Post-IRA Economics of Home and Vehicle Decarbonization:

How the Greenhouse Gas Reduction Fund Can Fill the Financing Gap

March 5, 2024

2:00 P.M. ET

RMI thanks JP Morgan Chase for the funding that enables this event

Agenda

Greenhouse Gas Reduction Fund Overview

Green Upgrade Calculator

Residential Solar PV

Single Family Home Electrification

Personal Electric Vehicle

Closing Remarks from JCF

Q&A

1

GGRF is the single largest IRA investment in low income and disadvantaged communities

National Clean Investment Fund (NCIF)

$14B Fund for Direct Investment in Qualified Projects

EPA will grant:	Funding will serve:	Funding Uses:	Possible Financial Products:	Project Examples:
• 2-3 national nonprofit hubs to create national clean financing institutions	• At least 40% low income and disadvantaged communities	• Direct investment in qualified projects (financial assistance) • Predevelopment & market-building activities	• Debt • Equity • Hybrids • Credit enhancements	• Rooftop solar, solar-plus-storage, fuel cells • Building retrofits and electrification • New construction of net-zero buildings • EV charging infrastructure • Transit-oriented development

Clean Communities Investment Accelerator (CCIA)

$6B Community-Focused Fund

EPA will grant:	Funding will serve:	Funding Uses:	Possible Financial Products:	Project Examples:
• 2-7 hub non-profits	• 100% low income and disadvantaged communities	• Provide funding and technical assistance to a national network of community lenders to finance priority, qualified clean energy projects	• Grantees pass-through 80-90% of awards to community lenders as subsidies or subgrants	• Same as NCIF

Solar for All

$7B Solar Fund

EPA will grant:	Funding will serve:	Funding Uses:	Possible Financial Support:	Project Examples:
• Up to 60 states, Tribal and municipal governments, and eligible non-profit entities	• 100% low income and disadvantaged communities	• Expand existing or create new low-income solar programs • Fund new workforce training programs • Technical assistance for project deployment	• Subsidies, rebates, and subsidies • Debt • Equity • Hybrids • Credit enhancements	• Residential serving community solar • Rooftop solar paired with heat pump and EE

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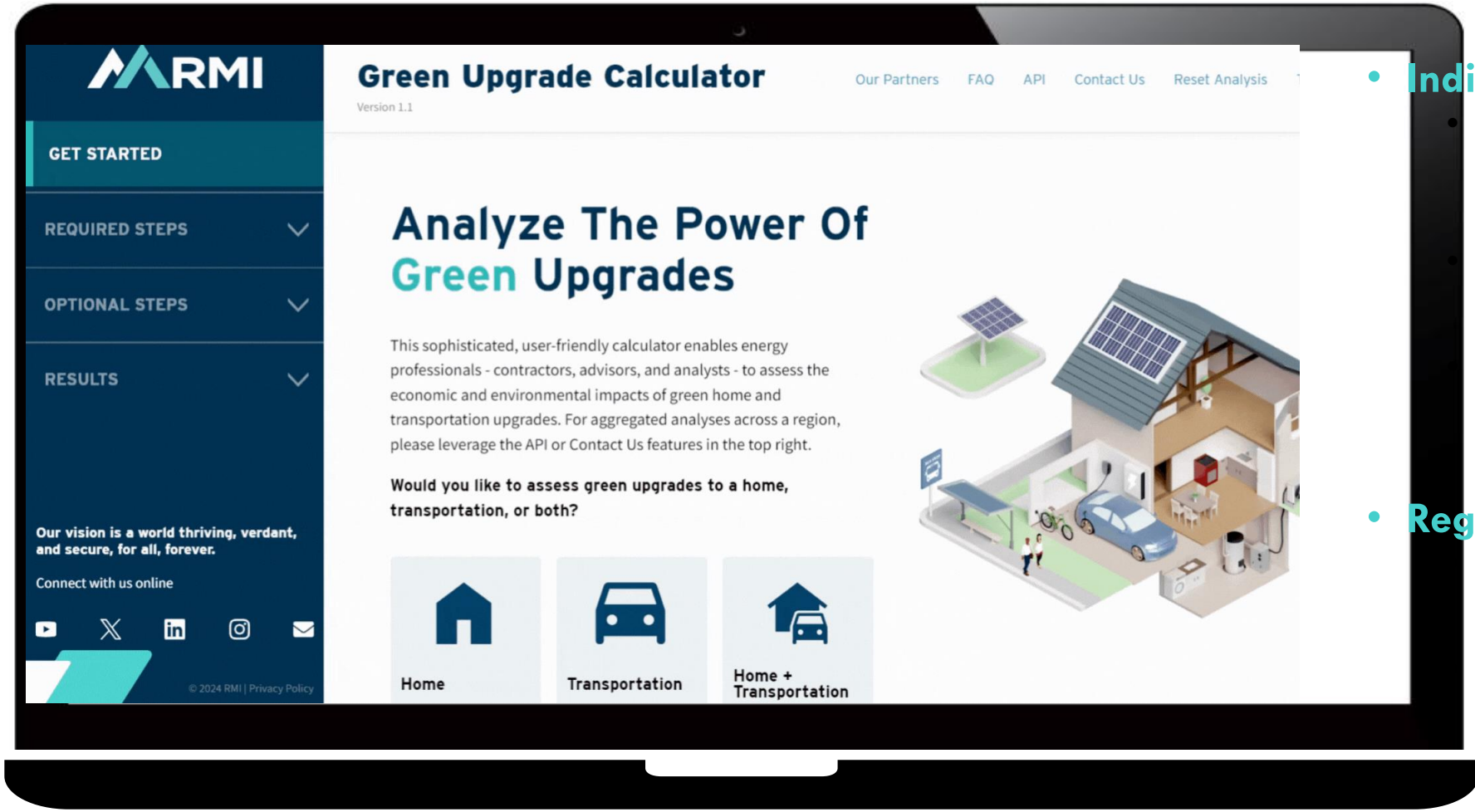
- Greenhouse Gas Reduction Fund Overview
- **Green Upgrade Calculator**
- Residential Solar PV
- Single Family Home Electrification
- Personal Electric Vehicle
- Closing Remarks from JCF
- Q&A

Sneak preview of the Green Upgrade Calculator: A free, sophisticated online tool for energy professionals to assess the economic and climate impacts of residential upgrades



- **Individual Home Analyses**
  - *Financial Institutions* can project lifetime cost impacts of different financing terms on various upgrades
  - *Contractors* can modify system design specifications and project bill impacts for customers
  - *Home Advisors* can compare the lifetime cost and climate impacts of different quotes for homeowners
- **Regional Analyses**
  - *Policy advisors* can analyze impacts of a proposed policy on residents
  - *Energy analysts* can map the cost and climate impacts of different upgrades, as done for this presentation!

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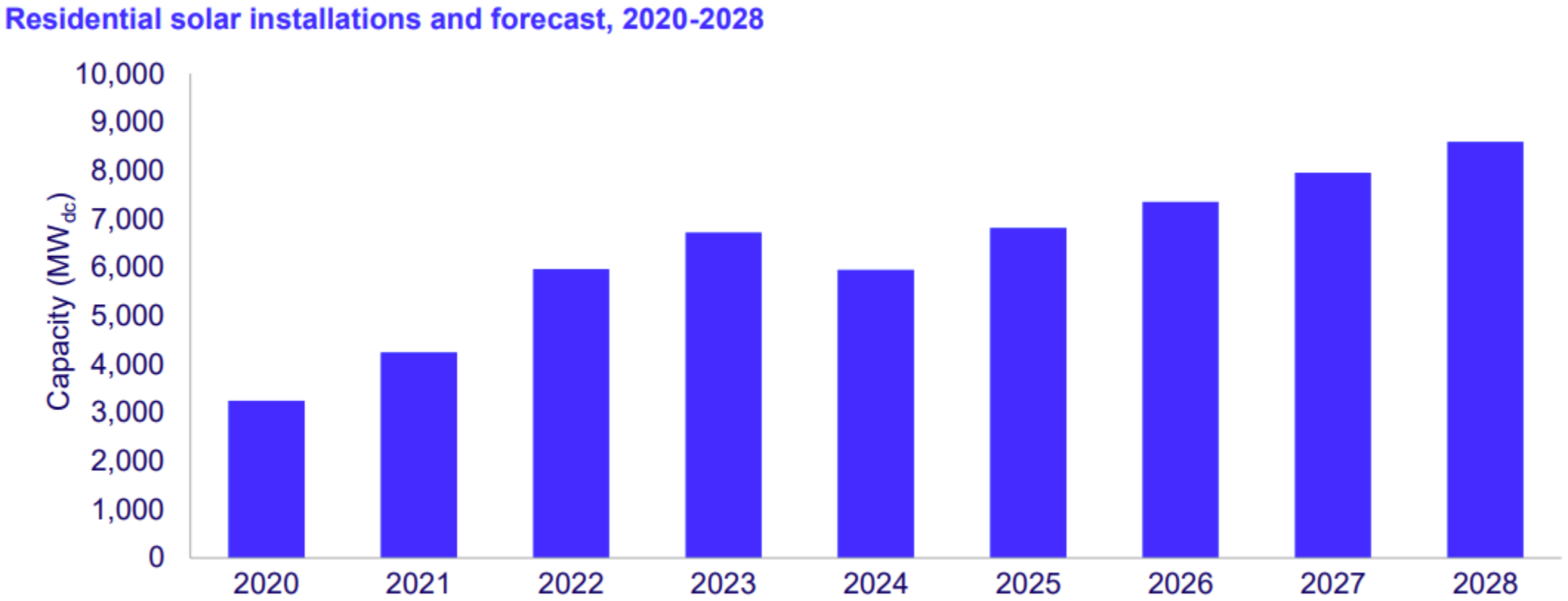
Residential solar currently has an over $18B market size and could double by 2030



Source: Wood Mackenzie

Rooftop solar upfront costs are highly dependent on the system size, market maturity, and tax liability

Residential Rooftop Solar			
	Typical	**Typical Range**	**Depending on…**
Size	7 kW	4-10 kW	roof size, home electric usage, NEM
Relative Upfront Cost	$2.85/Watt	$2.40/Watt-$3.50/Watt	system size, market, contractor
Upfront Cost	$20,000	$15,000-$25,000	
Federal Tax Credit	$6,000 (30%)	$0-$7,500	tax liability and upfront cost
Upfront Cost Post Incentives	$14,000	$10,000-$25,000	

The IRA made residential and commercial ITC very different incentives

Residential ITC (25D)

- 30% ITC
- Roofing materials are not covered, storage included
- Non-refundable, nontransferable
- No dollar limit

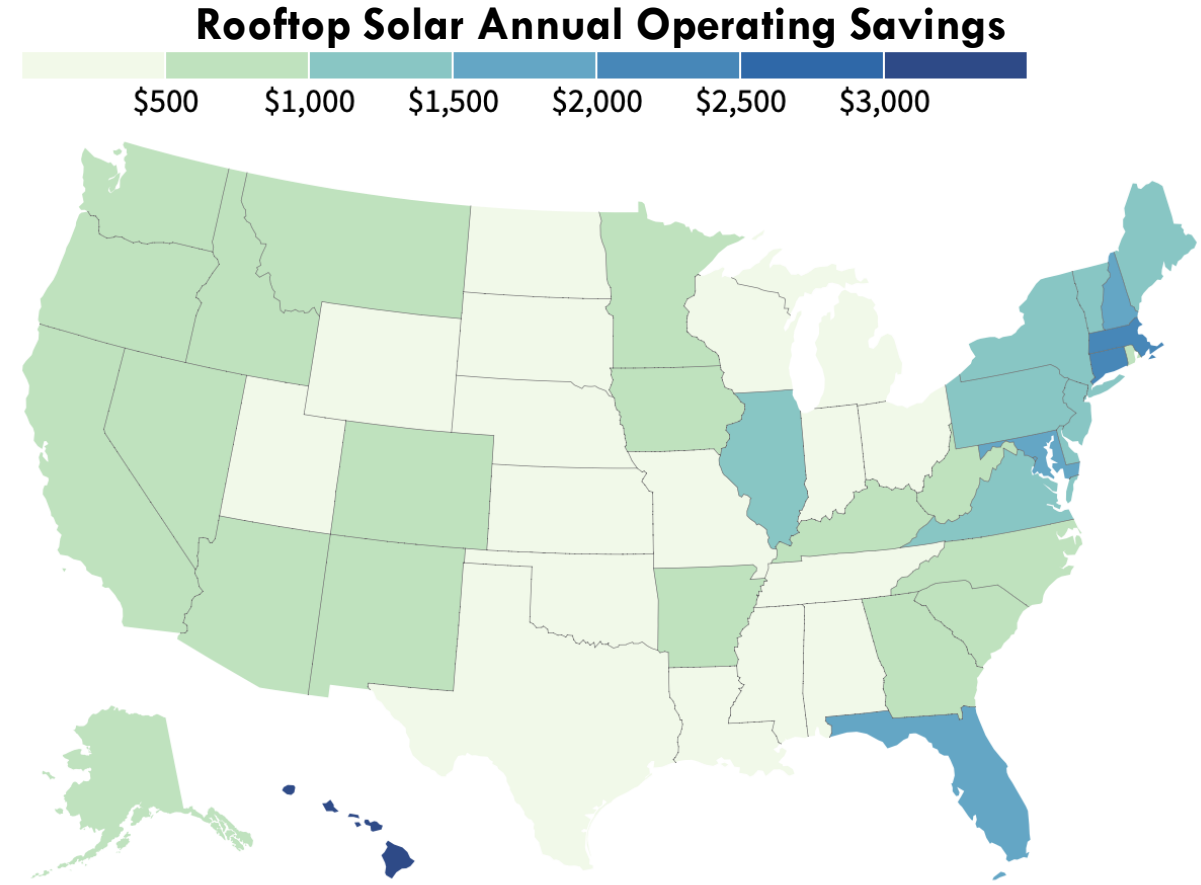
Commercial ITC (48)

- 30-70% ITC
- Roofing materials are not covered, storage included
- Direct pay/transferrable
- No dollar limit

Solar for All

Depends on state/city/tribal program design

Rooftop solar operating savings are highly dependent on system size, solar resource, electricity rates, and policy

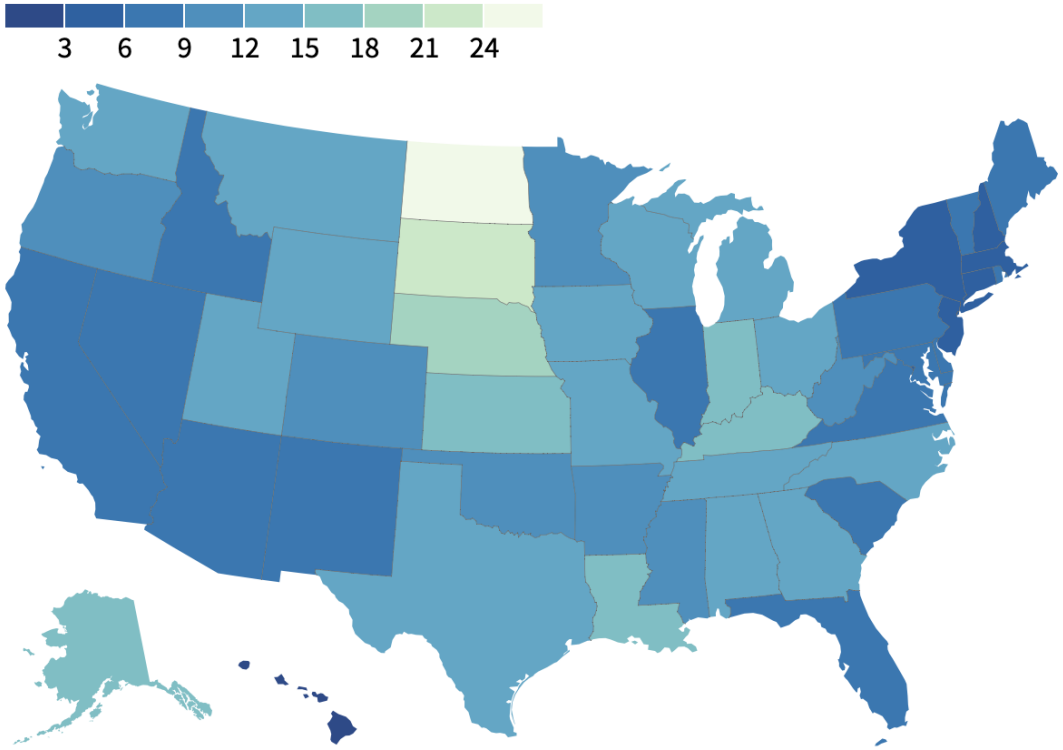


Source: RMI Green Upgrade Calculator

Model assumptions: See all assumptions at greenup.rmi.org.
Analysis assumptions: Applied model results for individual homes to each state's single-family home building inventory

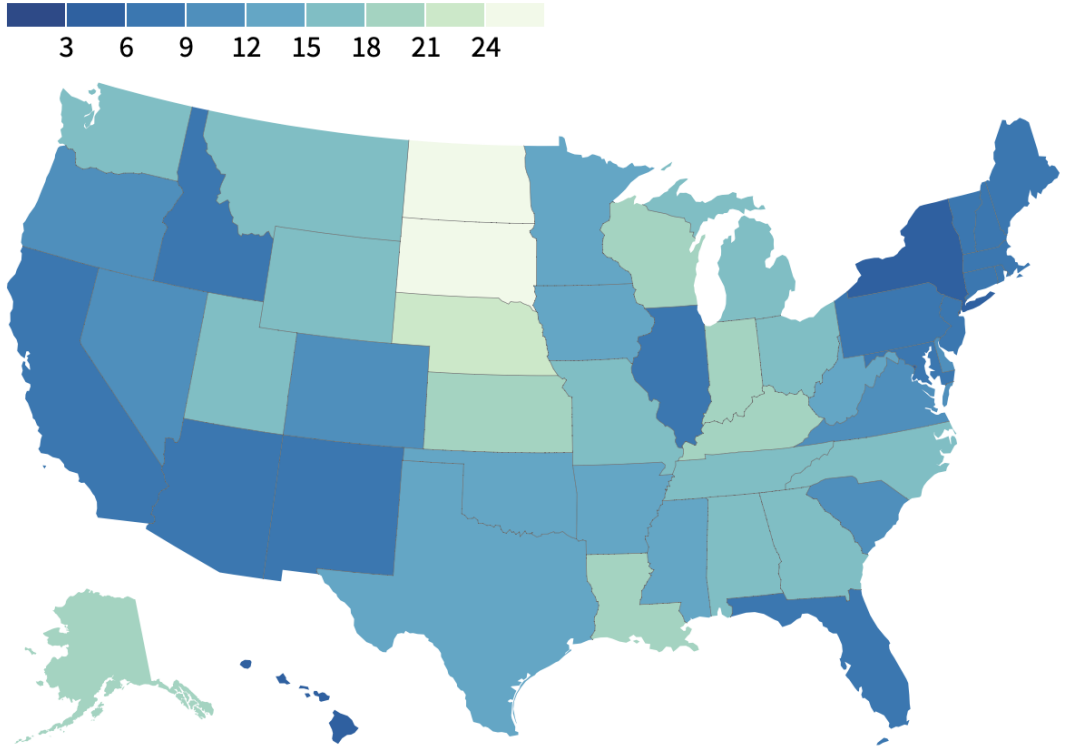
Rooftop solar payback is highly dependent on market prices, 25C tax credit, and operating savings

Rooftop Solar Payback (Years) with 25C
42 states have payback less than 15 years.



Source: RMI Green Upgrade Calculator

Rooftop Solar Payback (Years) without 25C
30 states have payback less than 15 years.



Source: RMI Green Upgrade Calculator

Model assumptions: See all assumptions at greenup.rmi.org.
Analysis assumptions: Applied model results for individual homes to each state's single-family home building inventory

Low-income communities have not proportionally benefited from solar

High upfront costs

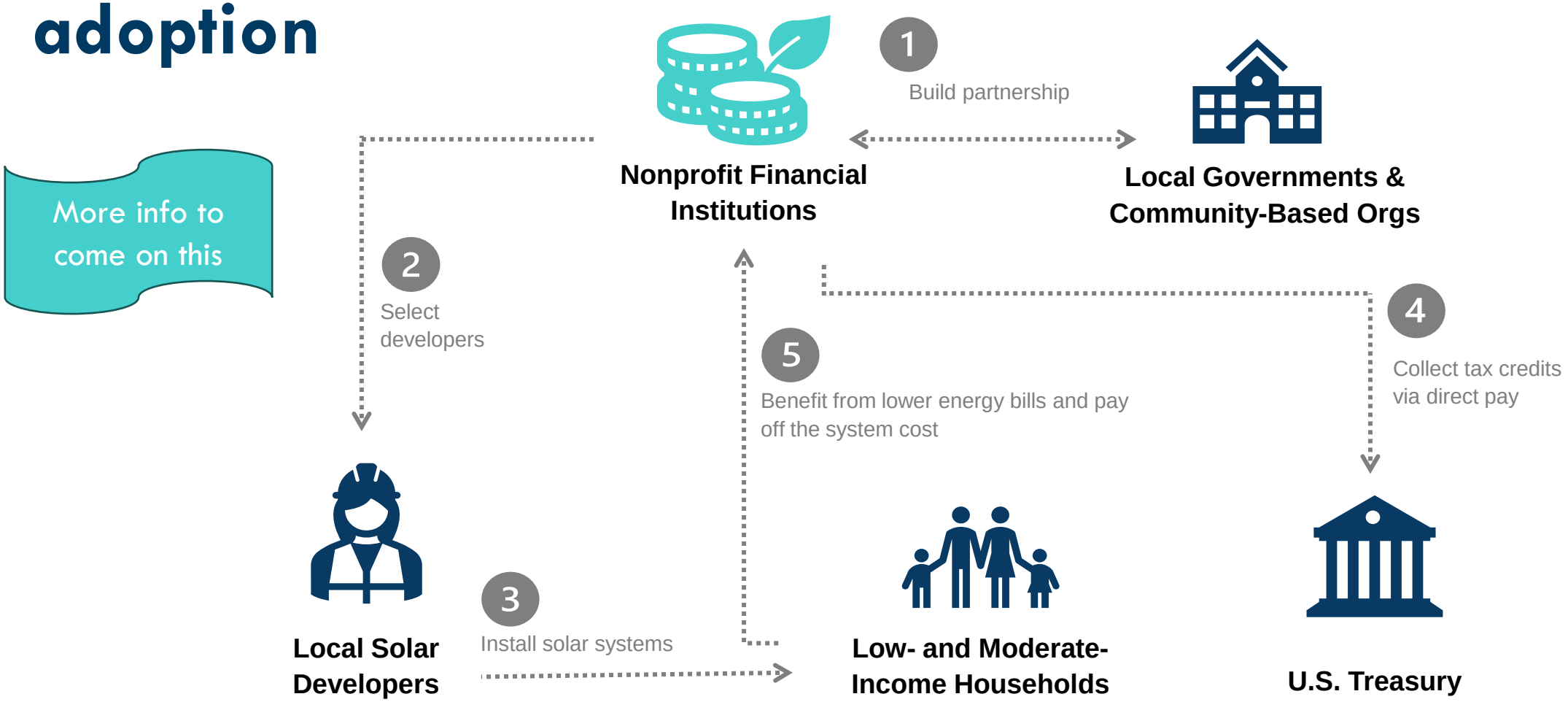
- Upfront costs can be even higher when enabling upgrades are needed, such as roof repairs or electric panel upgrades.

Variable income stream

- Solar energy production varies month to month resulting in an uneven income stream

Tax credit monetization challenges.

Direct pay offers a new mechanism for nonprofit financial institutions to accelerate low-income solar adoption



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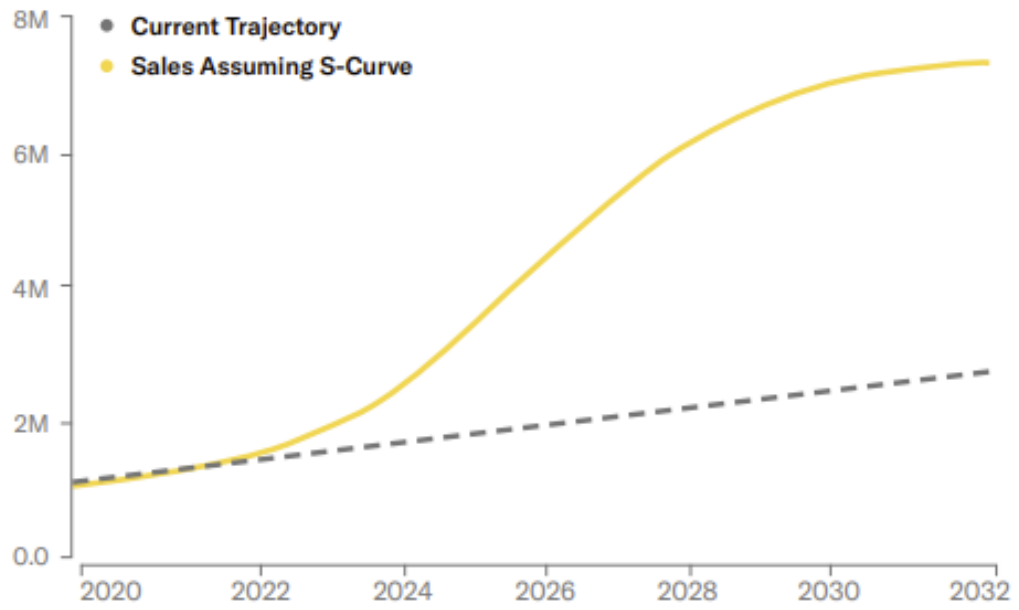
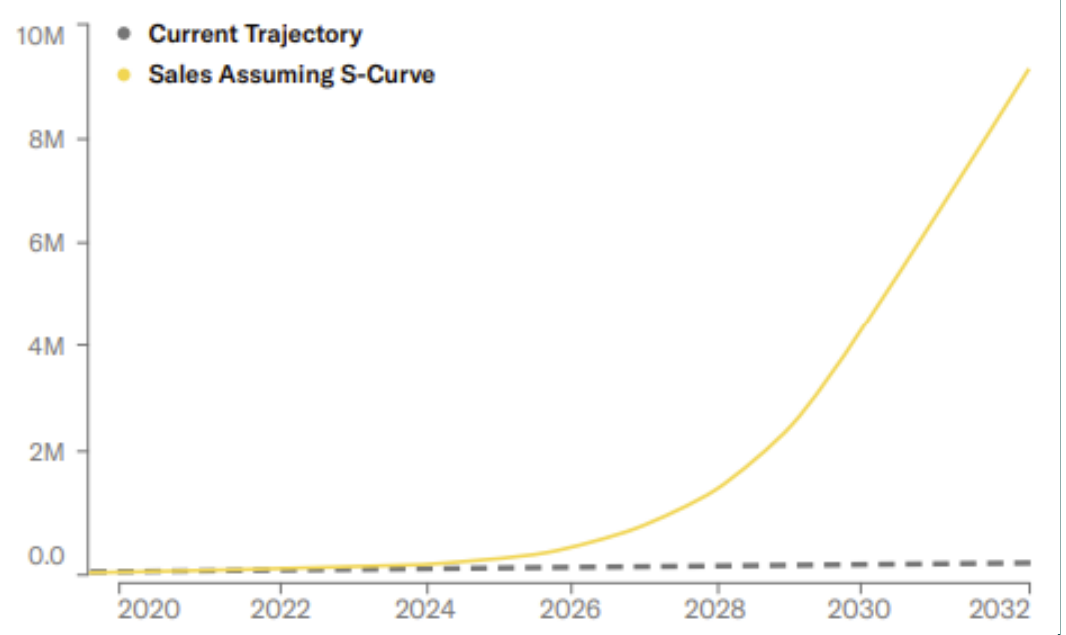
Residential heat pumps has a market size of ~$10B and could grow 6-fold by 2030 to be climate aligned

Electric Heat Pump Sales



Source: Rewiring America

Heat Pump Water Heater Sales

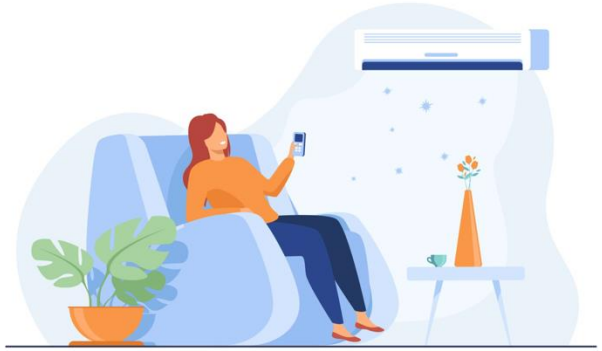


Source: Rewiring America

Home electrification upfront costs are highly dependent on climate zone, market maturity, federal incentives, system size, and existing ducting

	Air-Source Heat Pump			Heat Pump Water Heater		
	Typical	**Typical Range**	**Depends on…**	**Typical**	**Typical Range**	**Depends on…**
Upfront Cost	$18,000	$12,000-$25,000	Climate, ASHP size, market maturity, existing ducts	$5,000	$3,000-$6,000	Tank size, market maturity, existing electrical
Federal Tax Credit	$2,000	$0-2,000	Tax liability, specs	$975	$0-$1,800	Tax liability, specs
Federal Rebates	$8,000	$0- $8,000	Upfront cost, income, specs	$1,750	$0- $1,750	Upfront cost, income, specs
Upfront Cost Post Incentives	$8,000	$4,000-$20,000	Incentive qualifications	$2,275	$1,000- $3,500	Incentive qualifications
Net Upfront Cost vs. Traditional Replacement	$0 premium	$6,000 cheaper - $10,000 premium	All the above plus traditional replacement details	$1,000 cheaper	$2,000 cheaper - $1,000 premium	All the above plus traditional replacement details

IRA creates new rebates, which is important since the tax credits are not refundable



Home Electrification and Appliance Rebates Program ($4.5B)

- Providing **point-of-sale discount** to consumers for certain high-efficiency electric appliances and energy efficiency products
- Available for households whose income is below 150% of the area median
- 100% of project cost for low income up to $8,000 for heat pump

Home Efficiency Rebates Program ($4.3B)

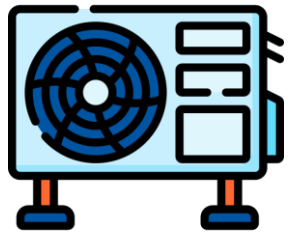
- Providing **savings-based incentives** for whole-home efficiency upgrades/retrofit
- Rebates double for low income households
- Rebate up to $8,000 per unit for 35%+ energy savings in low income households

Energy Efficient Home Improvement Credit (25C)

- Providing **non-refundable tax credit** for appliances
- 30% of project cost up to $2,000 for heat pumps and hot water heat pumps
- Only eligible for owner occupied homes

Understanding how federal and local incentives stack and the process for stacking can help inform financing

Example: Cold Climate ASHP installation in Colorado



Upfront Cost (Before Incentives) = $20,900

Final Cost

Low-Income (<80% AMI)

- **Federal HEAR Rebate**
  - Incentive Amount $8,000
  - Point of Sale
- **Financial Loan**
  - Up to $12,900 (the total amount after rebate is applied)

Installation Occurs

- **XCEL ccASHP Rebate**
  - Incentive Amount $2,000
  - File rebate after installation
- **Federal 25C Tax Credit**
  - Incentive Amount $0
  - Assuming no tax liability.

= $10,900

Median-Income (80%-150% AMI)

- **Federal HEAR Rebate**
  - Incentive Amount $8,000
  - Point of Sale
- **Financial Loan**
  - Up to $12,900 (the total amount after rebate is applied)

Installation Occurs

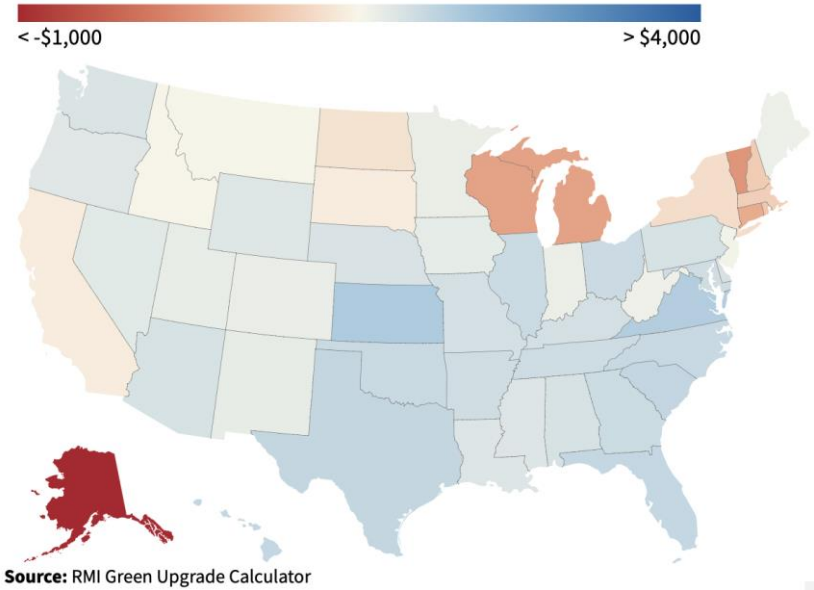
- **XCEL ccASHP Rebate**
  - Incentive Amount $2,000
  - File rebate after installation
- **Federal 25C Tax Credit**
  - Incentive Amount $2,000
  - Assuming 30% of project cost post incentive

= $8,900

Home electrification operating savings are highly dependent on existing fuel source and climate zone

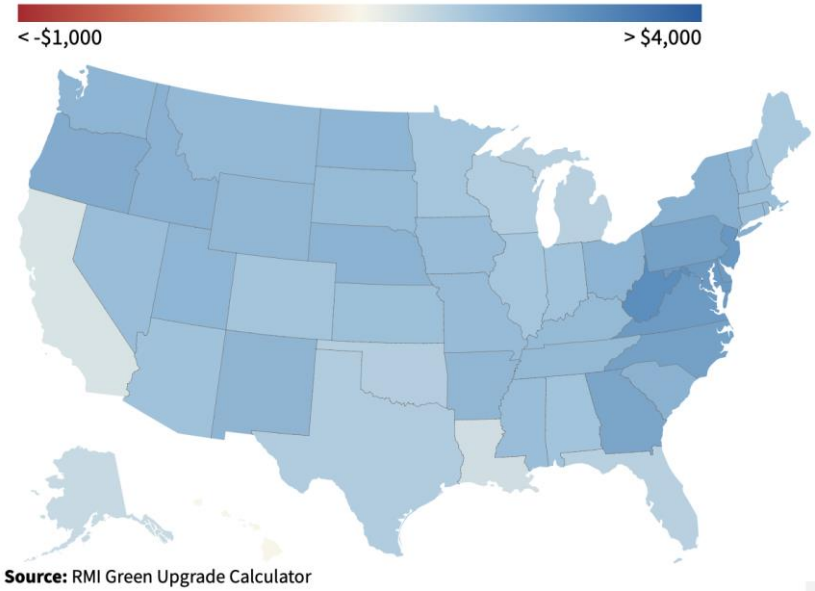
- **The average annual net operating savings operating an air-source heat pump, heat pump water heater, and induction versus the like-for-like replacement system is:**

Natural Gas Retrofit Savings
National Average: $350/yr



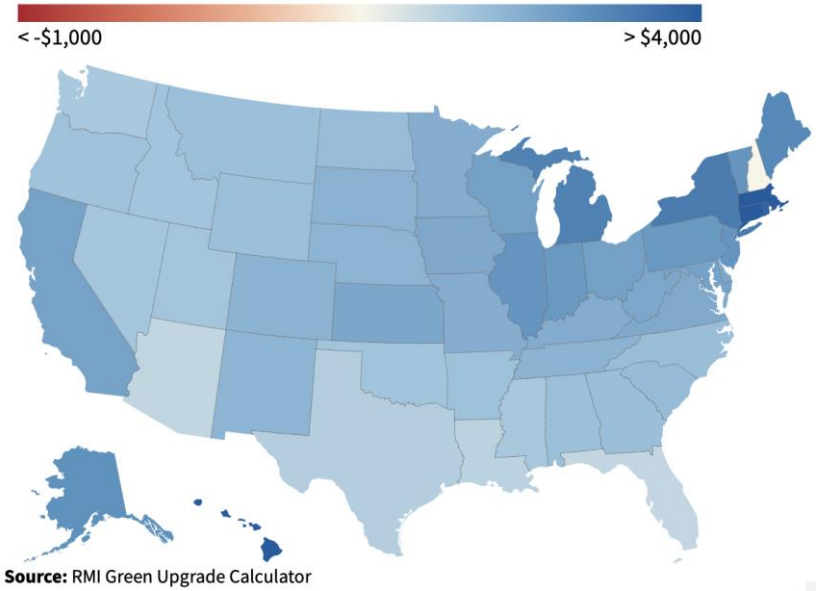
Source: RMI Green Upgrade Calculator

Delivered Fuel Retrofit Savings
National Average: $1,450/yr



Source: RMI Green Upgrade Calculator

Electric Resistance Retrofit Savings
National Average: $1,990/yr



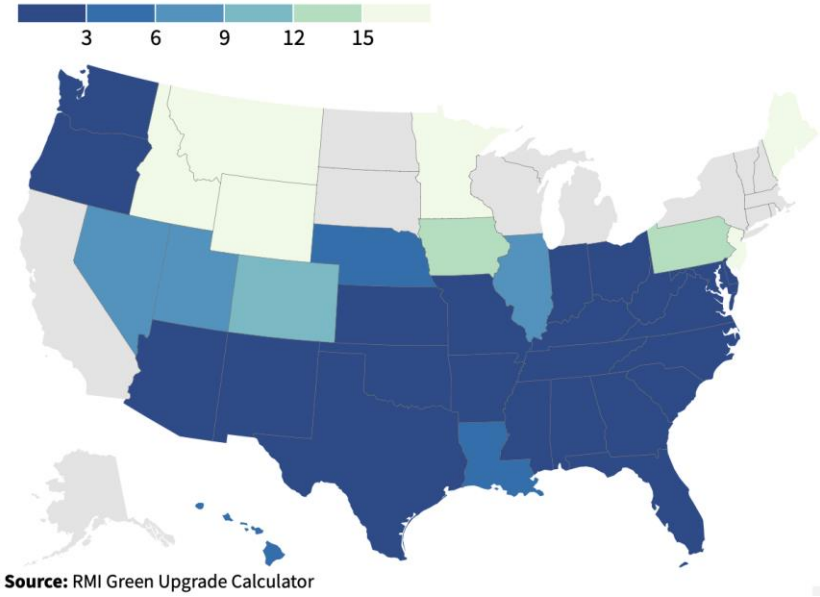
Source: RMI Green Upgrade Calculator

Model assumptions: See all assumptions at greenup.rmi.org.
Analysis assumptions: Applied model results for individual homes to each state's single-family home building inventory

Home electrification payback is highly dependent on climate zone, federal incentives, and existing fuel source

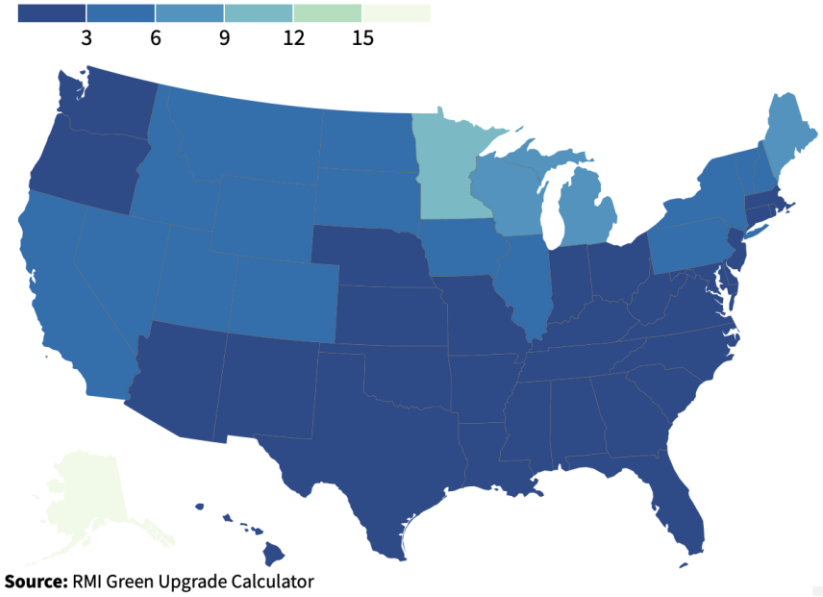
- **The average net payback operating an air-source heat pump, heat pump water heater, and induction versus the like-for-like replacement system with the federal Home Energy Rebate programs is:**

Natural Gas Retrofit Payback
32 states have payback <15 years



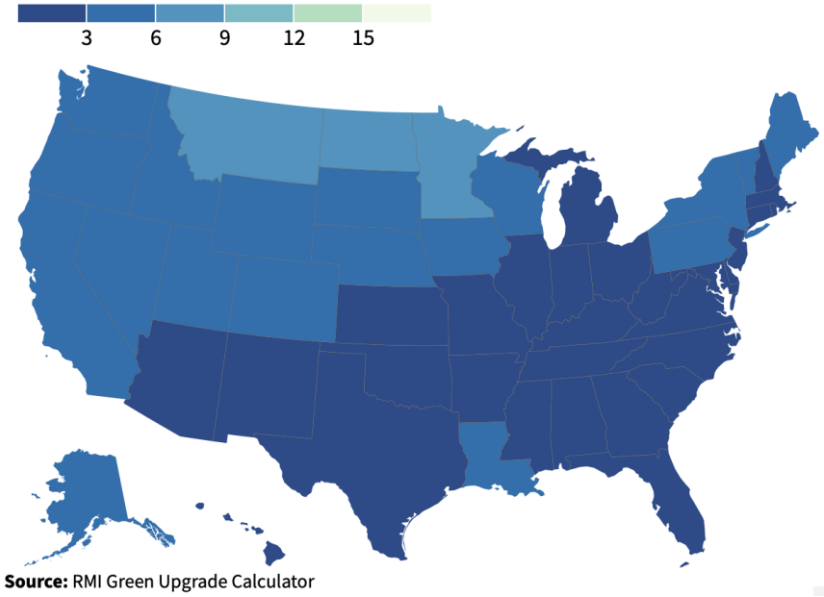
Source: RMI Green Upgrade Calculator

Delivered Fuel Retrofit Payback
49 states have payback <15 years



Source: RMI Green Upgrade Calculator

Electric Resistance Retrofit Payback
All states have payback <15 years



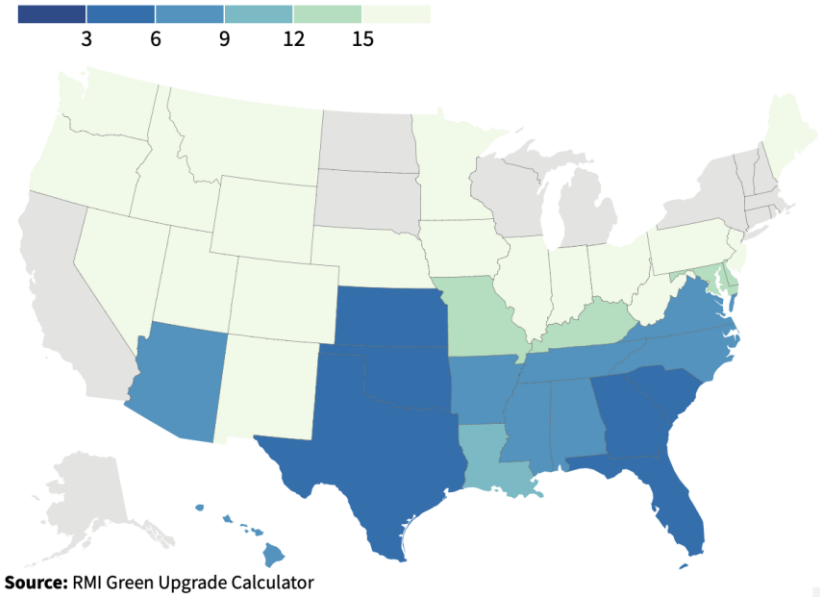
Source: RMI Green Upgrade Calculator

Model assumptions: See all assumptions at greenup.rmi.org.
Analysis assumptions: Applied model results for individual homes to each state's single-family home building inventory

Home electrification payback is highly dependent on climate zone, federal incentives, and existing fuel source

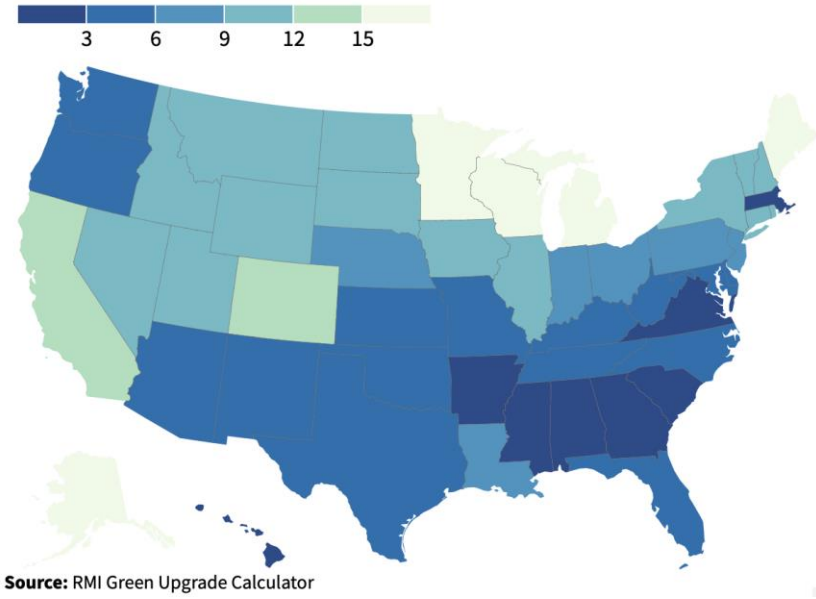
- **The average net payback operating an air-source heat pump, heat pump water heater, and induction versus the like-for-like replacement system without the federal Home Energy Rebate programs is:**

Natural Gas Retrofit Payback
19 states have payback <15 years



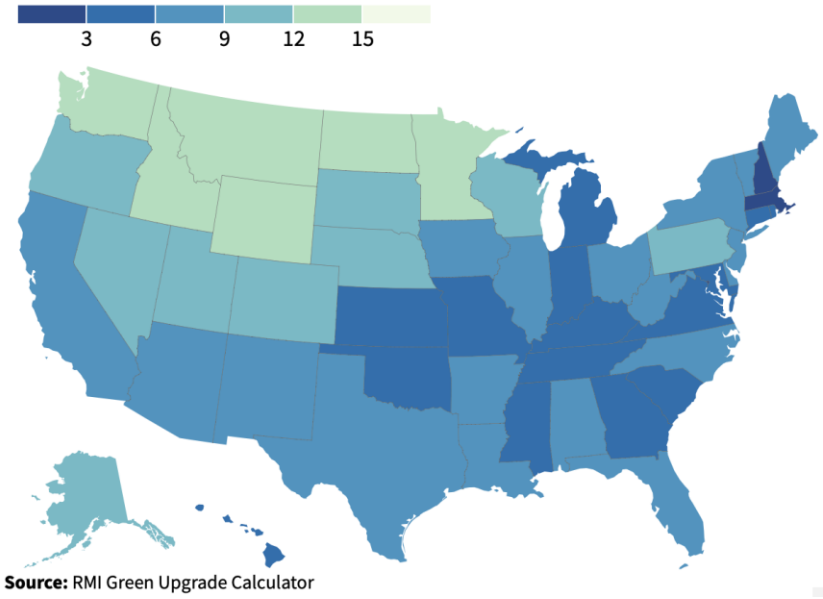
Source: RMI Green Upgrade Calculator

Delivered Fuel Retrofit Payback
45 states have payback <15 years



Source: RMI Green Upgrade Calculator

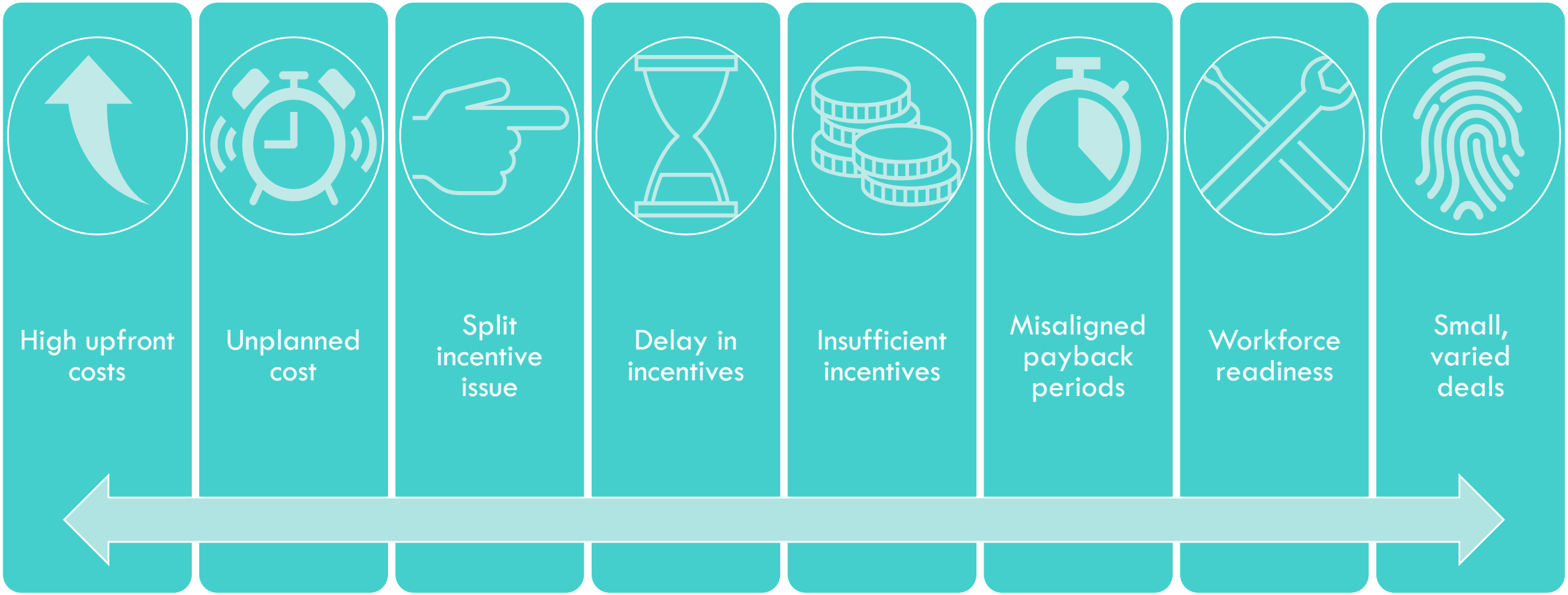
Electric Resistance Retrofit Payback
All states have payback <15 years



Source: RMI Green Upgrade Calculator

Model assumptions: See all assumptions at greenup.rmi.org.
Analysis assumptions: Applied model results for individual homes to each state's single-family home building inventory

There are financial barriers preventing beneficial electrification projects



GGRF new financial offerings can help

Creating preferential financing options that combine the below principles will help electrification customers overcome barriers and scale adoption.

No upfront costs and low or no interest

- *Overcome first cost barrier and minimize overall payback expense*
- *Combine with flexible, long-term payback periods*

Simple application with instant approval

- *Avoid requiring complicated steps*
- *Align timing of financing with urgency of equipment replacement*

Offered by the contractor

- *Customer doesn't have to seek financing on their own*
- *Give contractors an incentive to participate*

Payments are on-bill (if possible)

- *Simplified repayment via trusted entity*
- *Expanded customer eligibility*
- *May be structured in variety of ways*

Strong consumer protections

- *Transparency around bill impacts*
- *Protection against service shutoffs (for on-bill)*
- *Avoid predatory marketing*

More info to come on this

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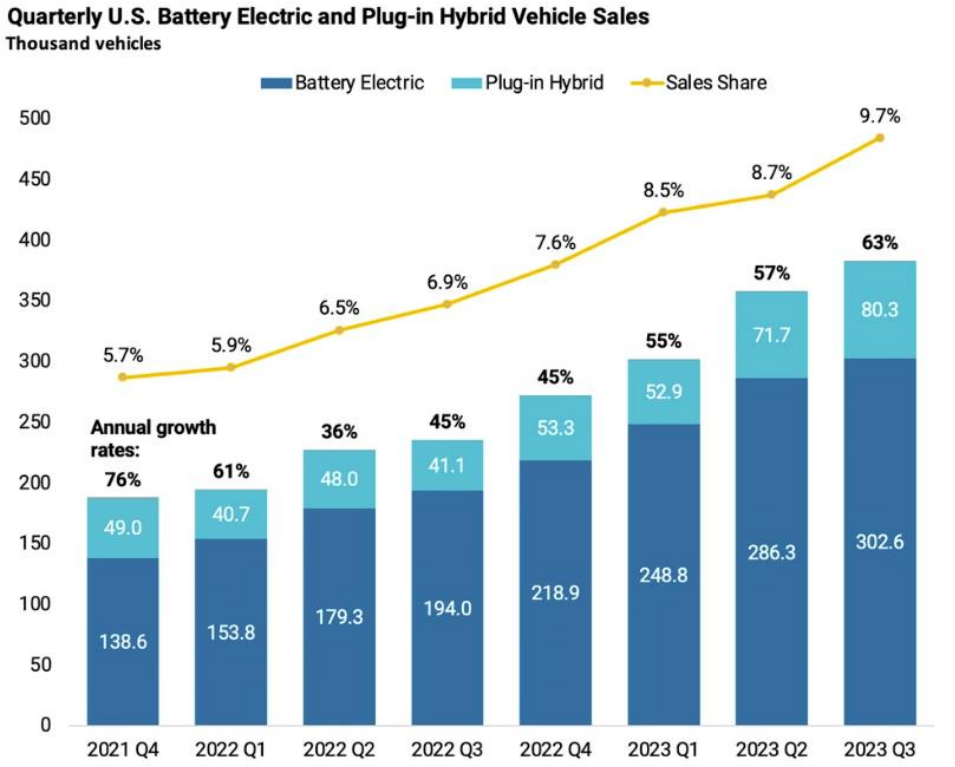
5

With EV's on an S-curve, the market size in 2030 is projected to grow to $350B (up from $41B in 2022)

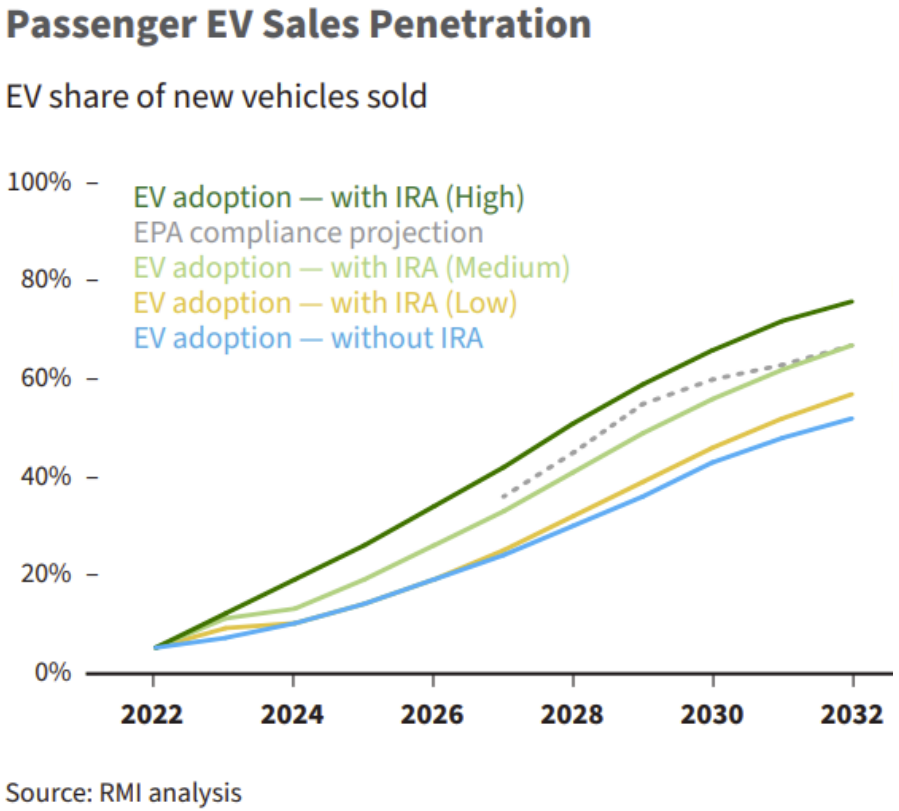
Looking back



Data source: Argonne National Laboratory, "Light Duty Electric Drive Vehicles Monthly Sales Updates - Historical Data"
https://www.anl.gov/esia/reference/light-duty-electric-drive-vehicles-monthly-sales-updates-historical-data

Image source: Heatmap

Looking forward



Source: RMI analysis

Electric vehicle upfront costs are highly dependent on eligibility for federal incentives

New Electric Vehicle			
	Typical	**Typical Range**	**Depending on…**
Upfront Cost	$45,000	$27,000-$100,000+	Battery range (miles), AWD capability, Vehicle type
Federal Tax Credit	$3,750	$3,750, or $7,500	Vehicle MSRP; Household income; Location of manufacturing and critical minerals
Upfront Cost Post Incentives	$41,250	$27,000-$100,000+	Incentive qualifications
Net Upfront Cost vs. Gas Vehicle	$5,000 premium	$0-$20,000 premium	All the above plus the comparable gasoline vehicle

IRA updated existing EV tax credits and expanded new credits to existing and commercial vehicles

Clean Vehicle Credit (30D)

- Existing tax credit for new clean vehicles through 2032
- Up to $7,500 per vehicle. The credit is divided in two $3,750 half credits for a 1) critical mineral requirement and 2) battery component requirement
- Transferable to the dealer

BEFORE
Over 70% of Americans were unable to use the credit due to a lack of tax appetite [2]

AFTER
IRA transforms into point-of-sale rebate [3]

Credit for Previously-Owned Clean Vehicles (25E)

- New tax credit for pre-owned clean vehicles through 2032
- Credit is the lesser of $4,000 or 30% of the sale price
- Transferable to the dealer
- No critical mineral, battery, or domestic content requirements

BEFORE
Over 70% of Americans buy used vehicles. Previously there wasn't a credit for used EVs

AFTER
IRA creates new credit for affordable used EVs

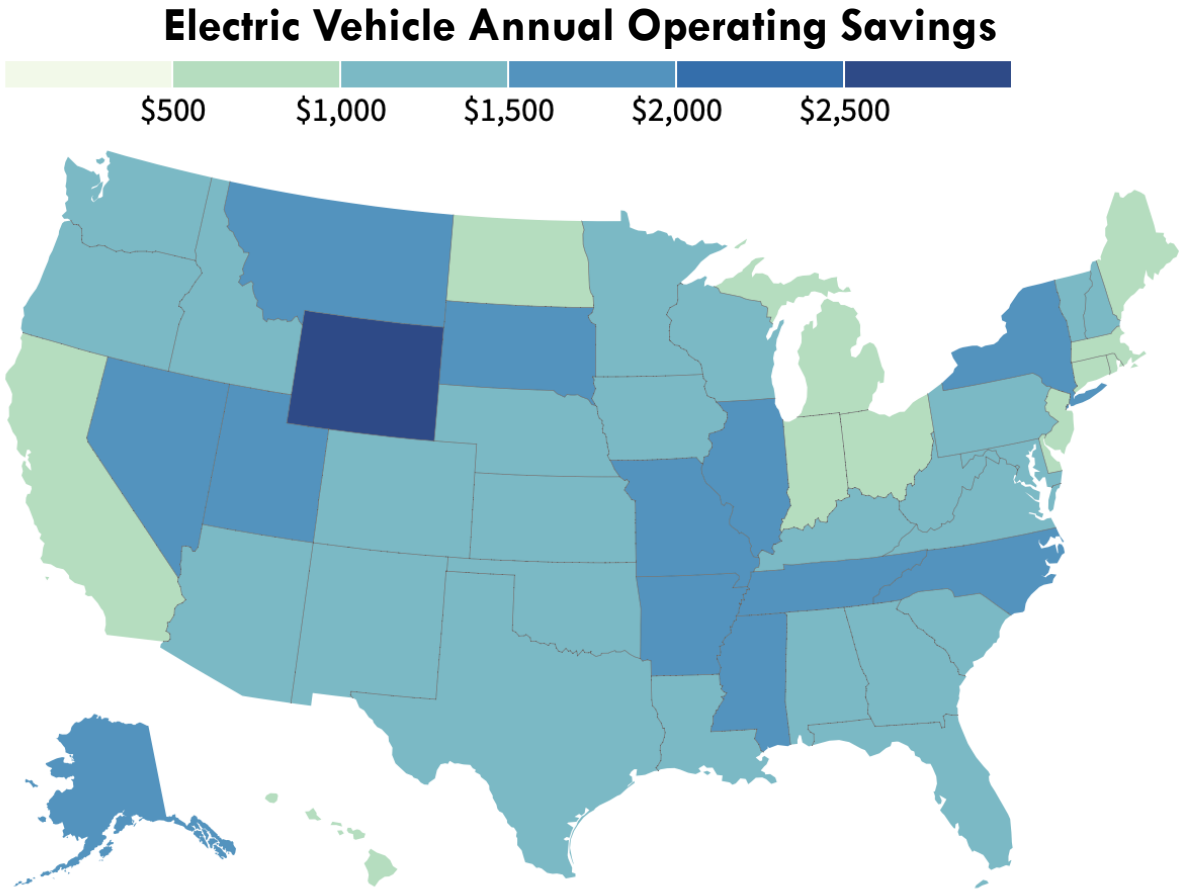
Qualified Commercial Clean Vehicles (45W)

- New tax credit for light, medium, and heavy-duty EVs purchased for commercial use or lease
- 30% of cost for light duty vehicles up to $7,500
- Direct Pay option for tax-exempt entities
- No critical mineral, battery, or domestic content requirements
- Can be used by individuals through leasing EVs

Alternative Fuel Vehicle Refueling Property Credit (30C)

- Tax credit for EV chargers for individuals or businesses
- 30% of cost for individuals up to $1,000
- Must be located in low-income or rural area

Electric vehicle operating savings are highly dependent on miles traveled, electricity rates, and vehicle efficiency



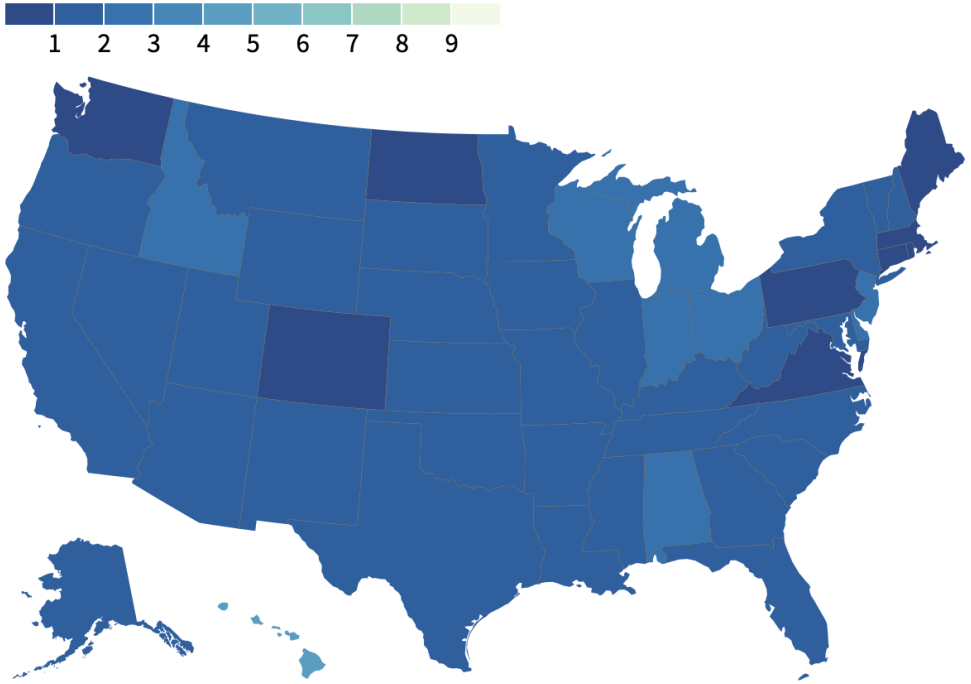
Source: RMI Green Upgrade Calculator

Model assumptions: See all assumptions at greenup.rmi.org.
Analysis assumptions: Average hatchback vehicle

Electric vehicle payback is highly dependent on upfront cost and operating savings

EV Payback (Years) with $3,750 tax credit

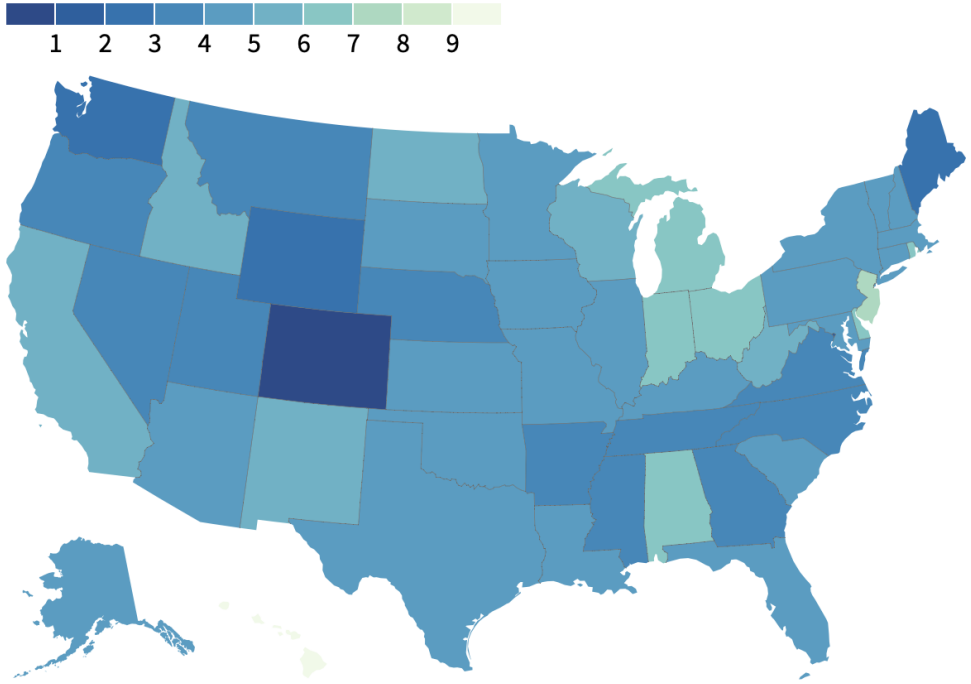
50 states have payback <5 years



Source: RMI Green Upgrade Calculator

EV Payback (Years) without federal tax credit

36 states have payback <5 years



Source: RMI Green Upgrade Calculator

Model assumptions: See all assumptions at greenup.rmi.org.
Analysis assumptions: Average hatchback vehicle

There are financial barriers preventing clean transportation projects

High upfront costs

- High purchase costs for personal EVs poses a barrier to low-income individuals already struggling to afford personal vehicles. Car alternatives like e-bikes and e-scooters also come at a premium.

Costs beyond vehicles required

- Added costs for charging infrastructure in homes places personal EVs out of reach. Homes requiring electric panel upgrades face additional costs.

Public changing less available

- Public chargers are only profitable where people drive EVs, and EVs only make sense where there are chargers. Long payback periods for EV infrastructure could help here.

GGRF new financial offerings could help

Low-cost and flexible financing for personal EVs that build-in charger costs

- Building in charger costs can help where charging infrastructure is otherwise an additional cost.

Factor in total cost of ownership in evaluation of projects

- Often operating expenses are lower for EVs than ICE meaning households have more monthly income available.

Financing products and programs catered to “small” purchases

- ($1,000-5,000) for personal mobility purchases/ car alternatives

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Thank You!

Use QR for link to recording and slides