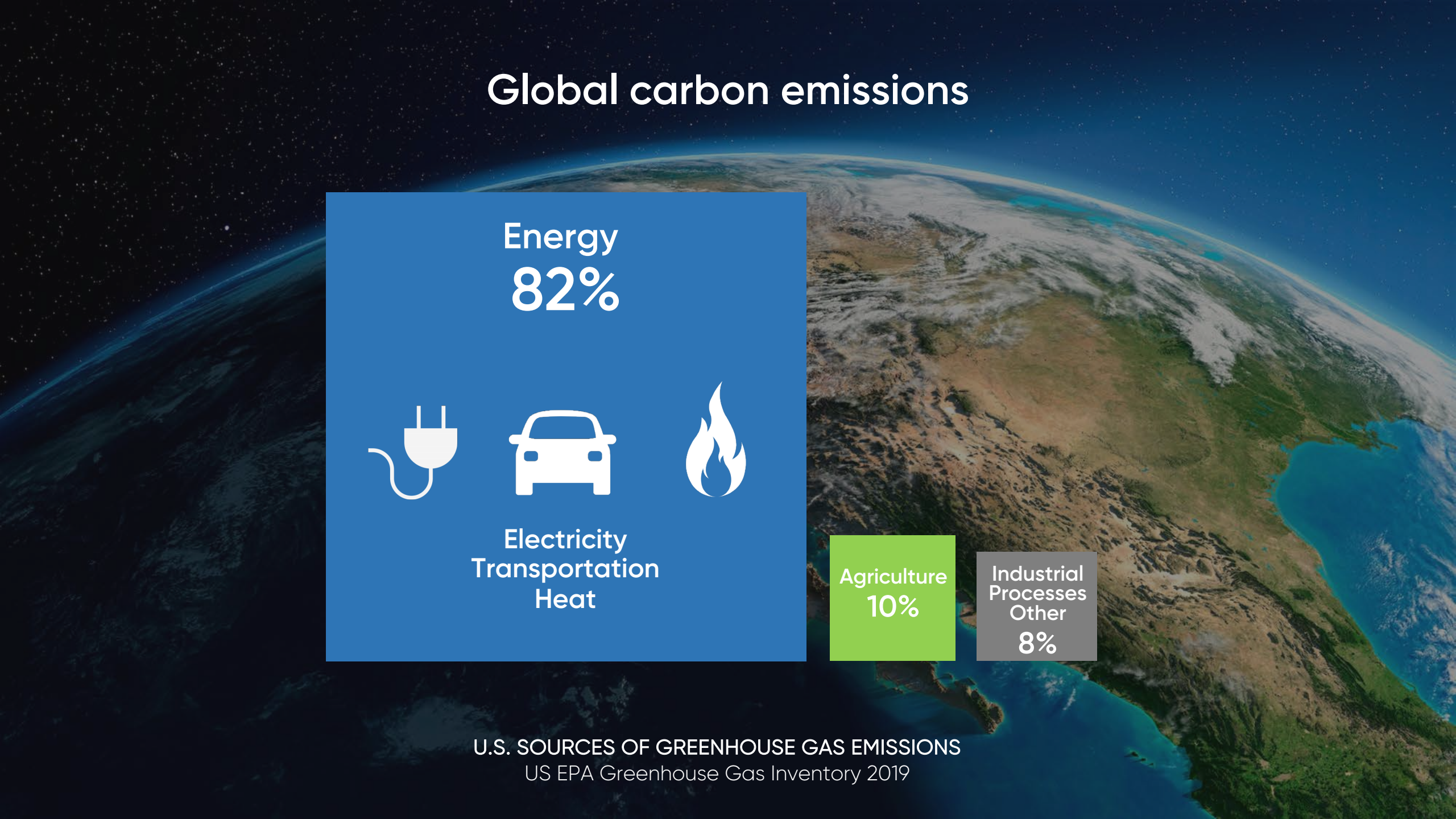
# The Benefits of Electrification

Brian Stewart

electrify now

# Global carbon emissions




U.S. SOURCES OF GREENHOUSE GAS EMISSIONS
US EPA Greenhouse Gas Inventory 2019

# Household carbon emissions

**Energy**
**60%**

Electricity
Transportation
Heat

**Stuff we buy**
**26%**

**Food**
**14%**

U.S. HOUSEHOLD EMISSIONS
Union of Concerned Scientists


Electricity
Coal & Natural Gas
Transportation
Gasoline / Diesel
Heat
Natural Gas, Propane
Bad News
We have to stop burning fossil fuels

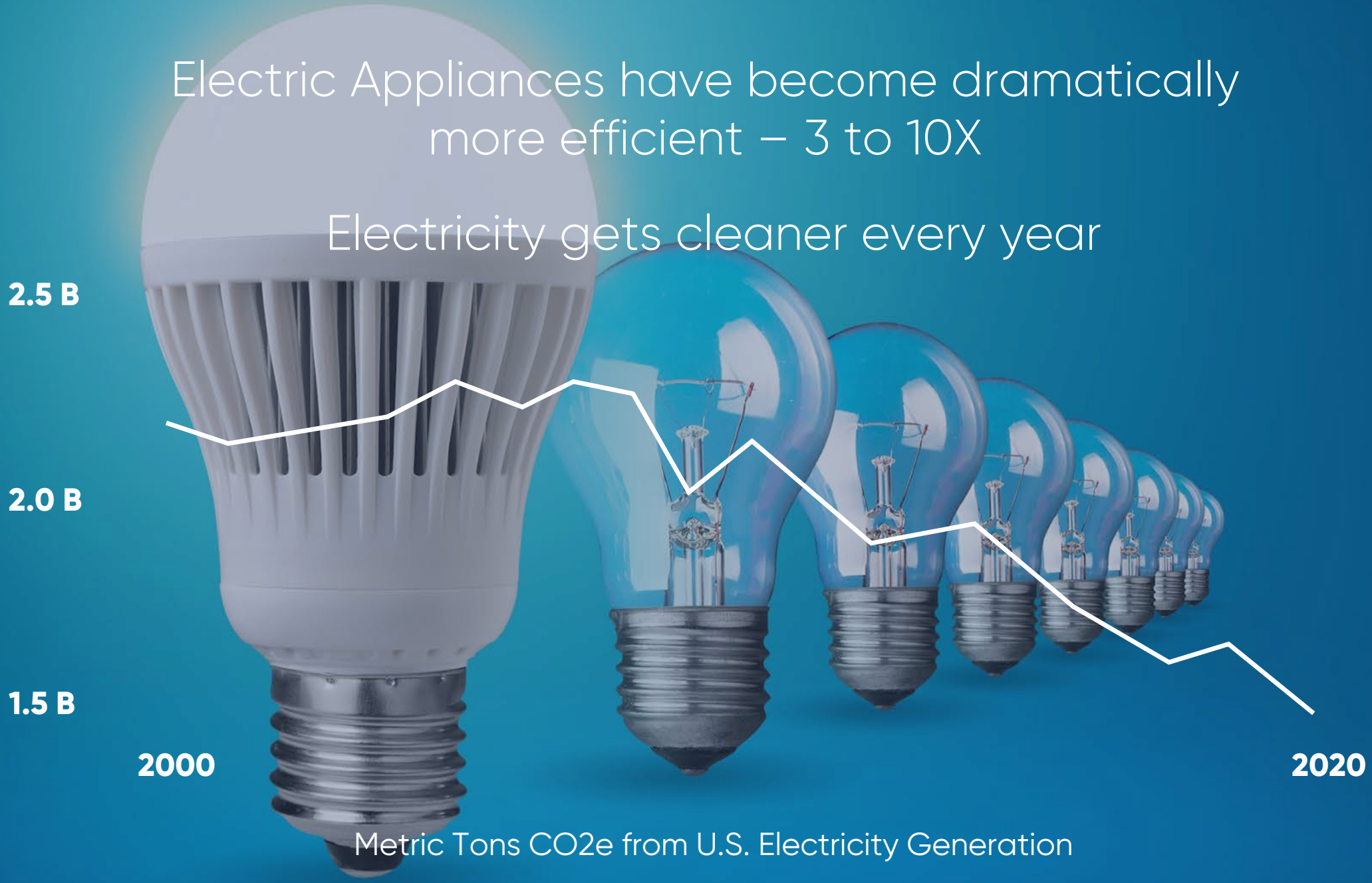
# Good News

## Wind and solar are now the lowest cost sources of new energy


Levelized Cost of Energy – Unsubsidized Analysis from Lazard – Dec 2021

Electric Appliances have become dramatically more efficient – 3 to 10X

Electricity gets cleaner every year




Metric Tons CO2e from U.S. Electricity Generation

# Electrify Everything

A sustainable future where the
wind and sun powers **ALL** our primary energy needs


cleaner **Air**
cleaner **Water**
stronger **Economy**

# The stark reality:

Every single thing that burns fossil fuels must be replaced with a clean energy alternative before 2050

**Thousands**
of coal and gas power plants

**Millions**
of cars and trucks

**Millions**
of gas furnaces and water heaters

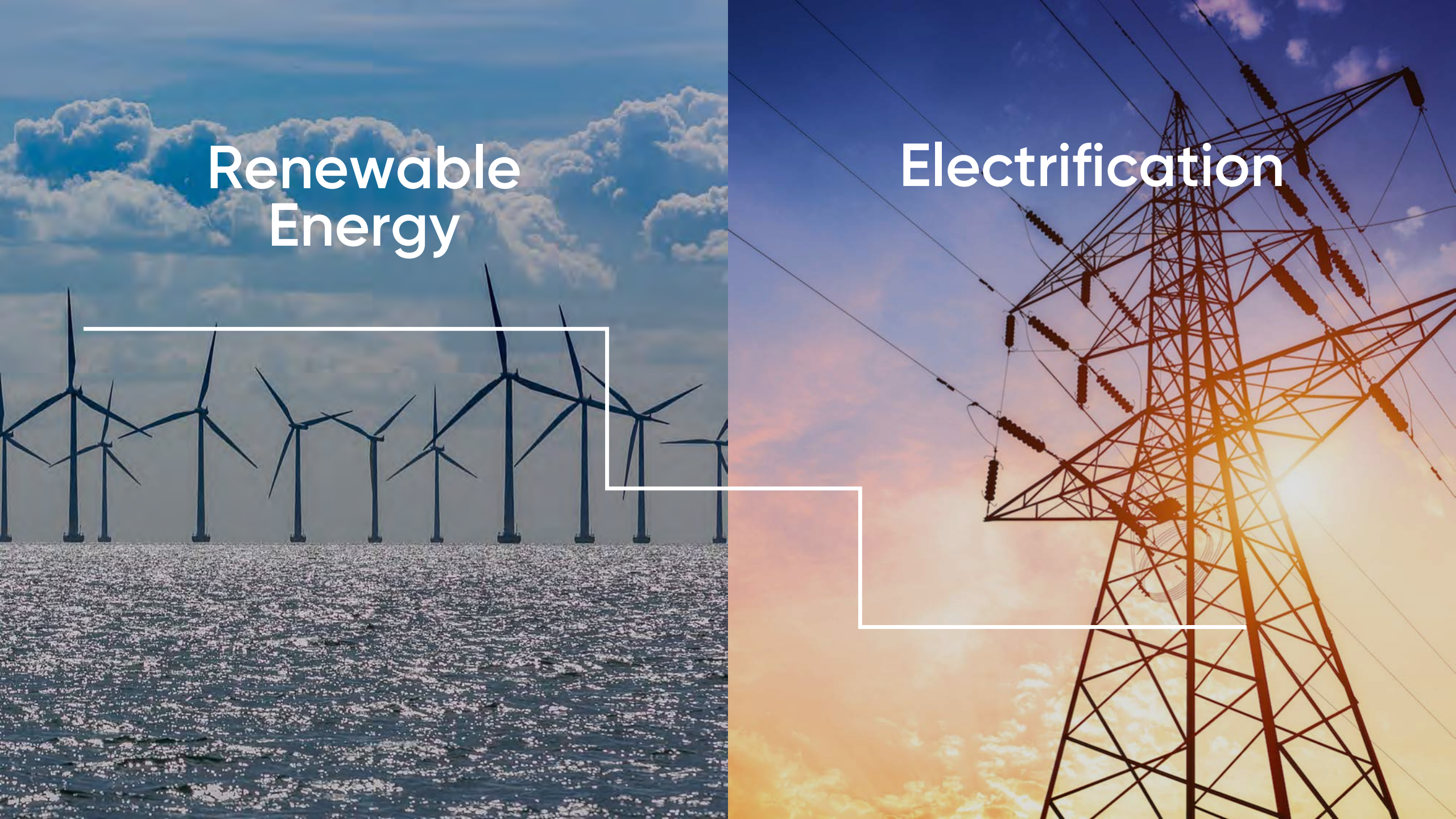
# We have potent solutions:

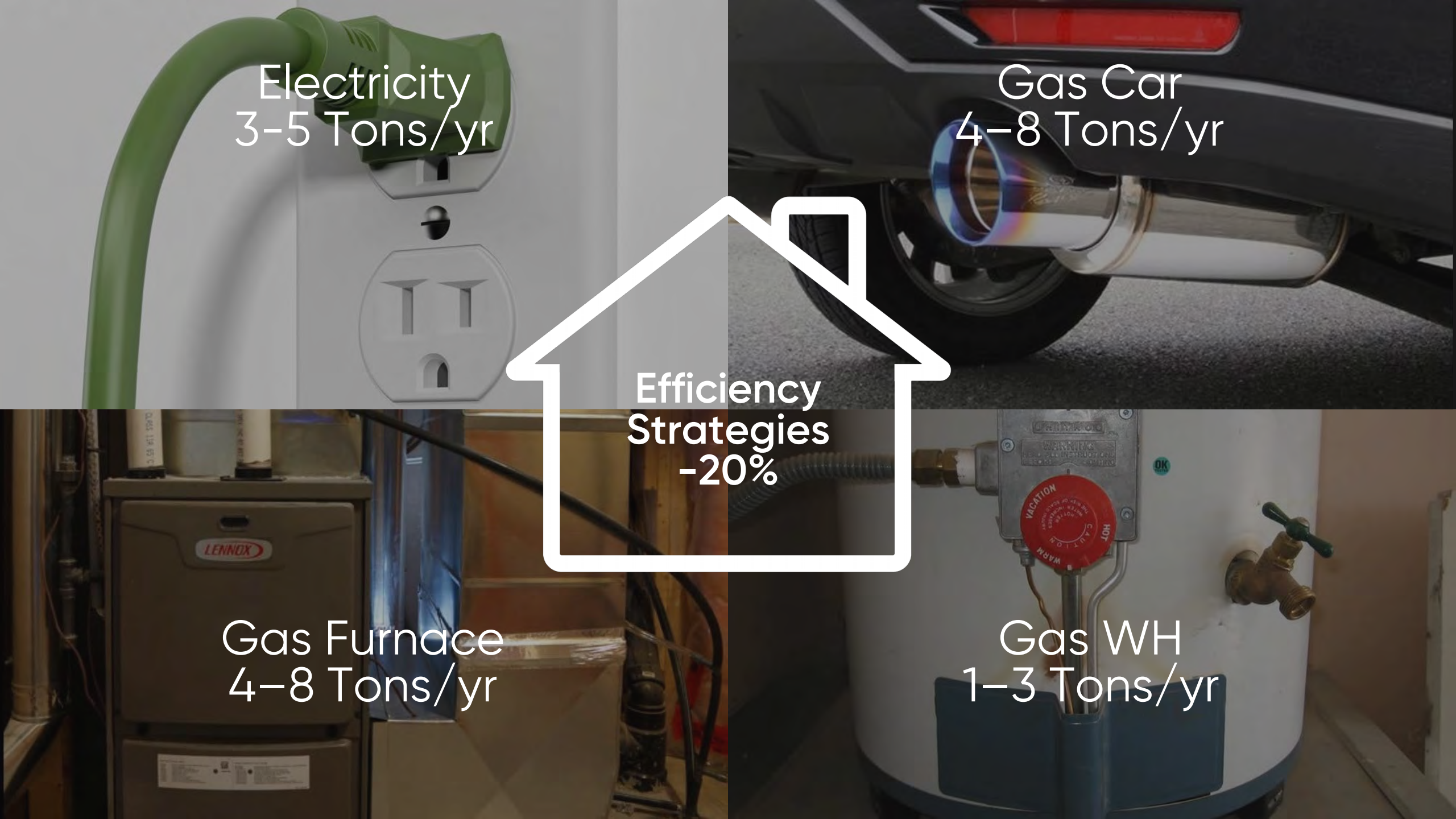
Ready to scale, cost effective, eliminate carbon

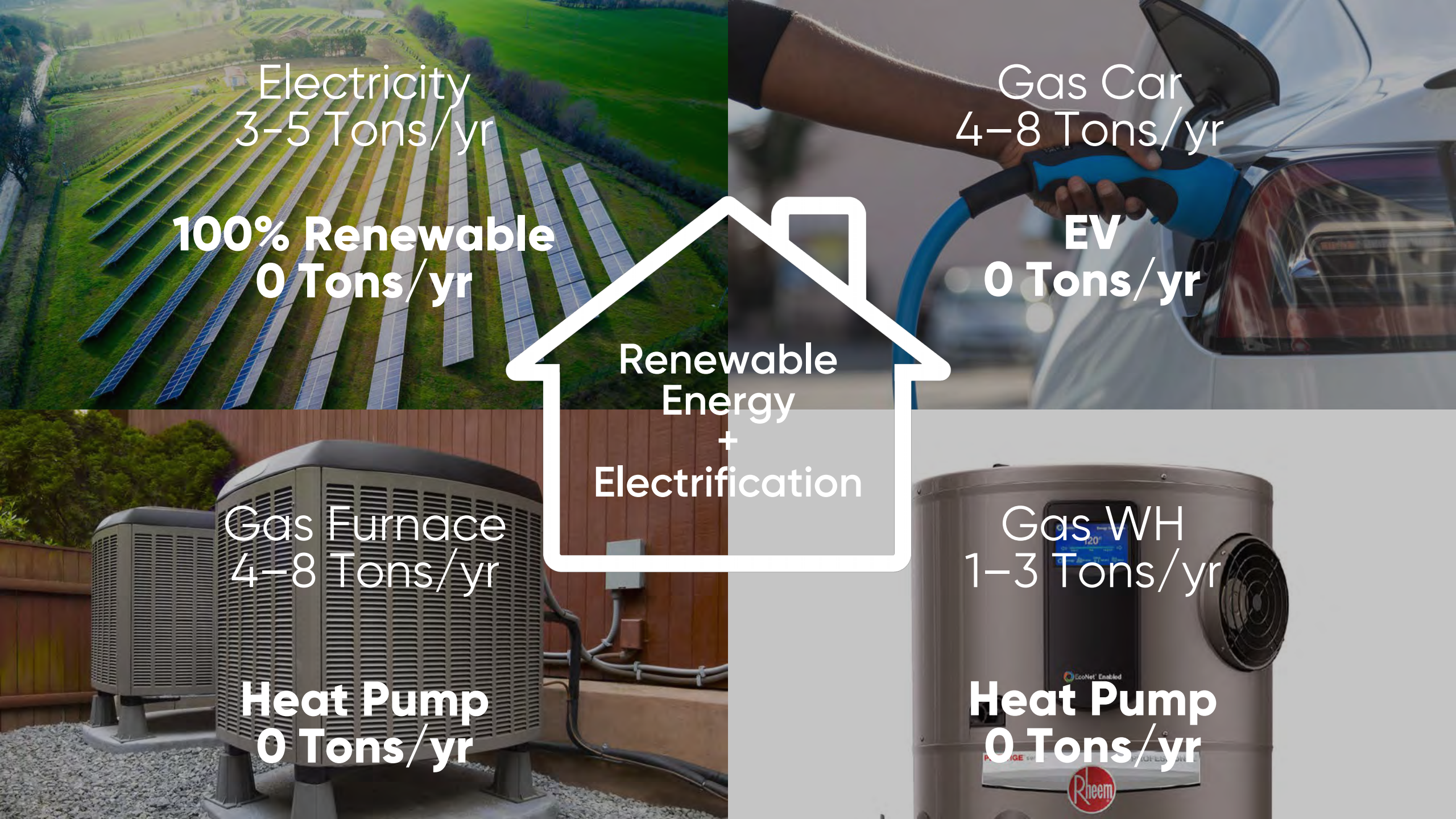
Wind
Solar


Electric
Vehicles

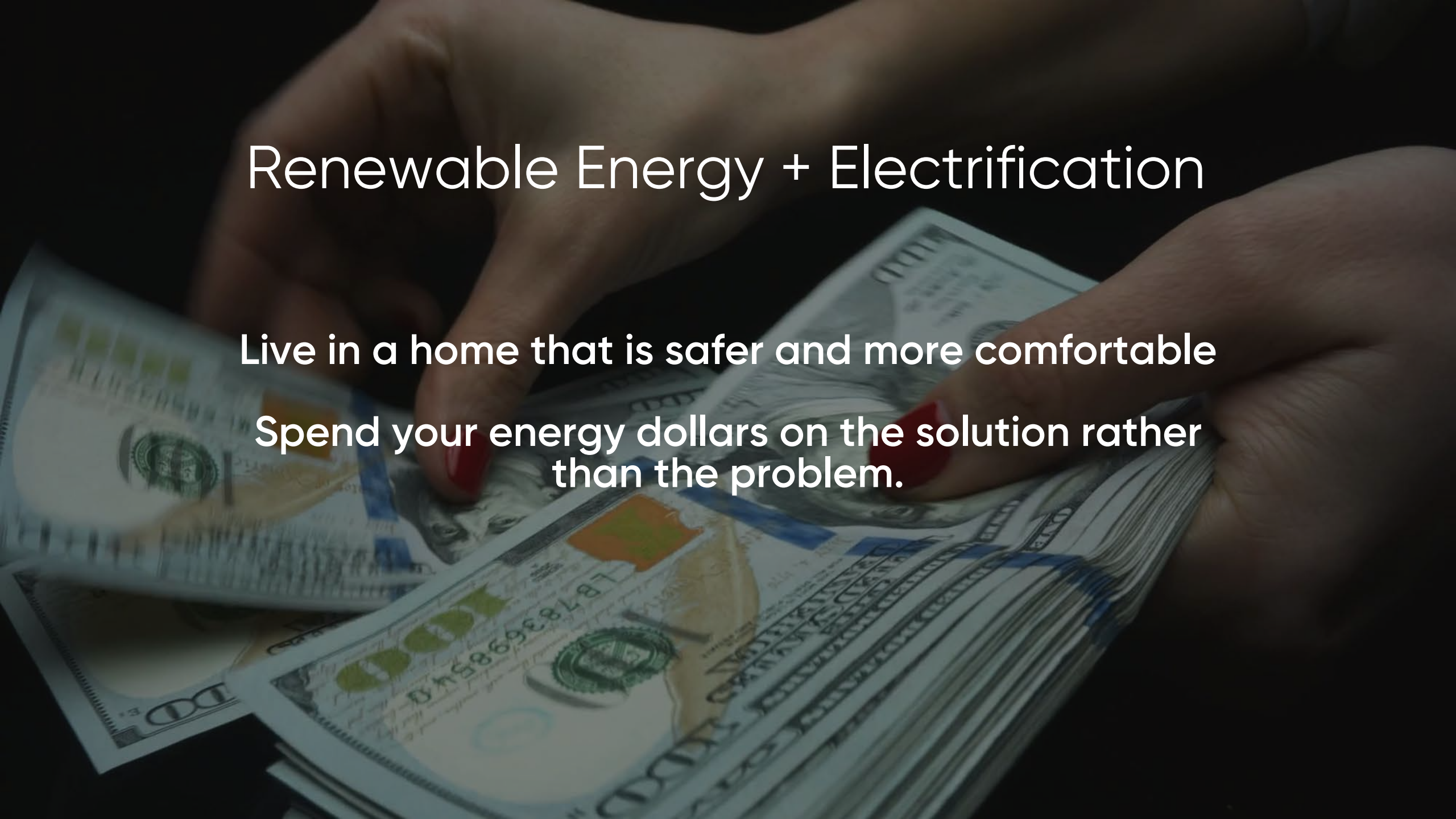
Electric
Heat Pumps


Renewable Energy
Electrification


Electricity
3-5 Tons/yr
Gas Car
4–8 Tons/yr
Efficiency
Strategies
-20%
LENNOX
Gas Furnace
4–8 Tons/yr
Gas WH
1–3 Tons/yr


Electricity
3-5 Tons/yr
100% Renewable
0 Tons/yr
Gas Car
4–8 Tons/yr
EV
0 Tons/yr
Renewable
Energy
+
Electrification
Gas Furnace
4–8 Tons/yr
Heat Pump
0 Tons/yr
Gas WH
1–3 Tons/yr
Heat Pump
0 Tons/yr


Typical
Home
20-30 Tons CO2/yr
$4,000/yr
Renewable Energy
+ Electrification
0 Tons CO2/yr
$3,000/yr



# Renewable Energy + Electrification

**Live in a home that is safer and more comfortable**

**Spend your energy dollars on the solution rather than the problem.**

# electrify!

1. Clean up your electric supply

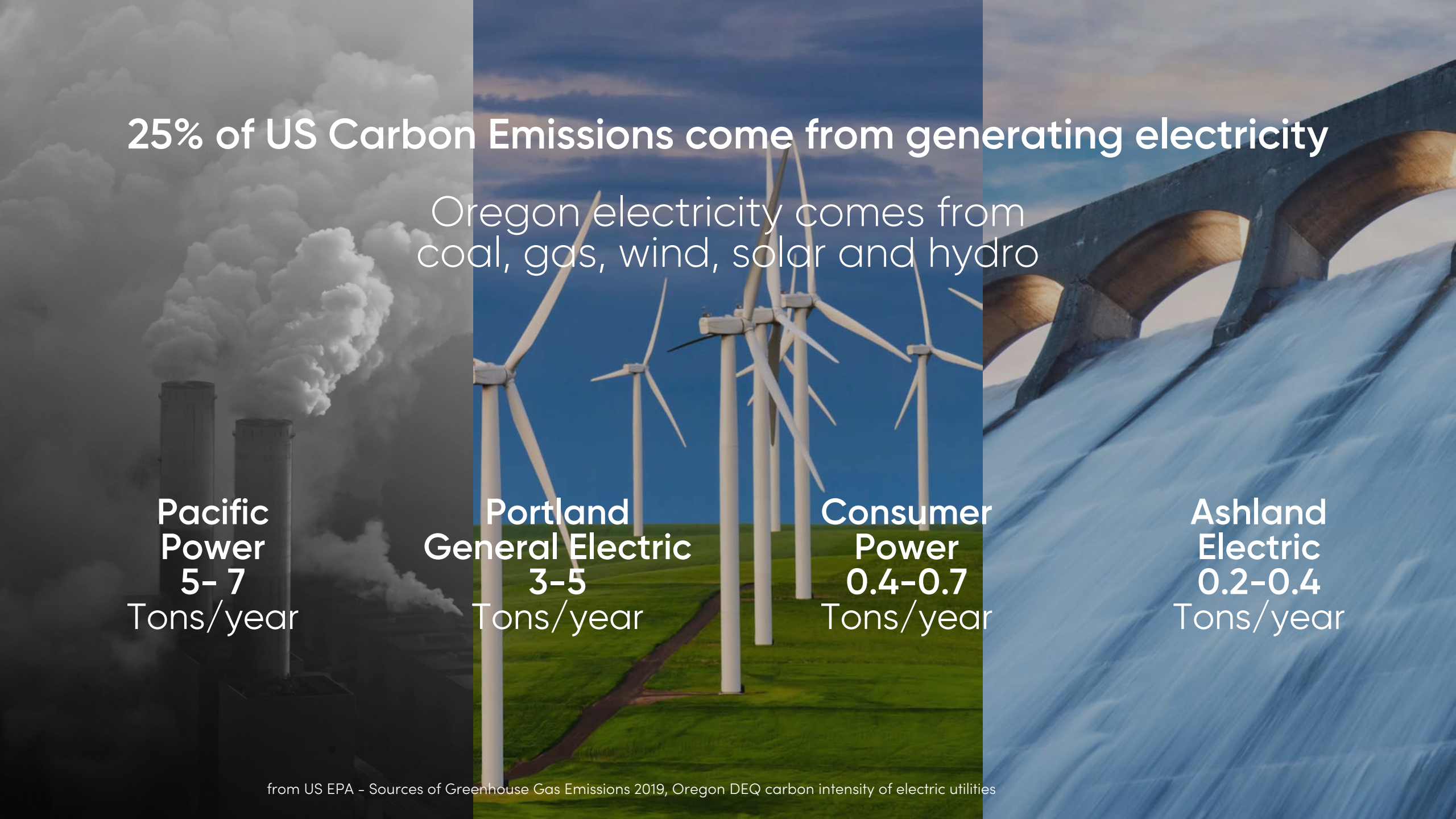
2. Electrify your home

3. Electrify your ride

4. Electrify Everyone

electrify now

# 1. Clean up your electric supply



# 25% of US Carbon Emissions come from generating electricity

Oregon electricity comes from
coal, gas, wind, solar and hydro

**Pacific Power**
**5- 7**
Tons/year

**Portland General Electric**
**3-5**
Tons/year

**Consumer Power**
**0.4-0.7**
Tons/year

**Ashland Electric**
**0.2-0.4**
Tons/year

from US EPA - Sources of Greenhouse Gas Emissions 2019, Oregon DEQ carbon intensity of electric utilities


Oregon is headed to 100% Clean Energy by 2040
We can all get 100% clean energy right now


Power your life with zero emissions energy
Help finance new clean energy generation
Green Power plans
Rooftop Solar
Community Solar

# 2. Electrify your home

# Methane Gas – Not the clean fuel advertised

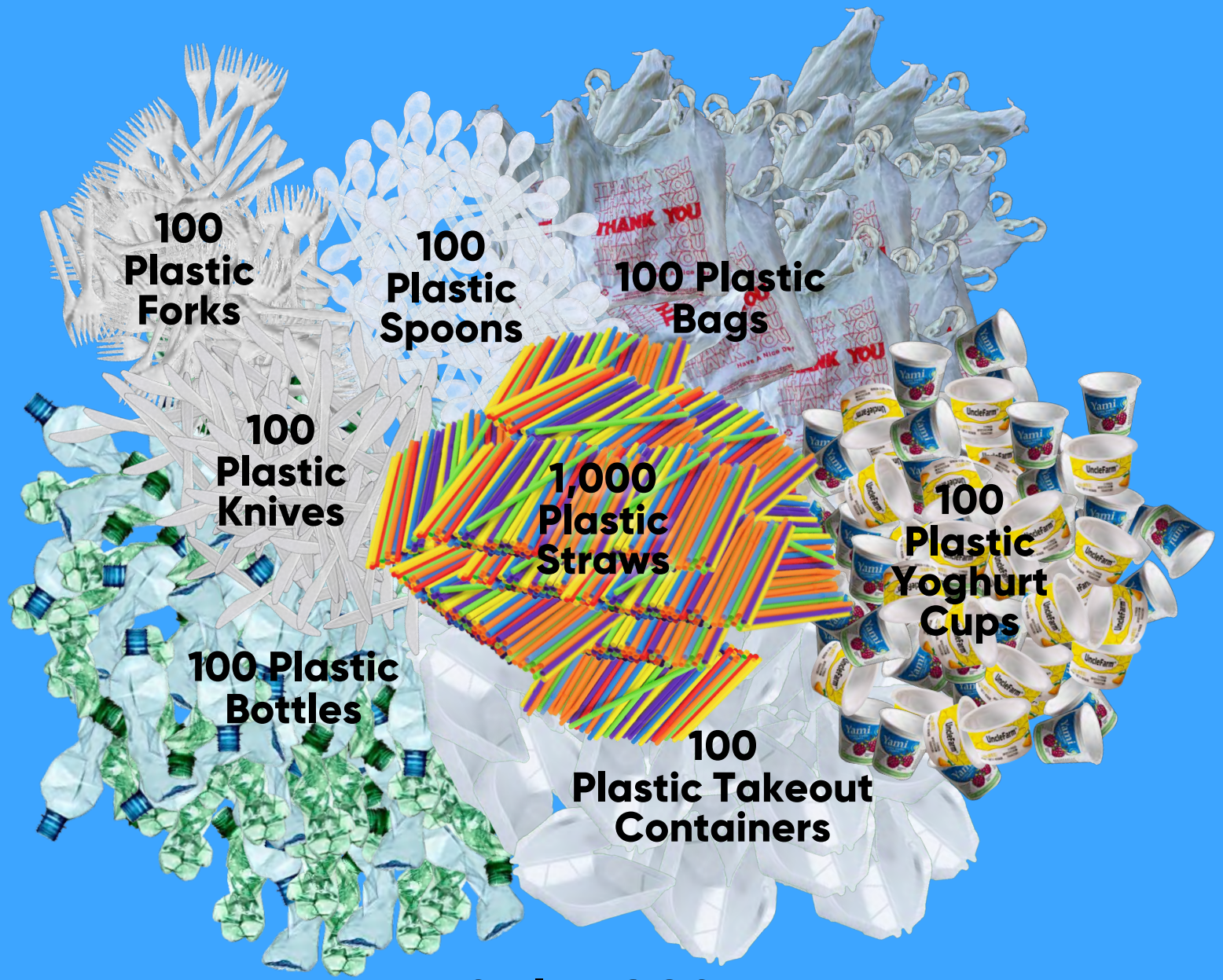
Burning natural gas for heat produces over 25% of US emissions.

Major source of indoor and outdoor air pollution

from US EPA Greenhouse Gas Inventory 2019, from “How Green is Blue Hydrogen”, Howarth, Jacobson July2021


Gas Furnace:
4-8 TONS CO2e/yr


Gas Water Heater:
1-3 TONS CO2e/yr




**23 lbs CO2e**

**1 Day of Heating with Natural Gas**

**44 lbs CO2e**

**1 Gallon of Gas**

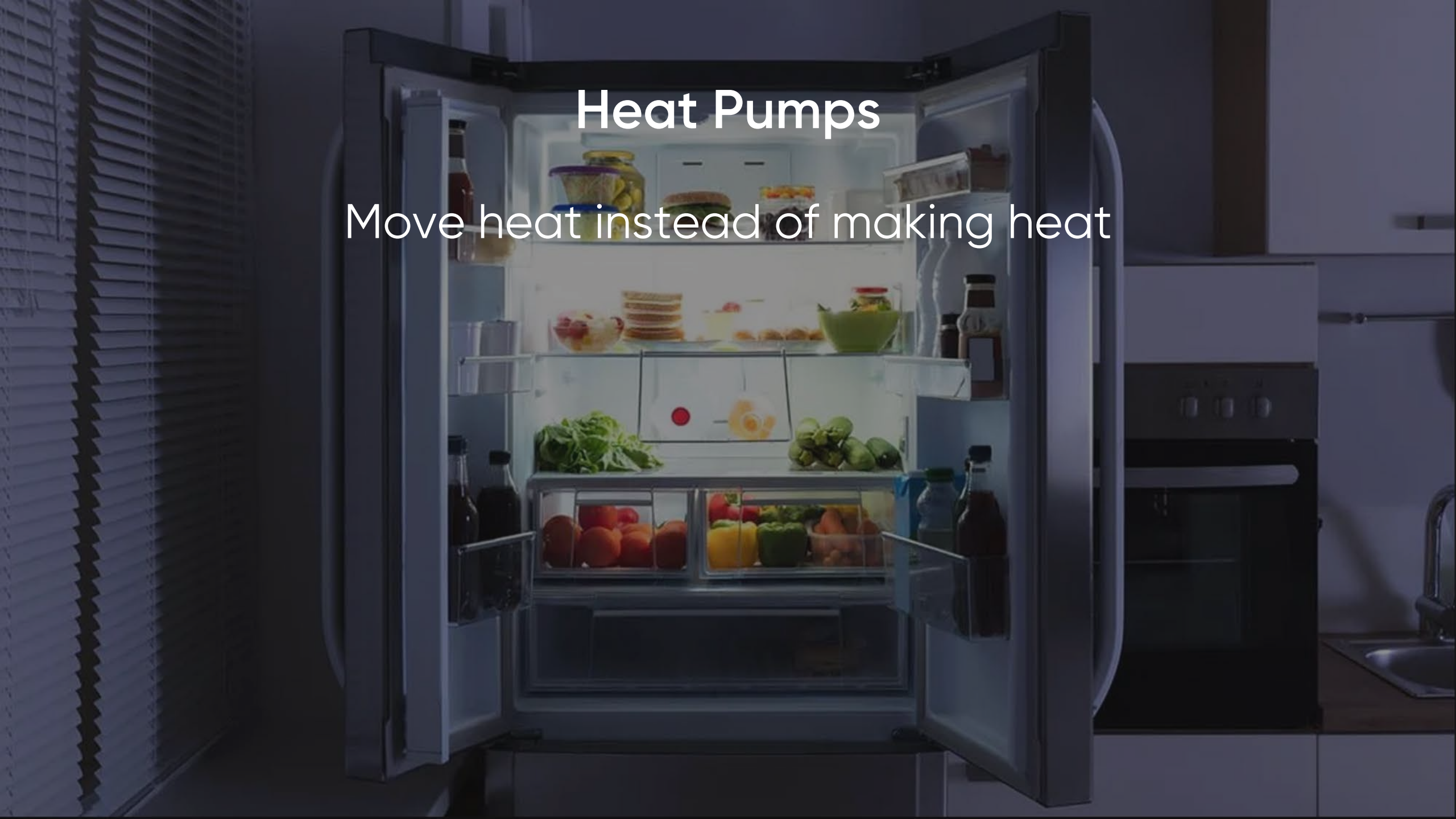
**25 lbs CO2e**

From: product weights from manufacturers, plactics carbon intensity from US EPA, fuel carbon intensity from Oregon DEQ – extraction, distribution and combustion, Average Oregon Residential Gas Consumption from EIA


Filling up.....


Zero Emissions
Space Heating

Zero Emissions
Water Heating



# Heat Pumps

Move heat instead of making heat

# Heat Pumps

Makes ice even when your kitchen is hot

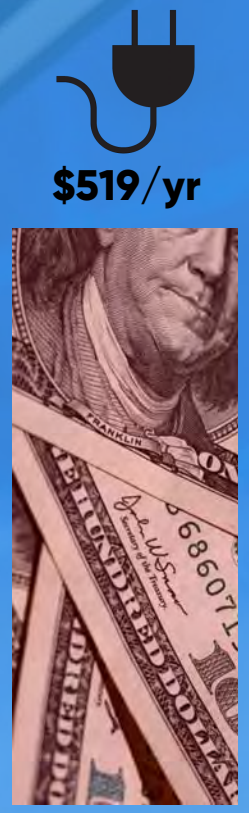

# Heat Pump Water Heater

## Lowest cost, lowest carbon hot water

- Ambient air is pulled into unit and heat is absorbed by the the refrigerant
- Compressor increases the temperature of the refrigerant
- Hot refrigerant is pumped through the condenser coil to heat the water
- 3X more energy efficient than other systems
- Best in basement or garage

# More Showers for the Money

## Pacific Power



$519/yr

Electric Storage

$279/yr

Gas Storage

$202/yr

Gas Tankless

$95/yr

Heat Pump

2.0 Tons/yr

Electric Storage

2.3 Tons/yr

Gas Storage

1.6 Tons/yr

Gas Tankless

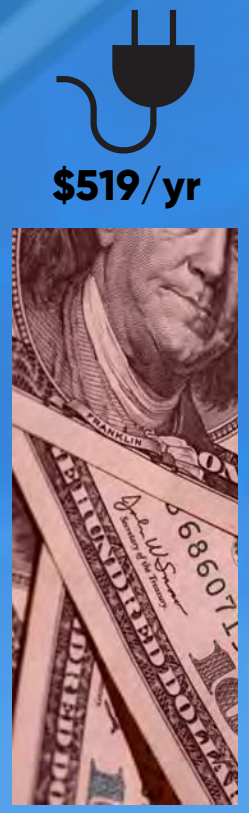
0.5 Tons/yr

Heat Pump

From Energy Guide Labels for energy consumption, 2022 Oregon energy prices and carbon intensity from DEQ Fuel Pathways

# More Showers for the Money

## Consumer Power



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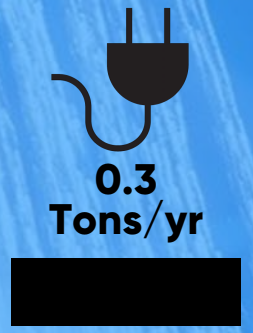


0.3 Tons/yr

Electric Storage

2.3 Tons/yr

Gas Storage

1.6 Tons/yr

Gas Tankless

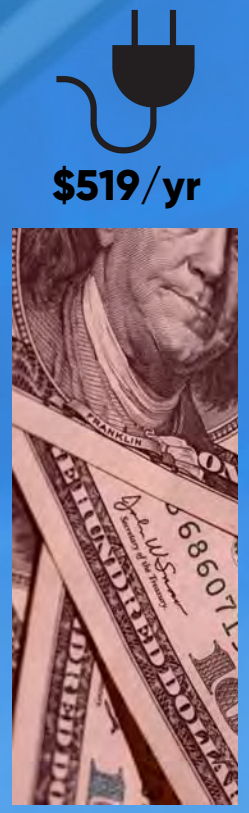
0.1 Tons/yr

Heat Pump

From Energy Guide Labels for energy consumption, 2022 Oregon energy prices and carbon intensity from DEQ Fuel Pathways

# More Showers for the Money

## Renewable Electricity



$519/yr

Electric Storage

$279/yr

Gas Storage

$202/yr

Gas Tankless

$95/yr

Heat Pump

0 Tons/yr

Electric Storage

2.3 Tons/yr

Gas Storage

1.6 Tons/yr

Gas Tankless

0 Tons/yr

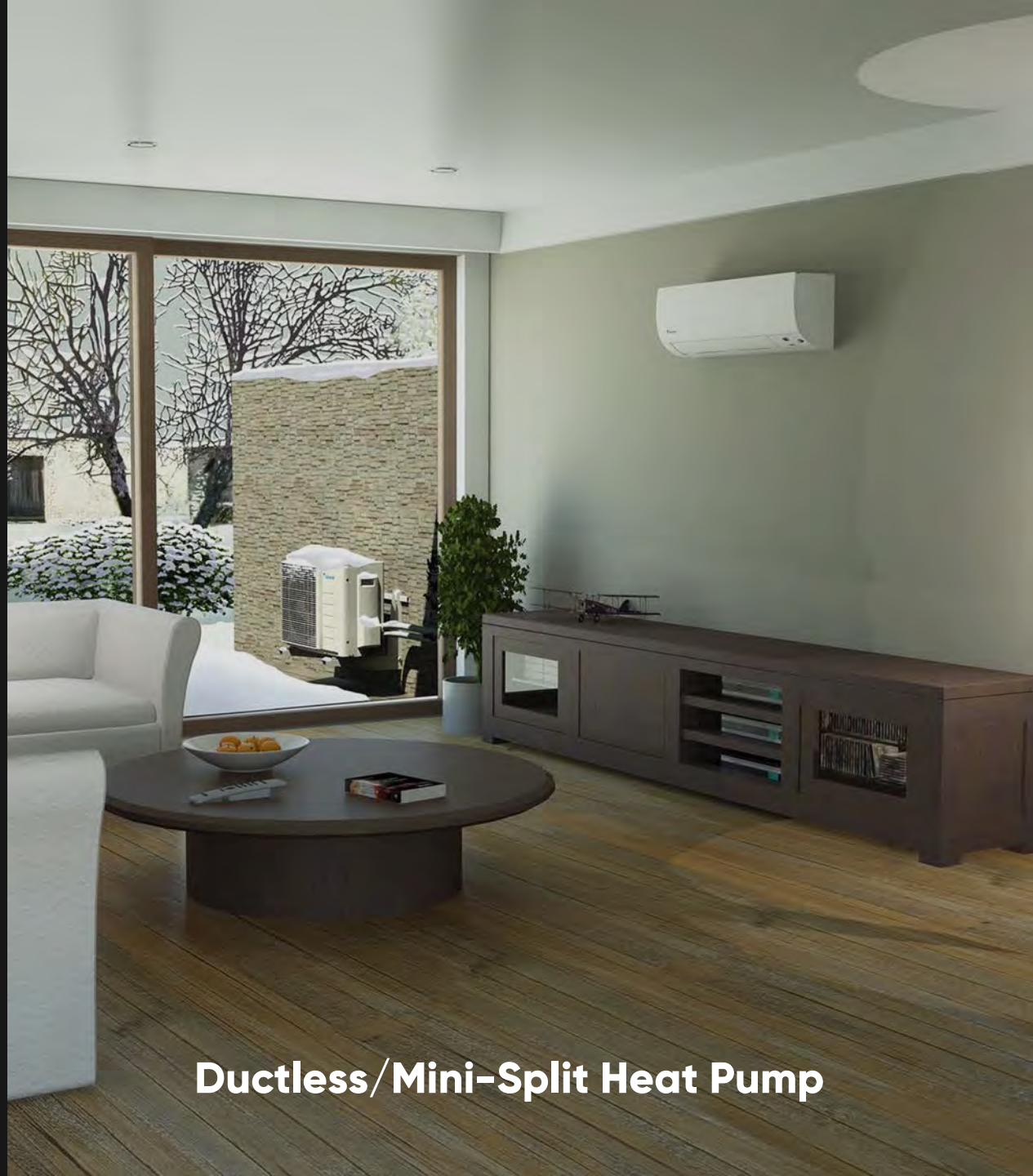
Heat Pump

From Energy Guide Labels for energy consumption, 2022 Oregon energy prices and carbon intensity from DEQ Fuel Pathways

# Heat Pump Space Heating/AC

More comfort and cleaner air

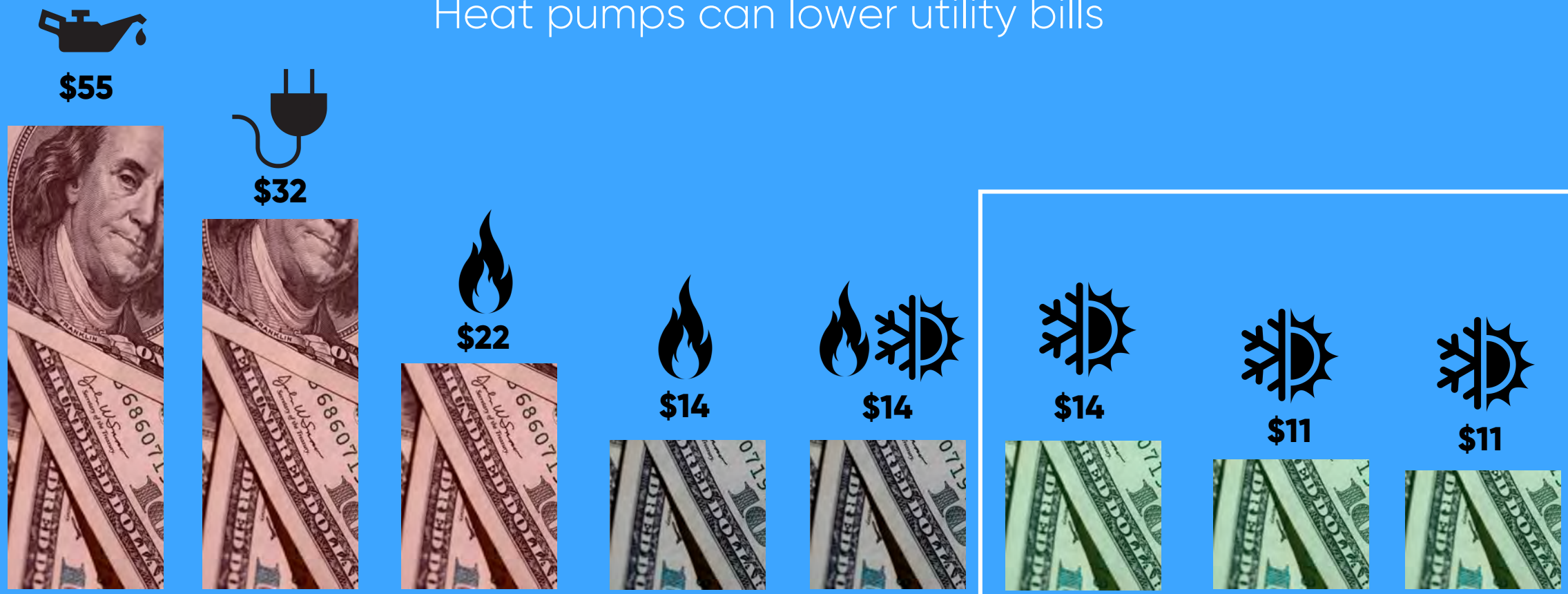

Ducted/Central Heat Pump



Ductless/Mini-Split Heat Pump

# More warmth for the money

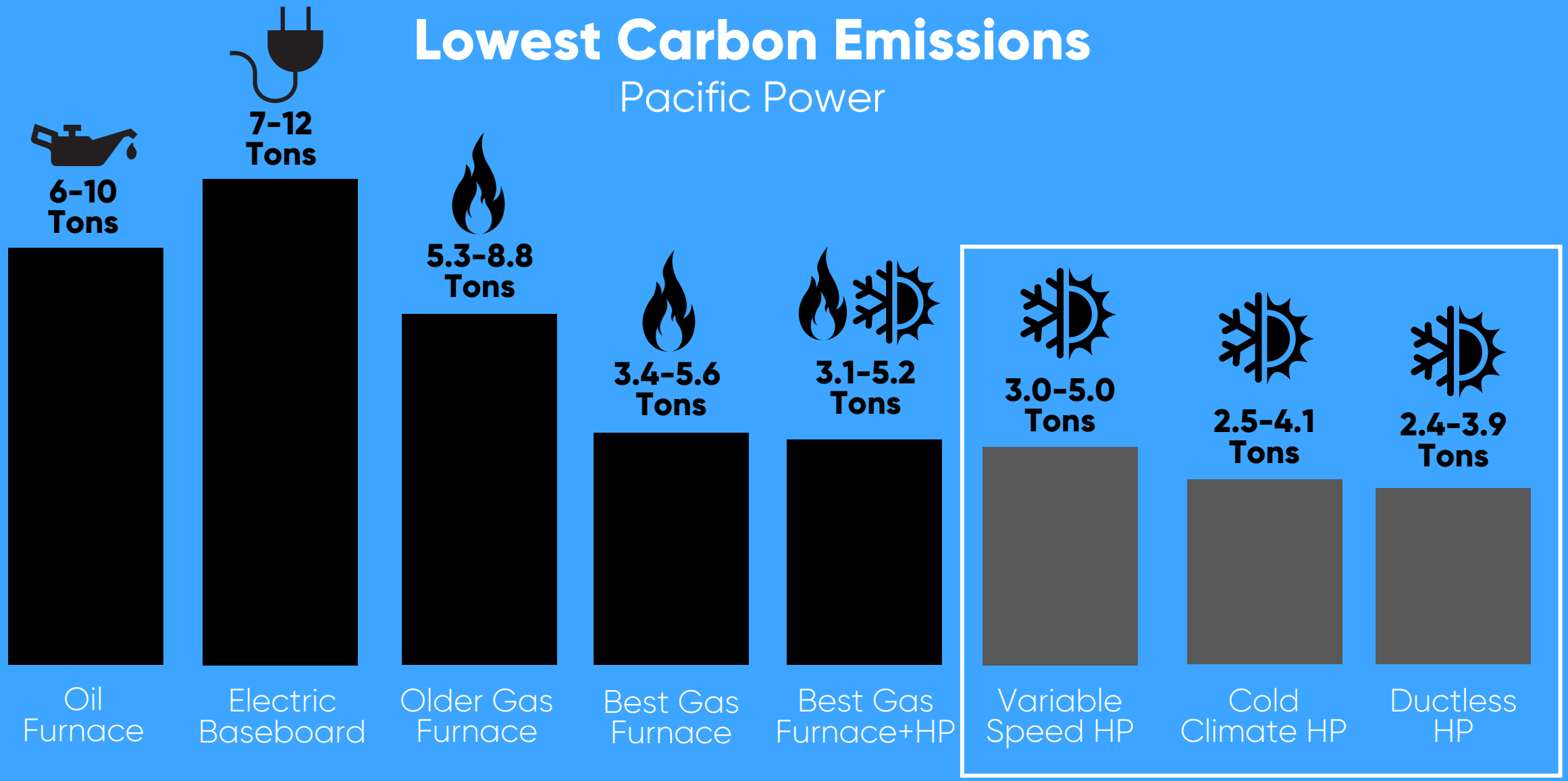
## Heat pumps can lower utility bills




Cost of 1 MMBTU and annual costs based on typical Oregon heating load of 30 – 50MMBTU, utility costs for Oregon 2022

# Lowest Carbon Emissions

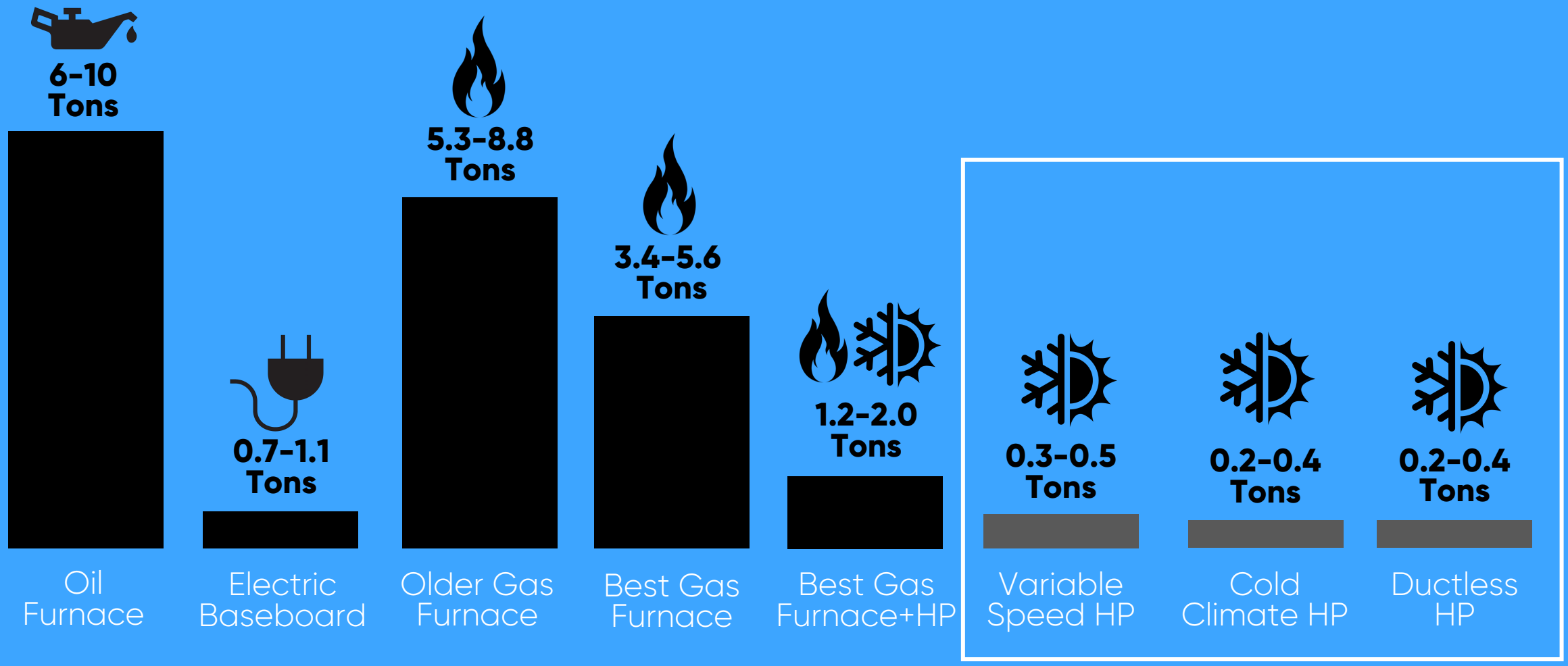
Pacific Power




Typical Oregon heating load of 30 – 50MMBTU, DEQ Fuel Pathways values for carbon intensity of fuels for Oregon utilities statewide average

# Lowest Carbon Emissions

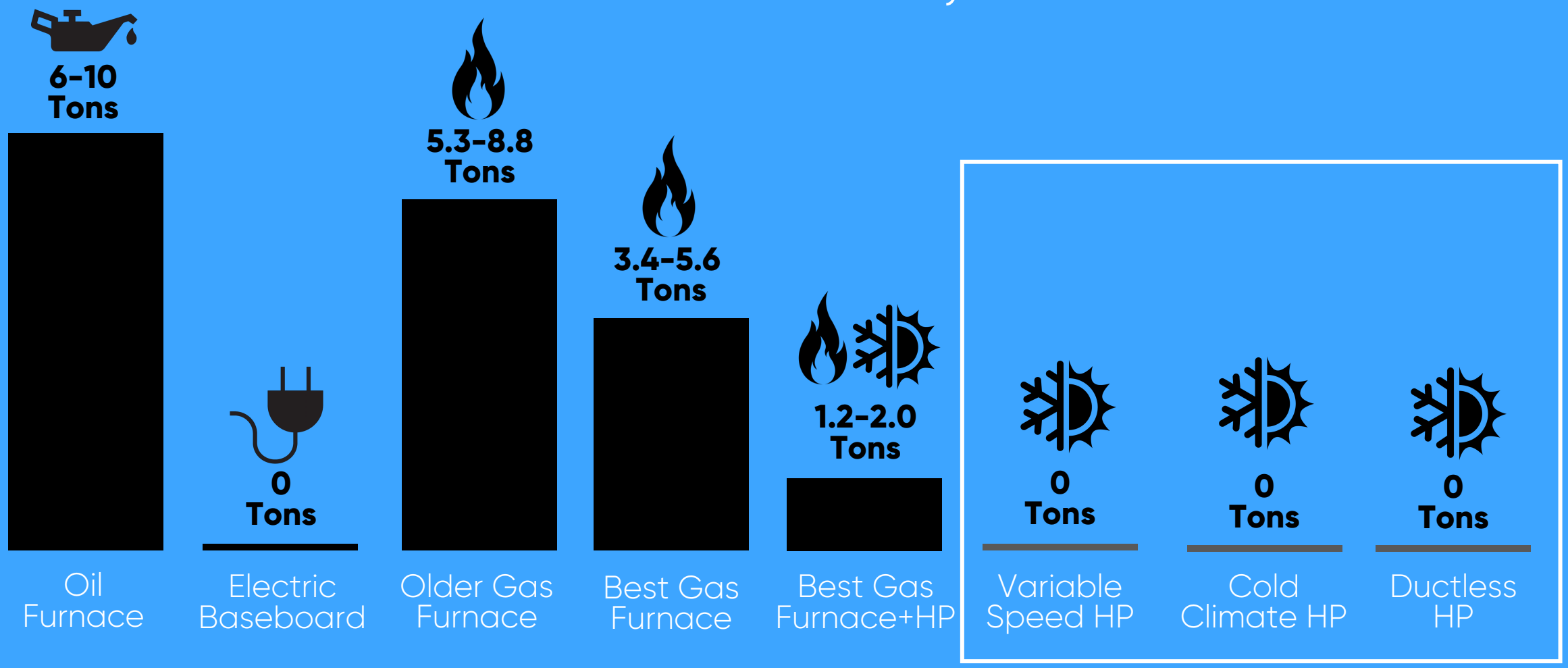
## Consumer Power




Typical Oregon heating load of 30 – 50MMBTU, DEQ Fuel Pathways values for carbon intensity of fuels for Oregon utilities statewide average

# Lowest Carbon Emissions

## Renewable Electricity

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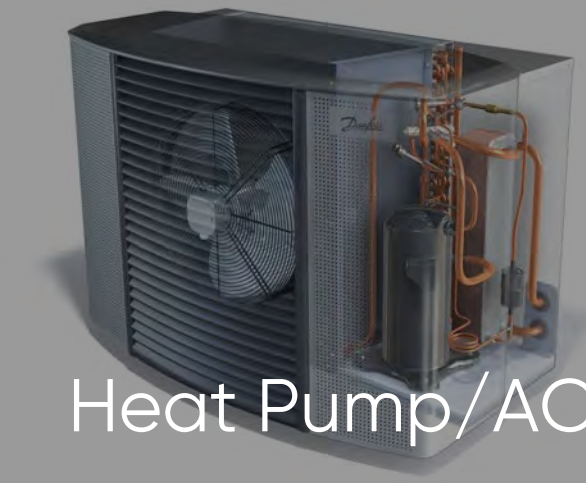


Heat Pump/AC

Heat Pump
Water Heater

# Electric Heat Pumps - no compromise comfort

## ZERO EMISSIONS

## Avoid 5-11 Tons CO2/year

# Superior Indoor Air Quality

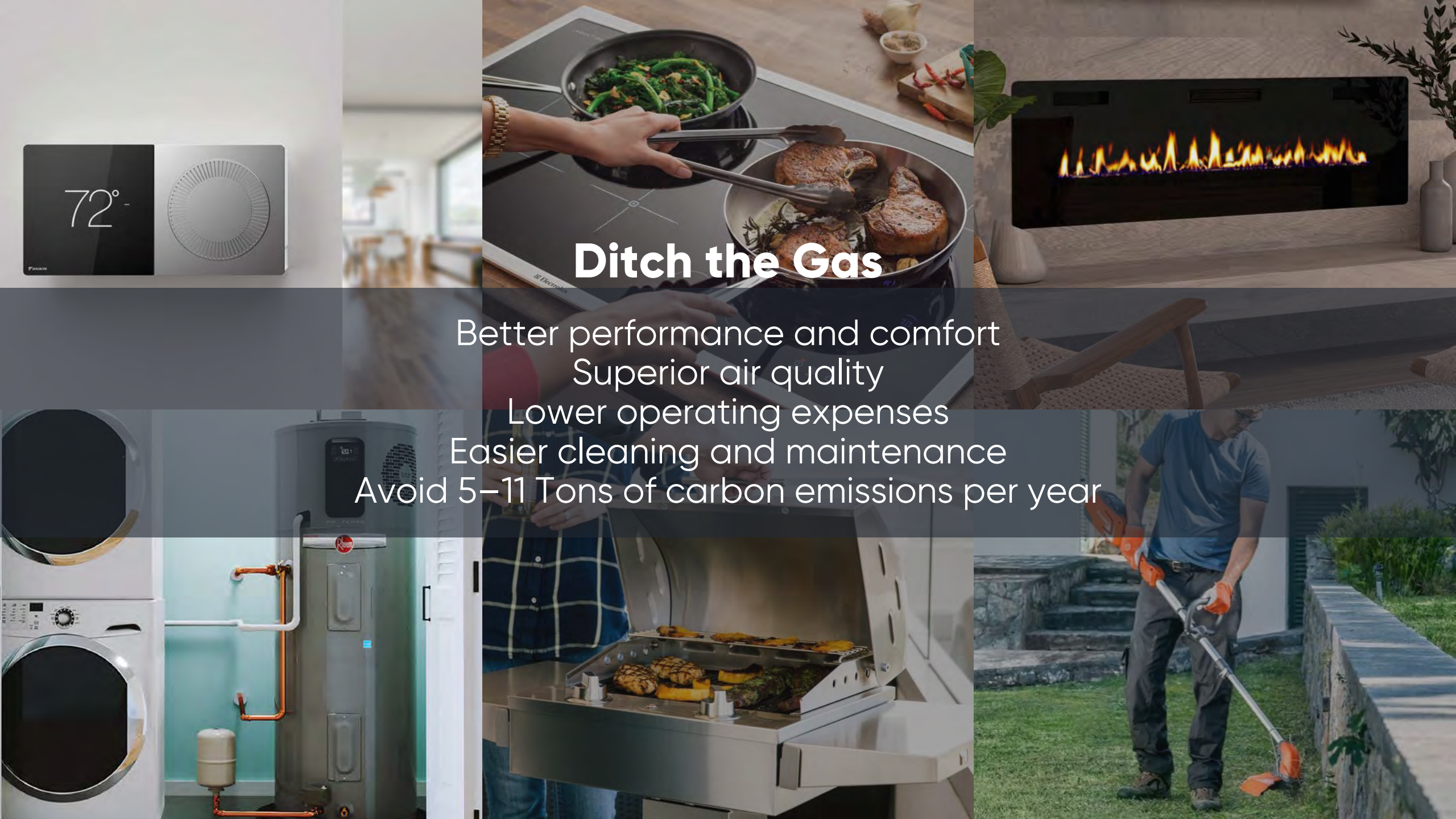
## Methane Gas

- CO and NO2 emissions are linked to higher risk of asthma, especially in children
- Peak indoor air pollution can reach levels that would be illegal outdoors
- Leak Methane even when not in use

## Induction

- Better control and faster heating
- Much easier to clean
- Safer – cool to the touch
- **ZERO** CO and NO2 emissions
- Less than 1/10$^{th}$ the carbon emissions

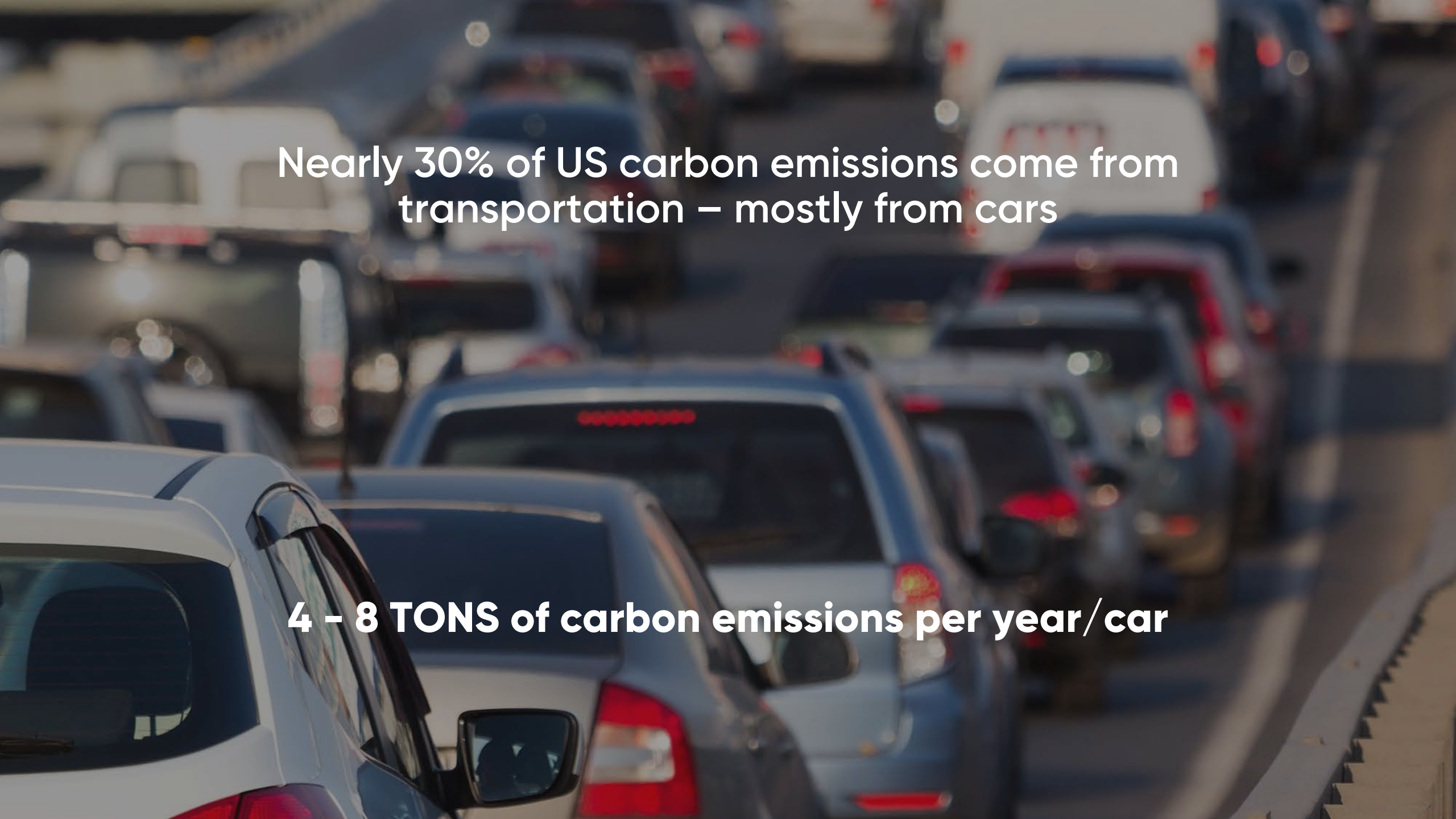
from: Health Effects from Gas Stove Pollution, RMI, Physicians for Social Responsibility, Sierra Club, Mothers Out Front, May 2020
DEQ Fuel Pathways values for carbon intensity of fuels in Ashland



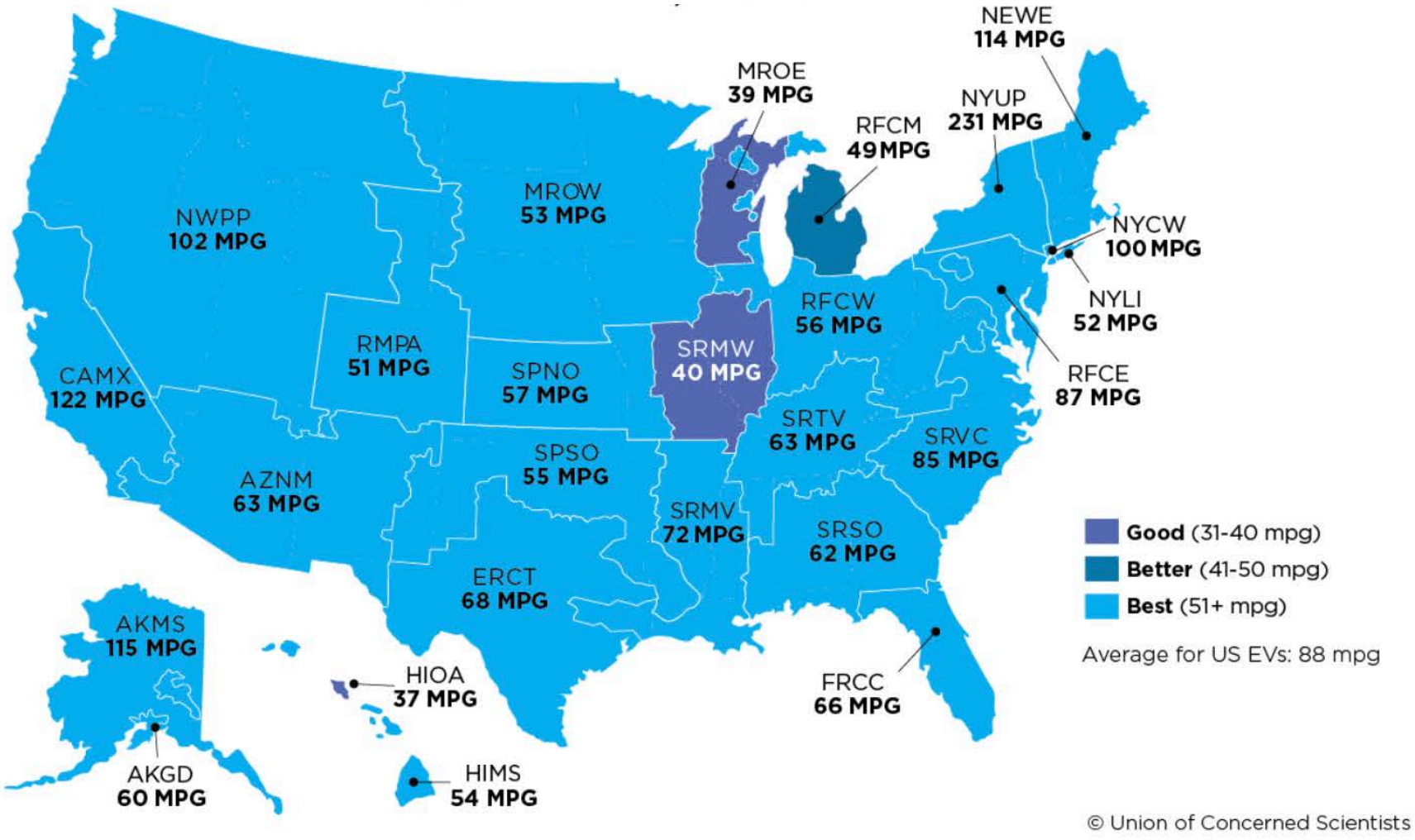

# Ditch the Gas

Better performance and comfort
Superior air quality
Lower operating expenses
Easier cleaning and maintenance
Avoid 5–11 Tons of carbon emissions per year

# 3. Electrify your ride


Nearly 30% of US carbon emissions come from transportation – mostly from cars
4 - 8 TONS of carbon emissions per year/car

# US Average EV equivalent MPG – 88 MPG




from Union of Concerned Scientists 2020

# EV's are more energy efficient – more miles for the money

Hyundai Kona


55 miles


Hyundai Kona EV

338 miles

from manufacturers mileage estimates, gas at $4.64/gal, and electricity at $0.11/kWh,

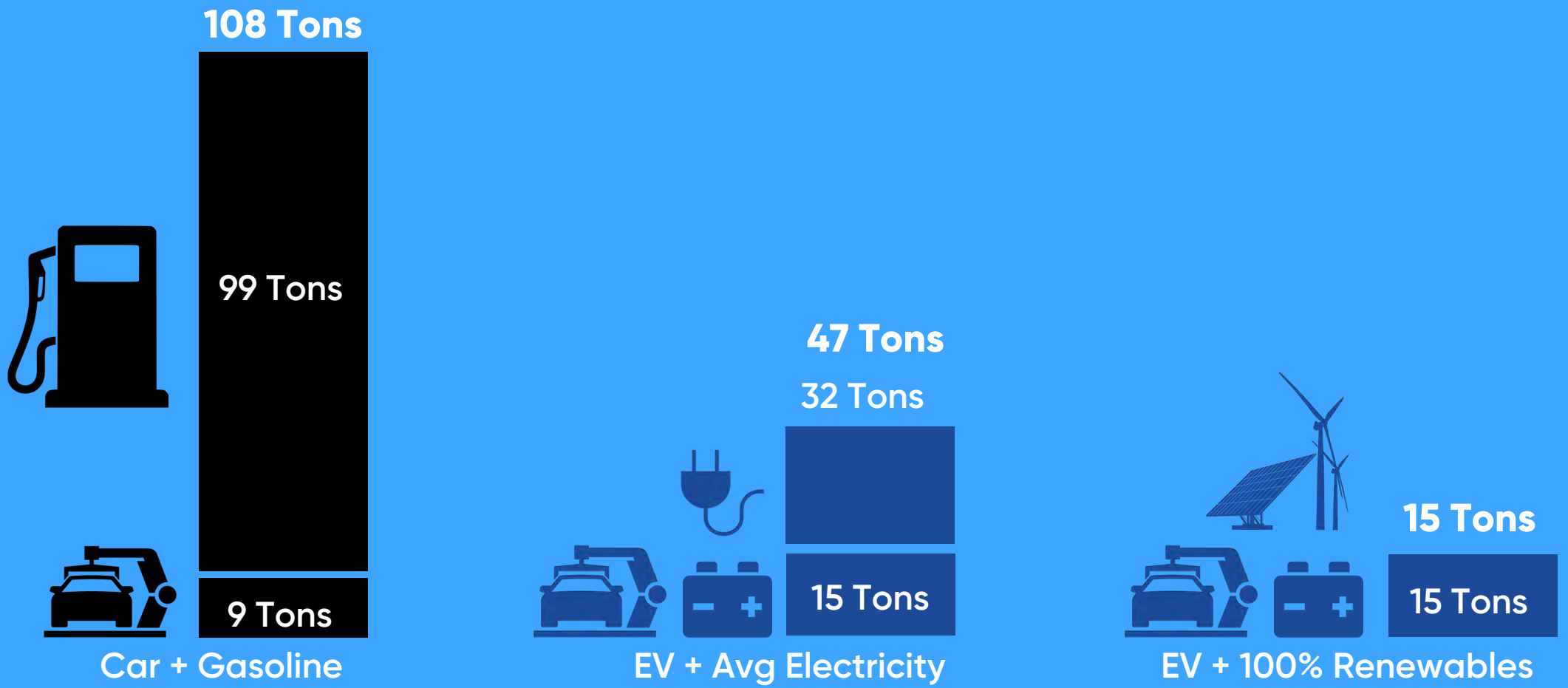
# EV's are cheaper than you think!

| | Kona | Kona EV |
|---|---|---|
| List Price | $24,745 | $35,245 |
| Fed Tax Credit | | -$7,500 |
| State Tax Credit | | -$2,500 |
| | **$24,745** | **$25,245** |
| 5 yr fuel cost | $9,280 | $1,544 |
| 5 yr maintenance | $2,000 | $880 |
| **Total 5 yr Cost** | **$36,025** | **$27,669** |

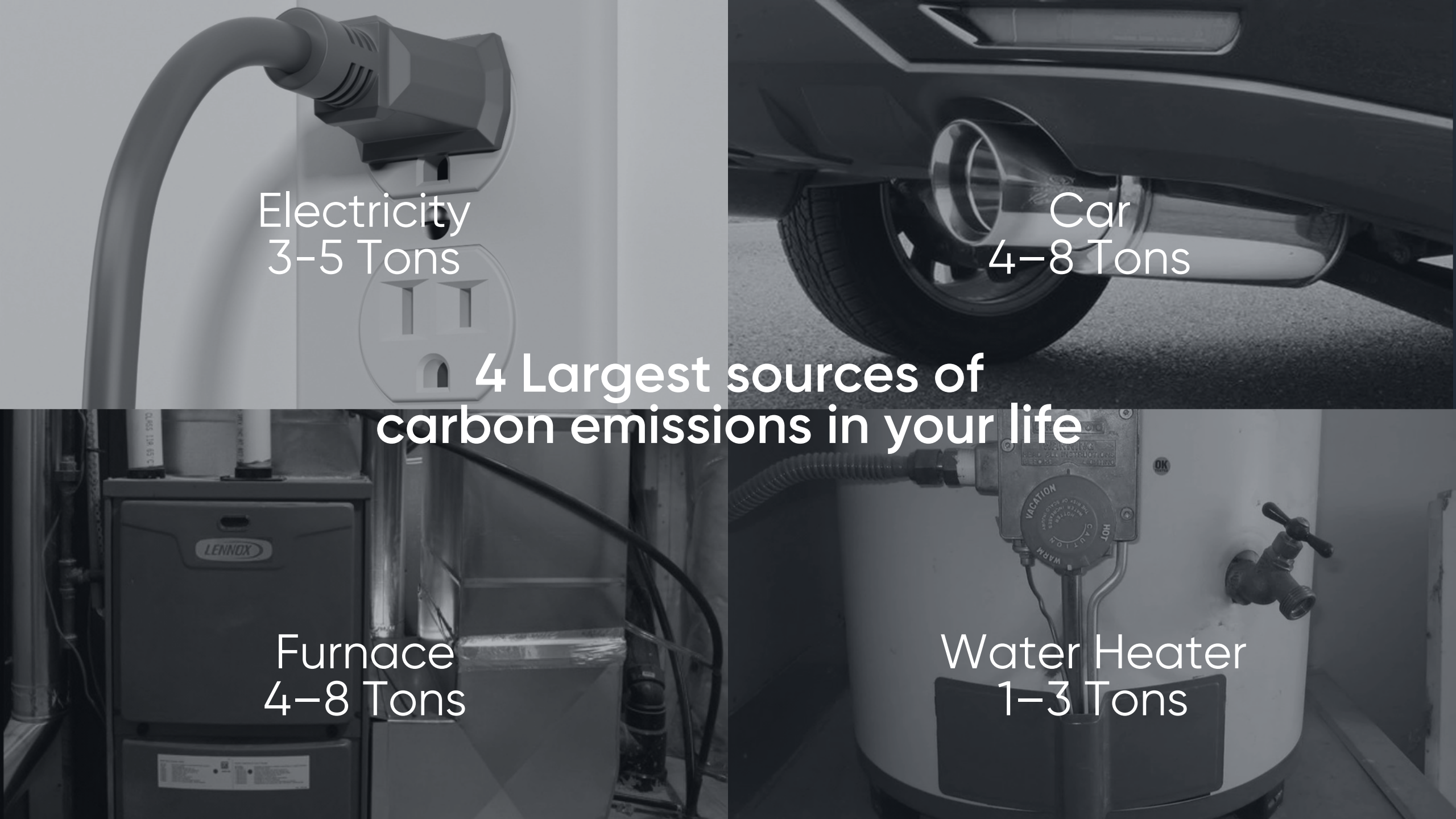
from manufacturers website, mileage estimates, gas at $3.70/gal, and electricity at $0.154/kWh, and Consumer Reports 5 year maintenance cost estimates

# What about the manufacturing the batteries?

A full sized EV will produce far fewer lifecycle emissions than a gas car




from Union of Concerned Scientists for full sized cars, BEV with range of 265 miles, 15 year operating life, Oregon Avg Electricity


Electricity
3-5 Tons
Car
4–8 Tons
4 Largest sources of
carbon emissions in your life
LENNOX
Furnace
4–8 Tons
Water Heater
1–3 Tons

electrify now

1. Clean up your electric supply
2. Electrify your home
3. Electrify your ride
4. Electrify Everyone

*electrifynow.net*