Electrification Coaching 101

What's on your plan?

- Handout: EvelectrifyEverything_2023.pdf from https://www.rewiringamerica.org/electrify-everything-handouts
- Latest: https://content.rewiringamerica.org/reports/Rewiring%20America%20Go%20Electric%20Digital%20Guide.pdf
- Retrofitting a single family home: https://www.redwoodenergy.net/research/a-pocket-guide-to-all-electric-retrofits-of-single-family-homes
- YouTube videos: https://www.youtube.com/@ElectrifyNowUSA

FREE Electrification Coaching

by Betsy Longendorfer, Bergen County, NJ

What I offer:
I am a homeowner who has been through the process of installing solar panels, obtaining energy audits, insulating my home, and replacing HVAC systems and appliances. I remember how overwhelming and time-consuming this was, and the mistakes I made that could have been avoided.

I can help you:

- understand the reasons for electrifying your home, including comfort, safety, resale value, and financial savings, as well as lessening your carbon footprint
- identify potential issues
- help you develop a custom plan
- find resources to identify contractors, many of whom will file the appropriate paperwork for you.

You will then select and work with the contractors yourself on specific projects.

Skills and expertise:

- Electrification Coaching Certification from Rewiring America, a national organization dedicated to tackling the climate crisis by electrifying American homes and businesses.
- Retired electrical/computer engineer.

About me:

- The climate crisis is an existential issue for humankind, and I wanted to use the gift of time during my retirement, and my skills, to contribute to its solution in any way possible, no matter how small. What more important problem could an engineer work on?

- I write a Substack newsletter series (with Dr. Judith Green) called ClimateFriendlyLifestyle.substack.com. Subscribe! It's free! The newsletters compile information about practical actions that individuals can take to make their lifestyle greener. **There are articles that expand on the information here**, on most topics.

Why Electrify Now?

Alignment of:

Financial savings ~ Comfort ~ Safety ~ Decarbonization

Make a plan NOW before emergency strikes!

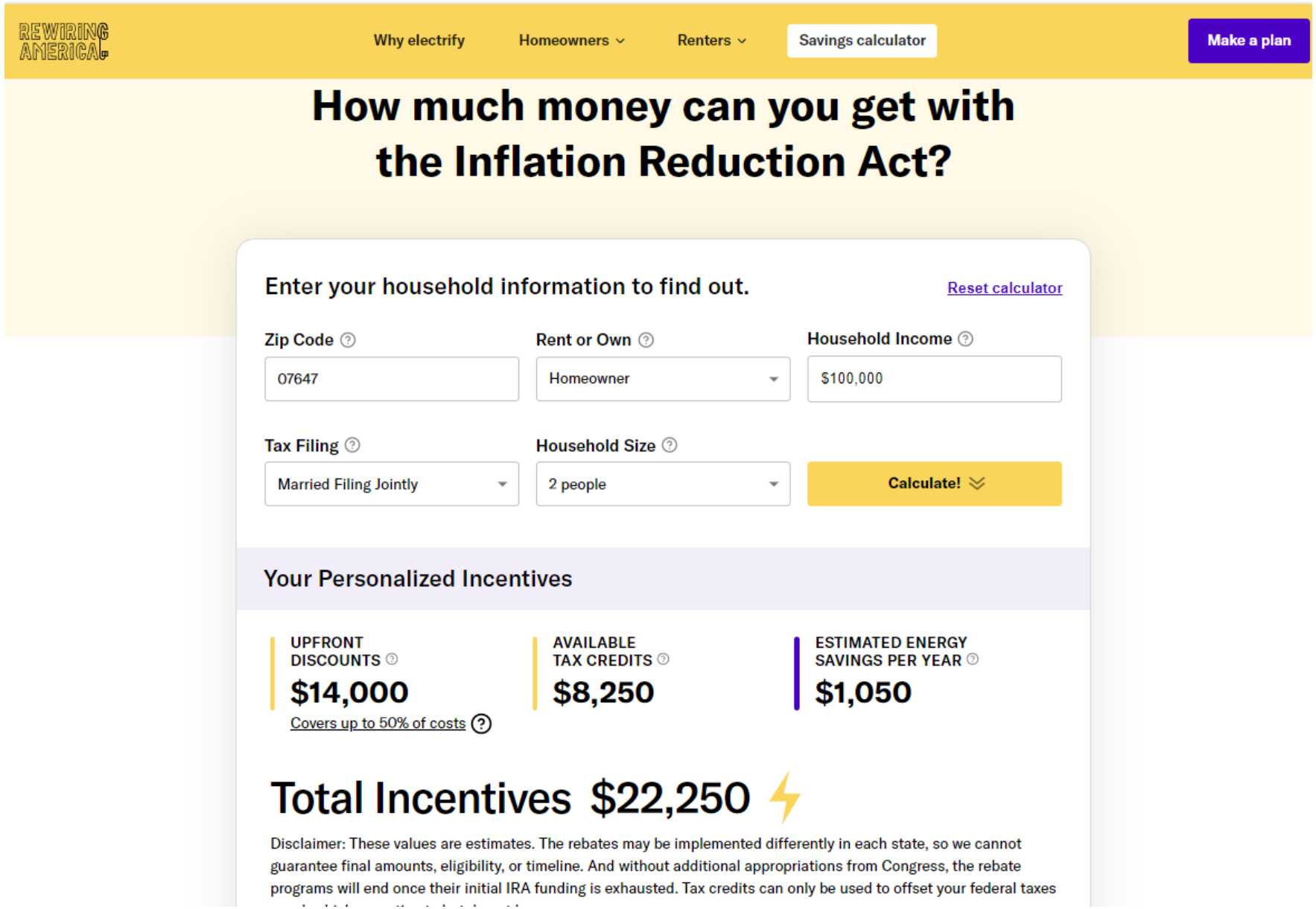
* Some of these technologies are newer
* Not all contractors are familiar with them
* Order of implementation matters
    * Upgrade electrical panel ONE time
    * Insulate BEFORE calculating size of heating/cooling units

Further info: https://climatefriendlylifestyle.substack.com/p/electrify-everything-part-1-make

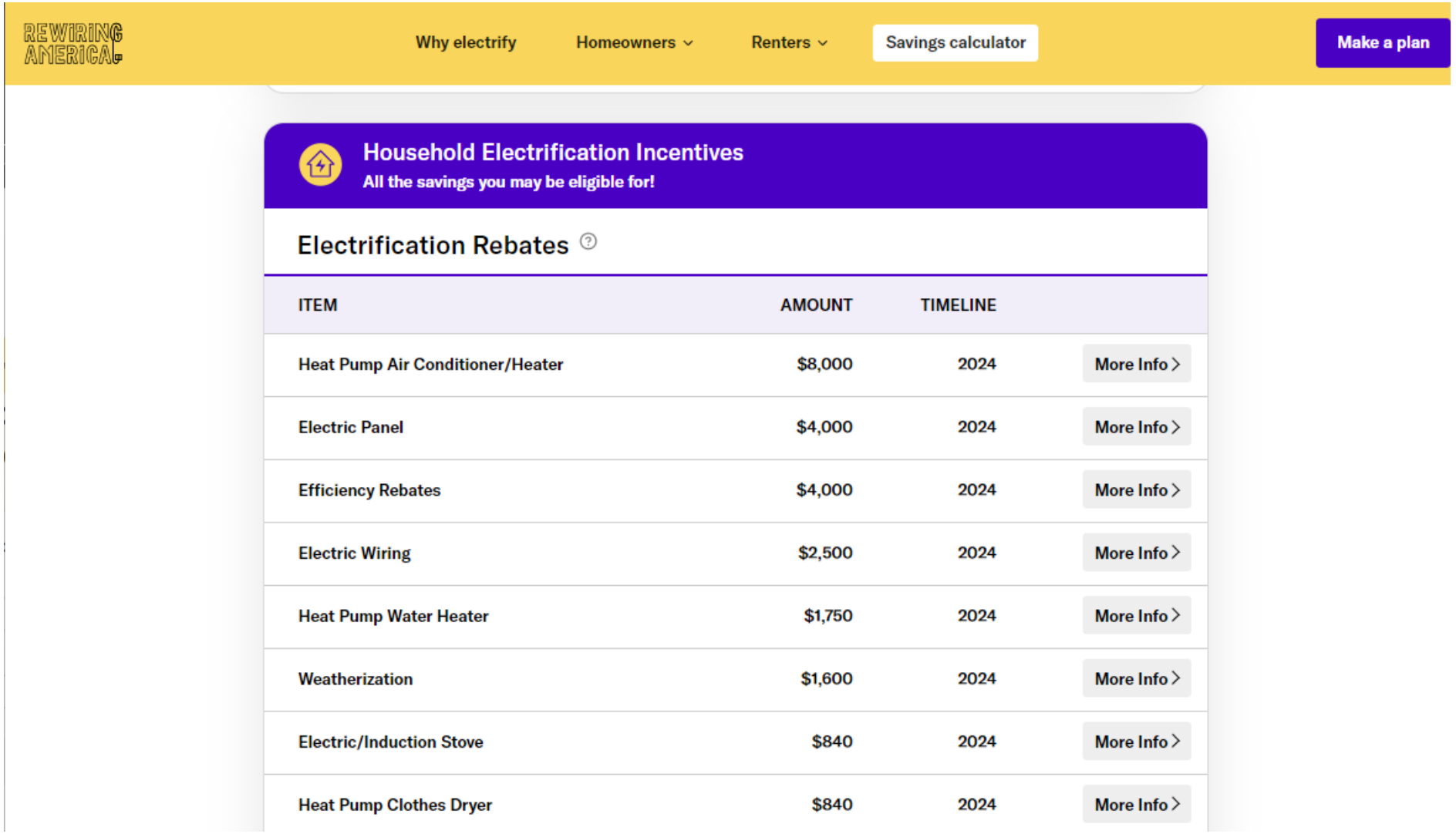
Make a plan

Your plan might include:

- Weatherizing & Insulation
- Heating & Cooling
- Hot Water
- Energy Storage & Generation
- Cooking
- Appliances
- Transportation
- Lawn & Garden



https://www.rewiringamerica.org/app/ira-calculator



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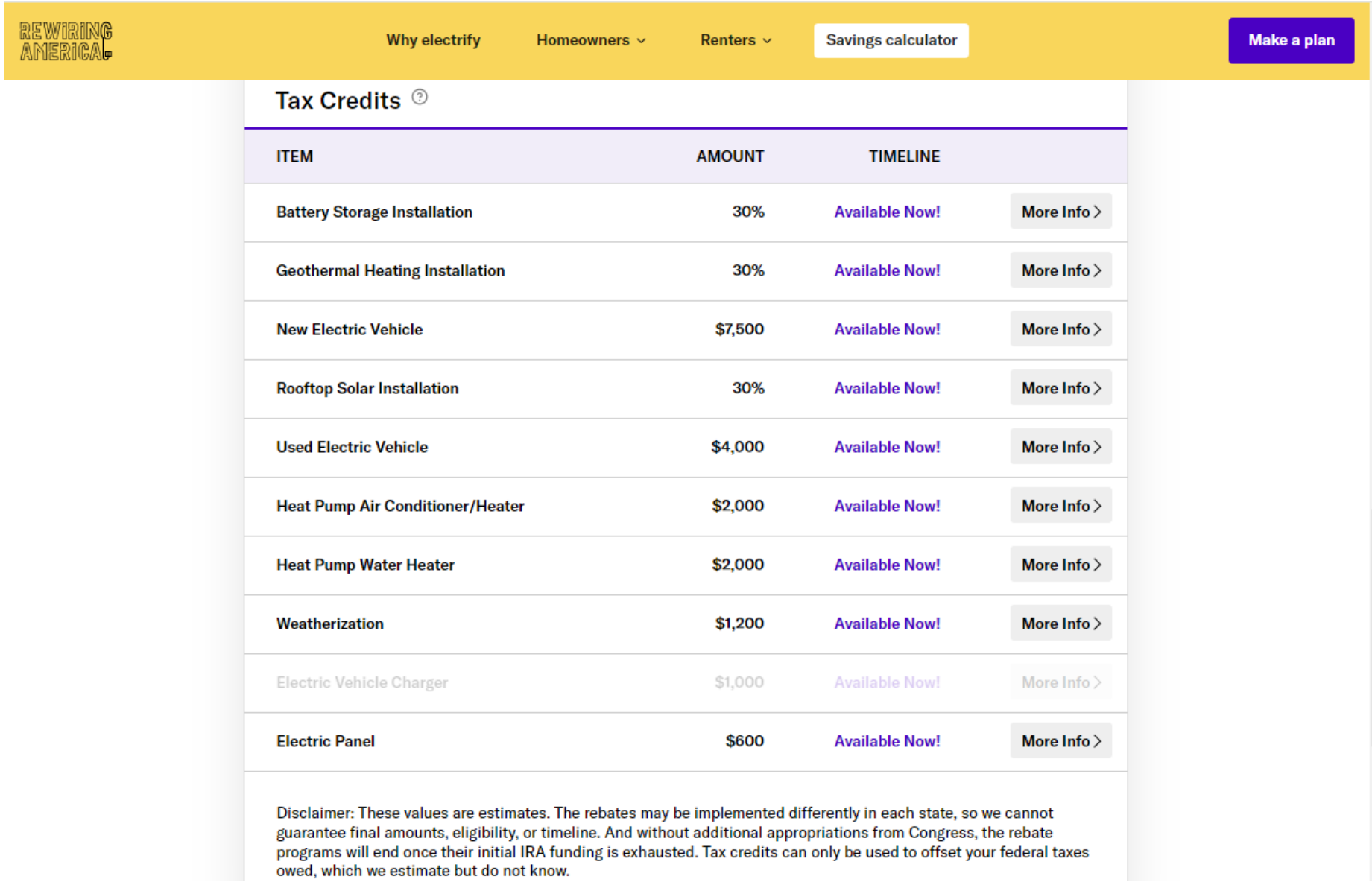
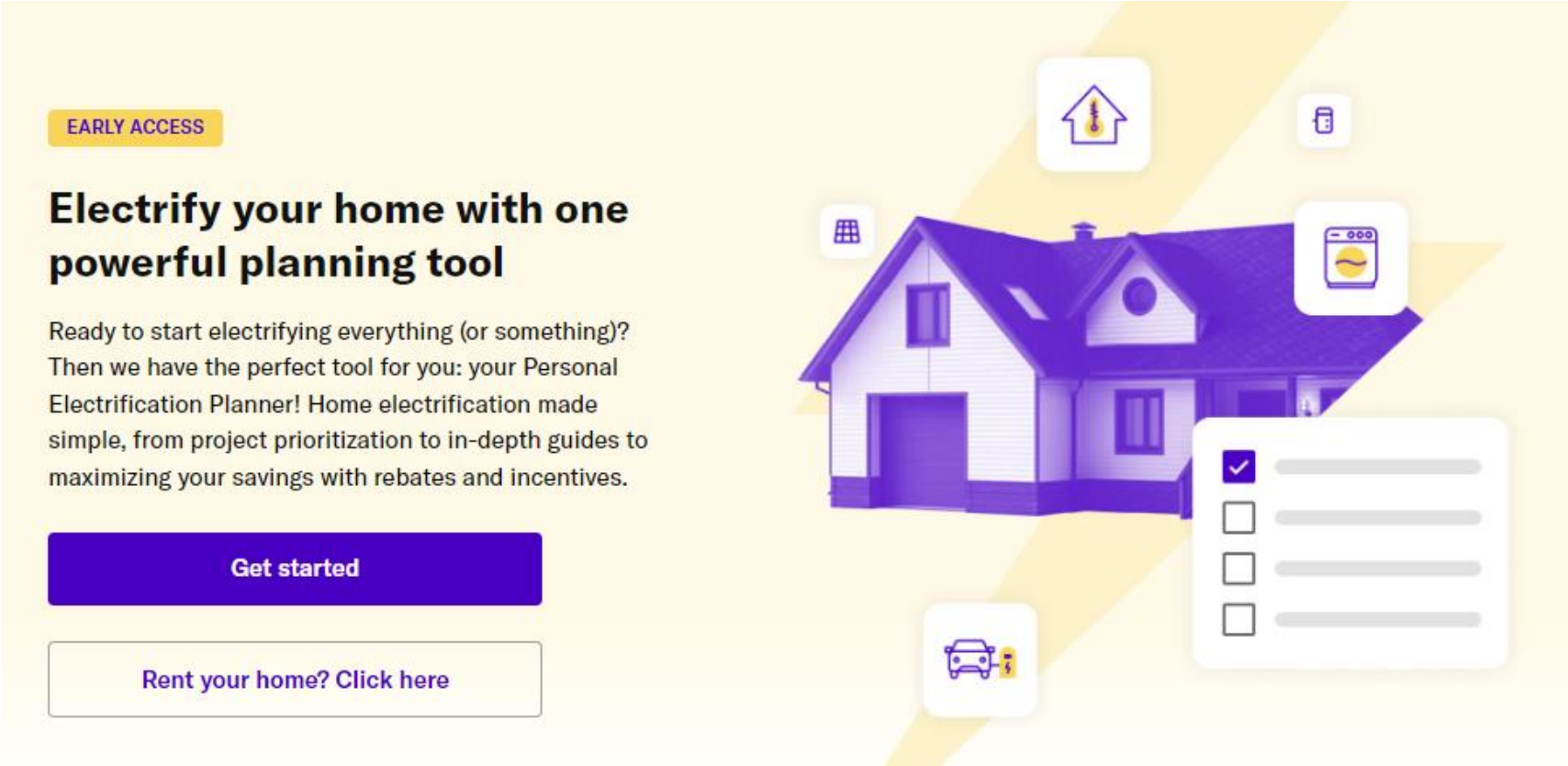


https://www.rewiringamerica.org/app/ira-calculator

Planning Tool

Personal electrification planner from Rewiring America

https://homes.rewiringamerica.org/personal-electrification-planner



Federal Financing

	LIFE IN YEARS	ELECTRICAL UPGRADE	UP FRONT COST BEFORE REBATES	ANNUAL OPERATING SAVINGS	HARDER	% HOME EMISSIONS	IMPROVES AIR QUALITY	RENTER CONTROLS
1. Purchase Renewable electricity			$0					R
2. Electrical Service	20-25 YRS		$750-4,000		✓			
3. Heat Pump Space Heating and Cooling	15-20 YRS	AT INSTALL	$1,000 DIY, TO $20,000+	$$$	✓	25%		R
4. Heat Pump Water Heater	10-15 YRS	MAYBE	$1,500 DIY, $4,000 INSTALLED	$		10%		
5. Electric Cooking	13-15 YRS	YES	$2,000-3,000			5%		R
6. Electric Clothes Dryer	10-13 YRS	MAYBE	$1,000-2,000	$$		3%		R
7. Electric Vehicles	20-25 YRS		$10K (USED) AND UP	$$$		50%		R
8. EV Charger (240V EVSE)	10-15 YRS	YES	$500-2,500					R
9. Rooftop Solar PV Panels	20-30 YRS	AT INSTALL	$15,000-30,000	$$$	✓		HELPS ALL	
10. Home Battery Storage	5-15 YRS[6]		$10,000-20,000	$	✓		HELPS ALL	

KEY:

- $ SAVE $50+ PER YEAR
- $$ SAVE $200+ PER YEAR
- $$$ SAVE $500+ PER YEAR
- INDOOR & OUTDOOR
- OUTDOOR

Federal, State, Utility Financing Summary

- Miller's Google Doc which includes utility info: https://docs.google.com/document/d/10vSXEtbjYZ3fBYhZbBahOLVxXrn82QKHkJGHGTRnvyg/edit

Building Electrification rebates and tax credits

NJ HOME CREDITS & REBATES	Rebates from NJ utilities (in addition to NJ rebates and U.S. tax credits). May be available until Jan 1, 2025. Rebates are for "Energy Star" devices. HVAC-related rebates for JCP&L, PSEG, Rockland Electric & Atlantic City Electric are indexed in https://energyefficiencyalliance.org/wp-content/uploads/2023/08/NJ-HP-Incentives.pdf				IRA TAX CREDIT CAPS: 30% and $3200 max/calendar-year; IRA credits have a three-year carryback and a twenty-two year carry forward. Credits transferable (limited by passive activity rules).	IRA REBATE ($14K total cap); STATES MAY VARY (effective- 2025 in NJ); stackable with tax credits; funding may quickly run out; All are "HEEHRA" unless labeled "HOMES". Appliances must be rated "Energy Star". Incomes are 80% & 150% of NY/NJ median income	
	JCP&L REBATES Appliance Rebates | JCP&L		PSEG REBATES			<80% Median Income:$93K	<150% Median income: $174K
AIR SOURCE HEAT PUMP	Cold Climate Other than cold climate	1K 400 to 1K	Cold Climate Other	$600 $240 - $600	30% (capped at $2K/year for heat pump + heat pump water heater)	100%, up to $8K	50%, up to $8K;
GEOTHERMAL HEAT PUMP	REPLACE AIR OR GND SOURCE HEAT PUMP	500			30% for geothermal; no caps and no limits	100% up to $8K	50% up to $8K
GEOTHERMAL HEAT PUMP	REPLACE ELECTRIC FORCED AIR FURNACE/AC	1500			30% for geothermal; no caps and no limits	100% up to $8K	50% up to $8K
HEAT PUMP WATER HEATER		$750		$600	30% for heat pump water heater capped at $2K/year for heat pump + heat pump water heater)	100% up to $1750;	50%, up to $1750;
ELEC OR INDUCTION STOVE						100% up to $840	50% up to $840
EV CHARGERS	$250 Must be level 2 Energy Star charger from NJ approved list https://chargeup.njcleanenergy.com/ev-charger-incentive				30% up to $1K		
WEATHERIZATION	NJ utilities typically provide: free or low cost energy audits; list of authorized weatherization companies; low or no interest "on bill" 7 to 10 year loans; "Home Performance with Energy Star" (see below)				30% cap/year: max $1200 /yr (incl $600elec.panel); insulation; $250/door; $600 windows; $150 energy audit;	100% up to $1600	50% up to $1600

Financing cont'd

ELECTRIC PANEL 200Amp					$30%; $600 cap/year	100% up to $4K	50% up to $4K
ELECTRIC WIRING						100% up to $2500	50% up to $2500
HEAT PUMP CLOTHES DRYER	"Most Efficient" Other Models	$300 $100				100% up to $840	50% up to $840
Modeled and Measured Energy Efficiency of Whole House	Home Performance with Energy Star (HPwES) $5K max rebate for 25% improvement in energy efficiency. Less rebate for less improvement (To be superceded in 2024)					*HOMES Energy Efficiency (modeled): 80% up to $8K	*HOMES Energy Efficiency modeled: 50% up to $4K "measured" program is 50% (no cap)
GOOD SOURCE:	https://www.rewiringamerica.org/app/ira-calculator THIS IS BEST SITE: determine rebate and tax credits for YOUR location and family income						
JCP&L https://residential.energysavenj.com/jersey-central/hvac/ Appliances must be "Energy Star" https://chargeup.njcleanenergy.com/ev-charger-incentive FED:https://www.energystar.gov/about/federal_tax_credits/electric_panel_upgrade FED https://www.kiplinger.com/taxes/605201/federal-tax-credit-for-electric-vehicle-chargers					Highest efficiency "energy star" products required		
PSEG https://residential.energysavenj.com/jersey-central/sites/jersey-central/files/2022-04/PSEG_HVAC_Incentive_Claim_Form_2022.pdf Appliances must be "Energy Star"						Area Median Income: LOOKUP BY ADDRESS: https://ami-lookup-tool.fanniemae.com/amilookuptool/ HUD Lookup Tool see"dataset"	
*HOMES: Proposed project reqmts: >20% energy savings (modeled), or >15% energy savings (measured). "measured" has NO cap; stackable with tax credits; fuel neutral; up to $200 contractor incentive							
"HEEHRA" (High Efficiency Electric Home Rebate Act) REBATES are "point of sale"; includes multifamily buildings where >50% of building is occupied by LMI households; provides up to $500 contractor incentives; rebates flow thru contractors & big-box stores							

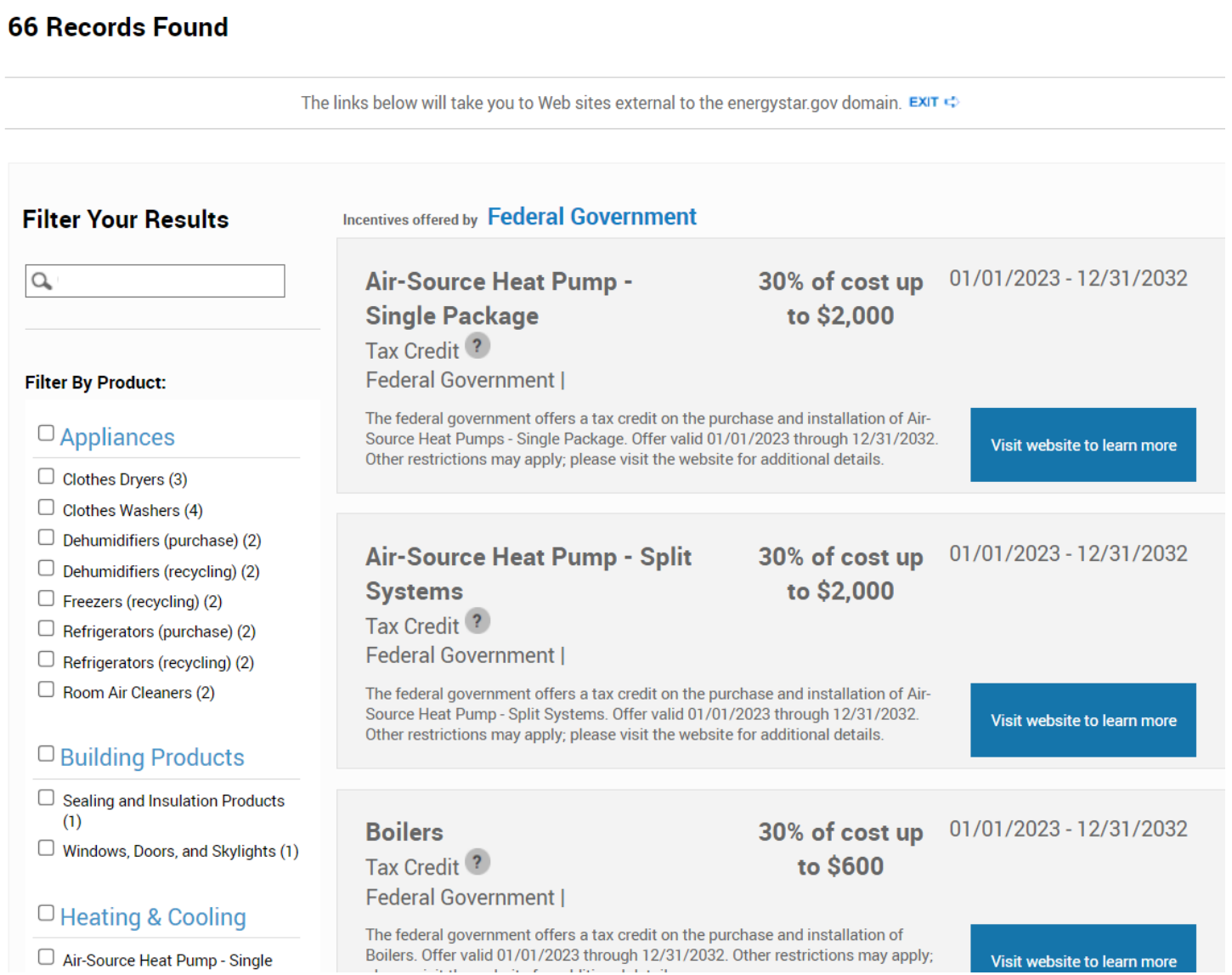
Letauthor know of errors; Anyone is welcome to improve this table. **Notify author to receive access**. stevemiller@comcast.net 12/15/2023 ver 2.11

EnergyStar Rebate Finder

Federal govt + local utilities

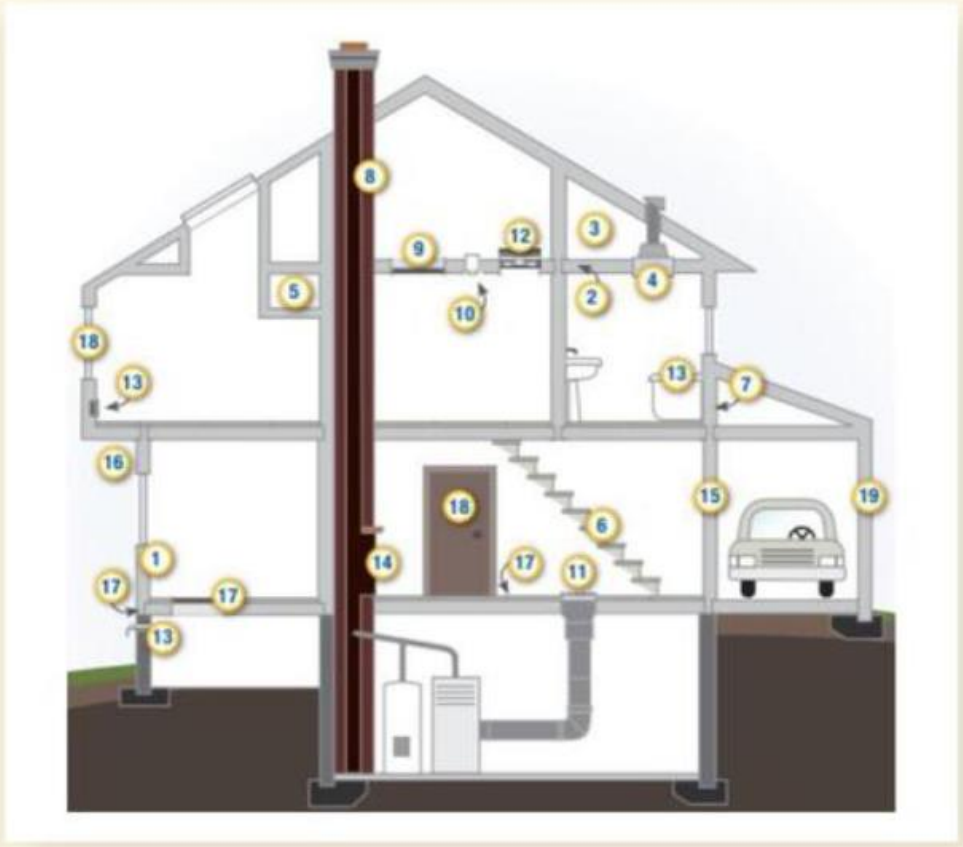
https://www.energystar.gov/rebate-finder

EnergyStar Rebate Results (Partial)



Energy Audit

- Do you know where your actual problems are?
  - Manual J calculation (math)
  - Blower door test (actual test)
  - Windows – single/double pane, material, area
  - Walls – construction material, amount of insulation
  - Attics – insulation thickness, weatherstripping
  - Basements – sealing ceiling
  - Air Leaks around windows, doors, lighting, plumbing, ϵ
- Do you know which are the most severe?
- Do you know which cost the least/most to fix?



Further info: ClimateFriendlyLifestyle.substack.com, Energy Audit article coming soon

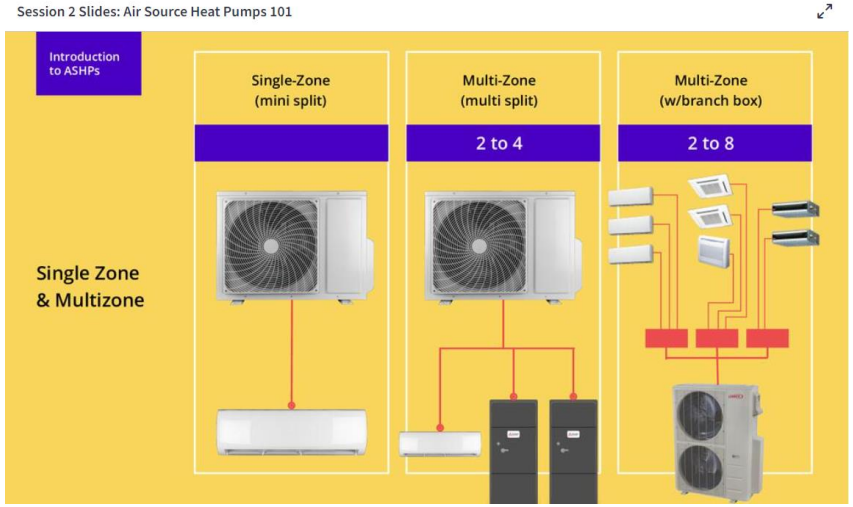
Who Performs Energy Audits?

- Your utility
- Insulation contractors (look for BPI or RESNET certification)
- Evaluate bids – which are financial savings? Comfort? Safety?
  - Actions should be spelled out in detail
  - Contractor should tell you about financial incentives and apply for you
  - Did they perform Manual J calculations? Blower door test?
  - Must state their plan for finding and sealing all air leaks

My experience with energy audits – 3 good contractors, with different approaches

- Contractor 1:
  - Very thorough report, but agent could not adequately answer my questions
  - Multiple options from ~$10K to ~$43K, with about 30-40% credits/rebates
  - My sunroom was the worst problem, but they just completely ignored it – didn't fit into their standard pitch
- Contractor 2:
  - No written report but very experienced agent who could answer all questions
  - Immediately said sunroom was worst problem, and told me to get door/windows installed, even though he wouldn't make a penny
  - ~$10K bid, wouldn't discuss fiberglass batts – would only use blown cellulose
- Contractor 3:
  - Very experienced agent who spent 90 minutes in house, answered all questions
  - Emphasized they would do what we wanted, but made recommendations and good suggestions on what was most important. About 3 phone calls and multiple emails.
  - Very detailed written bid. ~$11.5K minus $5K in rebates and then 0% financing of remainder by utility

Heating & Cooling With Heat Pumps



- What is a heat pump?
  - Your refrigerator
  - Moves heat between from outside to inside to heat.
  - Reverse the direction for cooling
  - Used in Europe for many years

Further info:

Drafts:

https://climatefriendlylifestyle.substack.com/publish/post/141130495

https://climatefriendlylifestyle.substack.com/publish/post/141131342

NYT Wirecutter article on heat pumps: 2/15/2024

YouTube videos: https://www.youtube.com/@ElectrifyNowUSA

Why use heat pumps?

- SAFER – No burning of fuel!
  - No gas leaks
  - No carbon monoxide
  - No hot flue pipes
- MORE COMFORTABLE
  - Constant operation & temperature. Dehumidification.
- CLEANER & LESS POLLUTING
  - Your electricity is as clean as your grid
- MORE EFFICIENT & SOMETIMES LESS EXPENSIVE –
  - Cost savings for heat depends on relative price of gas and electricity
    - This is NOT electric resistance heating (COP of ~ 1)
    - Typically, COP of 2.5-4.5
  - Typically 2-3x less expensive than window/central AC.

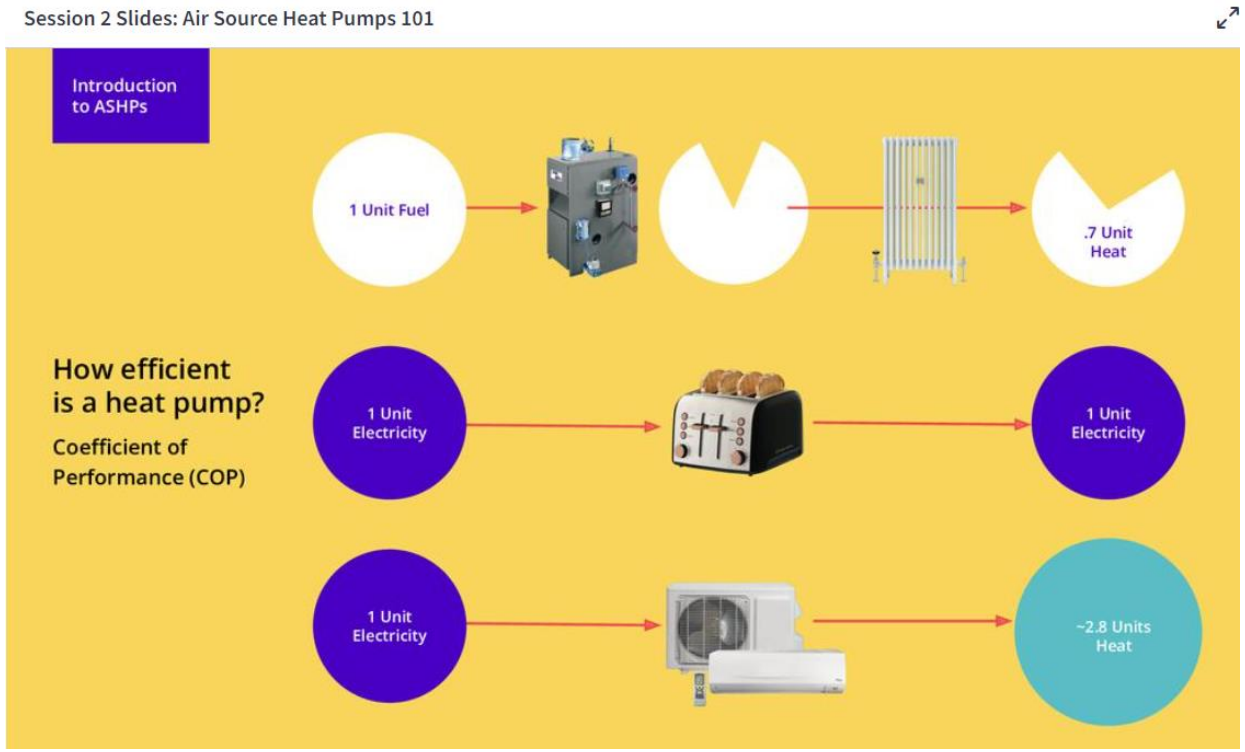
How can a heat pump be > 100% efficient?

- Efficiency (COP) => (units of heat out) / (units of fuel in)
- COP (coefficient of performance), which is often 2.5 to 4.5 for heat pumps

Other types of HVAC have to burn a fuel to produce the heat and THEN transfer it.

Because the fuel (electricity) is only used to transfer heat that it gets from the outdoors, not much energy is used.

BUT ~ Efficiency changes with outdoor temperature!



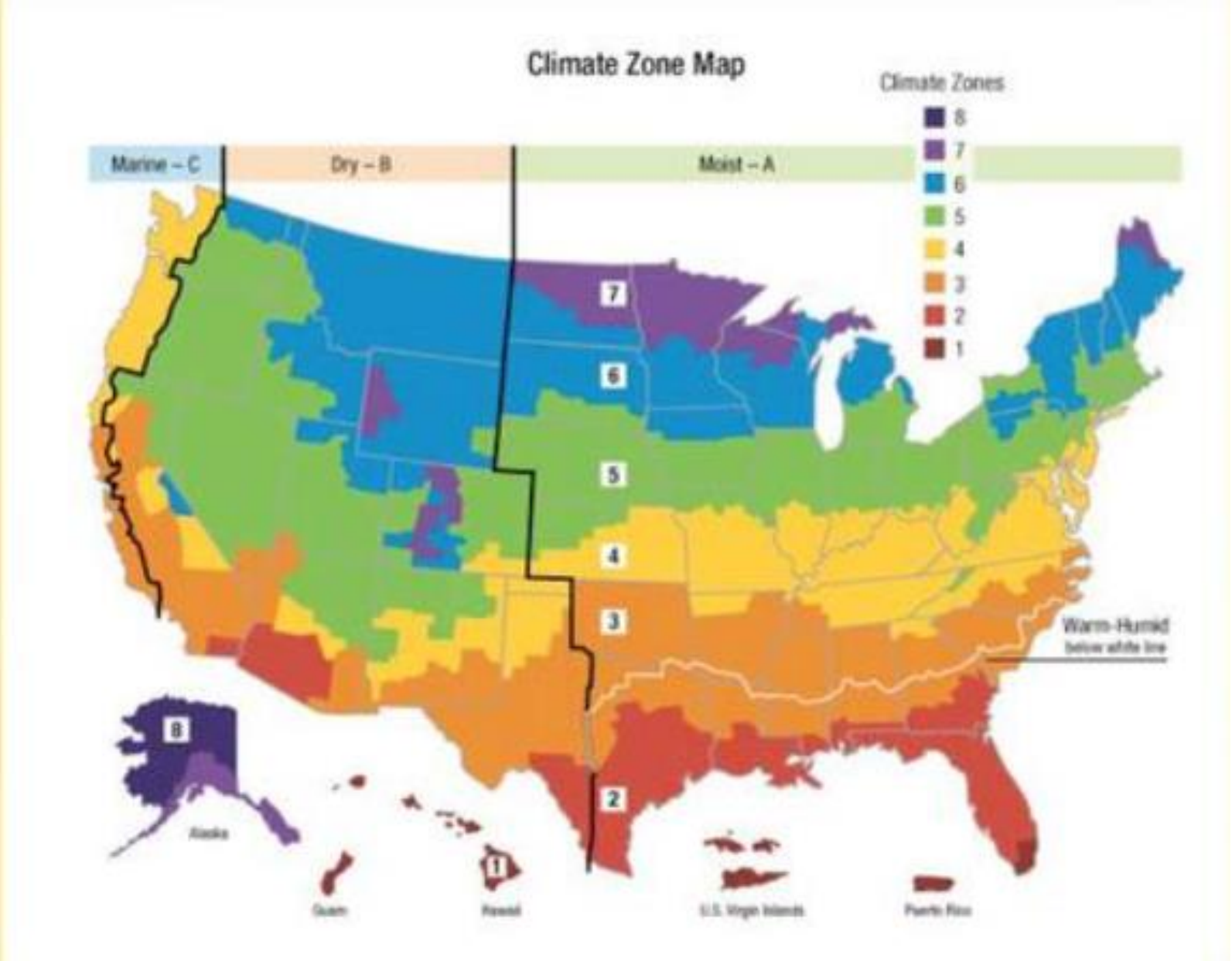
How is a homeowner's experience different with a heat pump than with a furnace?

- Analogy: Think about a casual walk around the block vs repeatedly sprinting for 100 yards and stopping. Both accomplish the same thing. But running/stopping uses more energy and causes fatigue.
- Heat pumps work at a very high efficiency (200-300%) when they are maintaining a temperature and operating at a fraction of top capacity
- Heat pumps are inefficient when they must work at top capacity, or out of the designed outdoor temperature range

Therefore:

- Maintain a constant temperature – don't raise/lower the thermostat
- Right-size your heating capacity. Over- or under-sizing creates on/off conditions. This is why energy audit/insulation/weatherstripping should be done FIRST.

Choose a heat pump carefully: Step 1 – Climate zone & design temperatures



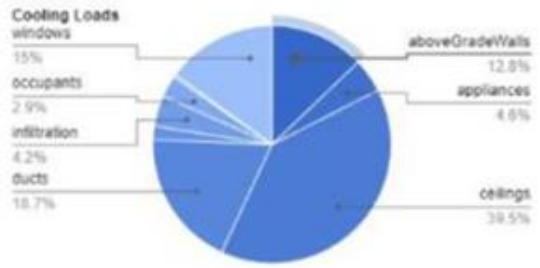
Heat pumps in cold climates

- Many have small ancillary heating unit – electric strip (resistance) or gas that may require 60A service
- There ARE also cold climate heat pumps that are tuned differently – determined by expected low temp
  - Larger outdoor units to collect more heat
  - May have ice reduction hardware
  - Tuned differently for heat extraction, so they don’t perform as well at high temperatures
- Northern NJ is Region 5 – May need cold climate heat pump

Choose a heat pump carefully:
Step 2 – Figure the heating/cooling load

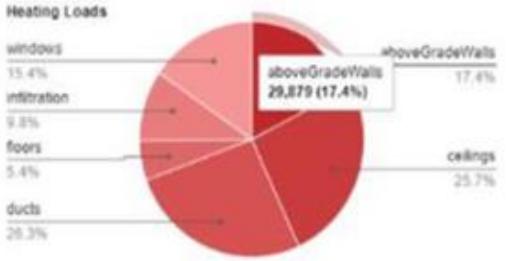
- From the Energy Audit above, the Contractor should have done a “Manual J” calculation of your home heating and cooling loads.

Cooling Loads			
Section	Area	Sensible	Latent
AEDExcursion	0	0	0
aboveGradeWalls	1,830.8	9,447	0
appliances	0	3,400	0
ceilings	1,583.9	29,080	0
ducts	0	11,210	2,567
floors	1,199.8	1,345	0
infiltration	0	1,135	1,964
occupants	0	1,150	1,000
plants	0	0	300
skylights	0	0	0
windows	432	11,046	0
Totals		67,813	5,831



HEATING AND COOLING LOADS

Heating Loads		
Section	Area	Heat Loss
aboveGradeWalls	1,830.8	29,879
ceilings	1,583.9	43,944
ducts	0	44,979
floors	1,199.8	9,309
infiltration	0	16,698
skylights	0	0
windows	432	26,438
Totals		171,246



Choose a heat pump carefully: Step 3 – Zones within home, type of heat pump

- Consult experienced contractor. Decides zones based on:
  - total volume of each area,
  - desirability of individual temperature control,
  - installation difficulties and expense,
  - location of outdoor units and ductwork, and
  - Internal flow of air.
- Some homes may present difficulties: hydronics (radiators/baseboards)

Session 1 Slides: Building science & mechanical systems basics

Heat Pump Ready Home

Heat Pumps Rated Performance

Depending on your region, the same model heat pump will perform differently. We will talk much more about that in detail later. However, it is important to note that HSPF2 (heating season performance factor) is based on region 4. The rating represents what happens when you put 1 Watt of electricity into the system how many BTUs it puts out on average over the course of the heating season.

MITSUBISHI ELECTRIC Smart Multi
Central Air Conditioning Heat Pump (HP)
Multizone All Non-Ducted
AHRI Cert #: **207517158**
Outdoor Unit Model #: **MXZ-SM48NAMHZ**
Indoor Model #:
Maximum Heating Capacity (Btu/h) @5°F: **54,000**
Rated Heating Capacity (Btu/h) @47°F: **54,000**
Rated Cooling Capacity (Btu/h) @95°F: **48,000**

Basic View

Advanced Data - Sizing for Heating

Information Tables

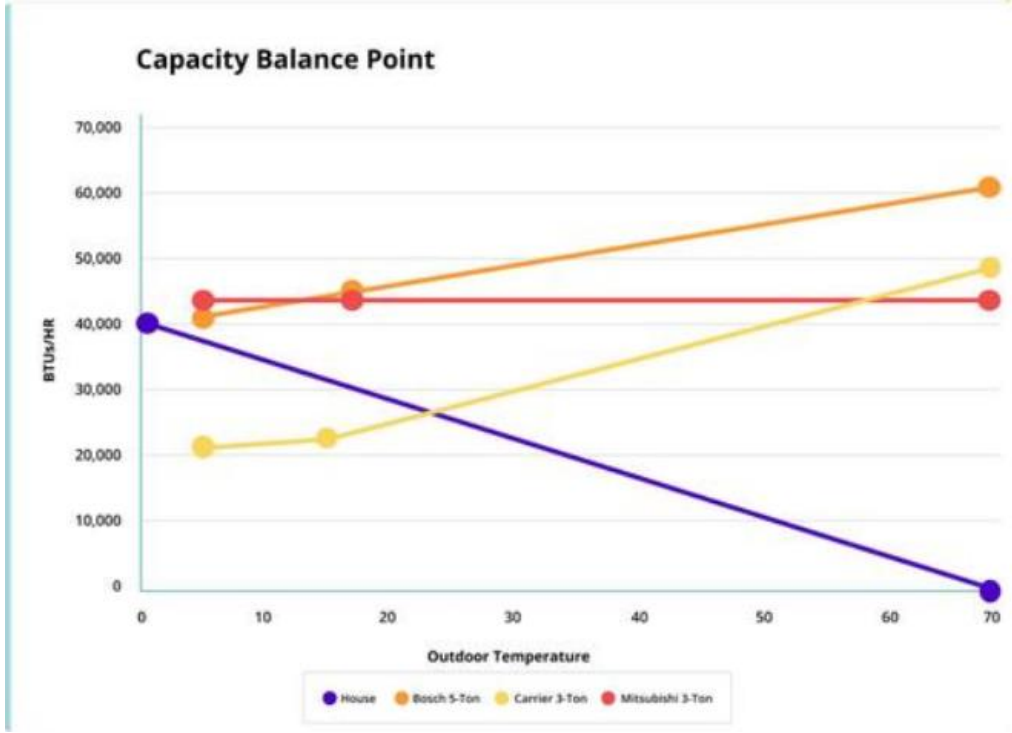
Brand	MITSUBISHI ELECTRIC
Series	Smart Multi
Ducting Configuration	Multizone All Non-Ducted
AHRI Certificate #	207517158
Outdoor Unit Model #	MXZ-SM48NAMHZ
Indoor Model #	
Indoor Unit Type	Non-Ducted Indoor Units
Furnace Model #	
EER	13.1
SEER	23
HSPF (Region IV)	12
EER2	13.1
SEER2	23
HSPF2 (Region IV)	11.5
HSPF2 (Region V)	
ENERGY STAR V6.1	✓

Performance Specs

Heating / Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Cooling	95°F	80°F	Btu/h	16,000	48,000	48,000
			kW	1.3	3.67	3.67
			COP	3.61	3.83	3.83
Cooling	82°F	80°F	Btu/h	12,678	-	48,000
			kW	0.75	-	3.46
			COP	4.95	-	4.07
Heating	47°F	70°F	Btu/h	27,000	54,000	54,000
			kW	1.4	3.96	3.96
			COP	5.65	4	4
Heating	17°F	70°F	Btu/h	11,000	39,000	54,000
			kW	0.92	4.23	6.33
			COP	3.5	2.7	2.5
Heating	5°F	70°F	Btu/h	8,025	-	54,000
			kW	0.73	-	7.92
			COP	3.22	-	2
Heating	-13°F	70°F	Btu/h	3,259	-	42,632
			kW	0.35	-	5.91
			COP	2.73	-	2.11

Choose a heat pump carefully
Step 4 – Pick a model

Must be able to handle your heating and cooling loads at ALL expected temperatures. Use of ancillary heating can be expensive.



Session 2 Slides: Air Source Heat Pumps 101

LG Multi F Max LGRED
Central Air Conditioning Heat Pump (HP)
Multizone All Non-Ducted
AHRI Cert #: **10445376**
Outdoor Unit Model #: **LMU300HHV**

EER	12.5
SEER	20
HSPF (Region IV)	11

Heating/ Cooling	Outdoor Dry bulb	Indoor Dry bulb	Unit	Min	Rated	Max
Cooling	95°F	80°F	Btu/h kW COP	8,400 2.61 0.94	28,400 2.14 3.45	34,080 3.18 3.14
Cooling	82°F	80°F	Btu/h kW COP	9,053 0.85 3.12	- - -	36,731 2.85 3.78
Heating	47°F	70°F	Btu/h kW COP	10,248 1.3 2.31	28,600 2.33 3.6	34,200 3.26 3.07
Heating	17°F	70°F	Btu/h kW COP	7,500 1.08 2.04	18,900 1.98 2.8	31,600 3.69 2.51
Heating	5°F	70°F	Btu/h kW COP	6,262 0.97 1.89	- - -	28,600 3.88 2.16

DAIKIN
Central Air Conditioning Heat Pump (HP)
Multizone All Non-Ducted
AHRI Cert #: **202521824**
Outdoor Unit Model #: **4MXL36TVJU**

EER	12.5
SEER	21.7
HSPF (Region IV)	11.2

Heating/ Cooling	Outdoor Dry bulb	Indoor Dry bulb	Unit	Min	Rated	Max
Cooling	95°F	80°F	Btu/h kW COP	8,600 0.6 4.05	34,400 2.75 3.67	40,500 3.91 3.04
Cooling	82°F	80°F	Btu/h kW COP	8,880 0.55 4.73	38,000 2.53 4.4	43,330 3.6 3.53
Heating	47°F	70°F	Btu/h kW COP	6,600 0.26 7.44	36,600 2.52 4.26	54,500 5.45 2.93
Heating	17°F	70°F	Btu/h kW COP	5,080 0.26 5.73	22,400 2.36 2.78	41,960 5.4 2.28
Heating	5°F	70°F	Btu/h kW COP	4,420 0.25 5.18	- - -	36,600 5.36 2

Choose a heat pump carefully
Step 5 – Evaluate operating cost

Operating Cost depends on relative price of gas and electricity in your region. Heat pumps MAY or MAY NOT be cheaper.

Rates shown are for Massachusetts for 60mmBTU/yr home

Your cost for this home:

For electricity:

Multiply Annual Cost by (your cost for kWh)/0.28

For gas:

Multiply Annual Cost by (your cost for 1 therm/1.80)

In NJ, my cost:

For electricity: Multiply by 0.19/0.28 = $1193

For gas: Multiply by 0.92/1.80 = $613

Heat Pump Ready Home

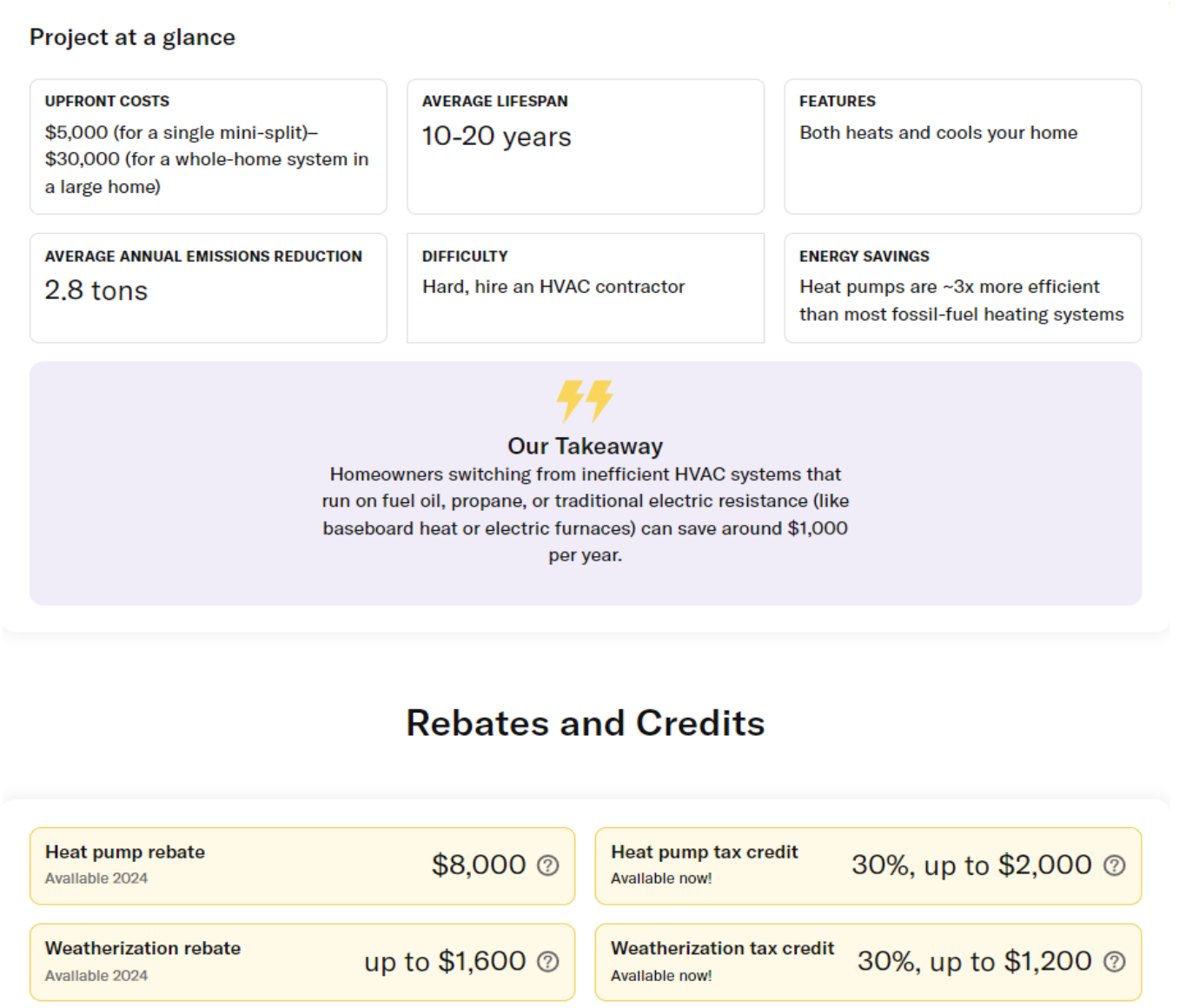
A home needs 60mmBTUs/yr (mm= 1 million) what is the cost for heating with each energy source?

Energy Source	BTUs/unit	Unit	$/unit	Efficiency	Annual Cost
Propane	92,0000	Gallon	$4.25	.90	$3,079.71
Natural Gas	100,000	Therm	$1.80	.90	$1200
Home Heating Oil	138,500	Gallon	$5.75	.87	$2,863.19
Electricity (Resistance)	3,412	kWh	$.28	1.0	$4,923.80
Electricity (ASHP)	3,412	kWh	$.28	2.8	$1,758.50
Electricity (GSHP)	3,412	kWh	$.28	4.5	$1,094.18

Choose a heat pump carefully
Step 5 – Evaluate installation cost

From Rewiring America:
https://homes.rewiringamerica.org/projects/heating-and-cooling-homeowner

Utilities may offer 0% loan for 84 months or more



Domestic Hot Water Heaters – Fossil Fuel Types

- Electric water heater (condensing or non-condensing)

Vs

- Tankless electric water heater
  - Heats water on demand
  - Sized by expected simultaneous use of hot water

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Fossil Options

Standalone Storage Tank

- Cheap to install
- Often easy to replace/install
- Low efficiency due to high standby loss
- Potential major source of carbon monoxide
- Limited total capacity

Condensing Storage Tank

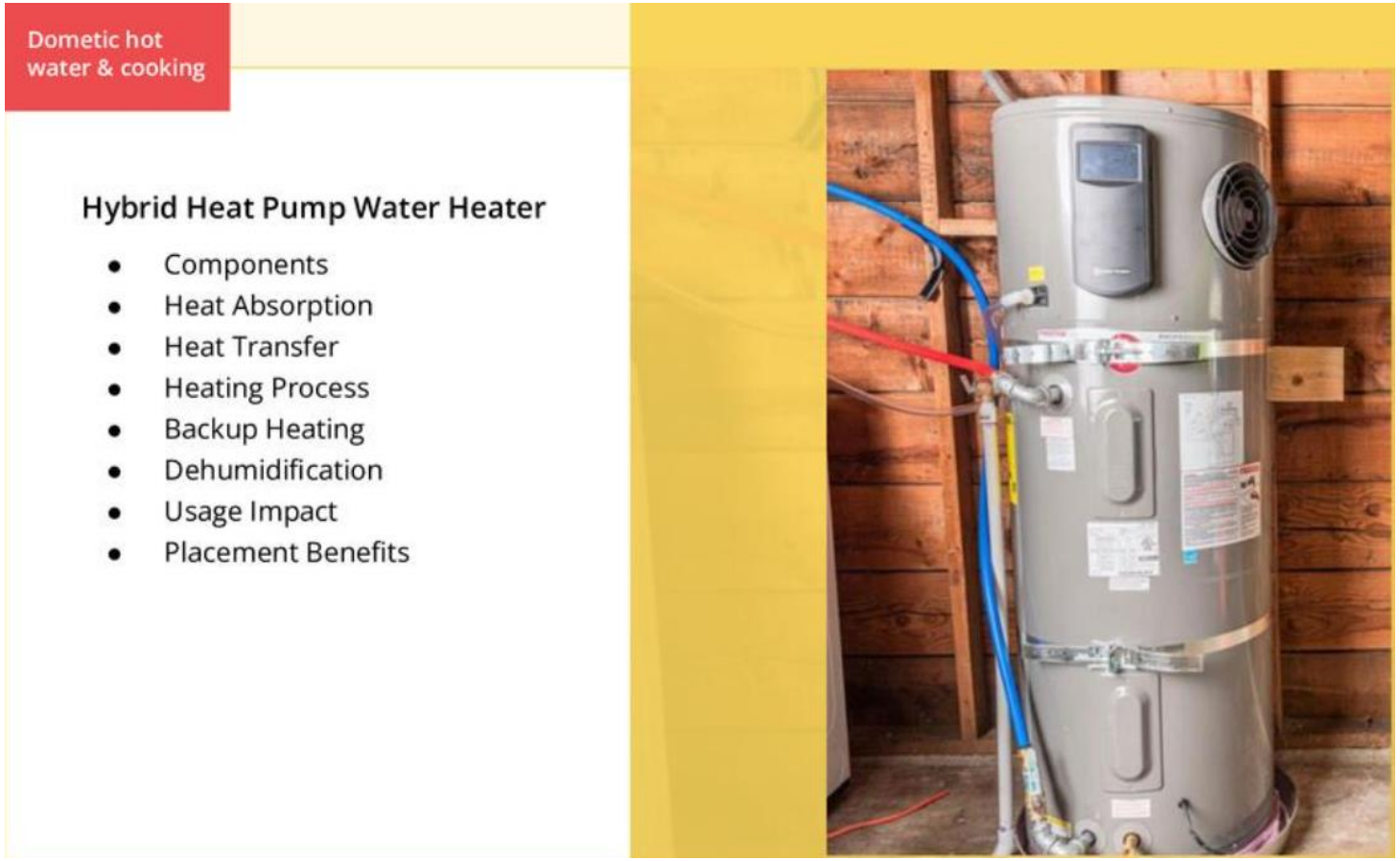
- 30% more efficient than standard tank
- Much Safer
- Some standby efficiency losses
- Limited total capacity
- Needs gas or propane

On-Demand Water Heater

- Most efficient fossil fuel-based option
- Sealed combustion is much safer than atmospherically vented systems Infinite water if the appliance is below the minimum gallons/minute
  - Gallons per minute dependent on inlet water temp
  - Premium to install (enlarge gas lines, side wall venting, rerouting plumbing

Heat Pump Water Heaters

- https://homes.rewiringamerica.org/projects/heat-pump-water-heater-homeowner
- 3-4x more efficient, dehumidifies and cools the space around them
- More even temperature throughout home



Further info:
(Draft)
https://climatefriendlylifestyle.substack.com/publish/post/141131662
YouTube: https://www.youtube.com/@ElectrifyNowUSA

HPHW Installation Considerations

- Requires air space to draw from and outputs cool dry air
- 110V heat pump water heater now available in some parts of the US.
- More work for your furnace/heat pump if not ducted outside

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Considerations

Venting

→ Can either be balanced, pressurize, or depressurize a space

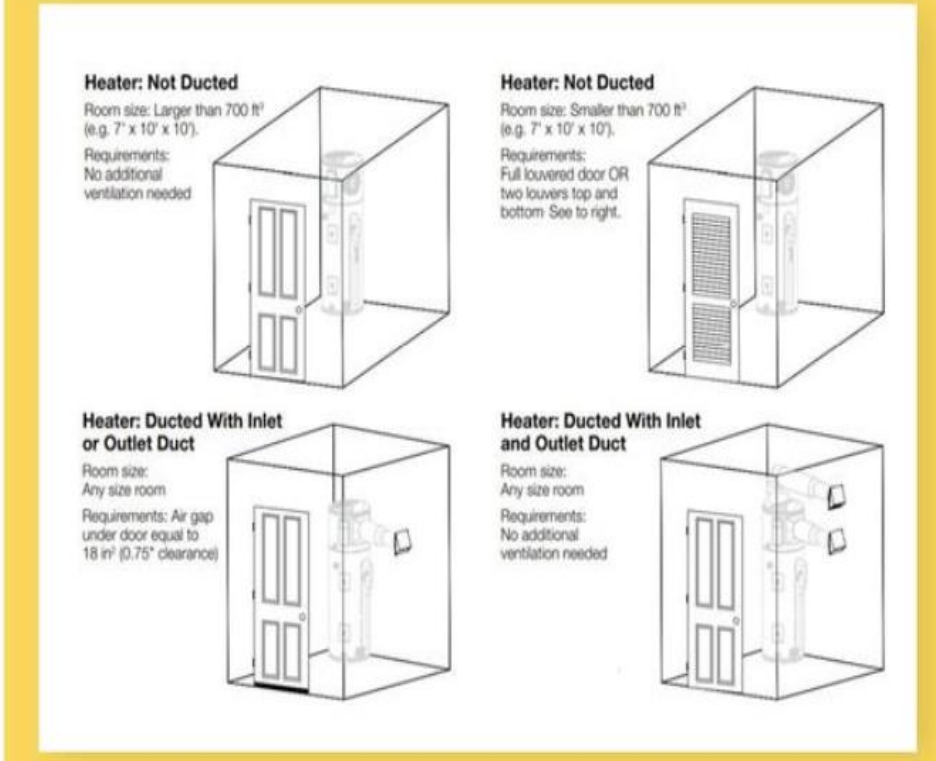
→ The output of the water heater is cool dry air

→ May need venting if in a utility closet

→ 750cubic feet is typically required

Electrical

→ Nearly all hybrid HPHW need a dedicated 30AMP 2-pole breaker. This is roughly the same requirement of any electric dryer or oven.



Operating Cost

- UEF (Uniform Energy Factor) is 2.2 to 3.5+ for HPWH, and about 0.6 to 0.95 for fossil-fueled types

efficiencymaine.com/at-home/water-heating-cost-comparison/

Compare Water Heating Costs

This calculator shows the approximate costs of heating water for a typical family. Gallons-per-day, temperature rise, cost-per-unit, and energy factor values are all adjustable.

To use a different fuel costs and/or energy factor, type the new values into the fields and then click "Calculate" below.

Gal/Day: 50 **Temperature Rise °F:** 70

	Energy Unit	Cost/Unit	Energy Factor	Annual Cost	10-yr Cost
Heat pump water heater	kWh	$ 0.10	3.5	$89	$891
Natural gas instantaneous	therm	$ 0.92	0.95	$103	$1,030
Natural gas storage tank	therm	$ 0.92	0.67	$146	$1,461

The Energy Guide labels are misleading when they compare gas and electric water heaters because they assume a specific price for kWh of electricity and a specific price for therms of gas. Instead, read the label and use your own price.

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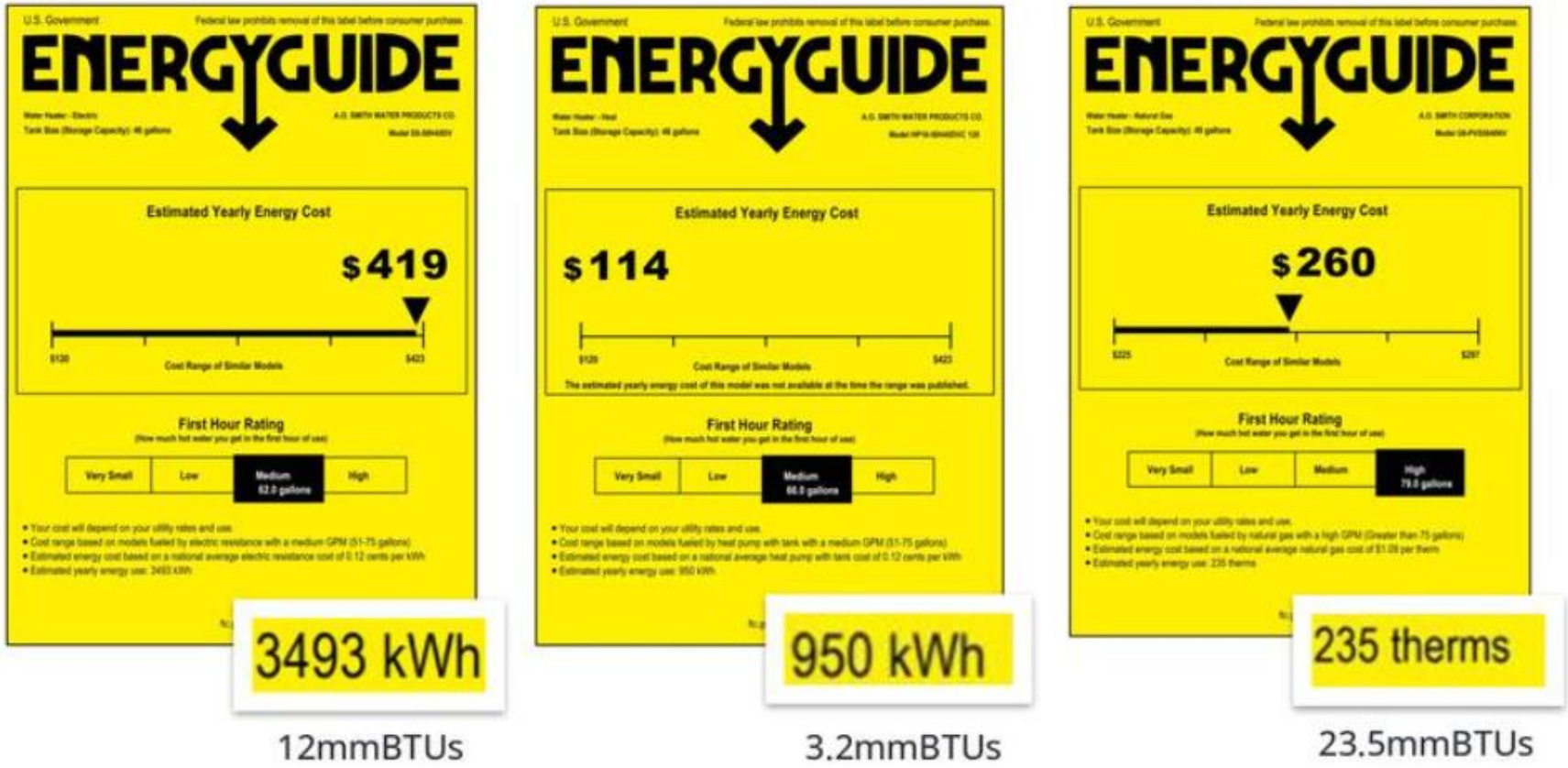
on-site energy should matter



Installation Cost

- Heat pump water heaters have as much impact on your energy savings and emissions as heating and cooling, while being cheaper to implement.
- Great bang for the buck!

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Incentives + tax credits

Take advantage of 25C annually to maximize the tax benefit.

Year 1:
Ductless Mini Split

Year 2:
HPWH

Year 3:
Slim Duct upstairs bedrooms.

Upfront Discount

Save up to $1,750
Depending on income

For low-income households (under 80 percent of Area Median Income), HEEHRA covers 100 percent of your HPWH costs up to $1,750. For moderate-income households (between 80 percent and 150 percent of Area Median Income), HEEHRA covers 50 percent of your HPWH costs up to $1,750.

Total HEEHRA discounts across all qualified electrification projects are capped at $14,000.

Tax Credit

$2,000
Depending on income

25C provides households a 30 percent tax credit for heat pumps and heat pump water heaters, capped at $2,000 per year. The credit resets each tax year, effectively becoming available again for additional projects.

25C also includes a 30 percent tax credit up to $600 for an electrical panel upgrade, but only if it's upgraded in conjunction with another upgrade covered by 25C (like a heat pump water heater). So it might be advantageous to do both at once!

Cooking with Induction: No more slaving over a hot stove!

- Induction ranges
  - SAFER:
    - Air quality/asthma: 42% higher chance of asthma in children with gas stoves vs. electric. Worse when ACH is tightened. Run the hood. NOx levels may exceed those that the EPA forbids outdoors.
    - No flame/no burns/no gas leaks
    - No waste heat!
  - Quick, controllable, even heating
  - Preferred by professional chefs
  - TRY A PORTABLE UNIT!
- Remember Microwave Ovens introduction – now no one heats food in a pan on the stove anymore!
- Other electric appliances: microwaves, air fryers, rice cookers, toaster ovens, coffee makers, etc.

Further info:

https://climatefriendlylifestyle.substack.com/p/induction-cooktops

YouTube video playlist: https://www.youtube.com/@ElectrifyNowUSA

Energy Storage & Generation

- Solar panels (PV – photo voltaic) on home
  - Batteries can also be installed for power grid independence, but may double the cost of installation
  - (New!) EV batteries may sometimes be used to power the home
  - You still pay for grid connectivity (~$6/mo in NJ), sell your generated power back to the utility during the day, and buy power during the night
  - My home generated enough power to cover all of our power usage and we were paid at the end of the year for the excess power

  Further info:

  https://climatefriendlylifestyle.substack.com/p/choosing-solar-panels

  https://climatefriendlylifestyle.substack.com/p/living-with-solar-panels
- Community Solar
  - Someone else installs the solar panels (warehouses, office buildings), you lease them, and get the power they generate – win/win
  - However, the state must approve the installations and they must be in your local area

  Further info: https://climatefriendlylifestyle.substack.com/p/community-solar

Appliances

- Energy Star (energystar.gov)
  - Refrigeration is 18-20% of your energy budget
  - Dryers:
    - Electric dryer

    vs

    - Heat pump dryer: Doesn't require ventilation, gentler on clothes, more efficient
      - https://homes.rewiringamerica.org/projects/electric-clothes-dryer-homeowner
- Replace all your incandescent lightbulbs with LEDs

Alternatives to Upgrading Your Electric Panel

“The Watt Diet calculator”

- Shares some appliances that aren’t needed at the same time
- Advice on careful acquisition and management of appliances
- https://www.redwoodenergy.net/watt-diet-calculator

General advice on retrofitting your single family home, with specific model recommendations

- https://www.redwoodenergy.net/research/a-pocket-guide-to-all-electric-retrofits-of-single-family-homes

Find & hire contractors

- Rewiring America is working on identifying contractors
  - Their guide: https://a-us.storyblok.com/f/1014573/x/a2935fa088/hvac_contractor_guide.pdf
- Electrify Now FB site and the HVAC2.0 company
- Your utility may recommend contractors:
  - Make sure it is NOT simply a list of contractors who signed up
- Contractors should be BPI-certified
- Check local reviews on Google/Angi. Make sure there are many reviews. Ask for local references
- My own opinion/prejudice: look for independent contractors, not those who have been bought up and merged into a larger entity, who are more focused on sales dollars than maintaining a long term relationship with repeat business and referrals. Ask your HVAC contractor to recommend other types of contractors.

Transportation

EVs: Fully electric, Plug-in hybrid, Hybrid

Personal transportation: Ebikes and Escooters

Further info:

https://climatefriendlylifestyle.substack.com/p/living-with-an-electric-vehicle-ev

https://climatefriendlylifestyle.substack.com/p/financial-incentives-for-
https://climatefriendlylifestyle.substack.com/p/evs-on-two-wheels-e-bikes

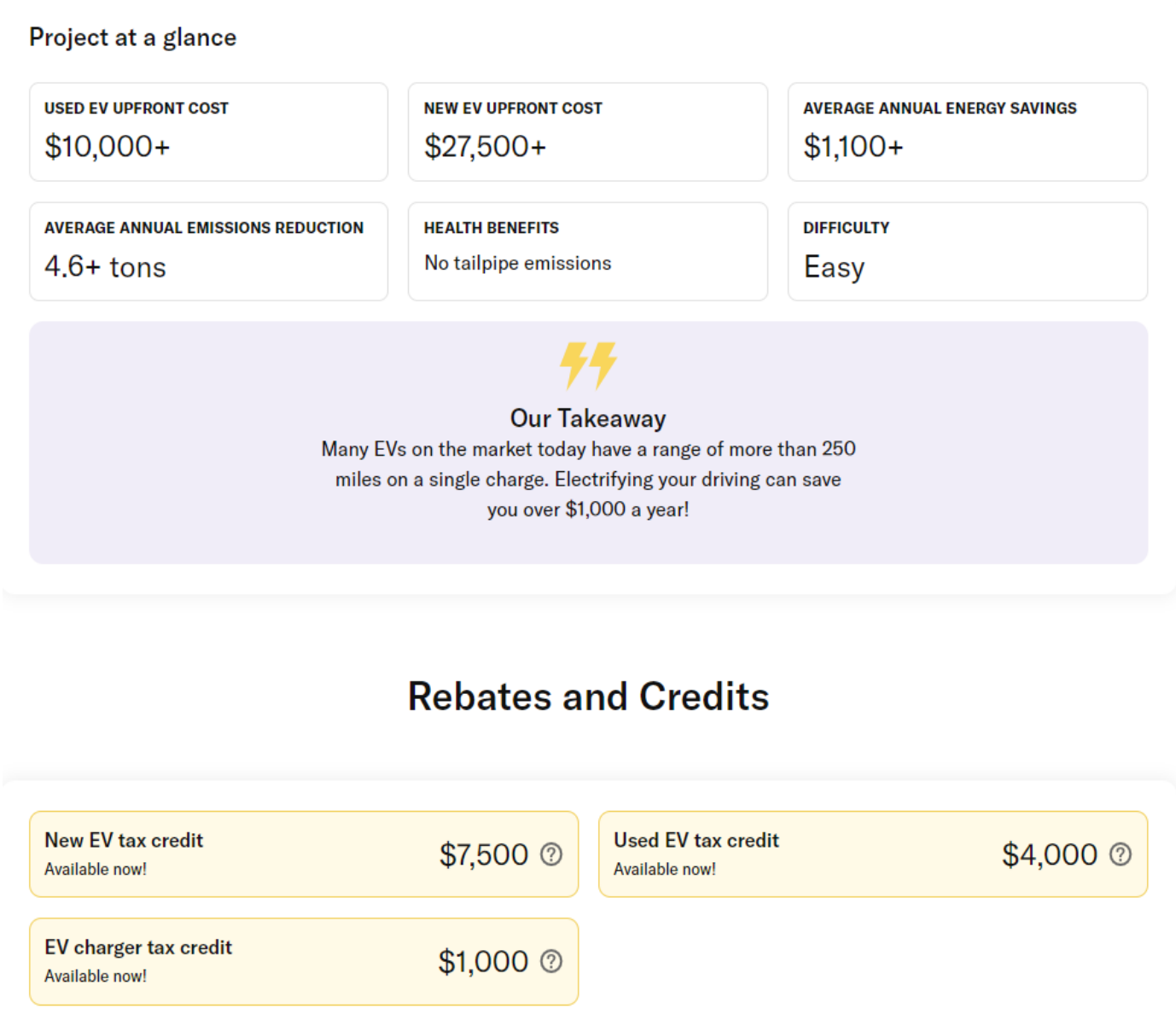
https://climatefriendlylifestyle.substack.com/p/evs-on-2-wheels-e-scooters

PLAN ALL ELECTRIC PANEL UPGRADES TO INCLUDE EVs

- Avoid upgrading panel twice
- Alternatively, power sharing with a “switch box” is sometimes feasible
  - E.g. electric dryer shares with EV charging. Charging stops when dryer is running.

Financing EVs

- From Rewiring America: https://homes.rewiringamerica.org/projects/driving-homeowner



Lawn & Garden

- Replace ALL 2-cycle engines: mower, leaf blower, trimmer
  - Incredibly dirty: 1 hr operation ~ 1500 miles in car
  - BEST ACTION YOU CAN TAKE FOR THE MONEY
- Plant shade trees to reduce solar gain

For further info:
https://climatefriendlylifestyle.substack.com/p/electric-lawn-mowers-etc