Minnesota Mobilizing Climate-Aligned and Community-Led Capital

October 28-30, 2024

RMI is an independent, nonprofit organization of experts accelerating the clean energy transition. We are transforming the global energy system to secure a clean, prosperous, zero-carbon future for all.

Objectives

1. Gain critical knowledge about the Greenhouse Gas Reduction Fund (GGRF) and the Inflation Reduction Act (IRA) to leverage relevant programs for your organization and clients.

2. Identify opportunities for your organization to attract or spend GGRF and IRA funds.

3. Learn which clean energy and technology opportunities are most feasible for Minnesota.

4. Build relationships that will support bringing GGRF and IRA funds and benefits to Minnesota.

Agenda (Day 1)

Time	Activity
1:00	Welcome & Introductions
1:30	Keynote Speaker
1:45	Introduction to IRA and GGRF
3:15	Who’s in the Room & Neighbor Meet
3:25	Break
3:40	Panel: Minnesota’s Green Financing Landscape
4:55	Closing
5:30	Informal Social Hour

Ground Rules

Be Present

Respect Confidentiality

Sharing Needed

Reminders

Restrooms

Safety Protocol

Meet the Team

Aaron Brickman

Julia Meisel

Whitney Mann

Alisa Petersen

Miguel Moravec

Nathan Iyer

Carla Vita

Sophie Rios

Lisa Hughes


Minnesota Chamber of Commerce
ENERGY SMART
COOPERATIVE ENERGY FUTURES
COMMUNITY POWERED ENERGY
minnesota power
AN ALLETE COMPANY
CROOKSTON
COMMUNITY DEVELOPMENT & HOUSING
BLOOMWISE
BENTON
Economic Partnership, Inc.
auri
Fresh Energy
GRID CATALYST
Initiative
FOUNDATION
HAP
CATALYST
COALITION
First Children's Finance
cee
Center for Energy and Environment
Center City
Housing Corp.
Hennepin
Habitat
for Humanity
of Minnesota
GREATER MINNESOTA
HOUSING FUND
Access to Capital
FORTIS
CAPITAL
Financial • Knowledge • Social
Goodhue
County
MINNESOTA
IRON RANGE RESOURCES
& REHABILITATION
IEDC
LiUNA! LOCAL 563
VISIT LAKE STREET
LAKE STREET COUNCIL
African
Economic
Development
Solutions
Minneapolis
City of Lakes
MINNESOTA POLLUTION
CONTROL AGENCY
Blandin Foundation
1 ROOF
COMMUNITY
HOUSING
CRF
USA
ARMI
LEDC
LEECH LAKE
BAND OF OJIBWE
LOWER SIOUX
INDIAN
COMMUNITY
LiUNA! MINNESOTA & NORTH DAKOTA
LISC
TWIN CITIES
LISC
DULUTH
SAINT PAUL
MINNESOTA
AEDA
EMPLOYMENT AND
ECONOMIC DEVELOPMENT
Bemidji
STATE UNIVERSITY
APEX
gets business
City of
Fergus
Falls
Minnesota
ARDC
Planning
A Division of ARDC
City of
RED WING
THE
McKNIGHT
FOUNDATION
SOUTHWEST INITIATIVE
FOUNDATION
Shared Capital
Cooperative
Minnesota
INTERFAITH
POWER & LIGHT
MCCD
Metropolitan Consortium
of Community Developers
Saint Paul
PORT AUTHORITY
COMMERCE
DEPARTMENT
MMCDC
Midwest Minnesota
The Nature
Conservancy
BROOKLYN
CENTER
AT THE CENTER
Itasca County
Minnesota
EVER-GREEN
ENERGY
Twin Cities
Habitat
for Humanity
SRDC
MANAGEMENT
AND BUDGET
CLIMATE INNOVATION
FINANCE AUTHORITY
MINNESOTA
CDFI COALITION
clean energy
economy mn
SUNRISE
BANKS
WOMEN VENTURE
West Central
Initiative
African
Development
Center
of Minnesota
NeighborWorks
HOME PARTNERS
Northwest
Minnesota
FOUNDATION
East Side
REGIONAL
DEVELOPMENT
COMMISSION
usbancorp
Impact Finance
MINNEAPOLIS
FOUNDATION
SHERBURNE
COUNTY
REGION FIVE
Development Commission
RAMSEY
COUNTY
Minnesota
Venn Foundation
solarinformatics
MTL
NDC
NCF
People's Energy
Cooperative
propel
nonprofits
TRANE
Extension
Wildflower Schools
REWIRING
AMERICA
R9

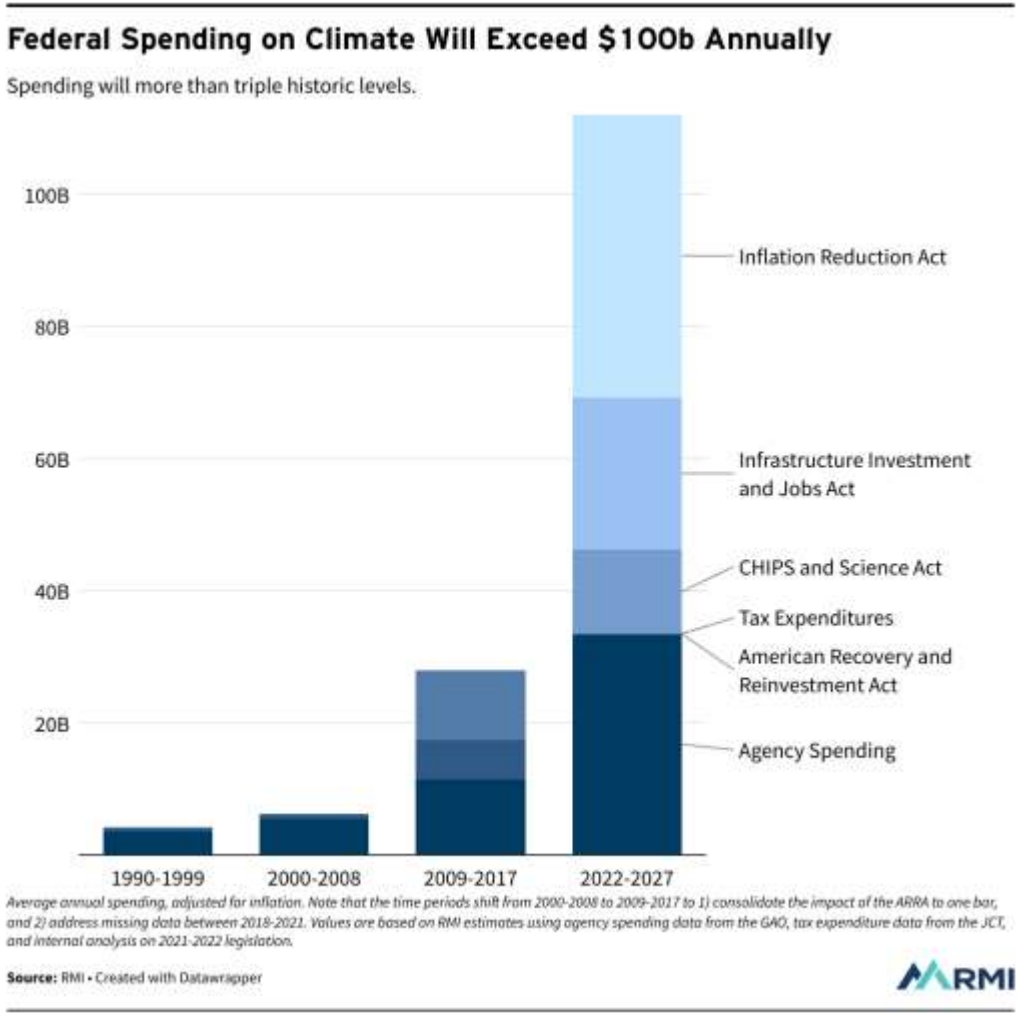
Menti

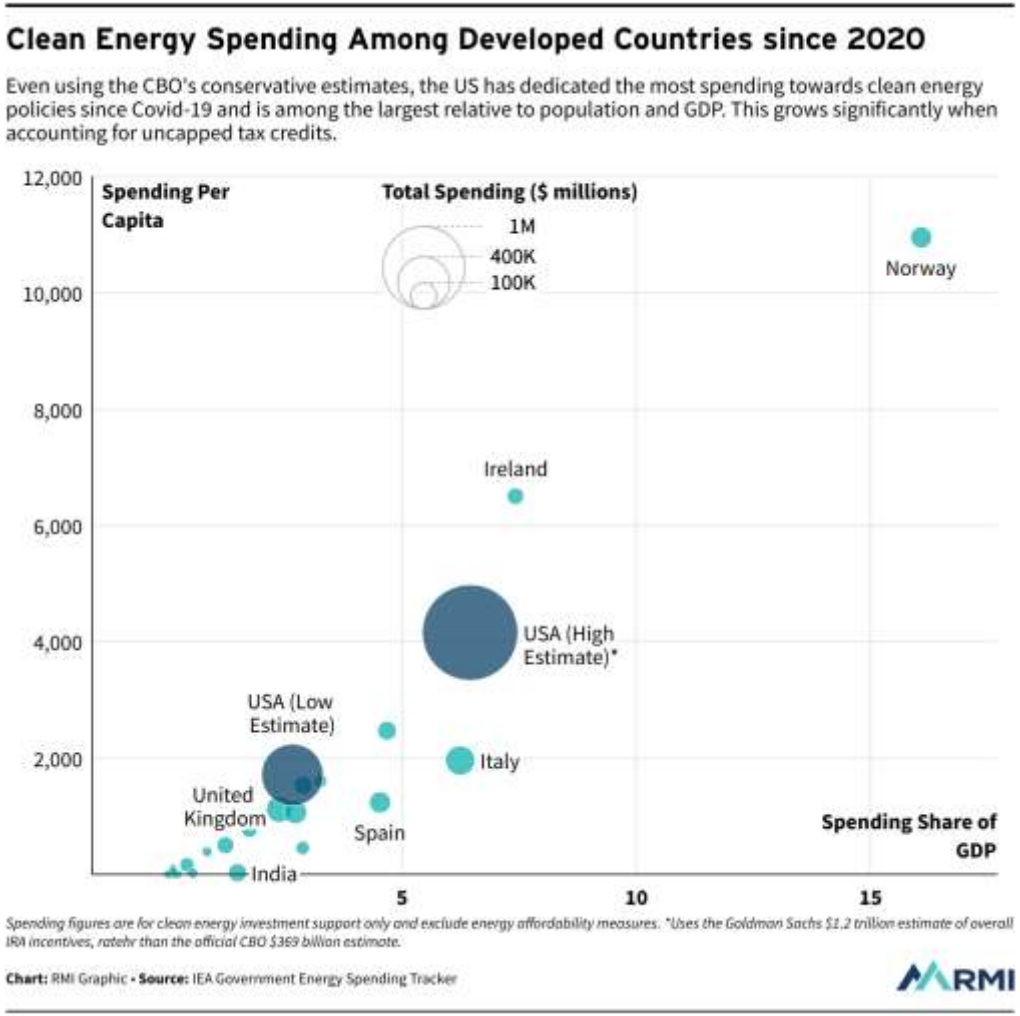
We are going to use an interactive polling tool to capture thoughts and ideas throughout the convening. You should have already opened this link at registration but using a device (phone or computer):

- **Go to menti.com**
- **Enter the following code: 3976 2816**
- **Follow along and answer the questions on screen!**

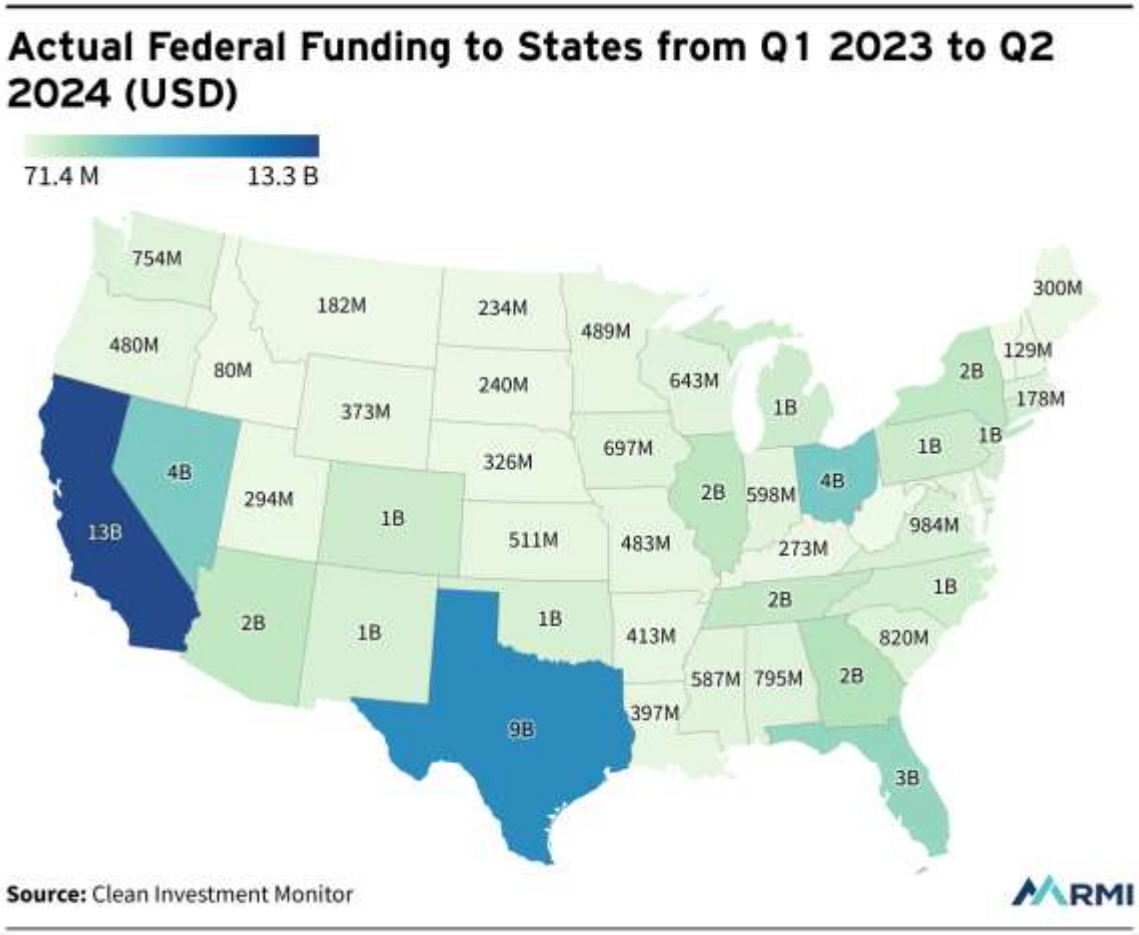
- **If at any point you want to submit a question, navigate to the "Open Q&A" button to submit a question**

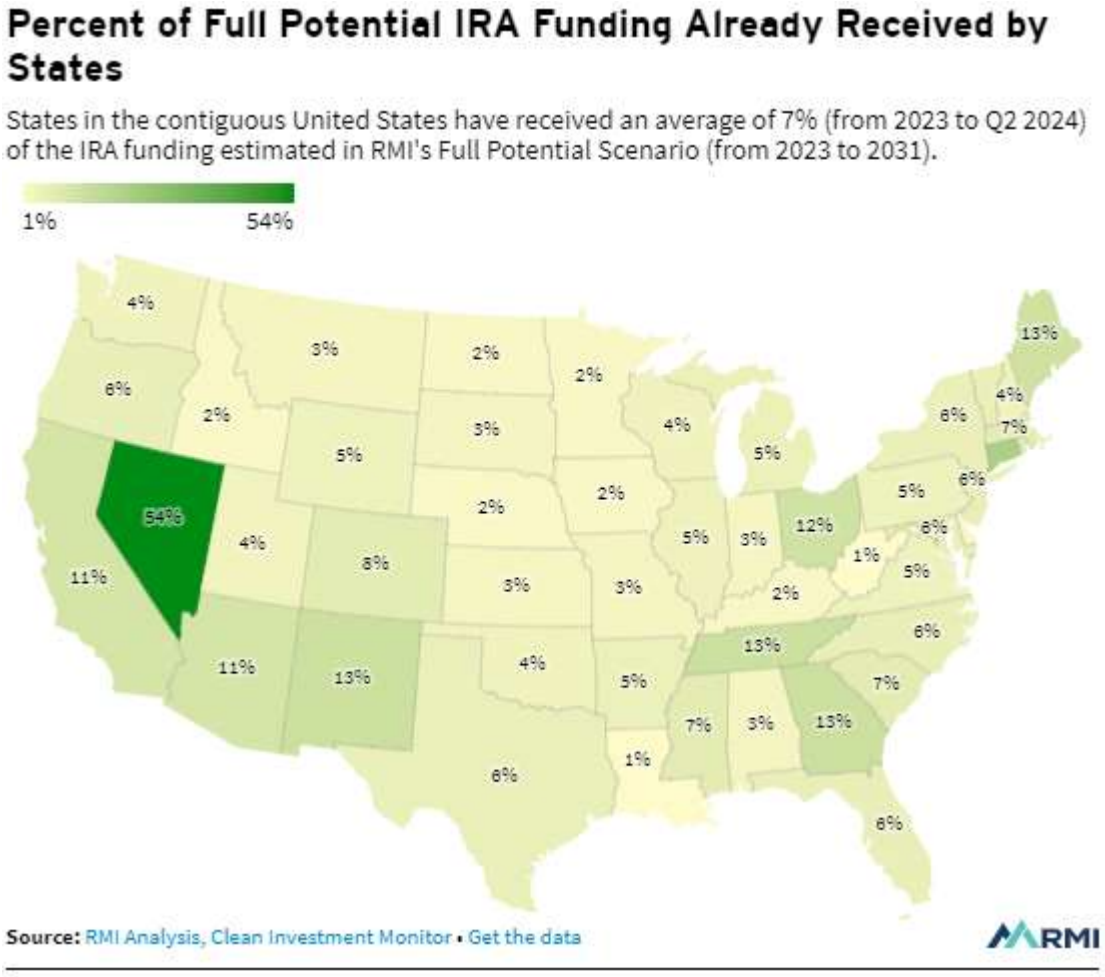
IRA+BIL+CHIPS is the largest investment in cleantech deployment and manufacturing





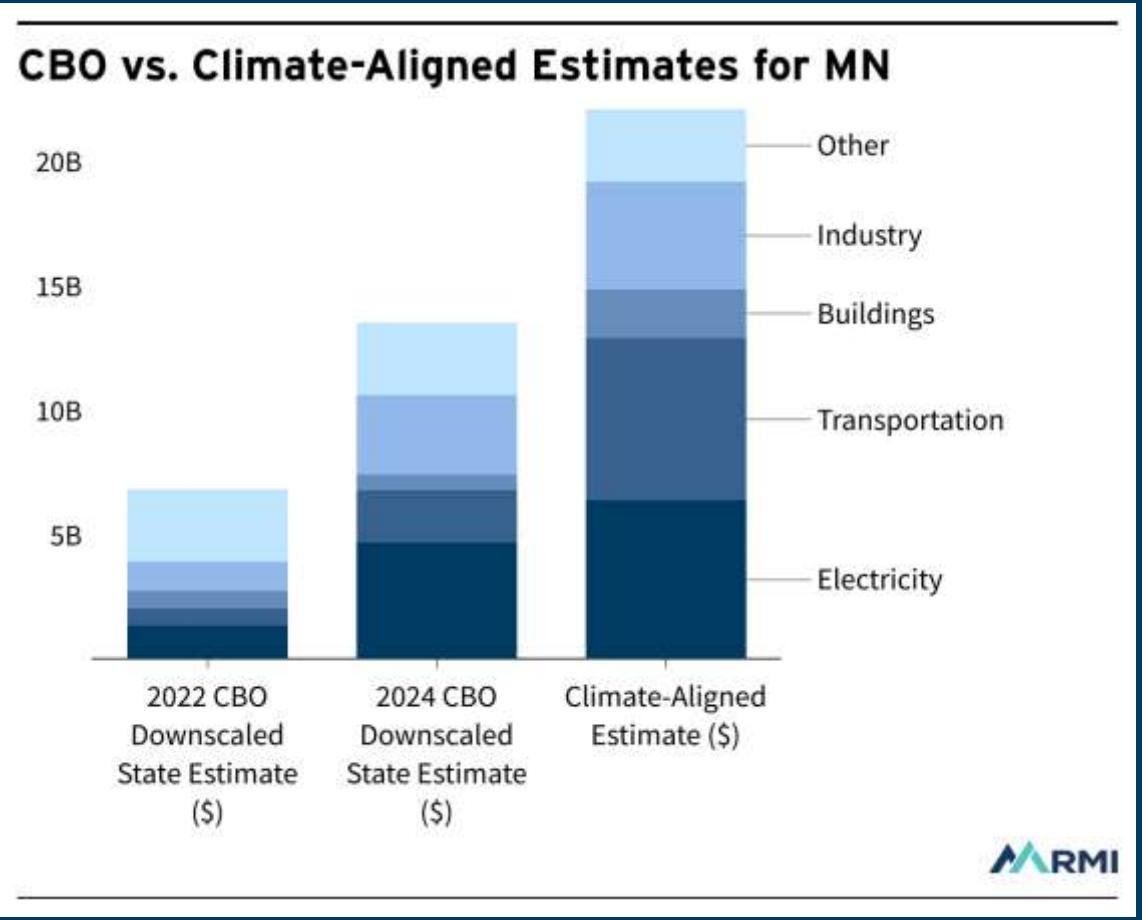
Over $489M in federal funds have already gone to MN, but that just scrapes the surface

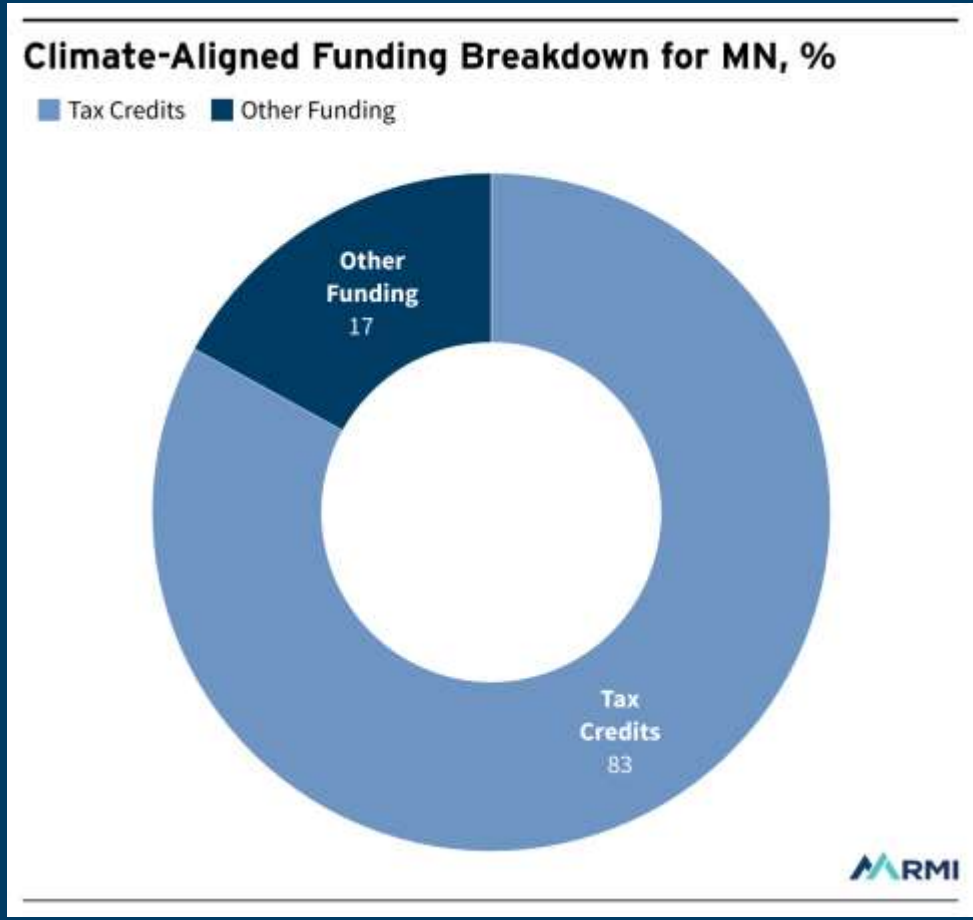




What does this mean for Minnesota?

Minnesota could attract $22 Billion in IRA investments, most through tax credits

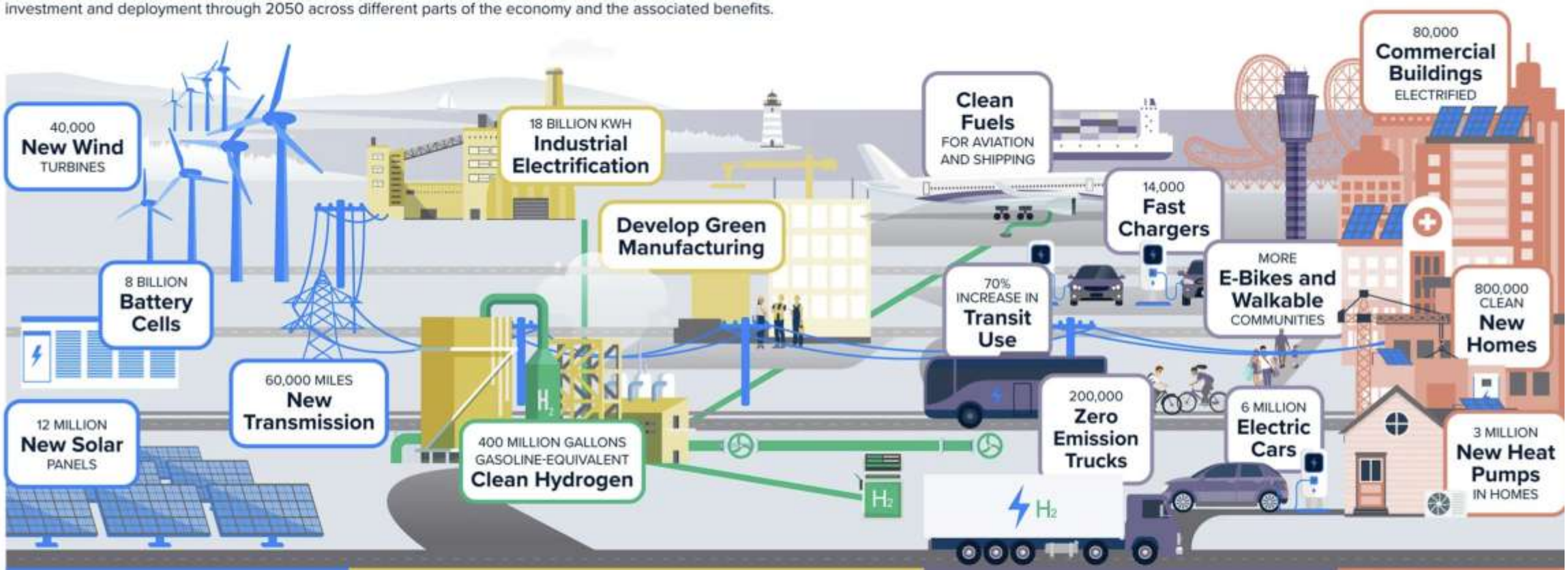




Clean Energy Economy Opportunity

MINNESOTA

This chart depicts the economic opportunity of the energy transition by showing estimated clean technology investment and deployment through 2050 across different parts of the economy and the associated benefits.



Size of bars based on current annual greenhouse gas emissions (million metric tons CO_2e)

HUMAN IMPACT

150,000 New Clean Economy **JOBS**

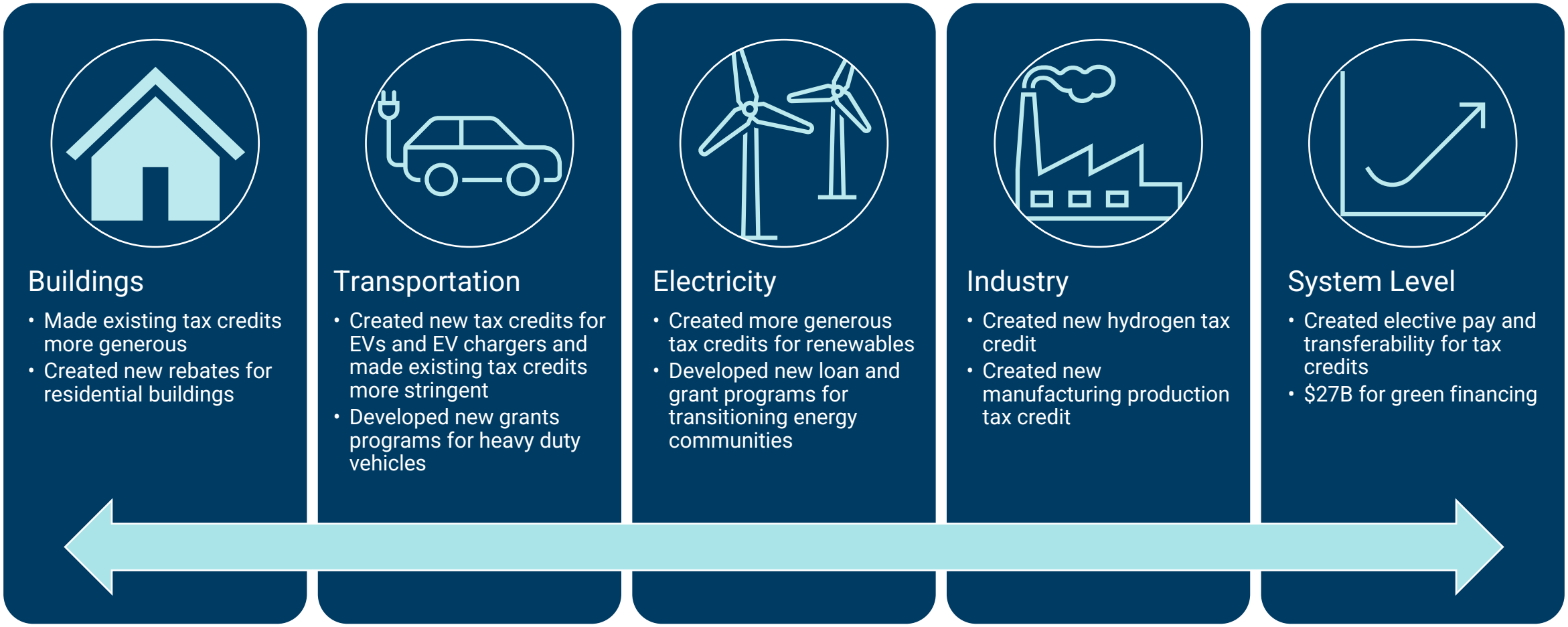
$3 Billion per year saved from AVOIDED DEATHS

5,000 FEWER YEARLY **Asthma Attacks**

$22 Billion Potential Federal Investment from IRA

This data came from the Net-Zero America project and the Energy Policy Simulator and may not align with other state-specific modelling. Additional information at: rmi.org/state-graphics

IRA supports clean energy across all sectors

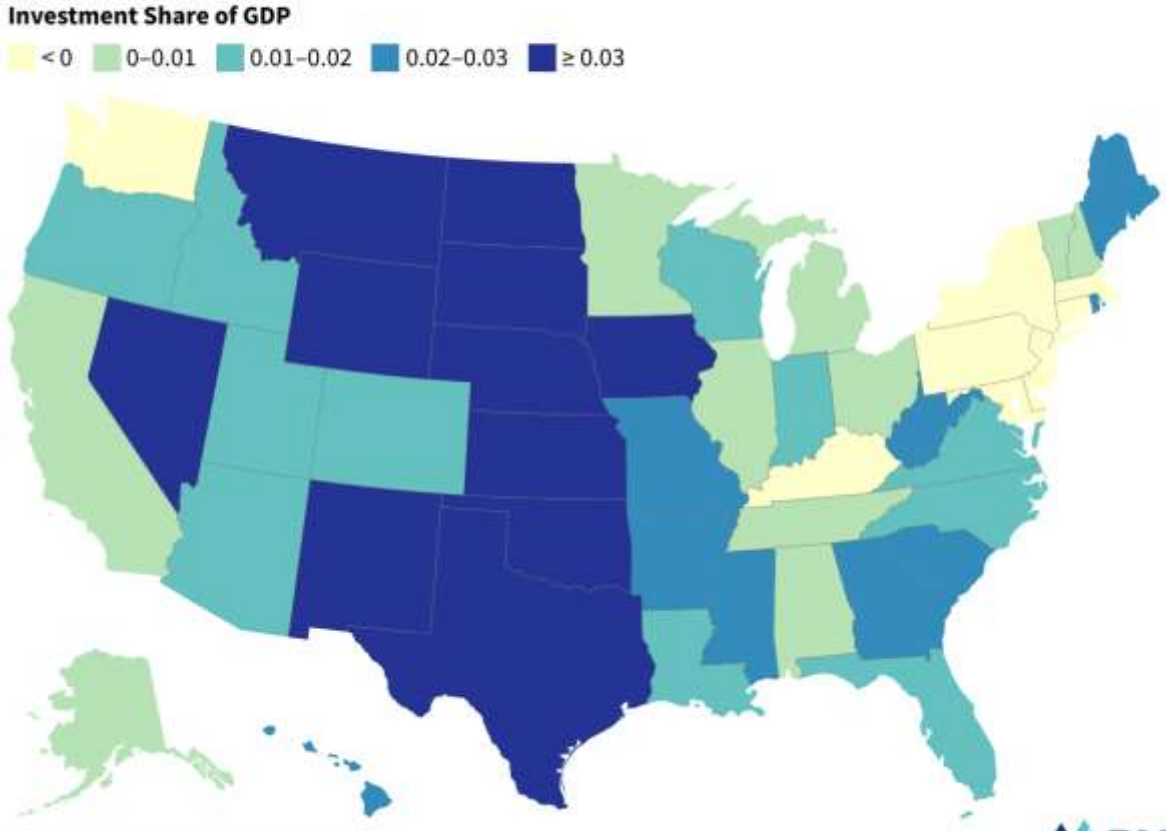


IRA was designed to spur domestic manufacturing using both carrots and sticks

- **Increase demand**
  - Requires battery and critical mineral domestic content to get EV tax credit(30D)
  - Requires meeting domestic content requirements to use elective pay for electricity credit (48/45)
- **Increase supply**
  - Generous manufacturing tax incentives (48C/45X)
  - Bonus incentives for domestic content (48/45)
  - Grants and loans for retooling existing manufacturing

Investment in the clean energy transition is taking off, and MN has opportunity for growth

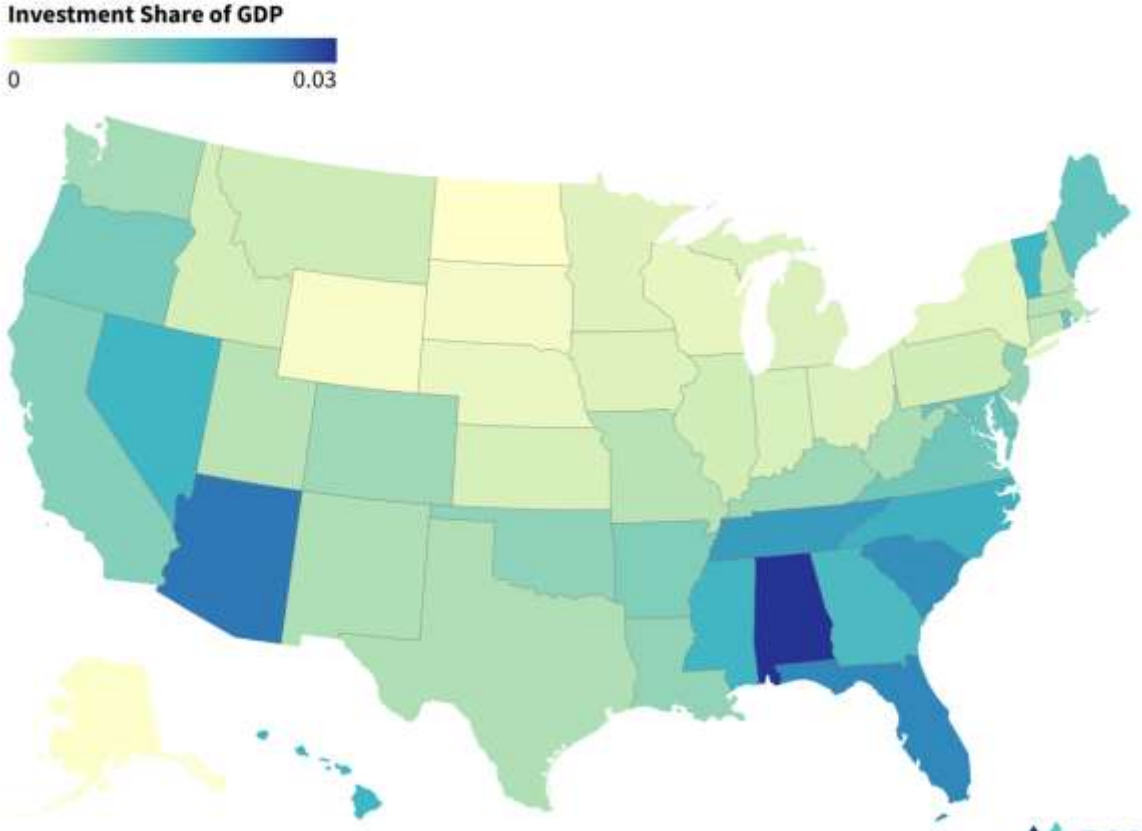
Great plains states with strong wind resources have seen the largest energy and industry investment since 2018



Map: RMI Graphic • **Source:** Clean Investment Monitor

RMI

Clean retail investment is being led by heat pumps and solar in the South



Map: RMI Graphic • **Source:** Clean Investment Monitor

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Build America, Buy America (BABA)

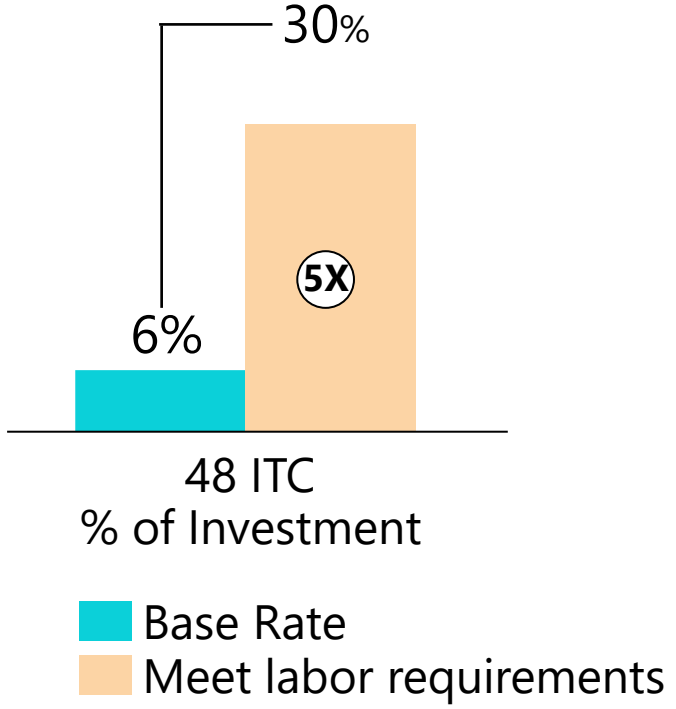
- **Came into law in 2021 under BIL, and established a domestic content preference for federal government procurement and various federal-aid infrastructure projects**
- **All federal awards with infrastructure projects must include the Buy America Preference in the terms and conditions, including GGRF**
- **Requirements:**
  - **Iron and steel and construction materials:** All manufacturing processes for iron, steel, and construction materials must have occurred in the United States. For iron and steel, this means all activities "from the initial melting stage through the application of coatings.". The definition of "manufacturing process" differs for different construction materials.
  - **Manufactured products:** Must be manufactured in the US and the cost of the domestic components is greater than 55% of total cost.
- **Waivers are allowed for nonavailability and unreasonable cost (defined as 25%+ higher).**

Project Category	Buy America Preference Applicability
Residential-serving community solar	Yes
Publicly accessible EV charging stations	Yes
Publicly accessible community centers and roadways on multi-family properties	Yes
Privately owned retail establishments	Yes, if public accommodation
Privately owned energy generation and / or storage facilities	Yes, if they serve a public function
Publicly owned energy generation and/or storage transportation facilities	Yes
Publicly owned transportation facilities (e.g., bus depot)	Yes
Privately owned transportation facilities	Yes, if they serve a public function
Publicly owned vehicles	Case specific
Privately owned vehicles for private use	No
Single family homes (private residences for personal use)	No
Privately owned multi-family homes or mixed-use property: • Publicly accessible community center, roadway, or EV charging station	Yes
Mixed-use property: • Project primarily serves non-residential portion of multifamily property that meets public function test (e.g., commercial with public access)	Yes
Privately owned multi-family homes (unsubsidized by government funding source) • Not mixed-use • Not a publicly accessible community center, roadway, or EV charging station	No
Privately owned multi-family homes (unsubsidized by government funding source) • Mixed-use (project may benefit both private housing units and commercial tenants in same property) • Not a publicly accessible community center, roadway, or EV charging station	Case specific
Privately owned manufacturing or industrial facilities	No
Privately owned offices	No
EV charging stations installed at private homes, including multi-family homes (no public access)	No
EV charging stations installed at privately-owned manufacturing or industrial facilities	No, unless publicly accessible

Source: Explainer – BABA and Domestic Content CESA

Most IRA tax credits were designed to support the creation of new good-paying jobs through prevailing wage and apprenticeship bonuses

- **Prevailing wage:**
  - A prevailing wage is the combination of the average basic hourly wage rate plus any fringe benefits rate
  - Varies by specific labor classification, type of construction being performed, and geographic area
- **Apprenticeship requirement:**
  - Apprentices must account for 15% of total labor hours starting in 2024
- **Applicable Projects:**
  - solar/wind projects over 1 MW, commercial EV charger projects, carbon capture sequestration and storage, hydrogen, manufacturing ITC, commercial buildings tax deduction, sustainable aviation fuel, and nuclear



Some federal funding requires prevailing wage, including GGRF

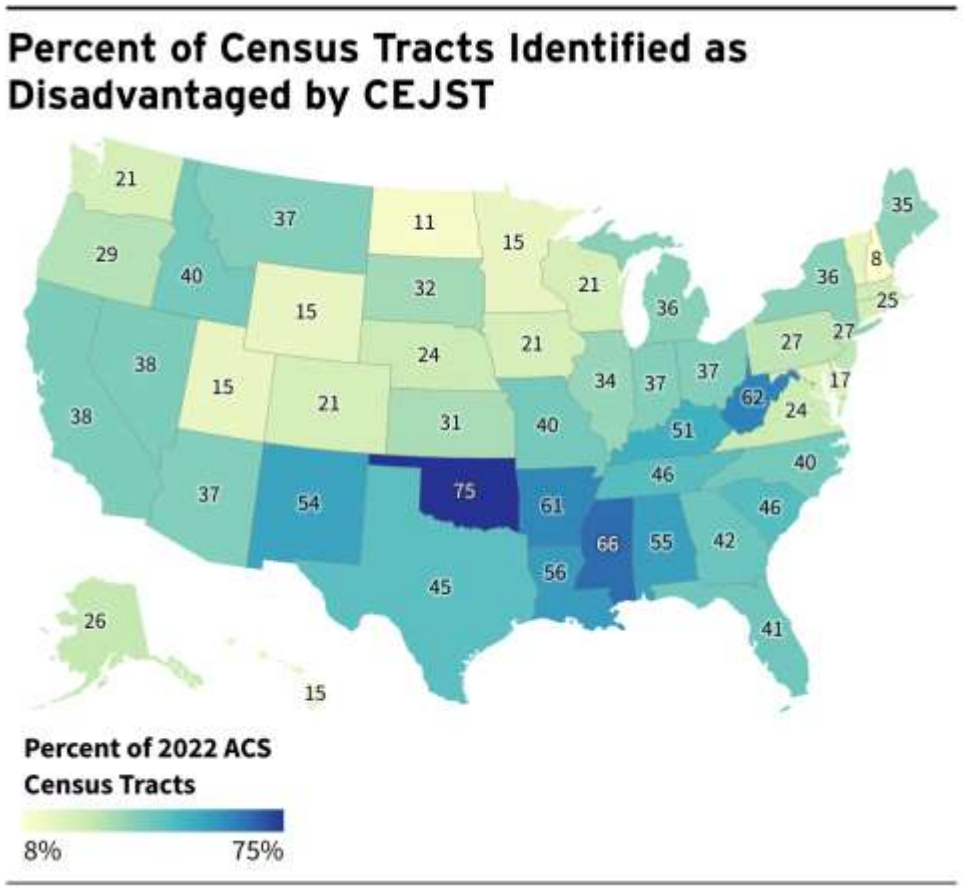
The Davis-Bacon Act (DBA) is a federal law enacted in 1931 that requires contractors and subcontractors working on federally funded construction projects to pay their laborers and mechanics prevailing wages.

Davis Bacon-Related Act (DBRA) is a statute in which Congress incorporated DBA labor standards for “federally assisted construction.” IRA is not, but BIL, CHIPS and Clean Air Act are DBRAs.

GGRF programs administered by EPA are governed by the Clean Air Act, a DBRA, so GGRF requires prevailing wage.

Neither DOL nor program administering agency can waive DBA standards

Under Justice40 Initiative, 40% of the overall benefits must flow to disadvantaged communities



- **Justice40 targets these disadvantaged communities identified by CEQ's Climate and Economic Justice Screening Tool for federal funding**
  - Uncapped tax credits are exceptions
  - Grants and loan programs must factor in J40
  - GGRF goes above the J40 requirements for certain programs
- **A census tract is identified as disadvantaged if it:**
  - Meets the threshold for a climate or environmental burden
  - Has associated socioeconomic burden
  - Is completely surrounded by disadvantaged communities
  - Is above 50th percentile for low income

Source: Climate and Economic Justice Screening Tool

Direct pay and transferability make a big difference for green project capital stacks

			Eligible for direct pay	Eligible for transferability
Electricity	45, 45Y	Clean electricity production tax credit	✓	✓
	48, 48E	Clean electricity investment tax credit	✓	✓
	45U	Zero-emission nuclear power production credit	✓	✓
	45Q	Credit for carbon oxide sequestration*	✓	✓
Fuels	45Z	Clean fuel production credit	✓	✓
	45V	Clean hydrogen production tax credit*	✓	✓
Vehicles	30C	Alternative fuel vehicle refueling property credit	✓	✓
	45W	Credit for qualified commercial clean vehicles	✓	**N/A**
Manufacturing	48C	Advanced energy project credit	✓	✓
	45X	Advanced manufacturing production credit*	✓	✓

* Note: Direct payments for these credits are available to taxable entities for five years.

Greenhouse Gas Reduction Fund (GGRF)

A tool to leverage the clean energy transition for economic & community development in Minnesota

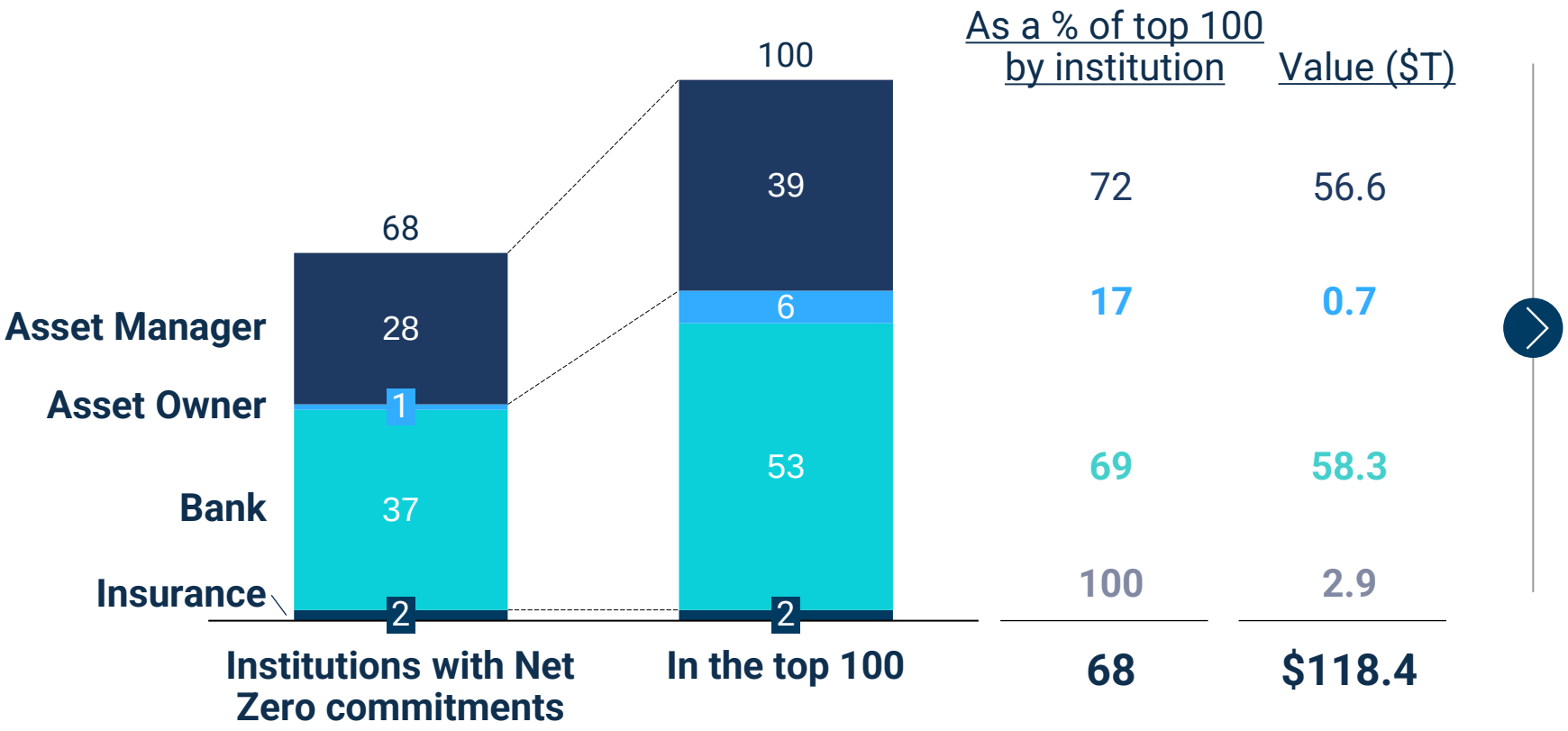
Beyond emissions: financing clean energy matters

Decarbonizing the US economy presents financial & economic risks and opportunities everywhere; they're equally relevant for Minnesota's approach

Net-zero is now mainstream

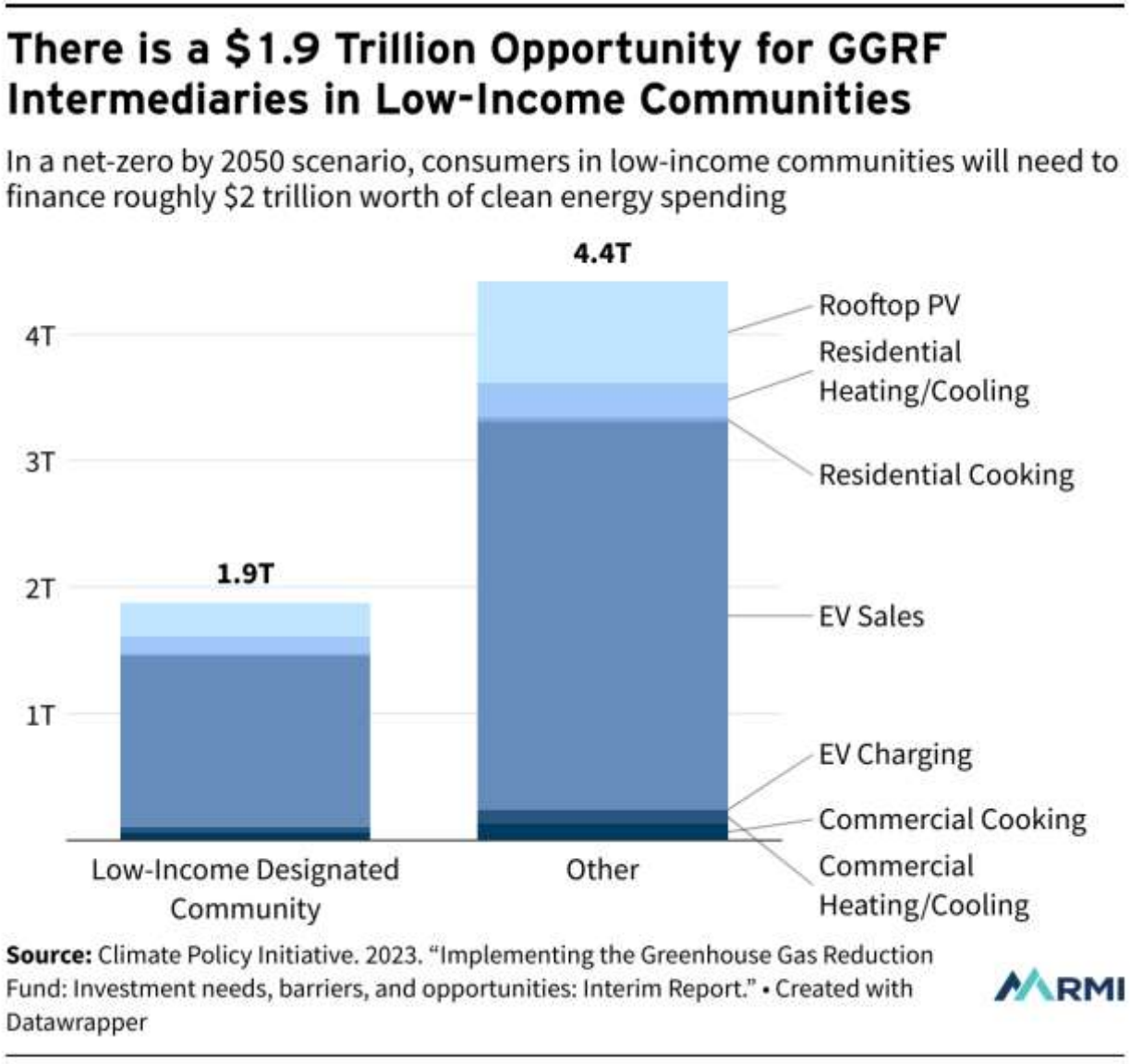
Investors are shifting portfolios away from high-emission sectors in line with net-zero goals.

Leading financial institutions with Net Zero targets by institution type



- 68% of the top 100 Financial Institutions have Net Zero targets, representing $118T in assets

The net-zero transition is expensive; our financing approach can close or worsen the US wealth gap

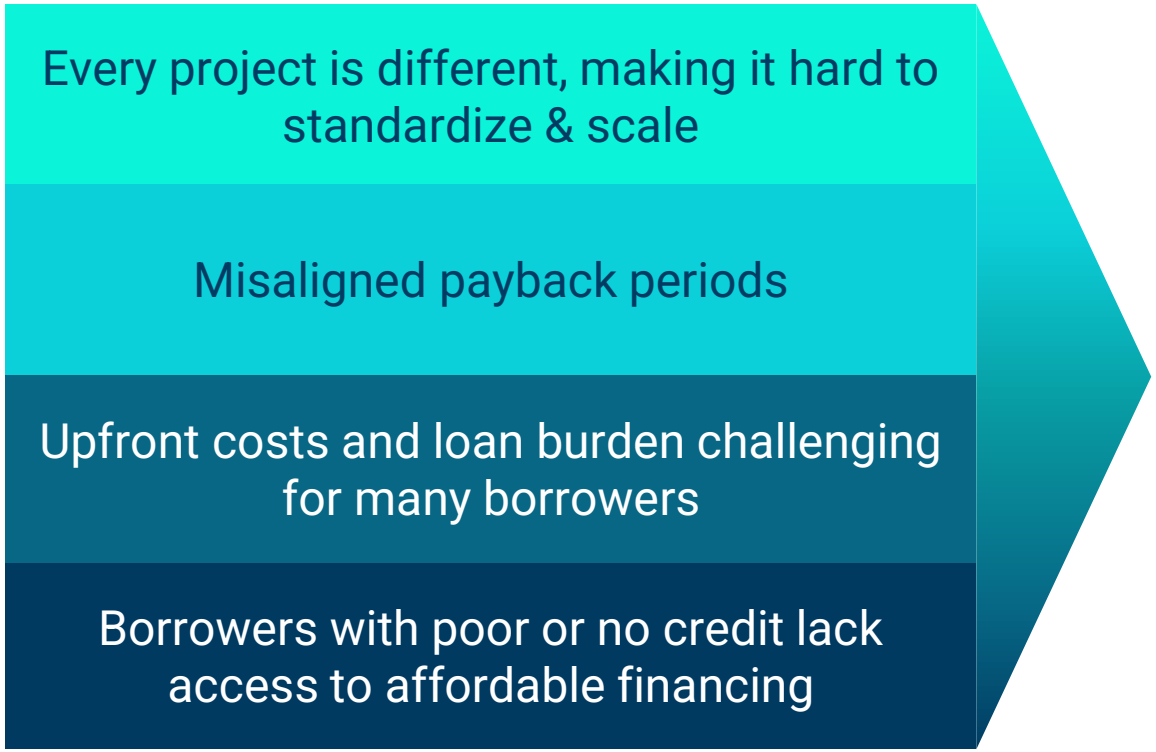


Without approaches that address systemic barriers, low-income communities at risk of getting left behind during national transition to net-zero

Financing clean energy projects is challenging

Especially in low-income communities, the road to net-zero has bumps and potholes

Financing challenges….



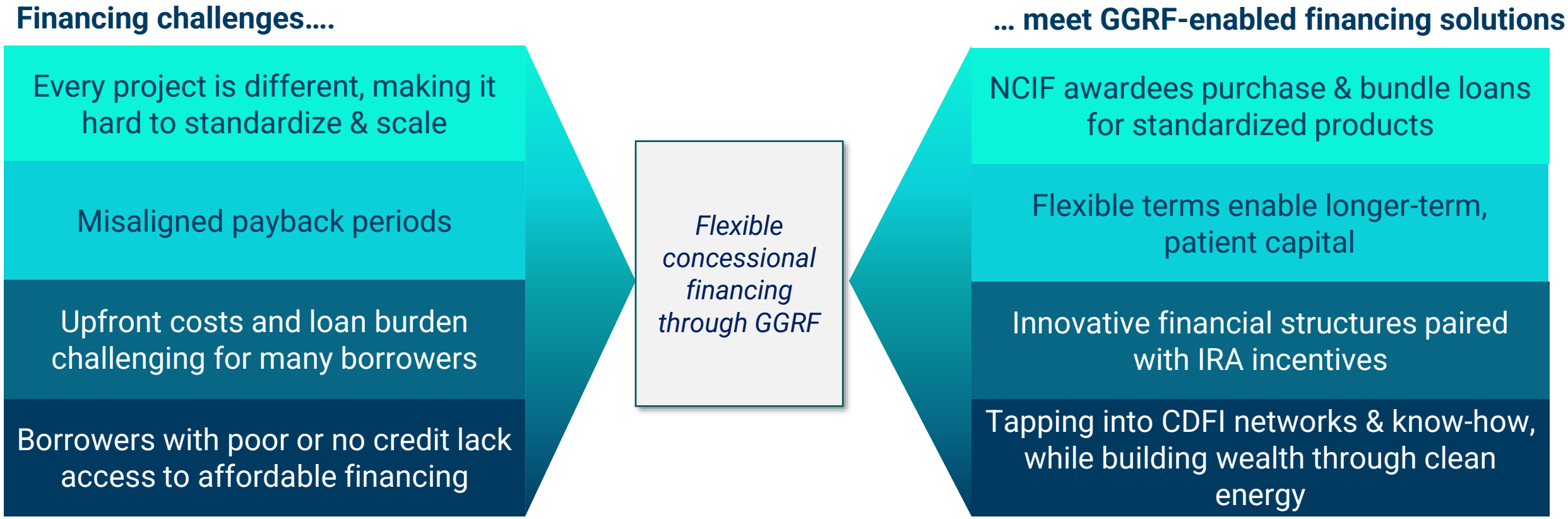
Contribute to underinvestment in clean, cost-saving technologies for households, small businesses, and communities

GGRF is $27B investment to deliver an equitable climate transition with three main objectives

Largest ever climate investment low-income communities has loftier goals than emissions reductions

1. Reduce greenhouse gas emissions & other air pollutants
2. Deliver benefits to American communities, particularly low-income communities
3. Mobilize financing for additional project deployment

GGRF helps address historical barriers to efficiently financing clean energy projects



GGRF is a flexible enabler; not a magic wand

GGRF can unlock impact at scale, but it has very specific use cases and objectives

Project-Level Concessional Finance for More Green Projects in More Places

Financial assistance intended as a marginal contribution for projects to pencil out

Market-Building and Technical Assistance Grants Contribute to Enabling Environments

Limited resources available to create conditions for sustained project pipelines that benefit communities

Program-Level Impacts Add Up to Market Transformation

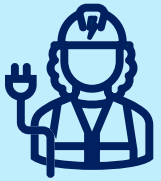
Over time and overall, GGRF should offer replicable proof points, adjust risk misperceptions, and build scale that drives down cost of capital

GGRF succeeds by delivering economic outcomes through clean energy

Accelerate bankability of clean energy projects

Attract private capital to previously overlooked markets

Build wealth through new approaches to clean energy financing



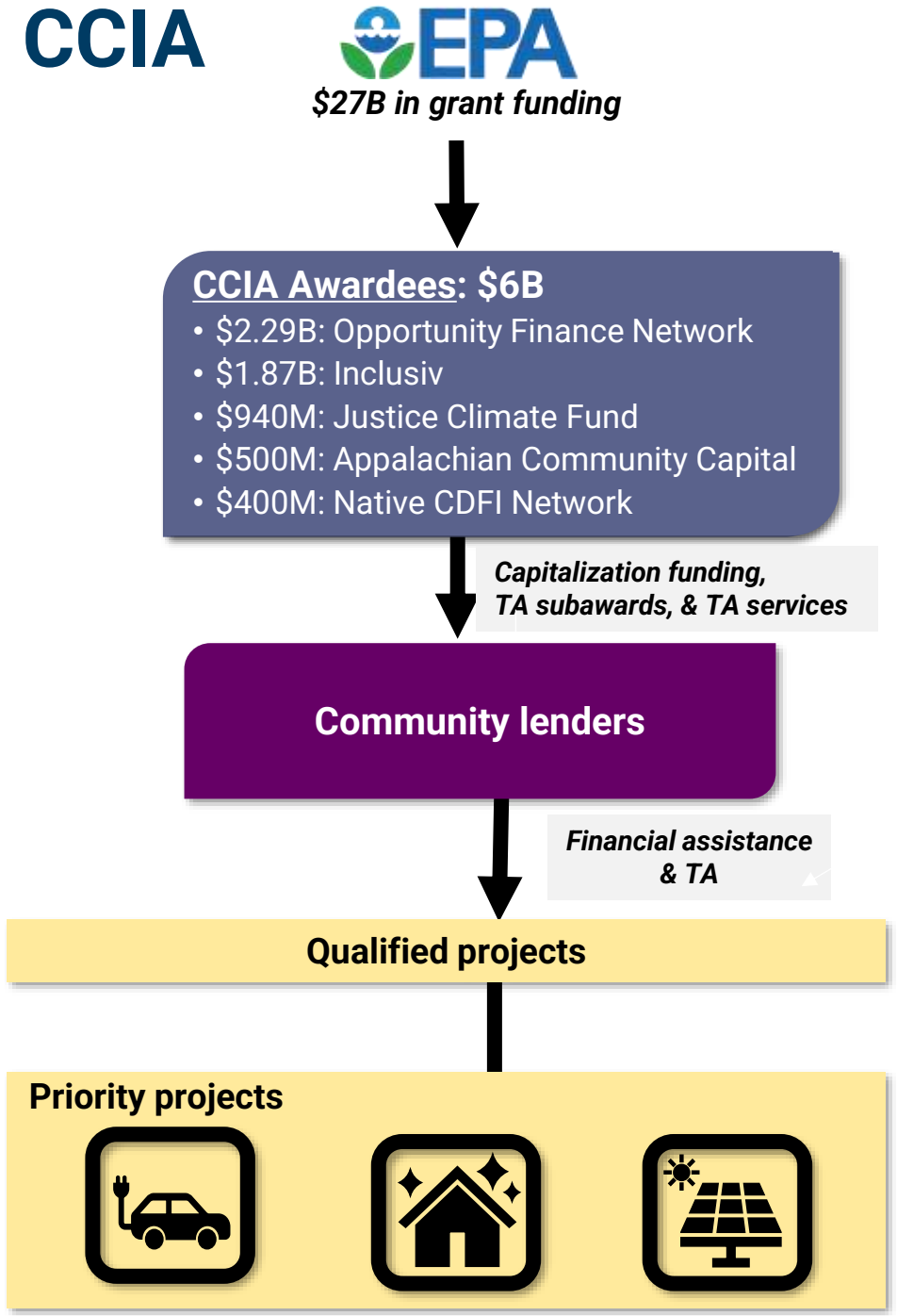
Foster green jobs to capture green development benefit

GGRF's $27B is allocated through three programs

	National Clean Investment Fund (NCIF)	Clean Communities Investment Accelerator (CCIA)	Solar for All
Funding Amount:	**$14B**	**$6B**	**$7B**
Awardees:	3 national nonprofit financing organizations	5 hub nonprofits	60* local, state, and tribal governments, and eligible nonprofits
Mandate:	Create **centralized, long-term** clean energy financing institutions	**Expand capacity of community lenders** to ensure financing for clean energy projects in low-income and disadvantaged communities (LIDCs)	Create, maintain, or expand **solar-financing programs** for their constituents
LIDC Allocation:	At least 40%	100%	100%
Fund Uses:	• Financial assistance • Market-building activities • Pre-development • Program administration	• Capitalization funding • Technical assistance sub-awards and services • Program administration	• Financial assistance • Project deployment technical assistance • Program administration

GGRF Capital Flows: CCIA

CCIA Awardees make **subawards to community lenders** who use the subgrants for i) technical assistance, and ii) providing workable financial products for qualified, priority projects

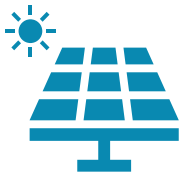


Qualified Projects Must Meet Six Criteria

1. Would **reduce or avoid GHG emissions** consistent with US climate goals
2. Would **reduce or avoid emissions of other air pollutants**
3. **May not otherwise have been financed**
4. Would **mobilize private capital**
5. Is a **commercial technology**
6. Would **deliver additional benefits** in one or more qualified categories

- climate change
- clean energy and energy efficiency
- clean transportation
- affordable and sustainable housing
- training and workforce development
- remediation and reduction of legacy pollution
- development of critical clean water infrastructure

Priority project categories



Distributed Energy Generation and Storage

Power generation, and/or storage technologies, and carbon-free enabling infrastructure

Examples:

- Residential rooftop solar
- Community wind and solar
- Fuel cells
- Distributed generation and storage assets that support microgrids

Net-Zero Buildings

Retrofits for existing buildings that contribute towards them becoming net-zero or construction of new net-zero buildings in LIDACs (residential, commercial, industrial, etc.)

Examples:

- Affordable family housing decarbonization
- Decarbonization retrofits as adaptive reuse of existing buildings
- New construction of net-zero residential building

Zero Emission Transportation

Zero-emission transportation modes and their enabling infrastructure, especially in communities overburdened by diesel pollution and particulate matter concentration

Examples:

- Charger deployment
- Micromobility modes of transportation
- Zero-emission Medium and heavy – duty vehicles

How community lenders deliver & benefit from GGRF

Balance sheet capital for green projects

Green Consumer Loans
- Affordable credit for clean tech & retrofits
- Tax credit & rebate bridge loans

Green Small Business Loans
- For operations (e.g., buildings, fleets, etc.)
- For business models (e.g., new skills, new markets)

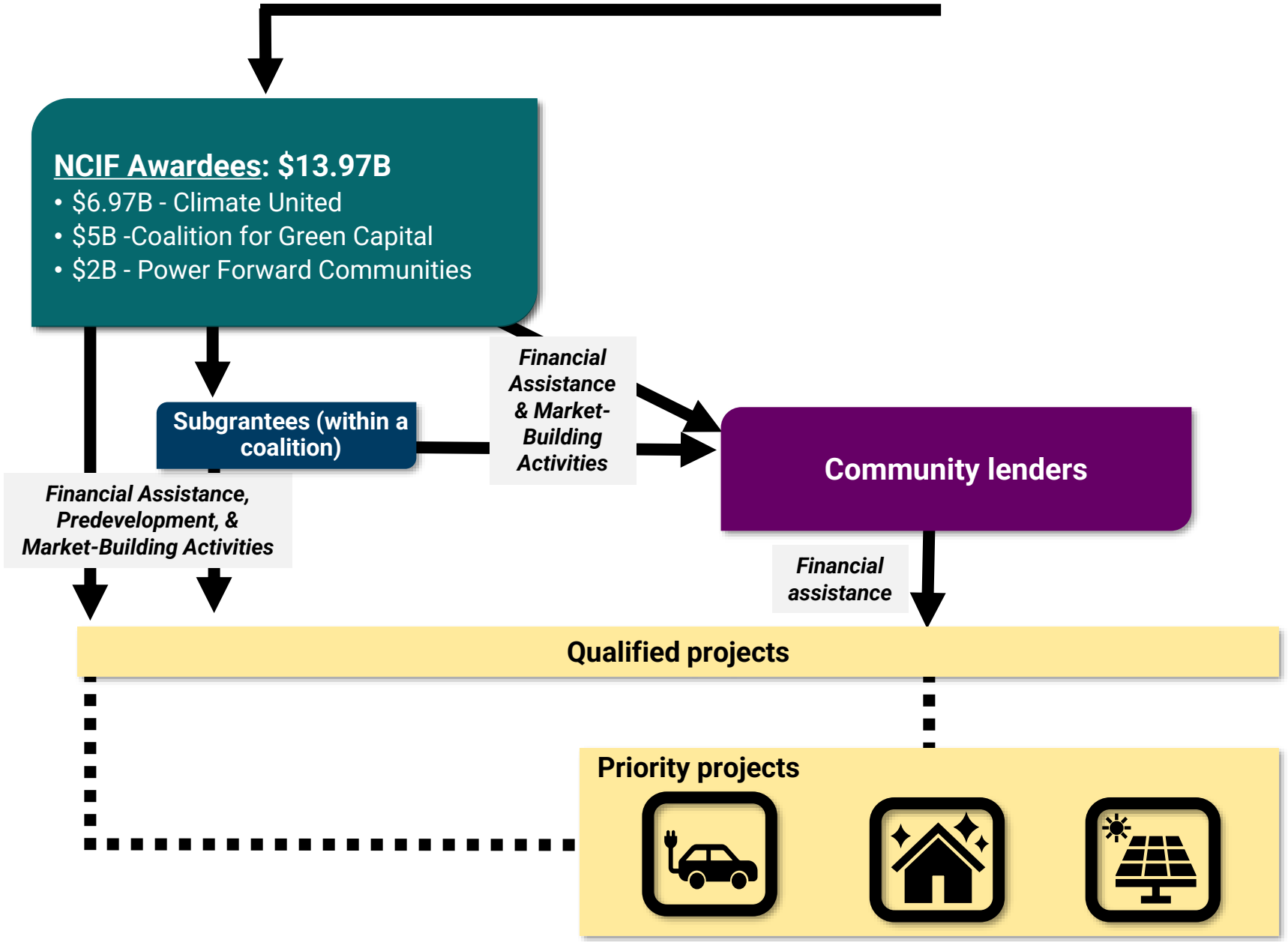
Community revitalization through affordable, wealth-building clean energy access

Stronger balance sheets to crowd in more capital over time

Technical assistance and market-building resources

GGRF capital flows: NCIF

$27B in grant funding



NCIF Awardees have a **flexible, scalable financing toolkit** to make direct investments in qualified projects, purchase loans from and provide balance sheet capital to community lenders, and other market interventions and credit enhancements.

GGRF capital flows

EPA

$27B in grant funding

NCIF Awardees: $13.97B
- $6.97B - Climate United
- $5B -Coalition for Green Capital
- $2B - Power Forward Communities

CCIA Awardees: $6B
- $2.29B: Opportunity Finance Network
- $1.87B: Inclusiv
- $940M: Justice Climate Fund
- $500M: Appalachian Community Capital
- $400M: Native CDFI Network

Solar for All Awardees (SFA): $7B
- 60 awards to states, municipalities, territories, Tribal governments, and eligible nonprofit lenders

Financial Assistance & Market-Building Activities

Subgrantees (within a coalition)

Financial Assistance, Predevelopment, & Market-Building Activities

Capitalization funding, TA subawards, & TA services

Community lenders

Financial assistance

Financial assistance & TA

Financial assistance & Project Deployment TA

Qualified projects

Priority projects

Eligible technologies:
Residential solar & enabling upgrades

Climate-aligned community-led financing can reinforce economic development

BUSINESS & INVESTMENT ATTRACTION

Places that foster the right market conditions for GGRF-eligible projects are more likely to receive funds; EDOs can meet the influx of GGRF-fueled capital supply by proposing sites for GGRF-eligible projects

WORKFORCE DEVELOPMENT

Partnering with GGRF awardees who have funds earmarked for workforce development plans can build efficiencies and support effective local- or regionalization of national programs.

INFRASTRUCTURE DEVELOPMENT & RETROFITS

GGRF supports investments in infrastructure development (e.g., EV charging and public transit), as well as retrofitting EDO-owned building stock.

BUSINESS RETENTION & EXPANSION

EDOs can engage local businesses on how to use GGRF funds to lower operational costs, reduce financial risks, and introduce new revenue streams

MN can take steps to optimize benefit from GGRF

Collaboration can help create conditions to attract GGRF funding & associated benefits

Identifying and developing pipeline projects

- Identify and promote projects with greatest economic/community development benefits
- Streamlined representation of state plans and opportunities to NCIF awardees

Supporting Minnesota CDFIs to receive GGRF funding

- Assist CDFIs in making initial green loans, improving their chances of receiving future subawards
- Support pipeline identification and CDFI loan participations
- Collaborate with national groups on trainings and technical assistance

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City of Lakes
MINNESOTA POLLUTION
CONTROL AGENCY
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AEDA
EMPLOYMENT AND
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Bemidji
STATE UNIVERSITY
APEX
gets business
City of
Fergus
Falls
Minnesota
ARDC
Planning
A Division of ARDC
City of
RED WING
THE
McKNIGHT
FOUNDATION
SOUTHWEST INITIATIVE
FOUNDATION
Shared Capital
Cooperative
Minnesota
INTERFAITH
POWER & LIGHT
MCCD
Metropolitan Consortium
of Community Developers
Saint Paul
PORT AUTHORITY
COMMERCE
DEPARTMENT
MMCDC
Midwest Minnesota
The Nature
Conservancy
BROOKLYN
CENTER
AT THE CENTER
Itasca County
Minnesota
EVER-GREEN
ENERGY
Twin Cities
Habitat
for Humanity
SRDC
MANAGEMENT
AND BUDGET
CLIMATE INNOVATION
FINANCE AUTHORITY
MINNESOTA
CDFI COALITION
clean energy
economy mn
SUNRISE
BANKS
WOMEN VENTURE
West Central
Initiative
African
Development
Center
of Minnesota
NeighborWorks
HOME PARTNERS
Northwest
Minnesota
FOUNDATION
East Side
REGIONAL
DEVELOPMENT
COMMISSION
usbancorp
Impact Finance
MINNEAPOLIS
FOUNDATION
SHERBURNE
COUNTY
REGION FIVE
Development Commission
RAMSEY
COUNTY
Minnesota
Venn Foundation
solarinformatics
MTL
NDC
NCF
People's Energy
Cooperative
propel
nonprofits
TRANE
Extension
Wildflower Schools
REWIRING
AMERICA
R9

Day 2: Clean Energy Opportunities and Available Incentives

RMI – Energy. Transformed.

Agenda (Day 2)

Time	Activity
8:50	Neighbor Meet & Day 1 Reflections
9:00	Keynote Speaker
9:15	Solar Energy and Storage Projects
11:00	Break
11:30	IRA Programs for Clean Energy and Cleantech Projects
12:30	Lunch
1:30	IRA Programs for Clean Energy and Cleantech Projects
4:00	Discussion & Reflection
4:30	Synthesis & Close

What is a question you are holding from Day 1 that you hope is addressed today?

Was there something your learned that surprised you about GGRF or IRA?

Solar Energy and Storage Projects

RMI – Energy. Transformed.

Menti

We are going to use an interactive polling tool to capture thoughts and ideas throughout the convening. You should have already opened this link at registration but using a device (phone or computer):

- **Go to menti.com**
- **Enter the following code: 3976 2816**
- **Follow along and answer the questions on screen!**

- **If at any point you want to submit a question, navigate to the "Open Q&A" button to submit a question**

Agenda

Solar and Storage Finance 101

IRA Programs for Solar and Storage

Financing Gaps for LMI Households

Solar for All & MN Examples

1

There are four common types of solar projects

	Residential Solar	Commercial Solar	Community Solar	Utility Solar
				
Scale	3-11 kW [1]	100 kW - 2 MW [1]	Typically < 5 MW [2]	>5 MW [1]
Average Price[3]	$3.40/Watt	$1.62/Watt	Varies	$1.04/Watt
Average Upfront Cost[4]	$10k - 25k	$162k - $3M	Varies	$5M - $104M
Location	Typically on rooftops	Rooftops, ground mounts, or solar carports	Rooftops, ground mounts, or solar carports	Off-site solar farms
Electricity Usage	The electricity generated offsets the homeowner's own energy consumption.	The electricity generated offsets the business's energy costs.	Individuals or businesses subscribe to a portion of the solar output and receive credits on their electricity bills.	The electricity generated is sold to the utility company and distributed across the grid.

Can be paired with battery storage

Sources: 1. NREL, *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks: Q1 2021*. 2. SEIA, *Community Solar*. 3. SEIA, *Solar Industry Research Data*. 4. The average upfront costs here do not include tax incentives. Image source: Freepik.

Multifamily folks may fall into either category

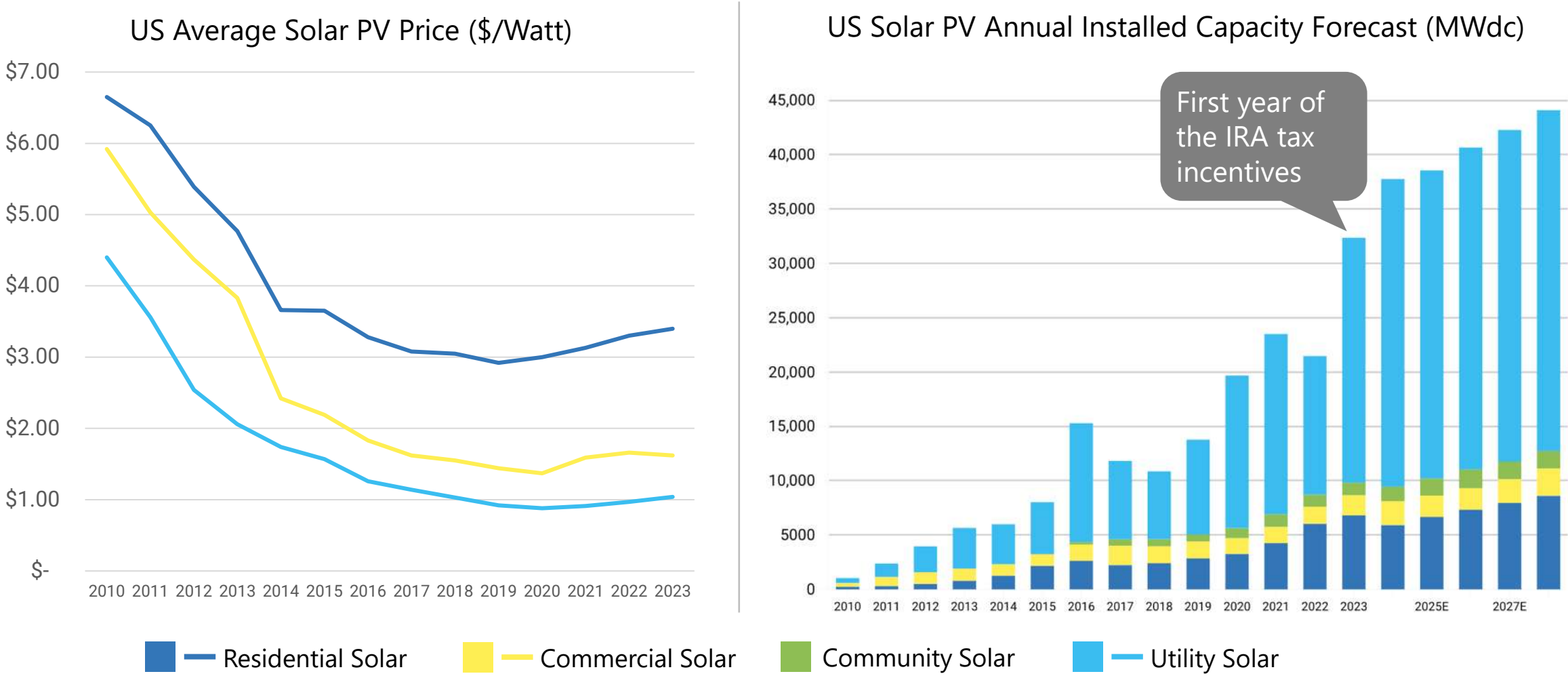
	Residential Solar	Commercial Solar	Community Solar	Utility Solar
				
Scale	3-11 kW [1]		Typically < 5 MW [2]	5-100 MW [1]
Average Price[3]	$3.40/Watt		Varies	$1.04/Watt
Average Upfront Cost[4]	$10k - 24k		Varies	$5M - $104M
Location	Typically on rooftops	Rooftops, ground mounts, or solar carports	Rooftops, ground mounts, or solar carports	Off-site solar farms
Electricity Usage	The electricity generated offsets the homeowner's own energy consumption.	The electricity generated offsets the business's energy costs.	Individuals or businesses subscribe to a portion of the solar output and receive credits on their electricity bills.	The electricity generated is sold to the utility company and distributed across the grid.

Special Note: Multifamily solar can be either residential solar or community solar, depending on its ownership structure

Can be paired with battery storage

Sources: 1. NREL, *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks: Q1 2021*. 2. SEIA, *Community Solar*. 3. SEIA, *Solar Industry Research Data*. 4. The average upfront costs here do not include tax incentives. Image source: Freepik.

Thanks to lower solar PV pricing and more tax incentives, the cumulative installed solar capacity in the US is expected to quadruple over the next decade

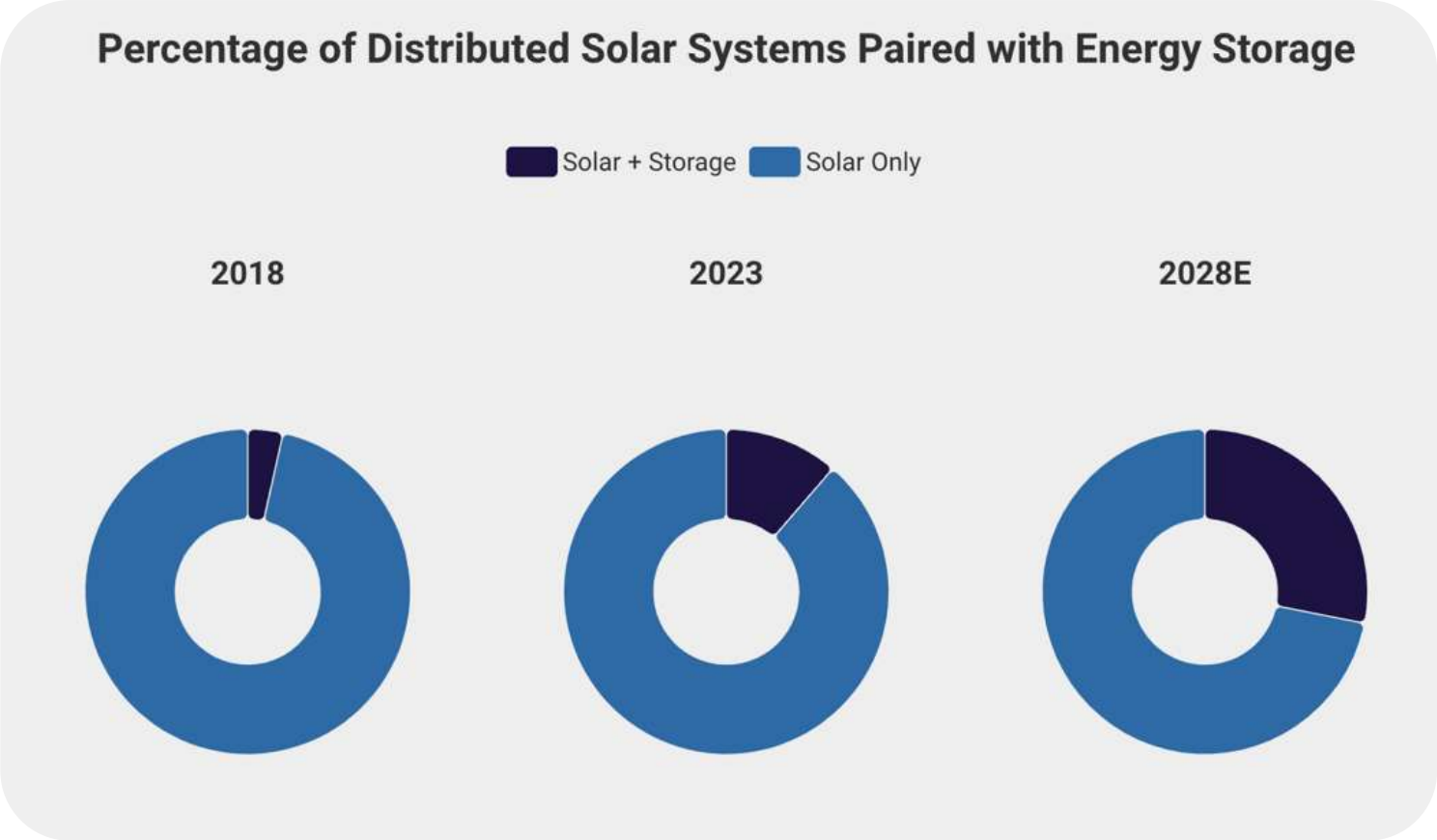


Source: SEIA, *Solar Industry Research Data*.

Meanwhile, battery storage is increasingly paired with all forms of solar for greater financial and energy resilience

By 2028, **28%** of all new distributed solar capacity will be paired with storage, compared to under **12%** in 2023.

- Providing backup power and increasing resilience
- Managing evening energy ramps
- Smoothing electricity prices by storing energy when it's cheap and releasing it when it's expensive.[3]



Sources: 1. SEIA, *Solar Industry Research Data*. 2. SEIA, *Solar + Storage*. 3. This only applies to customers eligible for demand charge.

Residents and businesses can procure solar and storage via direct purchase, loans, leases, power purchase agreements, or community solar subscription

	Solar Loans	Solar Leases	Solar Power Purchase Agreements (PPAs)	Community Solar Subscription
Who owns the system?				
Who gets the investment tax credit (§48)?	*Not eligible*			
Who gets the residential clean energy credit (§25D)?		*Not eligible*	*Not eligible*	Possible for  in rare instances [4]
Who operates and maintains of the system?				
What contract duration terms are available?	2-25 years[3]	15-25 years[3]	15-20 years[3]	Typically ~20 years, can be as low as one year [5]
Are monthly payments fixed?	Yes	Yes, but may include an annual escalator	No, payments are on a per kWh basis	Terms can vary.
Is insurance coverage provided?	No	Yes	Yes	Unlikely
Is this available to renters?	No	No	No	Yes

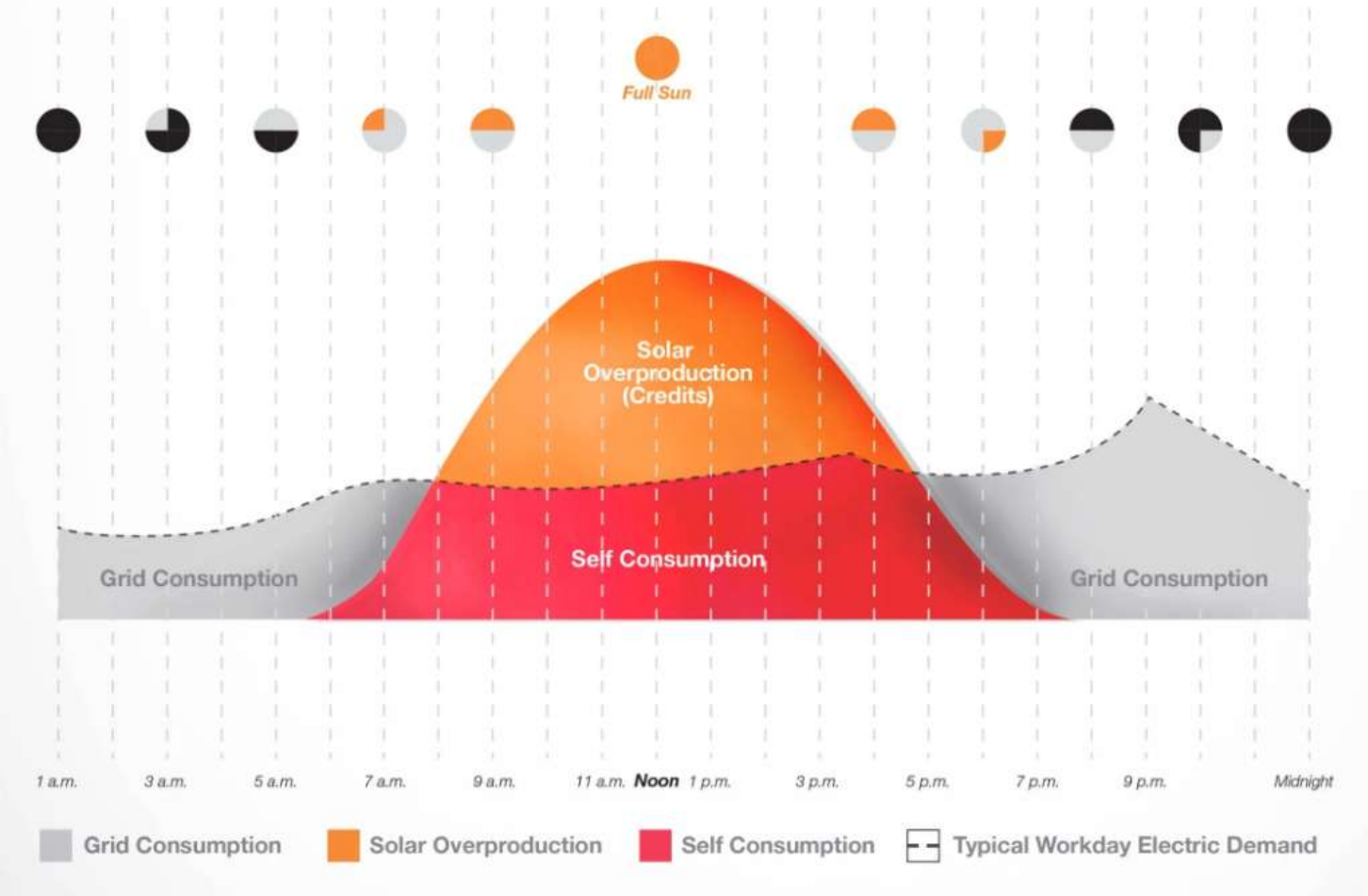
Homeowners or businesses

Third-party developers

Sources: 1. CESA & NYSERDA, *New York Homeowner's Guide to Solar Financing*. 2. SEIA, *The 25D Solar Tax Credit*. 3. CNET. 4. IRS. 5. Dominion Energy, *Virginia Community Solar Pilot Program*.

Some residential and commercial customers who generate their own solar energy can even sell the electricity they are not using back to the grid.

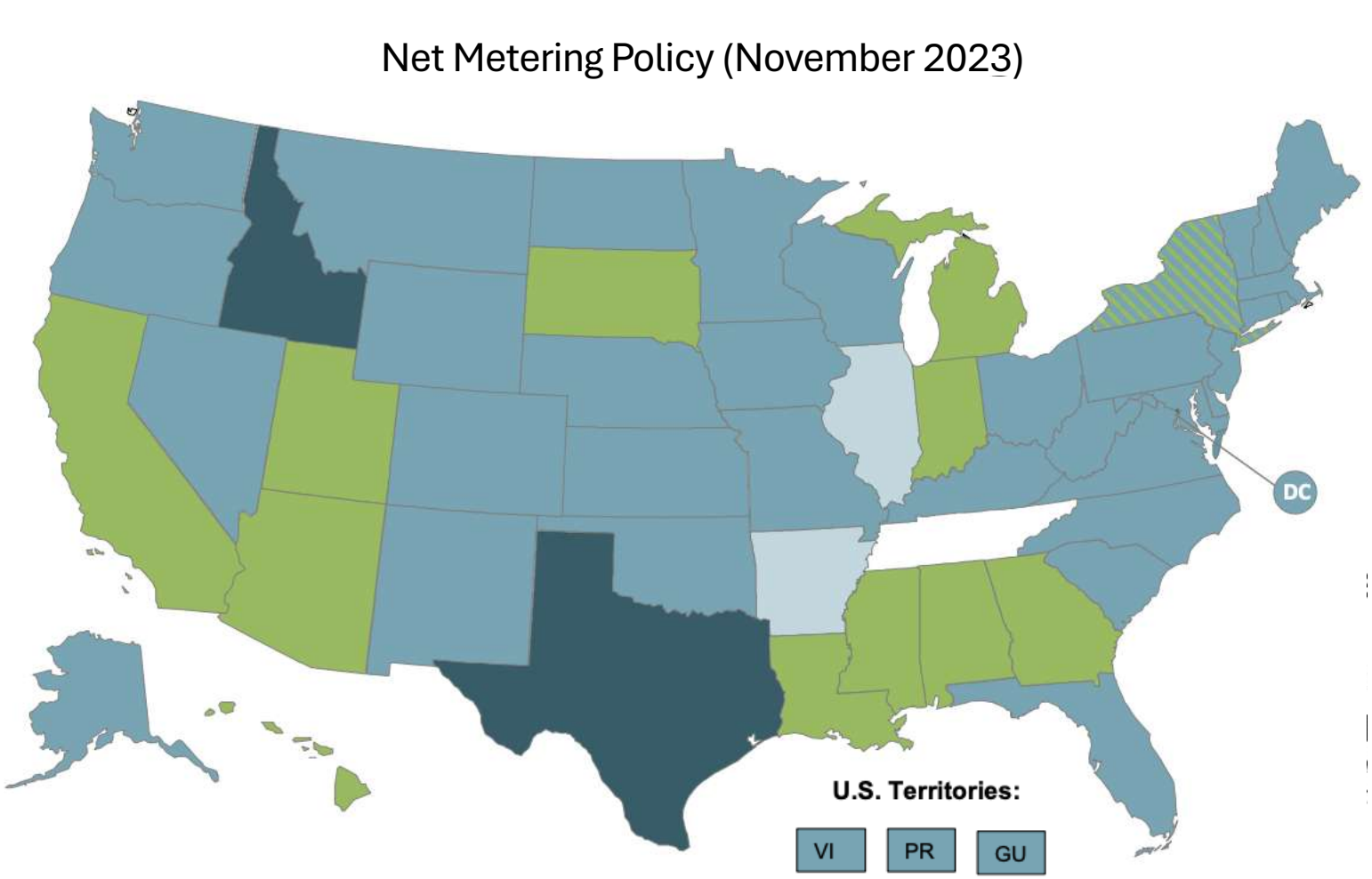
This billing mechanism is called "net metering."



- When solar production > electricity consumption (during daylight hours), the excess energy from solar panels not used in the home or business goes back to the grid.
- This excess energy is accepted by the utility in return for **energy credits**, which will be applied to the customer's account and can be used against future consumption.

Image source: Eagle Point Solar.

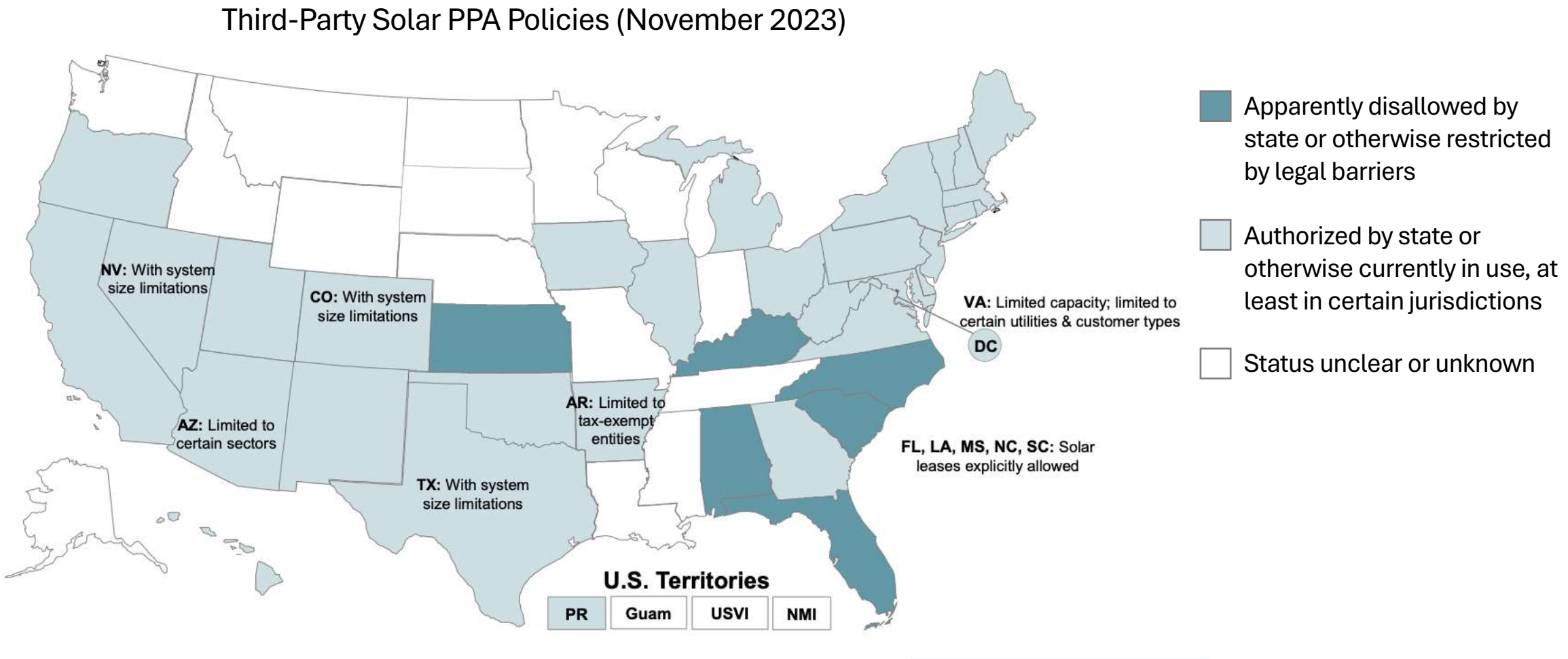
Minnesota has net metering policies that are favorable to the solar owner



- State-developed mandatory rules for certain utilities (34 states + DC+ 3 territories)
- In transition to statewide distributed generation compensation rules other than net metering (2 states)
- Statewide distributed generation compensation rules other than net metering (11 states)
- No statewide mandatory rules, but some utilities allow net metering (2 states)

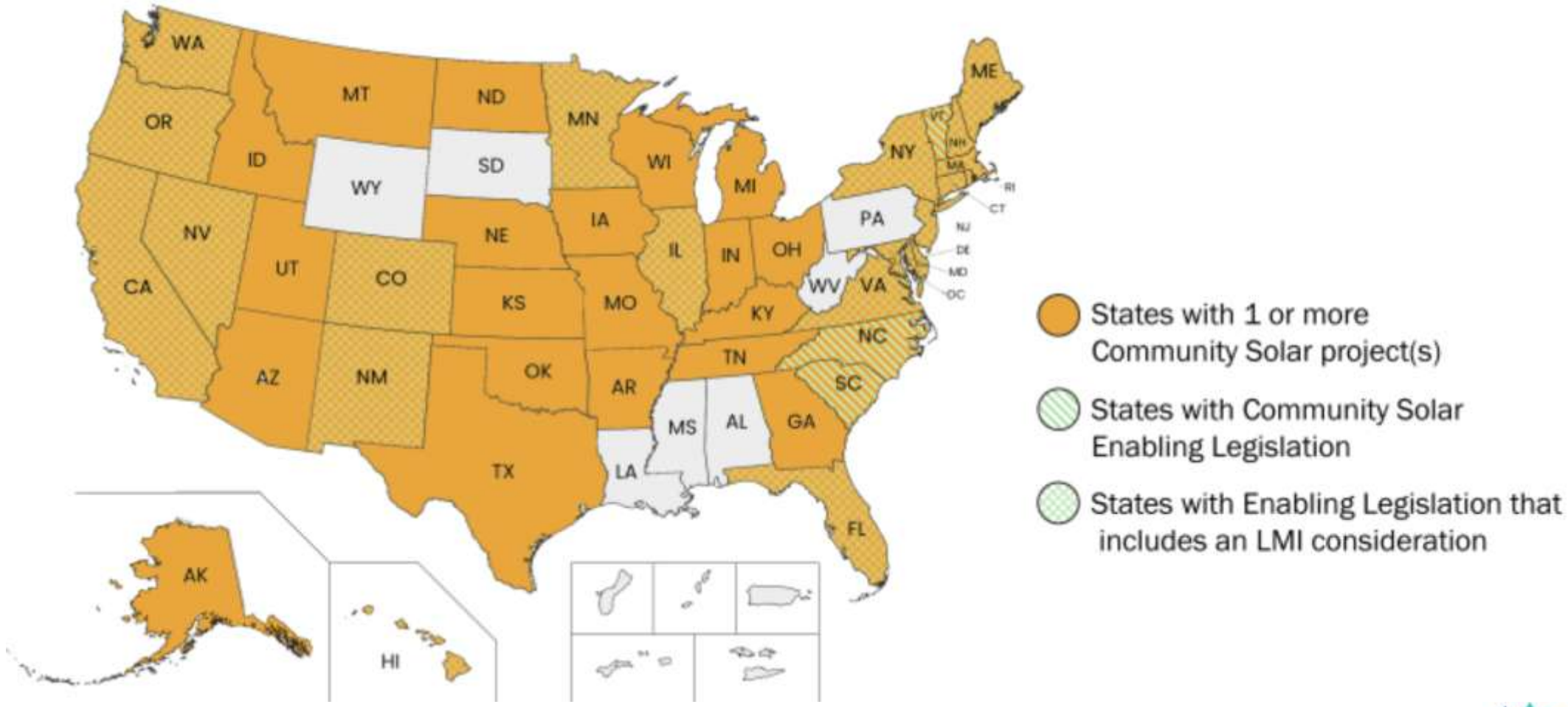
Source: DSIRE, *Detailed Summary Maps*.

Minnesota does not have clear rules on whether third party PPAs are legal, but there are PPAs in Minnesota



Source: DSIRE, *Detailed Summary Maps*.

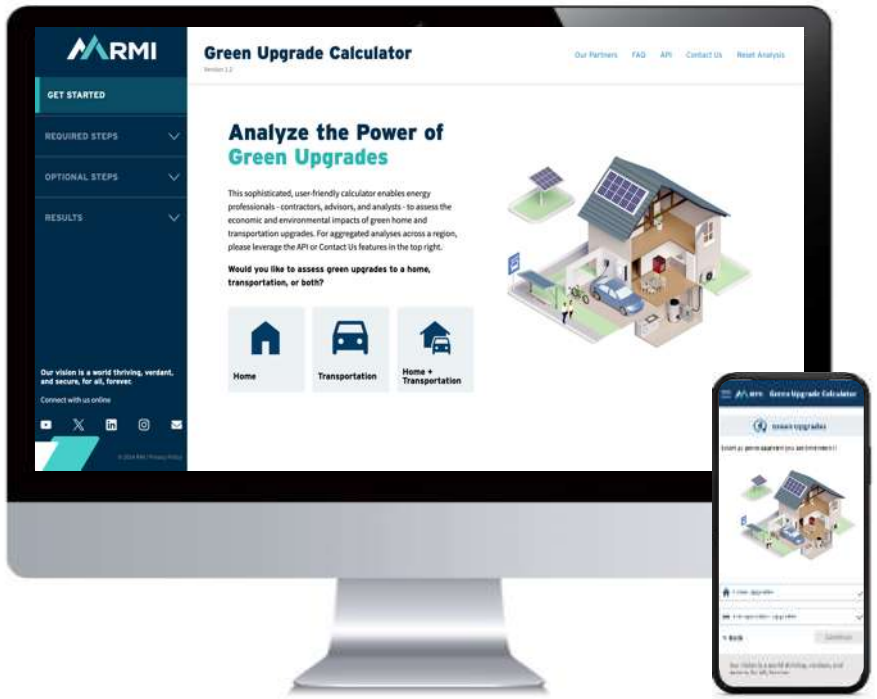
Minnesota has one of the best community solar enabling legislations in the US resulting in 75% of total community solar market being in FL, NY, MA, and MN.



Source: DSIRE, *Detailed Summary Maps*.

To compare the economic and climate impacts of different residential solar financing methods, community lenders can utilize the Green Upgrade Calculator

The Green Upgrade Calculator is a free online tool for energy professionals and analysts to quantify the individual-level impact of various home and transportation upgrades

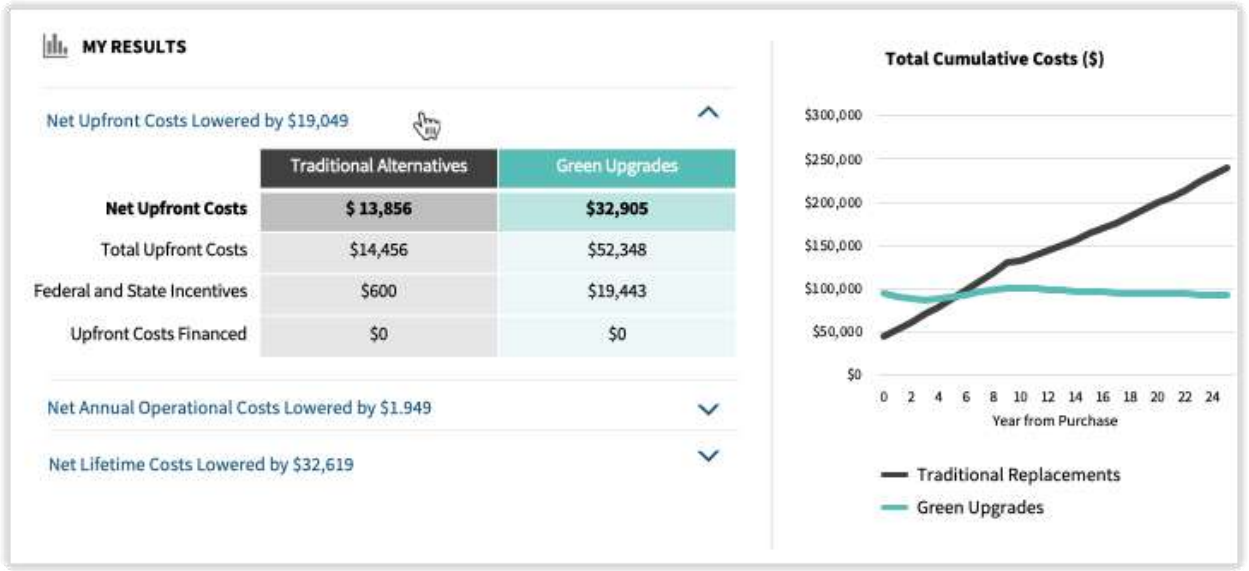


Home

- Rooftop Solar
- Battery Storage
- Community Solar
- Weather ization
- Air Source Heat Pump
- Heat Pump Water Heater
- Induction Range

Transportation

- Electric Vehicle
- Electric Bike
- Public Transit
- Car Free



Agenda

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- **IRA Programs for Solar and Storage**
- Financing Gaps for LMI Households
- Solar for All & MN Examples

Priority Project Categories for GGRF

Distributed Energy Generation and Storage

Power generation, and/or storage technologies, and carbon-free enabling infrastructure

Examples:

- Residential rooftop solar
- Community wind and solar
- Fuel cells
- Distributed generation and storage assets that support microgrids

Net-Zero Buildings

Retrofits for existing buildings that contribute towards them becoming net-zero or construction of new net-zero buildings in LIDACs (residential, commercial, industrial, etc.)

Examples:

- Affordable family housing decarbonization
- Decarbonization retrofits as adaptive reuse of existing buildings
- New construction of net-zero residential building

Zero Emission Transportation

Zero-emission transportation modes and their enabling infrastructure, especially in communities overburdened by diesel pollution and particulate matter concentration

Examples:

- Charger deployment
- Micromobility modes of transportation
- Zero-emission Medium and heavy – duty vehicles

The Inflation Reduction Act (IRA) made residential and commercial Investment Tax Credit (ITC) very different incentives

Residential ITC (25D)	Commercial ITC (48/48E)
30% ITC	30-70% ITC
Non-refundable, nontransferable	Direct pay/transferrable

25D – Residential Clean Energy Tax Credit

Key Notes

- Applicable in both new construction and retrofits
- Roofing materials are not covered (except solar tiles)
- Nonrefundable, nontransferrable
- Labor costs qualify
- No dollar limit
- Tax credit rolls over if full amount can't be captured in year one
- No lifetime limit – credits are on an annual basis
- No prevailing wage requirements

Measure	Amount
Solar PV	30% of qualified expenditures
Solar Hot Water	
Fuel Cells	
Small Wind	
Geothermal HP	
Battery Storage	

Stacking guidance: if stacked with a state rebate, the credit is on post-rebate price. State tax incentive or utility net metering has no impact on 25D value.

The IRA expanded the two tax credits that have been important economic drivers for financing clean energy projects – and extended them to 2035

Production Tax Credit / PTC (45)

10-year credit on the energy produced (now includes solar)

Investment Tax Credit / ITC (48)

Upfront credit on the project's full eligible cost basis (now includes stand alone energy storage)

The commercial renewable tax credit now include “adders” that can stack up to a 70% ITC

Investment Tax Credit with Prevailing Wages

+

“Domestic Content”

+

“Energy Communities”

+

Projects financially benefitting low-income communities

OR

Projects in low-income or Tribal communities

Source: 26 U.S. Code § 48 - Energy credit. Note: While the production tax credit is calculated differently, the incentive ratios stack in a similar fashion.

Domestic content incentives show up in the Inflation Reduction Act in two main ways:

1 As a requirement:

- Clean Electricity Production (45Y) and Investment (48E) projects ≥ 1MW *must* meet domestic content requirements to avoid credit reduction or (eventually) outright elimination

2 As a bonus:

- Clean electricity projects that meet the 45, 45Y, 48 and 48E requirements can claim a 2 or 10% bonus if they meet domestic content requirements.

The “Domestic Content” incentive will spur demand for US made solar, wind, and storage

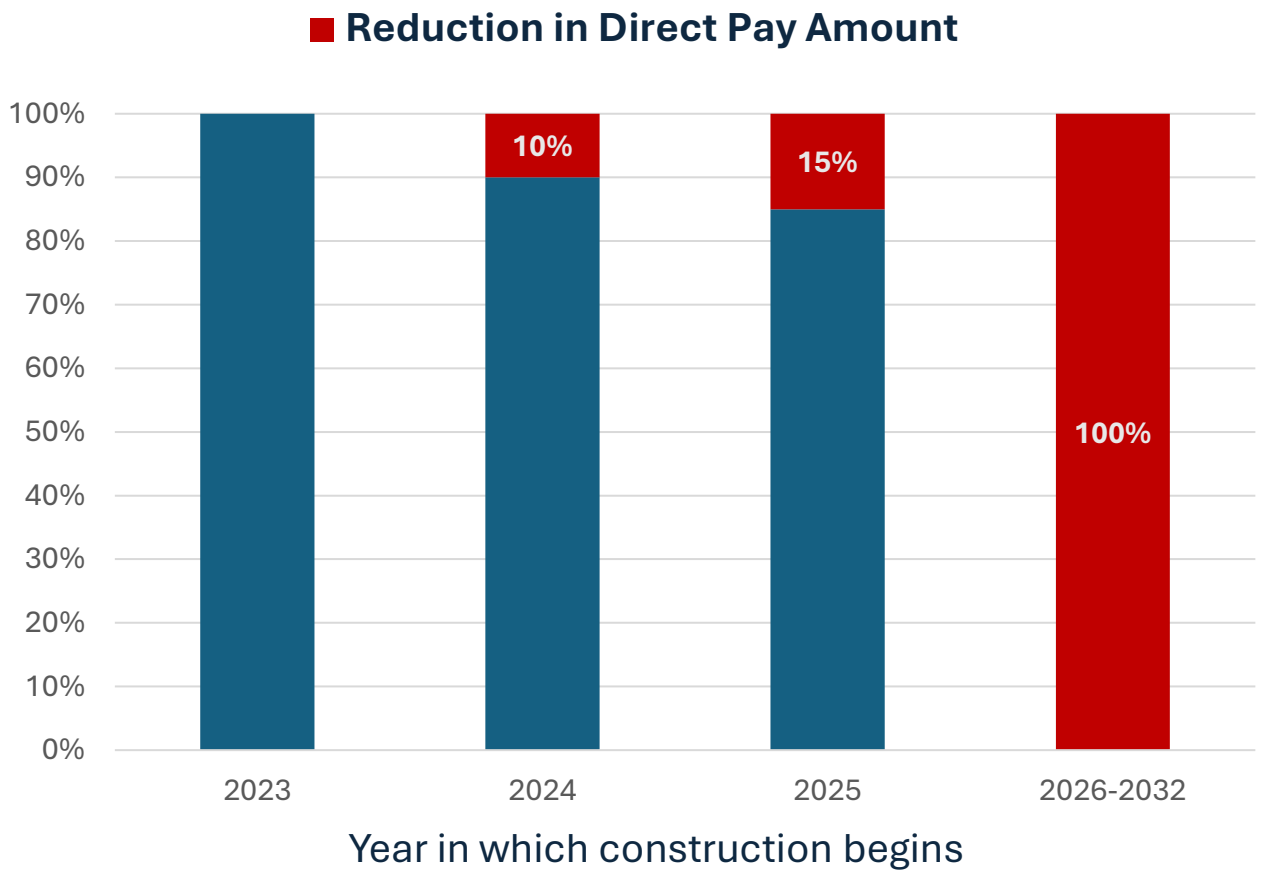
What: “Domestic Content” incentivizes investments into US-made materials

How Much: 10% credit for eligible clean energy project costs

Year	% of Components for Clean Energy	% of Components for Offshore Wind	Steel & Iron
2024	40%	20%	100%
2025	45%	27.5%	100%
2026	50%	35%	100%
2027	55%	45%	100%
After 2027	55%	55%	100%

Source: IRS.

To claim the full value of the credit, 45Y/48E projects ≥1MW must meet domestic content requirements - but there are "outs"



Exemptions:

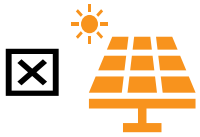
- Projects <1 MW of capacity
- If product(s) is/are unavailable domestically
- If procuring domestic content will increase total project costs by more than 25%

While domestic production of iron and steel is substantial, the output of solar, wind, and storage products remains limited

Current Sourcing for Domestic Components

Key solar components with active domestic production include metallurgical-grade silicon, solar-grade polysilicon, and module materials. For wind energy, major components like nacelle assemblies, towers, and bearings have strong domestic production.

Key Limitations in Domestic Manufactured Products

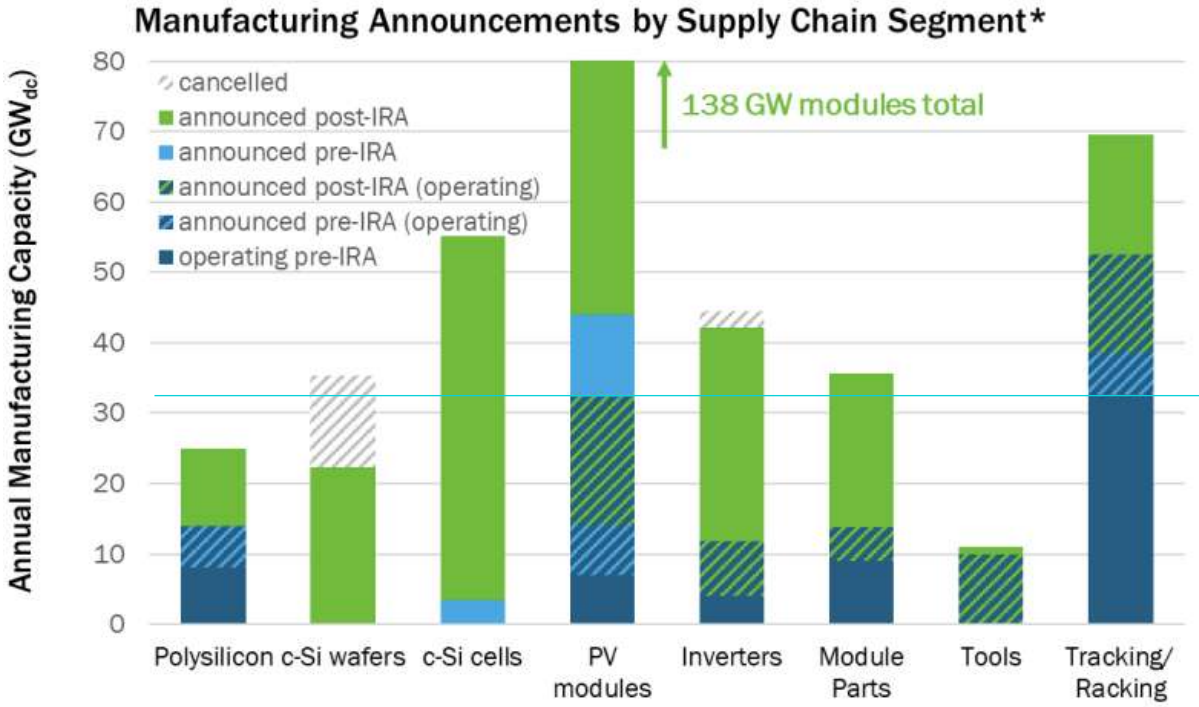


There is no active domestic production of crystalline silicon ingot, PV wafers, or PV cells. The U.S. has limited production capacity for the specialized flat glass used in solar panels, which is a crucial component for solar installations.

The U.S. has a limited supply chain for offshore wind components - there are only two cable facilities and one offshore substation facility producing components for offshore wind. About 15 manufacturing facilities for major offshore wind components have been announced, but many are still under construction.

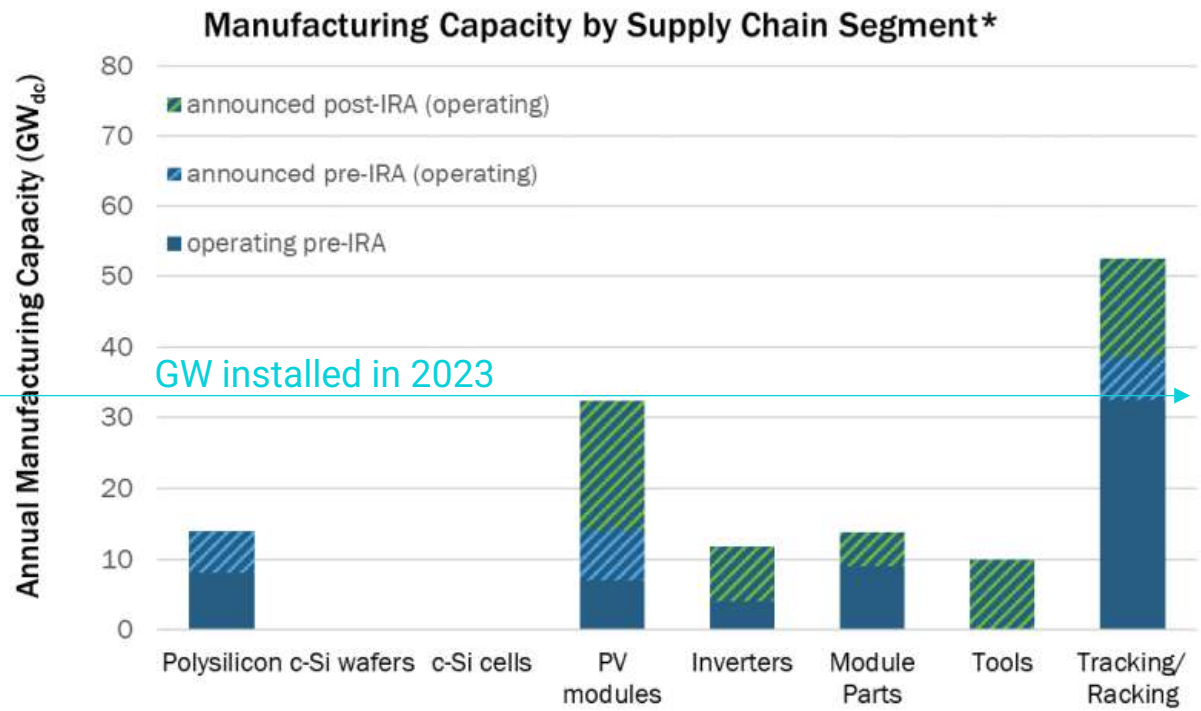
The supply chain for lithium-ion batteries is established but faces limitations - domestic production of key battery materials such as lithium, cobalt, nickel, and manganese is insufficient. Alternative storage technologies like sodium-ion and iron-air batteries are still in the early stages of development and commercial viability.

Since IRA passed, $15B of investments have been announced for manufacturing capacity across the solar supply chain, but more is needed



Sources: U.S. Census Bureau USA Trade Online and internal DOE tracking of public announcements.

*Not all announcements include facility locations, job, operating capacity, or investment numbers.



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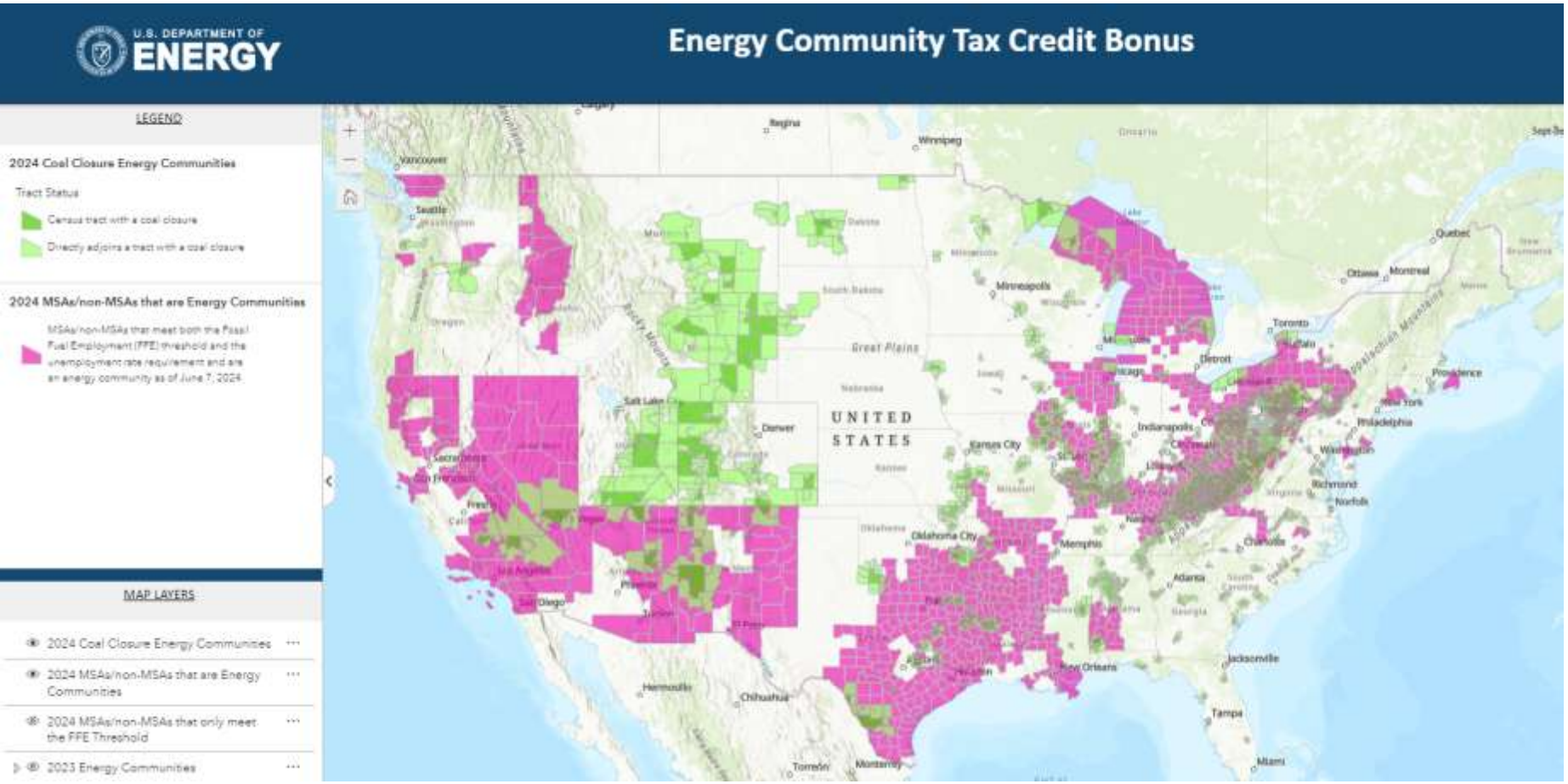
Energy Communities Map 2024



Coal Closure

Brownfield Site

Employment

*Map does not include brownfields

The Low-Income Communities Bonus, 48(e), is the only adder that is not guaranteed

Annual capacity limitation is capped at 1.8 GW

Requires applying and being selected to receive credit. If not awarded credit must reapply the next year

Project must be smaller than 5 MW

Project cannot be placed in service before credit is allocated

10 or 20% bonus depending on criteria

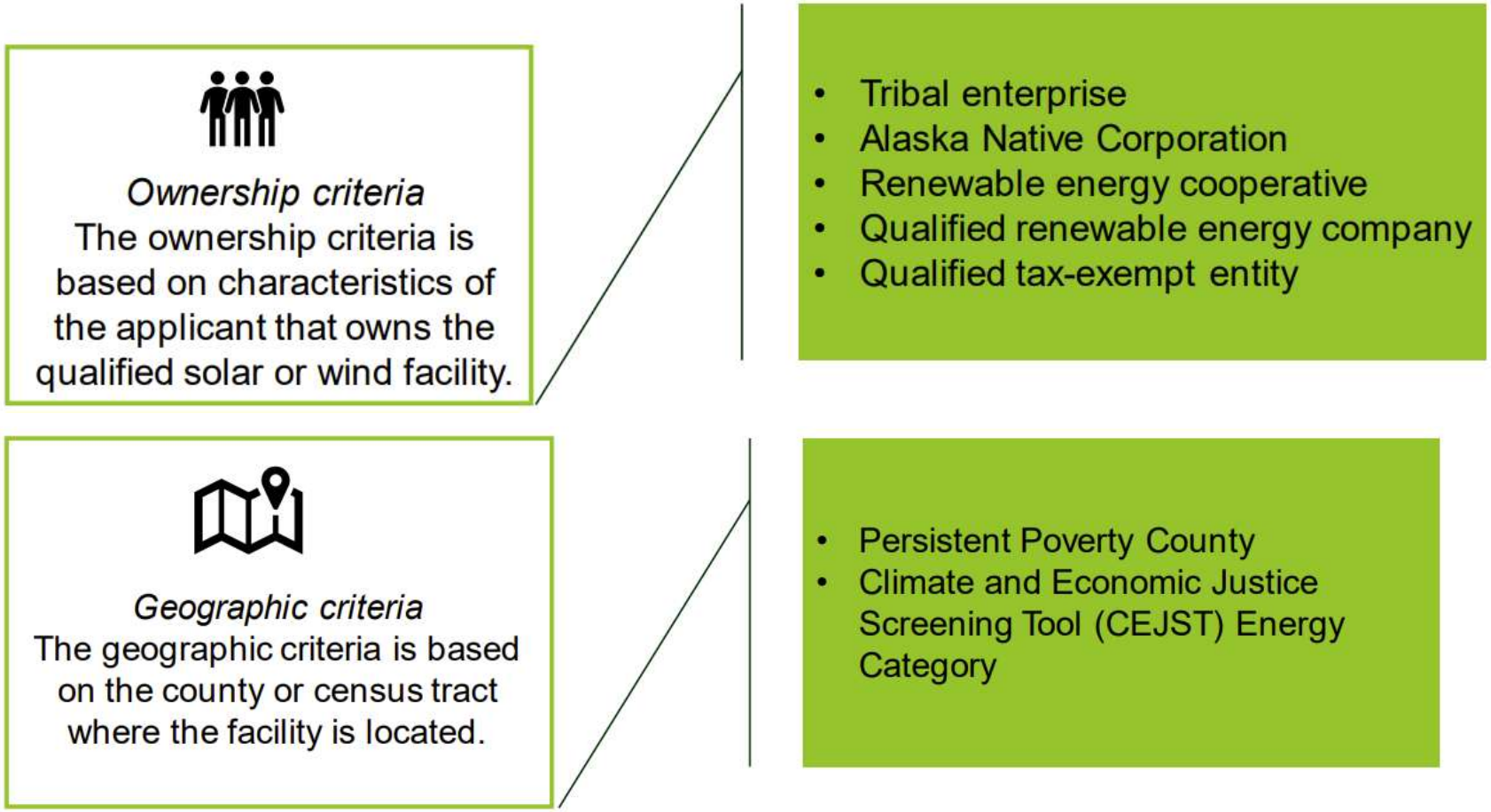
Source: DOE, *Low-Income Communities Bonus Credit Program*. Image source: Freepik.

The Low-Income Communities Bonus Credit Program 48(e) was undersubscribed in 2023 in some categories

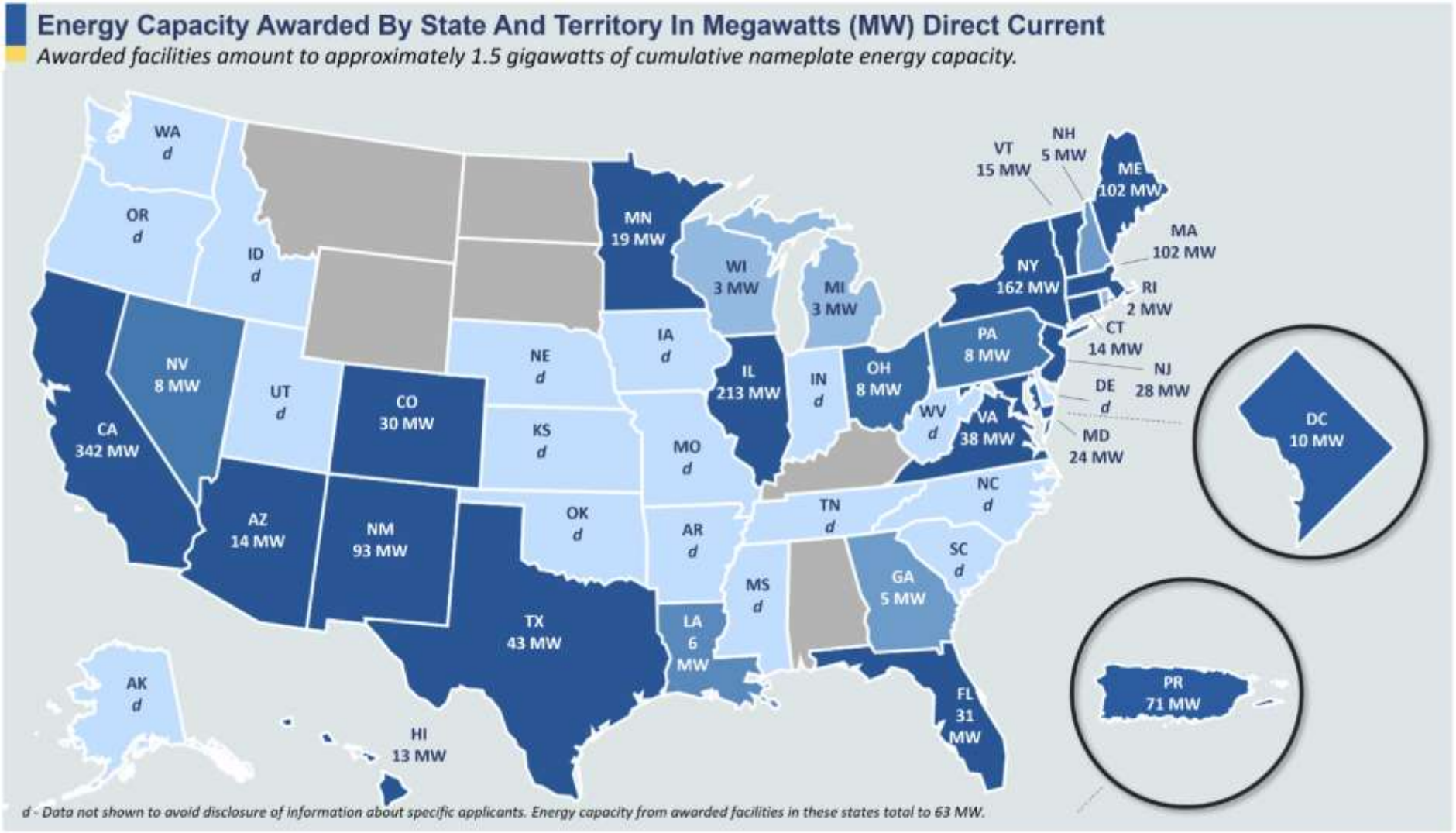
Category 1: Located in low-income community	Category 2: Located on Indian Land	Category 3: Qualified Low-Income Residential Building Project	Category 4: Qualified Low-Income Economic Benefit Project
10% Adder	10% Adder	20% Adder	20% Adder
2023 Allocation: 700 MW	2023 Allocation: 200 MW	2023 Allocation: 200 MW	2023 Allocation: 700 MW
Awarded 2023: 604 MW	Awarded 2023: 40 MW	Awarded 2023: 136 MW	Awarded 2023: 694 MW

Source: DOE, *Low-Income Communities Bonus Credit Program*.

Meeting additional selection criteria is critical to receiving allocation in category 1 and 4



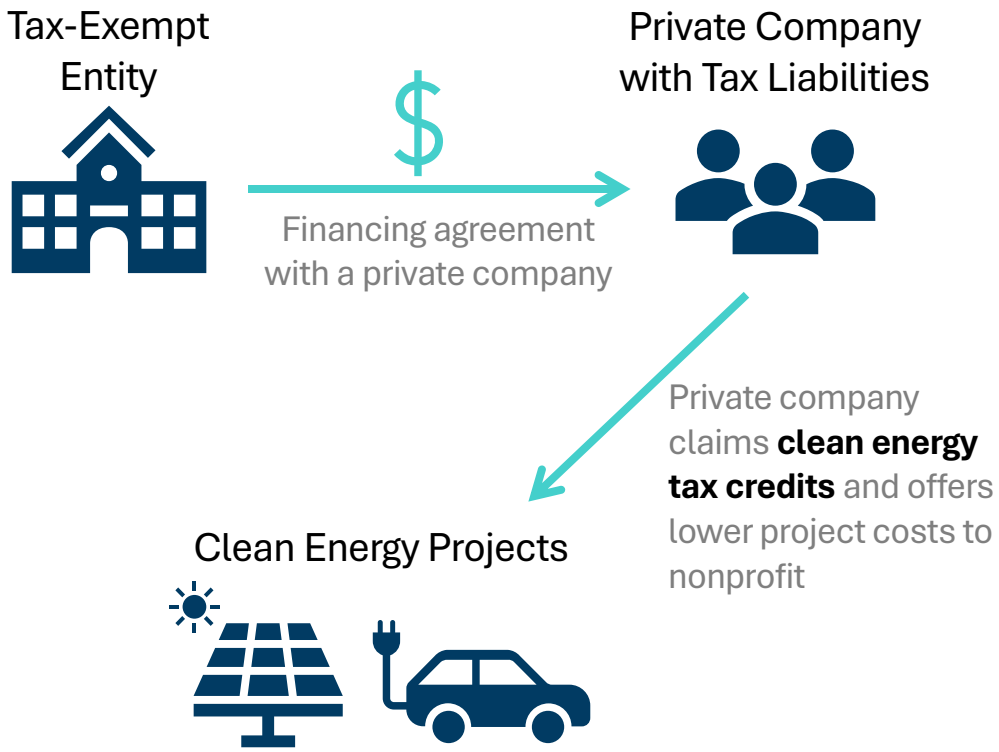
This program resulted in solar low-income uptake across the country, including 19 MW in MN!



IRA creation of direct pay is a gamechanger

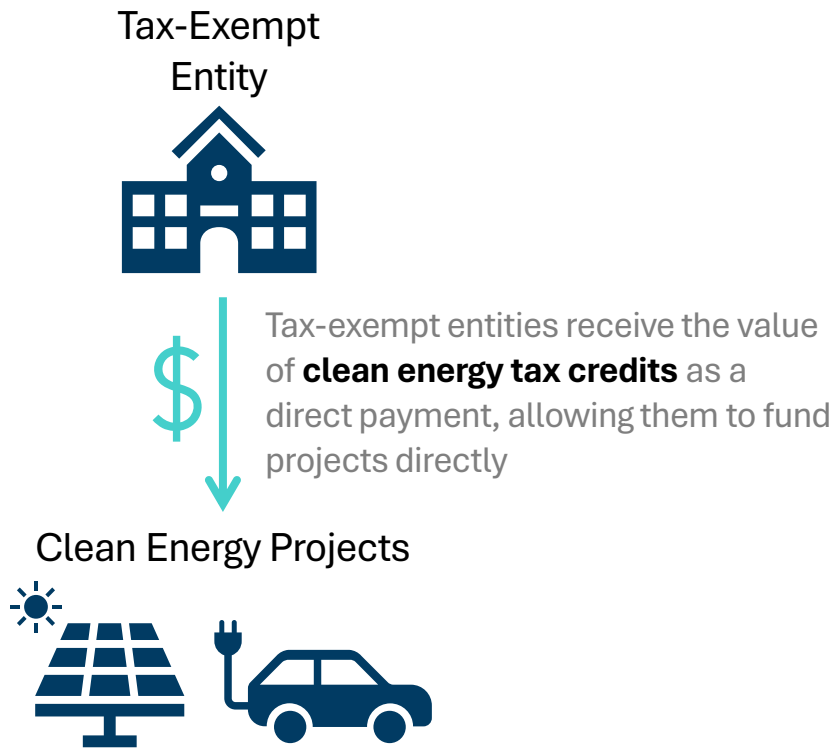
Direct pay allows tax-exempt entities to benefit from clean energy tax credits directly

Before Direct Pay

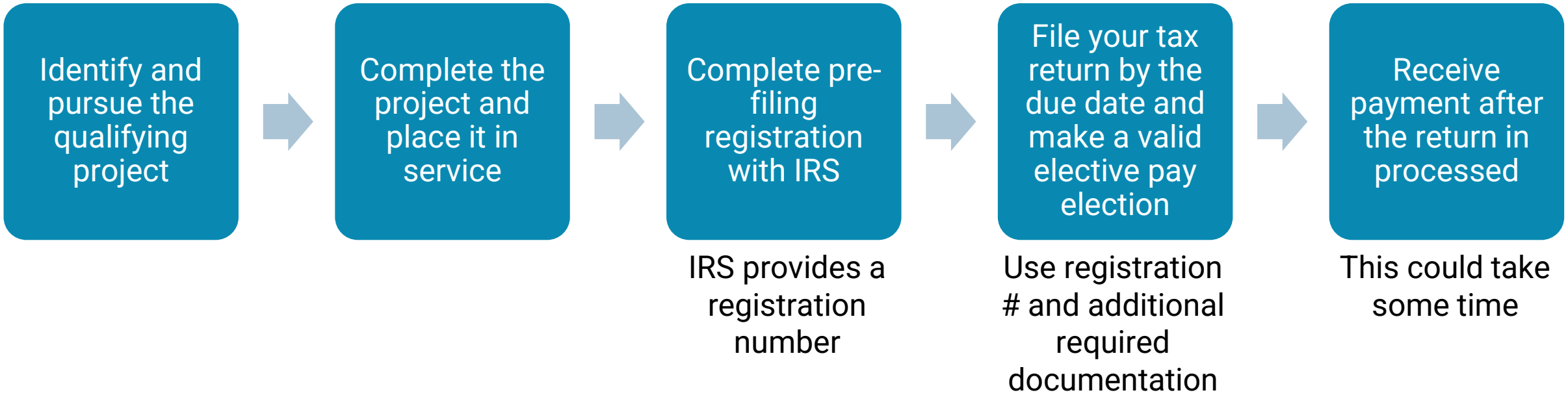


Problem: Fewer incentives passed on to the tax-exempt entity or fewer options to own clean energy projects

After Direct Pay



Direct pay requires close attention to the process – there is little room for error



Entities Not Eligible for Direct Pay Can Utilize Transferability, Which Lowers Transaction Fees

Before Transferability

Entities without enough tax liabilities had to:

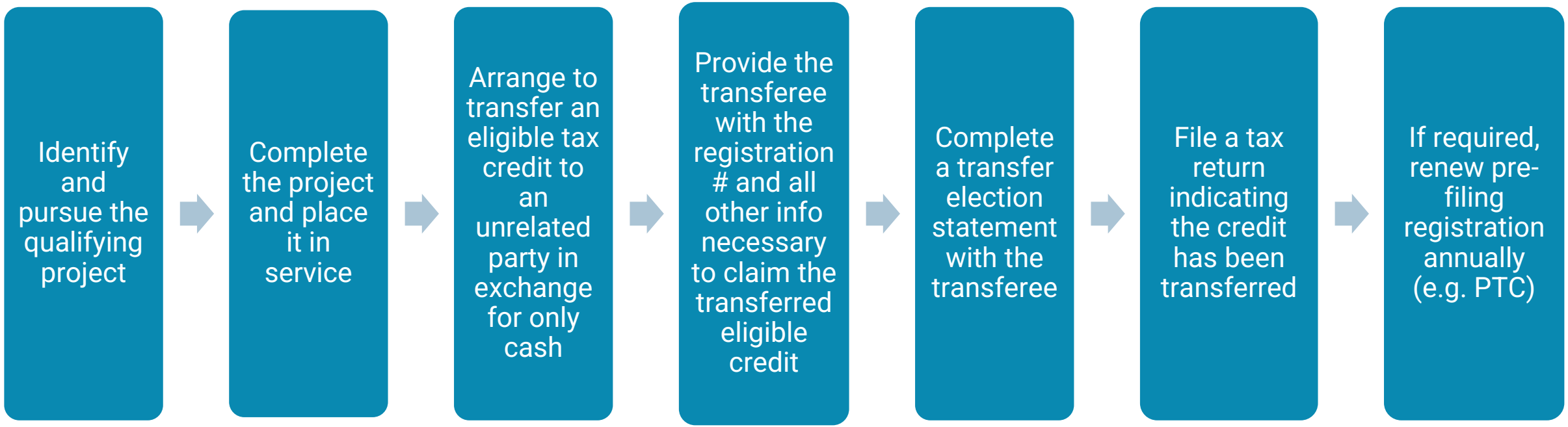
- Pick a tax equity investor from a limited pool of large banks to partner with
- Set up complicated tax equity deals with high transaction fees
- Forfeit a higher % of the clean energy tax credit

After Transferability

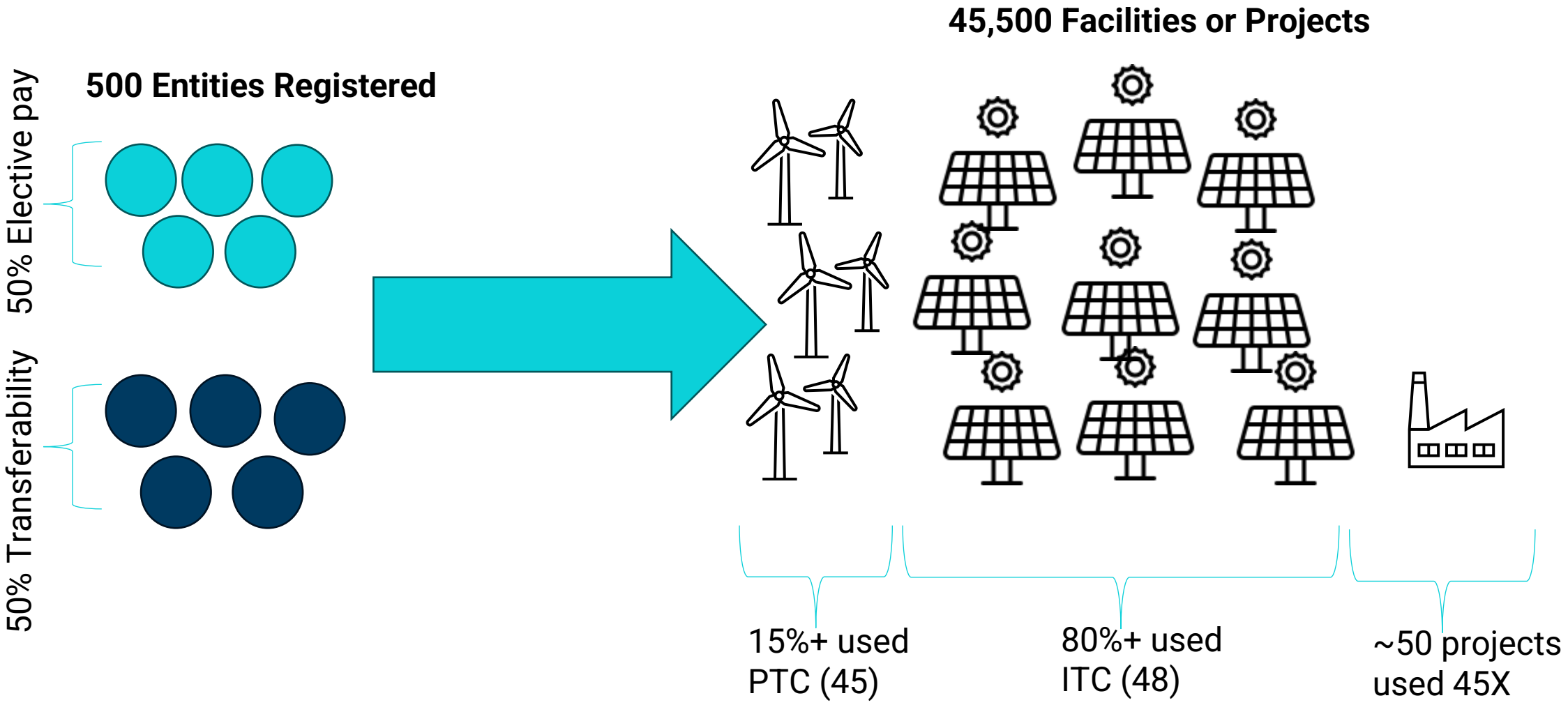
- Simpler transactions (selling tax credits in the transferable credits market in exchange of cash)
- Lower transaction fees
- Broader pool of potential investors with increased competition, which means entities can raise more cash per dollar of tax credit

Image source: NBC Studios, Greg Daniels, Michael Schur. Disclaimer: All characters and images from Parks and Rec were created by Greg Daniels and Michael Schur and are owned by NBC Studios.

Transferring eligible credits requires a buyer and creating an established new market



In 2023, 45,500 Projects Started The Elective Pay/Transferability Process



Direct Pay and Transferability Can Make a Big Difference for Green Project Capital Stacks

			Eligible for direct pay	Eligible for transferability
Electricity	45, 45Y	Clean electricity production tax credit	✓	✓
	48, 48E	Clean electricity investment tax credit	✓	✓
	45U	Zero-emission nuclear power production credit	✓	✓
	45Q	Credit for carbon oxide sequestration*	✓	✓
Fuels	45Z	Clean fuel production credit	✓	✓
	45V	Clean hydrogen production tax credit*	✓	✓
Vehicles	30C	Alternative fuel vehicle refueling property credit	✓	✓
	45W	Credit for qualified commercial clean vehicles	✓	**N/A**
Manufacturing	48C	Advanced energy project credit	✓	✓
	45X	Advanced manufacturing production credit*	✓	✓

* Note: Direct payments for these credits are available to taxable entities for five years.

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3

Low- and moderate-income communities have not proportionally benefited from solar

Ineligible for residential clean energy credit (§25D)

- >4 in 10 US households cannot receive *any* of the solar tax credits.
- ~7 in 10 US households cannot receive the *full* solar tax credits in year one. [1]

Not able to afford high upfront costs

Upfront costs can be even higher when enabling upgrades are needed, such as roof repairs (~$9,300) and electrical panel upgrades (~$3,000).[2]

Lower borrowing power due to solar debt

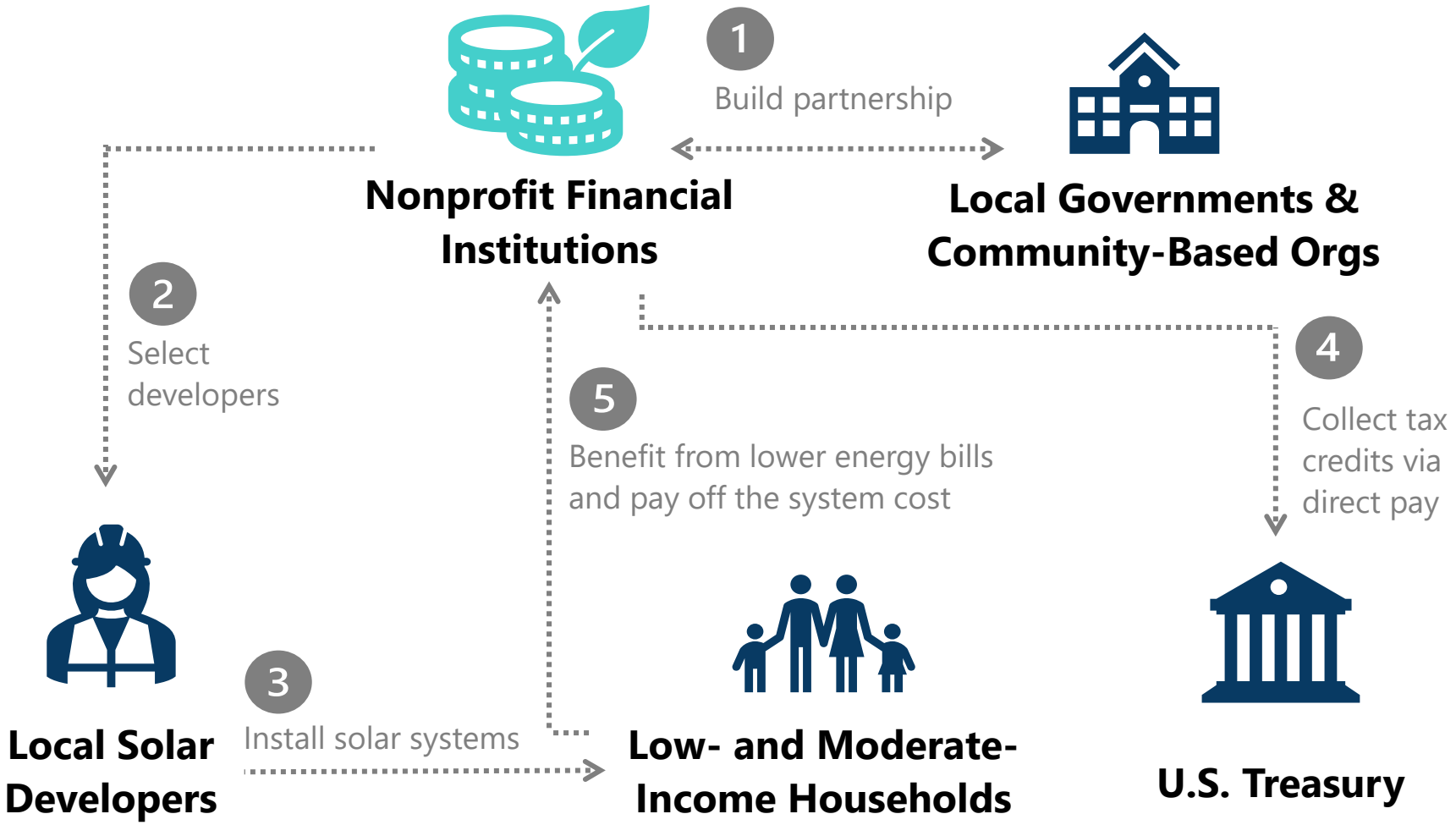
Getting new solar debt and/or even one missed solar loan payment will lower a household's credit scores, particularly in the short term, which would make it more difficult and costly to take on additional debt.

Variable monthly income stream

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

Source: 1. RMI, *Congress Cannot Ignore Residential Solar Tax Credit Inequities*. 2. RMI, *Green Upgrade Calculator*. Image source: Freepik.

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



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- **Solar for All and MN Examples**

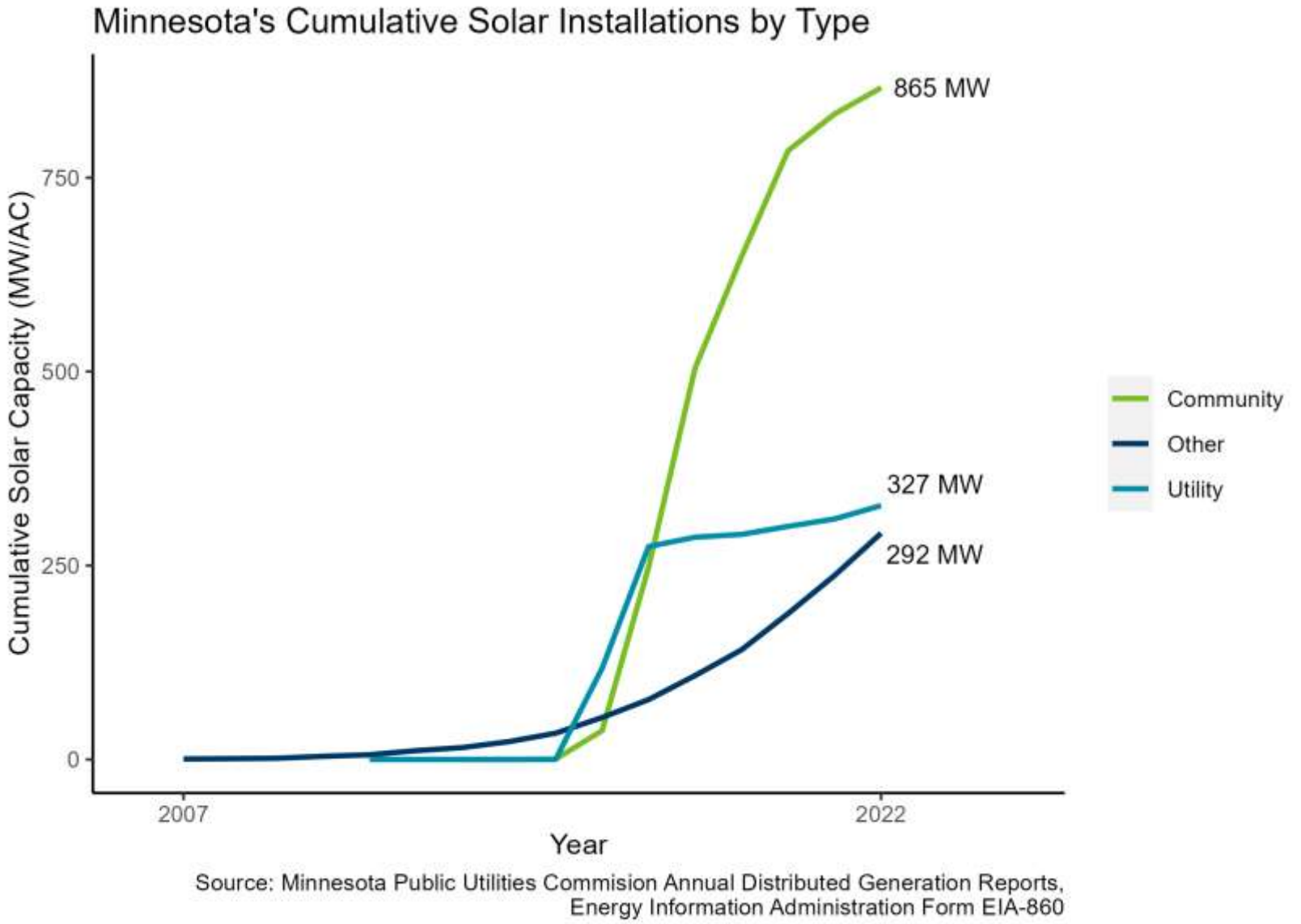
4

Minnesota: Context for Climate and Energy Policy and Implementation

Lissa Pawlisch, Assistant Commissioner
Division of Energy Resources

Solar, Solar, Solar!

Solar deployment to date in Minnesota



EPA Greenhouse Gas Reduction Fund: Solar for All

- $7 billion Solar in federal funding
- Proposal was submitted in fall 2023. Award announcements came on Earth Day 2024.

Purpose:

- Expand the number of low-income and disadvantaged communities primed for distributed solar investment
- Drive lasting market shift toward scaling solar in this market

What's included in Solar for All?

- Residential serving solar
  - Single family
  - Multifamily
  - Community solar up to 5 MW
- Funding for projects
- Funding for technical assistance, education & engagement, workforce development

Award: $62,450,000

Investment Categories	Amount Invested
Financial Assistance Program Areas	**$46.85M**
1. Single-Family Home Credit Enhancements	$2.0M
2. Manufactured Home Grants Aligned with Weatherization	$1.0M
3. Multifamily Forgivable Lending	$10.0M
4. Community-Owned Community Solar Lending	$23.85M
5. Tribal Development Funding	$10.0M
Project-Deployment Technical Assistance Strategy	**$7.4M**
1. Workforce Development	$2.6M
2. Interconnection and Pre-Development Technical Assistance	$4.8M
Equitable Access and Meaningful Involvement Plan	**$8.1M**
1. Energy Navigators, Community Engagement and Education	$3.7M
2. Compliance, Management and Administration	$4.1M
Total Program	**$62.45M**

Meaningful Benefits We Must Deliver

Household Savings: Deliver a minimum of 20% household savings

Equitable Access to Solar: Maximize the breadth and diversity of households that can benefit from solar.

Community Ownership: Low income and disadvantaged communities to own.

Workforce Development and Entrepreneurship: Invest in high-quality jobs and training efforts

Single Family

- Funding: $2M
- Initial funding for credit enhancements
- Partnership with MHFA
- Aligns well with existing incentives, e.g., Solar*Rewards within Xcel territory
- Exploring opportunities to support additional incentives
- Pursue alignment with other NCIF and CCIA funded opportunities

Manufactured Housing

- Funding: $1M
- To scale solar for manufactured home residents
- Partnership with Mn Weatherization Assistance Program
- Address barriers to strategy with DOE $
- Ground-mounted solar alongside weatherization measures

Image: https://www.westernenergyboard.org/wp-content/uploads/07-02-2021-PV-On-Pole-Report-Final.pdf

Multifamily

- Funding: $10M
- Partnership with Minnesota Housing
- Implement through the Publicly Owned Housing Program (POHP) and/or the annual Consolidated RFP or relevant RFP

Consolidated RFP HTC

Community Solar

- Funding: $23.85M
- Community-owned community solar
- Funds through MnCIFA
- One year planning effort: define opportunities to align with municipal and cooperative utilities

Solar for Tribal Nations

- $10,000,000
- Funds allocated to each of 11 Tribal Nations that share MN geography
- Residential serving; projects to be defined by Tribal Nations
- Technical assistance and planning opportunities
- MTERA three state program aligns

Timeline

Before Now

- Feedback from partners
- Engagement with community partners for insights on programming
- Ongoing conversations with tribal nations

Now

- Finalizing contract document with EPA

Now - December

- On-going refinement of work plan
- Partner conversations
- Planning around leveraging funds from other sources

January 2025

- Official start date
- Finalized work plan will facilitate access to financing resources

First Quarter 2025

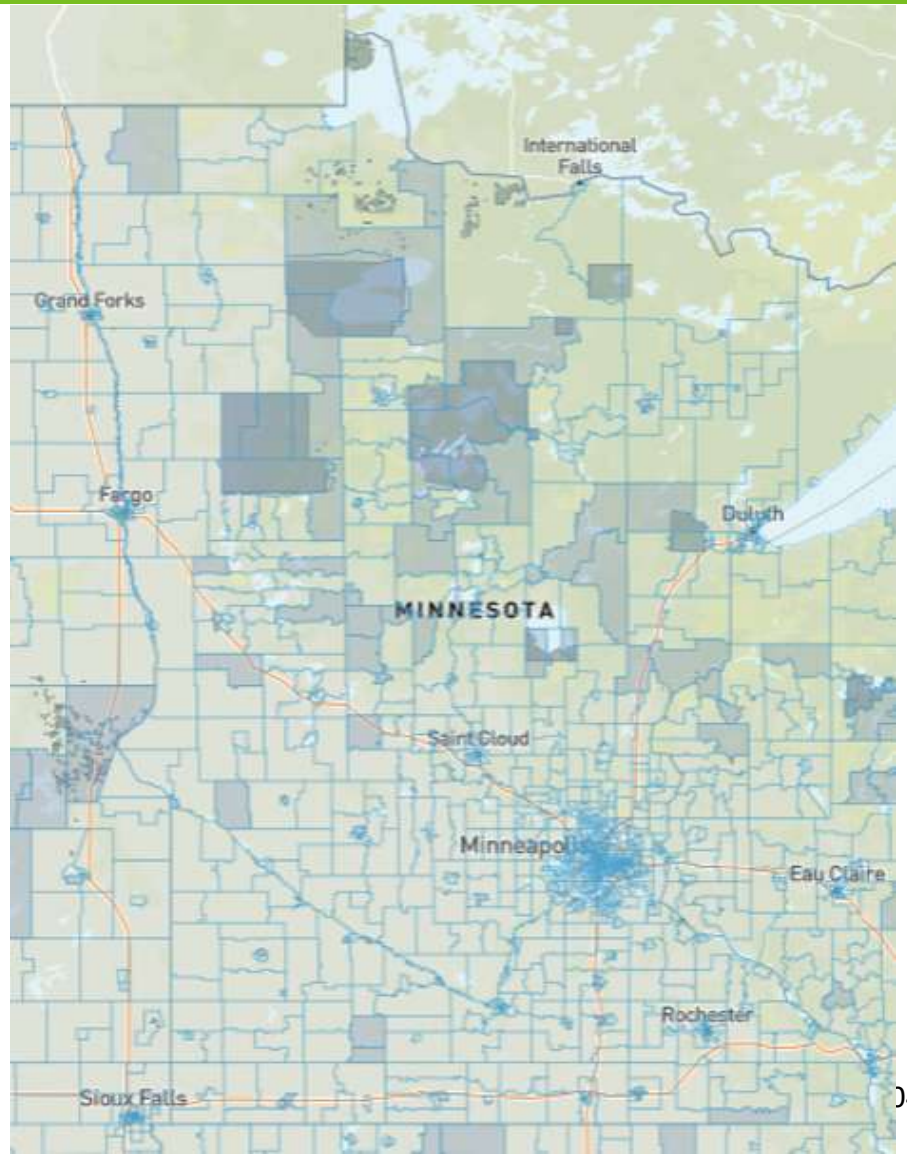
- First opportunity for financing dollars to begin flowing
- Multifamily and Community Solar programs to launch

One year planning cycle

- Runs through full year
- Programmatic planning and design
- Mechanisms to harness funds

Terms and Conditions Apply

- Households must be Disadvantaged (per CEJST or EJ Screen) OR < 80% AMI; specific requirements for each program area
- Must deliver 20% Bill Savings
- Must abide by Davis Bacon and Build America, Buy America
- No NEPA review ($ through Clean Air Act fund)



But wait, there’s more!

Federal Investments

Infrastructure Investment & Jobs Act (IIJA)

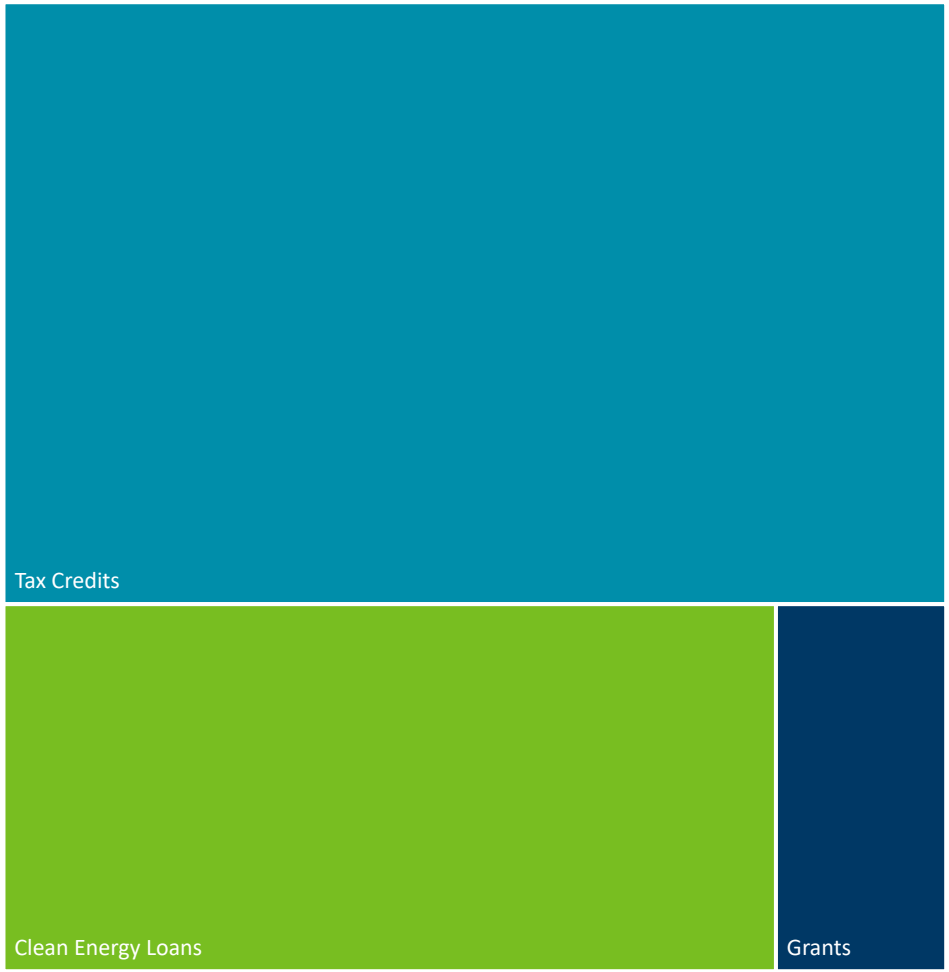
[Uncle BIL]

Federal $ an Opportunity to Leverage and Scale MN Investments

Inflation Reduction Act (IRA)

[Uncle IRA]

Inflation Reduction Act (IRA)



Mechanisms

- Grants: $110 Billion (capped)
  - Most in review or awarded
- Clean Energy Loans: ~$400 Billion (capped)
- Tax Credits: $700 Billion - $1.2 Trillion (uncapped)

Eligibility

- Private Enterprise
- Tribal Nations
- State / Local Governments
- Non-Profit Organizations

More on Tax Credits

- IRA contains 22 tax credit programs
  - 5 target individuals (no direct pay option)
  - 17 target businesses (12 include direct pay option)
  - Most go until 2032 or later.
- Congression Research Service:
  - Direct pay option expected to account for 40-48% of the use of tax credits that are direct pay eligible
- Congressional Budget Office:
  - Expect $820 billion in tax credit activity (early 2024 updated projections)

Direct Pay Provisions

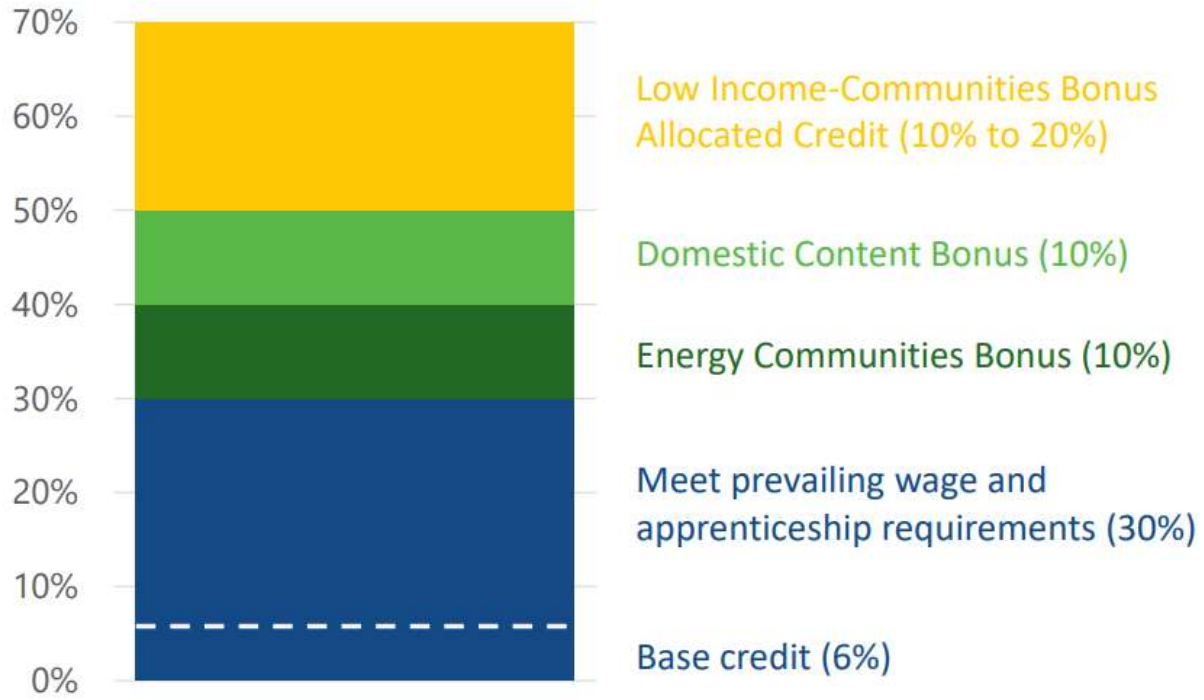
"Direct pay" allows tax-**exempt** entities to **capture tax benefits**

- States
- Cities, Counties, Townships
- Tribal Nations
- Non-profits
- Faith Communities
- Cooperative and Municipal Utilities
- Other governmental entities

The Promise of Direct Pay

Clean Energy Layer Cake

Total Investment Tax Credit



Idea credit Paul Horn, Inside Climate News

A hypothetical 1 MW community solar facility costing $1 million could earn a **70% tax credit** worth $700,000

If it is owned by a tax-exempt entity, this could be a **direct cash payment** from the IRS

Applies to clean electricity investment and production tax credits, available till at least 2032

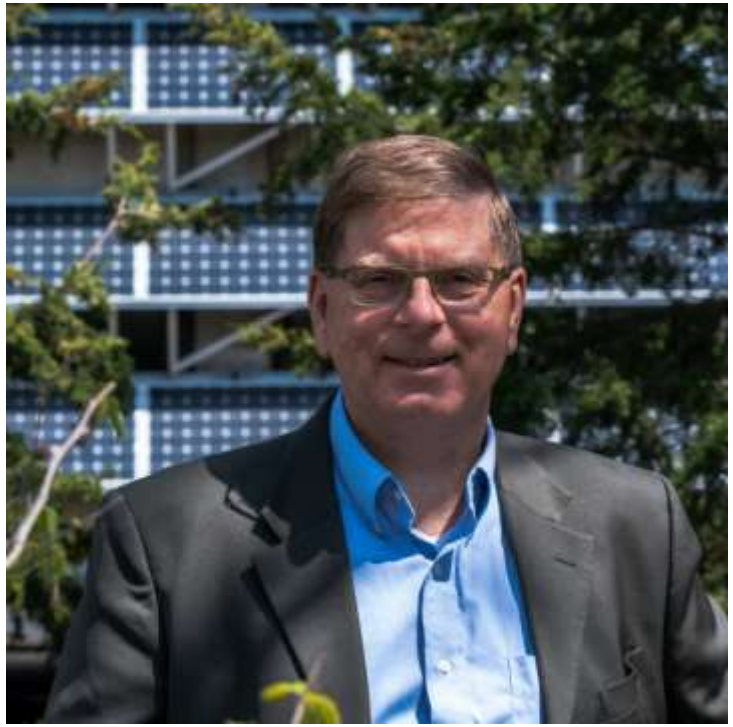
Slide Credit: Paul Donohoo-Vallet, US DOE

Implementation is key: 2023 MN ENERGY LEGISLATION

Buy Clean, Buy Fair Minnesota
100% Carbon-Free Electricity by 2040
Sustainable Building Guidelines Modifications
Preference Order for Purchase of State Vehicles
RDA Projects Subject to Prevailing Wage/Diversity Report
Solar Reward Expansion
Air Ventilation Program Act
Auto dealers must employ personnel with knowledgeable of electric vehicles
Utility Reporting Due Date Modification
Repeal/Reinstatement of Intervenor Compensation Statute
Electric Vehicle Deployment Program
Strengthen MN Homes
Customer's Access to Electricity Usage Data
Transportation Electrification Plan
Community Solar Garden Modifications
Prairie Island Nuclear Power Plan Settlement Payments
Distributed Solar Energy Standard
Energy Storage Systems Deployment Target
Utility Customer Dispute Resolution
Definition of Low-Income Household
Approval of Projects to Modernize Transmission and Distribution System
Large Wind Energy Conversion System Certification of Need Exemption
Modification of Threshold Requiring PUC Approval
Commerce's Assessment Increase
Compensation for Certain PUC Proceeding Participants
State Competitiveness Funds (1.0 & 2.0)
Climate Innovation Finance Authority
Commissioner authority to administrator Solar for Schools Program
Pre-weatherization and Workforce Training Program
Energy Benchmarking
Electric School Bus Deployment Program
Solar for School Modifications from Xcel to Commerce Department
Solar on Public Building Program Establishment
Energy Storage Incentive Program
Distribute Energy Resources System Upgrade Program
Electric Vehicle Rebates
Dealers Grants to Cover cost manufacturer certification
PACE Loan Program
Residential Electrical Panel Upgrade Grant Program
Residential Heat Pump Rebate Program
Public Utility Diversity Reporting
Energy Storage System Definition
Conforming Changes to definition of large energy power facilities and site permit
Gas and Hazardous Liquid Definitions Changes
Greenhouse Gas Emission Reduction Goal Modifications
Modification to Annual Report on Telecommunications Access Program
Restriction on single family solar installations prohibited
Extension of Sunset on Gas Utility Recovery of Infrastructure Costs
Creation of a Tribal Advocacy Council on Energy
Electric Grid Resiliency Grants
Community Solar Garden Study
Local Climate Action Grant Program

Climate Investment Finance Authority

Climate Investment Finance Authority: a new Minnesota "Green Bank". (SF3035, Article 21, section 2)	$ 45,000,000



Supporting projects through Bridge Lending

The Heights

- 112-acre brownfield
- 1,000 units of housing
- 1,000 living-wage jobs
- 20 acres of green space
- Demolition and remediation complete

April 1 – Start utility construction.
June 15 – Start of construction on first buildings.

THE HEIGHTS COMMUNITY ENERGY

$4.7 million bridge loan on a $12 million project

IRA Direct Pay Credit

Gap financing options

- Securing additional funds – Loan Programs Office
  - Minnesota Climate Innovation Finance Authority is a State Energy Finance Institution, or SEFI
  - Can pursue DOE Loan Programs Offices funds without the "innovation" requirement
- Securing additional funds – Utilizing Commerce's State Competitiveness Fund 2 resources to scale up funding opportunities
  - $75,000,000 for eligible entities pursuing projects receiving loan or tax credits where benefits are in disadvantaged communities

Leveraging Loan Programs Office Funding

- State can **bundle/ aggregate** opportunities to scale resources
- State invests 20%; LPO lends 80%.
- Requires two phases of federal review; accelerated process for loans backed by gov't entities, higher bond ratings.

MINNESOTA STATE

Proposed Program
Green Campus Initiative

Institution	Campus	Project Phase	Description	Cost
Alexandria Technical College		Energy Efficiency	performance contracting: lighting, building enclosure, RCx, controls, HVAC	$ 2,212,475
Alexandria Technical College		Energy Generation	Refurbish existing Waste-to-energy from Pope-Douglas WEF	$ 1,000,000
Anoka Technical College		Energy Efficiency	performance contracting: lighting, building enclosure, RCx, controls, HVAC	$ 1,448,330
Anoka Ramsey Community College	Cambridge	Energy Efficiency	performance contracting: lighting, building enclosure, RCx, controls, HVAC	$ 484,929
Anoka Ramsey Community College	Coon Rapids	Energy Efficiency	performance contracting: lighting, building enclosure, RCx, controls, HVAC	$ 2,045,367
Bemidji State University		Energy Efficiency		$ 8,679,300
Bemidji State University		Energy Generation	District geothermal	$ 30,000,000
Central Lakes College	Brainerd	Energy Efficiency		$ 1,628,051
Central Lakes College	Staples	Energy Efficiency		$ 1,231,173
Century College		Energy Efficiency		$ 3,322,121
Dakota County Technical College		Energy Efficiency		$ 2,426,960
Fond du Lac Tribal and Community College		Energy Efficiency		$ 845,843
Hennepin Technical College	Brooklyn Park	Energy Efficiency		$ 2,221,205
Hennepin Technical College	Eden Prairie	Energy Efficiency		$ 1,870,637
Inver Hills Community College		Energy Efficiency		$ 1,466,303
Lake Superior College		Energy Efficiency		$ 1,795,797
Metropolitan State University		Energy Efficiency		$ 4,264,800
Minneapolis Community and Technical College		Energy Efficiency		$ 6,596,429
Minnesota North College	Hibbing	Energy Efficiency		$ 1,547,222

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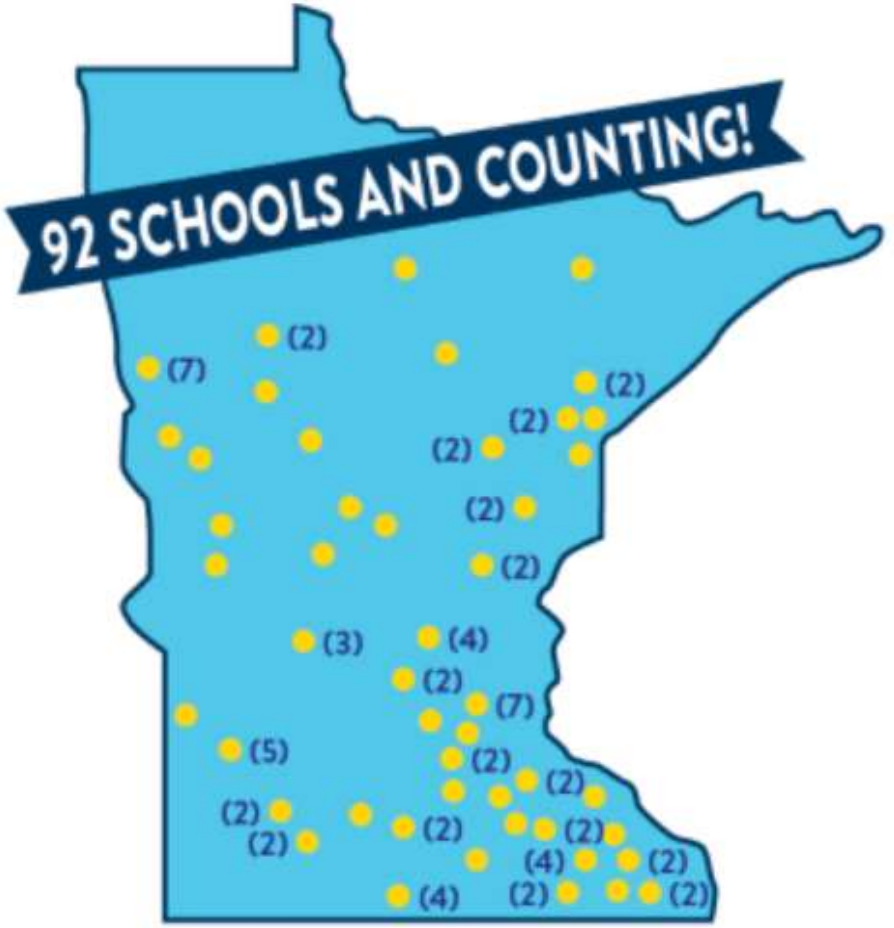
Bridge & gap financing: Solar for Schools

- Solar on Schools first SEFI proposal submitted to LPO: $150M; State $30M, LPO $120M
- Buildings on Commerce's existing successful Solar for Schools Program
- Utilizes an annual appropriation lease
- MnCIFA would own; projects would be cash-flow positive
- MnCIFA would recoup tax credits via direct pay; once repaid, ownership flips to schools



SFS Program Updates

- Through the program's first 2 years, 105 schools have been awarded grants.
- Another 66 schools have been invited to submit full grant applications so far in 2024.
- Program is on track to **double** the state's solar schools and installed solar school's capacity in less than 3 years.

Installed Capacity		Funds Reserved
Pre-SFS	13.7 MW	--
2022	4.76 MW	$7,283,502
2023	2.53 MW	$4,071,981
2024 (Round 1)*	10.16 MW	$10,906,419
2024 (Round 2)*	4.40 MW	$5,499,203
Total	**35.55 MW**	**$27,761,105**

Full Grant Recipient List

Questions and Discussions

COMMERCE DEPARTMENT

Choose the path of no return!!

TRACK 1

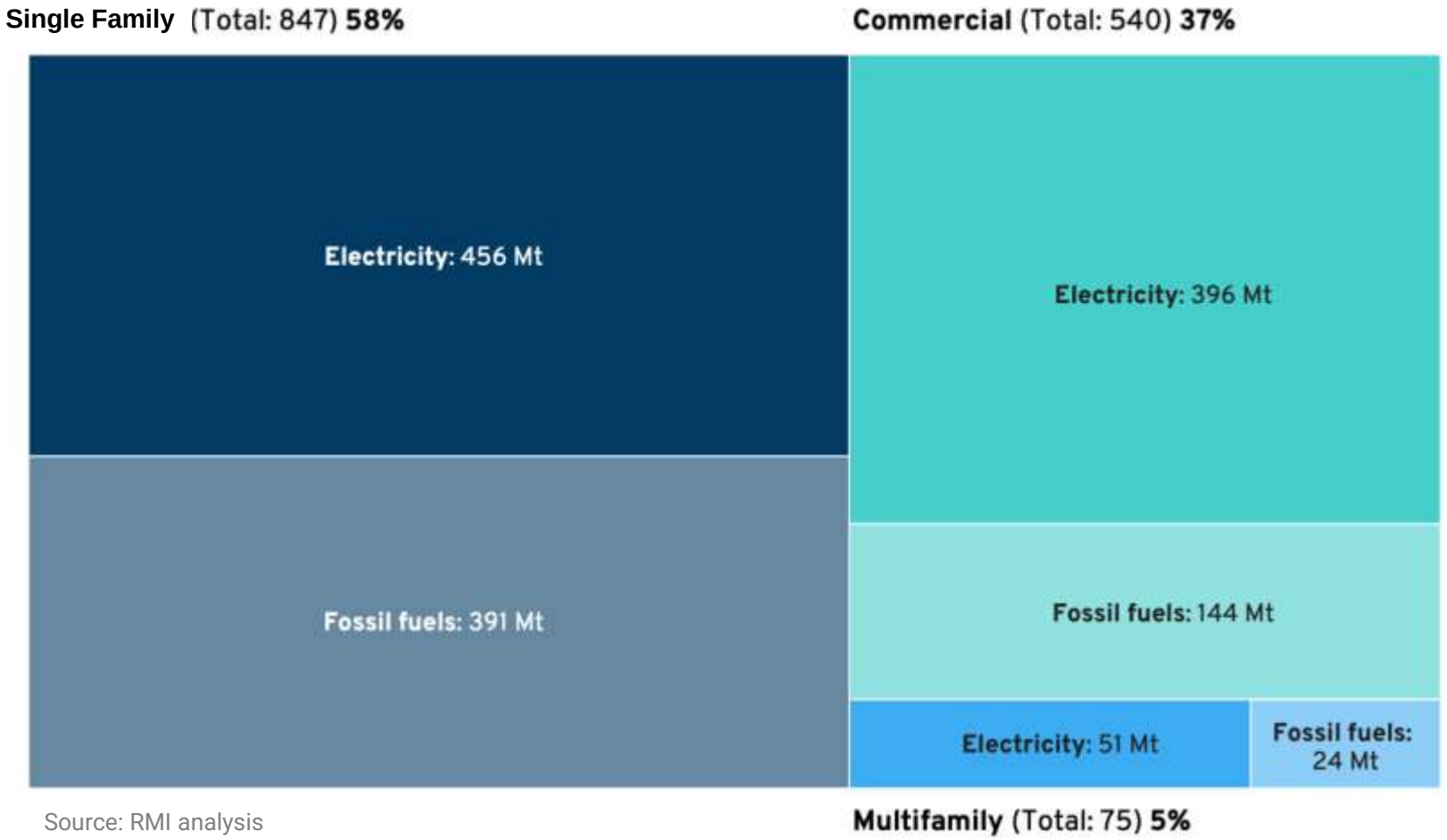
- Net Zero Buildings
- Zero Emission Transportation
- Financing Examples

TRACK 2

- Green Hydrogen
- Cleantech Manufacturing
- Brownfields

Green capital flows are nowhere near adequate to what is required to decarbonize the US real estate sector.

US building sector operational emissions are dominated by residential buildings: > 60%



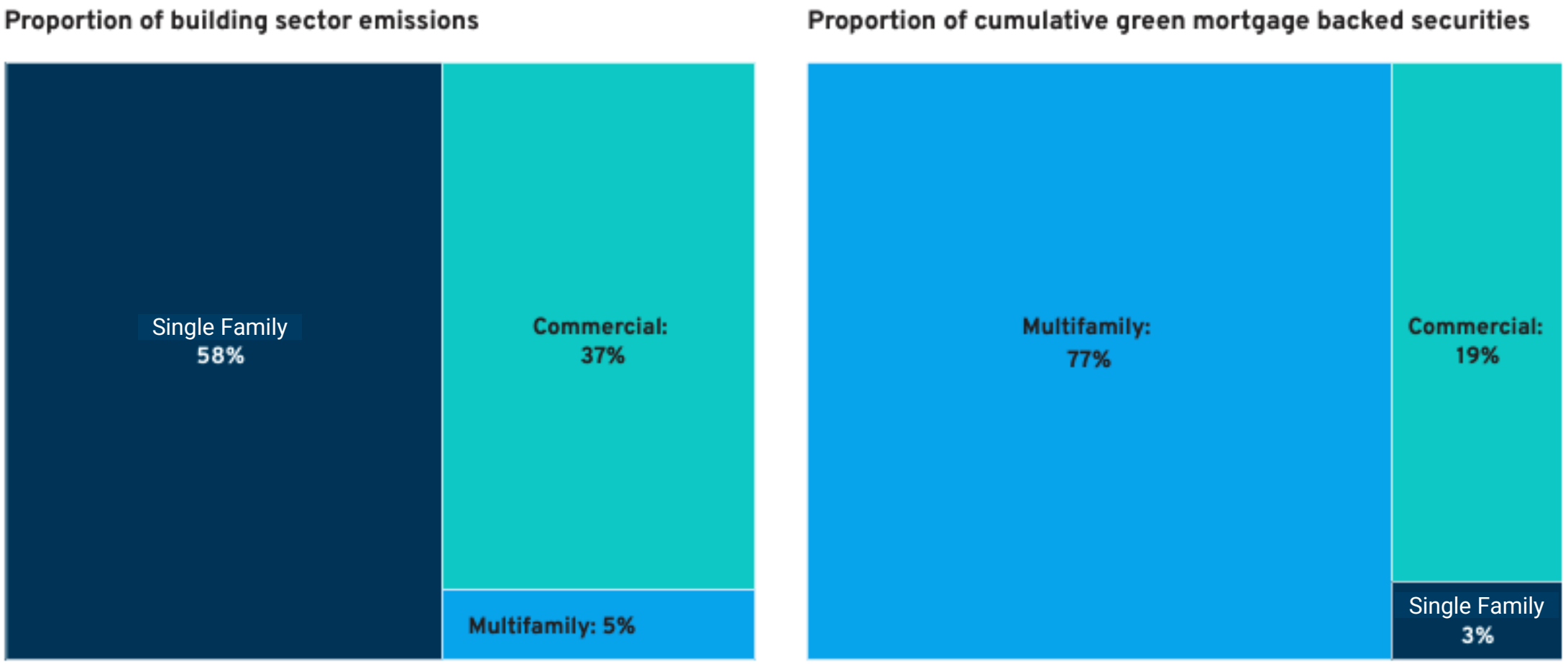
Source: RMI analysis

Existing buildings stock value dwarf annual new construction market

Note: B = billion; T = trillion. Flow (i.e., new construction).

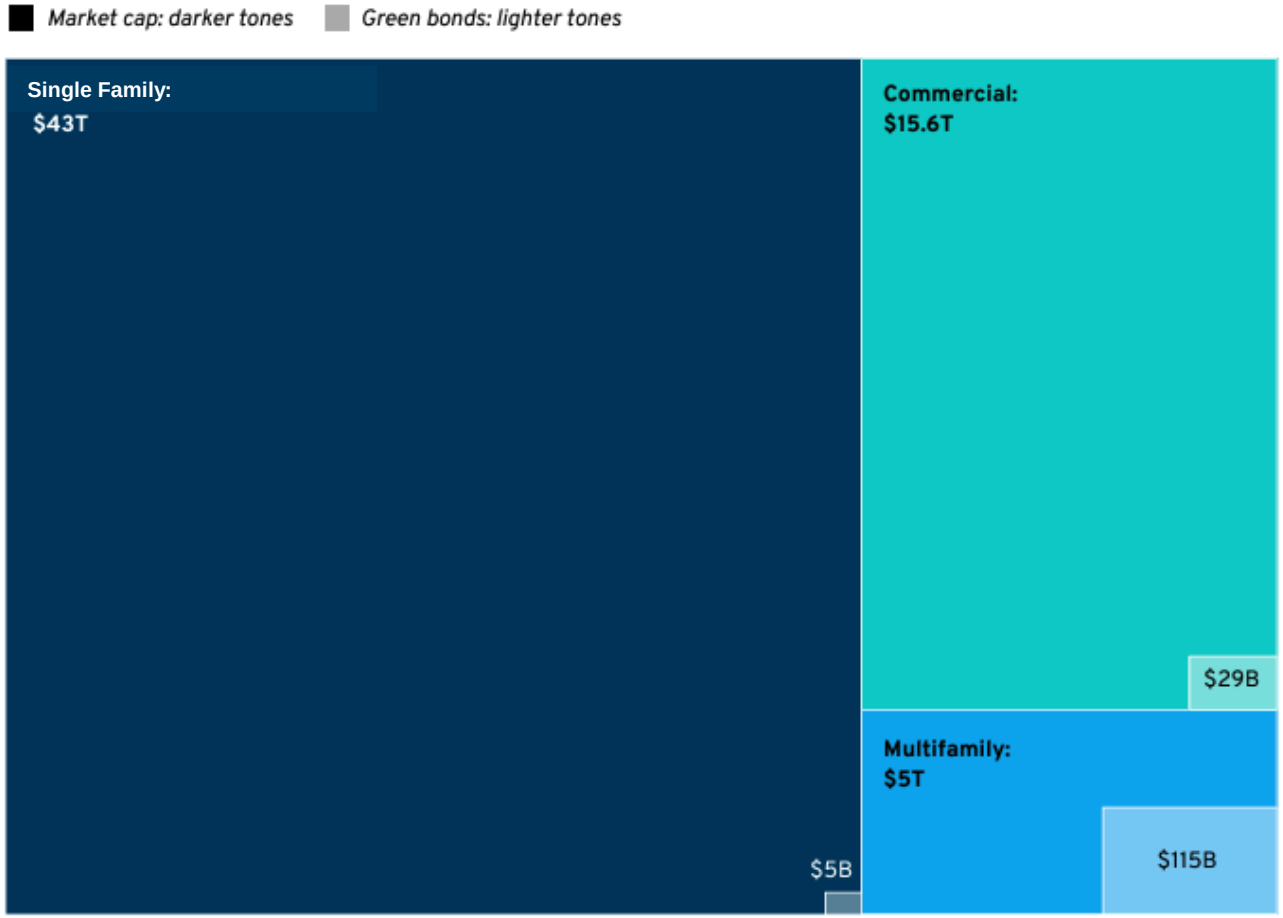
Source: RMI analysis

Green financing is out of alignment with where emissions are concentrated



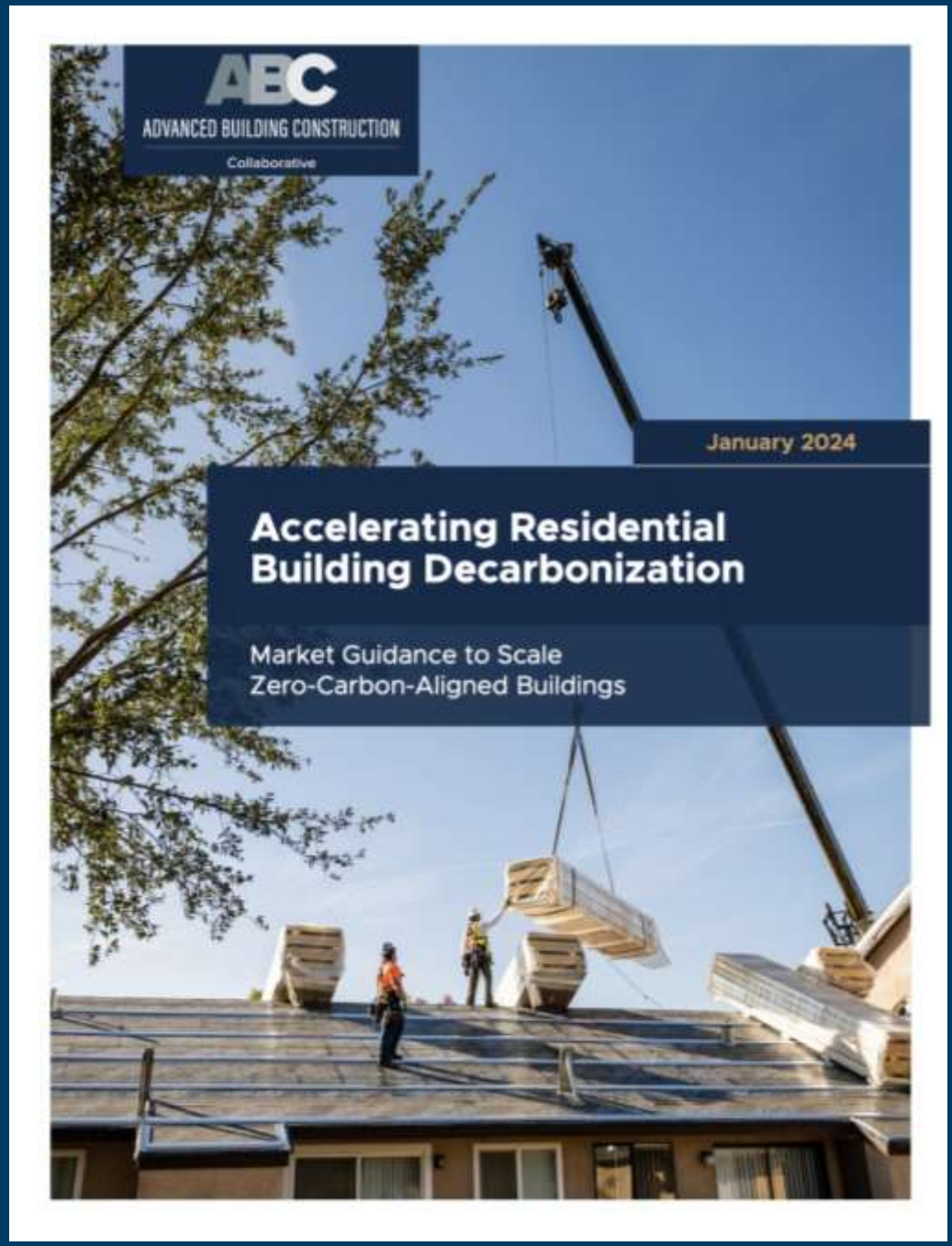
Source: For graphic sources see RMI report: Financing US Building Decarbonization Leveraging a Sector-Wide Emissions Model to Prioritize Capital Flows

Decarb financing is orders of magnitude below the existing stock's market cap

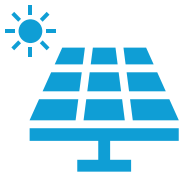


Note: T = trillion. Green bond issuance figures not drawn to scale for ease of visibility
Source: For graphic sources see RMI report: Financing US Building Decarbonization Leveraging a Sector-Wide Emissions Model to Prioritize Capital Flows

Qualified Projects



Priority Project Categories for GGRF

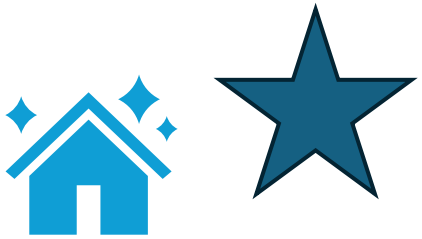


Distributed Energy Generation and Storage

Power generation, and/or storage technologies, and carbon-free enabling infrastructure

Examples:

- Residential rooftop solar
- Community wind and solar
- Fuel cells
- Distributed generation and storage assets that support microgrids



Net-Zero Buildings

Retrofits for existing buildings that contribute towards them becoming net-zero or construction of new net-zero buildings in LIDACs (residential, commercial, industrial, etc.)

Examples:

- Affordable family housing decarbonization
- Decarbonization retrofits as adaptive reuse of existing buildings
- New construction of net-zero residential building

Zero Emission Transportation

Zero-emission transportation modes and their enabling infrastructure, especially in communities overburdened by diesel pollution and particulate matter concentration

Examples:

- Charger deployment
- Micromobility modes of transportation
- Zero-emission Medium and heavy – duty vehicles

White House's National Definition of a Zero Emissions Building

Highly energy efficient

The building is among the most efficient:

- Existing building: ENERGY STAR score of 75+ or EUI 35% better than median EUI
- New Construction: ENERGY STAR score of 90+ or DOE ZERH

Free of on-site emissions from energy use

Has no-onsite fossil fuel use, except for use of emergency backup generation when grid power is unavailable

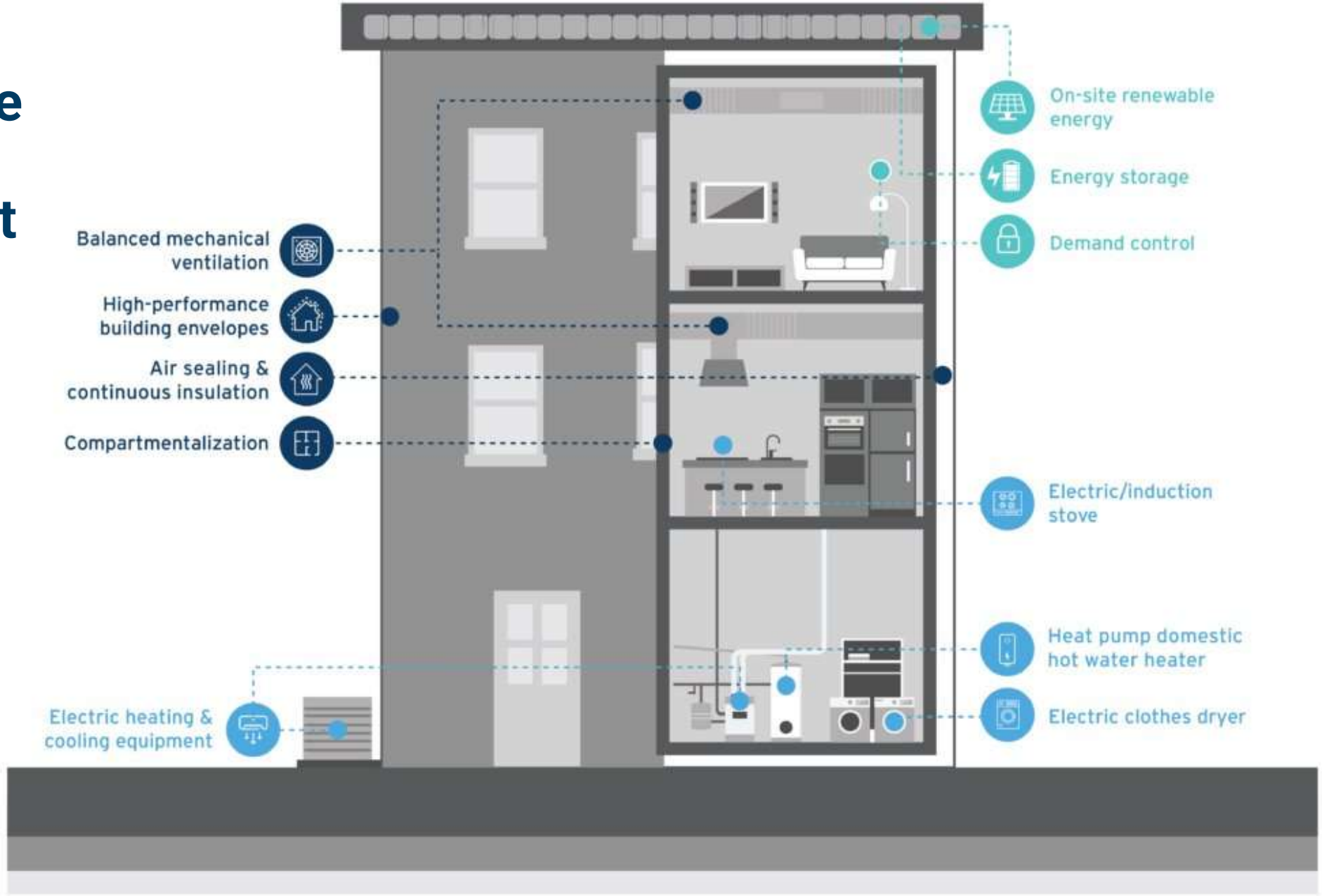
Powered solely from clean energy

All the energy used by the building, both on-site and off-site, is from clean energy sources.

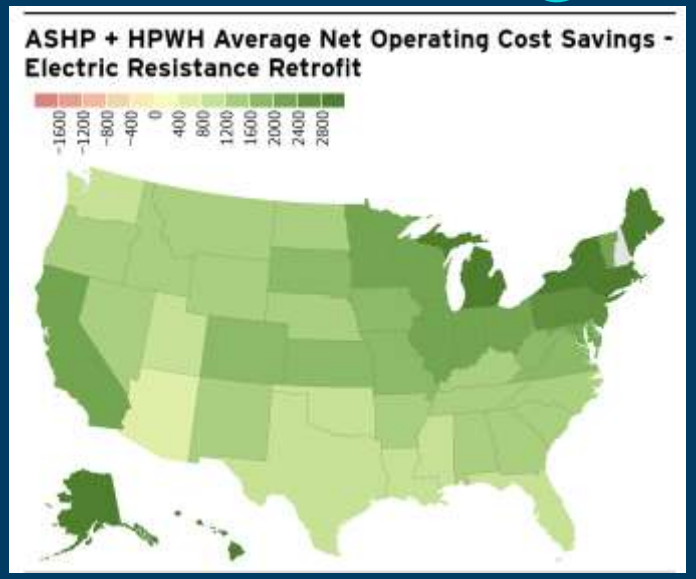
Source:

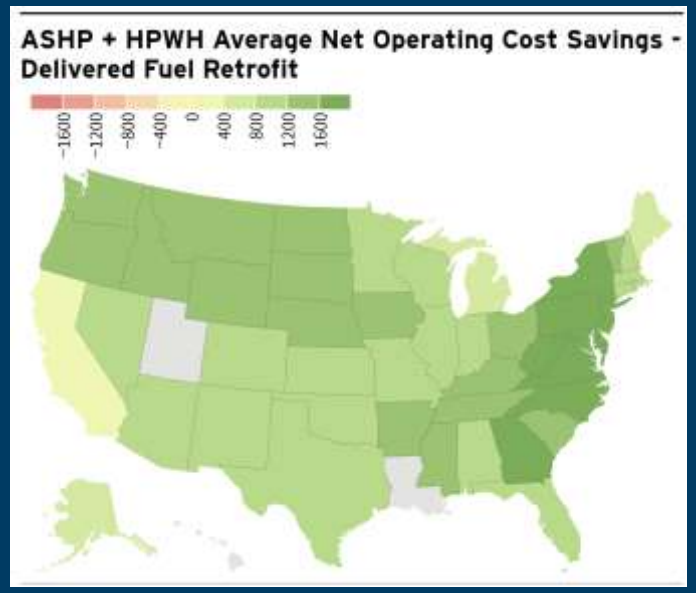
- https://www.energy.gov/eere/buildings/national-definition-zero-emissions-building
- ABC Market Guidance to Scale Zero-Carbon-Aligned Buildings

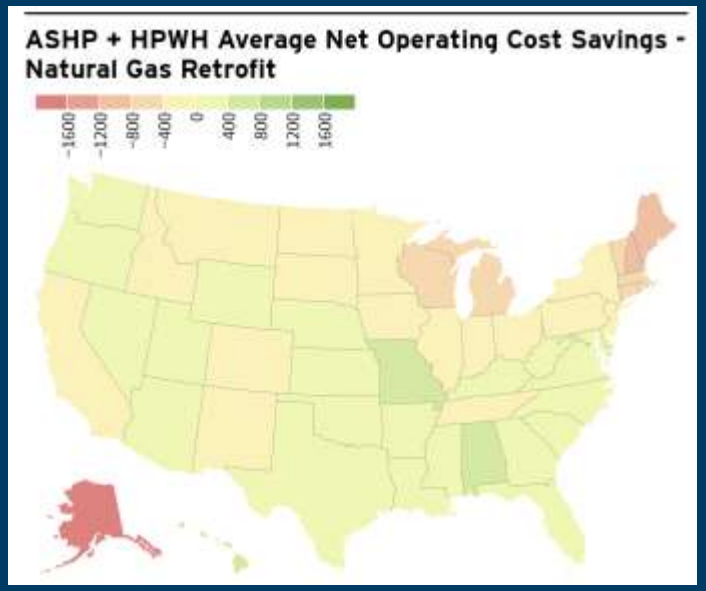
Zero emission buildings include many of the following project types



Beneficial electrification retrofits are highly dependent on climate zone, federal incentives, and existing fuel source







Electric Resistance → HP

- **Operating: ~$2,000**
- **~130K exist**

Delivered Fuel → HP

- **Operating: ~$960**
- **~290K exist**

Natural Gas → HP

- **Operating: ~$190 higher**
- **~1.2M exist**

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

Home Efficiency Rebates Details – MN will receive $73.4M

Exhibit 1. Home Efficiency Rebate Amounts

	Single Family	Low-Income Single Family [ii]	Multifamily	Low-Income Multifamily [iii]
Modeled,[iv] 20%–35% building-wide savings	Lesser of $2,000 or 50% of project cost	Lesser of $4,000 or 80% of project cost	$2,000/dwelling unit; building maximum of $200,000	Lesser of $4,000/dwelling unit or 80% of project cost
Modeled, 35%+ building-wide savings	Lesser of $4,000 or 50% of project cost	Lesser of $8,000 or 80% of project cost	$4,000/dwelling unit; building maximum of $400,000	Lesser of $8,000/dwelling unit or 80% of project cost
Measured,[v] 15%+ building-wide savings	Savings rate multiplied by kWh saved or 50% of the project cost [vi]	Low-income savings rate multiplied by kWh saved or 80% of the project cost	Savings rate multiplied by kWh saved or 50% of the project cost	Low-income savings rate multiplied by kWh saved or 80% of the project cost

*Additional details can be found in the legislative text, **Section 50121**.*

Home Electrification and Appliance Rebate Values – MN was approved for $74.9M

Exhibit 1. Home Electrification Rebate Values

Income Eligibility and % Cost Covered	
Low Income: <80% Area Median Income (AMI)	100% *(including installation)*
Moderate Income: 80%–150% AMI	50% *(including installation)*
Rebate Max for Qualified Electrification Projects	
Heat Pump HVAC	$8,000
Heat Pump Water Heater	$1,750
Electric Stove/Cooktop	$840
Heat Pump Clothes Dryer	$840
Breaker Box	$4,000
Electric Wiring	$2,500
Weatherization *Insulation, air sealing, ventilation*	$1,600
Maximum Total Rebate	
Max Consumer Rebate	$14,000
Max Contractor Rebates	$500

**This is a screenshot from our memo

25C – Energy Efficient Home Improvement Tax Credit (Single Family)

Other Key Notes

- Retrofit only; not for new construction
- $1,200 annual max for non-HP/biomass measures
- $2,000 annual max for HPs & biomass measures
- Can stack non-HP and HP for up to $3,200 annually
- Credit is for installation year

- Renters **can** use the tax credit for HVAC and energy audits if they pay for the improvements.
- Landlord **cannot** use the credit for the home they are renting.
- Stacking guidance: if stacked with a state rebate, the credit is on post-rebate price. State tax incentive has no impact on 25C value
- Non-refundable, non-transferrable

45L - New Energy Efficient Home Credit

Effective: Jan 1, 2023

Can be stacked with the Low-Income Housing Tax Credit Without Reducing Basis.

New AND Major Renovations

Dwelling units acquired after December 31, 2022.

Energy Performance	Prevailing Wage	Multifamily	Single Family (detached one family, duplex, townhomes, manufactured homes)
EPA's Energy Star New Construction	No	$500/dwelling unit	$2,500/dwelling unit
DOE's Zero Energy Ready Homes	No	$1,000/dwelling unit	$5,000/dwelling unit
EPA's Energy Star New Construction	Yes	$2,500/dwelling unit	$2,500/dwelling unit
DOE's Zero Energy Ready Homes	Yes	$5,000 dwelling unit	$5,000/dwelling unit

179D – Energy Efficient Commercial Buildings Tax Deduction

Site EUI Reduction	Without Prevailing Wage	With Prevailing Wage + Apprenticeship
25% Min	$0.50/SF	$2.50/SF
+1%	$0.02/SF	$0.10/SF
50% Max	$1.00/SF	$5.00/SF

For tax exempt entity, allowed to allocate deduction to person responsible for designing the property in lieu of property owner

There are a lot of incentives in MN

- RMI collected key data on:
  - Federal and State Incentives
  - Local and Utility incentives in Duluth, Rochester, and Minneapolis
- Single-family and multi-family buildings have access to 20 programs+.
  - Many of which can be combined with other programs to minimize costs

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

Order	Funding Source	Incentive Amount	Cost of Upgrade Post Incentive	Process for Application	Assumptions/Notes
Assumed Upfront Costs: $18,800 for ccASHP					
1	Home Electrification and Appliance Rebate Program	$8,000	$10,800	Point of Sale	Home Electrification Rebate assumes 50/100% of project cost depending on income, up to $8000. Energy Star rated.
Installation Occurs					
2	Minnesota Heat Pump Rebate	$4,000	$6,800	TBD	Energy Star. SEER 15.2, HSPF 8.5. Requires energy audit. The applicant must insulation and the air sealing measures recommended by the auditor
3	XCEL's Heat Pump Rebate	$1,100	$5,700	Contact qualified contractor who will submit rebate application after installation.	XCEL electric customers only. 15.2 SEER2, 9.6 EER2, 7.8 HSPF2+
4	25C- Federal Residential Energy Efficiency Tax Credit	$1,710	$5,090	File IRS 25C Tax Form (5695)	CEE Top Tier.
Estimate Cost of Measure to Household After Incentives are Applied		**$5,090**		This upgrade is eligible for gap loans at the time of installation with programs such as Minnesota Housing and Finance Agency's secured and unsecured loans, FixUp loans, rehabilitation loans, Minneapolis Energy Efficiency Loan program, etc.	

Why is Urban Homeworks Building Green Homes?

The mission

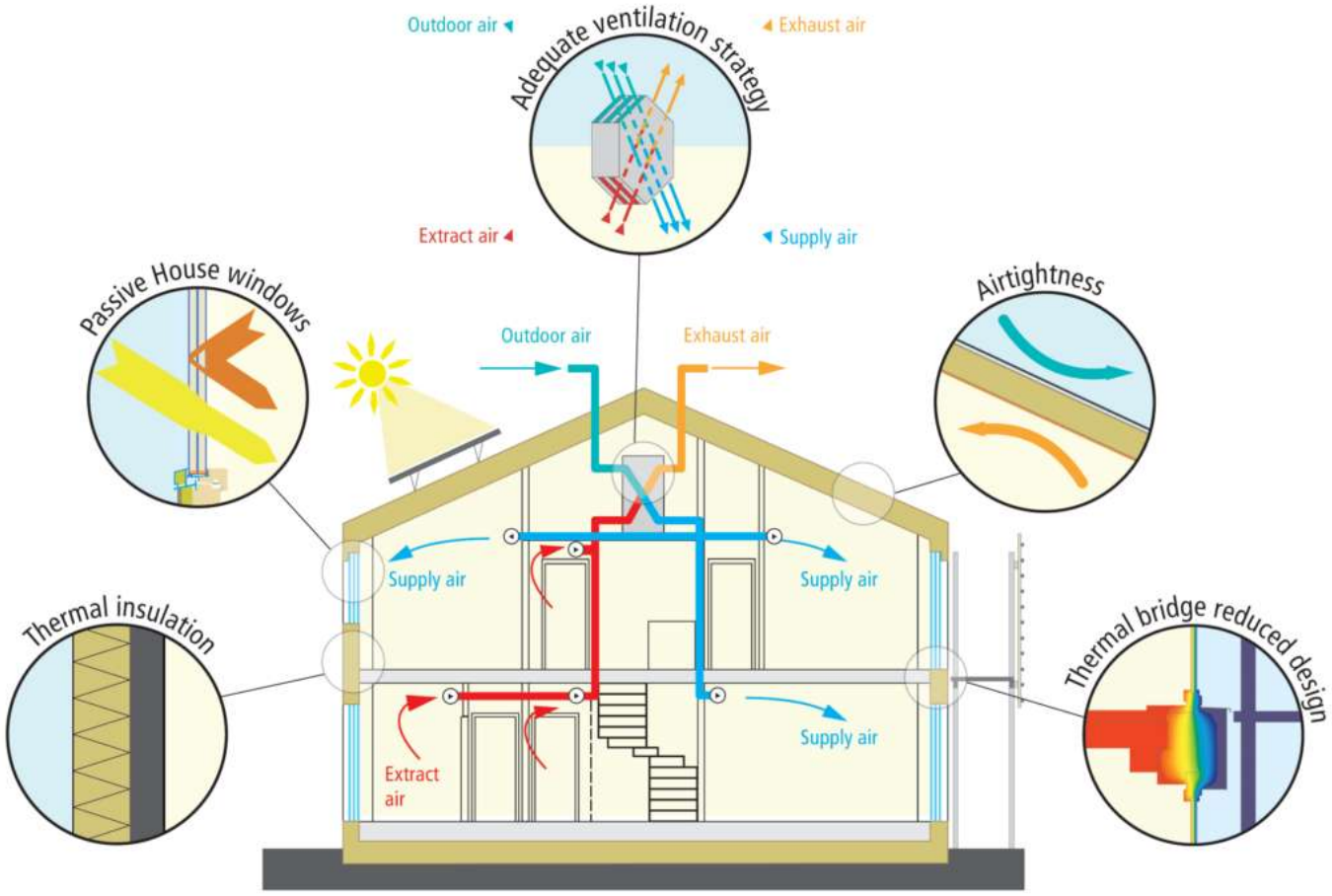
of Urban Homeworks is to lead the fight for housing justice so that all people have a safe, stable, and dignified place to live.

It fulfils our mission

The mission *of Urban Homeworks is to lead the fight for housing justice so that all people have a safe, stable, and dignified place to live.*

- *Safe*
  - *Passive Homes help us create safer and healthier living spaces.*
    - *Indoor Air Quality, Security, non toxic Materials.*
- *Stable*
  - *Reduced Energy Bills provides lower TCO for 60-80% AMI Buyers*
- *Dignified*
  - *Our homes are part of the solution for increased climate equity.*

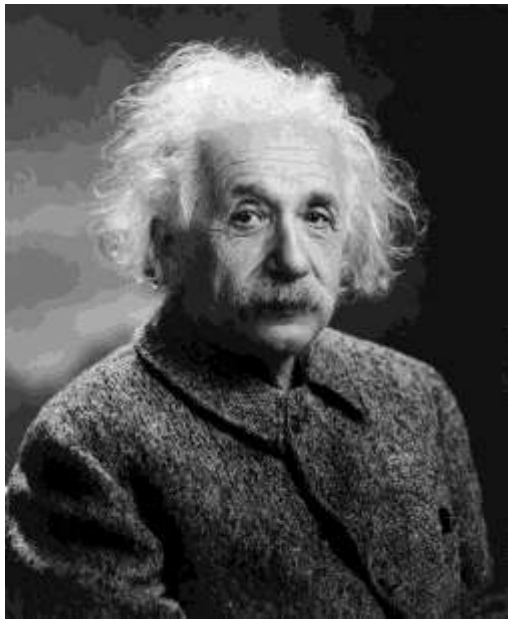
What is a High-performance Building



- ***Homes that incorporate Building Science Informed Design, Execution, and verification.***
- ***ZERO is the GOAL***

What is building Science?

- Building science is a multidisciplinary field that uses the principles of engineering, architecture, physics, chemistry, and biology to understand and improve the physical behavior of buildings



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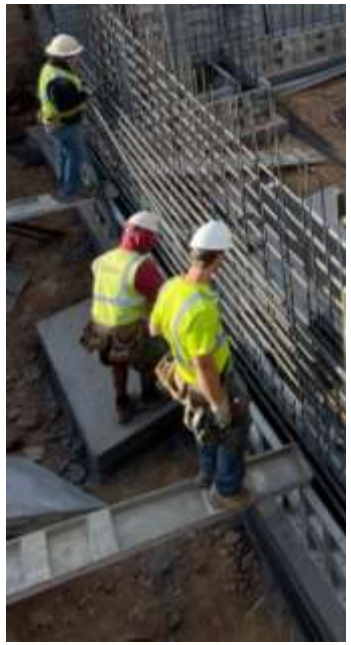

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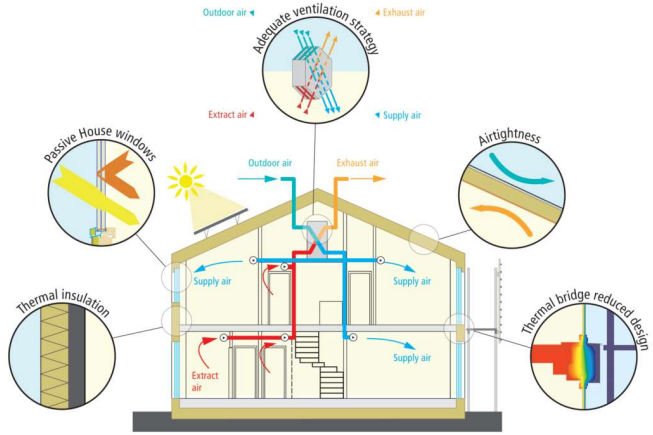
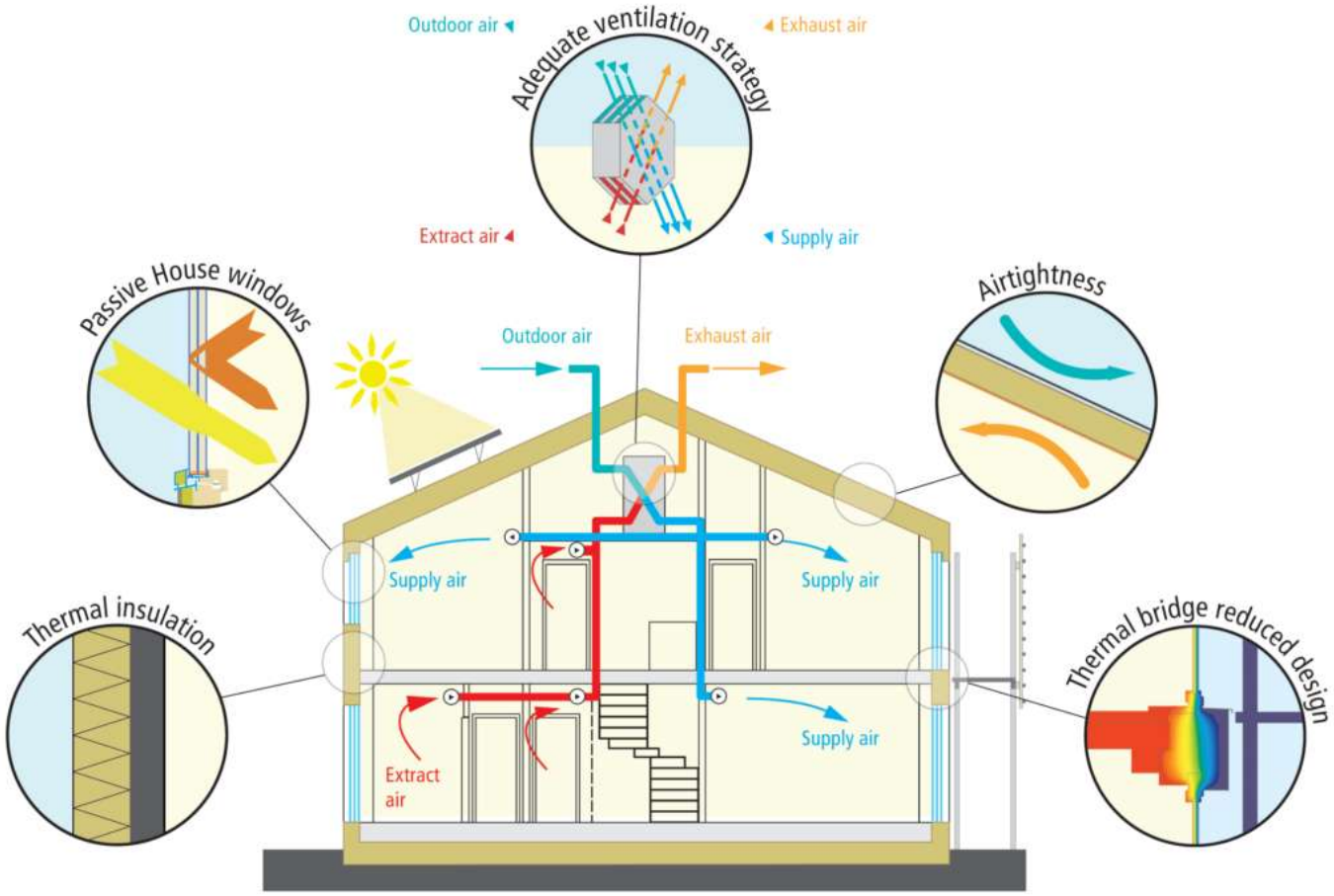


What makes a High-performance Building



Building Science

- Thermal Insulation
- Thermal Bridging
- Windows
- Airtightness
- Ventilation

What is the difference?

Code Built Home

???????

High-Performance Home

???????

What is the difference?

FORD F-150 $50,000

450 HP

4X4?

Cloth Seats

18 MPG

FORD Raptor $80,000

700 HP

4x4

OFFROAD

Leather Seats

15 MPG

What is the Difference?

Code

- Thermal Insulation
  - Effective R Value R 17 (2x6 16” o.c. R21 batt)
- Thermal Bridging
  - Everywhere (foundation, rim joist, roof, walls)
- Windows
  - U Value .32 (3.125 R value)
- Airtightness
  - 3 ACH
- Ventilation
  - Balanced

High-performance

- Thermal Insulation
  - Effective R Value R 38.5 (2x4 16” o.c. R15 batt + 6 ½” SIP)
- Thermal Bridging
  - None
- Windows
  - U Value .15 (6.6 R value)
- Airtightness
  - .45 ACH
- Ventilation
  - Balanced & verified

What are the Results?

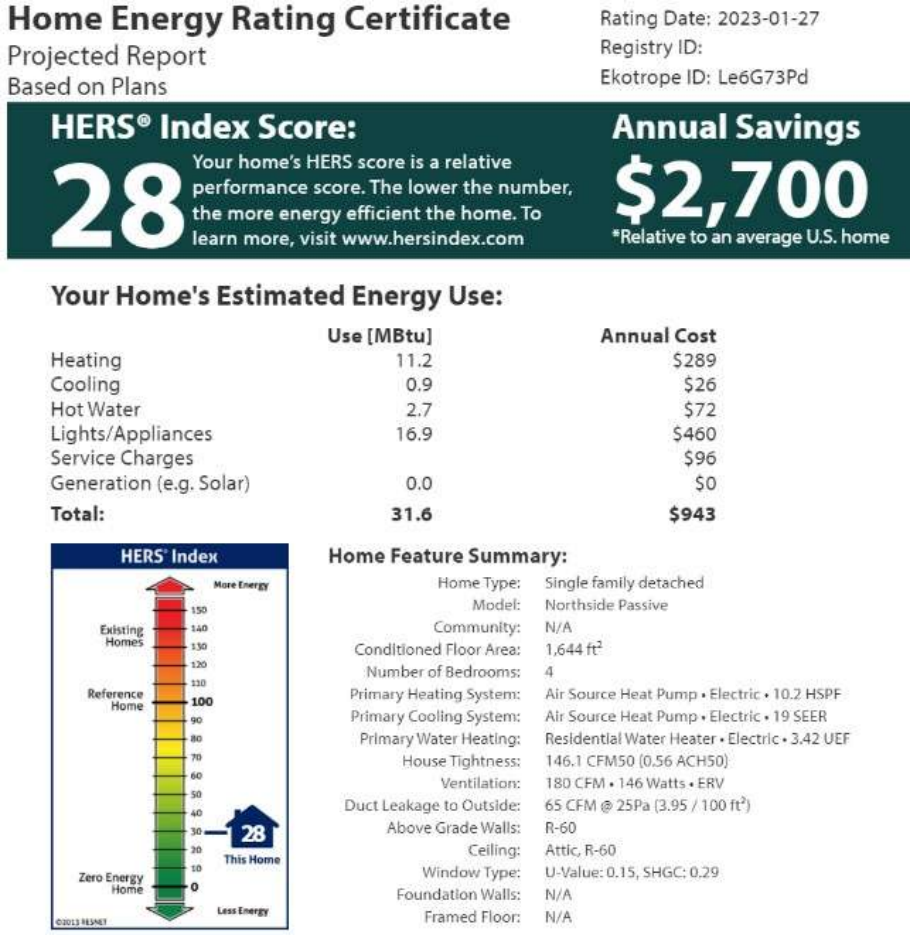
High-performance

- Increased Comfort
  - No cold spots or rooms
- Increased Durability
  - Less risk of water damage from condensation
- Better indoor Air Quality
  - Filtered Air
- Reduced Energy Consumption
  - Reduced Energy Bills
  - Reduction in Green House Gas Emissions
- Reduced Lending Risk
  - Total Cost of Ownership

Results

High performance Homes

- HERS Score 28 (Prelim before Solar)
  - Net Positive with Solar -8
- Mid point Blower Door
  - 0.03 CFM50/ft^2
  - .45 ACH
  - 5+ times more airtight than the code requires



Home Energy Rating Certificate
Projected Report
Based on Plans

Rating Date: 2023-01-27
Registry ID:
Ekotrope ID: Le6G73Pd

HERS® Index Score: 28
Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings $2,700
*Relative to an average U.S. home

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	11.2	$289
Cooling	0.9	$26
Hot Water	2.7	$72
Lights/Appliances	16.9	$460
Service Charges		$96
Generation (e.g. Solar)	0.0	$0
Total:	**31.6**	**$943**

Home Feature Summary:

Home Type:	Single family detached
Model:	Northside Passive
Community:	N/A
Conditioned Floor Area:	1,644 ft²
Number of Bedrooms:	4
Primary Heating System:	Air Source Heat Pump • Electric • 10.2 HSPF
Primary Cooling System:	Air Source Heat Pump • Electric • 19 SEER
Primary Water Heating:	Residential Water Heater • Electric • 3.42 UEF
House Tightness:	146.1 CFM50 (0.56 ACH50)
Ventilation:	180 CFM • 146 Watts • ERV
Duct Leakage to Outside:	65 CFM @ 25Pa (3.95 / 100 ft²)
Above Grade Walls:	R-60
Ceiling:	Attic, R-60
Window Type:	U-Value: 0.15, SHGC: 0.29
Foundation Walls:	N/A
Framed Floor:	N/A

Results

High performance Homes

- HERS Score 28 (Prelim before Solar)
  - Net Positive with Solar -8
- Mid point Blower Door
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Home Energy Rating Certificate
Projected Report
Based on Plans

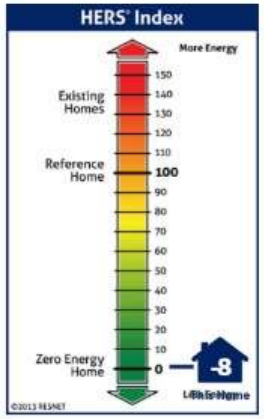
Rating Date: 2023-01-27
Registry ID:
Ekotrope ID: Le6G73Pd

HERS® Index Score: -8
Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings $3,546
*Relative to an average U.S. home

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	11.2	$289
Cooling	0.9	$26
Hot Water	2.7	$72
Lights/Appliances	16.9	$460
Service Charges		$96
Generation (e.g. Solar)	41.0	-$847
Total:	**31.6**	**$96**



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Home Type:	Single family detached
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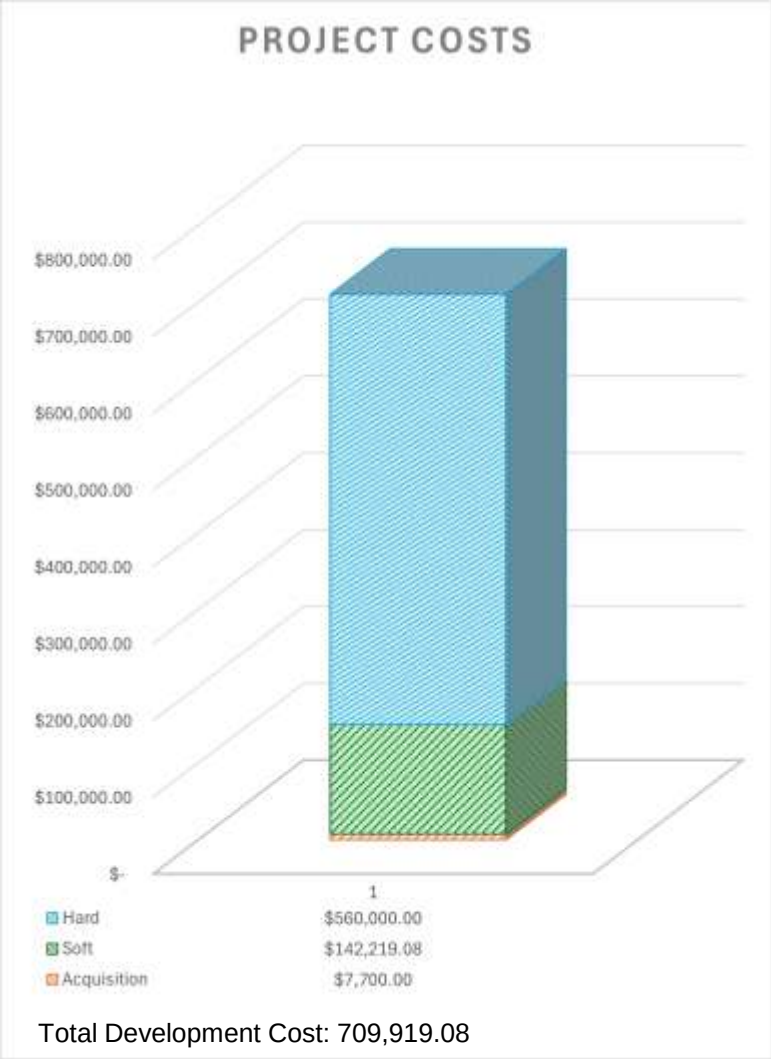
Foundation Walls:	N/A
Framed Floor:	N/A

What are the Challenges?

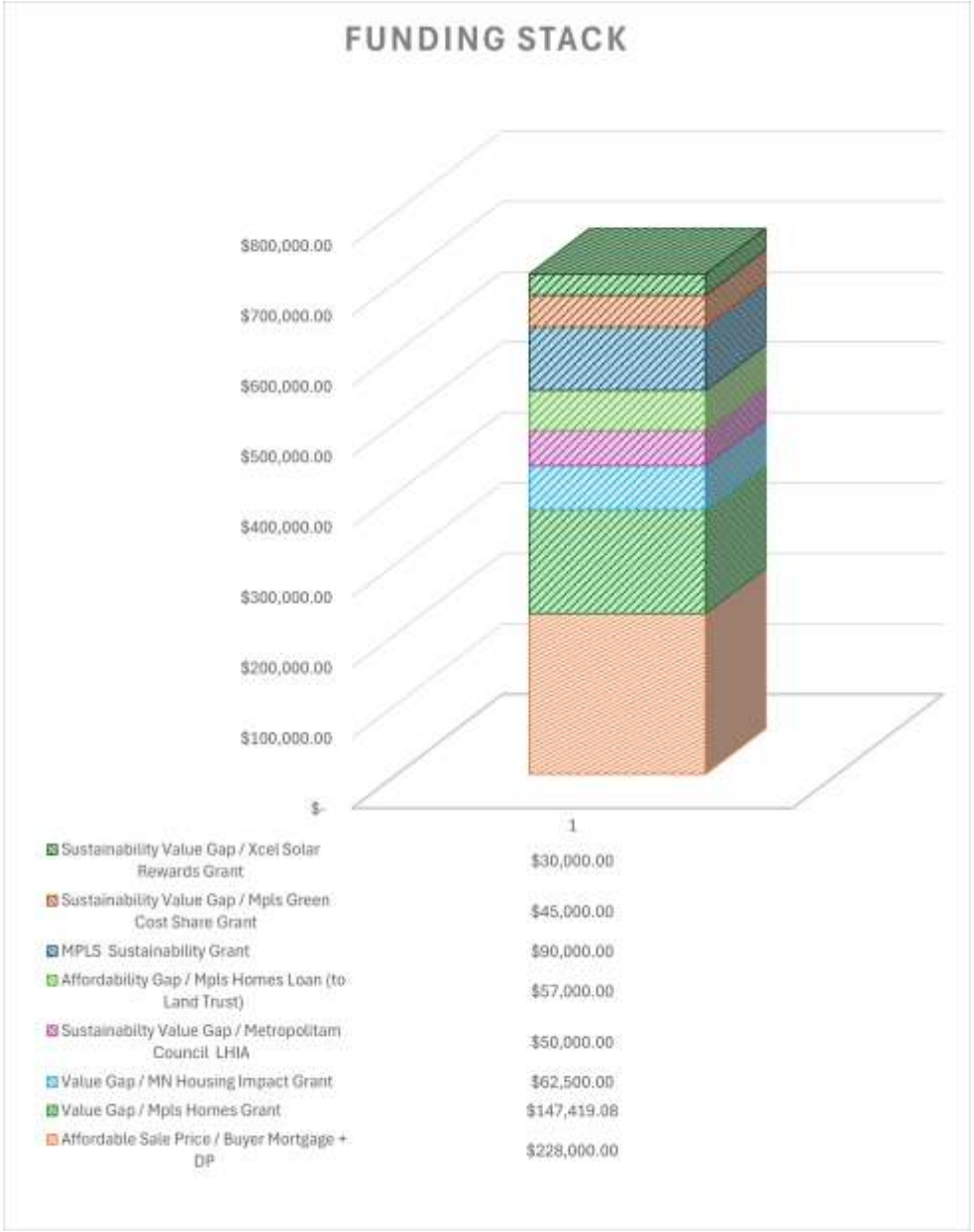
High-performance

- *Cost*
  - *15-20% more for Single Family*
  - *3-5% for multifamily*
- *Contractor Knowledge*
- *Plan Review and Permitting*
- *Appraisals*
  - *Residential Green and Energy Efficient Addendum Form 820.06*

How did we make it work?



Total Development Cost: 709,919.08



Questions?

CODE

Emissions Summary

Property
2704 N Bryant Ave
Minneapolis, MN 55411
Model: Northside Passive

2704 N Bryant Ave - Northside Passive
Initial House Design

Organization
Center for Energy and Env.
Tony Beres

Builder
Urban Homeworks

Inspection Status
Results are projected

cee
Center for Energy and Environment

Emissions by End-Use

Carbon Dioxide (CO_2) [tons/yr]	
Heating	3.4
Cooling	0.3
Water Heating	0.6
Lights & Appliances	3.6
Photovoltaics	-0.0
TOTAL	7.9

Sulfur Dioxide (SO_2) [lbs/yr]	
Heating	7.1
Cooling	0.7
Water Heating	1.3
Lights & Appliances	7.5
Photovoltaics	-0.0
TOTAL	16.6

Nitrogen Oxide (NO_x) [lbs/yr]	
Heating	4.0
Cooling	0.4
Water Heating	0.7
Lights & Appliances	4.2
Photovoltaics	-0.0
TOTAL	9.3

Energy Use Intensity (EUI) [kBtu/ft²]	
Site EUI	21.5

PHIUS

Emissions Summary

Property
2704 N Bryant Ave
Minneapolis, MN 55411
Model: Northside Passive

2704 N Bryant Ave - Northside Passive
Initial House Design

Organization
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Results

High performance Homes

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cee
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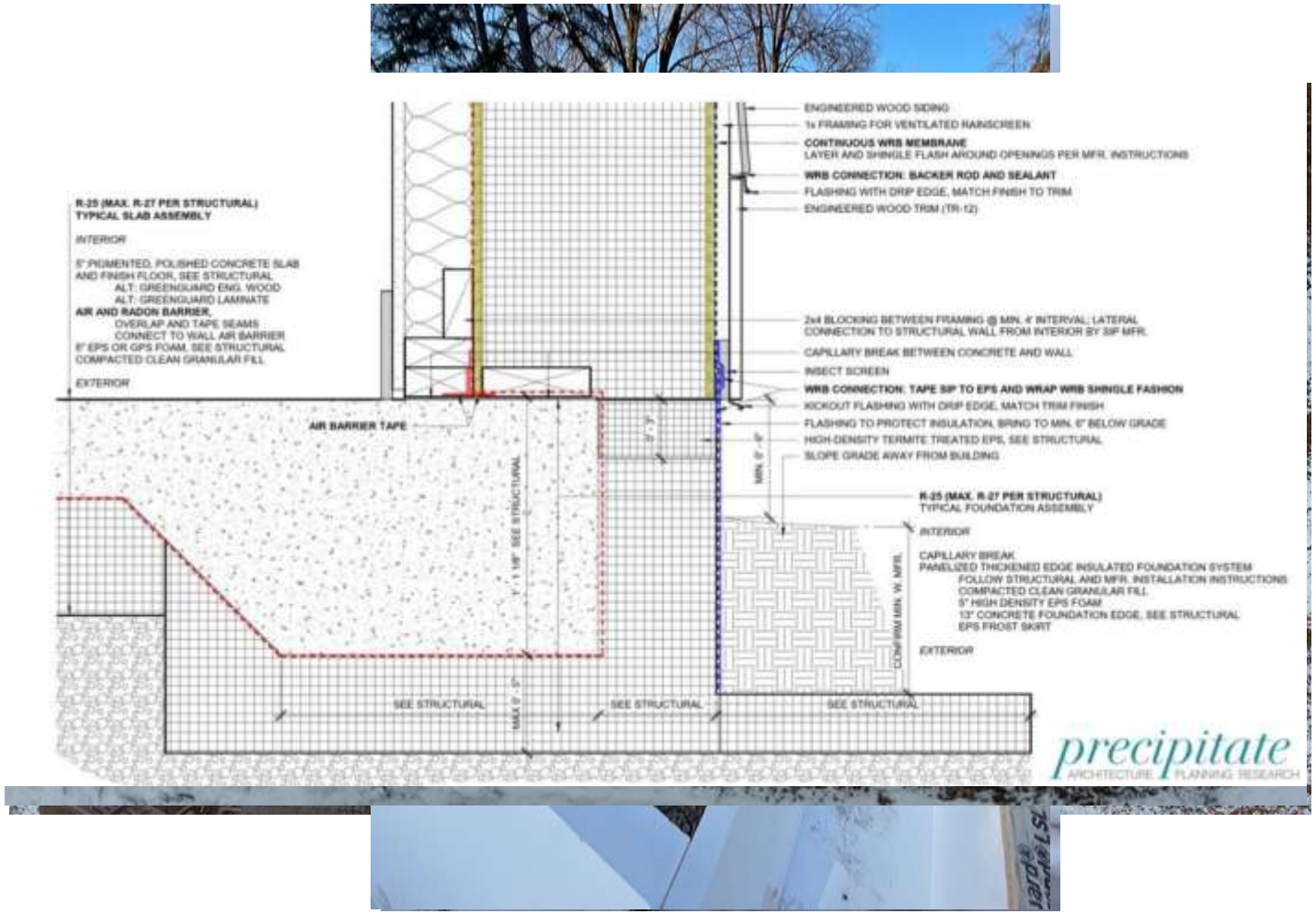
Lights & Appliances	7.5
Photovoltaics	-0.0
TOTAL	16.6

Nitrogen Oxide (NO_x) [lbs/yr]	
Heating	4.0
Cooling	0.4
Water Heating	0.7
Lights & Appliances	4.2
Photovoltaics	-0.0
TOTAL	9.3

Energy Use Intensity (EUI) [kBtu/ft²]	
Site EUI	21.5

Ekotrope RATER - Version 4.1.0.3124

HOW is UHW making this Customary



Design and Products

- ***FPSF***
  - ***Build Smart J-Form R25***
    - ***WarmForm***
  - ***Stego Wrap Vapor Barrier***
- ***Plan Review!!!***

HOW is UHW making this Customary

Design and Products

- ***Walls***
  - ***LP on ¾ rain screen***
  - ***Mento 1000 WRB***
  - ***12” SIPS R48***
  - ***Intello***
  - ***2x4 Structural Wall***
    - ***Fiberglass Batt R15***
  - ***Drywall***
- ***Structural!!!***

HOW is UHW making this Customary

Design and Products

- Ceiling
  - Energy Heel and blown in fiberglass R60
  - Utility Chase
  - Intello Cap
    - EZ Hatch

HOW is UHW making this Customary

Design and Products

- Equipment Specs
  - DHW: ASHP 3.45 UEF- Voltex Hybrid
  - ERV: RenewAire EV Premium L
  - ASHP Mitsubishi M-Series
    - 10.4 HSPF
    - 18.4 SEER
  - Windows Access Tilt Turns 0.15 U-Value

HOW is UHW making this Customary

APADANA SOLAR TECHNOLOGIES

Preliminary Design

Urban Homeworks
811 31st Ave N
Minneapolis, MN 55411

1/24/2024
Rev 1

Contact:
Andy Goke
651-707-3090
Andy.Goke@ApadanaTechnology.com

System Size: 10.5 kW DC / 26 Panels

Solar and Net Positive

- 10.5 kW System
  - Installed for $3.80/watt
  - Xcel Energy low income up front incentive for $2.75/watt
  - Green cost share production rebate $.40/watt
  - Tax Credits for long term owners 30-40%
  - Xcel Production incentive for $.03/kwh
  - + any net energy sold to xcel.

Designing Affordable Passive: Targets

Phius 2021
Performance Criteria Calculator v3.3

UNITS:	IMPERIAL (IP)
BUILDING FUNCTION:	RESIDENTIAL
PROJECT TYPE:	NEW CONSTRUCTION
STATE/ PROVINCE	MINNESOTA
CITY	MINNEAPOLIS-ST PAUL
Envelope Area (ft²)	3,978.4
iCFA (ft²)	1,346.5
Dwelling Units (Count)	1
Total Bedrooms (Count)	4

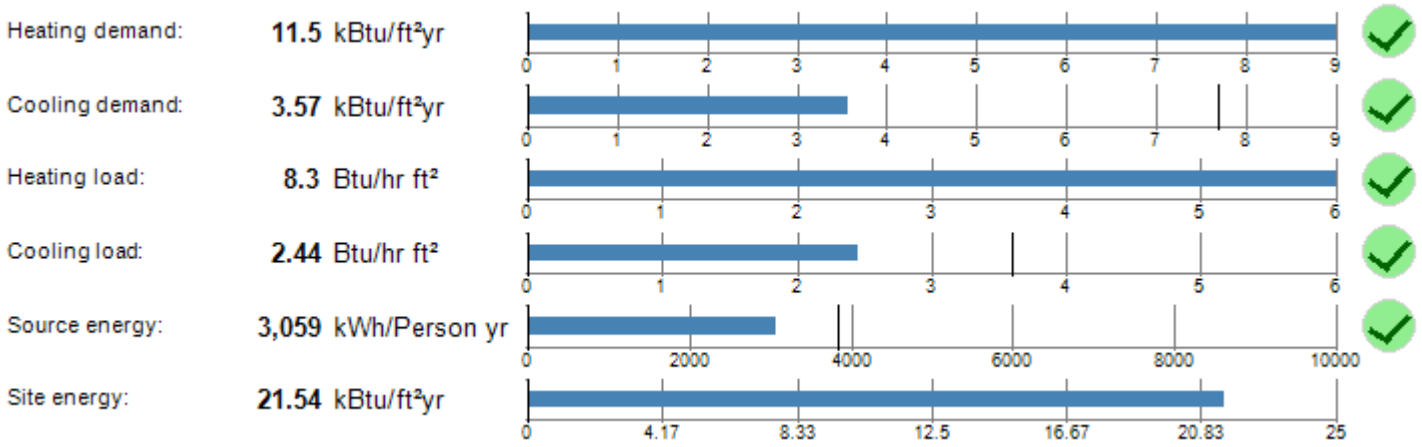
Space Conditioning Criteria

Annual Heating Demand	11.5	kBtu/ft²yr
Annual Cooling Demand	7.7	kBtu/ft²yr
Peak Heating Load	9.3	Btu/ft²hr
Peak Cooling Load	3.6	Btu/ft²hr

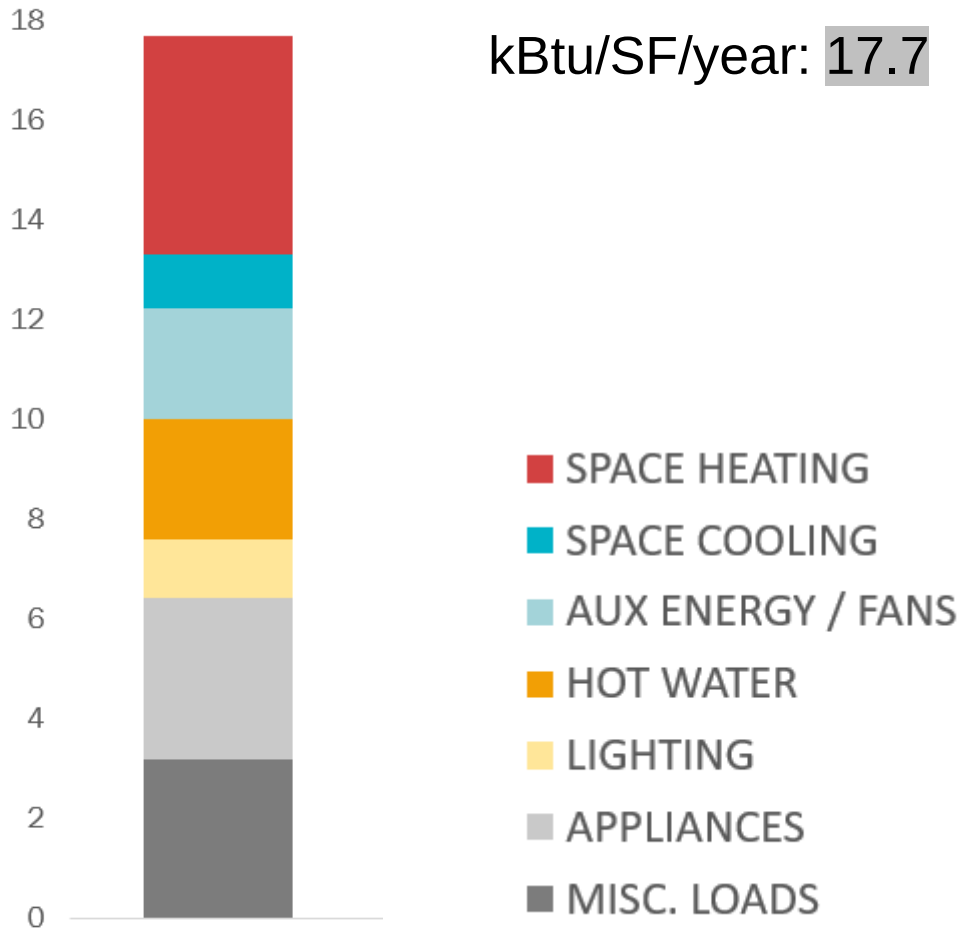
Source Energy Criteria

Phius CORE	3325	kWh/person.yr
Phius ZERO	0	kWh/person.yr

811 31st Targets from Phius (left) and results from WUFI Passive (below)



Designing Affordable Passive: Energy Use

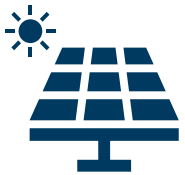


- *Assembly values*
  - *Roof*
  - *Walls*
  - *Slab*
  - *Windows / Doors*
- *Mechanical Systems*
  - *Air Source Heat Pump*
  - *Energy Recovery Ventilator*
  - *Domestic Hot Water*
- *Appliances*

Qualified Project Overview: Net-Zero Emissions Transport

Miguel Moravec, mmoravec@rmi.org
Alisa Petersen, apetersen@rmi.org
Marisa Bayer, mbayer@edinamn.gov

Priority Project Categories for GGRF



Distributed Energy Generation and Storage

Power generation, and/or storage technologies, and carbon-free enabling infrastructure

Examples:

- Residential rooftop solar
- Community wind and solar
- Fuel cells
- Distributed generation and storage assets that support microgrids

Net-Zero Buildings

Retrofits for existing buildings that contribute towards them becoming net-zero or construction of new net-zero buildings in LIDACs (residential, commercial, industrial, etc.)

Examples:

- Affordable family housing decarbonization
- Decarbonization retrofits as adaptive reuse of existing buildings
- New construction of net-zero residential building

Zero Emission Transportation

Zero-emission transportation modes and their enabling infrastructure, especially in communities overburdened by diesel pollution and particulate matter concentration

Examples:

- Charger deployment
- Micromobility modes of transportation
- Zero-emission Medium and heavy – duty vehicles

Question: who is interested in EVs but worried about the upfront price-tag?

Menti

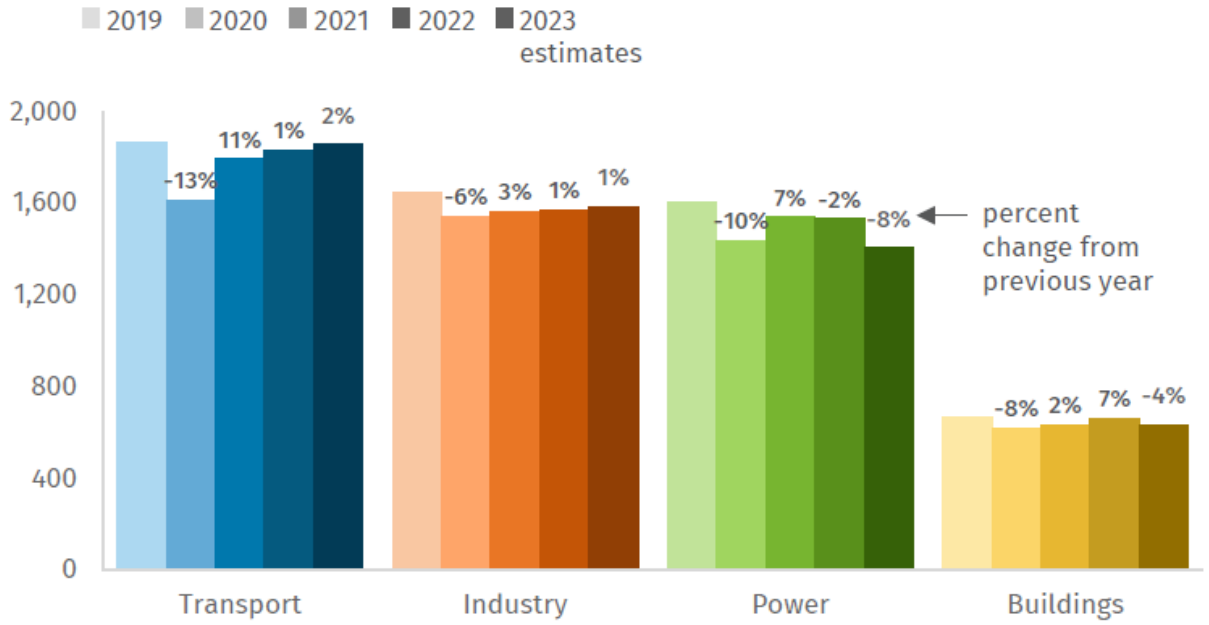
We are going to use an interactive polling tool to capture thoughts and ideas throughout the convening. You should have already opened this link at registration but using a device (phone or computer):

- **Go to menti.com**
- **Enter the following code: 3976 2816**
- **Follow along and answer the questions on screen!**

- **If at any point you want to submit a question, navigate to the "Open Q&A" button to submit a question**

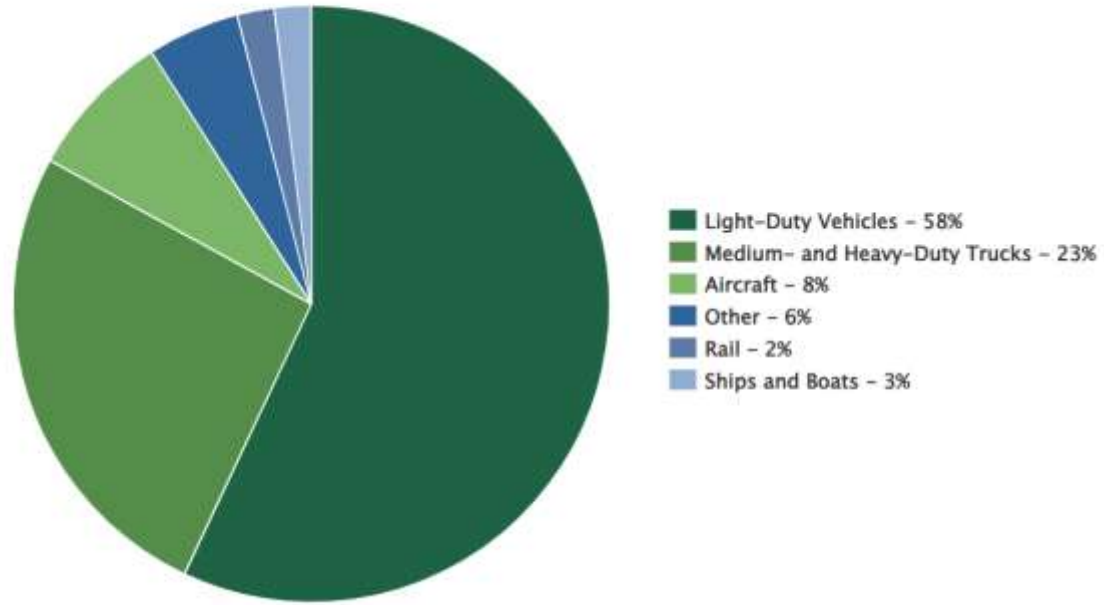
US transportation emissions are growing, dominated by car and truck trips (81%)

FIGURE 3
Year-on-year change in emissions by major sector
Million metric tons CO_2-equivalent and percent change



Source: Rhodium Group

2021 U.S. Transportation Sector GHG Emissions by Source



Electrifying vehicles has tremendous health benefit, especially for disadv. communities

- **2.79 million asthma attacks** avoided
- **2.67 million upper respiratory symptoms** avoided
- **1.87 million lower respiratory symptoms avoided**
- **147,000 acute bronchitis cases** avoided
- **508 infant mortality cases** avoided

American Lung Association.

State	Cumulative Health Benefits, 2020 - 2050			
	Health Benefits (Billions)	Premature Deaths Avoided	Asthma Attacks Avoided	Lost Work Days Avoided
Minnesota	$14.9	1,350	36,600	171,000

Electrifying vehicles has tremendous operation cost savings benefits, especially for fleets

Businesses and Local Governments: It's Never Been a Better Time to Electrify Your Vehicle Fleet

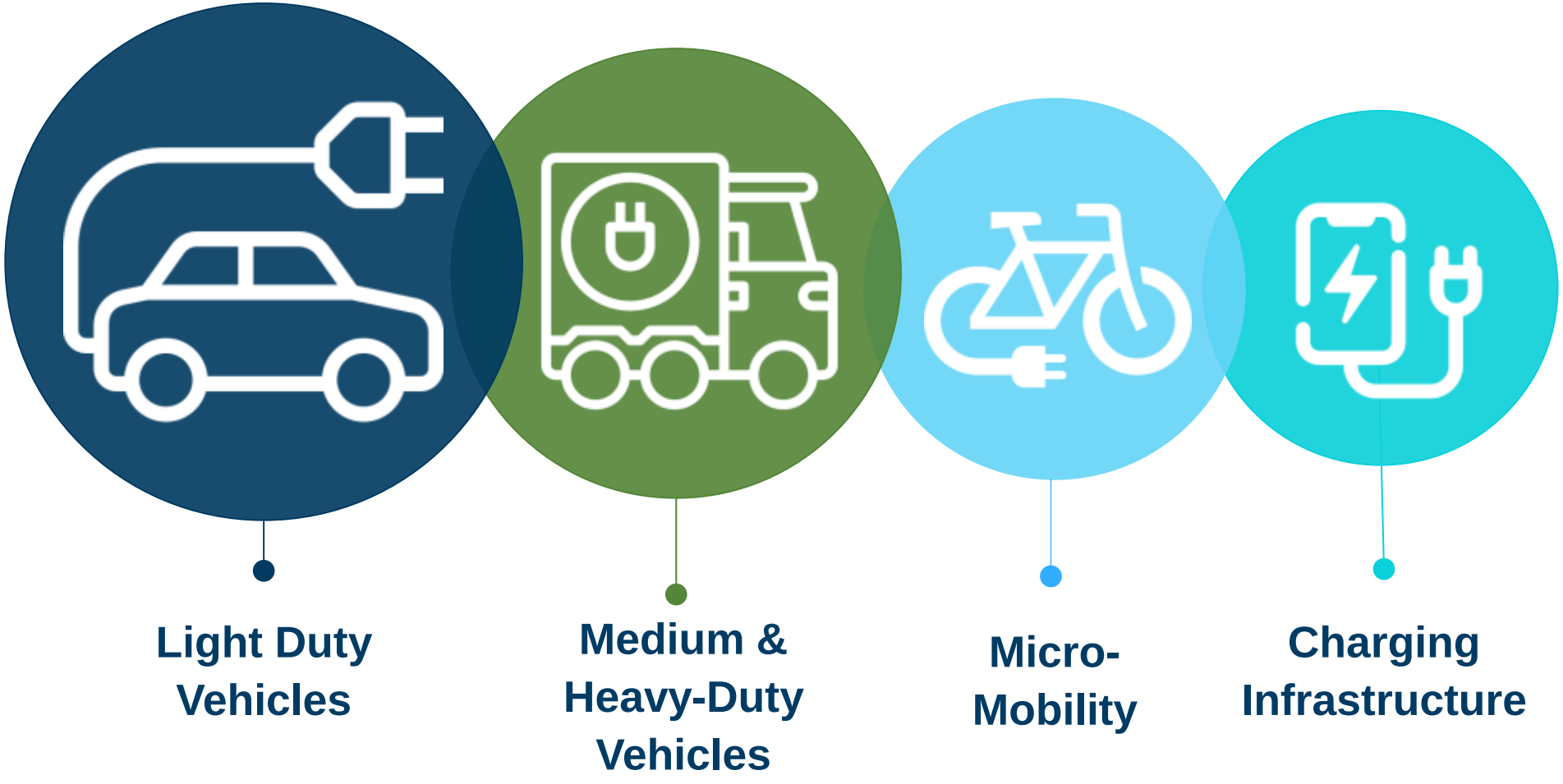
Technological advancements and Inflation Reduction Act incentives make fleet electrification economically attractive for businesses and governments, resulting in 9 percent cost savings.

McKinsey & Company

Automotive & Assembly

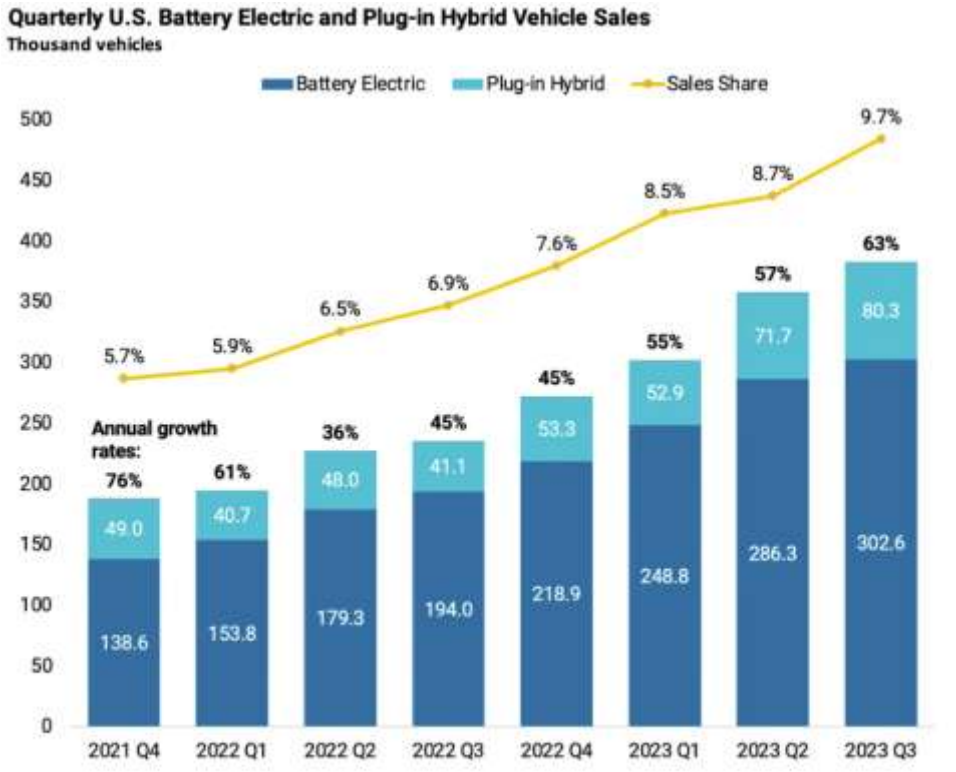
The economics of decarbonizing fleets are demonstrably viable. Now commercial transport operators need to identify the best way to capture value.

Technology solutions are here, but high upfront costs require finance solutions



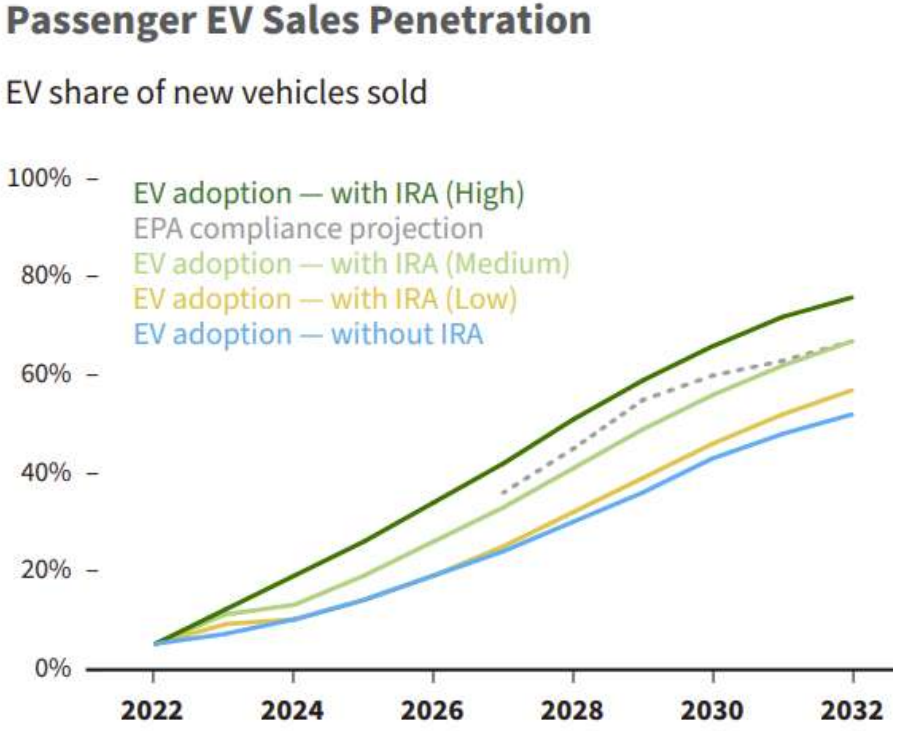
With EV's on an S-curve, US market size in 2030 is projected to grow to $350B (up from $41B in 2022)

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

Looking forward



Source: RMI analysis

The clean vehicle tax credit for individual EV buyers (30D) has been expanded & extended through 2032

Up to $7,500 per vehicle

Divided in two $3,750 half credits for a 1) critical mineral requirement and 2) battery component requirement

Eligibility Requirements

- Not have any **critical minerals** extracted, processed or recycled by a foreign entity of concern (China) starting in 2024 [4]
- The vehicle must have **final assembly** in North America
- The vehicle price must be below **Manufacturing Suggested Retail Price caps**
- Buyers must meet **income restrictions**

BEFORE

72% projected EV sales by 2025 would be ineligible due to a manufacturing cap [1]

AFTER

IRA removes the manufacturing cap

BEFORE

Over 40% 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]

Strict Domestic Content Requirements Mean Not All EVs Qualify for the Tax Credit

- 36 Cars Qualify for Some Portion
- 23 Cars Qualify for Full Value
- 13 Different Manufacturers

Make	Model	Model Year	Vehicle Type	Credit Amount	MSRP Limit	Eligibility
Acura						
	ZDX	2024	EV	$7,500	$80,000	Check w/ dealer
Audi						
	Q5 PHEV 55 TFSI e quattro	2023–2024	PHEV	$3,750	$80,000	Check w/ dealer
	Q5 S Line 55 TFSI e quattro	2023–2024	PHEV	$3,750	$80,000	Check w/ dealer
Cadillac						
	LYRIQ	2024	EV	$7,500	$80,000	Check w/ dealer

Make	Model	Model Year	Vehicle Type	Credit Amount	MSRP Limit	Eligibility
Chevrolet						
	Blazer EV	2024	EV	$7,500	$80,000	Check w/ dealer
	Bolt EUV	2022–2023	EV	$7,500	$55,000	Check w/ dealer
	Bolt EV	2022–2023	EV	$7,500	$55,000	Check w/ dealer
	Equinox EV	2024	EV	$7,500	$80,000	Check w/ dealer
Chrysler						
	Pacifica PHEV	2022–2024	PHEV	$7,500	$80,000	Check w/ dealer
Ford						
	Escape Plug-in Hybrid	2022–2024	PHEV	$3,750	$80,000	Check w/ dealer

Source: https://fueleconomy.gov/feg/tax2023.shtml

IRA created new credits for used and commercial vehicles

Credit for Previously-Owned Clean Vehicles (25E)

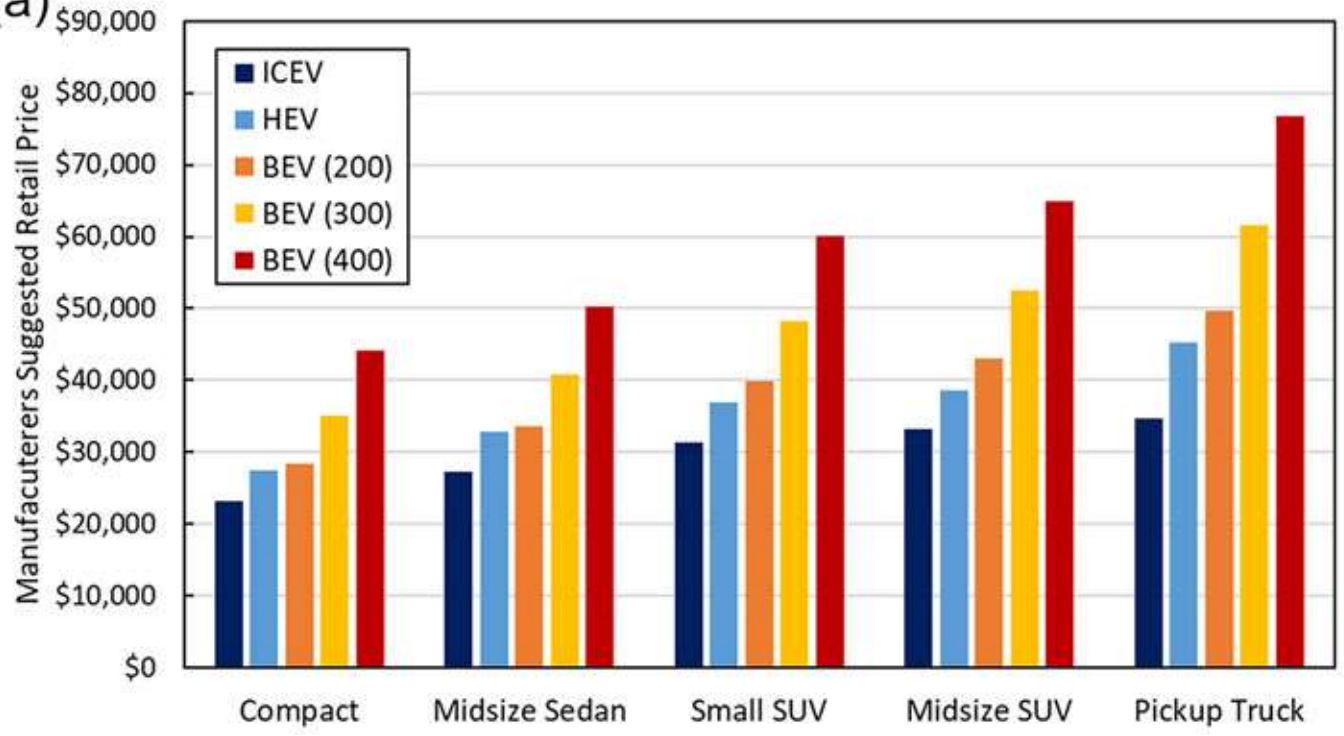
- New tax credit for pre-owned clean vehicles through 2032
- Credit is the lesser of $4,000 or 30% of the sale price
- Transferable to the dealer
- No critical mineral, battery, or domestic content requirements

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

Electric vehicle MSRP is still a premium to ICE vehicles

(a)



(b)

ICEV: Internal Combustion Engine Vehicle
HEV: Hybrid Electric Vehicle
BEV: Battery Electric Vehicle (Range)

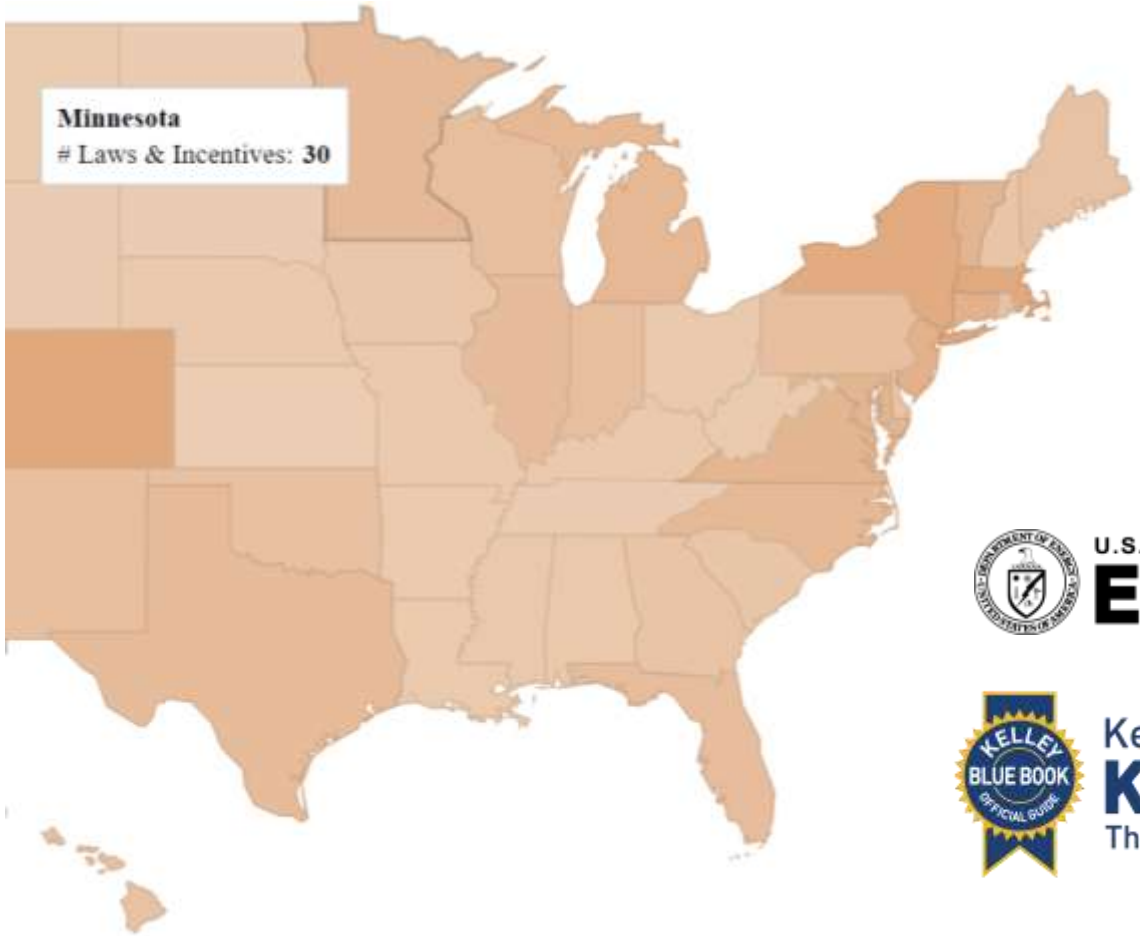
Model Year 2020 “Electric and gasoline vehicle total cost of ownership across US cities”

CENTER FOR SUSTAINABLE SYSTEMS UNIVERSITY OF MICHIGAN

Use Kelly Blue Book & DOE to find state EV and charging incentives

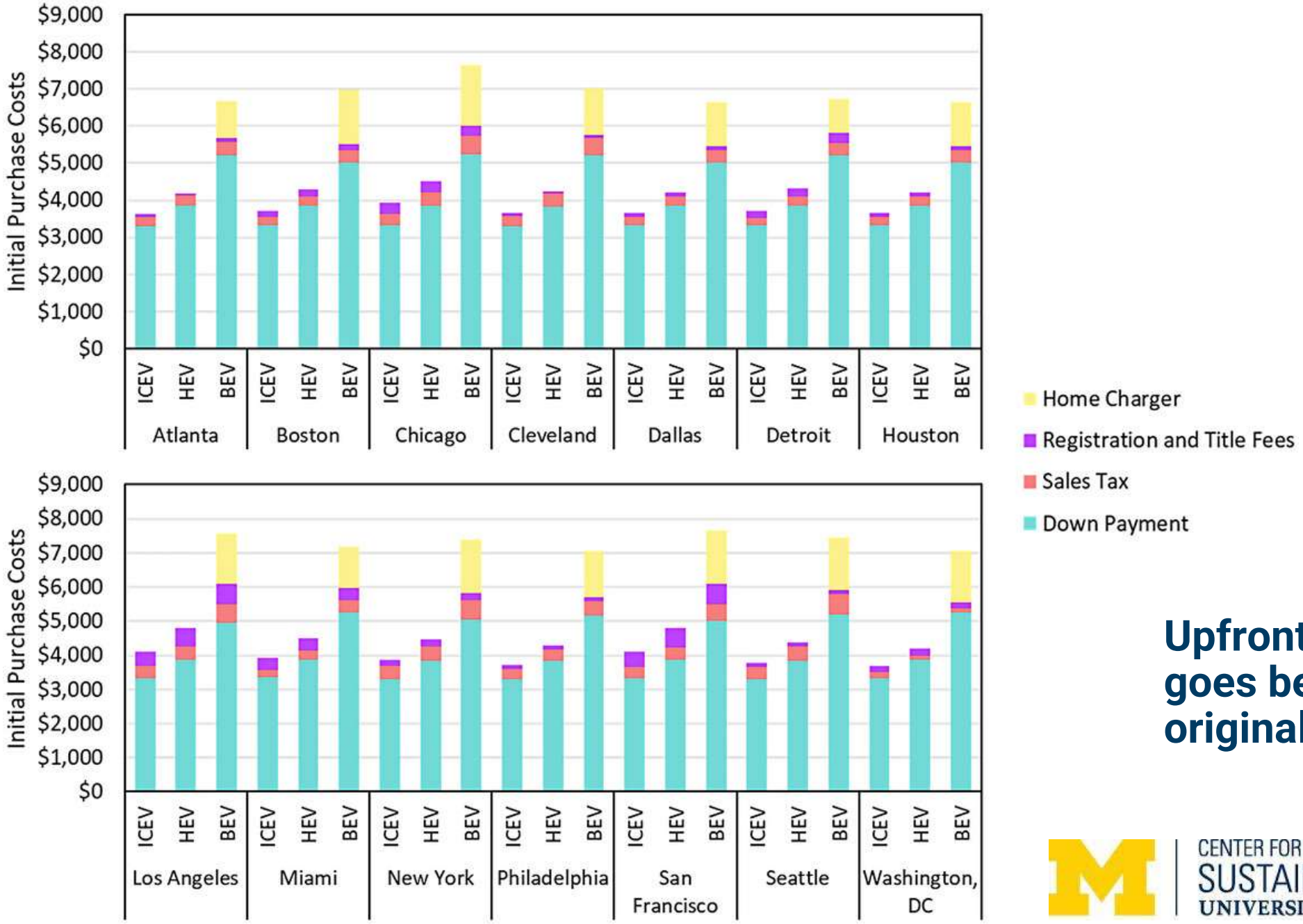
Minnesota EV Incentives:

- **Purchase & Lease Rebates:**
  - $2,500 new
  - $600 used
- **Grants**
  - 95% cost of EV School Bus & Charger
- **E-Zpass Credit:**
  - New $250
  - Used $125



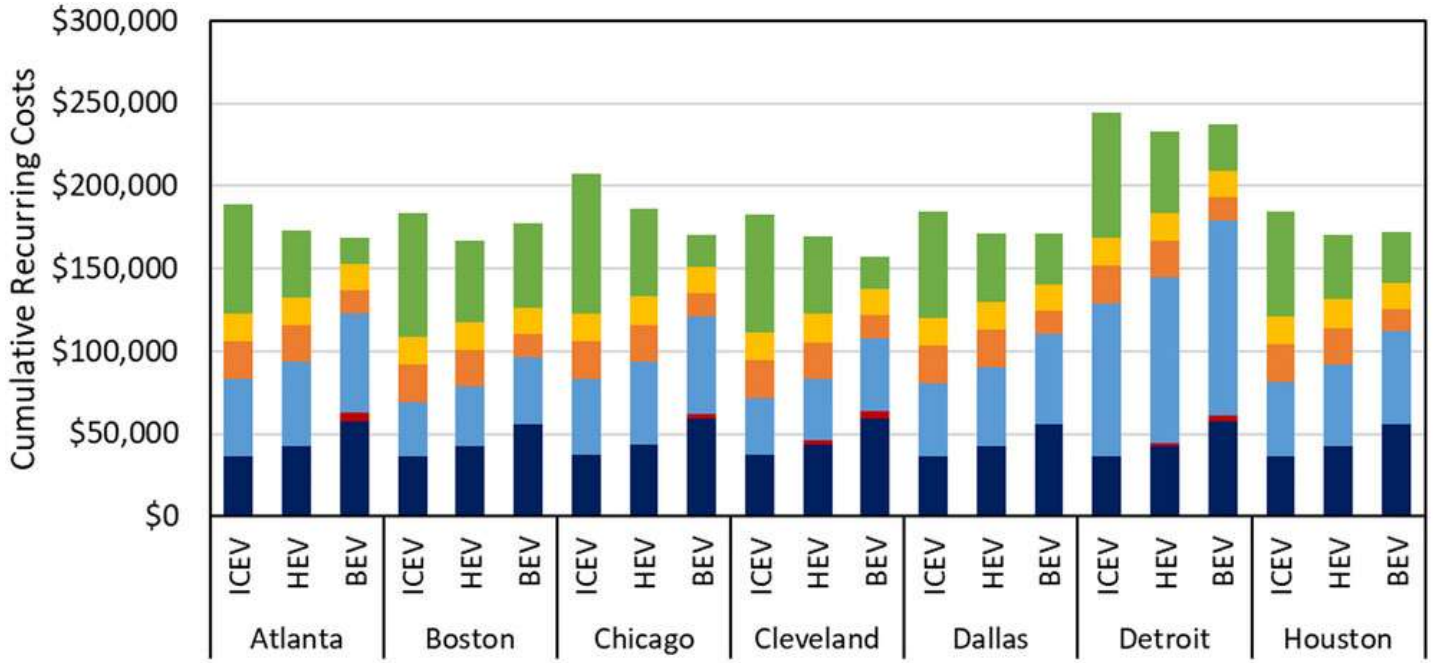
U.S. DEPARTMENT OF ENERGY

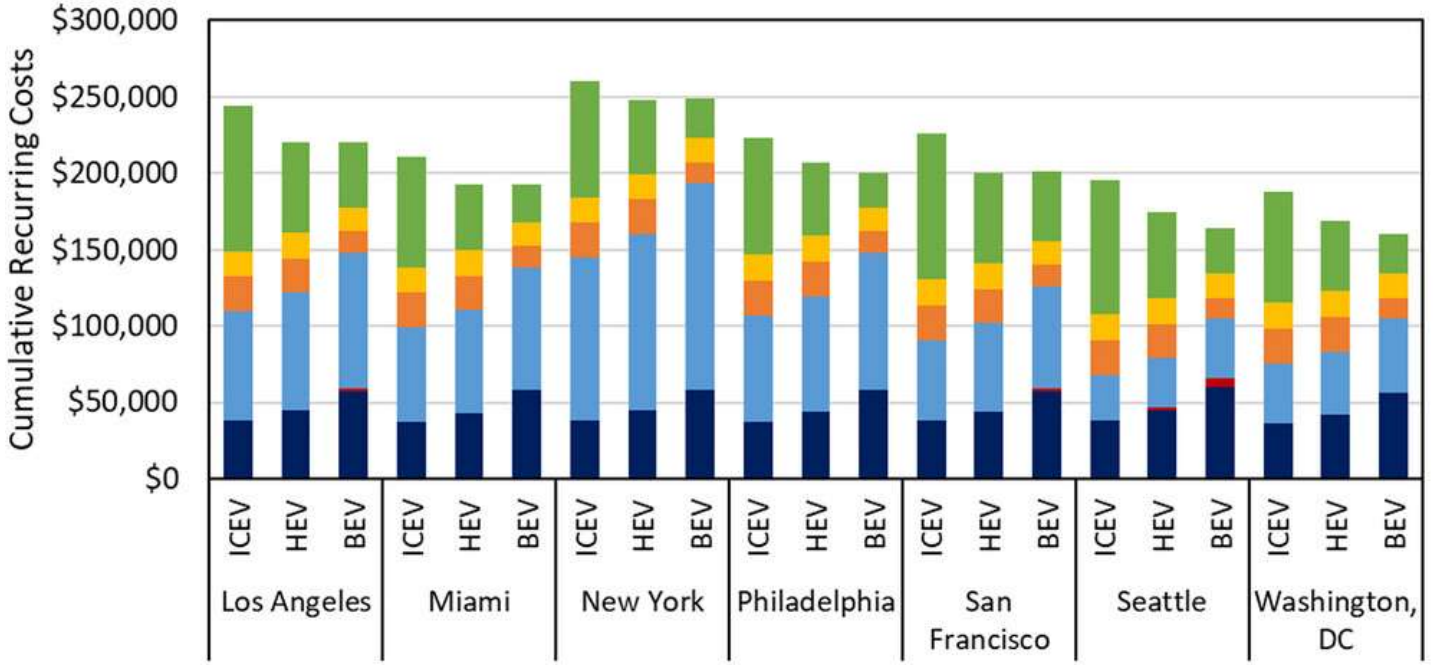
Kelley Blue Book
KBB.COM
The Trusted Resource



Upfront cost for EVs goes beyond just the original sticker price

CENTER FOR SUSTAINABLE SYSTEMS
UNIVERSITY OF MICHIGAN





Fuel
Repairs
Maintenance
Insurance
Annual Fees
Financing

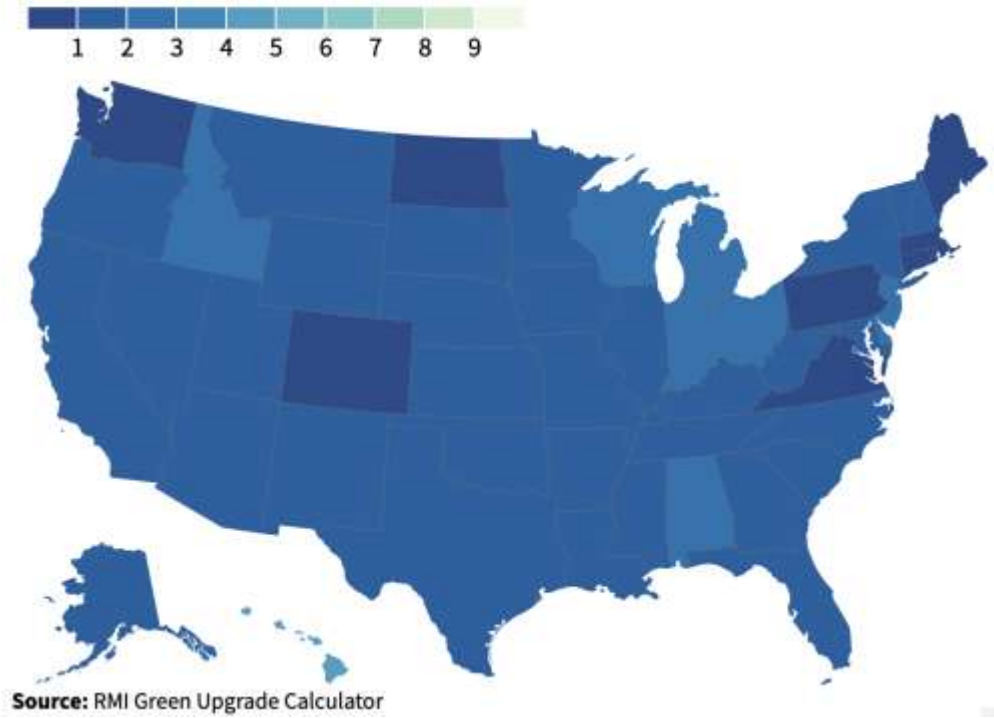
Electric vehicle operating costs are lower, meaning consumers have more cash on hand

CENTER FOR SUSTAINABLE SYSTEMS
UNIVERSITY OF MICHIGAN

EV payback compared to ICE is highly dependent on upfront cost and operating savings

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

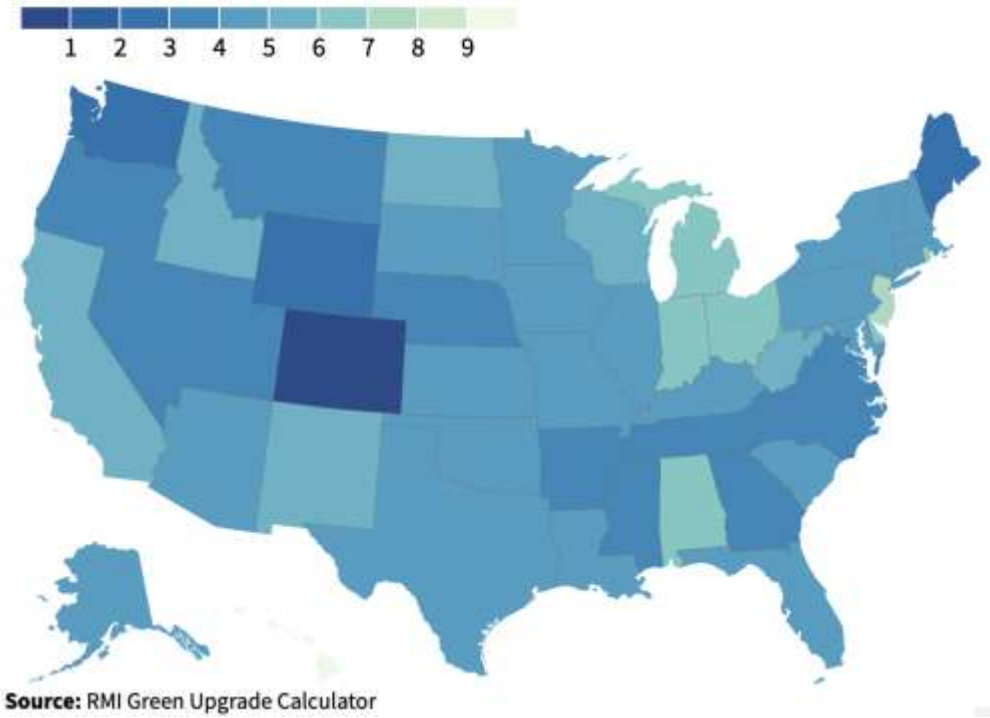
50 states have payback <5 years



Source: RMI Green Upgrade Calculator

EV Payback (Years) without federal tax credit

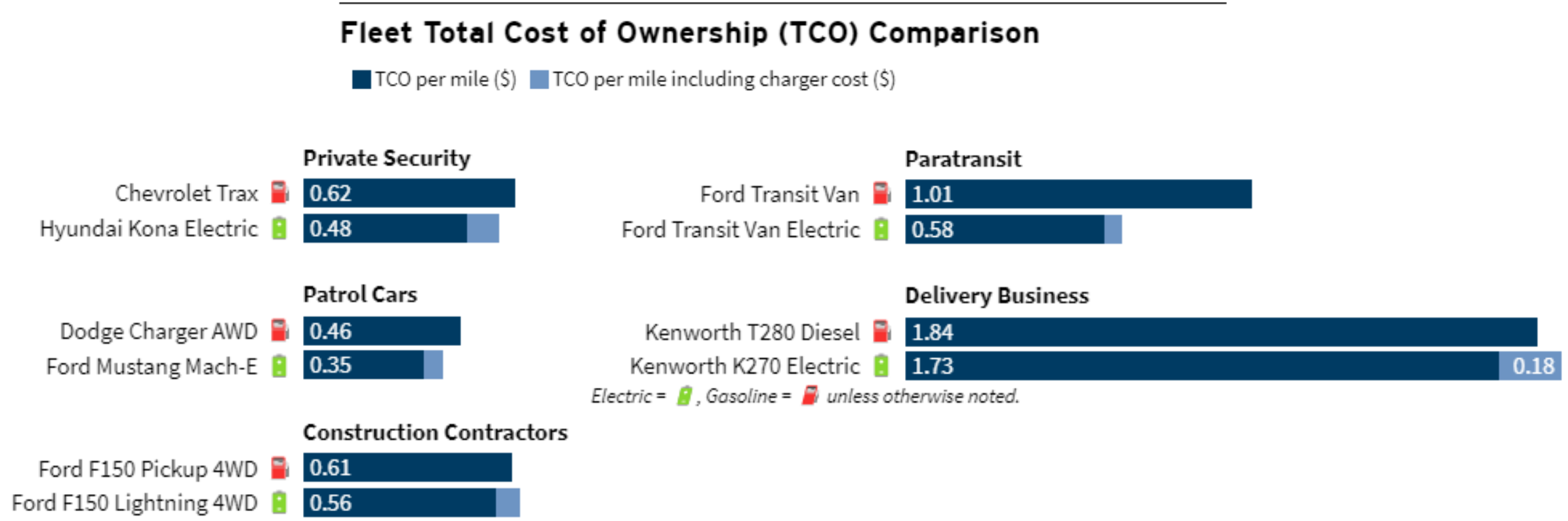
36 states have payback <5 years



Source: RMI Green Upgrade Calculator

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

EVs have a 9 percent lower total cost of ownership than equivalent fossil fuel vehicles, even when the cost of charging infrastructure is included



Use "DRVE Dashboard" for Rapid Vehicle Electrification Tool to see TCO for your fleet

Enter a new vehicle that this vehicle will be mapped to in the tool. If a vehicle isn't available in the tool, you can create a custom vehicle using the 'Create Custom' button to the right.

Create Custom

Electric Alternative

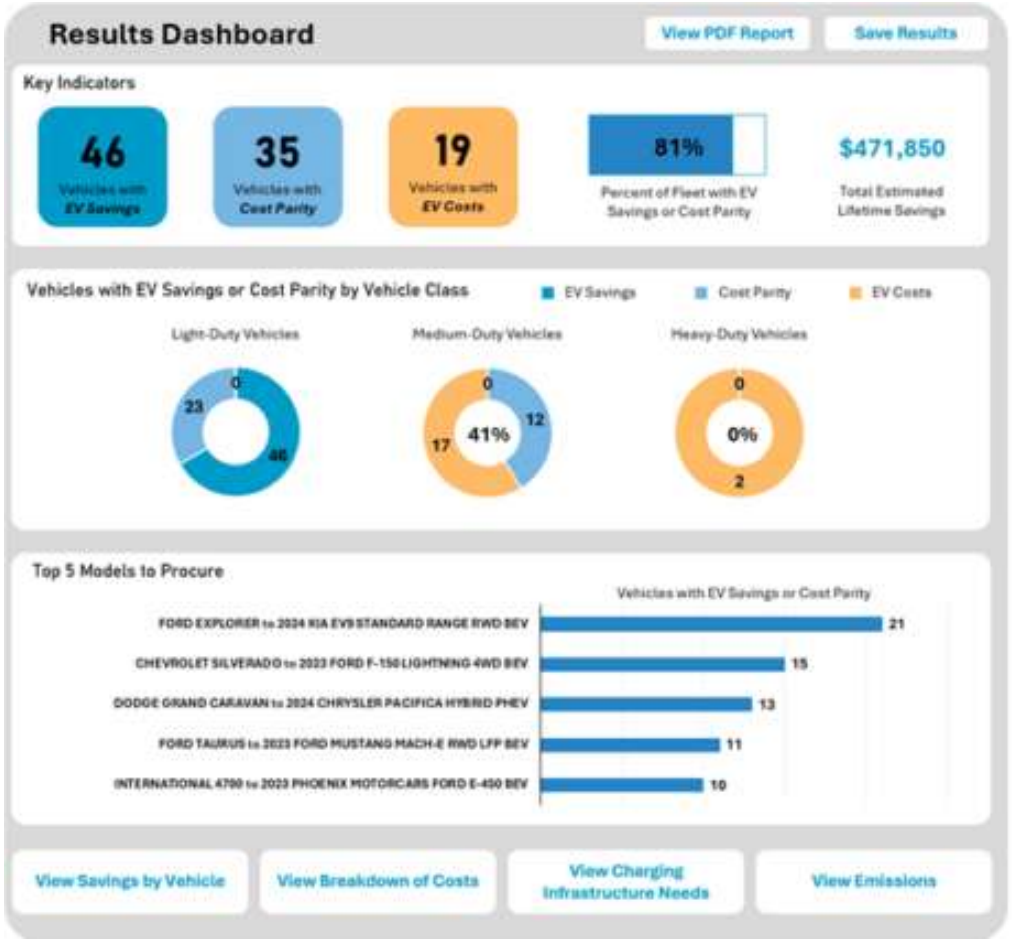
Original Vehicle: CHEVROLET COLORADO

Mapped Vehicle: 2023 FORD F-150 LIGHTNING

Class:	Passenger Vehicles (Light-Duty)	MSRP/Price ($):	$69,995		
Make:	FORD	Fuel Econ (MPG):	City:		Hwy:
Model:	F-150 LIGHTNING 4WD EXTENDE	Fuel Econ (MPGe):	City:	78	Hwy: 63
Year:	2023	State Incentive ($):	0		
Use Case:	Light Pickup				

Cancel

Update Vehicle Mapping



Source: Electrification Coalition, Atlas Public Policy

Fleet Electrification Case Study: City of Edina, MN

Marisa Bayer

Sustainability Manager
Engineering Department

The CITY of EDINA

City of Edina Fleet Electrification and EV Charging

Mobilizing Climate-Aligned and Community-Led Capital

October 2024

City of Edina Climate Action Plan Goals & Policies

- Climate Action Plan: reduce greenhouse gas emissions 45% by 2030, achieve net-zero emissions by 2050
  - TL 5: Convert municipal operations gasoline and e10 gasoline vehicles and equipment within municipal fleet to EV's
  - Increase municipal and public charging access
- Green Fleet Policy: Prioritize electric and hybrid vehicles during vehicle replacement schedule
  - Informed by Fleet Electrification Study, State contract, market knowledge

Charging Infrastructure

- Charging infrastructure
  - Prioritize municipal fleet access
    - Co-benefit of public charging opportunities
  - ChargePoint infrastructure acquired through approved vendor
  - Internal staff capacity and expertise to install charging infrastructure
- Private Fleet charging at Public Works Fleet Garage
- Public charging at City Hall, Public Works, parking garages, liquor stores, Braemar Arena

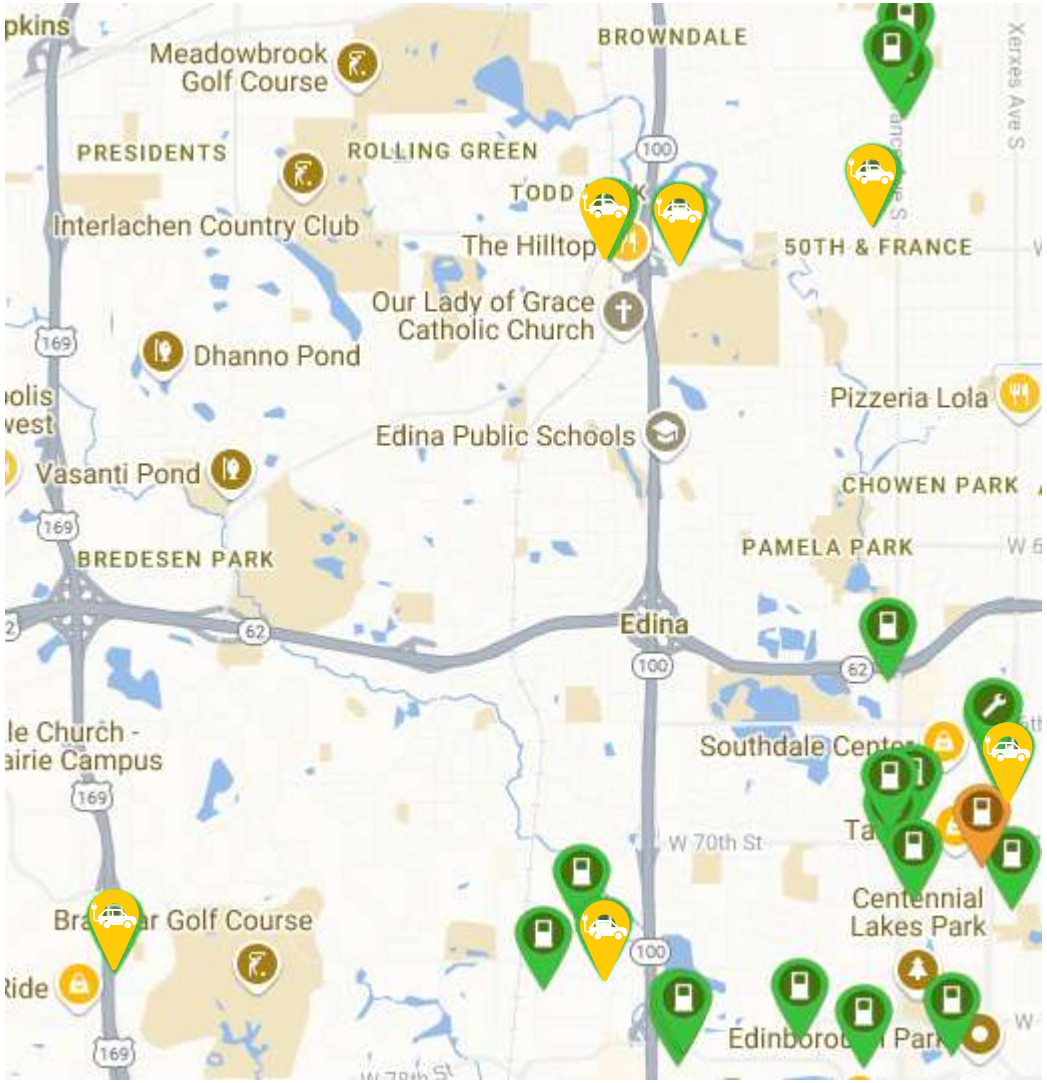


Image source: PlugShare.com

The CITY of EDINA
Energy. Transformed.

Fleet Electrification

- Green Fleet Policy prioritizes EV and hybrid purchases
- Integrated into evaluation process during vehicle replacement schedule
- Informed by Fleet Electrification Study funded by Xcel Energy
- Early adopters & champions: Engineering, Police

Image source: City of Edina

The CITY of EDINA
Energy. Transformed.

Paying for EVs and Infrastructure

- Conservation & Sustainability Fund (CAS Fund) covers Sustainability Division staff and programs
  - Annual funding allocation to vehicle and infrastructure
  - Rolls over year to year
  - Revenue generated from utility franchise fees

Funding for EV Purchases	
Equipment Replacement Fund	Base vehicle cost for 1:1 replacement
CAS Fund	Incremental difference from going from ICE to EV

Funding for EV Charging*	
Staff time	Site Assessment, design, installation
CAS Fund	EV charger, infrastructure (as needed)

* Larger infrastructure projects will go to bid and use external contractor for assessment, design and installation

EV Example: Chevy Blazer EV PPV	
Equipment Replacement Fund	$44,999
CAS Fund	$16,419
Total Vehicle Cost	**$61,418**

EV Example: Ford Maverick Hybrid	
Equipment Replacement Fund	$26,243
CAS Fund	$1,395
Total Vehicle Cost	**$27,638**

Role of Elective Pay

- Elective Pay allows us to claim credits for EV purchases and eligible purchases
- Revenue from Elective Pay goes back into CAS Fund
- Additional revenue will fund additional vehicle replacements and other clean energy investments
- Creates ability to build in Elective Pay credits into project cost estimates

Elective Pay Estimates*	
2023	$30,000 (4 vehicles)
2024	$45,000 (6 vehicles)

*Estimates only, based on anticipated eligible equipment and vehicle purchases

Current & Future Challenges

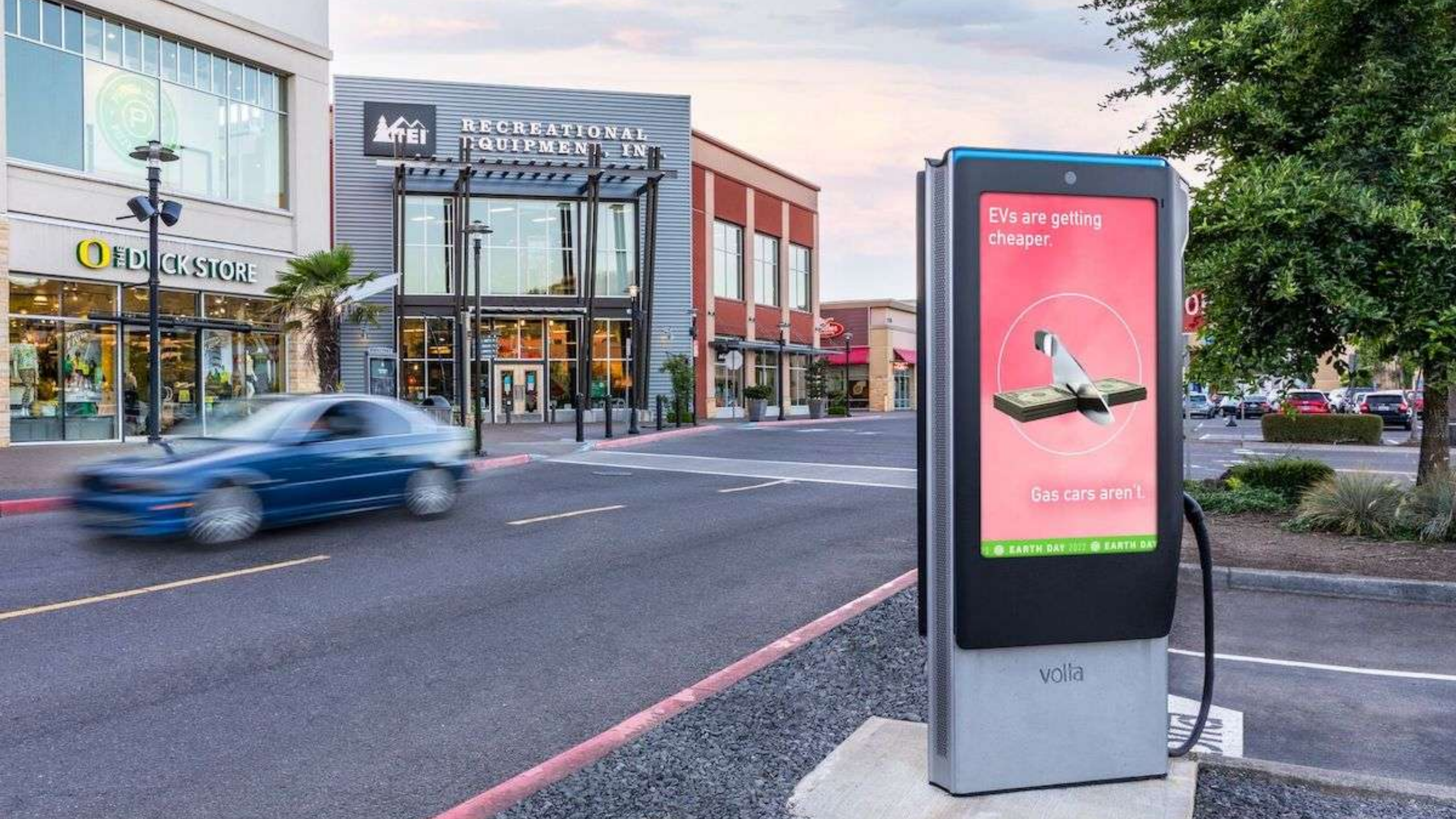
- **Medium- and heavy-duty fleet electrification**: Limited model availability, high cost to transition
- **24-hour service need**: Public Safety requirements for service, limited range and charging capacity during winter and high demand shift schedules
- **Charging infrastructure limitations**: Reaching capacity at City buildings for charging infrastructure
- **Fast charger expansion**: High cost to install fast charger to meet ongoing demand
- **Shifting costs**: Centralized fueling station with Dept fobs/accounts; how to account for charging costs incurred at different sites on different utility accounts by different Depts?

The CITY of EDINA

Thank you!

Marisa Bayer, Sustainability Manager
mbayer@EdinaMN.gov

Charging Infrastructure


RECREATIONAL
EQUIPMENT, INC.
THE DUCK STORE
EVs are getting cheaper.
Gas cars aren't.
volta

EV Charger Types:

		Range	Application
Level 1		2 to 5 miles of range per hour	• Single Family Homes • Multi-Unit Residential • Condos
Level 2		10 to 30 miles of range per hour	• Single Family Homes • Multi-Unit Residential • Workplace • Fleet • Public
Level 3 (Direct Current Fast)		150 to 350+ miles of range per hour	• Fleet • Public • Multi-Unit Residential

Cost	Depending on:
$100-$1,500 per cable	• Installation cost • Need for retrofits • Power Output • Software • Warranty
$1,500-$5,000 per station	
$40,000 – $175,000 per station	

The bipartisan infrastructure law gave funding to build the backbone for EV charging along highways, but there are still gaps for community charging

National Electric Vehicle Infrastructure (NEVI) Formula Program

- $5B
- **Recipients:** States
- **Projects:** Primarily level 3 chargers along highway
- **Cost share:** 80% federal, 20% non-federal
- **Progress update (As of Aug 2024):**
  - ➢All states submitted to receive NEVI funds
  - ➢MN announced first round of conditional awards for 13 locations. Combined this is $7.8M of total $68.2M in total funding MN will receive under NEVI
  - ➢192,000 public charging ports across country, DOUBLING our national charging network since the state of the Biden-Harris Administration

Charging and Fuel Infrastructure Competitive Grants

- $2.5B
- **Recipients:** State, MPO, local governmental, tribe
- **Projects:** Half goes towards community charging (e.g. school, parks), half towards corridor charging
- **Cost share:** 80% federal, 20% non-federal
- **MN Impact:**
  - ➢$6.4M to MN DOT to install 42 electric vehicle charging stations for use in rural, tribal, and historically underserved communities in Greater Minnesota. The project will prioritize electrification of shared mobility charging projects like car share, van pools, ride hail and taxis
  - ➢$815K to Hennepin County to install 19 EV charging ports at four county-owned buildings in areas with the highest climate vulnerability and lack of clean transportation options.

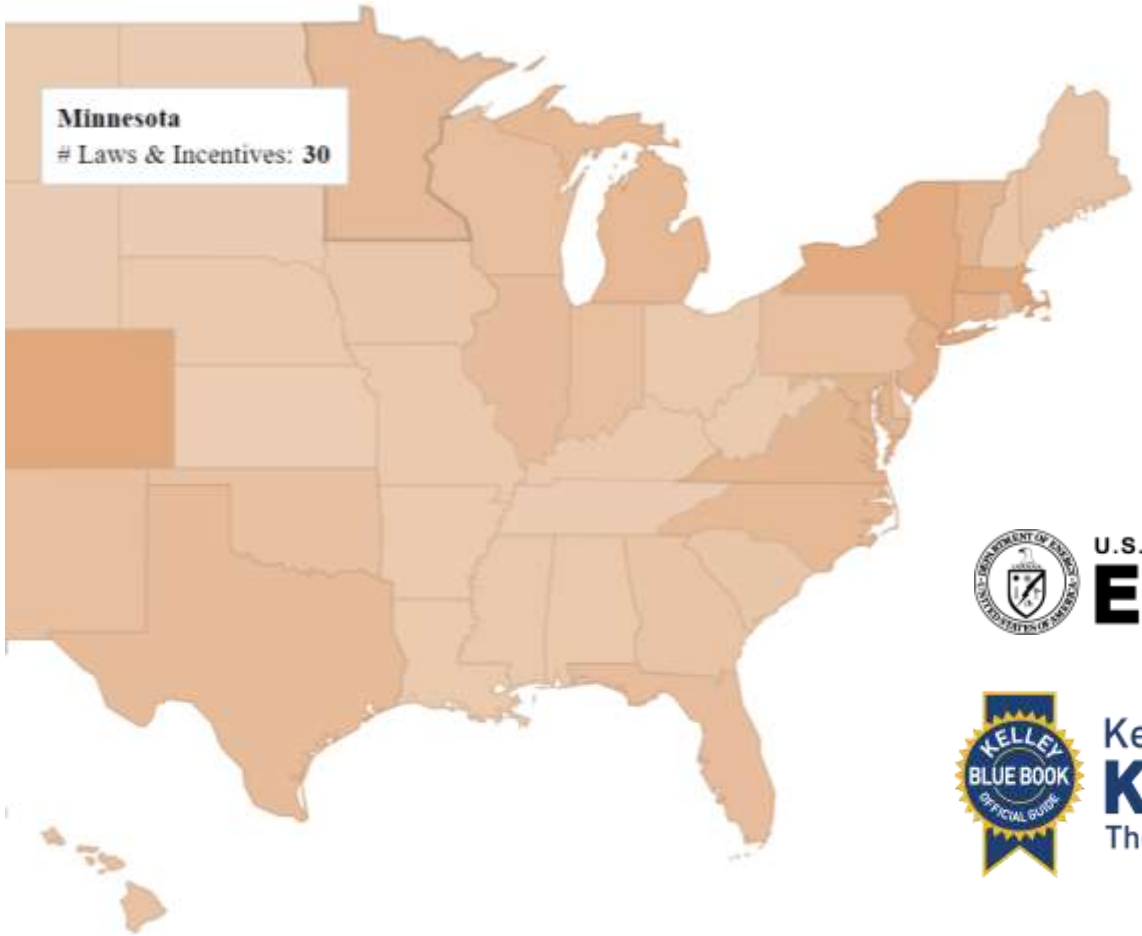
The IRA expanded the tax credit for alternative fuel vehicle refueling property (30C) and extended its availability to 2032

- Increasing the maximum credit available to 30% equipment cost up to $100K (for commercial customers).
- Making the credit also available to individuals (30% up to $1,000)
- NEW: allowing the credit to be calculated per single unit rather than per location
- Requiring the property to be in low-income or rural areas

Use Kelly Blue Book & DOE to find state EV and charging incentives

Minnesota Charging Incentives Include:

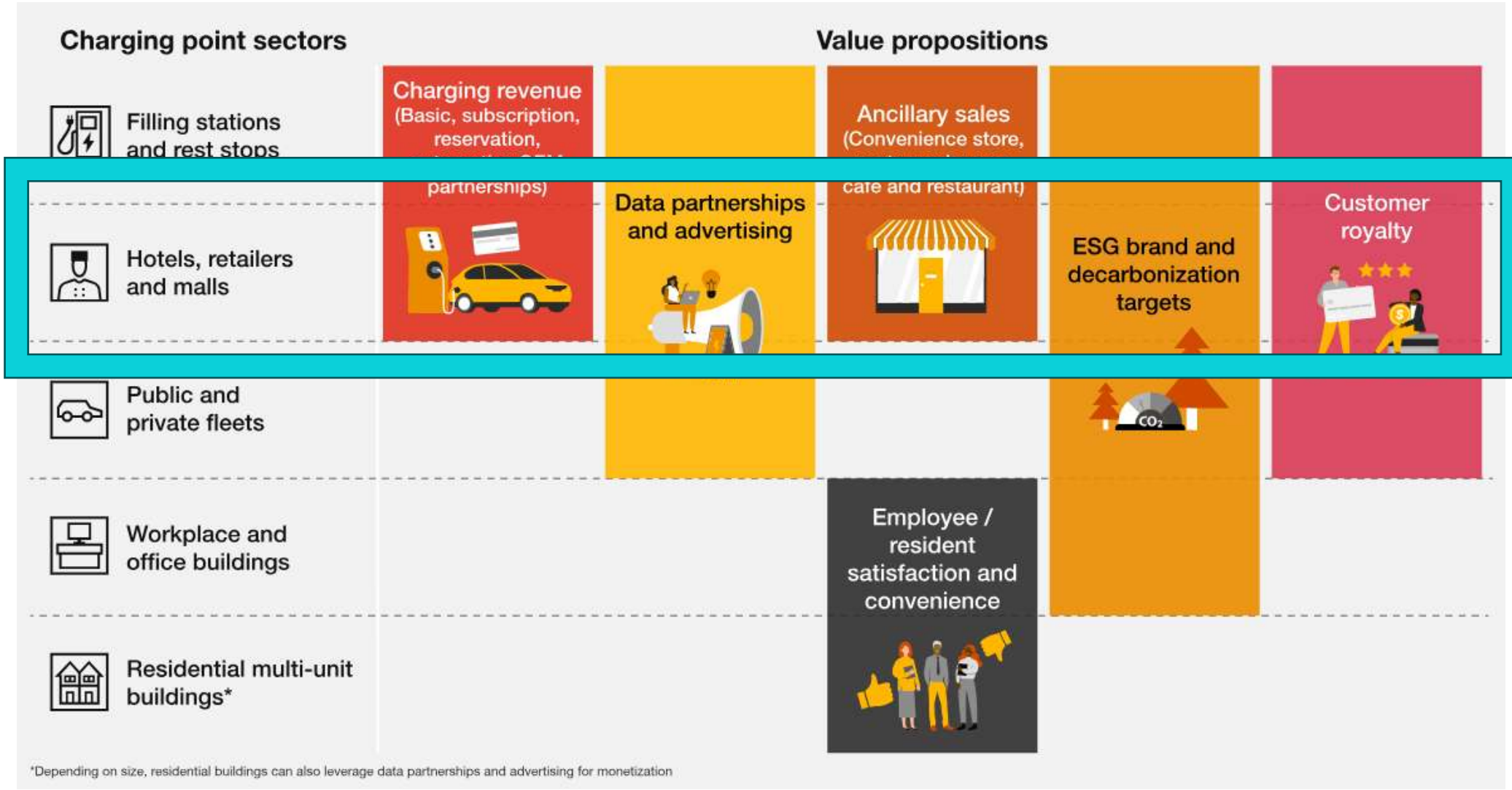
- **$500 Rebates**
  - Level 2 Chargers from most MN utilities
- **Time of Use Discounts**
  - Xcel Energy
- **Commercial Discounts for Fleet Charging**



U.S. DEPARTMENT OF ENERGY

Kelley Blue Book KBB.COM The Trusted Resource

Unlike gas stations, EV chargers have value proposition for small businesses of all kinds



Source: PwC

EV Charger fee structure depends on use case:

No Fee

Charging is offered for free to customers solely as an amenity. Value is derived from alternative sources such as increased sales or corporate branding.

Nominal Fee to Cover Costs

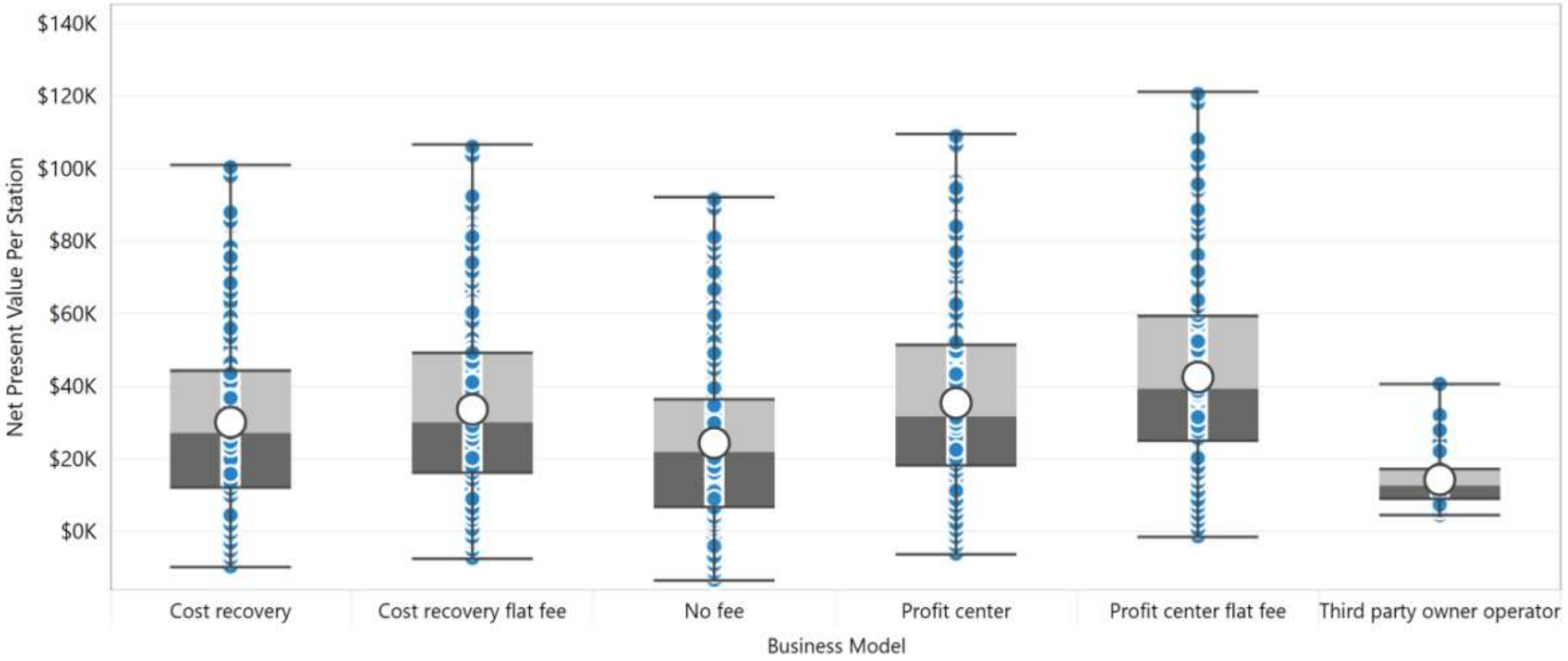
Fees are set high enough to recoup operational and/or installation costs and insulate the owner-operator from spikes in costs from increased utilization.* Fees are typically set as a price per kilowatt-hour of electricity delivered, per unit of time, or per charging session.

Profit Center

The fee for charging is designed to turn a profit from the sale of charging services. Fees are typically set as a price per kilowatt-hour delivered, per unit of time, or per charging session.

Source: Atlas Public Policy

EV Charger retail profitability & risk sensitive to fee structure + ownership



Net present-day value of future income per charging station, assuming a 10-year lifetime

Source: Atlas Public Policy 2020

Housing gap: renters want chargers, willing to pay more for access

27% of renters:

interested in EV charging at apt.

$337 per year:

Premium renters would pay for charging

Source: 2022 National Multifamily Housing Council Survey

Case Study: Large Multi-family

“If I had a crystal ball and were to look into the future, probably 80% of parking spots at multifamily properties will have Level 2 charging access”

- Aim for 3 year pay back period
- Discounts for buying in bulk
- Cheaper to build units with EV-ready wiring, rather than retrofit
- Work with utility to identify local rebates and needed service

MULTIFAMILY DIVE

- Chris Vargas, senior vice president of sales and marketing for Chargie

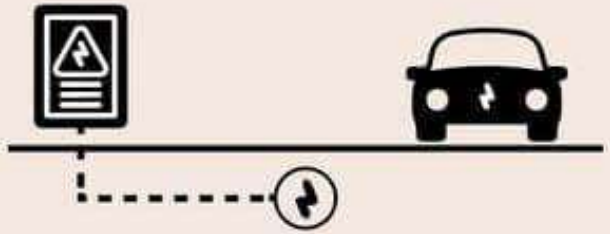
Case Study: Large Multi-family

1. EV-Capable

Install electrical panel capacity with a dedicated branch circuit and a continuous raceway from the panel to the future EV parking spot.

Aspen, CO: 3% of parking is EV-Capable (IBC)

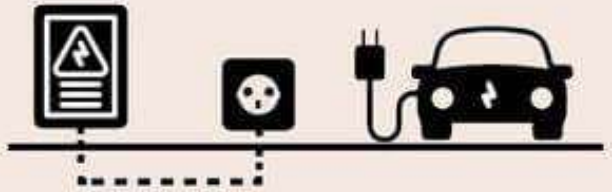
Atlanta, GA: 20% is EV-Capable (Ordinance)



2. EVSE-Ready Outlet

Install electrical panel capacity and raceway with conduit to terminate in a junction box or 240-volt charging outlet (typical clothing dryer outlet).

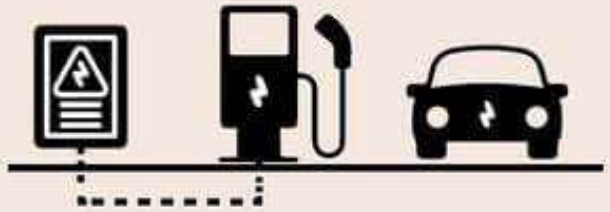
Boulder, CO: 10% of parking is EV-Ready Outlet



3. EVSE-Installed

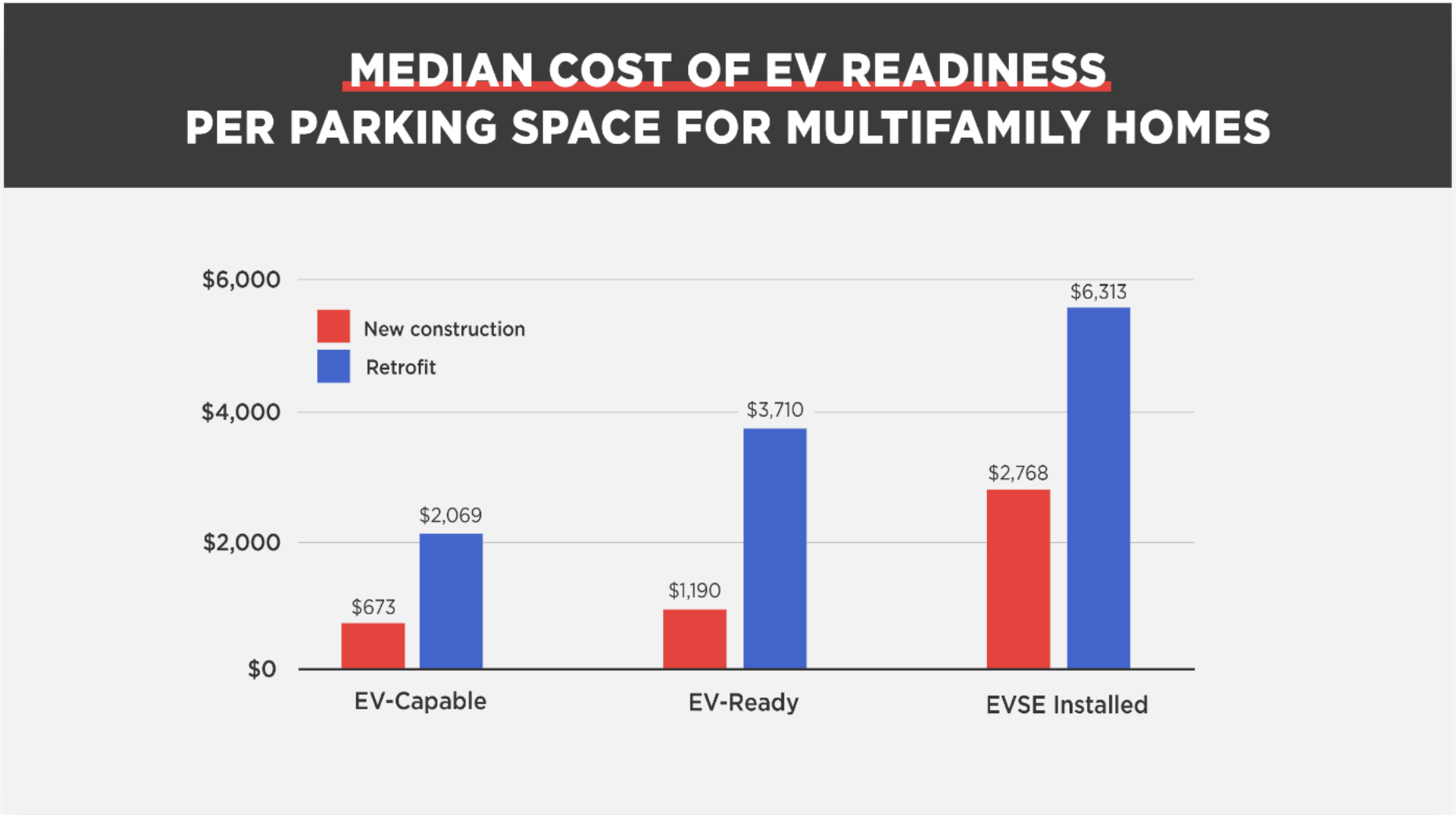
Install a minimum number of Level 2 EV charging stations.

Palo Alto, CA: 5-10% of parking is EV-Installed



Source: SWEEP

Case Study: Large Multi-family



Case Study: Office Building

Number of Chargers: 5
Location: New York State
Business Owner's Energy Costs: $0.10/kWh
EV Charging Fee: $0.30/kWh
EV Charging Fee Margin: $0.20/kWh

Average Number of Cars Using Each EV Charging Station per Day: 3
Average charge in kWh per EV station Use: 30 kWh
EV Charger Projected Lifespan: 8 Years

	Estimated Cashflow	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Costs & Incentives	Initial System Install Costs	-$150,000.00								$ (150,000.00)
	NY State Tax Credit	$25,000.00								
Projected Revenue & Cashflow	Estimated Projected Annual Profit	$32,400.00	$ 32,400.00	$ 32,400.00	$32,400.00	$32,400.00	$ 32,400.00	$ 32,400.00	$ 32,400.00	$ 259,200.00
	Yearly Cash Flow	-$92,600.00	$ 32,400.00	$ 32,400.00	$32,400.00	$32,400.00	$ 32,400.00	$ 32,400.00	$ 32,400.00	$ 162,000.00
	Cummalative Cash Flow	-$92,600.00	$(60,200.00)	$(27,800.00)	$ 4,600.00	$37,000.00	$ 69,400.00	$101,800.00	$ 134,200.00	

Source: Genie Solar Energy

Case Study: Small multi-family/retail

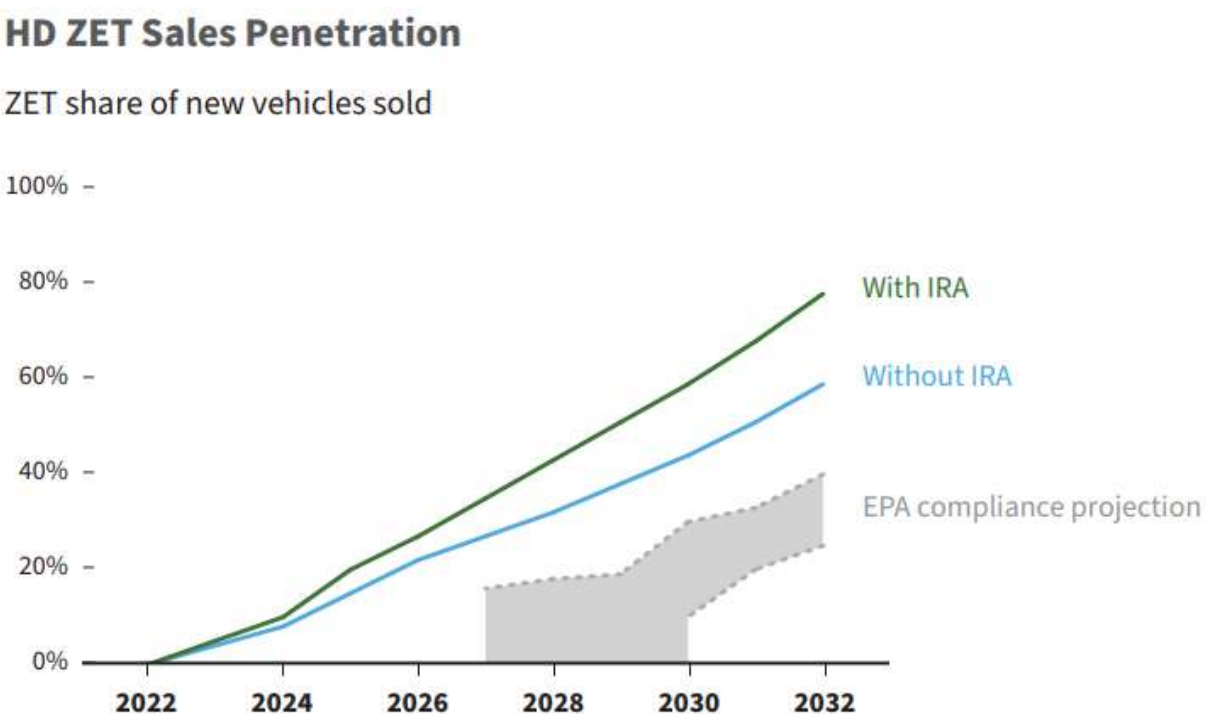
Number of Chargers: 2
Location: Maryland
Owner's Energy Costs: Variable
EV Charging Fee Public: $0.30/kWh
EV Charging Fee Residents: $0.20/kWh

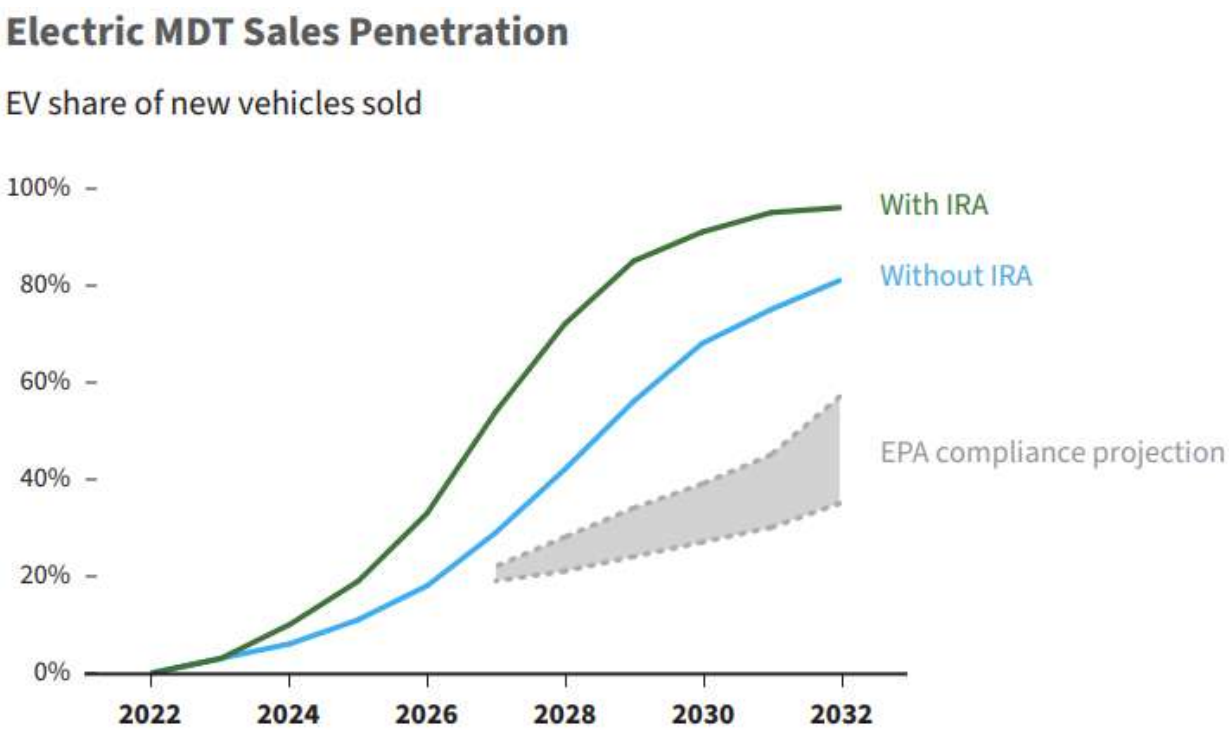
Installation Cost: $60,000
After State & Utility rebates: $16,000
Financing: Montgomery Co. Green Bank, City First Enterprise's Small Business Energy Savings program
Maintenance Cost: $100 annual subscription per plug
Network Cost: $720 annual
Utility Demand Charge: $50-200 monthly

Source: Clarksburg Condo, My Green Montgomery 2022

Medium & Heavy-Duty Vehicles

By 2032 the majority of new trucks sold in US will be electric





Source: RMI

IRA Further Supports MD & HD ZET Cost Decline

Qualified Commercial Clean Vehicles (45W)

- New tax credit for light, medium, and heavy-duty EVs purchased for commercial use
- 30% of cost for medium and heavy duty vehicles up to **$40,000**
- Direct Pay option for tax-exempt entities
- No critical mineral, battery, or domestic content requirements

The Bipartisan Infrastructure Law created a generous new Clean School Bus Program

Clean School Bus Program (Competitive Grant)

- $5B, with $1B released each year
- **Recipient:** Local or state government, nonprofit school transportation association, tribe
- **Project:** Can cover up to 100% of costs of electric school bus
- **<u>2024 Clean School Bus Rebate Program is accepting application through January 9th, 2025!</u>**
- **Progress update (Feb 2024):**
  - ➢$1.84B awarded
  - ➢5,103 clean school buses
  - ➢Prioritized low-income, rural, or tribal communities (80%+ or projects)
  - ➢In 2023, split into grant and rebate program to balance administrative burden

Table 5. 2023 CSB Grant Program Maximum Per-Bus Funding Levels and Prioritization Status.

School District Prioritization Status	Replacement Bus Fuel Type and Size					
	ZE – Class 7+*	ZE – Class 3-6*	CNG – Class 7+	CNG – Class 3-6	Propane – Class 7+	Propane – Class 3-6
Buses serving school districts that meet one or more prioritization criteria	$395,000 (bus + charging infrastructure)	$315,000 (bus + charging infrastructure)	$45,000	$30,000	$35,000	$30,000
Buses serving school districts that are not prioritized	$250,000 (bus + charging infrastructure)	$195,000 (bus + charging infrastructure)	$30,000	$20,000	$25,000	$20,000

*Funding levels include combined bus and EV charging infrastructure.

Table 6. 2023 Rebate Program Per-Bus Funding Levels and Prioritization Status

School District Prioritization Status	Replacement Bus Fuel Type and Size					
	ZE – Class 7+*	ZE – Class 3-6*	CNG – Class 7+	CNG – Class 3-6	Propane – Class 7+	Propane – Class 3-6
Buses serving school districts that meet one or more prioritization criteria	Up to $345,000 (bus + charging infrastructure)	Up to $265,000 (bus + charging infrastructure)	Up to $45,000	Up to $30,000	Up to $35,000	Up to $30,000
Buses serving school districts that are not prioritized	Up to $200,000 (bus + charging infrastructure)	Up to $155,000 (bus + charging infrastructure)	Up to $30,000	Up to $20,000	Up to $25,000	Up to $20,000

*Funding levels include combined bus and EV charging infrastructure.

Regional Hauler Truck Upfront Costs:

Tesla Semi (500 mile range)			
	Typical	**Range**	**Depending on…**
Upfront Cost	Vehicle - $180,000	$150,000-$500,000+	Battery range (miles), AWD capability, Vehicle type
Federal & State Tax Credit	Federal - $40,000	State: $0-$120,000	Vehicle MSRP; Household income; Location of manufacturing and critical minerals
Upfront Cost Post Incentives	Vehicle - $140,000	$20,000 - $460,000+	Incentive qualifications & state of purchase incentives
Net Upfront Cost vs. Gas Vehicle	$15,000 premium (plus charger)	$0-$375,000 premium (plus charger)	All the above plus the comparable gasoline vehicle
Charger	Single port fast charger: $150,000	$40,000 - $250,000	Number of ports, charge speed, software, warranty

Use DRVE "Dashboard for Rapid Vehicle Electrification" Tool to see TCO for your fleet

Enter a new vehicle that this vehicle will be mapped to in the tool. If a vehicle isn't available in the tool, you can create a custom vehicle using the 'Create Custom' button to the right.

Create Custom

Electric Alternative

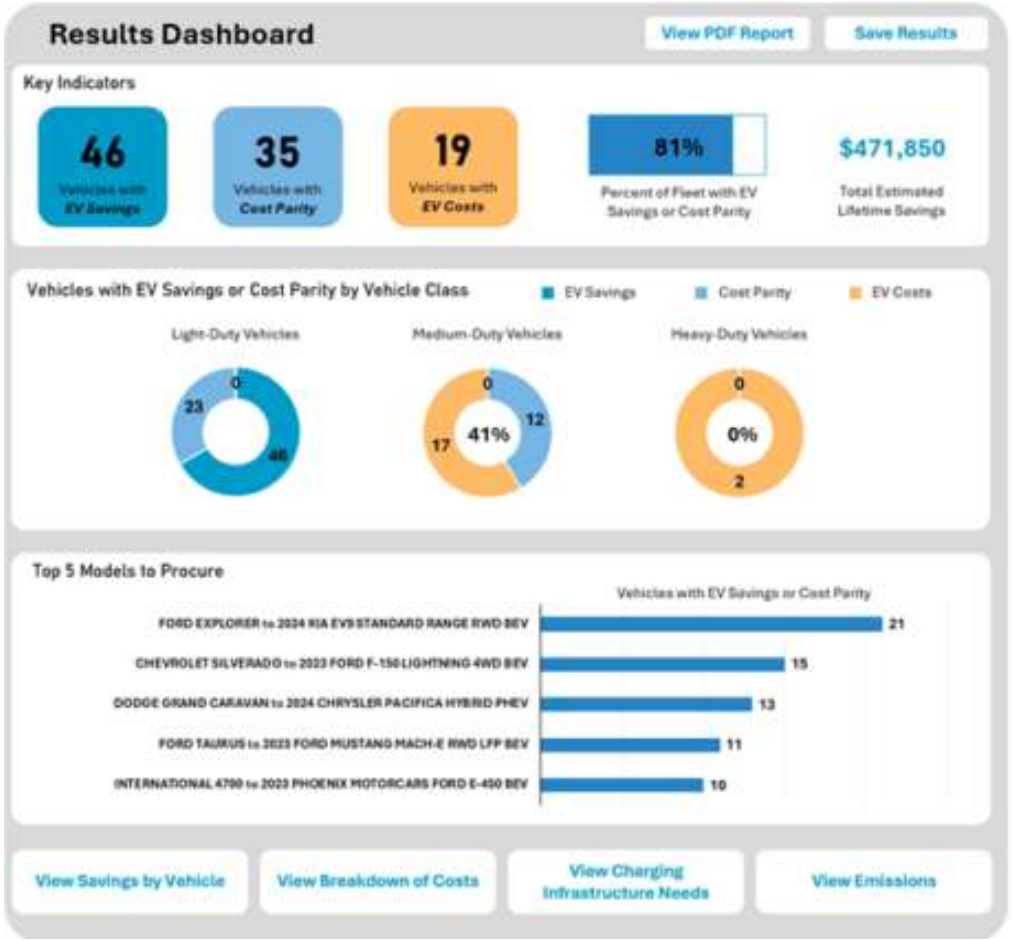
Original Vehicle: CHEVROLET COLORADO

Mapped Vehicle: 2023 FORD F-150 LIGHTNING

Class:	Passenger Vehicles (Light-Duty)	MSRP/Price ($):	$69,995		
Make:	FORD	Fuel Econ (MPG):	City:		Hwy:
Model:	F-150 LIGHTNING 4WD EXTENDE	Fuel Econ (MPGe):	City:	78	Hwy: 63
Year:	2023	State Incentive ($):	0		
Use Case:	Light Pickup				

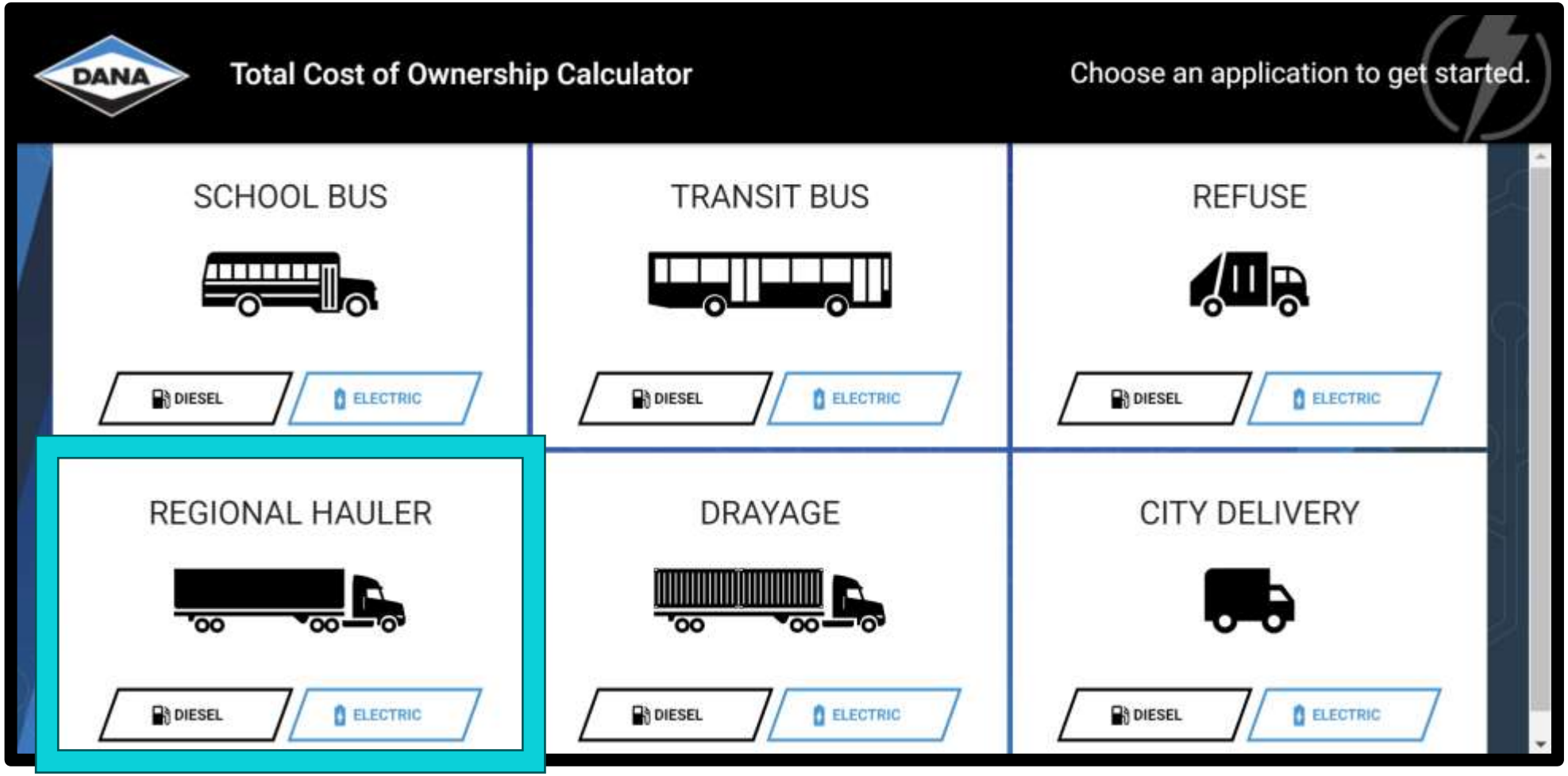
Cancel

Update Vehicle Mapping

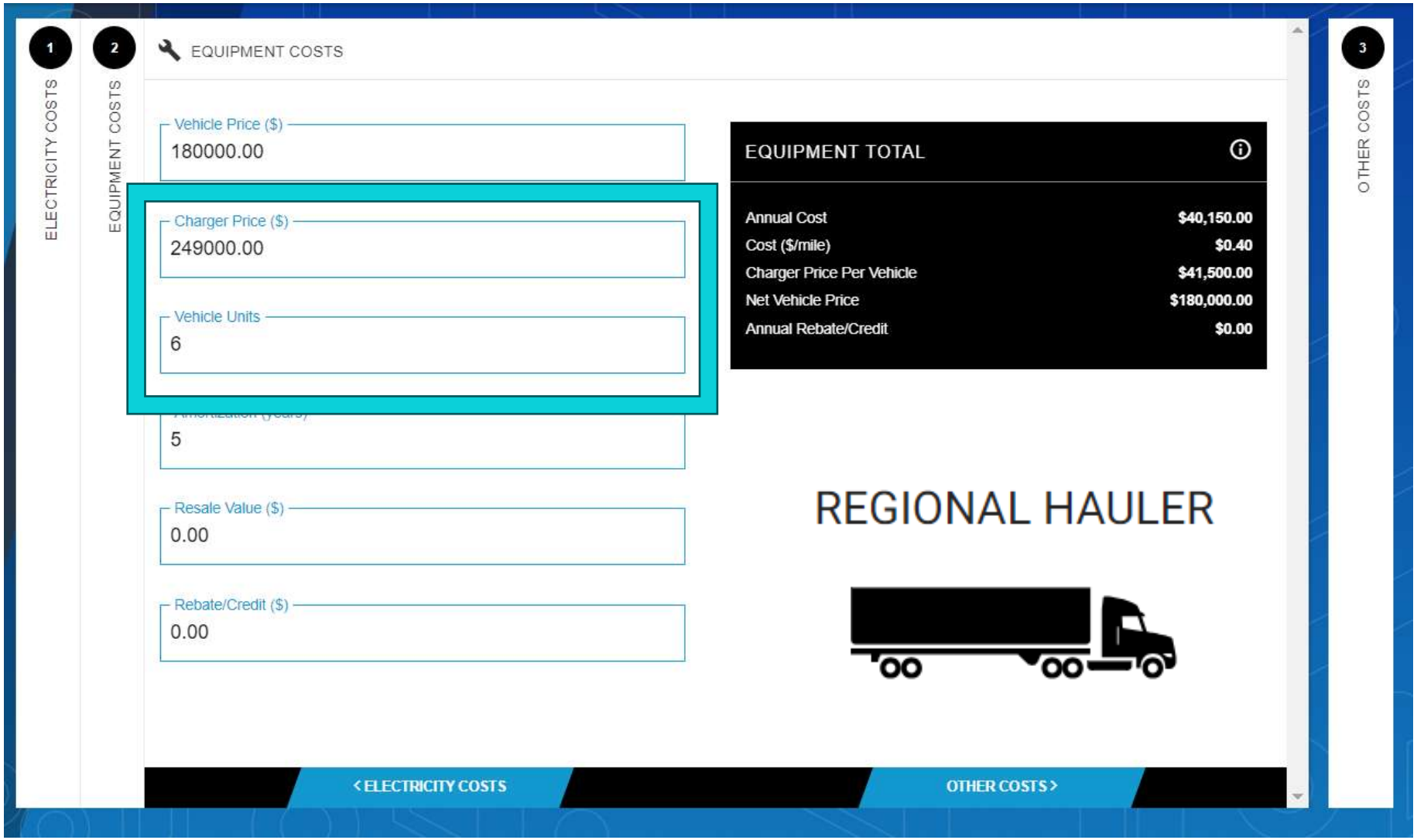


Source: Electrification Coalition, Atlas Public Policy

Use DANA Calculator to predict TCO for MD & HD vehicles (including charging)



Use DANA Calculator to predict TCO for MD & HD vehicles (including charging)



Use DANA Calculator to predict TCO for MD & HD vehicles (including charging)

	Total Annual Cost	Total Cost Per Mile
DIESEL VEHICLE COSTS ⓘ Modify Diesel Values	$148,000	$1.48
ELECTRIC VEHICLE COSTS ⓘ Modify Electric Values	$134,735	$1.35

REGIONAL HAULER

START OVER

CLOSE

PEPSICO Case Study

Micro-Mobility


AxleHire
ELECTRIFIED BY
URB-E
AxleHire
ELECTRIFIED BY
URB-E
URB-E
URB-E
WILLS

Micromobility, driven by e-bike adoption, is projected to grow to $360B by 2030 (up from $175B in 2022)

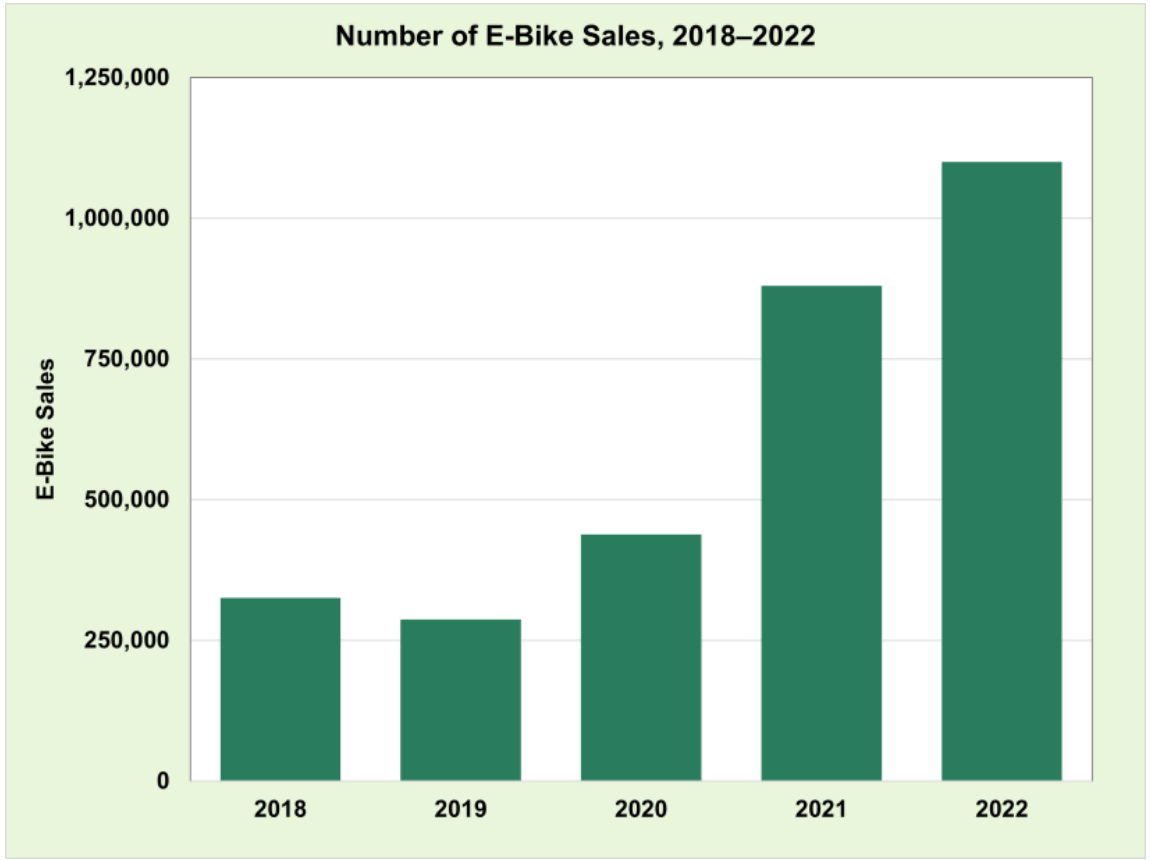


Image source: DOE

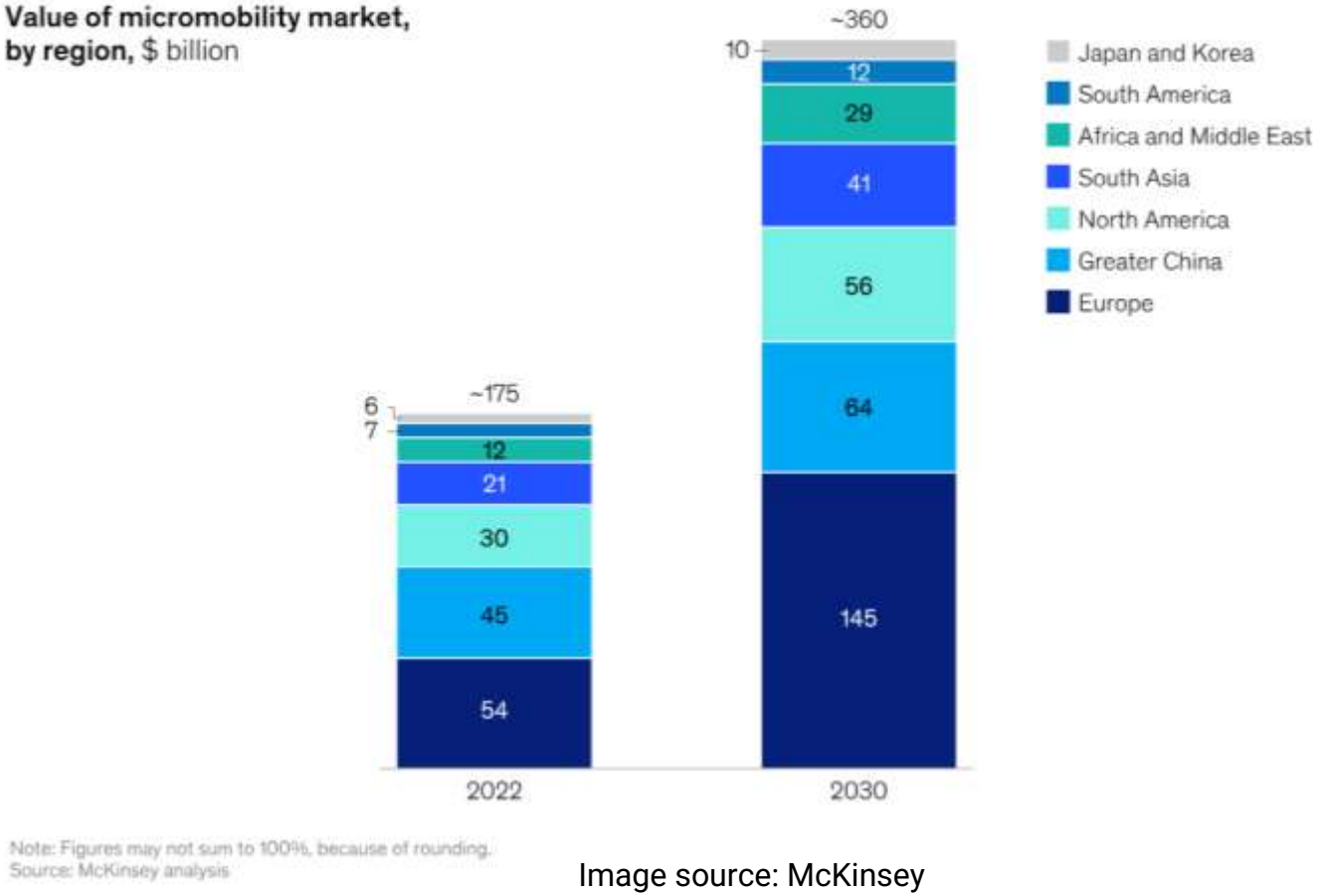


Image source: McKinsey

Minnesota leads the nation in micromobility access, with more coming:

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Morning Edition

Cathy Wurzer and Josh Cobb · April 25, 2024 2:20 PM

St. Paul adopts updates to bike plan, will add over 160 miles in next 15 years

Bring Me The News.

HOME > MN LIFESTYLE > MINNESOTA LIFE

Minnesota's e-bike rebate program gets 14,000 applications in 18 minutes

The program reopened for applications Tuesday.

DUSTIN NELSON • UPDATED: JUL 2, 2024 · ORIGINAL: JUL 2, 2024

Micro-modes don't have used market, may require financing

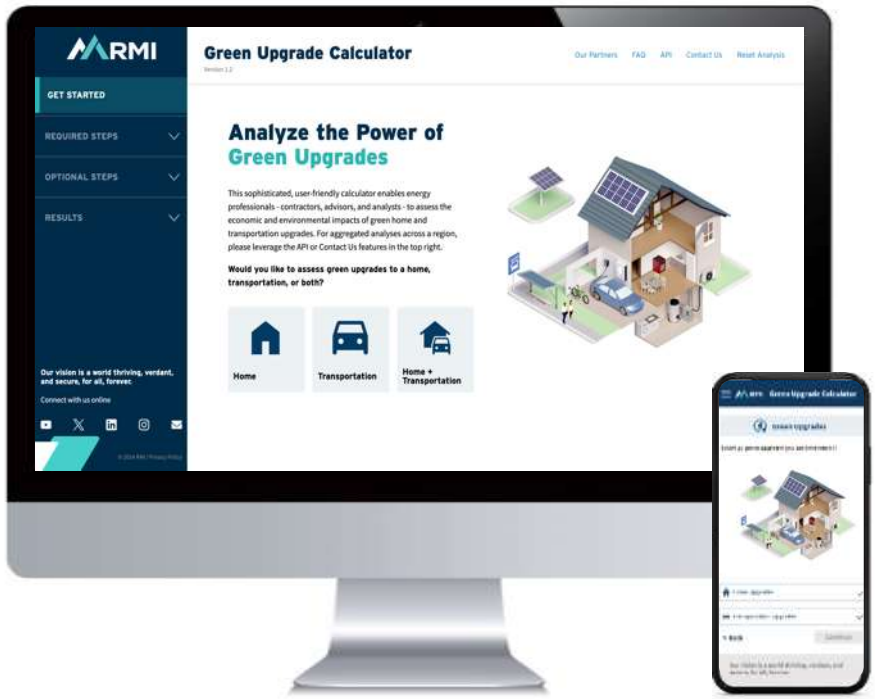
- Project owners: Couriers, Commuters
- Leverage ratio: 7%
- Loan Tenor: ~1.5 years

	E-Moped/ Motorcycle	E-Bike
Cash Up-front Scenario (US$)		
Net Up-front Cost	$2,394	$1,703
Year 1 Operating Costs	$1,674	$553
Net Total Cost for Delivery Operation (5 years)	$10,618	$4,208
Financing Scenario (US$)		
Net Up-front Cost	$157	$112
Year 1 Operating Costs	$2,197	$925
Net Total Cost for Delivery Operation (5 years)	$10,995	$4,476

Individual TCO, Couriers Operating in Seattle, Washington. Source: RMI Decarbonizing Last-Mile Delivery

Use RMI Green Upgrades Calculator to calculate TCO for micro-modes

The Green Upgrade Calculator is a free online tool for energy professionals and analysts to quantify the individual-level impact of various home and transportation upgrades



Home

Rooftop Solar | Battery Storage | Community Solar | Weather ization | Air Source Heat Pump | Heat Pump Water Heater | Induction Range

Transportation

Electric Vehicle | Electric Bike | Public Transit | Car Free

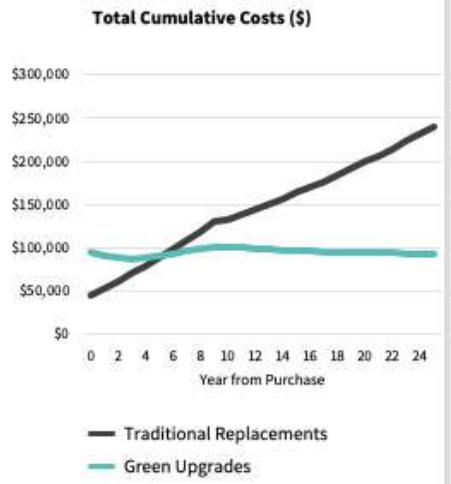
MY RESULTS

Net Upfront Costs Lowered by $19,049

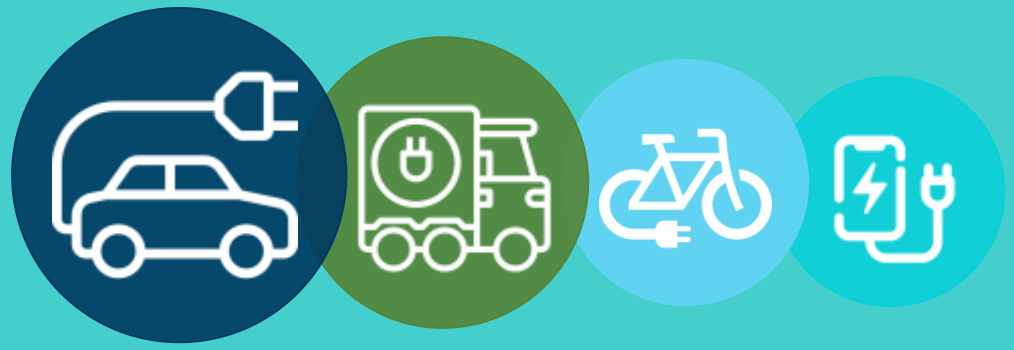
	Traditional Alternatives	Green Upgrades
Net Upfront Costs	**$ 13,856**	**$32,905**
Total Upfront Costs	$14,456	$52,348
Federal and State Incentives	$600	$19,443
Upfront Costs Financed	$0	$0

Net Annual Operational Costs Lowered by $1.949

Net Lifetime Costs Lowered by $32,619



Question: are you doing micro-sized loans? What would make these loans more appealing?



Q&A

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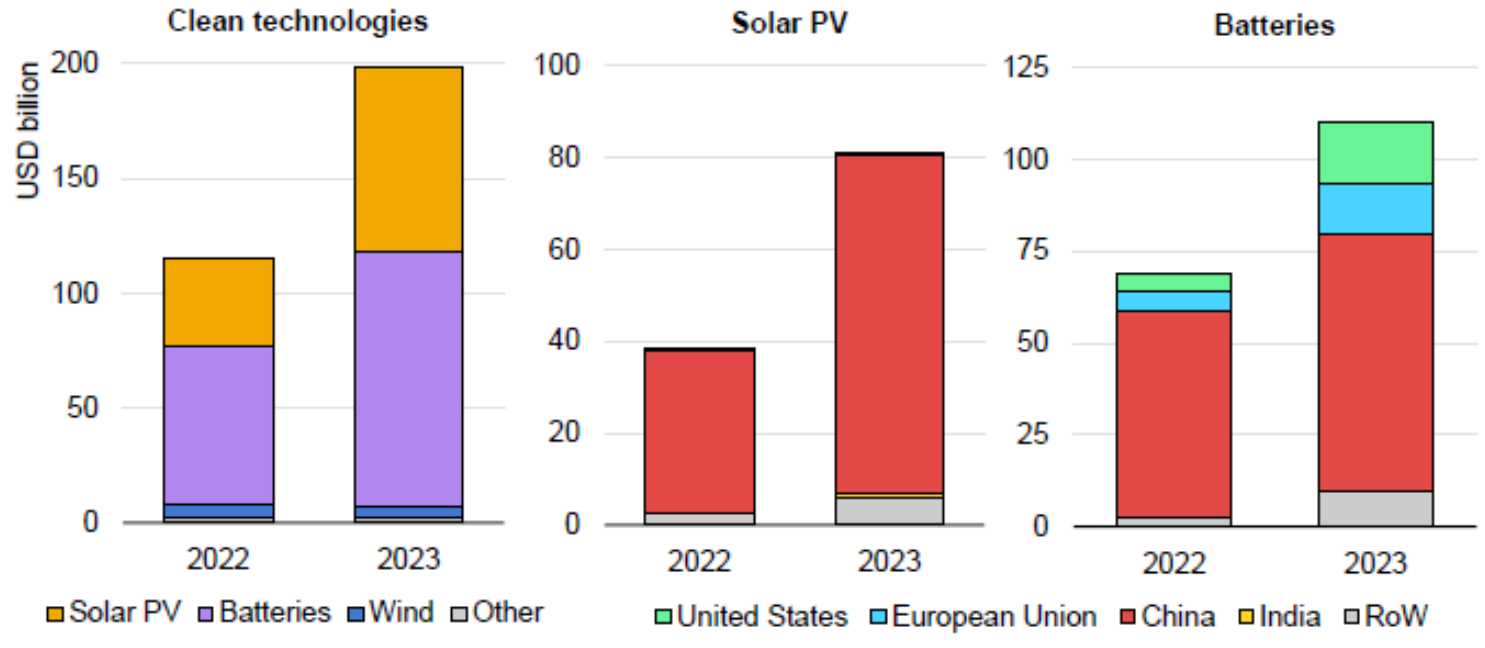
mmoravec@rmi.org
mbayer@edinamn.gov

Manufacturing 45X Tax Credit

Presenter: Nathan Iyer

Cleantech manufacturing and demand is growing rapidly globally

Figure 5 Clean technology manufacturing investment by technology and region, 2022-2023

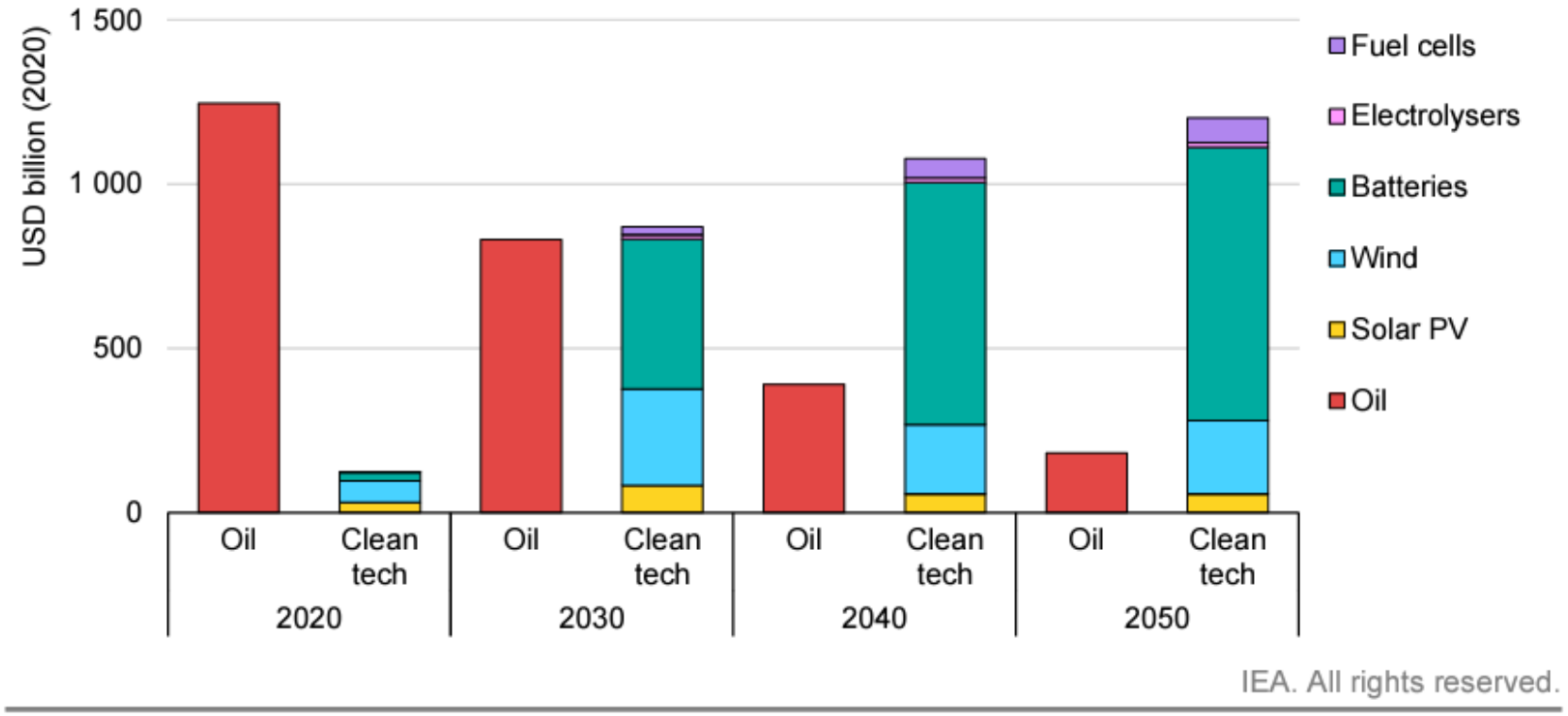


Notes: RoW = Rest of world. Solar PV includes facilities producing polysilicon, wafers, cells and modules; Batteries includes facilities producing packs and cells, anodes and cathodes; Wind includes facilities producing nacelles, blades and towers; Other includes electrolysers and heat pump manufacturing.

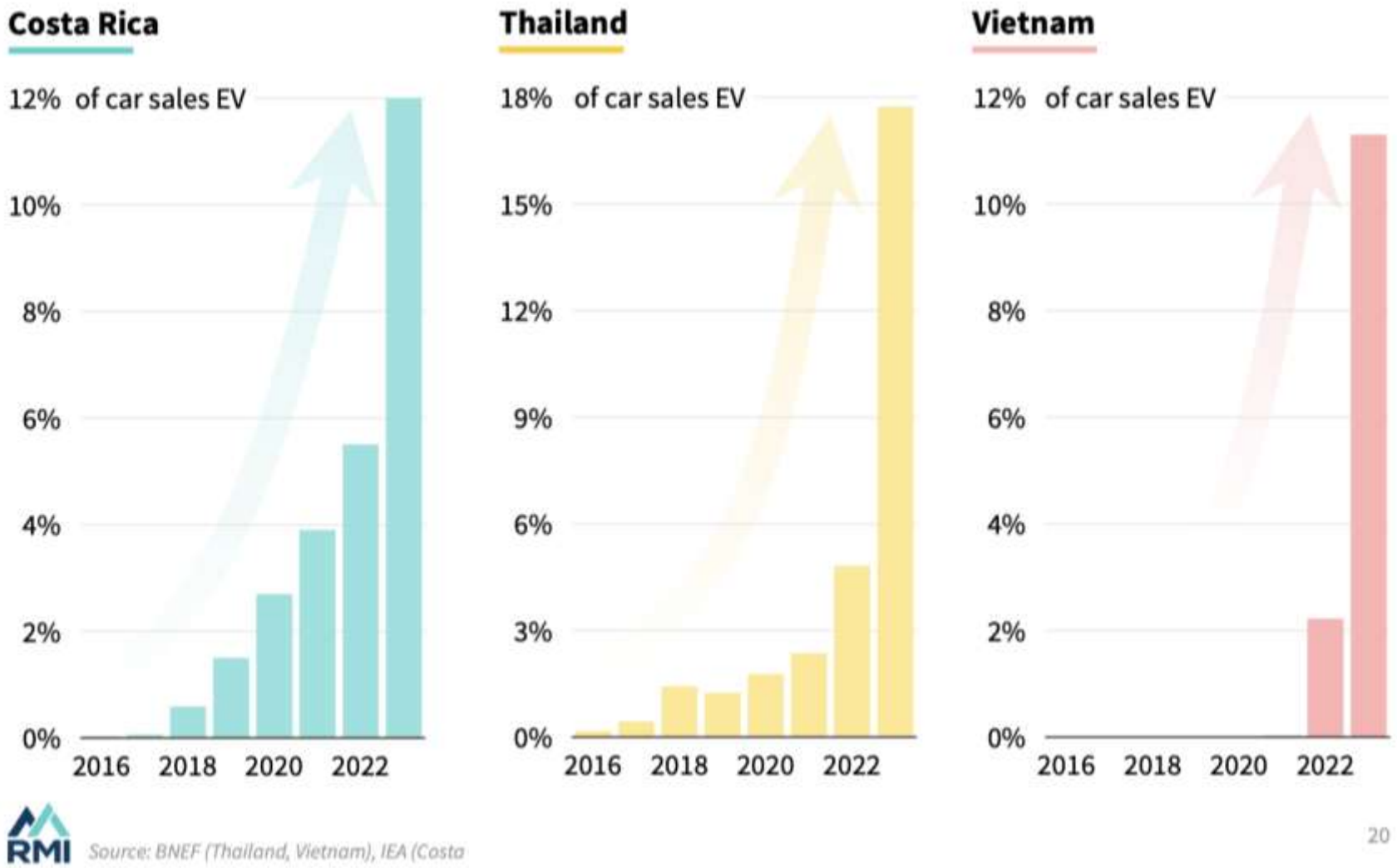
Sources: IEA analysis based on InfoLink, Thomson Reuters, Bloomberg New Energy Finance, Wood Mackenzie, S&P Global Commodity Insights, EV Volumes, and Benchmark Mineral Intelligence.

Cleantech investments projected to eclipse oil market share

Figure 3 Estimated market sizes, by value, of oil and selected clean energy technologies in the Net Zero Emissions by 2050 Scenario



The energy transition is global – and accelerating



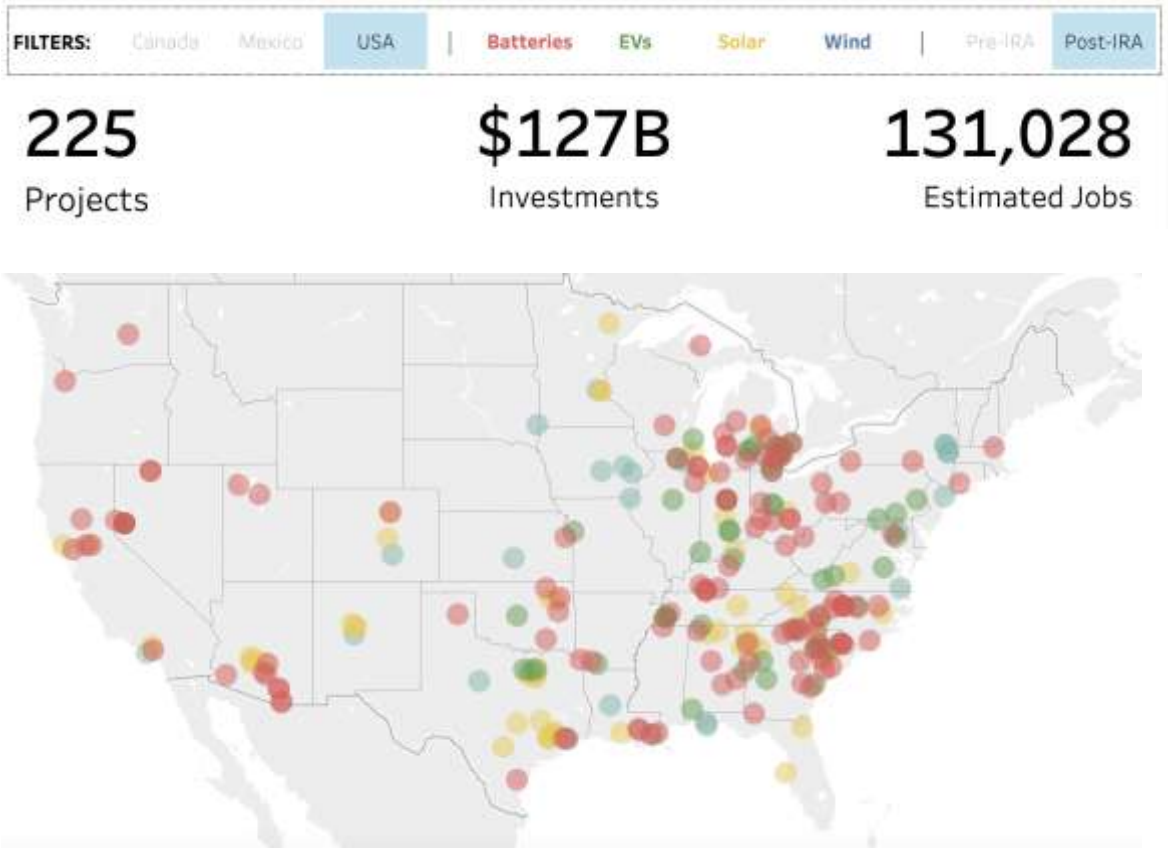
In 2021, the US had a small supply chain

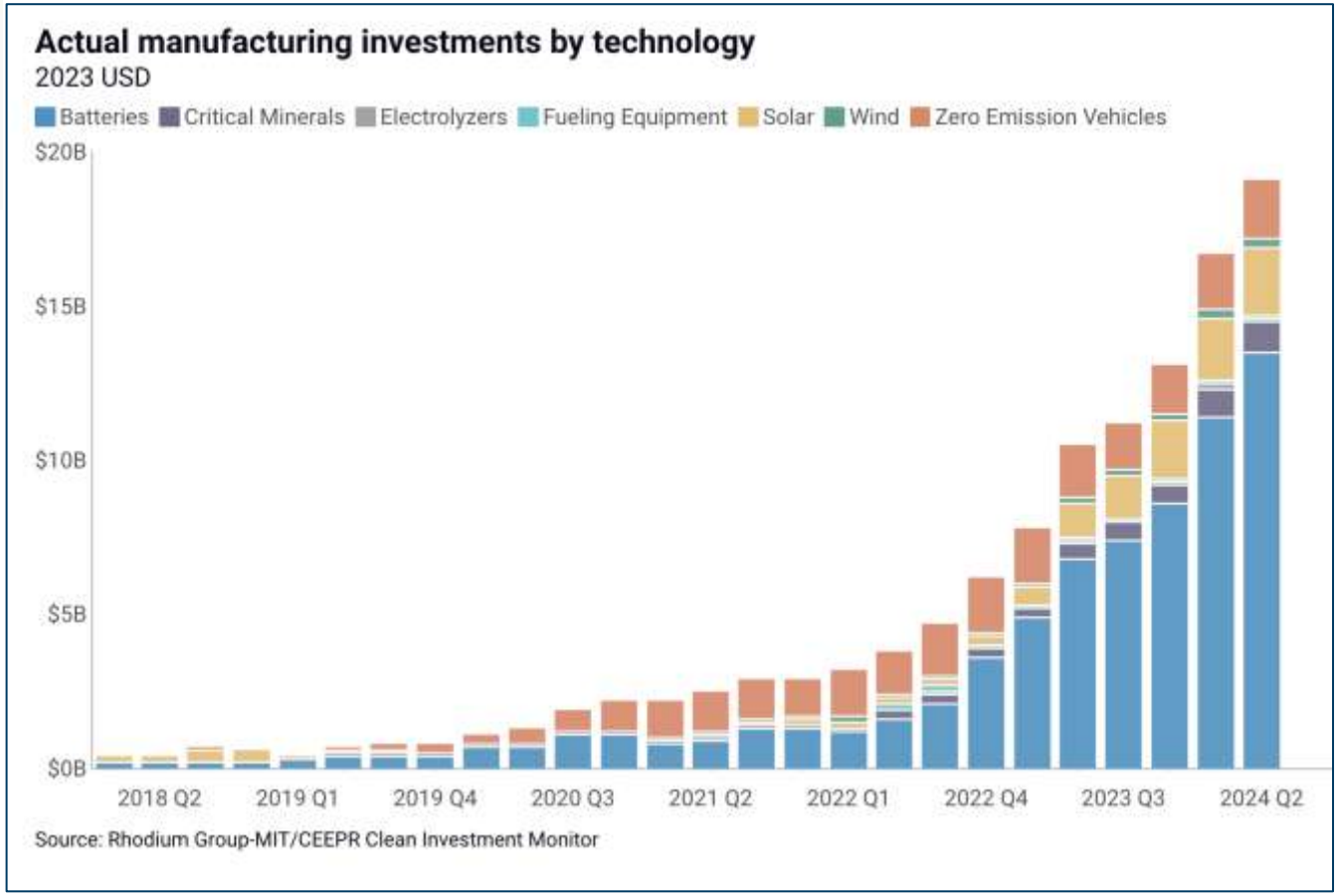
Table 3. United States' and China's Existing and Under Development Shares of Global Lithium-Ion Battery Subcomponent Capacity

	2021		Under Development	
	U.S.	China	U.S.	China
Cathode	0.70%	63%	0%	84%
Anode materials	0.60%	84%	0%	91%
Separator	3%	66%	0%	76%
Electrolyte	7%	69%	2%	75%

Source: BloombergNEF (2021)

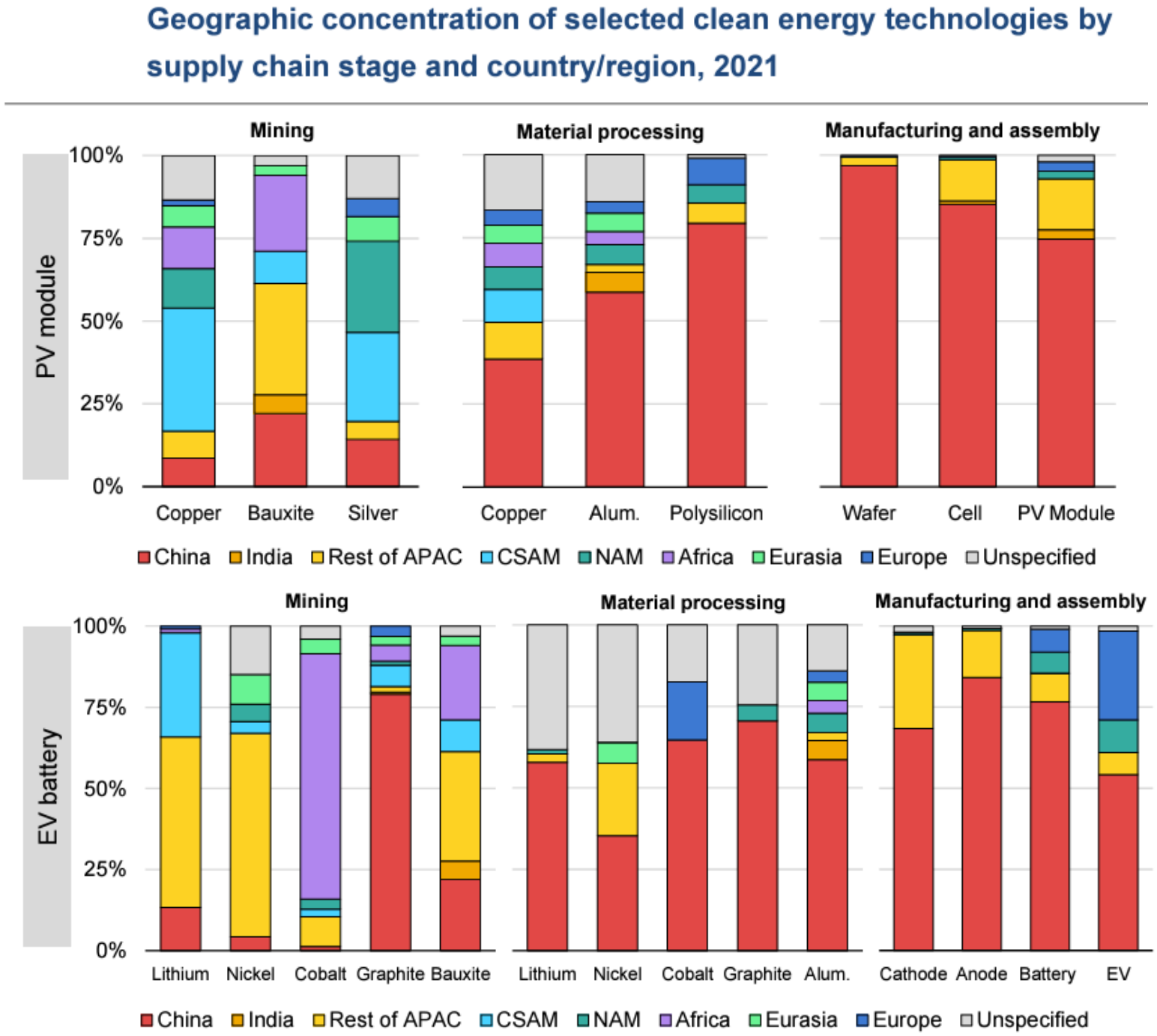
But the IRA 45X manufacturing credits drove a wave of investments across the US





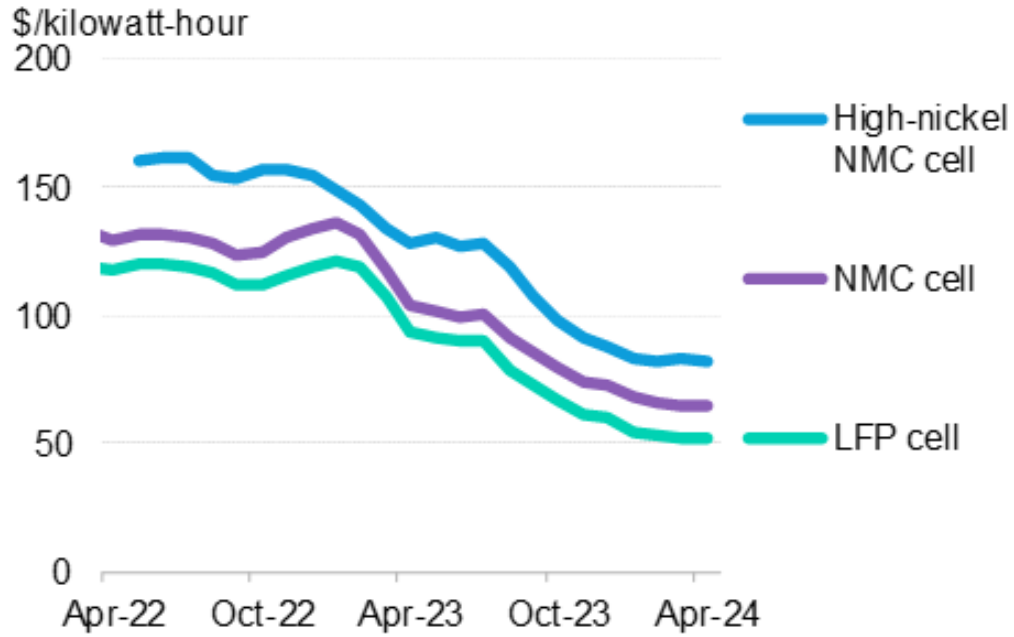
Global Competition

Global cleantech supply chains are highly concentrated



Global Price Dynamics Are Extremely Competitive

Observed China EV battery cell prices



ic format and exclude taxes. Nickel manganese cobalt aluminum oxide (NMC) 955, and nickel cobalt aluminum oxide (NCA); LFP is lithium iron phosphate.

BloombergNEF

- In 2023, Chinese battery cell prices dropped by **~60% in one year**

Global Price Dynamics Are Extremely Competitive

- Global module costs broke **$0.10/W** – cheaper than some fencing options!

The US has driven forward tariffs to give US producers a chance at scale

Technology	Before	New Tariff Rate
EV	25%	100%
Batteries	7.50%	25%
Graphite	0%	25%
Magnets	0%	25%
Critical Minerals	0%	25%
Solar cells	25%	50%

45X Advanced Manufacturing Tax Credit In Depth

45X is available in different amounts and lengths of time for each component type.

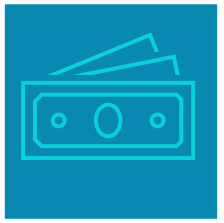
Qualifying Components
Solar: modules, PV cells, PV wafers, solar grade polysilicon, torque tubes, structural fasteners, polymeric backsheets
Wind: nacelles, blades, towers, offshore wind foundations, related offshore wind vessels
Inverters: central inverter, commercial inverter, distributed wind inverter, microinverter, residential inverter, utility inverter
Battery: electrode materials, battery cells, battery modules
And **critical materials** include a list of 50 minerals as defined in 45X statute

2023-29, phasing down fully by 2032

Driven **$126B** in domestic investments to date (majority batteries)

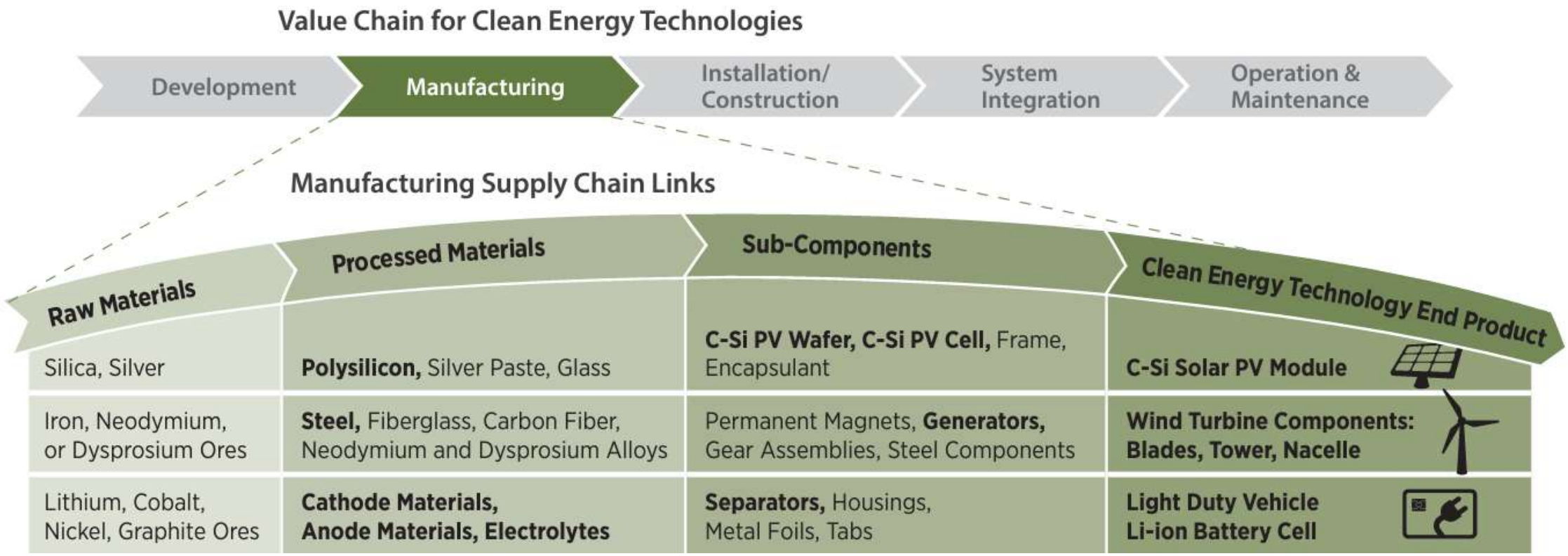
This credit is only available to domestic manufacturers.

There is no cap for this credit



Direct pay is available to tax exempt organizations the entire time, and is available to others for five years.

45X supports throughout the value chain



NREL: Clean Energy Manufacturing Center 2017

Key Investment Dynamics

Expires in ~5 years: faster ramp-up directly translates to more credits

The credit was calibrated based on 2022 values – the gap between US and global pricing could both expand or contract

Fixed $/unit credits disproportionately rewards low cost production

- A $0.10/kg credit can be:
  - 10% of a $1/kg process OR
  - 50% of a $0.20/kg process

Solar manufacturing received a major boost

$19B in total investment has been announced to date

Clean Technology	Manufactured Component	Tax Credit	~% of Current Price
Solar	Thin film of crystalline solar cell	$0.04/W	**24%**
	Solar cell or wafer	$12/$m^2$	
	Solar grade polysilicon	$3/kg	11%
	Polymeric solar cell backsheet	$0.40/$m^2$	
	Solar Module	$0.07/W	**27%**
	Torque tube	$0.87/kg	
	Structural fastener	$2.28/kg	
Inverters	Central inverter	$0.0025/W	
	Utility inverter	$0.015/W	6%
	Commercial inverter	$0.02/W	16%
	Residential inverter	$0.065/W	**30%**
	Micro-distributed inverter	$0.11/W	**38%**

Comprehensive wind manufacturing investments

$8B in total investment has been announced to date

Clean Technology	Manufactured Component	Tax Credit	~% of Current Price
Wind	Offshore wind vessel component	10% of sales price	
	Wind turbine blade	$0.02/W	10%
	Nacelle	$0.05/W	10%
	Tower	$0.03/W	15%
	Offshore foundation (fixed)	$0.02/W	4%
	Offshore foundation (floating)	$0.04/W	2%

The battery tax credits are among the most powerful in the IRA

$77B in total battery investments + $6B in critical minerals

Refining battery grade materials	Midstream components	Cells	Modules
10% cost of production **Includes** extraction if vertically integrated with refining	**10% cost of production** Includes input materials	**$35/kWh** (30-50% tax credit)	**+$10/kWh** Includes **thermal batteries** and **long-duration batteries**

Treasury released final guidance last week

2 Key Takeaways:

- **Broad eligibility to battery types** (electrochemical, thermal, flow) to enable stationary storage and industrial electrification

- Battery mineral refining and battery components provides a 10% processing tax credit that **now *includes* the value of the raw materials**

Calculating Credits - A Deep Dive

Refining

Included!

Raw material → Domestic → Qualifying refined material

If vertically integrated, ***include extraction*** *costs*

Active Materials

Not included

Qualifying refined material

Included!

Other materials

Domestic → Electrode active material

Included

Raw material

1 Domestic

Not double counted

Qualifying refined material

Included!

Other materials

2 Domestic → Electrode active material

Additional Rules:

1. Substantial transformation
2. Productive use
3. Sale to unrelated party
4. Not ”custom-built”

Deployment of New Clean Technologies Is Also a Major Opportunity

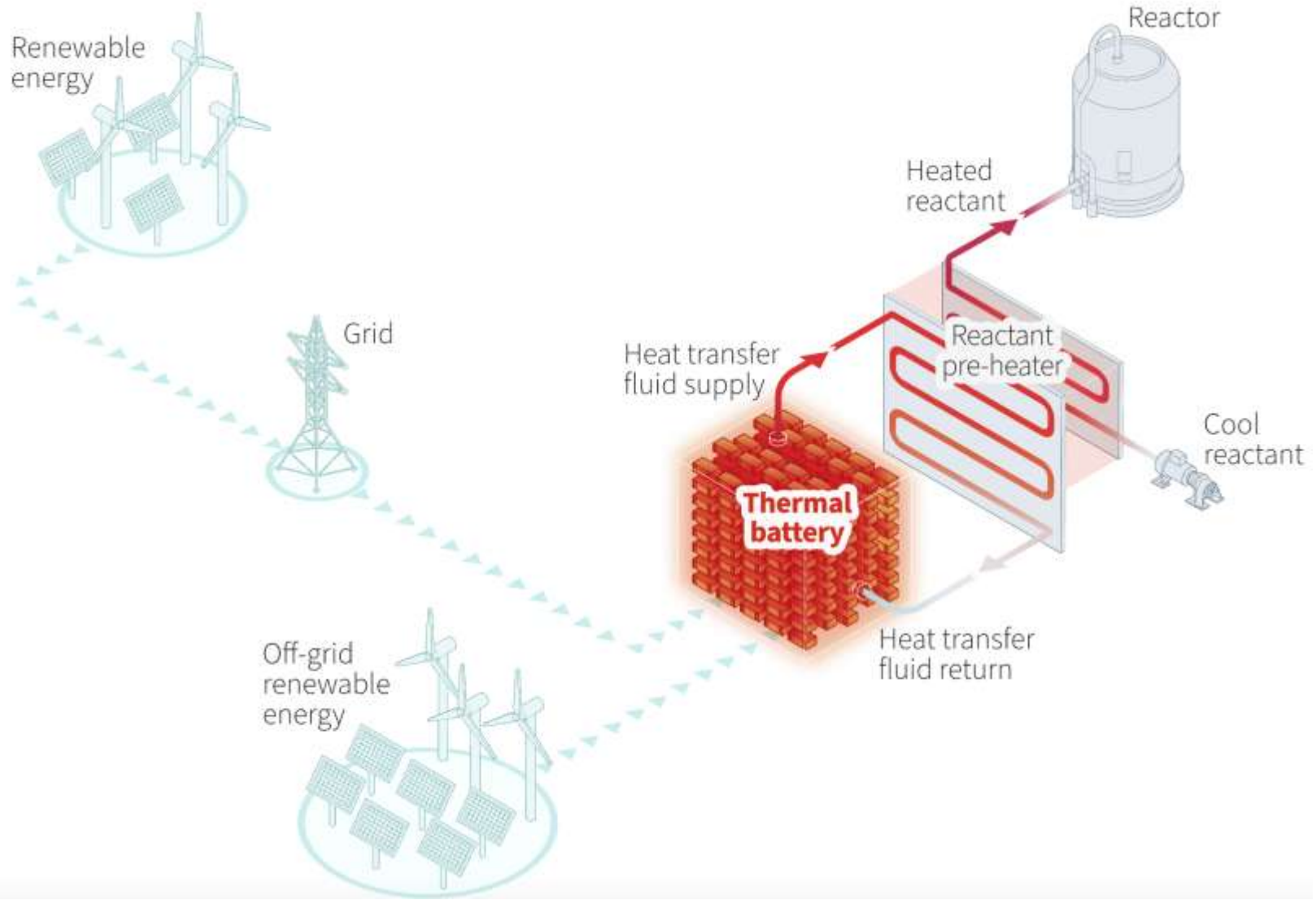
- New guidance supercharges novel **long-duration energy storage** projects
- 45X **significantly** supports project economics for technologies like Form energy
- Tension between maximizing deployment, and ensuring ratepayer passthrough

Cambridge Energy Storage Project

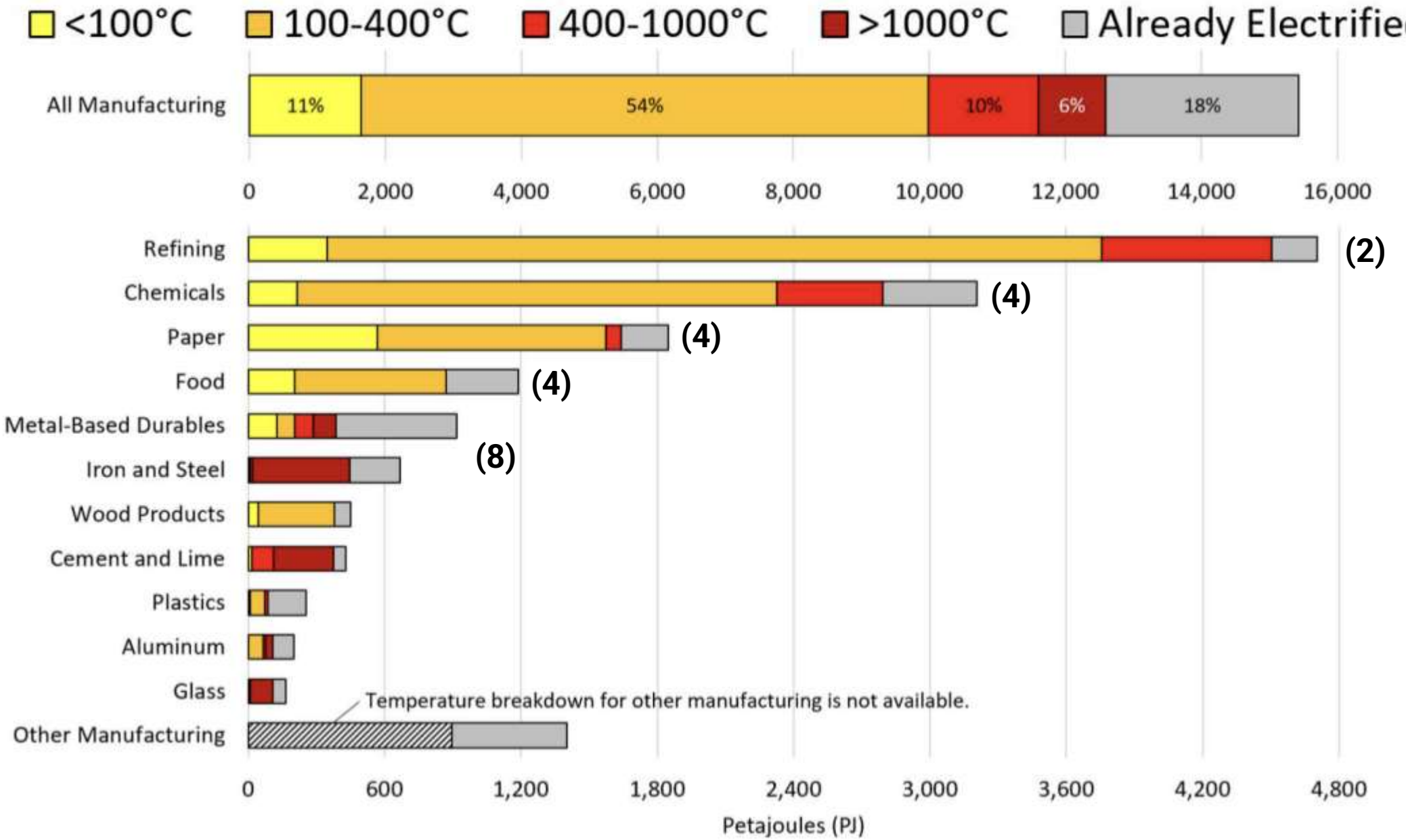
GREAT RIVER ENERGY

Form energy

Thermal batteries are an emerging technology that converts renewables into high quality heat for industry

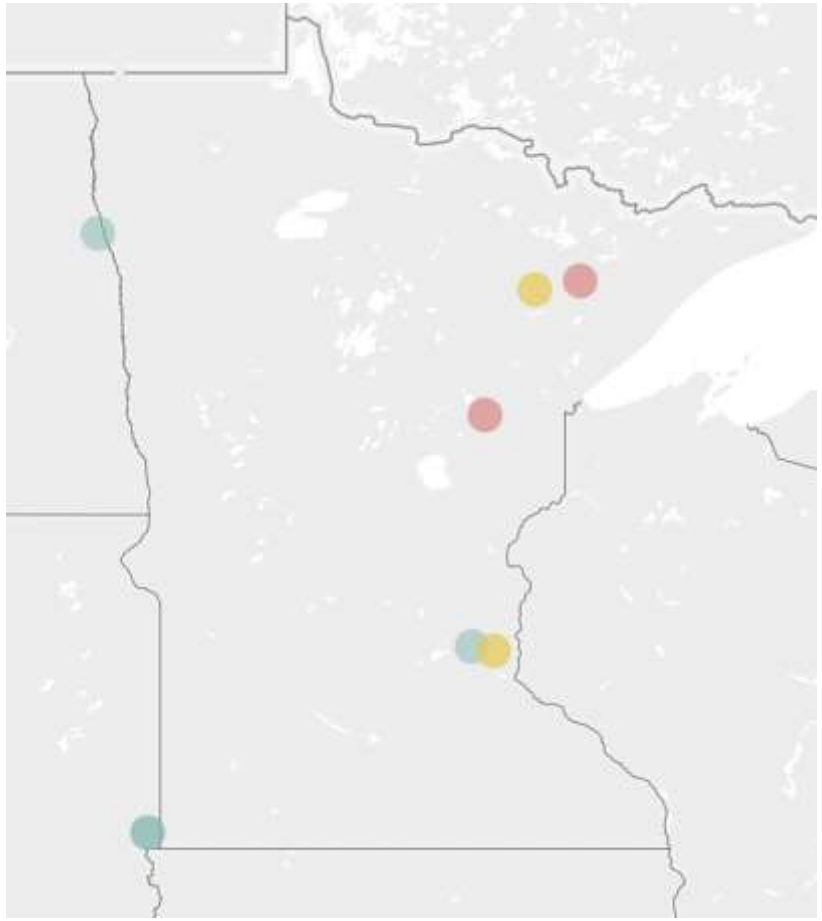


U.S. Manufacturing Energy Consumption by Temperature Range in 2022



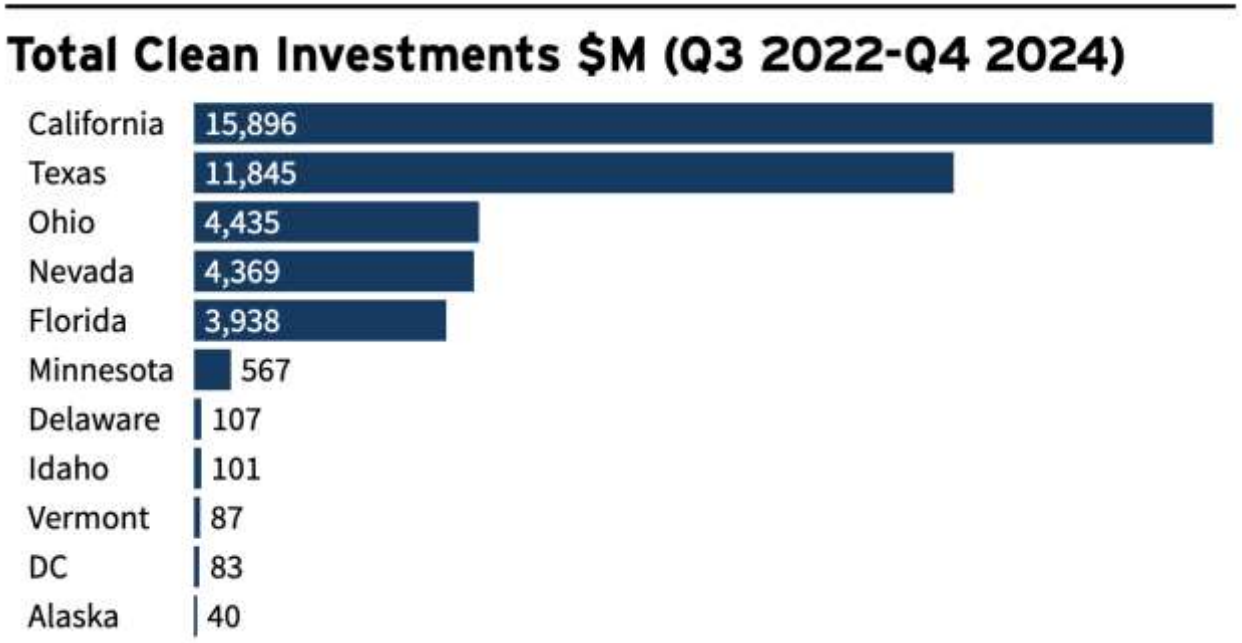
Energy Innovation - Industrial Thermal Batteries; EPA GHG Reporting Program

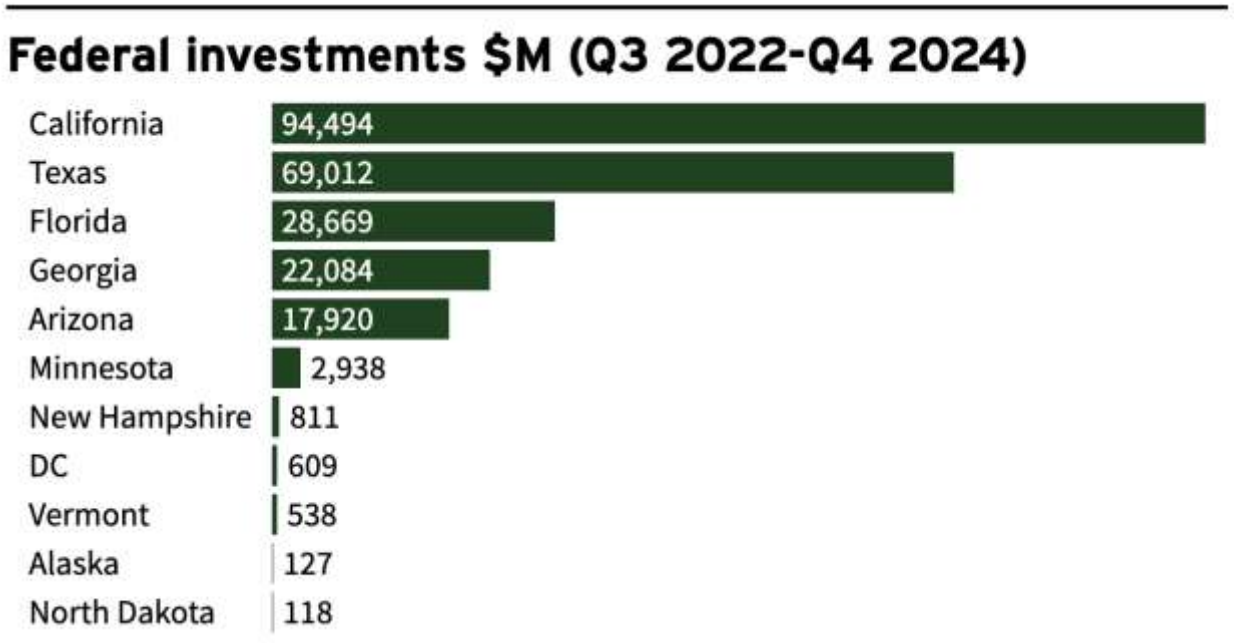
State of Play in Minnesota



Batteries EVs Solar Wind

Minnesota is in the middle of the pack in terms of IRA investments





Secured ~$500M in federal investment

Secured ~$3B in total clean investments

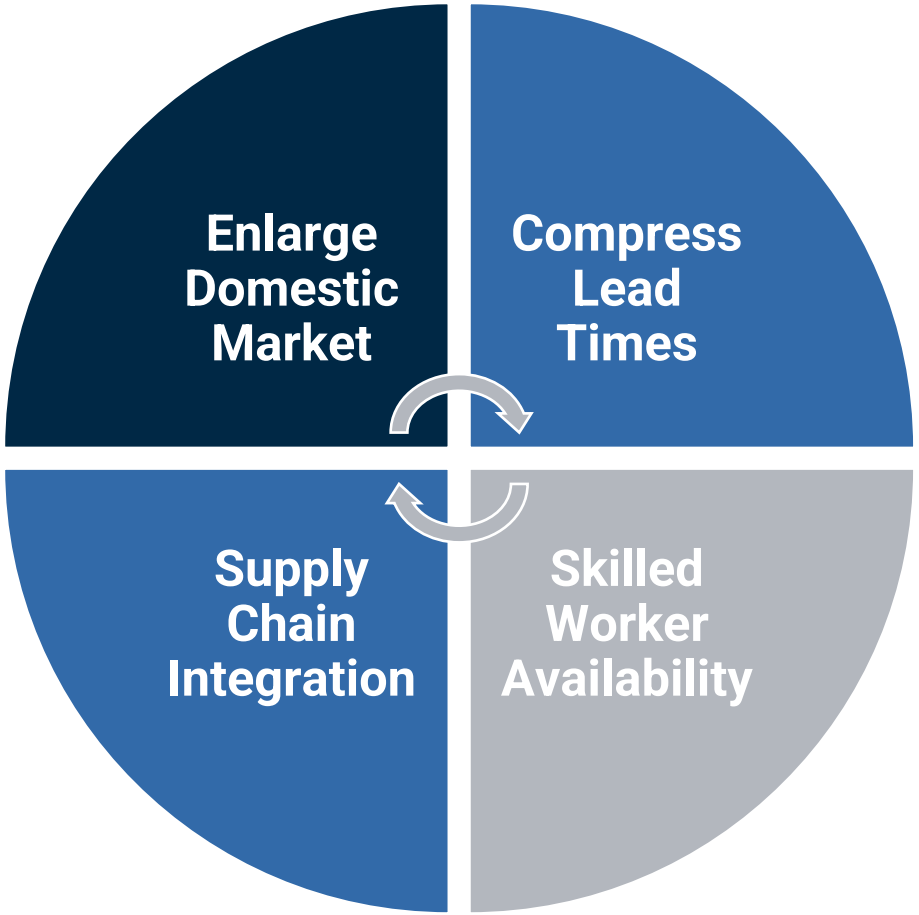
So what can communities do to compete?

Depends on the market and existing capacities.

	Solar	Wind	Batteries	Critical Minerals
Key competitiveness factors	Production costs (cheap to transport); economies-of-scale; supply chain integration	Proximity to demand centers (expensive to transport)	Integration w/ EV supply chain (L-ion) OR Existing high-heat industrial capacity (Thermal Batteries)	Skills, expertise (Chemical and metallurgical) Availability of energy Environmental management
Related industries	Aluminum, polysilicon,	Steel production	Auto manufacturing, electric equipment manufacturing	Mining, upstream metals processing
Risk Factors	High geographic concentration (China), small margins	Project delays (especially offshore)	Supply availability of raw materials (especially Lithium); availability of electricity	Supply availability of raw materials.
Development opportunity	Conventional investment attraction in PV; University-affiliated cluster development in next-gen tech	Existing facilities expansions; Value chain development in offshore markets	EV Value chain development in 'battery belt'; University-affiliated entrepreneurship	Workforce development and cluster creation in heavy industrial areas

What can Minnesota do to improve competitiveness?

- IRA is the core driver
- State demand-side policies can mobilize markets

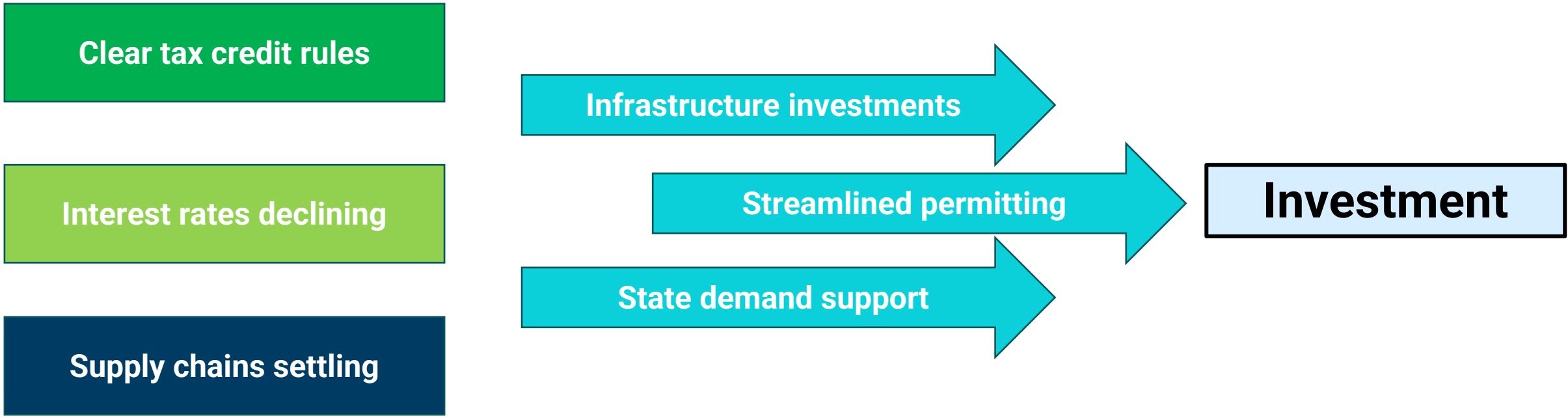


- Permitting and siting streamlining for key facilities
- Industrial site availability
- Infrastructure preparedness (power, water, land)

- Global partnerships and business integration
- Knowledge sharing and attraction of leading edge producers

- Skills gap analysis
- Curriculum development
- Address housing and other labor mobility factors

A Second Wave of Investment is Coming



Reinvesting in Brownfields and Energy Communities for the Clean Energy Transition

RMI – Energy. Transformed.

Vote with your feet….

How was lunch?

Best part of the day

Too long, I can’t get enough of the content at this bootcamp

Vote with your feet….

How are you thinking about this session?

I’m not interested in energy communities

Investing in energy communities is the key to economic development

Vote with your feet….

What is your familiarity with Brightfields or brownfields revitalization?

Bright what?

I’m an expert, I will be criticizing this presentation

These critical definitions will help us start today off on the same page

Brownfields

- A property where the expansion, redevelopment, or reuse may be complicated by the *presence or potential presence of a hazardous substance, pollutant, or contaminant*
- Examples include former industrial sites, inactive landfills/dumps, old factories, abandoned mines, and closed power plants

Energy Communities

- Designated communities across the country hard-hit by coal mine and coal power plant closures, which should be prioritized for focused federal investment
- Includes communities with a significant proportion of coal, oil, natural gas, and power plant workers who drove the industrial revolution and the economic growth that followed and have been essential to the growth of the United States

Environmental Justice

- The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies

This Session's Objectives

1

Establish baseline knowledge about brightfields and energy communities

2

Understand the potential opportunity that exists

3

Outline how your community can start to move forward and understand key incentives that exist

“Brightfields” repurpose previously disturbed, often-contaminated land with renewables to support a more local and equitable energy transition

Brownfield:

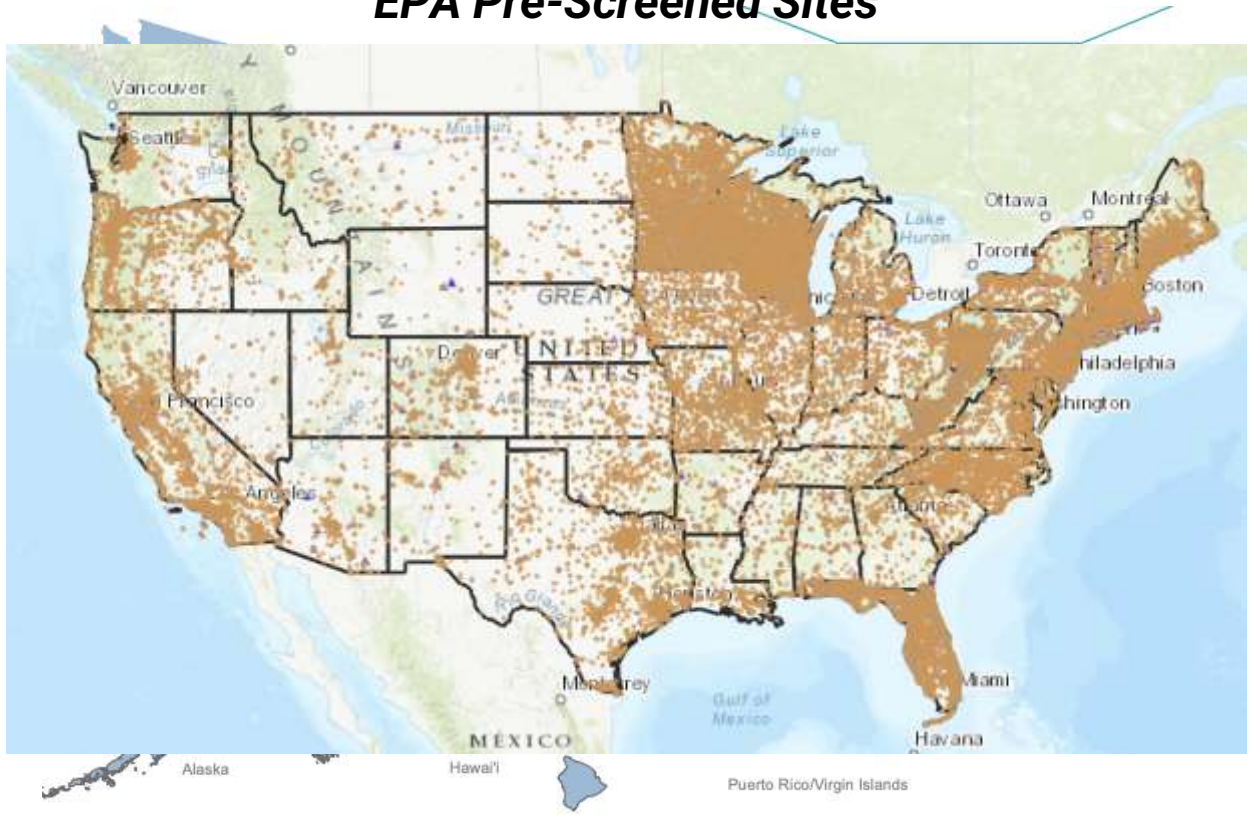
- A property where the expansion, redevelopment, or reuse may be complicated by the *presence or potential presence of a hazardous substance, pollutant, or contaminant*
- Common brownfields include former industrial sites, inactive landfills/dumps, old factories, abandoned mines, and closed power plants

Brightfield:

- A type of redevelopment where clean energy is built on a former brownfield or Superfund site.

Brightfields offer a large (yet largely untapped) potential market – especially with new federal incentives

Brightfields Deployed Across US by Technology
EPA Pre-Screened Sites



190,000+ potential brownfield sites for clean energy deployment on US EPA's RE-Powering Mapper

4,300+ closed/inactive landfills across America could host up to ~63 GW of solar (RMI)

Only 530 completed brightfields projects totaling ~2.5 GW through October 2023 (US EPA)

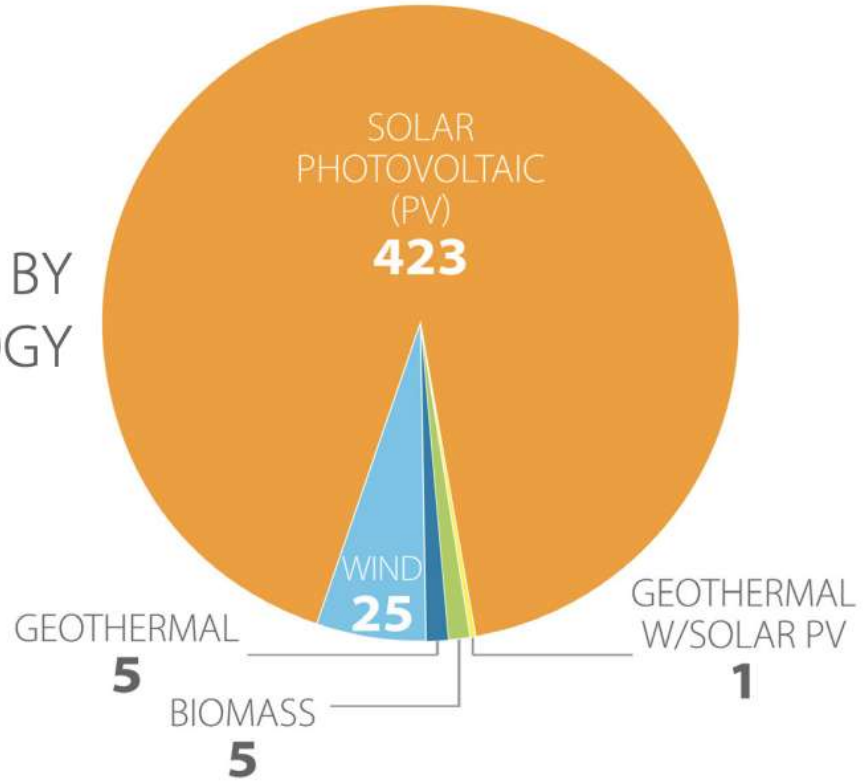
Just 1% of potential brightfields sites could support ~6 GW of clean energy and 60,000+ jobs.

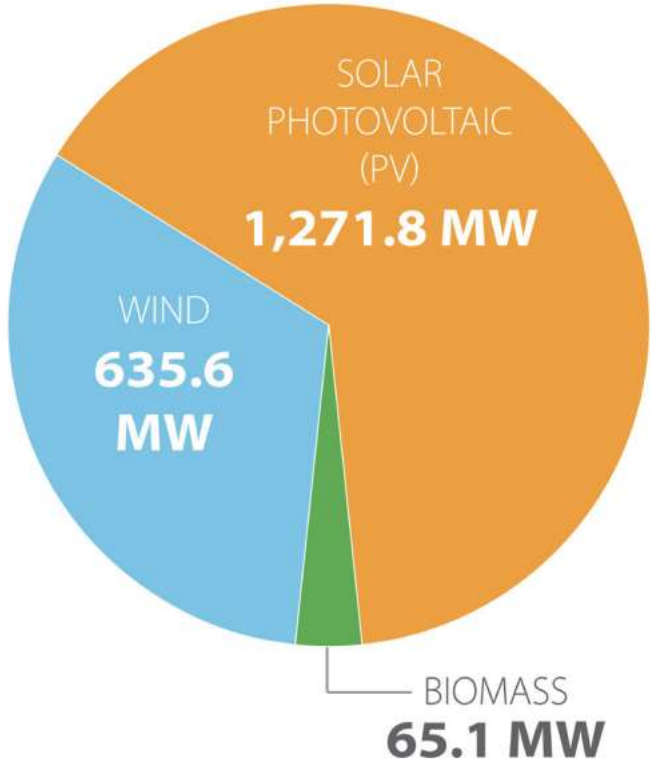
Source: US EPA Re-Powering America's Land Tracking Matrix 2023

Brightfields come in all shapes and sizes

Most existing brightfields use solar power, but they can include other renewable technologies, too

PROJECTS BY TECHNOLOGY





CAPACITY BY TECHNOLOGY

Source: https://www.epa.gov/re-powering/re-powering-tracking-matrix

Although a few states initially led the brightfields push, these types of projects are becoming part of the clean energy transition across America

Pittsburgh, PA

- 2 MW of solar installed on old steel mill in Hazelwood Green

Weirton, WV

- 30 MW of solar planned for ~200 acres of Brown's Island

Martin County, KY

- 200 MW of solar planned on shuttered Martiki mine land

Franklin County, OH

- 50 MW of solar planned on closed landfill

Houston, TX

- 52 MW of solar and community solar planned on 240-acre closed urban landfill

Communities can leverage brightfields to deliver wide-ranging local benefits

Sustainable land reuse

Using existing infrastructure

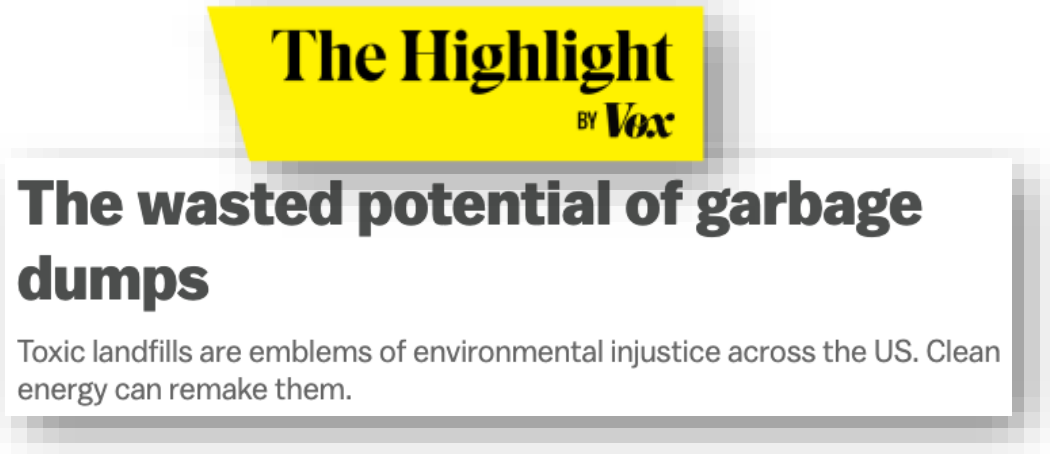
Local jobs & site revitalization

Environmental justice

Generate local revenue from innovative reuse

Hedge against rising utility bill

Don’t underestimate the media and public relations value of supporting a narrative of community revitalization



Closed landfills are particularly promising sites for hosting solar energy

Conducive Site Conditions	Landfills typically have good sun exposure and other characteristics that support solar energy installation
Limited Reuse Options	Closed landfills have few, if any, competing redevelopment options, and using landfills avoids land-use conflict with other revitalization priorities
Environmental Justice	Landfill solar offers a sustainable, non-hazardous reuse of sites that were often prior areas of environmental injustice
Potential for Revenue	Landfill solar can breathe new life and bring new revenue from property taxes and land leases from an otherwise inactive site

Houston’s “flagship” landfill solar project highlights the potential that brightfields have as catalysts for change

Project Impact:

- 52 MW on 240 acre-closed landfill, including 2 MW of community solar
- World’s largest landfill solar farm planned and permitted for low-income and historically marginalized black neighborhood
- Project is spurring federal, local, and private investments in solar and STEM workforce training for 175+ Houston residents

Pulse Check: *How are you feeling after learning the basics of brightfields?*

1. Excited by this potential opportunity
2. Unsure/skeptical
3. Not interested/not a fit for my community
4. Still digesting lunch

Developing these types of projects is rarely a linear journey. While guidance and lessons learned can help, there is NO cookie cutter approach that can serve every project or every community.

Brightfields Site Selection Checklist

Strategic Reuse:

- ❑ ***Is this a productive reuse of the site?***
  - ❑ Does this reactivate a site without current plans?
  - ❑ Does this risk impeding future reuses nearby?
- ❑ ***Is this the "highest and best use" of this site?***
  - ❑ How well does this align with existing site owner goals and/or community visioning?
  - ❑ Are zoning, right-of-way, or land-use conditions aligned with the proposed reuse for this site?
  - ❑ Can co-locating clean energy further enhance plans for the site?

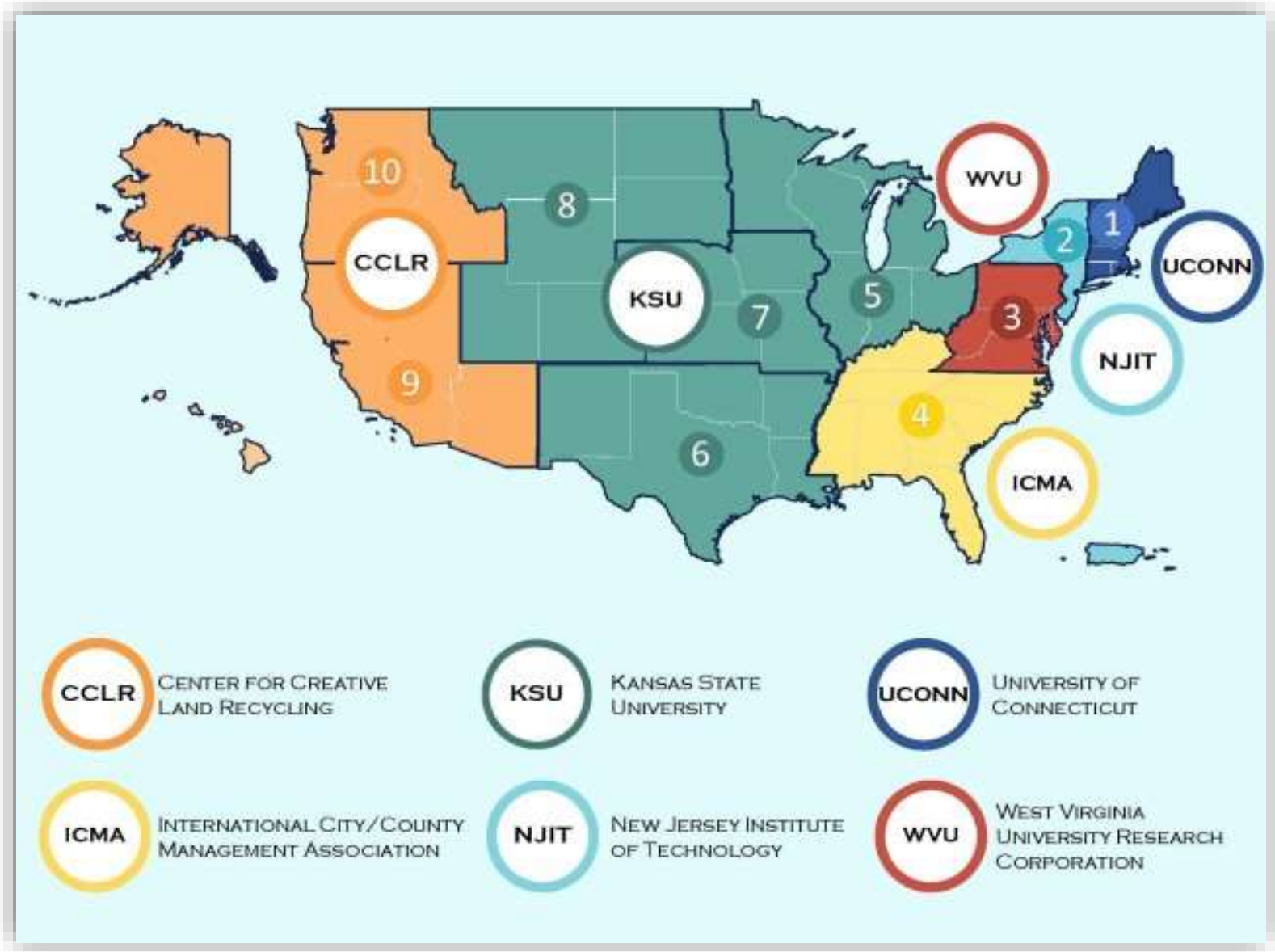
Technical Reuse:

- ❑ ***Does the site seem like it can reasonably support clean energy?***
  - ❑ What clean energy technologies (i.e., solar, wind, geothermal, or energy storage) could make sense?
  - ❑ Are there serious concerns about shading (for solar), wetlands, or floodplains?
  - ❑ Is there infrastructure on-site or nearby that may complement clean energy reuse?
- ❑ ***Is there a reasonable pathway for how the electricity generated would be consumed?***
  - ❑ Is there on-site or nearby demand for electricity?
  - ❑ Would the electricity support the utility's grid?

EPA's Technical Assistance to Brownfields program can help communities address brownfields challenges

TAB Guidance & Services:

- Inclusive community visioning
- Acquiring, assessing, cleaning up, and redeveloping brownfield properties;
- Health impacts of brownfield sites
- How to comply with voluntary cleanup requirements
- Funding and financing strategies, including EPA brownfields grant application support
- And more…



Source: US EPA

RMI is partnering with regional Technical Assistance to Brownfields programs to help communities across America advance brightfields projects from idea to implementation.

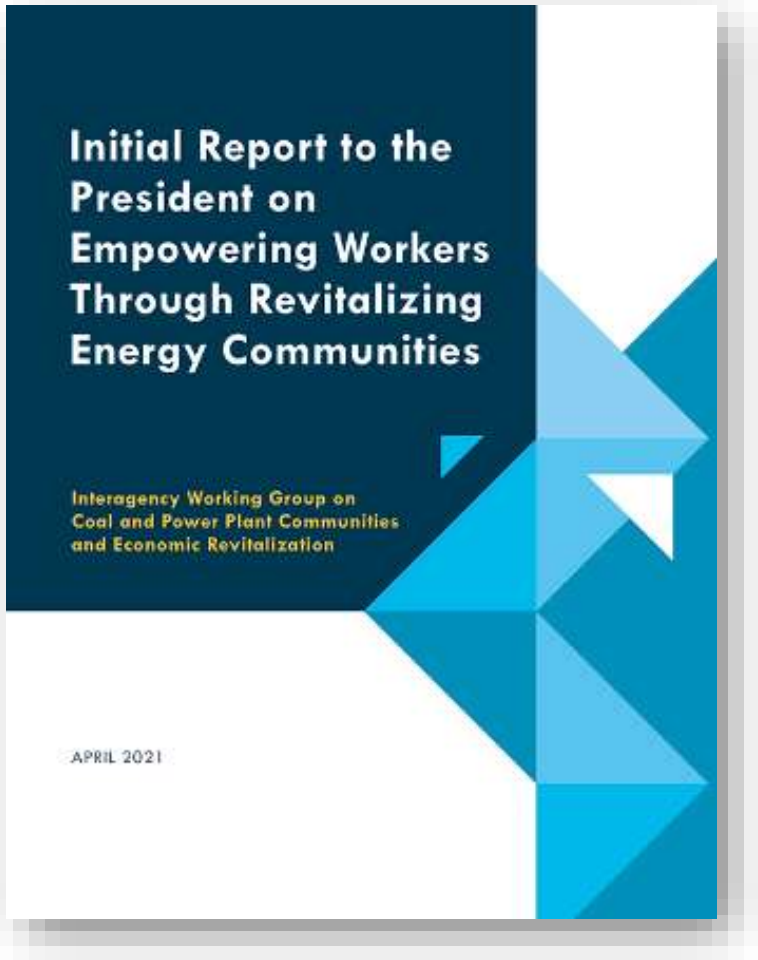
To ***educate communities and site owners*** about brownfields reuse options that include clean energy

To ***provide pre-development site evaluation and analysis*** to communities considering “brightfields”

To ***provide other technical assistance and tools*** to help with reuse planning, funding, financing, and clean energy procurement

Opportunities for Energy Communities

Investing in “Energy Communities” is a critical part of not leaving anyone behind in the energy transition



The Situation:

- United States coal mining employment fell from more than 175,000 in 1985 to roughly 40,000 in 2020

Federal Priorities:

- Interagency Working Group is focusing initial federal investments in areas with high concentrations of coal-dependent jobs

Goal:

- Ensure energy communities have both the foundational infrastructure and targeted place-based investments to transition to more sustainable, resilient, and equitable economies

Recently created and enhanced incentives in the IRA will increase the financial opportunity for brightfields in energy communities

With What:

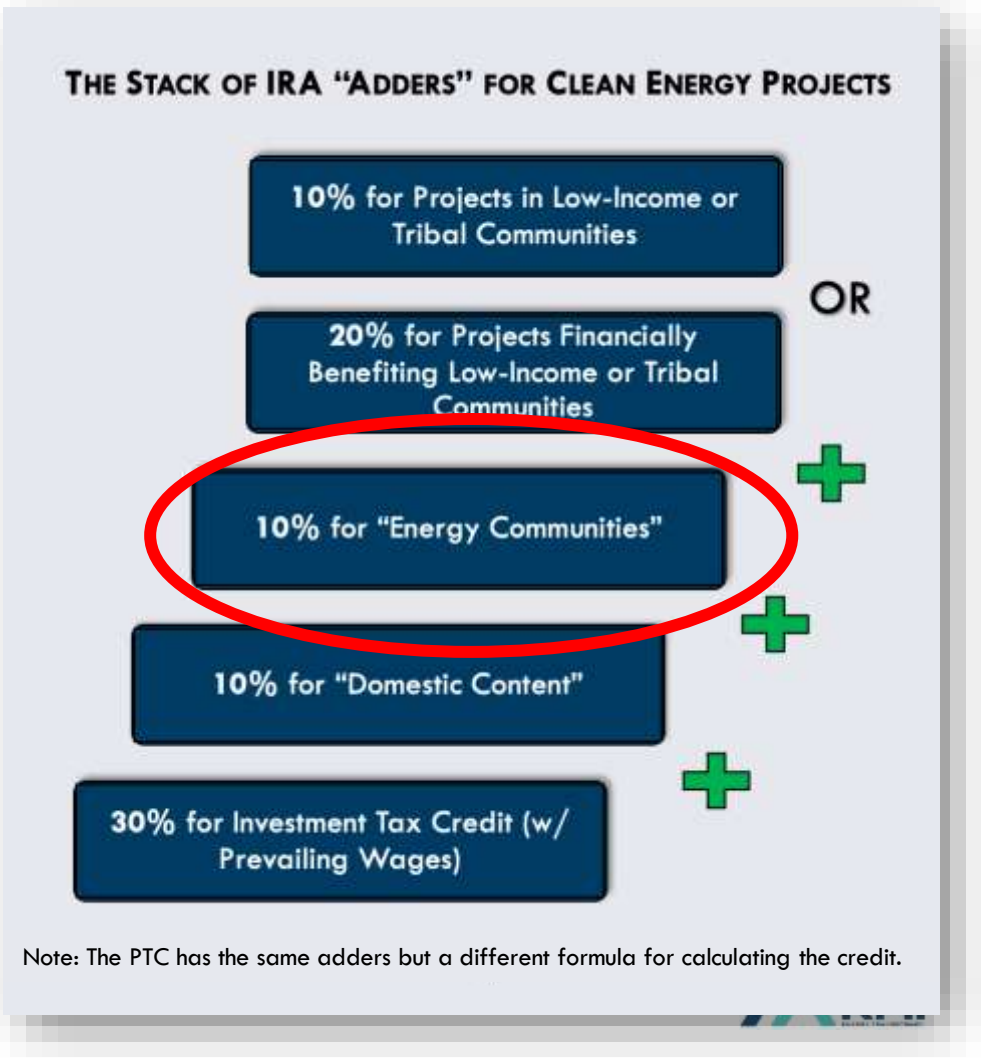
- U.S.-sourced materials (domestic content)

Where:

- Solar installed in Energy Communities, Tribal communities, and/or low-income communities
- "Energy Communities" include brownfields, coal communities, and other communities that have relied economically on fossil fuels

Who Benefits:

- Projects that financially benefit Tribal communities or low-income communities



So… what are “Energy Communities” exactly?

Brownfields

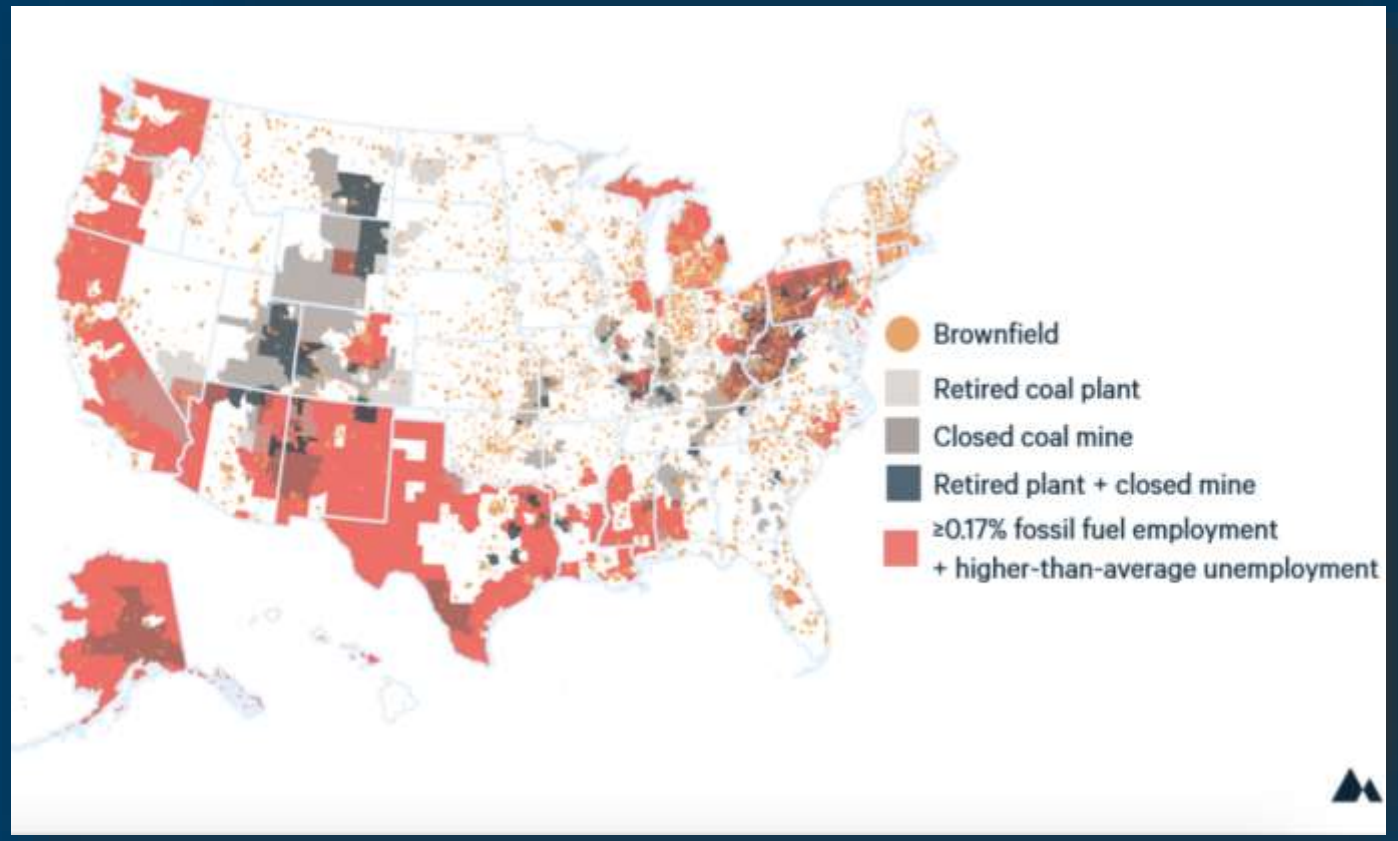
- Sites designated as “brownfields” that contribute to longer term community development legacies

Coal Communities

- Census tracts where a coal-fired power plant has closed since 2010 ***or*** a coal mine has closed since 2000, plus directly adjacent census tracts

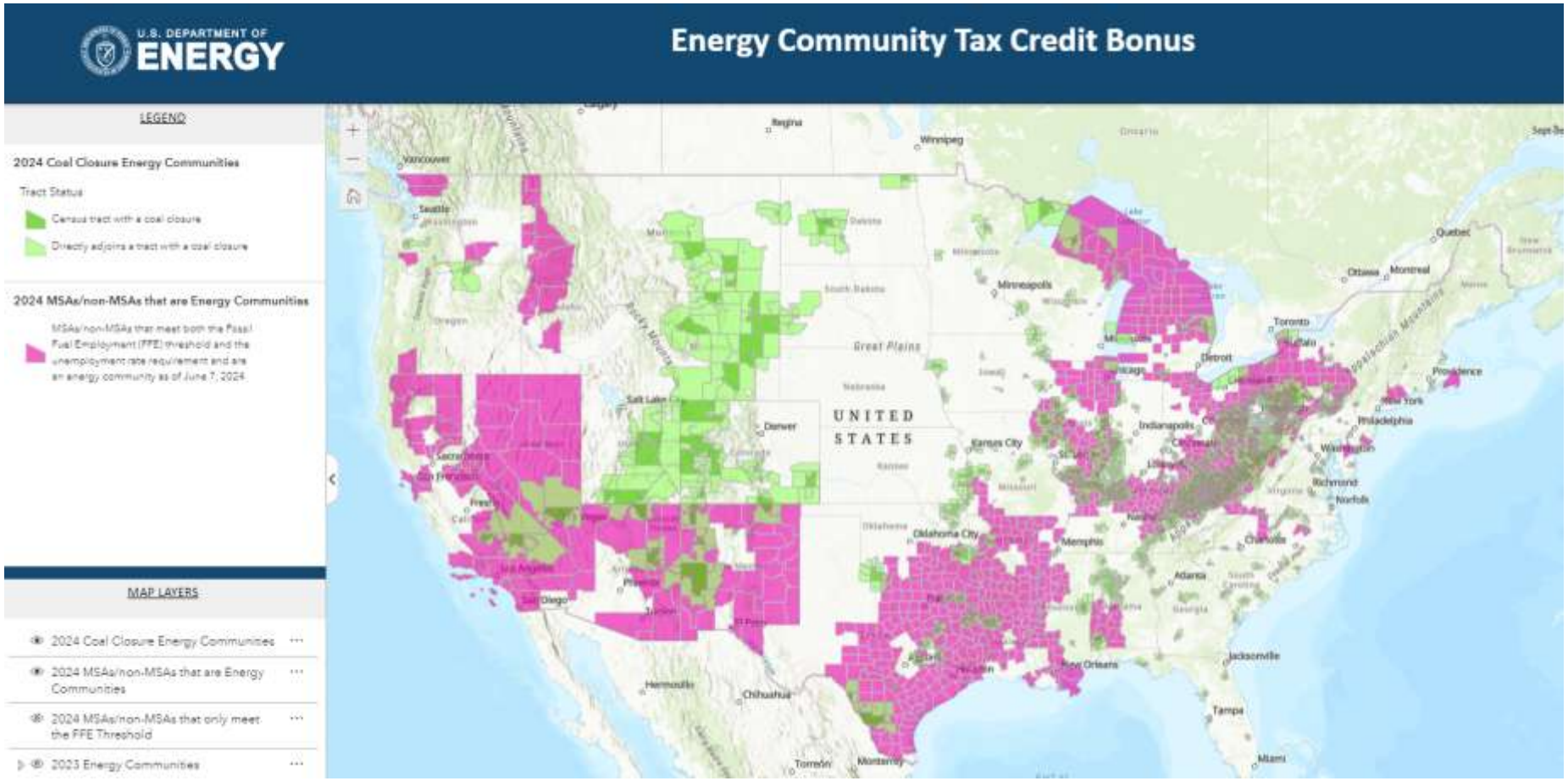
Areas of Higher Fossil Fuel Economies

- Areas where direct employment or local tax revenues are substantially related to fossil fuels ***and*** where unemployment is at or above the national average in the previous year



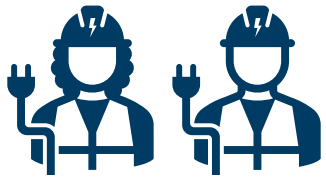
Data Source: US EPA; Chart Source: Resources.org

The Energy Communities Bonus Tax Credit offers a 10% adder to reuse these sites and areas for energy investments



Source: US Department of Energy

The Energy Infrastructure Reinvestment (EIR) program offers $250 billion in low-cost financing to reinvest in energy communities



Energy Infrastructure:

- A facility, and associated equipment, used for:
  - The generation or transmission of electricity; OR
  - The production, processing, and delivery of fossil fuels, fuels derived from petroleum, or petrochemical feedstocks

Qualifying Reuses (including but not limited to):

- Retool, repower, repurpose, or replace legacy energy infrastructure with renewable energy and/or storage, distributed energy, transmission interconnection, clean energy product manufacturing, nuclear energy, fossil or biomass generation with carbon capture and sequestration
- Enable operating energy infrastructure to avoid, reduce, utilize or sequester air pollutants or GHGs
- Repurposing oil and gas pipelines (e.g., for H2, CO2)
- Reconducting transmission lines with upgrading voltage

Program Requirements to Benefit Energy Communities:

- Customer Benefits: For utilities, financial benefits go to customers
- Community Benefits Plan

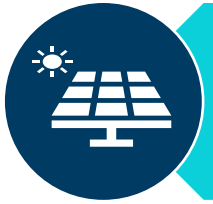
EIR enables a range of possible projects

Replacing a retired fossil fuel power plant with solar and storage	**Infrastructure**: 300 MW demolished coal power plant, but interconnection and roads remain	**Owner and Proposed Use:** Power producer wants to build 30 MW of solar and 250 MW battery	**Project Structure:** Loan to support construction, paid through tax incentives and revenue	**Community Benefits Plan:** Retraining and new employment for plant employees
Replacing a retired power plant with an energy-related industrial facility	**Infrastructure**: Retired gas plant with existing electrical, pipelines, rail, and roads	**Owner and Proposed Use:** Developer wants to build battery manufacturing facility	**Project Structure:** Loan to support construction, paid through tax incentives and revenue	**Community Benefits Plan:** Robust engagement with local government and stakeholders

Example: An independent power producer plans to demolish a 300 MW coal-fired power plant

An EIR loan can cover:

Remediation of on-site coal ash ponds



50 MW of solar and 250 MW of battery storage

Workforce retraining and new opportunities

☑ ***Competitive Advantage for Energy Communities***

☑ ***New Local Jobs and Tax Revenue for Community***

By understanding what is possible, communities, planners, development officials, and site owners can plan to repurpose their brownfields, closed power plants, and other sites with clean energy and new manufacturing – and how this can be a part of broader economic revitalization strategy.

RMI

How Weirton, WV is becoming a clean energy economy hub

Brownfields represented both a challenge and opportunity for Weirton, with abandoned industrial buildings dominating the riverfront community and former steel town

Challenges:

- Over 1,550 acres of underutilized, former manufacturing sites with decades of industrial contamination from the downtown to the riverfront

Opportunities:

- Weirton needed to transform its sites and perception, so it focused on site assessments, cleanup, infrastructure upgrades, and reuse planning to revitalize brownfields
- Leveraged local, federal, and private investments, including ~$4.2M in federal funding and $80M+ of private investment over 5+ years, helped solidify a reuse vision and reactivate its economy

Solar on a hard-to-access brownfield complements other reinvestment priorities and demonstrates innovation

Key Benefits

- ✓Offering a productive reuse for the hard-to-redevelop Brown's Island
- ✓Leveraging existing infrastructure on-site (e.g. roads, electrical)
- ✓Generating local revenue in Weirton with solar
- ✓Building momentum for reinvestment to reactivate the region

Planning for the clean energy economy takes significant time, strategy, effort, and resources

A decade of preparation

- Multiple plans, market engagement partnership building, and political buy-in laid groundwork for multiple multi-million dollar federal and private investments

Weirton embraced its legacy

- *"It became abundantly clear that Weirton… a historic steel community that [has]… raw infrastructure and know-how to make great things out of iron, would be the ideal location for our first commercial battery production facility"* – Form Energy

Funding followed the vision

- The existence of funding and financing didn't drive Weirton's future – the key was figuring out what future made sense for the site and community

Questions?

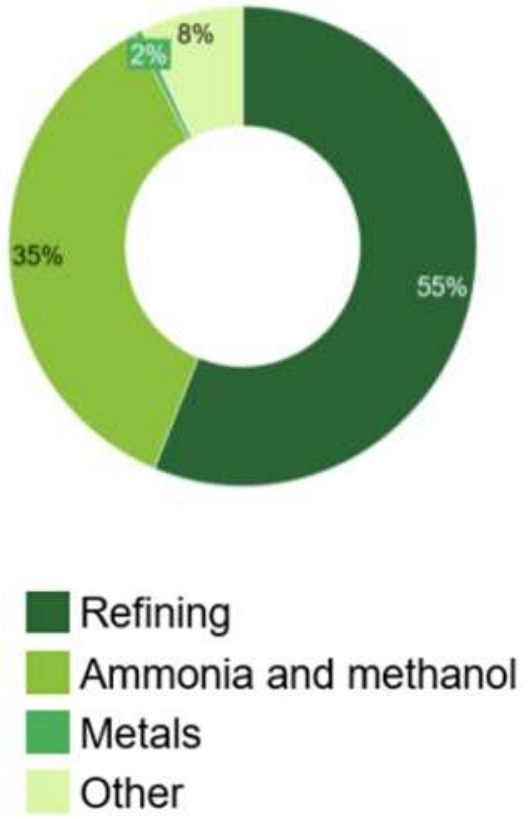
Clean Hydrogen 45V Tax Credit

Presenter- Nathan Iyer

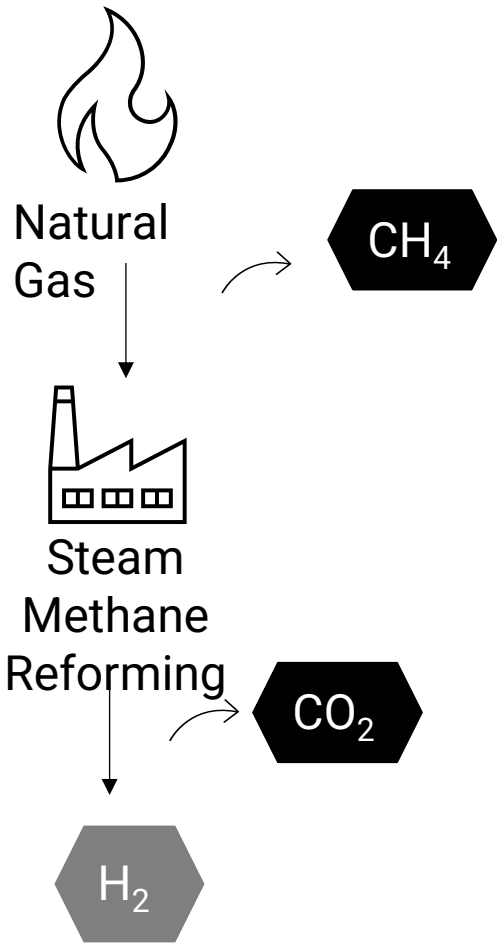
Introduction to Clean Hydrogen

- **Hydrogen:** A versatile non-carbon fuel and feedstock that can be used in a wide range of industries
- **Today's Hydrogen:** Mostly used in making nitrogen fertilizer, refining petroleum, and as an input to chemicals production
- **Future of Hydrogen:** Shipping, aviation fuel, heavy-trucking, steel

Hydrogen consumption in the U.S. by end use, 2021

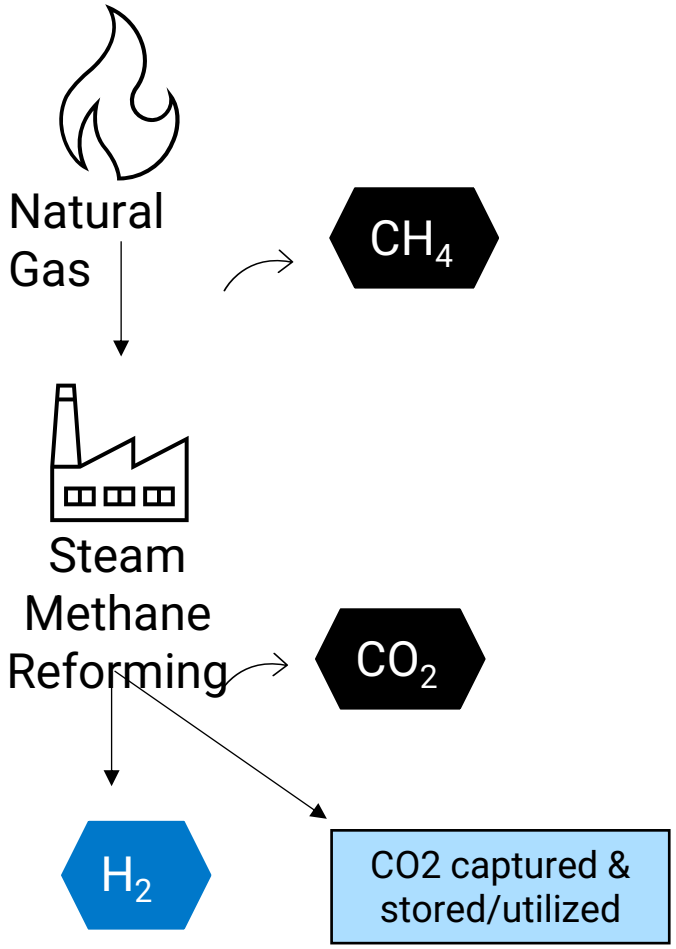


Grey Hydrogen Pathway



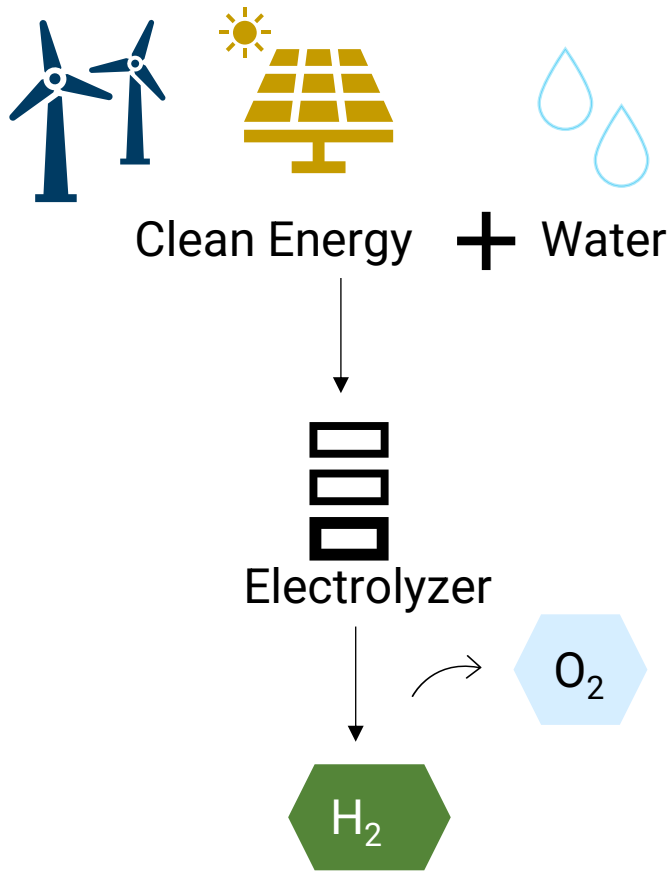
Emissions: ~10 $kgCO_2/kgH_2$

Blue Hydrogen Pathway



Emissions: ~2-9 $kgCO_2/kgH_2$

Green Hydrogen Pathway



Emissions: 0 $kgCO_2/kgH_2$

Today's approximate values shown, emissions dependent on efficiency of capture, upstream emissions, electricity sourcing.
Capture rate used: 56-95%. Based on RMI analysis, the best blue (95% capture, 0.05% leakage) case still results in ~1.7kgCO2/kgH2 based on a typical grid emissions.

Two Landmark Bills Drive Investment into Clean Hydrogen Production

Clean Hydrogen Production Tax Credit

Projected value of $30 – 100+ billion over 20 years

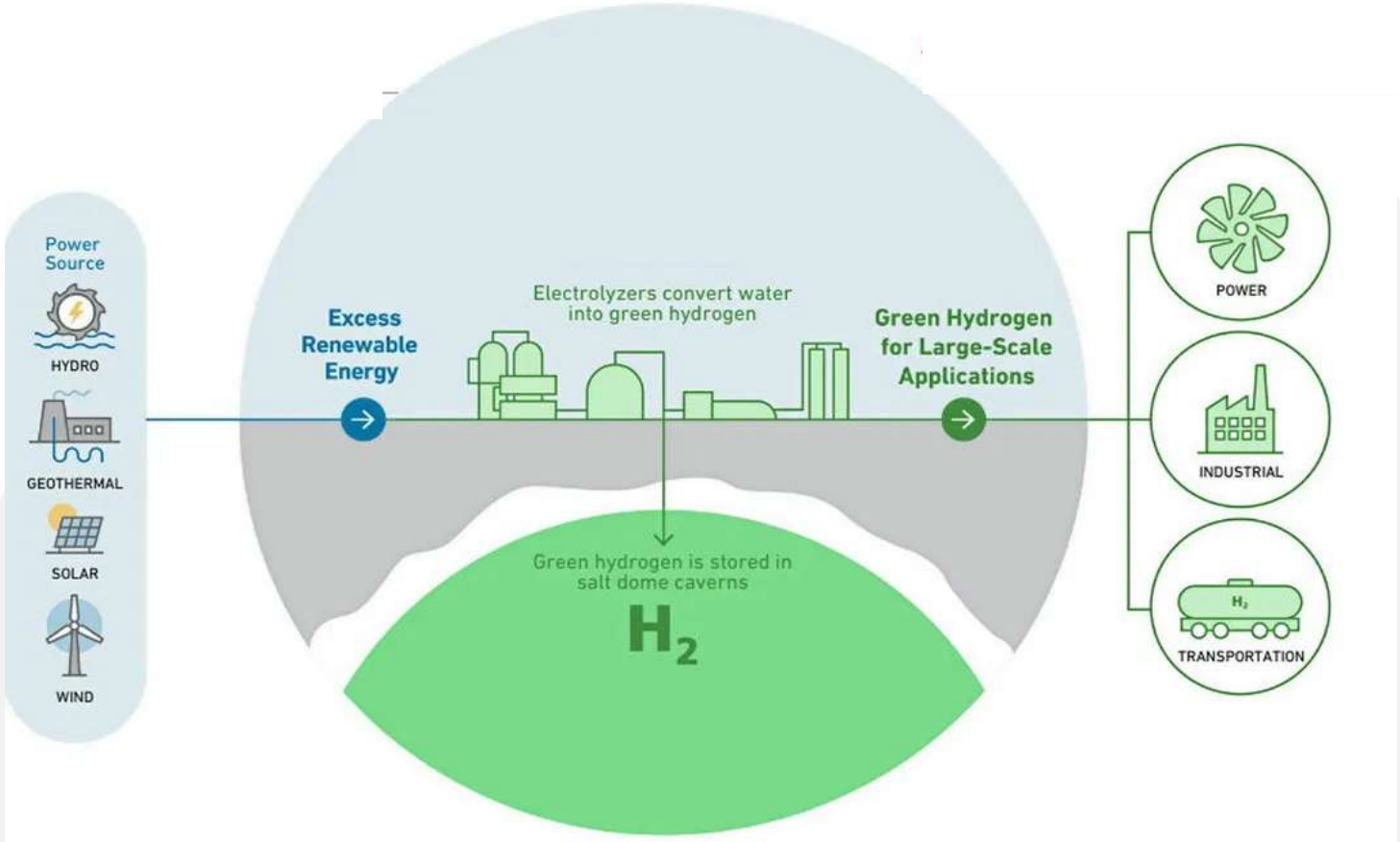
$7 Billion For America's First Clean Hydrogen Hubs, Driving Clean Manufacturing and Delivering New Economic Opportunities Nationwide

OCTOBER 13, 2023

U.S. DEPARTMENT OF ENERGY

What is a hub?

- Funded with $1B in federal cost-share grants
- Multiple producers, multiple offtakers
- Uses economies of scale and shared infrastructure to defray costs
- Designed to overcome “chicken-and-egg” infrastructure buildout challenges



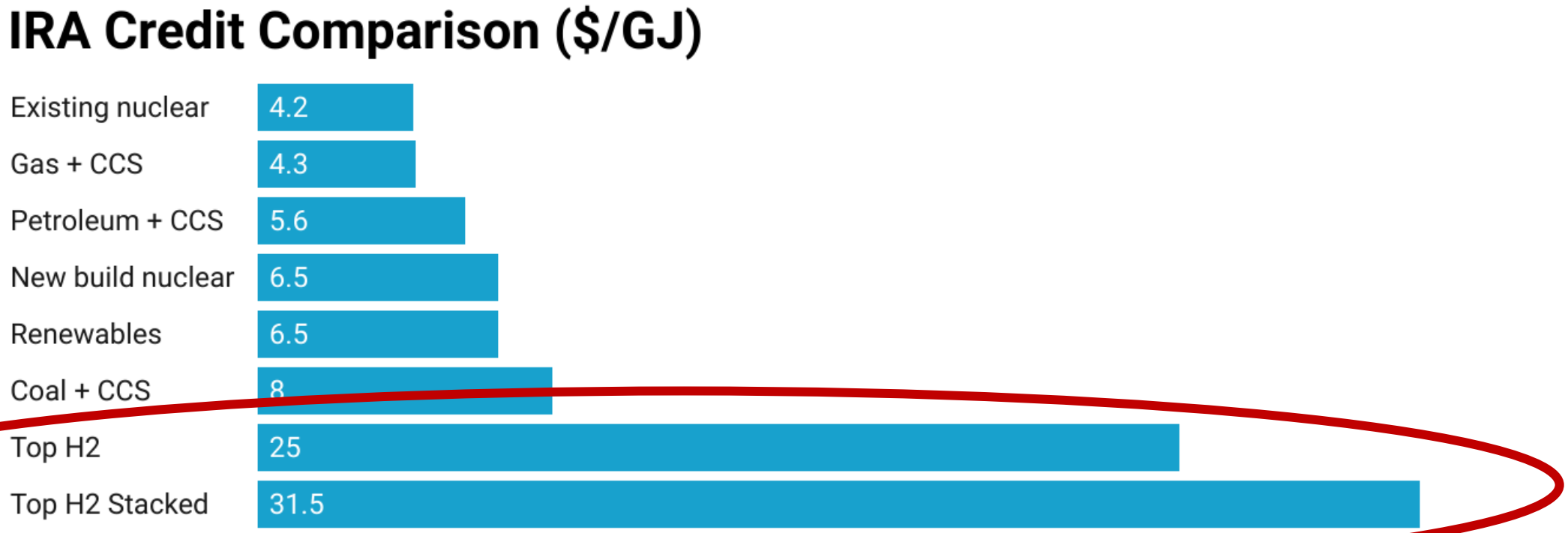
Clean Hydrogen Hubs Selections Designed For Innovation

The Bipartisan Infrastructure Law required:

- Many production methods (electricity, nuclear, natural gas, etc.)
- Many end uses (industry, transportation, buildings)
- Many geographies

However, regions not chosen may still outcompete these hubs if leaning on

Hydrogen Production Tax Credit is designed for deployment – and the largest in the IRA



Key takeaway:

Hydrogen credits are the most valuable in the IRA (equivalent to $3-4/ gallon of gas)

Clean Hydrogen Tax Credit - Eligibility

Additional requirements

- **Prevailing wage** and **apprenticeship.**
- Available for **direct pay** for the first 5 years of credit eligibility

Emissions intensity (kg CO_2/fkg H_2)	Percent reduction	($/kg H_2)
4.0-2.5	60-75% D-/C	0.60
2.5-1.5	75-85% C/B	0.75
1.5-0.45	85-95% B/A	1.00
0.45-0.0	95-100% A+	**3.00**

25%

33%

200%

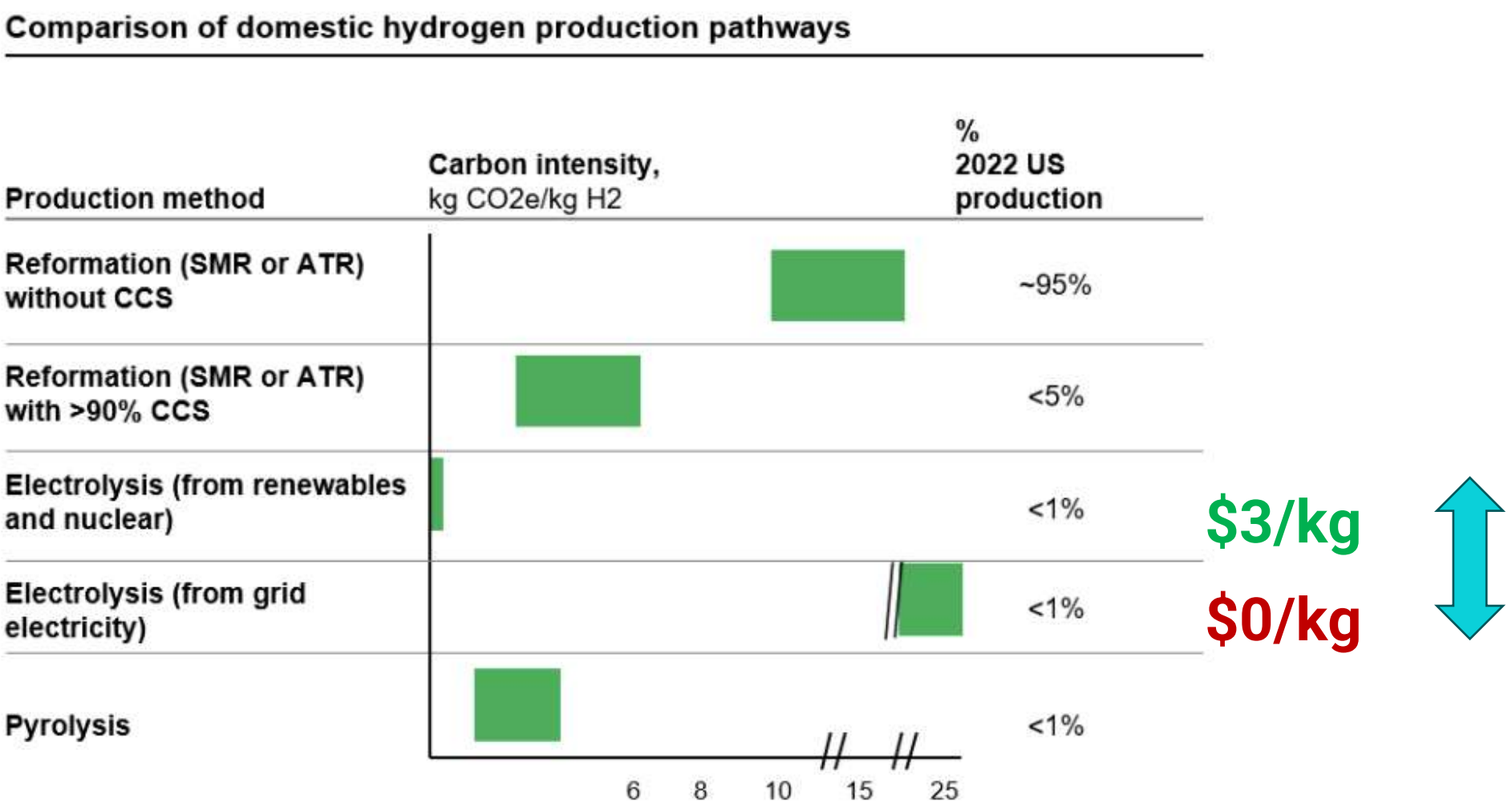
Note: Stackable Clean Electricity Credits add ~$1.50/kg of subsidy

**Direct pay option for 5yrs for eligible projects*

Three major pathways to achieve the top credit (A+)

	Benefits	Risks
Behind-the-meter	Easy to prove you are clean, lower grid interconnection costs	Harder to balance system, need to locate offtake with excellent renewables, requires permissive regulations
Grid-connected	Can benefit from grid balancing and diverse resources; back-up power; more geographic diversity	Margins for proving clean power are very tight (98-99.5% reductions); grid interconnection costs
Biogas + CCS	Allows for a methane-based pathway, does not require massive electricity consumption	Biogas is expensive and can leak, CCS consumes energy, requires capture and storage infrastructure

Production Pathways Can Have Vastly Different Emissions



Recent guidance includes a pathway to demonstrate grid electricity is clean

Deliverability: In the same deliverability region

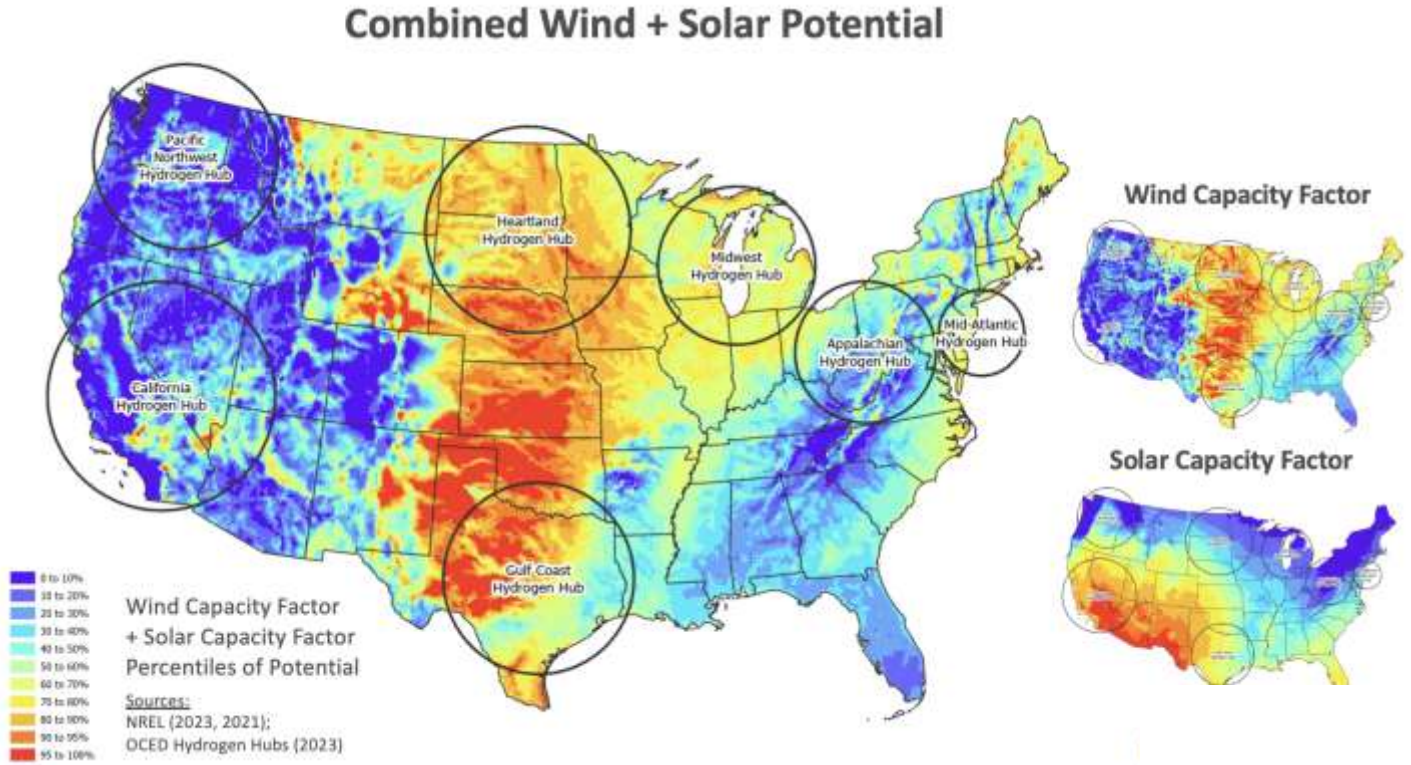
Incrementality: Built within 3 years, additional exceptions being considered

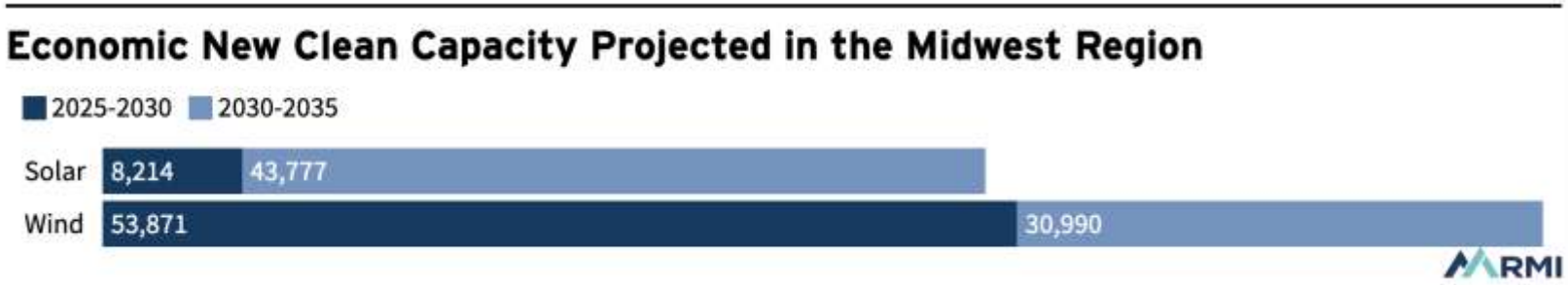
Hourly matching: starting in 2028, match on an hourly basis

Deliverability regions (DOE)

The winner? Regions that build diverse clean resources

Areas with excellent wind and solar potential are likely the most competitive out of the gate





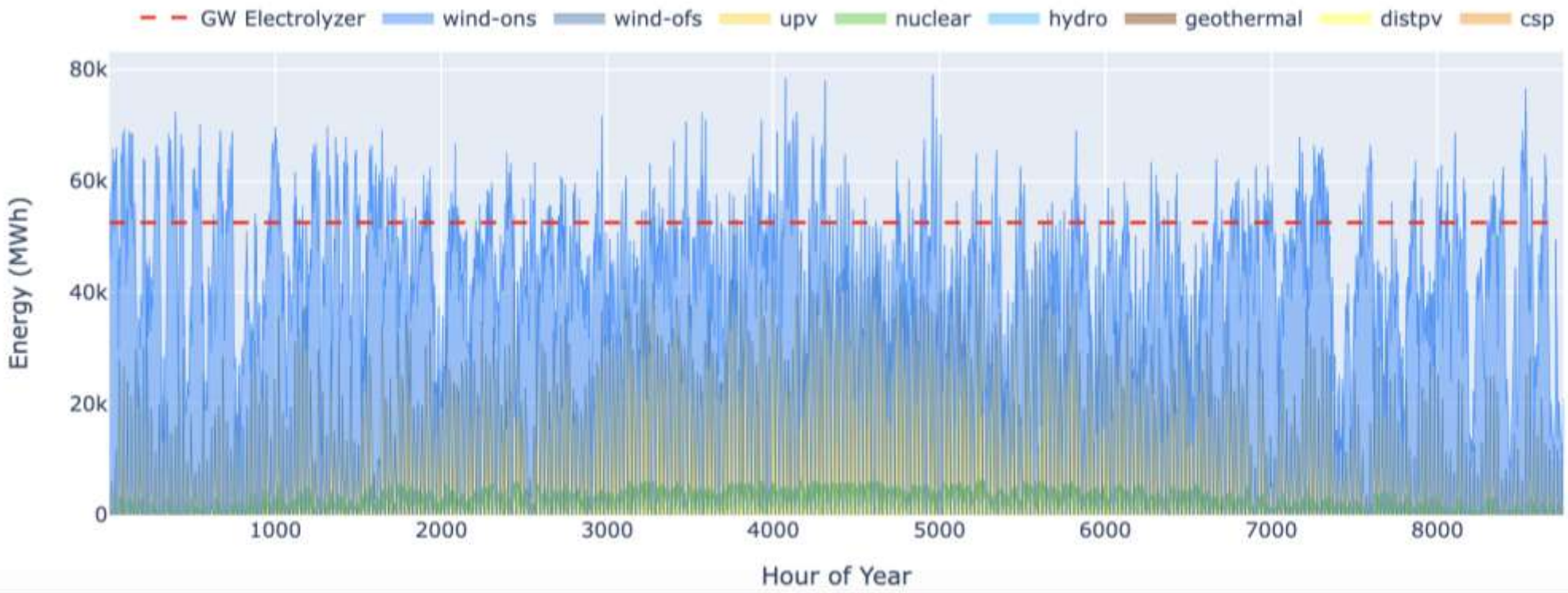
The Midwest is one of the most competitive regions due to high projected wind and solar buildout

Capacity Factor

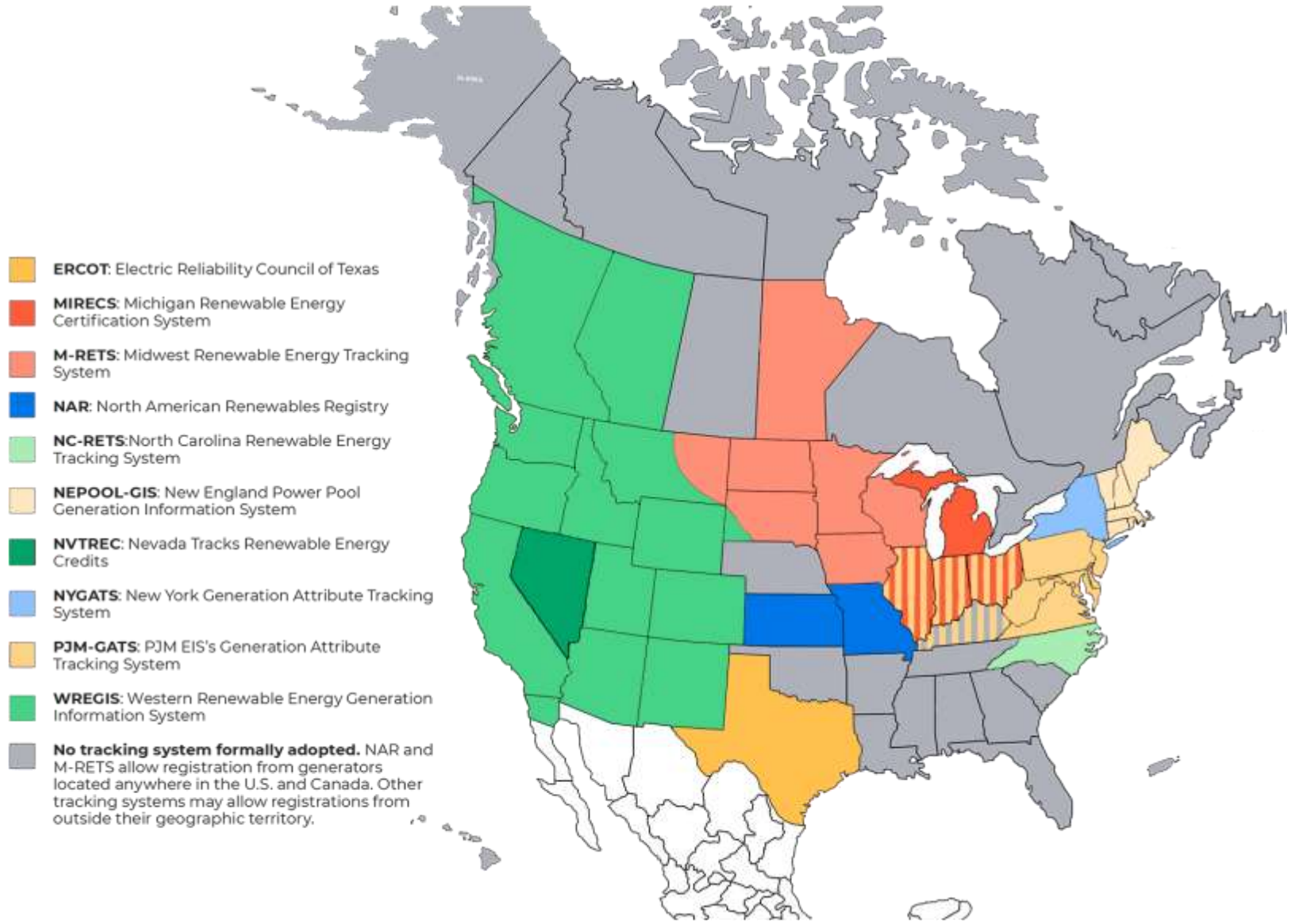
80%

Total H2 Produced

6.65 million tons



Granular RECs can be minted by registries



A number of companies can help with project development

Renewables forecasting

AMPERON

VAISALA

Registry management

Singularity

Flexidao

EAC Trading

ICE

LevelTen Energy

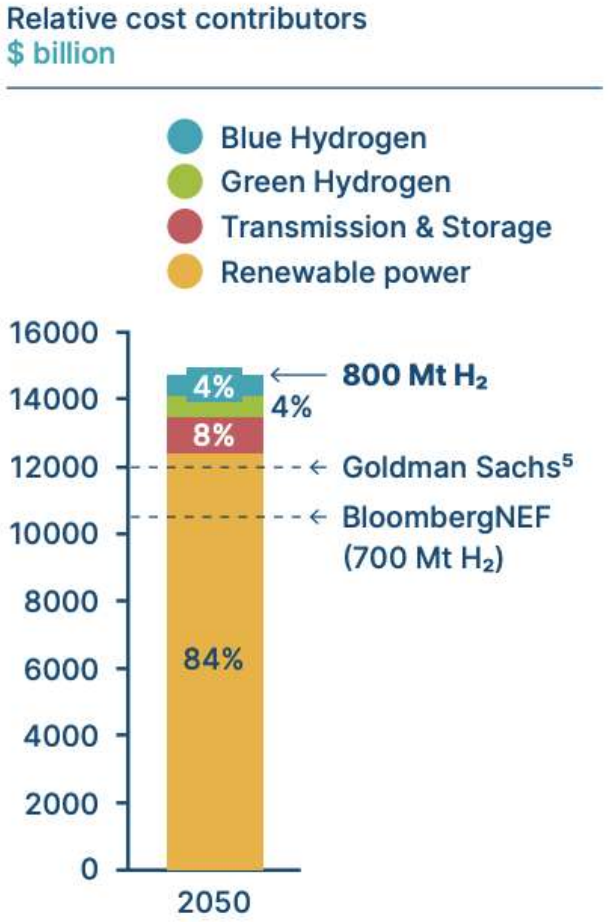
Advisory

BLACK & VEATCH

CRA

Green Giraffe Advisory

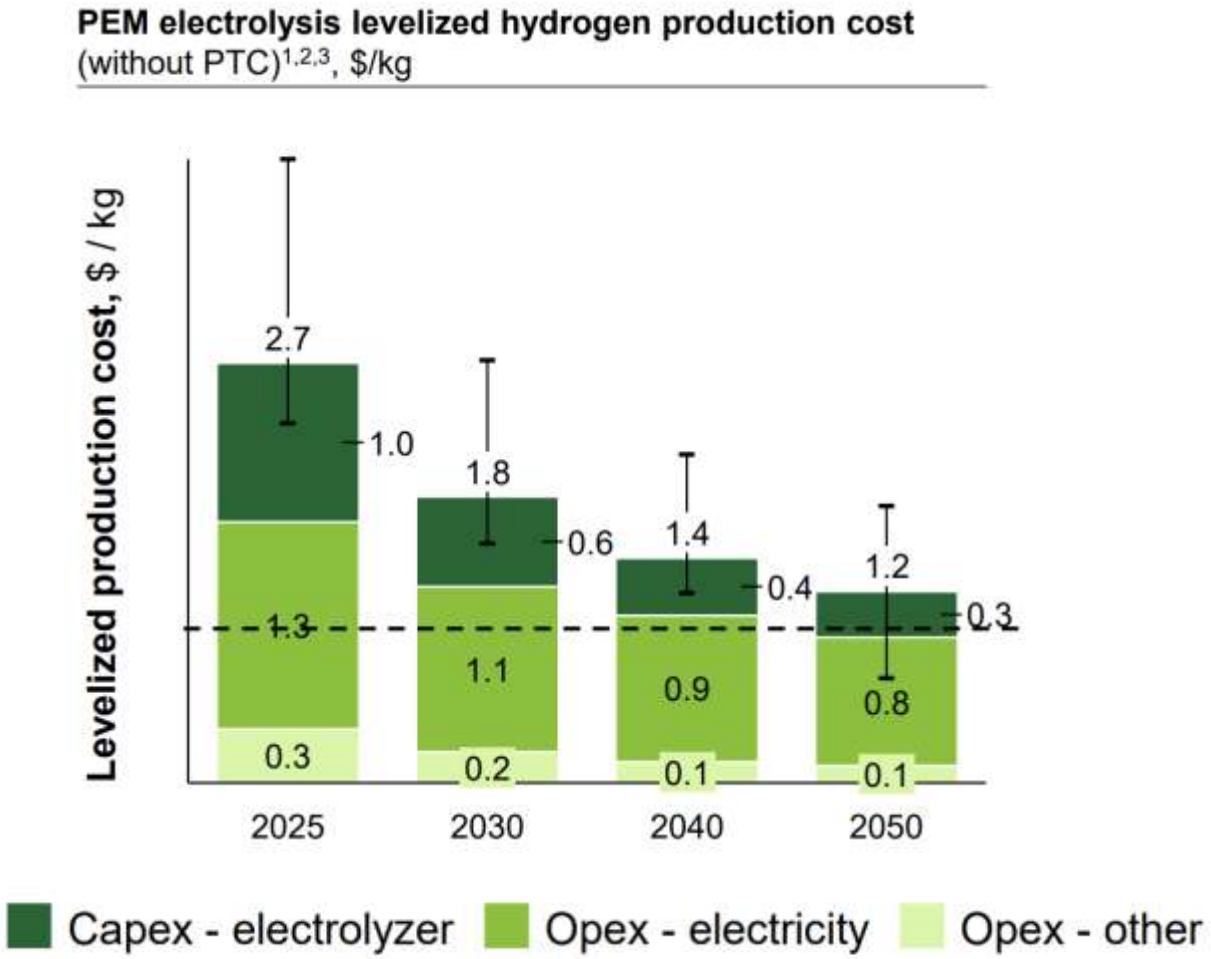
Anatomy of an electrolysis project



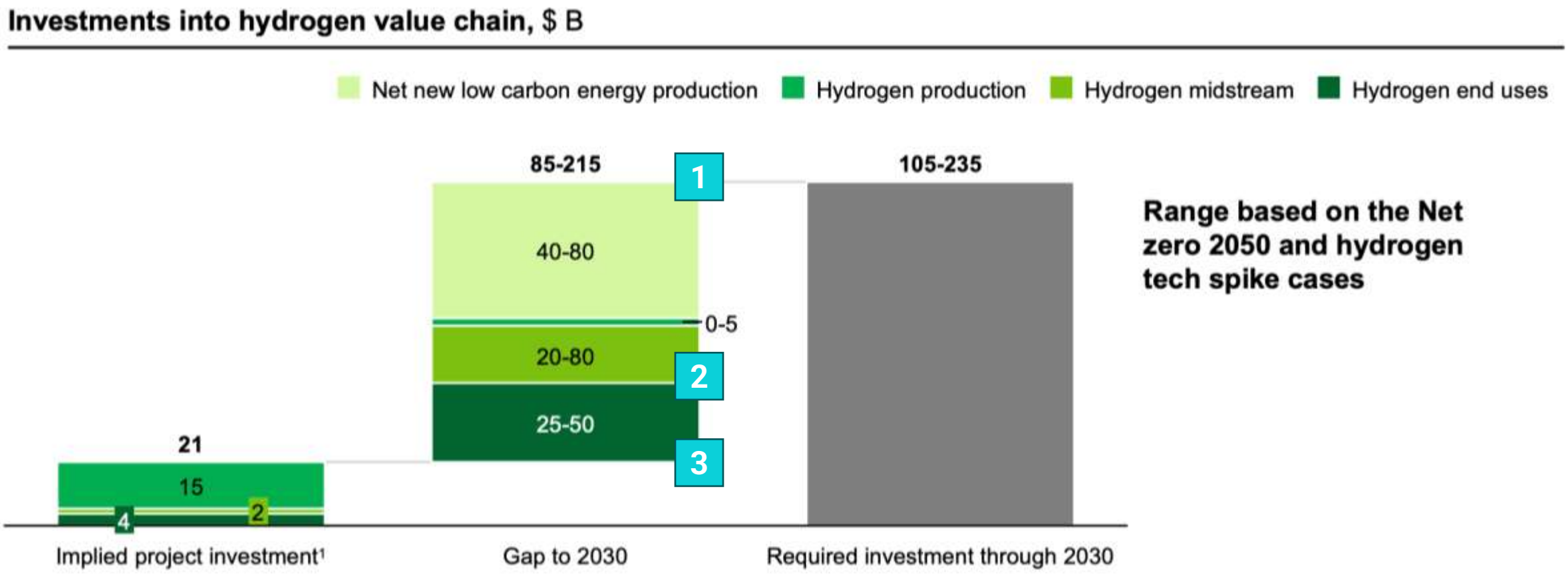
Projects have four major components:

1. Electrolyzer capex (45V)
2. Transmission and storage (credit: 48E)
3. New low carbon power (credit: 45Y)
4. End-uses (credit: hubs, 48C, state policy)

The Relative Magnitude of Project Costs will Change Over Time



Primary gaps are clean power, offtakers, and midstream infrastructure

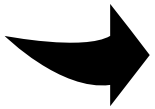


Hydrogen in the Heartland

There are four major regional opportunities:

- **Clean fuels**: use hydrogen as a feedstock to upgrade biomass into high quality aviation/transportation fuels

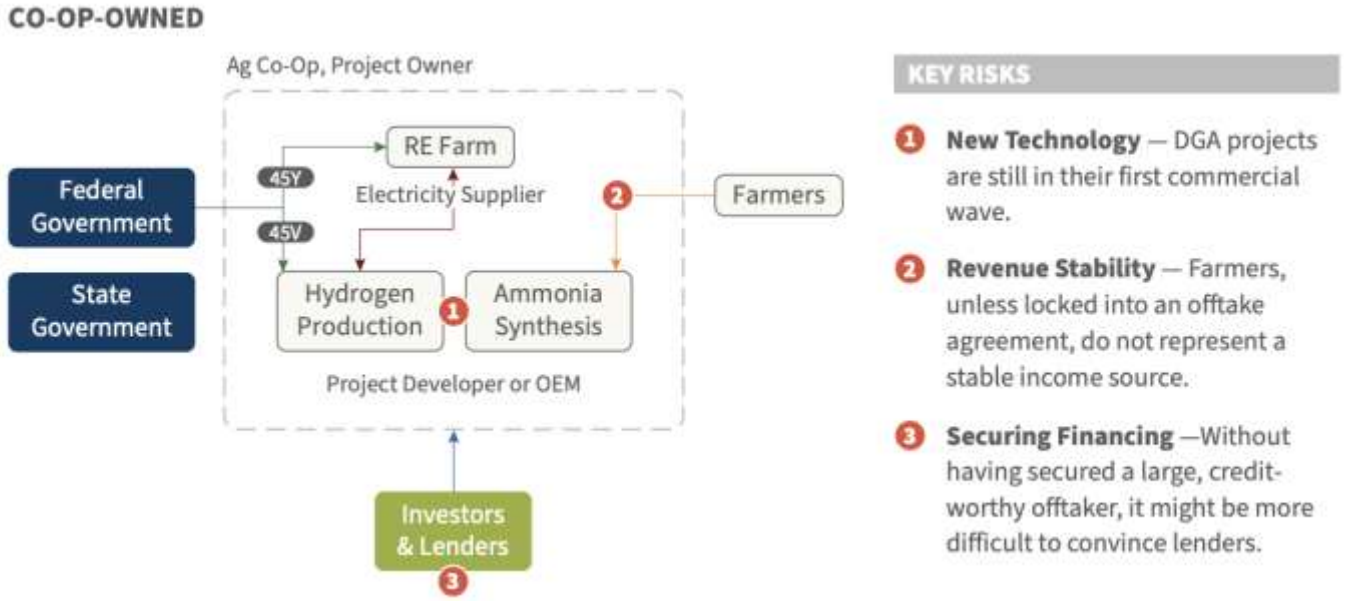
- **Decarbonize existing facilities:** replace high emissions hydrogen production and natural gas (e.g. refineries, metals)



- **Expansion of nearby hydrogen hubs** (e.g. Midwest and Heartland) use common carrier clean hydrogen infrastructure to connect hydrogen production to end-use

- **Localized fertilizer production** to buffer against gas fluctuations and transportation bottleneckss

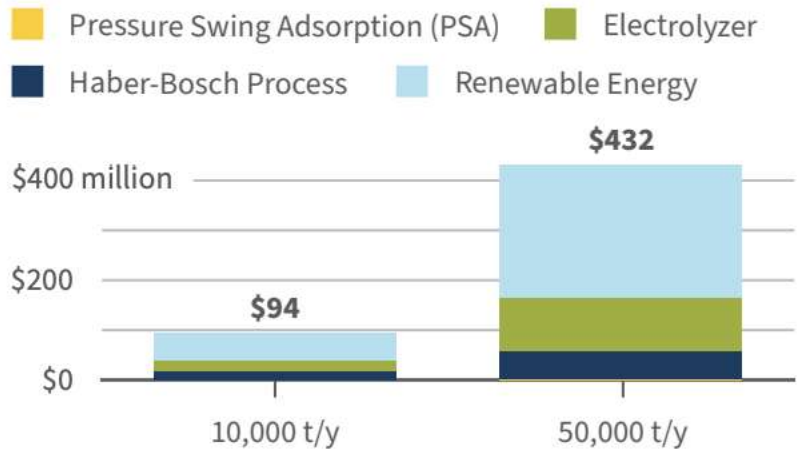
Distributed Ammonia Could Reduce Risks and Costs for Farmers in Minnesota



KEY RISKS

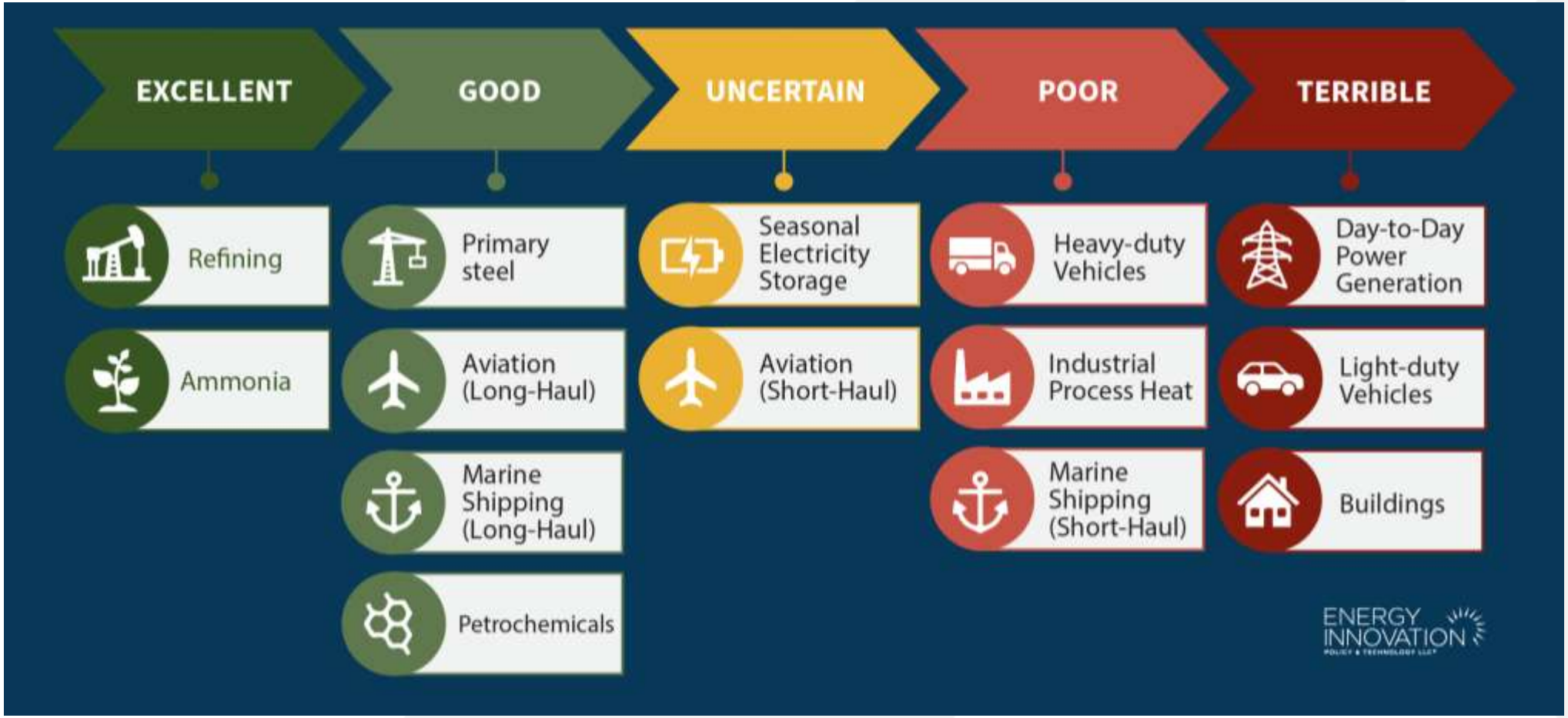
1. **New Technology** — DGA projects are still in their first commercial wave.
2. **Revenue Stability** — Farmers, unless locked into an offtake agreement, do not represent a stable income source.
3. **Securing Financing** —Without having secured a large, credit-worthy offtaker, it might be more difficult to convince lenders.

Total Capital Expenditure of Main Equipment for Distributed Green Ammonia Production Systems



https://rockymntstage.wpengine.com/insight/roadmap-for-distributed-green-ammonia-in-Minnesota/

Hydrogen can be used for many sectors, but only a few are economically competitive



Identifying competitive projects from hydrogen hype

The size of the credit will attract a lot of investment, but not all project concepts are viable.

Is the end use a competitive use of hydrogen?

Evaluate all options, weigh efficiency losses

Does the project have access to clean power?

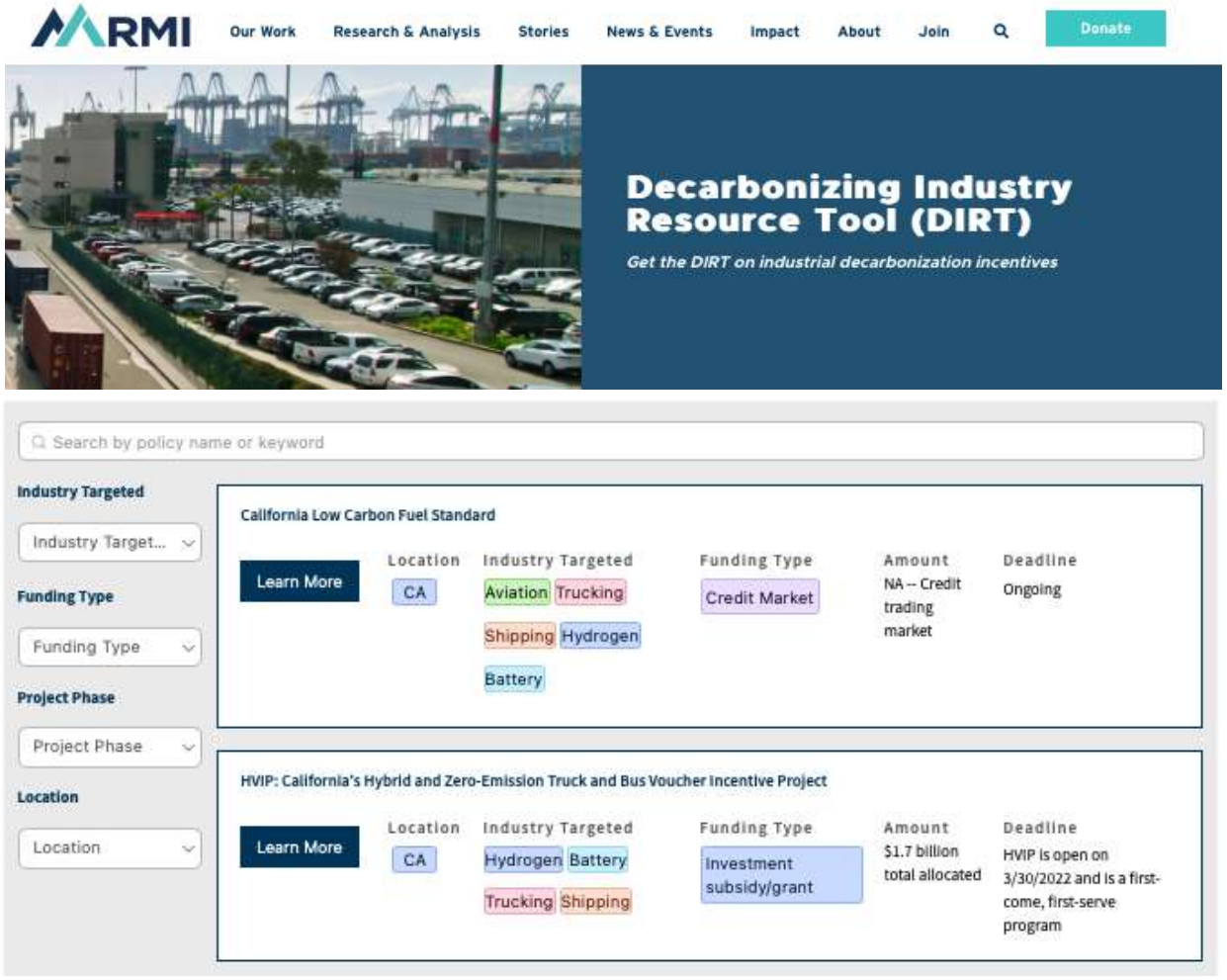
Diverse power sources, growing grid, and rapid interconnection

Preparing the grid for flexible clean hydrogen production

Producing low emission and low-cost hydrogen requires alignment between clean resources and hydrogen production:

- Regions that can **site, permit, and build** large volumes of clean power infrastructure (e.g. Texas)
- Jurisdictions that allow hydrogen developers to build renewables on their land and develop energy parks (e.g. nearby clean power, local wires, flexible demand)
- Utilities that **value flexibility** and enable electrolyzers to have exposure to **market signals**
- Utilities ready to integrate large loads onto the grid

Existing policies that can complement 45V



DIRT TOOL:
https://rmi.org/decarbonizing-industry-resource-tool-dirt/

- Hydrogen is **an intermediary product** – other policies can be highly complementary, but it can be complex to research and find
- Electricity tax credits, clean fuel subsidies, and industrial retrofit programs all provide additional revenue

Incentives for brightfields, power plant conversions, and new energy technology manufacturing can shape economic development planning

Programs like:

- Clean Energy Tax Credits (48/45)
- Energy Infrastructure Reinvestment (EIR) program
- Battery Manufacturing Tax Credits
- Empowering Rural America (New ERA) program
- Brownfields Multipurpose, Assessment, Cleanup, and Revolving Loan Fund Grants
- Economic Adjustment Assistance program

Inform how communities plan for:

- Site remediation and reuse
- Construct new manufacturing facilities that support a clean energy economy
- Support worker retraining
- Reactivate communities previously left behind in the energy transition
- Reinvest in clean energy while paying off coal debt, ramping down coal generation, and saving customers money
- Make use of grants and financing to retire coal plants and own clean energy

Q&A – Structuring Clean Hydrogen Projects

What questions do you have about qualifying projects, or the three pillars?

- Challenges you have heard from developers?
- How to support clean hydrogen projects?
- Largest gaps to development?
- Clarifications on the policy design?

Discussion

- Break into groups of 3-5.
- Take a moment to think about a project you want to see happen in your community.
- Which program that you learned about today could help with that project?
- Rotate around the group, each sharing info on your project.
- If you're stuck, let your groupmates be your consultants! Tell them about the project. Groupmates, ask questions about the project to help brainstorm.

Day 3: Bringing together finance and economic development to maximize IRA and GGRF benefits for Minnesota

Agenda (Day 3)

Time	Activity
8:45	Day 3 Overview
8:50	Keynote Speaker
9:05	Panel: Minnesota State Resources to Complement Federal Opportunities
10:20	Break
10:50	Minnesota Community Financing Roadmap
12:00	Lunch
1:00	Roadmap Backcasting
3:00	Close

Minnesota State Resources to Complement Federal Opportunities

Panelist:

- Kevin McKinnon, Deputy Commissioner, Economic Development
- Sam Rockwell, Federal Funds Implementation Coordinator
- Frank Kohlasch, Assistance Commissioner for Air and Climate Policy
- Alisa Petersen, Federal Policy Manger (moderator)

Menti

We are going to use an interactive polling tool to capture thoughts and ideas throughout the convening. You should have already opened this link at registration but using a device (phone or computer):

- **Go to menti.com**
- **Enter the following code: 3976 2816**
- **Follow along and answer the questions on screen!**

- **If at any point you want to submit a question, navigate to the "Open Q&A" button to submit a question**

MANAGEMENT AND BUDGET

High Level Overview: Federal Funds Implementation Office

Sam Rockwell | Federal Funds Implementation Coordinator

The Federal Funds Implementation Team

Federal Funds Coordinator

(a) This appropriation is from the general fund to the commissioner of management and budget for a coordinator and support staff to provide for maximization of federal formula and discretionary grant funds to recipients in the state, including but not limited to funds under: (1) the **Infrastructure Investment and Jobs Act** (IIJA), Public Law 117-58; (2) the **Inflation Reduction Act** of 2022, Public Law 117-169; (3) the **CHIPS and Science Act** of 2022, Public Law 117-167; and (4) subsequent federal appropriations acts associated with a spending authorization or appropriation under clauses (1) to (3).

(b) The duties of the federal coordinator include but are not limited to:

(1) serving as the **state agency lead on activities related to federal infrastructure funds**;

(2) **coordinating** on federal grants with the governor, legislature, state agencies, federally recognized Tribal governments, political subdivisions, and private entities; and

(3) developing methods to **maximize the amount and effectiveness** of federal grants provided to recipients in the state.

Climate Action Framework

Summary

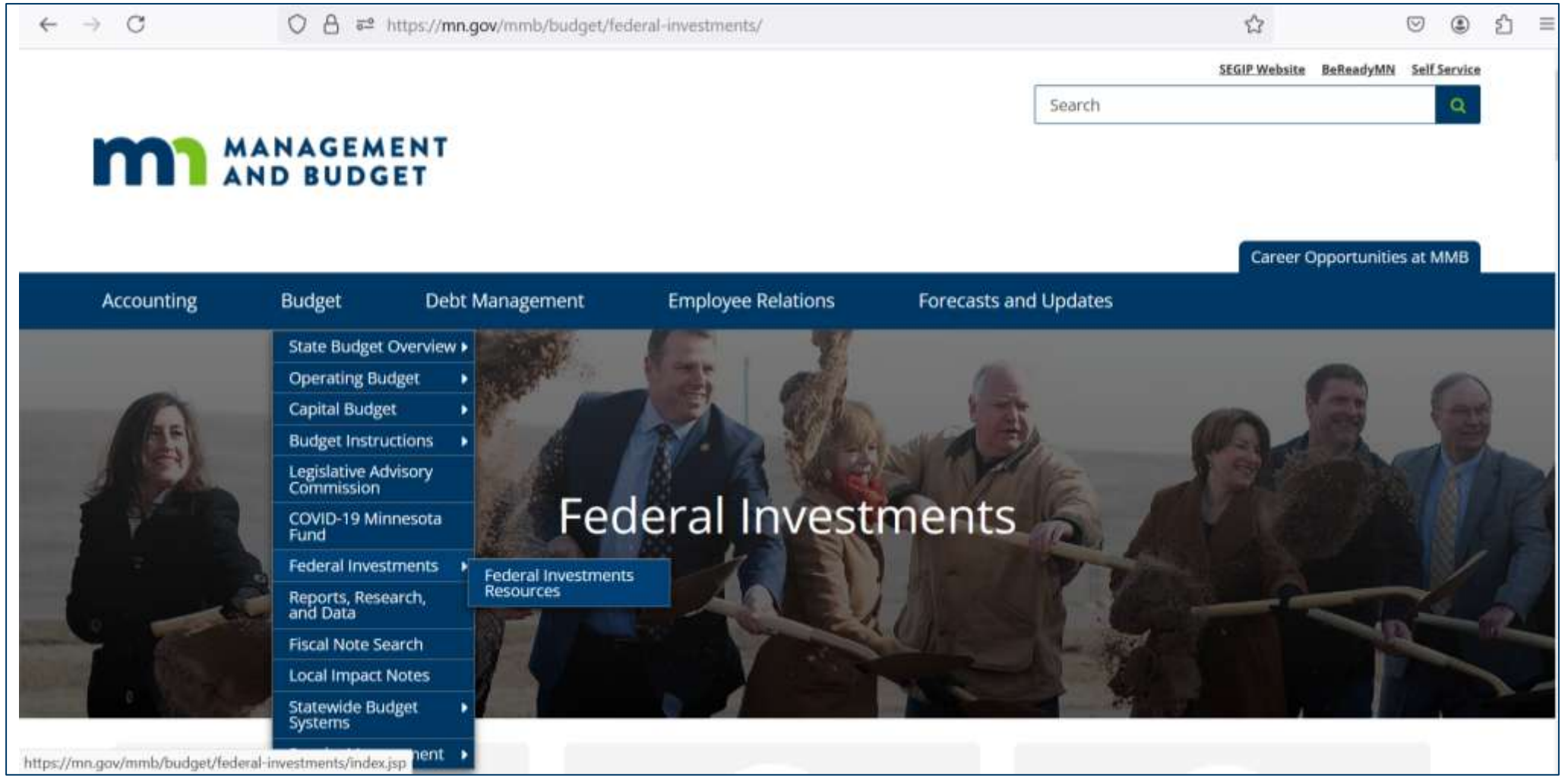
Goals and their related initiatives

Clean transportation	**Connected communities:** Maintain and improve multimodal transportation connections to reduce emissions and congestion.
	Clean and efficient vehicles: Accelerate the transition to electric vehicles, alternative fuels, and greater fuel efficiency.
Climate-smart natural and working lands	**Carbon sequestration and storage in forested lands, grasslands, and wetlands:** Manage forests, grasslands and wetlands for increased carbon sequestration and storage.
	Resilient landscapes and ecosystems: Enhance the ability of plants and animals, including crops, to adapt to the effects of climate change.
	Healthy farmland: Accelerate soil health and nitrogen and manure management practices that reduce emissions and enhance carbon storage, water quality, and habitat.
	Sustainable landscapes and water management: Reduce GHGs and improve landscape resiliency through multipurpose water storage and management practices that protect farmland, water supplies, and infrastructure.
	Investments in emerging crops, products, and local economies: Support emerging agricultural and forest technologies and products that reduce waste, create jobs, and expand economic opportunities.
Resilient communities	**Climate-smart communities:** Build the capacity of Minnesota communities to protect against and withstand the effects of climate change.
	Healthy community green spaces and water resources: Expand and protect tree canopies; parks and other green spaces; and lakes, rivers, and wetlands that provide community resilience benefits.
	Resilient buildings, infrastructure, and business: Help the built environment and local economies become more resilient to climate change.
Clean energy and efficient buildings	**Clean energy:** Transition to 100% carbon-free, reliable, and affordable electrical power and heat through policies, investments, and partnerships.
	Smarter buildings and construction: Reduce GHG emissions in the building sector by promoting conservation, efficiency, and lower-carbon design, materials, and fuels.
Healthy lives and communities	**Healthy communities:** Protect communities from the direct and indirect health effects of climate change.
	Climate-smart public health and healthcare systems: Bolster public health resources and promote strategies to reduce GHGs from health care facilities.
Clean economy	**Business innovation and entrepreneurship:** Invest in research and development, innovation, and partnerships.
	Equitable access to jobs and a just transition: Support workers to adapt and evolve their skills through inclusive strategies, ensuring family-sustaining jobs.

Climate Action Framework Elective Pay Intersections

Climate Action Framework	IRA Alignment
Overarching Goals (IPCC, Minn. Stat. 216H.02, and One Minnesota Goal aligned) • Reduce GHG emissions by 50% by 2030 • Achieving net-zero emissions by 2050	
Goal #1: Clean Transportation • Reduce GHG emissions from the transportation sector by 80% by 2040 • Reach 20% EVs on Minnesota roads by 2030 • Continue exploring opportunities for a clean fuels standard	§45W, §30C §45V, §45Z, §30C
Goal #4: Clean Energy and Efficient Buildings • By 2040, all of Minnesota's electricity is carbon-free	§45Y, §48E, §45U
Goal #6: Clean Economy • Develop worker skills • Support power-plant host communities	Apprenticeship bonuses/ requirements Energy community bonuses
Integrated priority across all CAF goals: Equity	§45(e), §45E(h)

We've Put Initial Resources Together



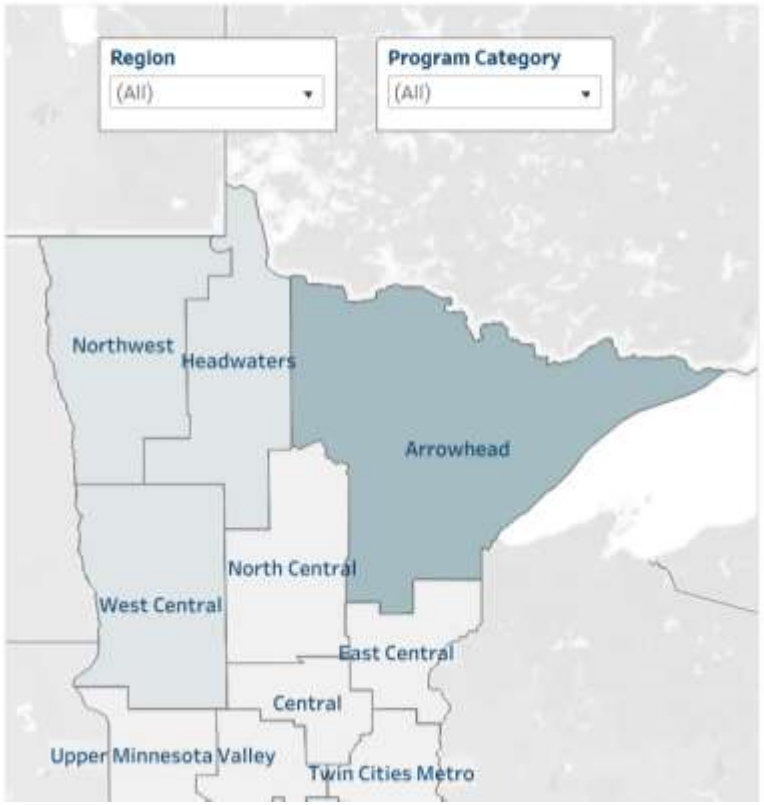
Tracking Awards Received

https://mn.gov/mmb/budget/federal-investments/

Summary | Program Tracking | Project Tracking

IIJA, IRA, or CHIPS & Science Act Committments by Region

You can filter projects by region by selecting a region on the map.



Projects Funded by the IIJA, IRA, or CHIPS & Science Act

You can filter projects by county using the dropdown menu below.

Geographic Area: ☑ Regional or Local ☑ Statewide

Program: (All)

County or Tribal Nation: (All)

County or Tribal Nation	Project	Description	IIJA/IRA/CHIPS Funds C..
Aitkin	AITKIN EAP AWARD	11 households served in 2022 and..	$27,415
	BNSF RAILWAY CO	Install gates, flashing lights and c..	$115,887
	COUNTY/MUNI:AITKIN..	Local road/bridge project	$526,408
	COUNTY/MUNI:AITKIN..	Local road/bridge project	$415,351
	COUNTY/MUNI:AITKIN..	Local road/bridge project	$2,200,000
	MN 27 FROM N. JCT M..	State Road Construction project	$119,108
	MN 47 FROM US 169 I..	State Road Construction project	$2,185,043
	MN 47, 0.64 MI. SO. 2..	State Road Construction project	$2,938,495
	MN 65 FROM N. JCT M..	State Road Construction project	$3,560,869
	MN 210, FROM AITKIN..	State Road Construction project	$37,314,586
	MN 210, FROM EAST D..	State Road Construction project	$403,646
	MN 210, REPLACE BR..	State Road Construction project	$24,583
	MN62 FROM I494 TO P..	State Road Construction project	$322,808
	US 2 FROM 0.30 MI. W..	State Road Construction project	$1,159,164
	US 14, AT EAGLE LAKE..	State Road Construction project	$310,123
Anoka	**SCOPE 18-23** BRID..	State Road Construction project	$2,431,836
	SCOPE 18-24 BRID..	State Road Construction project	$40,702,625

Tracking Open Funding

This data is sourced from Federal Funds Information for States (FFIS) and reporting by Minnesota government agencies. The dashboard is intended as a tool to provide insight based on currently available information for consideration and should not be used as a comprehensive data source.

Updated monthly. Last updated on 09/17/24.

Competitive Federal Investment Opportunities for Minnesota

Under the IIJA, IRA and CHIPS & Science Act (FY 2024 - 2026)

Please email Federal.Investments.MMB@state.mn.us to request an accessible format of this data.

Competitive Funding Opportunities for FY 2024 - 2026

Please use the filters below to refine results.

Fiscal Year
- ☑ 2024
- ☑ 2025
- ☑ 2026

Application Status
- ☑ Live Application
- ☐ Pending

Application Deadline
10/1/2024 — 1/1/2027

Funding Source
- ☑ CHIPS
- ☑ IIJA
- ☑ IIJA, IRA
- ☑ IRA

Recipient Type
(All)

Category
(All)

Opportunity Title	Funding Source	Category	Fiscal Year	Application Deadline	Funding Amount (000s)
Entrepreneurial Fellowship Pilot Program	CHIPS	Other	2025	10/23/2024	$500
Water Power Innovation Network	IRA	Clean Energy and Power	2025	10/23/2024	$4,800

Resources Beyond Elective Pay

- **DEED (State of Minnesota) Energy Transition Office**: A variety of grants sorted by source, and with a particular focus on funding to support communities impacted by fossil-fuel plant closures.
- **Minnesota Dept. of Commerce New Energy Programs**: Grants and rebates sorted by target audience (consumers, schools, utilities).
- **Minnesota Pollution Control Agency Grants, Loans, and Contracts**: Grants and loans sorted by source and target.
- **MnCIFA**: Primarily working to finance projects, or bundles of projects, in excess of $100M with federal Loan Program Office financing.
- **DSIRE**: A comprehensive list of financial incentives and policies that support renewables and energy efficiency. It includes up-to-date information on state and federal grant and loan programs; federal tax credits; and a variety of state, utility, and property tax incentives.
- **CEE Loan Programs**: A variety of statewide home improvement, home energy, and solar energy loans; metro-area city-specific loans; and Minneapolis neighborhood-specific loans.
- **Xcel IRA Resource Guide**: Stackable financing and other informational resources sorted by relevance to local governments, residents, businesses, and multifamily properties.
- **CDFIs**: Community-based financial institutions with focus on traditionally underserved people and communities.
- **Other private lenders**
- **Bonding**: FYI, up to a 15% reduction in the eligible credit amount.

Available Technical Assistance

- Lawyers for Good Government
  - FAQ page about elective pay in the IRA. If your question is not answered there, you can ask questions via a form
- Clean Energy Tax Navigator
  - Lawyers for Good Government portal that provides tailored guidance based on project details
- The State Support Center
  - Available for technical assistance
- Congressional Progressive Caucus Center
  - Portals through which you can request assistance with filings, etc.
- Community Infrastructure Center (Milken Institute initiative)
  - Assign case managers to match you with grants, tools, and technical assistance providers with specialized expertise; connect you to a community
- Alliance for Tribal Clean Energy
  - Technical assistance (finance and tax), education and workforce development, etc.

We’re a New Office…

- How can various agencies, utilities, levels of government, philanthropic entities, and financiers work together to effectively stack funding and financing for climate-positive projects?
- How can we best make people/entities aware of funding and financing opportunities? How do we spark interest and inspiration?
- Where is support most needed? Awareness and program overviews? Specific funding opportunity awareness? Planning projects? Designing projects to maximize funding potential? Federal fund applications? Spending the money when it comes in?

Thank you!

Sam Rockwell

samuel.rockwell@state.mn.us

917-453-6807

Climate-smart food systems initiative

EPA Climate Pollution Reduction Implementation Grant

MINNESOTA

CPRG Implementation Grants Program Objectives

CLIMATE POLLUTION REDUCTION GRANTS
U.S. Environmental Protection Agency

- Implement ambitious measures that will achieve significant cumulative greenhouse gas (GHG) reductions by 2030 and beyond
- Achieve substantial community benefits (such as reduction of criteria and hazardous air pollutants), particularly in low-income and disadvantaged communities
- Complement other funding sources to maximize these GHG reductions and community benefits
- Pursue innovative policies and programs that are replicable and can be “scaled up” across multiple jurisdictions

Minnesota Climate-Smart Food Systems grant award

Nearly $200 million

- Catalyze a transition toward a sustainable, equitable, resilient, and decarbonized food system
- Advance economic opportunity
- Fight hunger
- Reduce air and water pollution
- Support the health and wellbeing of all Minnesotans and future generations

About the grant

Competitively awarded by EPA with Inflation Reduction Act funding

Led by MPCA, with subawards to:

- Four state agencies (Agriculture, Health, Natural Resources, Board of Water and Soil Resources)
- Tribal governments
- Ramsey/Washington Recycling and Energy

Informed by engagement in 2023 and 2024

Work areas

Funds will be distributed via new and existing programs in seven work areas across the food system:

Lands and production

- Peatland restoration
- Climate-smart agricultural practices

Processing, transportation, and storage

- Industrial innovation
- Refrigerant replacement
- Vehicle and equipment replacement

Vibrant food economies

- Food scraps management and prevention of wasted food
- Tribal food sovereignty and local food systems decarbonization

Peatland restoration

$20 million

Restore over 10,000 acres of peatlands originally drained for agriculture

Expands restoration programs at the Minnesota Department of Natural Resources ($12M)

- Of the DNR subaward, $4M is reserved for restoration on Tribal lands

Expands restoration and easement programs at the Board of Water and Soil Resources ($8M)

Climate-smart agricultural practices

$20 million

Support farmers adopting practices such as use of controlled-release fertilizers, transition from row crops to perennials, and no-till farming

Scales up existing programs at the Minnesota Department of Agriculture:

- Minnesota Agricultural Water Quality Certification Program ($9.9M)
- Soil Health Financial Assistance program ($8.8M)
- Continuous Living Cover Market Development Grants program ($0.5M)

Industrial innovation

$60 million

Cut climate pollution, improve efficiency, and reduce waste at food and organic waste processing sites

Establishes a new industrial grant program at the Minnesota Pollution Control Agency ($50M)

- Grant program funds planning and implementation of various technologies toward zero waste and zero emissions

Subaward to Ramsey and Washington Counties for organics recycling ($10M)

Refrigerant replacement

$10 million

Replace coolers in supermarkets, schools, small businesses, and other locations with more climate-friendly refrigeration

Scales up the existing refrigerant replacement grant program at the Minnesota Pollution Control Agency

Vehicle and equipment replacement

$20 million

Replace vehicles and equipment we use to grow and transport food with those with cleaner fuels

Scales up the existing vehicle replacement grant program at Minnesota Pollution Control Agency ($12.5M)

Establishes a new equipment replacement grant program at the Minnesota Department of Agriculture ($7.5M)

Food scraps management and prevention of wasted food

$33.4 million

Keep valuable nutrients in circulation to feed people, livestock, and soil and prevent significant methane emissions

Scales up existing programs at the Minnesota Pollution Control Agency:

- Prevention of wasted food and food rescue grants ($12.5M)
- Organics management grants ($16M)
- Revolving loan fund for organics management projects ($2M)
- Food-to-livestock grants ($0.4M)

Tribal food sovereignty and local food system decarbonization, part 1

$34.6 million

Improve food security, expand Tribal and local food economies, strengthen food sovereignty, and reduce climate pollution in Tribal and local food systems

Administered through a partnership between the Minnesota Department of Health and Minnesota Pollution Control Agency

Tribal food sovereignty and food system decarbonization

Distributes funds to Tribes for food system projects that reduce greenhouse gas emissions ($15M)

Tribal food sovereignty and local food system decarbonization, part 2

Local food system decarbonization grants

Establishes a new grant program for local food system projects statewide ($15M)

Assesses opportunities and identifies community-driven, equitable solutions through the creation of Regional Food Networks

Timeline

- ☐ Agreements to transfer funds from MPCA to partner agencies (expected fall/winter)
- ☐ Hiring, engagement, program development (timeline varies)
- ☐ **Early- to mid-2025: first grant opportunities expected**

Grant period runs from Oct 1, 2024, through September 30, 2029

Sign up to receive email updates:

www.pca.state.mn.us/air-water-land-climate/minnesota-climate-smart-food-systems

Minnesota Community Financing Roadmap

October 2024

Community Financing Roadmap
Project Overview & Goals

WHY
To maximize local GGRF benefits

Accelerate bankability of clean energy projects

Attract private capital to previously overlooked markets

Build wealth through new approaches to clean energy financing

Foster green jobs to capture green development benefit

WHO
Economic and community development stakeholders

Community lenders

Industry

Business associations

Economic development organizations

Community-based organizations

State and local government

Workforce training organizations

WHAT

- Place-based investment strategy to help maximize GGRF potential
- Highlight areas of competitiveness, constraints, and coordination
- Facilitate community ownership and collaboration among local stakeholders

Project Key Findings

Competitiveness

Minnesota is well positioned to attract **wind and solar generation investments**, crucial for meeting its 100% clean energy law

The state's workforce has the **skills** to support the energy transition, including **manufacturing** key materials and components

Constraints

Minnesota lacks a coherent cleantech economic development **strategy** and supporting **policies and incentives**

Red tape, siloing, and local opposition slow clean energy and cleantech deployment

Workforce development efforts are not fully aligned with cleantech opportunities

CDFIs are **new to green finance**, while GGRF awardees are looking for experience

Coordination

Minnesota has a strong stakeholder ecosystem without major gaps

Coordination will be essential to **securing investment** to scale cleantech and clean energy deployment

- Workforce development
- Utility-scale renewables
- Green industry
- Green finance

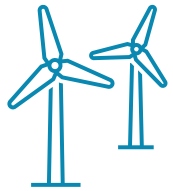
Existing **connectors and coalitions** could **overcome silos**

Minnesota Clean Manufacturing and Clean Energy Context

RMI – Energy. Transformed.

Minnesota Context Key Messages

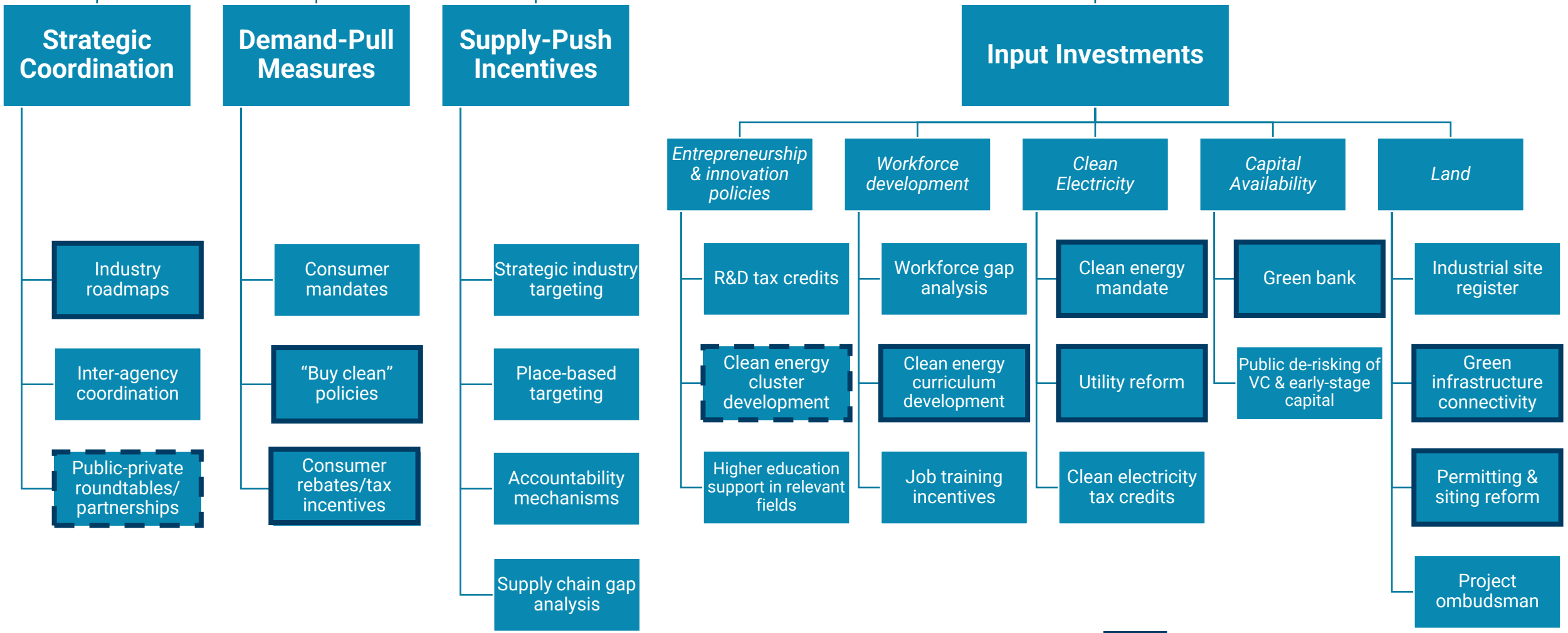
Minnesota has passed nation-leading climate legislation, but other policy gaps have slowed clean energy deployment and cleantech investment



The state possesses substantial wind generation potential, which will be essential for a renewables-based grid

The state's strong community lender landscape can be an asset for the shift to green finance

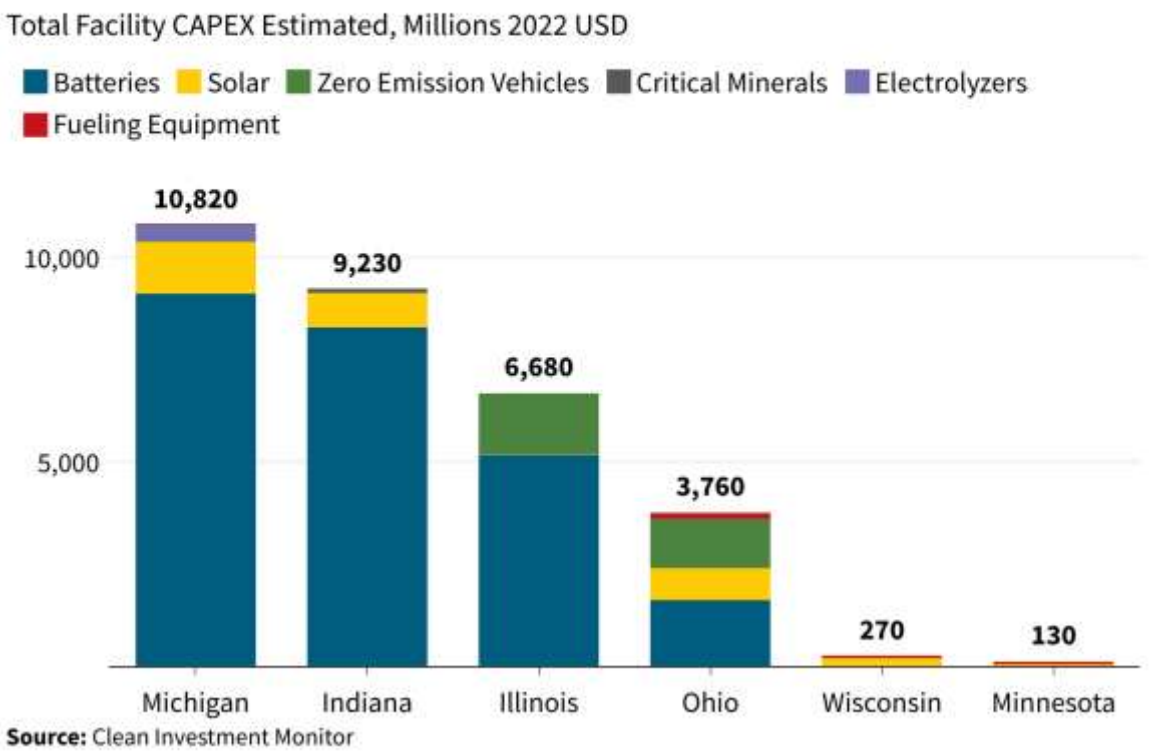
Minnesota has taken limited action to support cleantech-led economic development



Existing Minnesota action

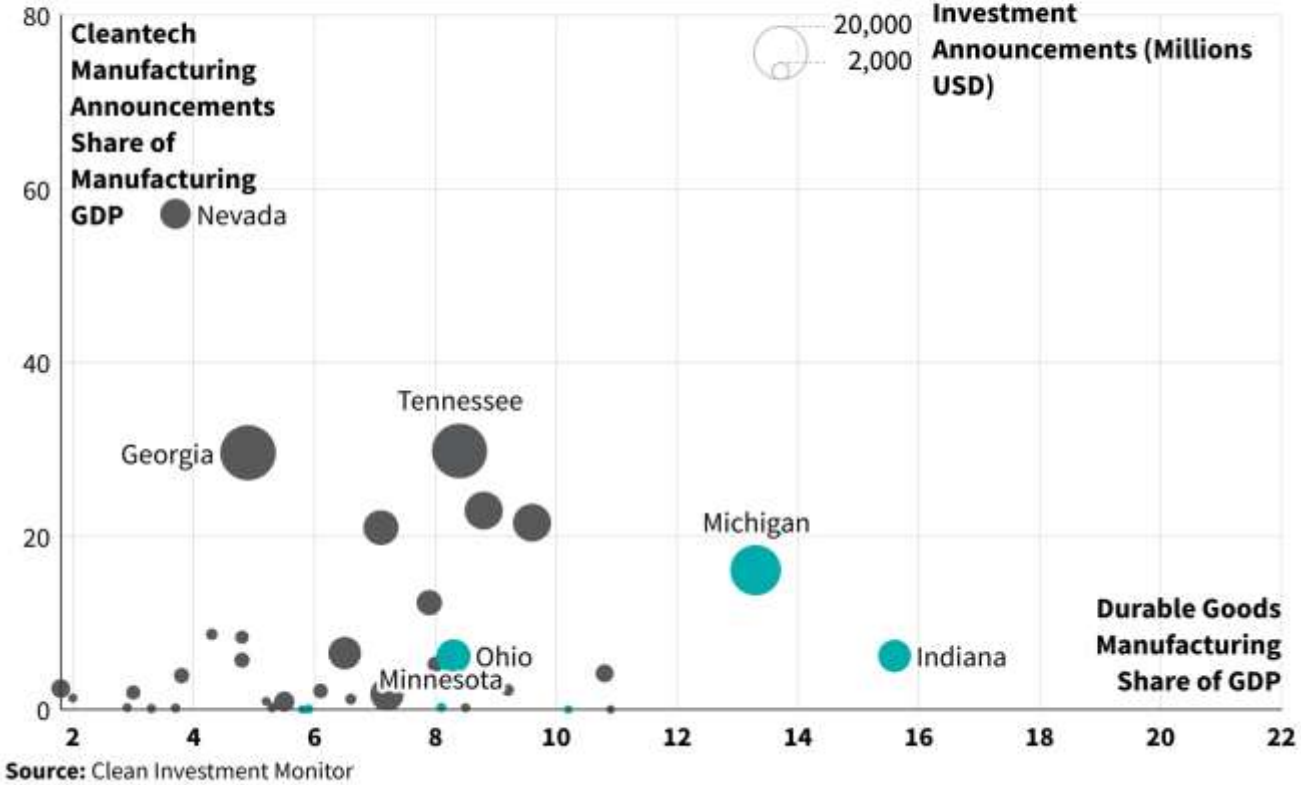
The state lags in securing cleantech investments

Minnesota has seen the lowest investment in clean energy manufacturing in the Great Lakes region since IRA Passage



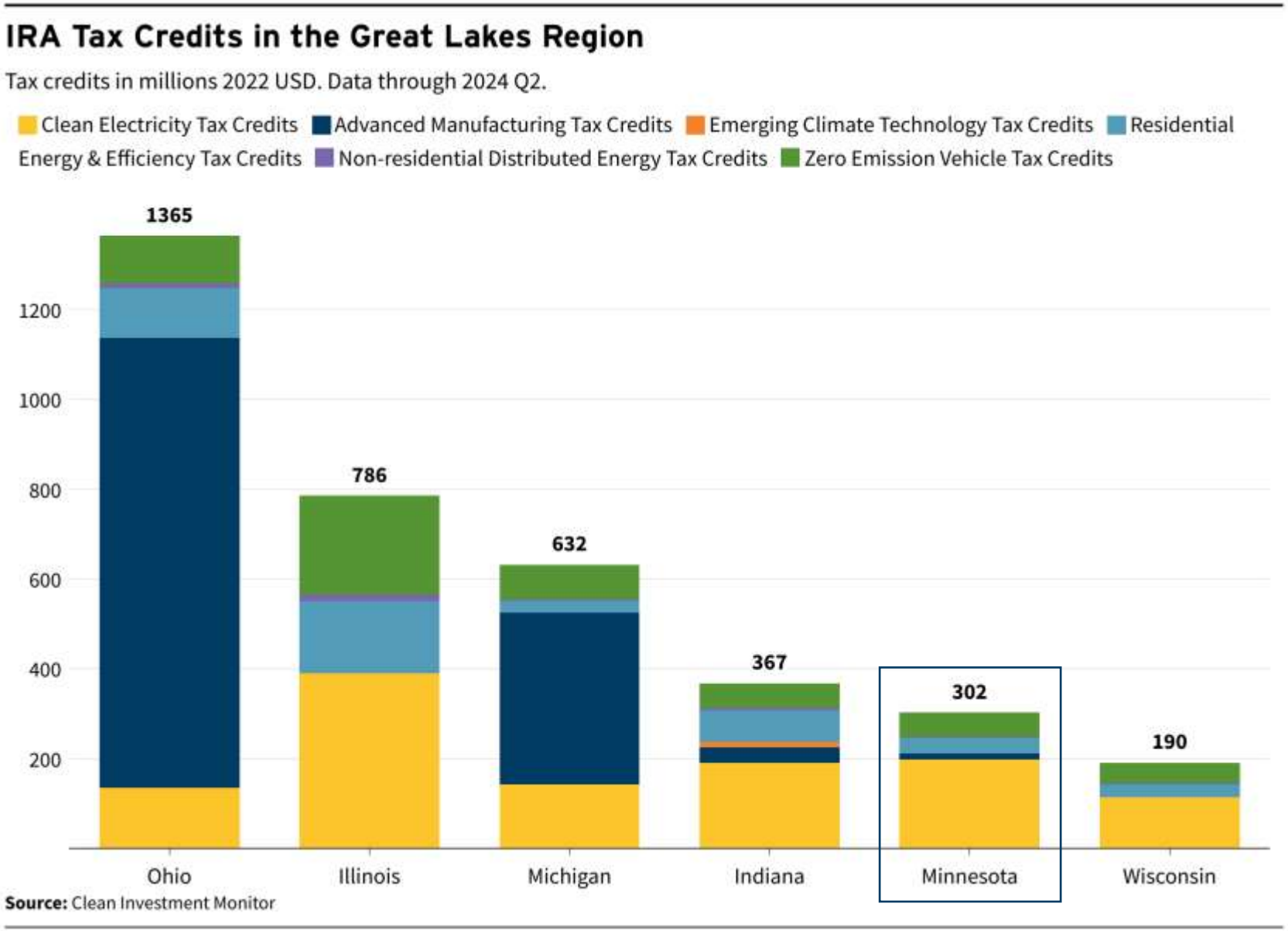
Source: Clean Investment Monitor

Minnesota is underperforming in clean technology manufacturing relative to the size of its broader manufacturing industry



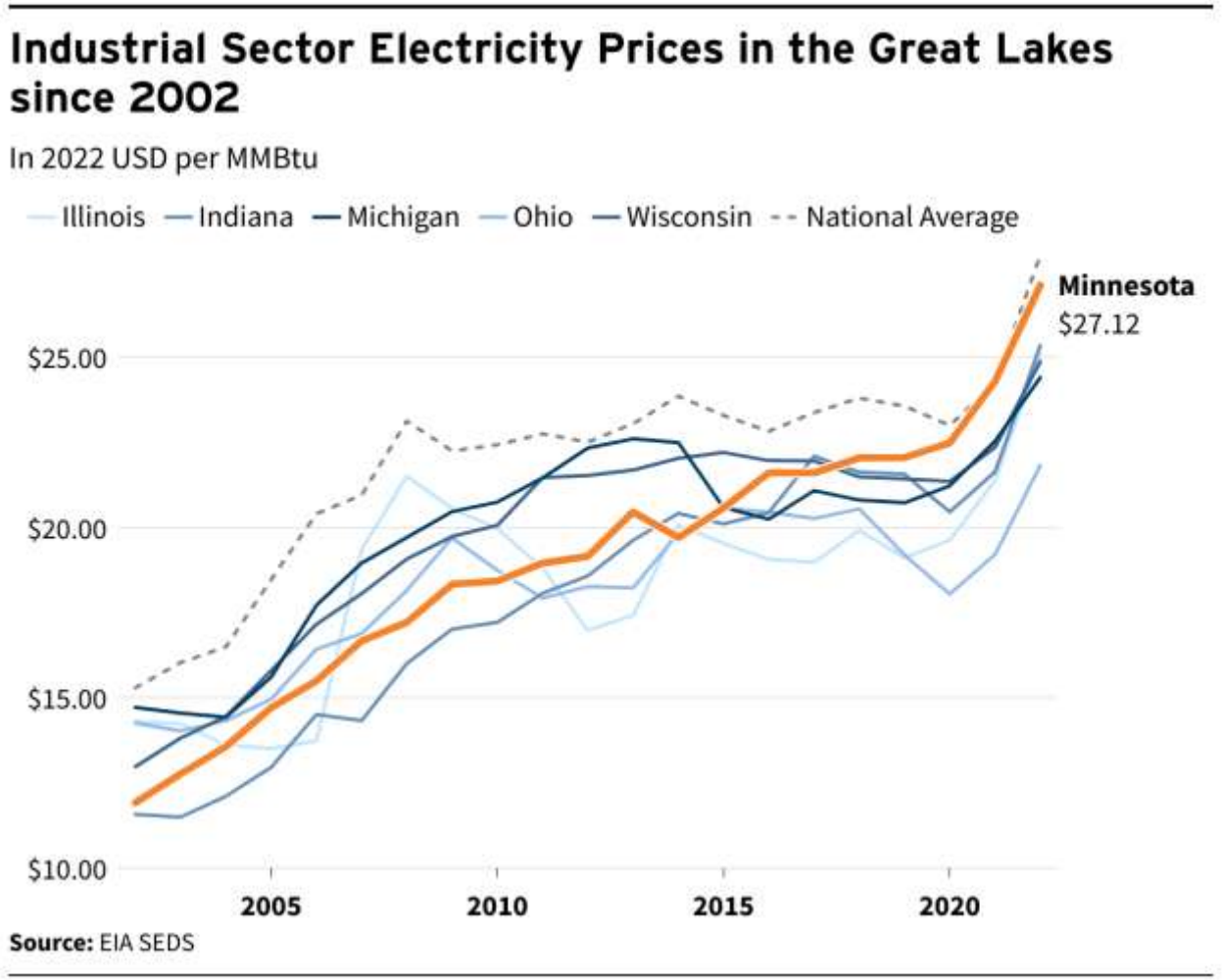
Source: Clean Investment Monitor

Minnesota also lags behind its neighbors in securing IRA tax credits



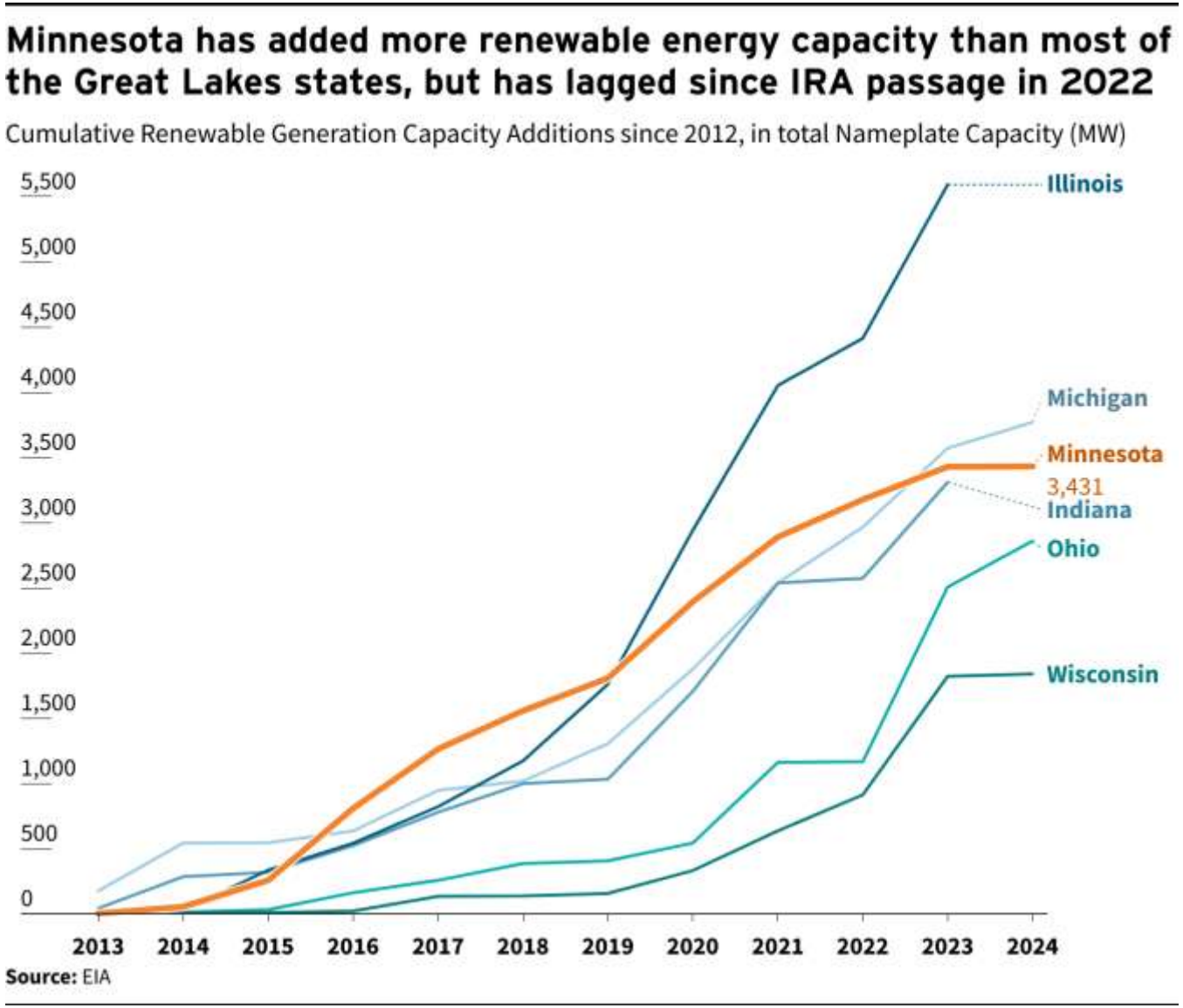
Minnesota's high industrial electricity prices hinder the state's competitiveness in attracting major investments

- **Prices in MN are 22% higher than the average of other Great Lakes states**
- **Cleantech industries increasingly require access to clean electricity**
- **Energy intensive industries including manufacturing across the Iron Range are particularly vulnerable to rising electricity rates**
  - Hibbing Northern Foundry cited high energy costs in its decision to close its plant in 2024

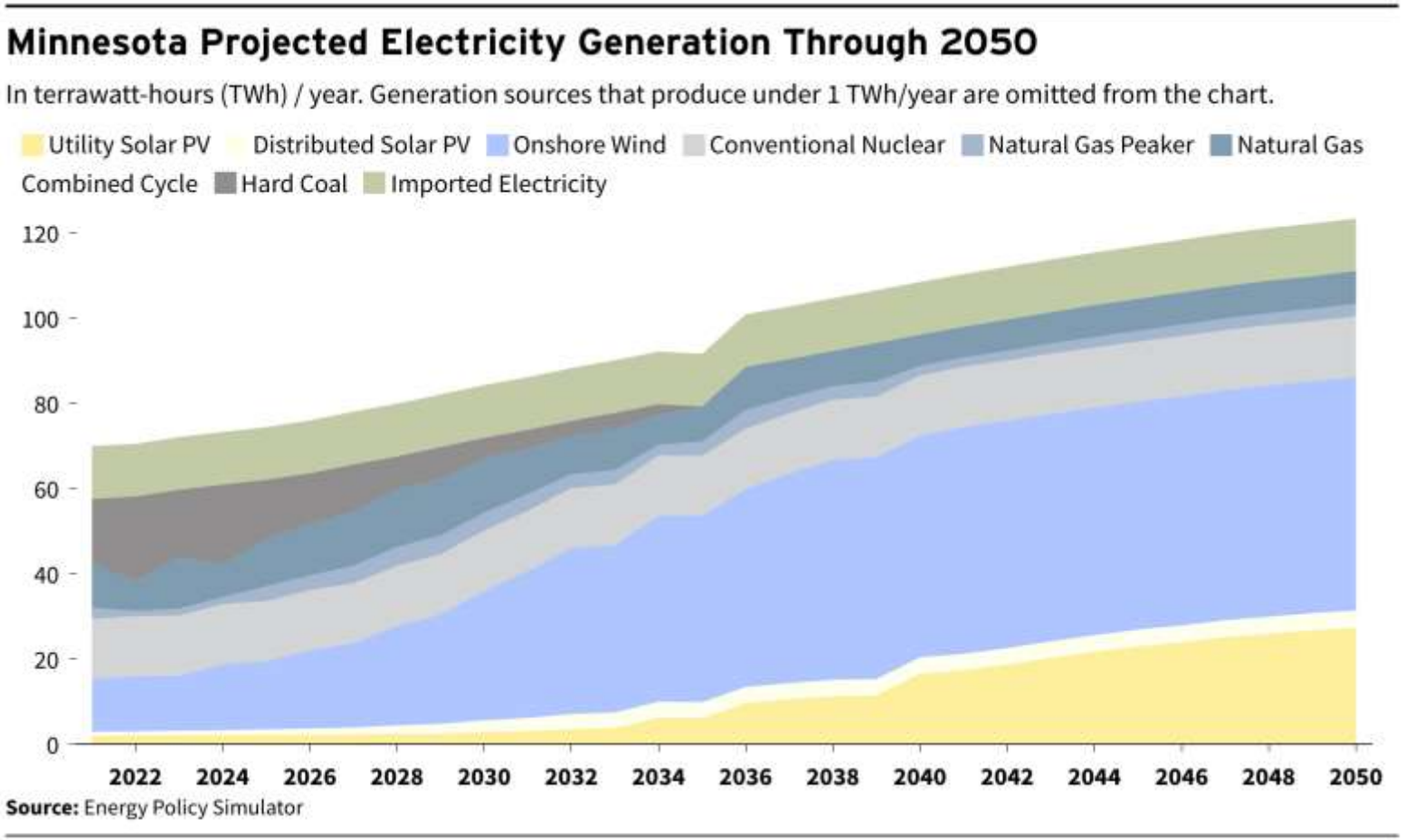


Minnesota has barely increased its renewable energy generation capacity since IRA passage

- MN's renewables capacity has grown only 8% since 2022
- WI's renewables capacity has increased by 25% since 2022, and OH's has more than doubled
- Renewables support both decarbonization and lower industrial electricity prices



To meet the requirements of Minnesota's 100% clean energy law, projections show significant growth in wind generation to power the state's grid

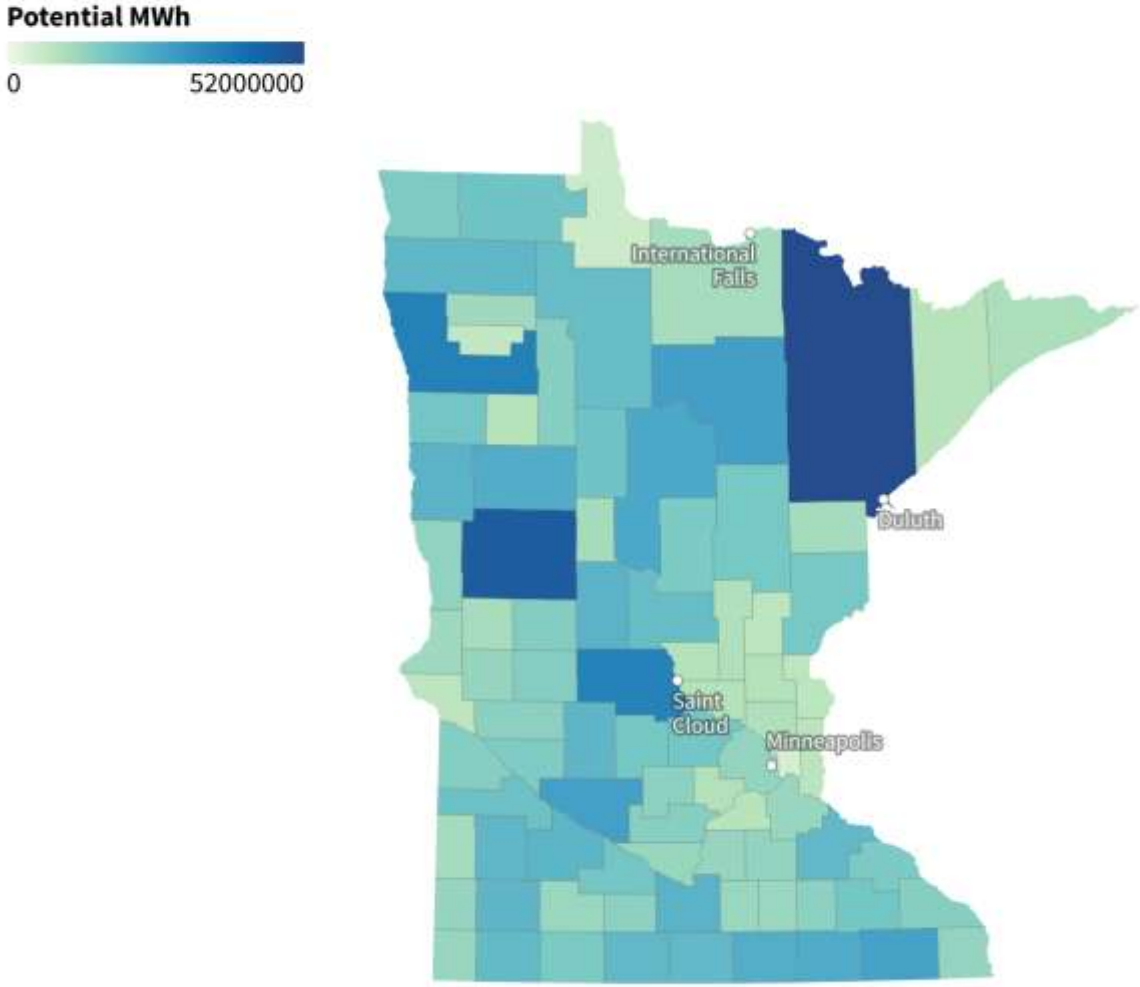


Minnesota has substantial wind generation potential

- In 2023, wind accounted for 25% of Minnesota's total net generation
- Improved transmission infrastructure and faster interconnection would help the state maximize its wind potential

Minnesota Technical Wind Generation Potential

Cumulative estimated potential for land-based and distributed wind.



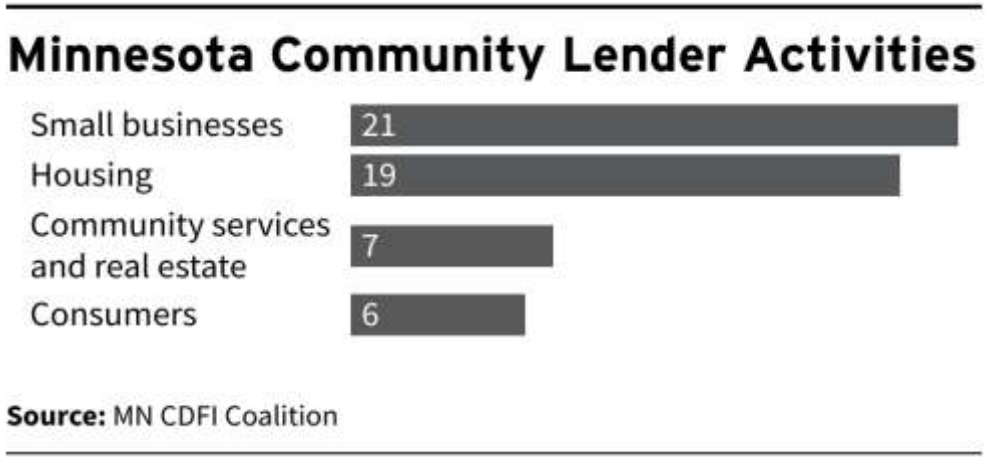
Source: NREL SLOPE

Siting and permitting affect the speed of bringing new clean energy online

- **MN's 100% clean electricity law simplified the process for siting and building clean energy projects**
- **MN passed additional legislation that could halve permitting time**
  - Some large-scale wind projects will no longer require PUC approval
  - Developers no longer are required to show a clean energy project is a needed part of the energy system nor to study alternative sites and routes
- **Nationally, inadequate interconnection points and regulatory red tape continue to hamper project development**
  - The timeline for project development in MN is in line with states with similar regulations. It is typically quicker than NY and CA and slower than TX.

Minnesota has a strong foundational finance landscape

- CDFIs: 33 based in the state
  - 27 loan funds, 4 credit unions, 1 bank, 1 bank holding company
  - + national CDFIs
  - + additional community lenders
- Green bank: MN Climate Innovation Finance Authority (MnCIFA)
  - Large projects
  - State energy financing institution
- Coordination: Minnesota CDFI Coalition, Catalyst Coalition, Initiative Foundations, Minnesota Credit Union Network



Minnesota's clean energy workforce lags in a challenging labor market

Strengths

- **Key ingredients**
  - State clean energy workforce grant programs
  - Clean energy workforce training programs
  - Cleantech startup accelerator
- **Clean energy jobs grew 4% in 2023 – 5x faster than overall**
- **Job seekers are interested in well-paying clean energy jobs**

Challenges

- **Uneven coordination on workforce training and alignment with clean energy opportunities**
- **Clean energy job growth is slower than national average**
- **Challenging overall labor market**
- **Less interest among young people in some jobs**

Regional Economic Competitiveness Opportunities

RMI – Energy. Transformed.

Competitiveness Key Messages

Minnesota's workforce has the skills needed across the power sector, buildings, and manufacturing to support the energy transition nationally and statewide

Minnesota has a comparative advantage in manufacturing products like low-carbon metals, heat exchangers, and solar components and in generating solar power

IRA tax credits are one driver of recent solar manufacturing investments in the state

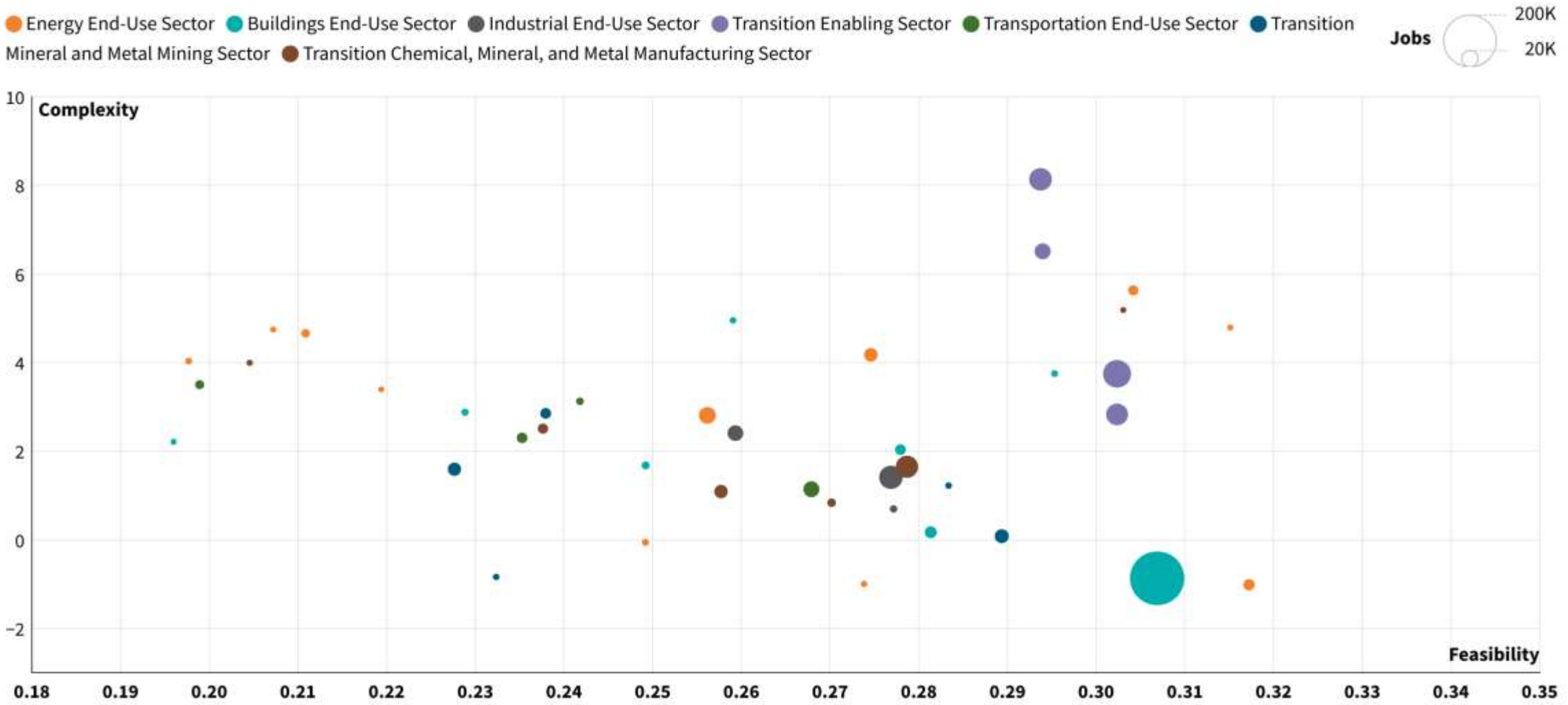
Understanding economic competitiveness: High feasibility, high complexity industries are more likely to attract investment and create good jobs

Definitions of terms used:

- Feasibility is a measure of how related an industry is to all the high-concentration industries in a region, in terms of those industries' shared productive capabilities. Feasibility can be used to predict which industries are more likely to appear in a region—or grow faster than the average—in terms of employment or output.
- Complexity is a metric that describes industries' capability requirements, based on the industry's ubiquity and whether it is present in cities with a diverse composition of other industries. As higher complexity industries start to succeed in a city, the city's overall economic complexity increases, which leads to more innovation and economic growth.
- Good jobs are those paying at least the local median annual earnings for full-time workers while providing employer-sponsored health insurance (a proxy for other types of employment benefits).

Learn more and find data: https://cleangrowthtool.rmi.org/

Minnesota Transition Technology Feasibility and Complexity

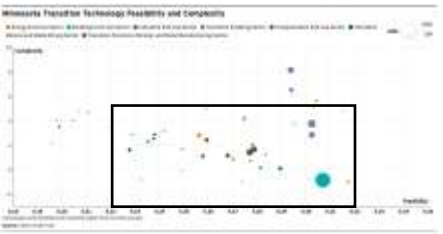


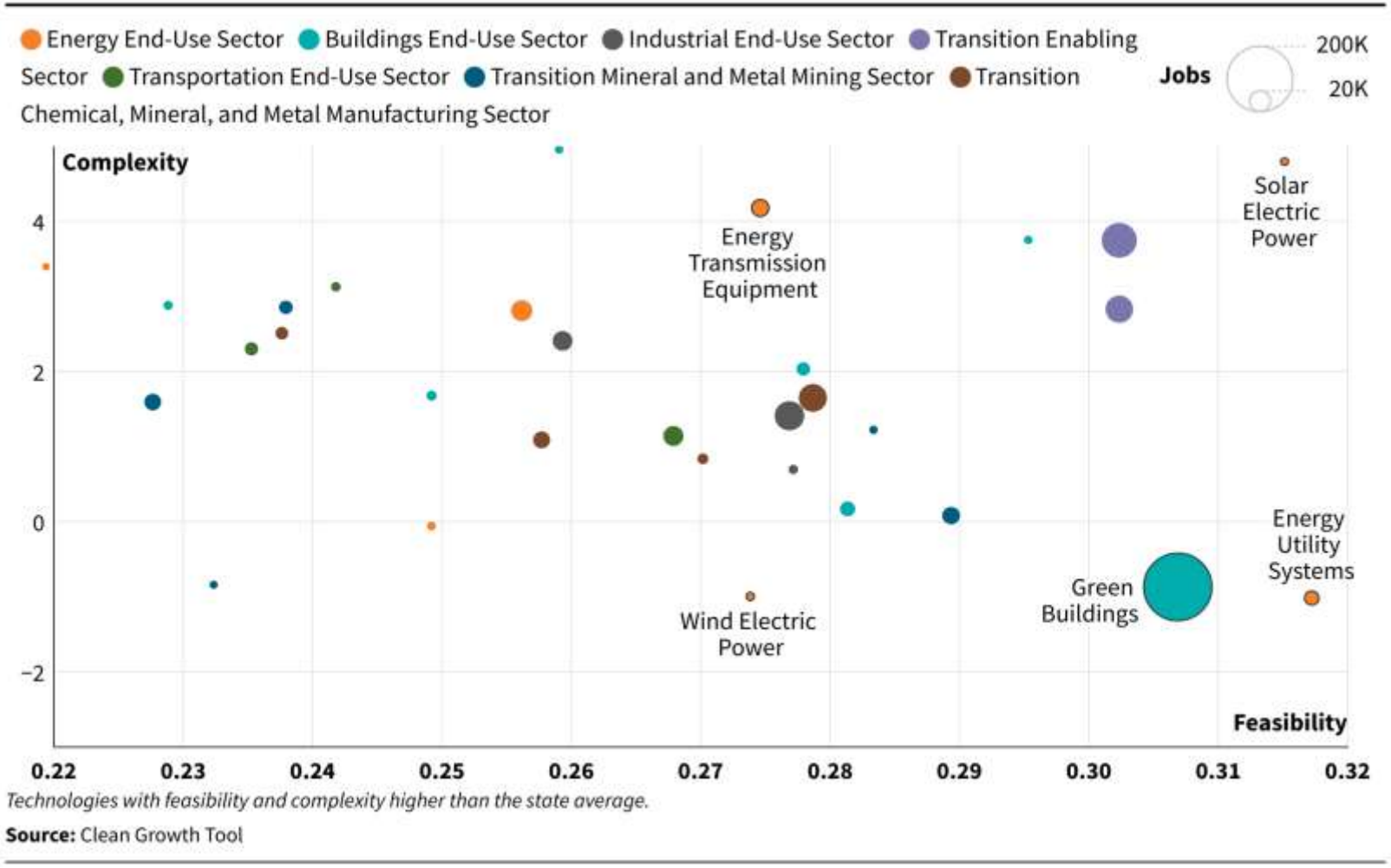
Technologies with feasibility and complexity higher than the state average.

Source: Clean Growth Tool

Minnesota has workforce skills needed to support the energy transition nationally and statewide

Buildings and energy sector skills drive job growth and help the state meet its clean energy goals



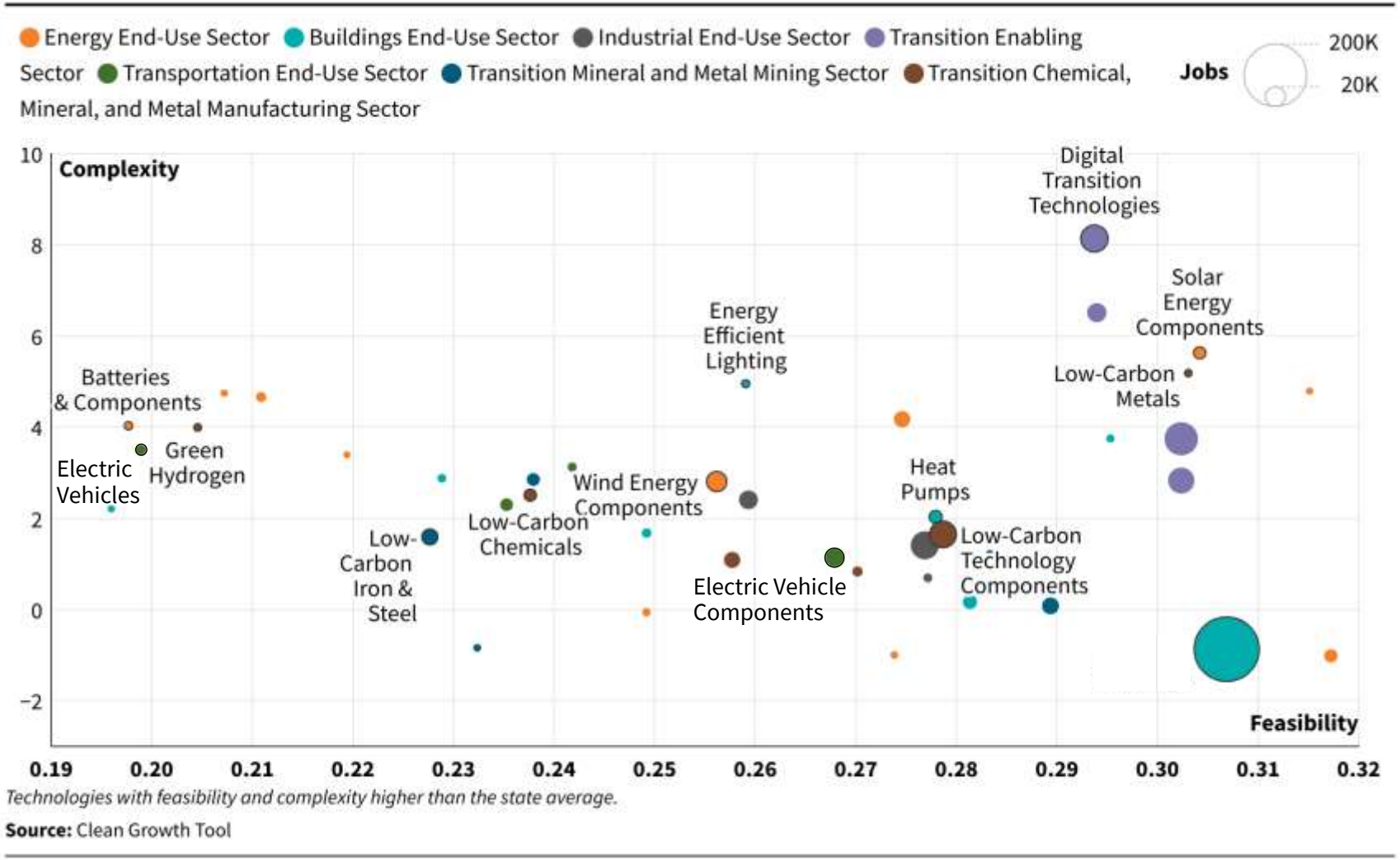


Technologies with feasibility and complexity higher than the state average.

Source: Clean Growth Tool

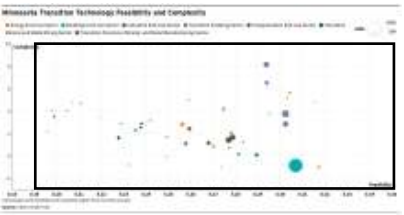
Minnesota has workforce skills needed to support the energy transition nationally and statewide

Existing manufacturing skills support local development and meet nationwide demand



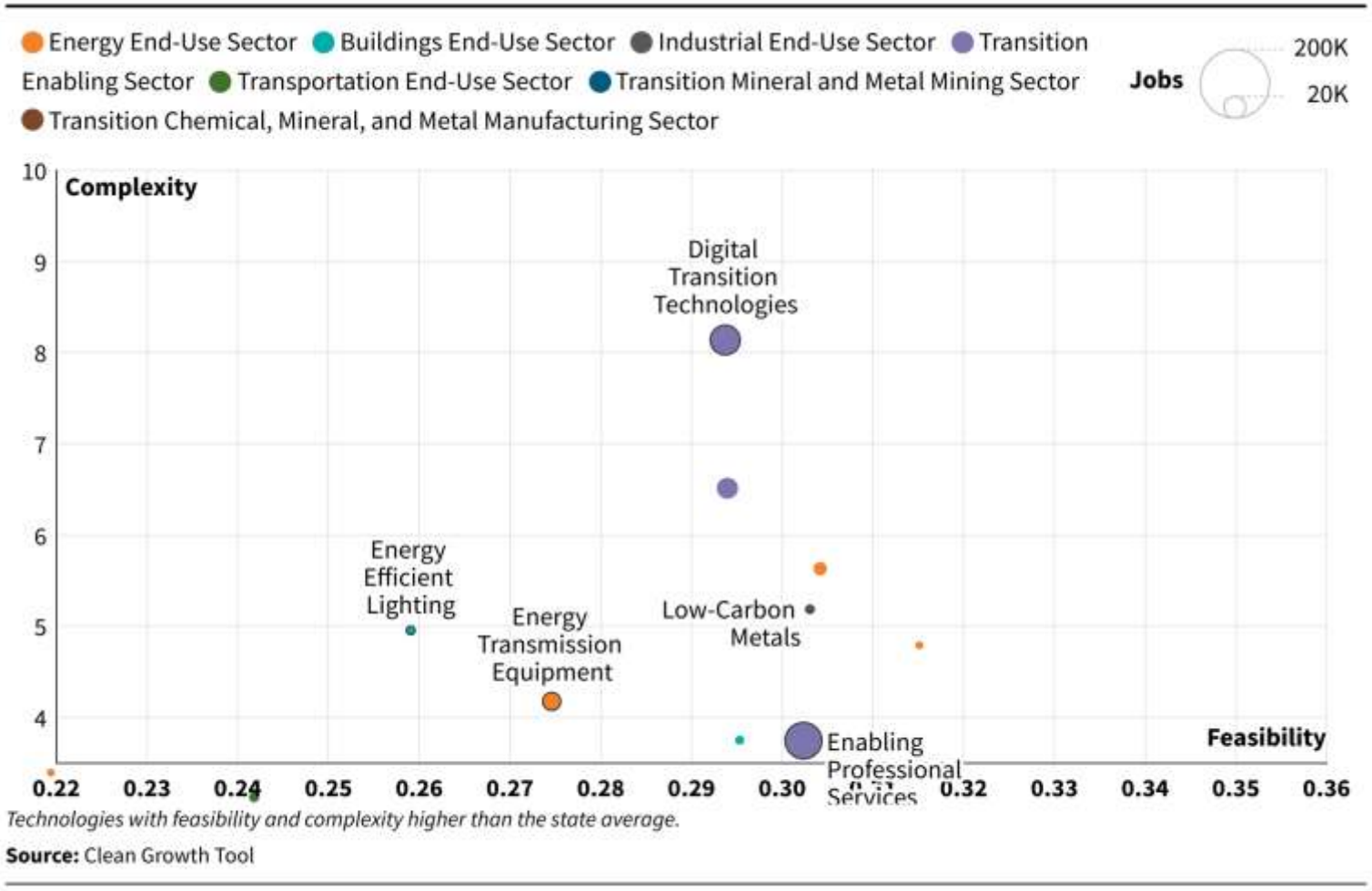
Technologies with feasibility and complexity higher than the state average.

Source: Clean Growth Tool



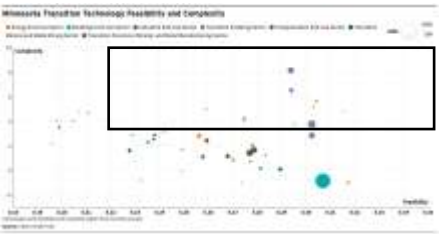
Minnesota has workforce skills needed to support the energy transition nationally and statewide

The existing science and technology workforce and opportunities in low-carbon metals can help attract high-complexity industries that drive innovation and economic growth



Technologies with feasibility and complexity higher than the state average.

Source: Clean Growth Tool



Minnesota is better positioned than many states to attract investments in key technologies

Transition Technologies by Minnesota Feasibility Percentile

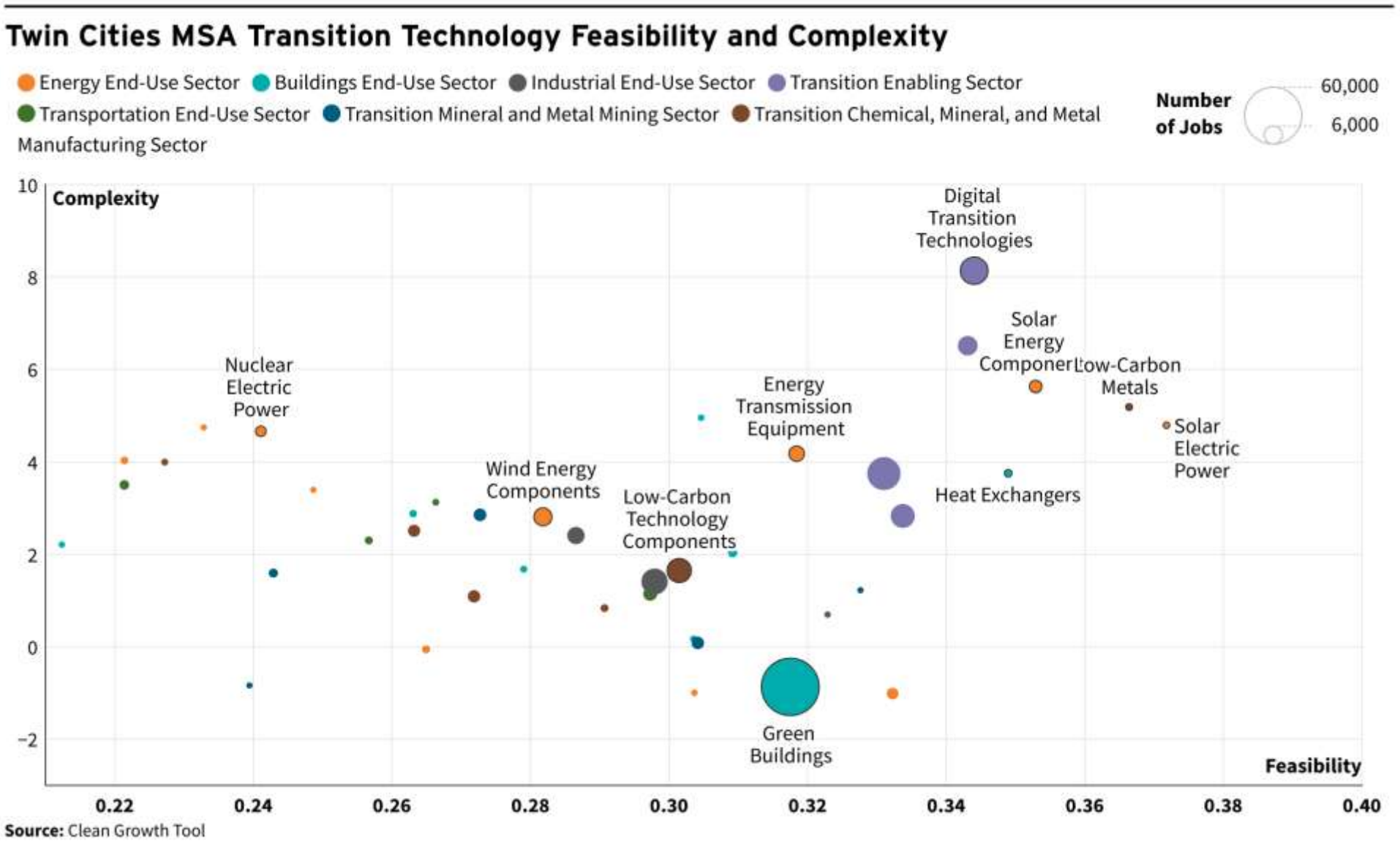
Numbers are feasibility percentile for Minnesota compared to other states.

Very High High
Medium Low
Very Low

Energy Transition Technology	Feasibility Percentile
Low-Carbon Metal Manufacturing	94
Heat Exchanger Manufacturing	92
Solar Electric Power Generation	90
Solar Energy Component Manufacturing	86
Low-Carbon Mining Equipment Manufacturing	86
Electric Industrial Vehicle Manufacturing	73
Digital Transition Technologies Manufacturing	71
Energy Transmission Equipment Manufacturing	69
Digital Transition Services	69
Research & Development Services	69

Source: Clean Growth Tool, Brookings Institute

Shared strengths between Greater Minnesota and the Twin Cities present coordination opportunities to attract investment and support transition sectors, especially for energy end-use sectors



Comparative advantage in solar and wind + IRA tax credits = new investments

Heliene, Premier Energies to build joint Minnesota solar plant

The upcoming facility aims to meet growing demand for solar modules and projects due to Inflation Reduction Act tax credits.

Published Aug. 19, 2024

→ **200 jobs**

1 GW silicon cells/year

Minnesota's biggest solar project will help replace a huge coal plant

Xcel Energy's 710-megawatt Sherco solar facility will create union jobs in a coal community, pilot long-duration storage tech, and advance the state's climate goals.

1 May 2024

→ **5th largest solar project in the nation**

Regional Constraints

Constraints Key Messages

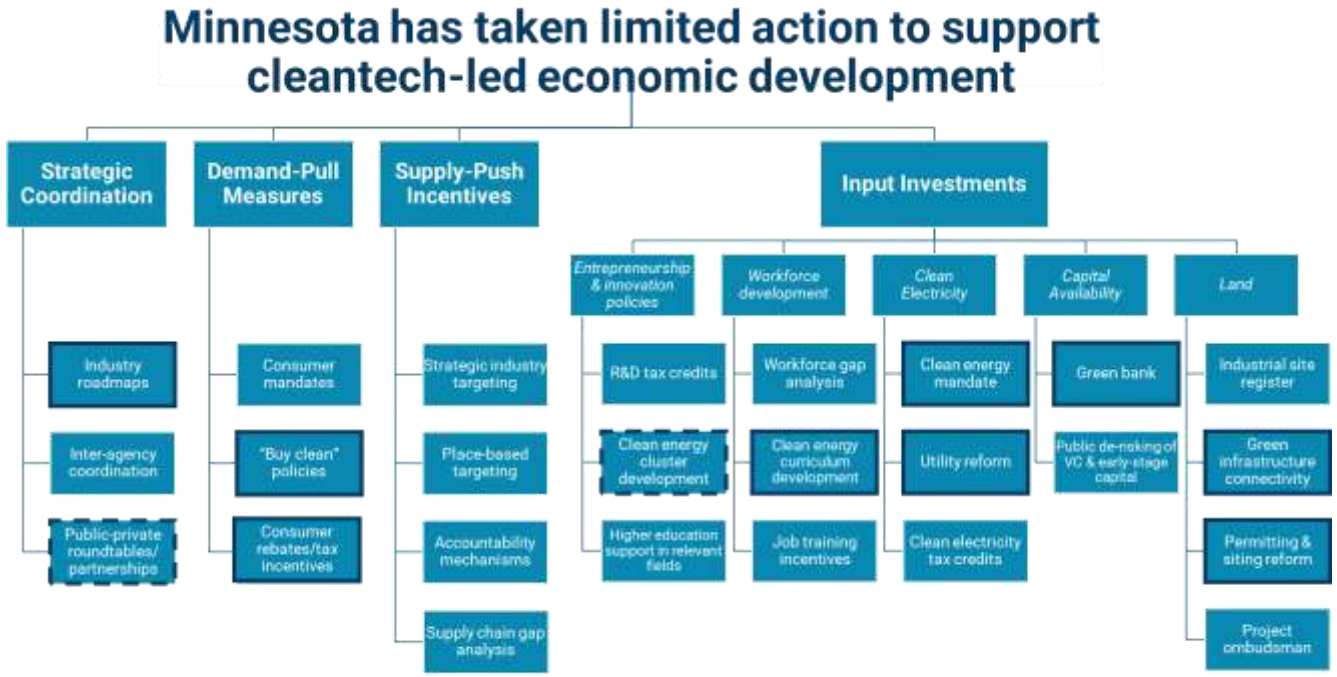
Minnesota lacks a coherent clean energy economic development strategy and the full suite of targeted industry policies and incentives to encourage economic development and manufacturing

Individual workforce development efforts are successful but not aligned with clean energy and cleantech opportunities

CDFIs are new to green finance and have limited capital and capacity; GGRF awardees are looking for experience

Red tape, siloing, and local opposition slow clean energy and cleantech deployment

Climate-aligned goals lack the sectoral policies for effective implementation



Minnesota

Renewables Ready Communities Program

Renewables Ready Communities Strategic Plan

Brownfield Renewable Energy Pilot

Siting and permitting TA

Workforce development

Clean energy laws

Michigan

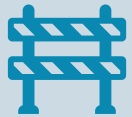
Discrete workforce development efforts miss opportunities

- **Individual clean energy and manufacturing workforce efforts aren't oriented to competitiveness opportunities.**
- **Workforce development efforts need to connect actors across education, training, and job placement.**
- **Limited supportive services (e.g., housing, childcare, transportation) constrain enrollment in workforce training in Greater Minnesota. Housing remains a constraint in the Twin Cities region.**

Positive examples:
- Xcel Energy Power Up Program
- Illinois Solar Training Pipeline Program

Limited capital and capacity hinder green finance

Universal challenges are still challenges

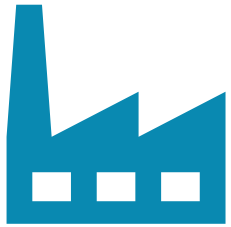


Sentiment among some CDFIs and customers that money doesn't get to the people who need it most or who are closely connected with implementation

Without a clear template, CDFIs don't know where to start on green finance

CCIA awardees may prioritize CDFIs with green finance experience

More universal challenges: Red tape, siloing, and local opposition slow deployment



Siting and permitting

Siloed actors

Limited understanding of local project impacts

Regional Coordination Opportunities and Needs

RMI – Energy. Transformed.

Coordination Key Messages

- Minnesota has a strong stakeholder ecosystem without major gaps
- Similar organizations work together, but different types of organizations are siloed
- Existing connectors and coalitions could help break down silos
- Coordination will be essential to securing investment to scale cleantech and clean energy deployment

Minnesota has a comprehensive stakeholder ecosystem

Similar organizations coordinate relatively well

BLUEGREEN ALLIANCE

State and local governments

GREAT PLAINS INSTITUTE Better Energy. Better World.

propel nonprofits

Workforce training organizations

Business associations

MINNESOTA Training Partnership

clean energy economy mn

Economic development organizations

Saint Paul PORT AUTHORITY

GREATER MSP Minneapolis Saint Paul Regional Economic Development Partnership

Community-based organizations

Industry

MPMA MINNESOTA PRECISION MANUFACTURING ASSOCIATION

MINNESOTA CDFI COALITION

ST PAUL AREA CHAMBER

MnSEIA

MREA

Community lenders

EMPLOYMENT AND ECONOMIC DEVELOPMENT

Improved coordination can build on existing efforts

Leverage connectors and coalitions to break down silos

Established

- Department of Employment and Economic Development
- Department of Labor and Industry
- Department of Commerce
- Minnesota Training Partnership
- BlueGreen Alliance
- Catalyst Coalition
- Minnesota Community Energy Network
- Grid Catalyst

See also: Minnesota Medical Alley

Nascent

- Minnesota CDFI Coalition
- Minnesota Climate Innovation Finance Authority
- Minnesota Energy Alley
- Power Up Program

See also: Groundbreak Coalition

Opportunities

- MnCIFA could provide balance sheet capital to MN CDFIs for climate-aligned investments or as GGRF co-finance
- Catalyst Coalition and MN CDFI Coalition could partner on GGRF capacity building and training for MN CDFIs
- DEED and DLI could work with grant recipients and employers to ensure job placement

Focus Area 1
Green Steel Manufacturing

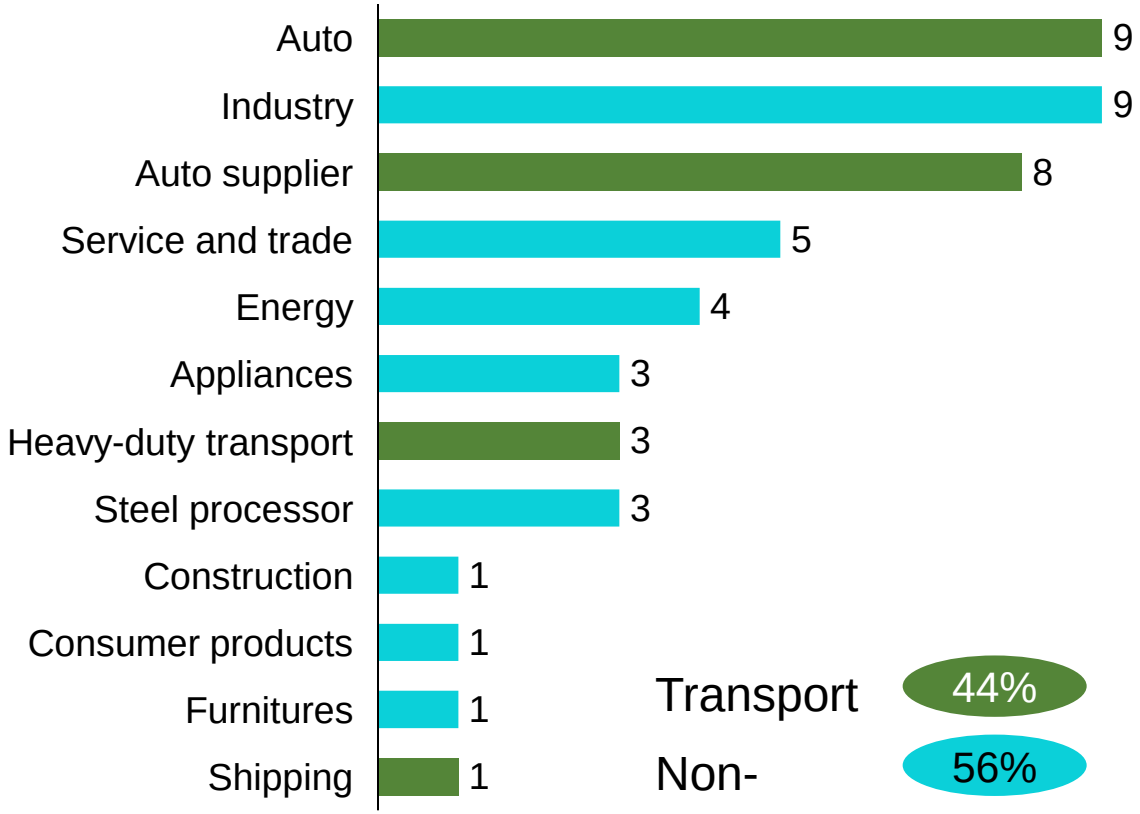
What is green steel?

- Steel production contributes to ~8% of global GHGs
- Green steel refers to the production of steel with zero carbon emissions
- The primary production method we'll focus on is **hydrogen-based reduction** (H2-DRI), which replaces coal with hydrogen
  - Federal incentive programs and tax credits can make H2-DRI competitive with incumbent production methods
- Global demand for green steel products is being driven by the automotive industry with green product premiums reaching 20-30% above traditional market value

Demand for primary green steel is growing, with buyers — led by the auto industry — signing offtake agreements with producers

Green secondary steel is also becoming available in the market with EAF producers procuring or generating renewable electricity. That said, offtake and demand for primary green steel remains essential to meet global climate goals.

Tracked supply agreements for green steel
Count of supply agreements



Source: BloombergNEF

VOLVO SSAB

Deal of undisclosed amount to supply SSAB fossil-free steel that started at a “small scale” in 2022 with Volvo’s heavy-duty electric trucks

H2 green steel

Following an equity investment, deal to supply 50,000 metric tons of “almost carbon-free steel” per year for European production

ZF H2 green steel

$1.6B deal with auto supplier ZF Friedrichshafen AG to cover a “significant share” of 2.5-million-ton annual steel demand

Minnesota is well positioned to produce near-zero-emissions steel

Available skilled labor force

- Current tight labor market in the US and Great Lakes requires acute targeting and funded training/apprenticeship programs

Demand Centers for Offtake

- Great Lakes continues to invest in manufacturing sectors that require large steel volumes (automotive, clean energy, etc.)

Logistics

- Minnesota has ample heavy material transport methods via waterway, roadway or rail already used for transporting ore.

Clean energy

- Ambitious clean energy generation targets paired with streamlined siting policy and regulation indicate that MN can support the development of industrial clean hydrogen production faster than most states

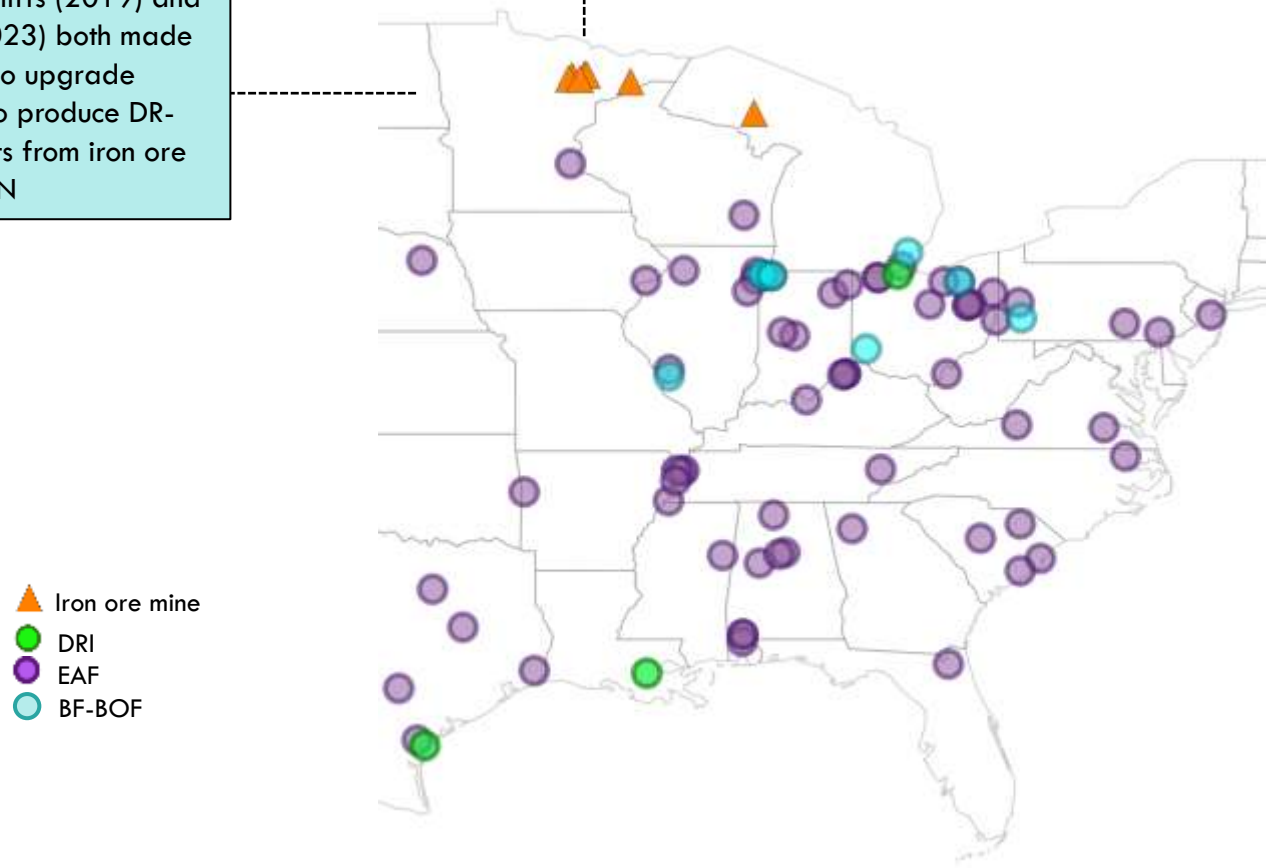
Iron ore

- Home of the Iron Range, MN is better positioned than any other state to supply green steel assets with DR-pellets
- USS and Cleveland-Cliffs have invested $100M or more to develop DR-pellet capacity already
- Mesabi Metallics and MagIron are developing projects that intend to considerably expand MN's DR-pellet production capacity

Clean steel announcements, trials, and investments abound across the US iron and steel supply chain, including in Minnesota's Iron Range

(2023) Coalition of northern MN partners awarded multimillion grant from Clean Energy to Communities Program (DOE) to pursue green H2 production and subsequent green iron production.

Cleveland-Cliffs (2019) and US Steel (2023) both made investments to upgrade equipment to produce DR-grade pellets from iron ore sources in MN



**IDP projects award winners announced but actual funding is contingent on meeting specific project phase gates.*

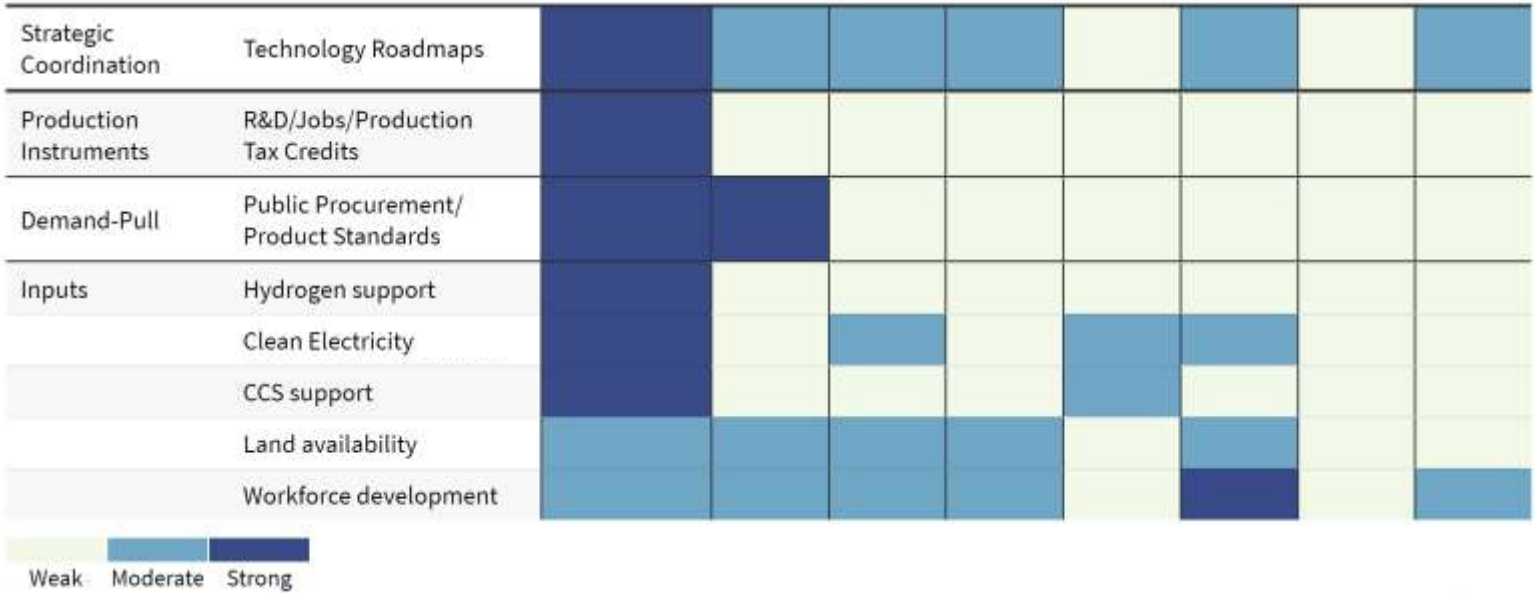
RMI graphic
Source: Corporate press releases
Note: Map does not include a comprehensive list of all US EAFs

Minnesota is working to create a policy-enabling environment for green steel and hydrogen production

- Minnesota's Buy Clean program prioritizes the purchase of steel with low-embodied carbon
- Executive Order 22-22 will support project development by assessing the state's regulatory preparedness for hydrogen

Green Steel Policy Gap Analysis in the Great Lakes

Despite being home to some of the mos valuable steelmaking in the country, most Great Lakes states lack a coordinated industrial strategy to support the technological transition to a sustainable steel industry.

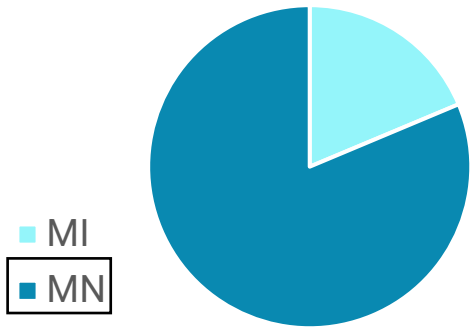


MN can move up the steel value chain and drastically increase employment density in the sector

- **MN** has the **smallest share of employment in midstream and downstream** steel sectors compared to other great lakes states
- **Midstream activities employ 10x** compared to upstream processes
- **Downstream activates employ 300x** compared to upstream processes

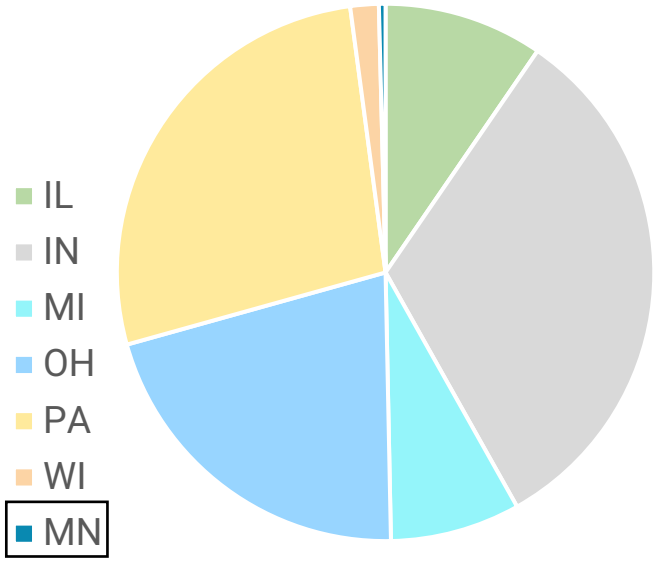
Employment totals apply to great lakes states: PA, OH, WI, MI, MN, IL & IN

Upstream (iron mining)
MN employment: 3,713
81.3%



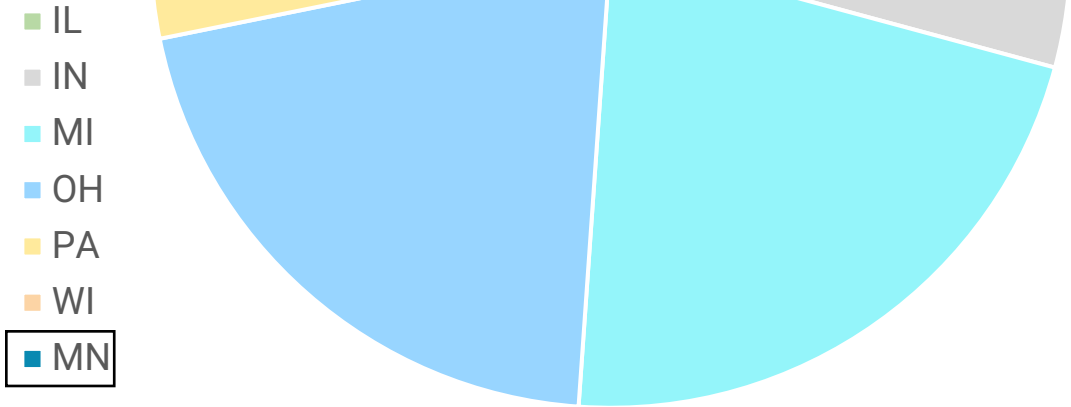
Total upstream employment: **4,566**

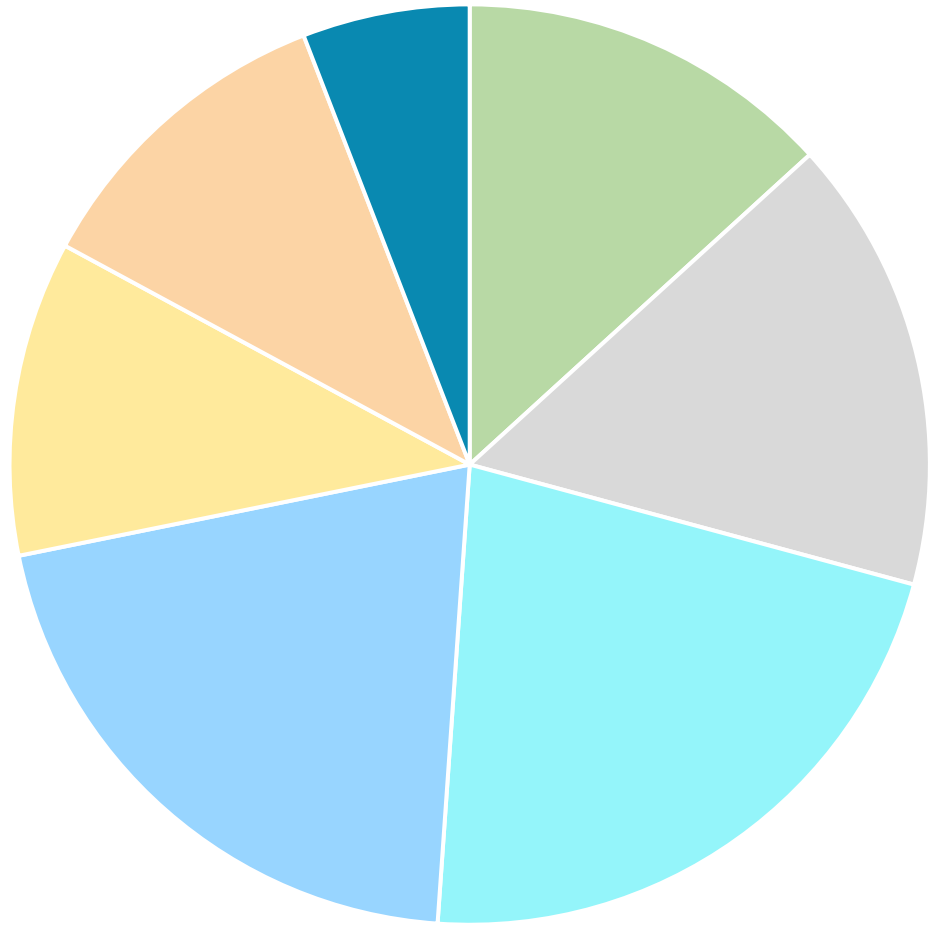
Midstream (steel/ferroalloy production)
MN employment: 175
0.4%



Total midstream employment: **43,819**

Downstream (high volume steel manufacturing)
MN employment: 83,725
5.9%





Total downstream employment: **1,424,192**

Employment figures are based on NAICS classification. Upstream includes: Iron ore mining (212210), midstream includes: Iron and steel mills and ferroalloy manufacturing (3311), downstream includes: machinery manufacturing (333), transportation equipment manufacturing (336), steel production manufacturing from purchased steel (3312), household appliance manufacturing (3352)

Transition Challenges

- Scaling green steel will require significant increases in renewable generation capacity and transmission reform to improve interconnection timelines and provide the necessary infrastructure to accommodate increased loads
  - Sourcing clean energy compatible with 45V tax credit guidance will be critical for developing green steel production
- New financing mechanisms and technological advancements are needed to expand carbon capture technology

Minnesota can begin taking steps to make green steel an attractive industry in the state

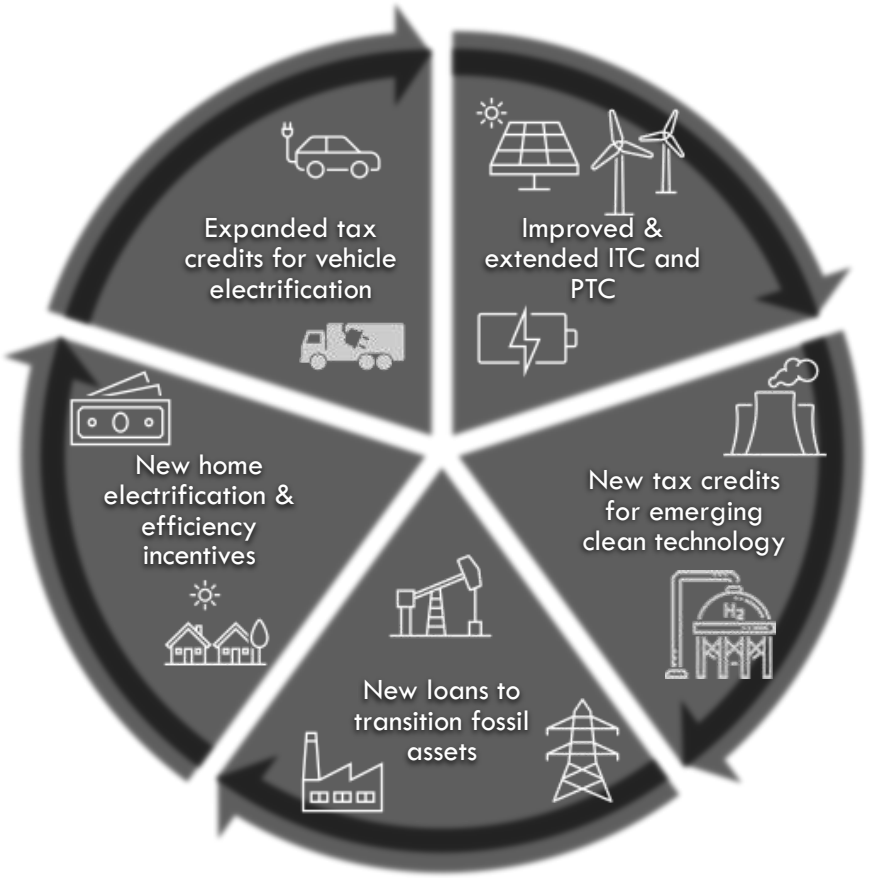
- Identify brownfield or suitable industrial zoned sites viable for hydrogen production and DRI development.
- Work with local utilities and electrical grid stakeholders to start planning for large load introduction, and sourcing of 45V eligible renewable energy sources.
- Establish regulatory processes to manage hydrogen production, storage, transmission and use in the state.
- Connect with community stakeholders across the Iron Range to hear local development perspectives and coordinate co-benefits.
- Develop workforce training opportunities to retrain and equip existing workers with the necessary skills for the green steel value chain.

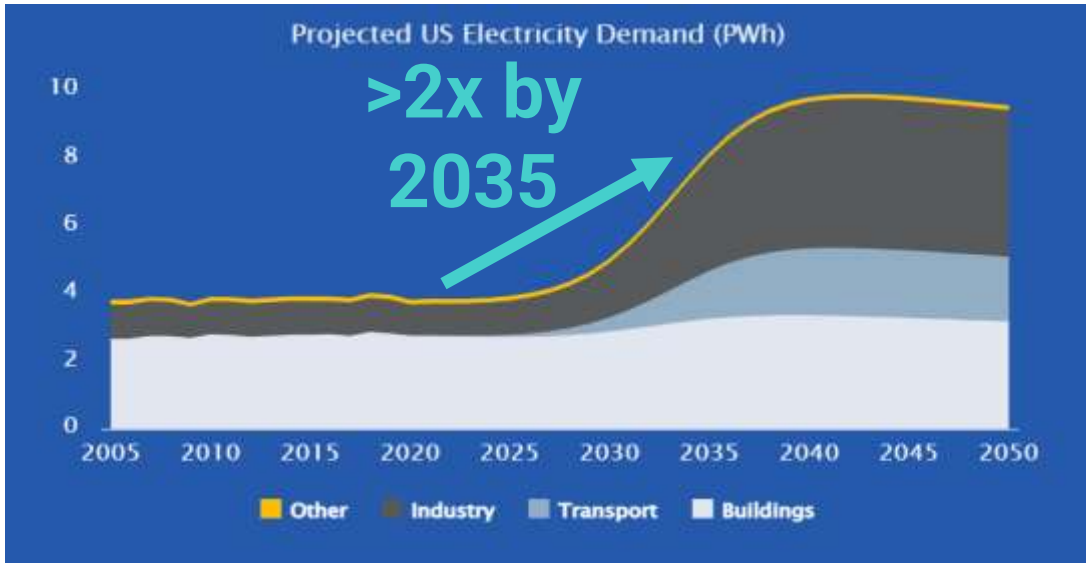
Focus Area 2
Clean Repowering and Transmission

Minnesota Clean Repowering Key Messages

What is clean repowering?	Clean repowering allows new clean energy to use existing points of interconnection, **reducing interconnection times from 5 years to <1 year**
Why is important?	Clean repowering offers a way to build new clean energy to **address load growth while avoiding significant interconnection delays and transmission congestion**
How could Minnesota benefit?	Clean repowering is an opportunity to deploy **3.7 GW of clean energy** in Minnesota and save customers **$63 million** each year
What are the risks of forgoing clean repowering?	Between Minnesota requiring **100% clean electricity by 2040** and EPA regulations **requiring CCS** on new high-capacity factor gas plants, a rush to gas could prove costly for ratepayers when clean alternatives are available

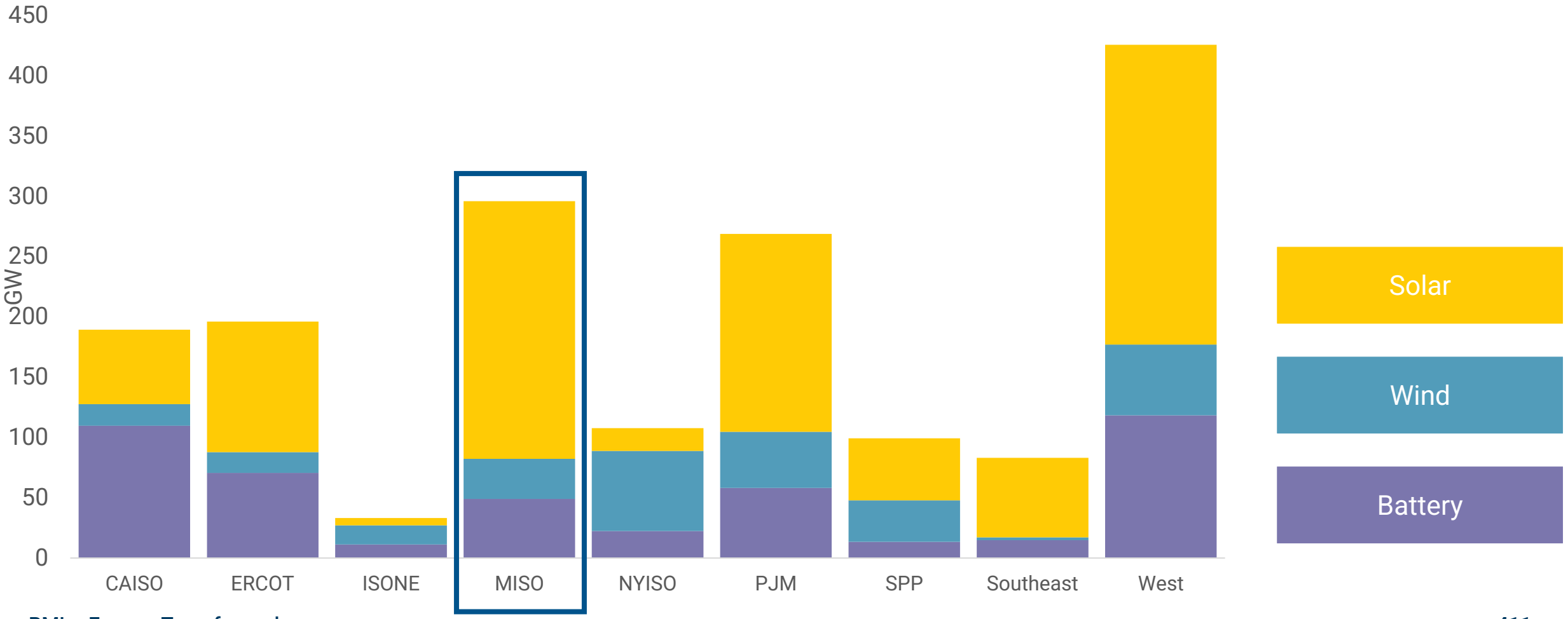
Electrification and clean manufacturing incentivized by the Inflation Reduction Act (IRA), as well as new datacenters, are driving significant load growth





Demand projection for 1.5°C aligned scenario

But US interconnection queues now have over 1.3 TW of renewables and storage with 3–5 years of wait time — a key barrier to 1.5°C alignment



Source: Lawrence Berkeley National Laboratory

Clean repowering leverages two IRA incentives to deploy clean energy using existing fossil plants' interconnections, accelerating interconnection of cost-competitive clean energy

Regional interconnection rules include two cases that allow for a more streamlined process

Surplus interconnection service: adding new generation at the site of an ***existing*** plant that would continue operating

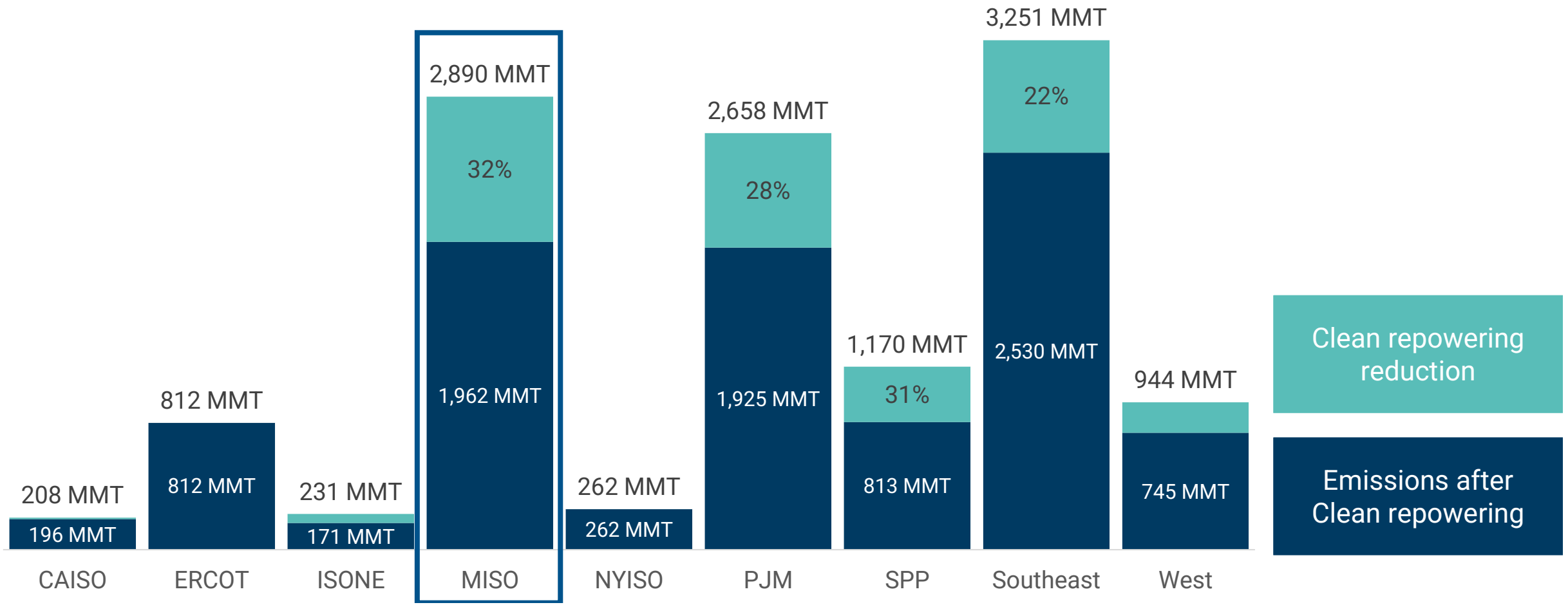
Generator replacement: adding new generation at the site of a ***retiring*** unit or plant

Two key **IRA incentives** improve the economics

Energy community tax credit bonuses: +10% on ITC or PTC

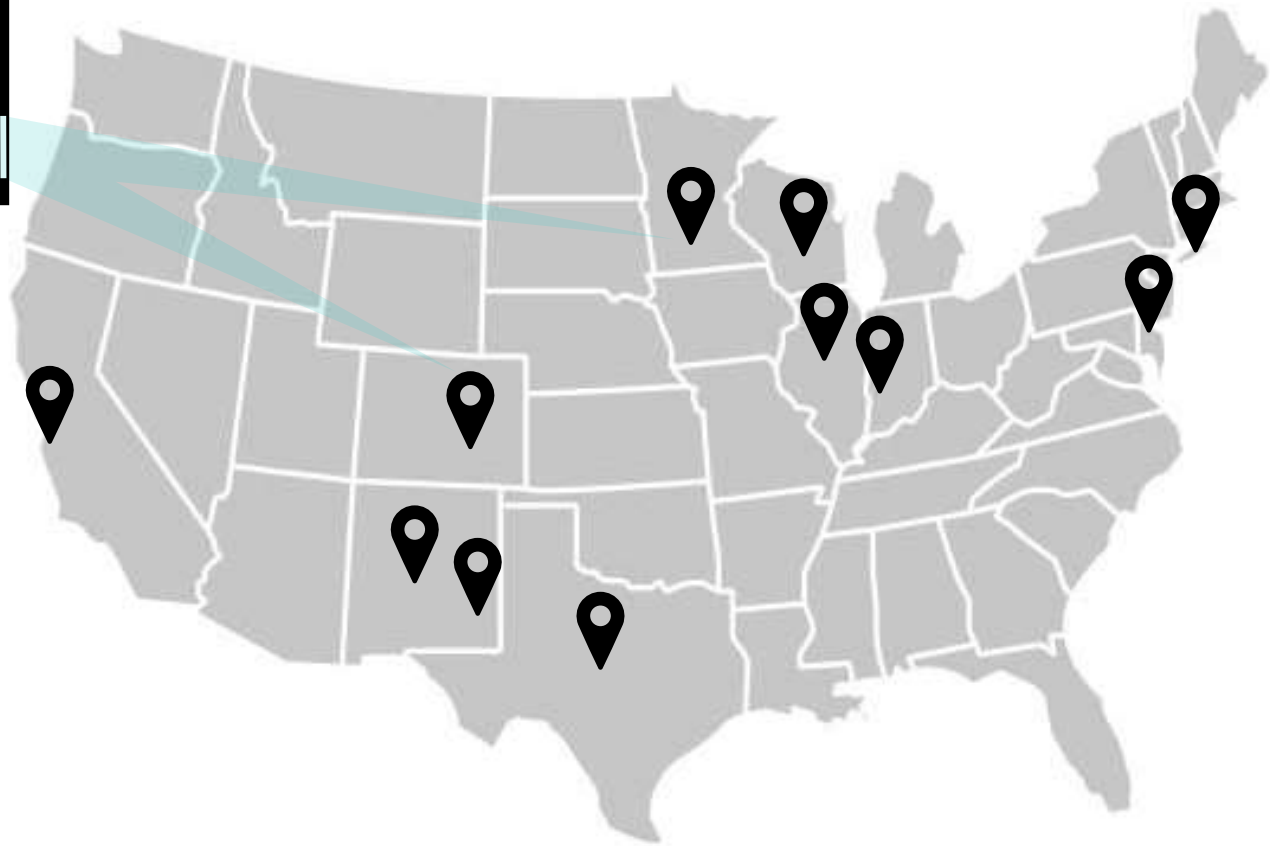
DOE Energy Infrastructure Reinvestment (EIR) Loans: up to $250B

Clean repowering could reduce US electricity emissions by 25% through 2035 – and MISO by 33%



Plans for clean repowering projects are in development in Minnesota and growing nationwide

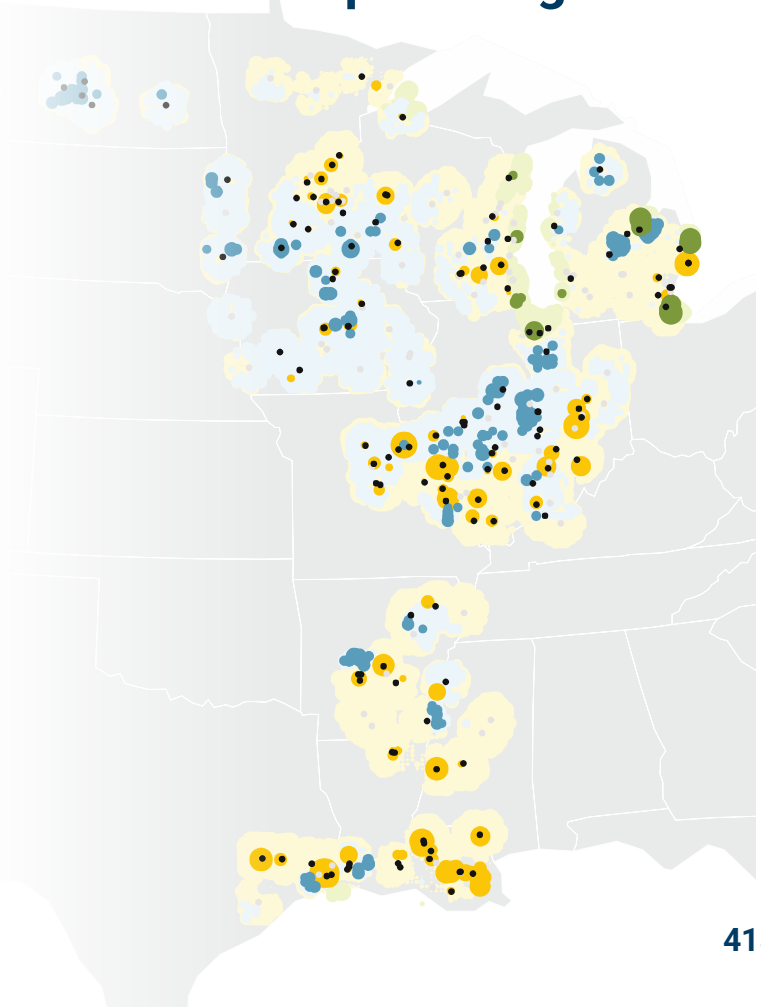
Xcel Energy plans to replace coal plants in **Minnesota** and **Colorado** with solar and long-duration iron-air storage



Clean repowering will help Minnesota replace coal and natural gas generation with wind and solar, helping the state meet the requirements of its 100% clean energy law

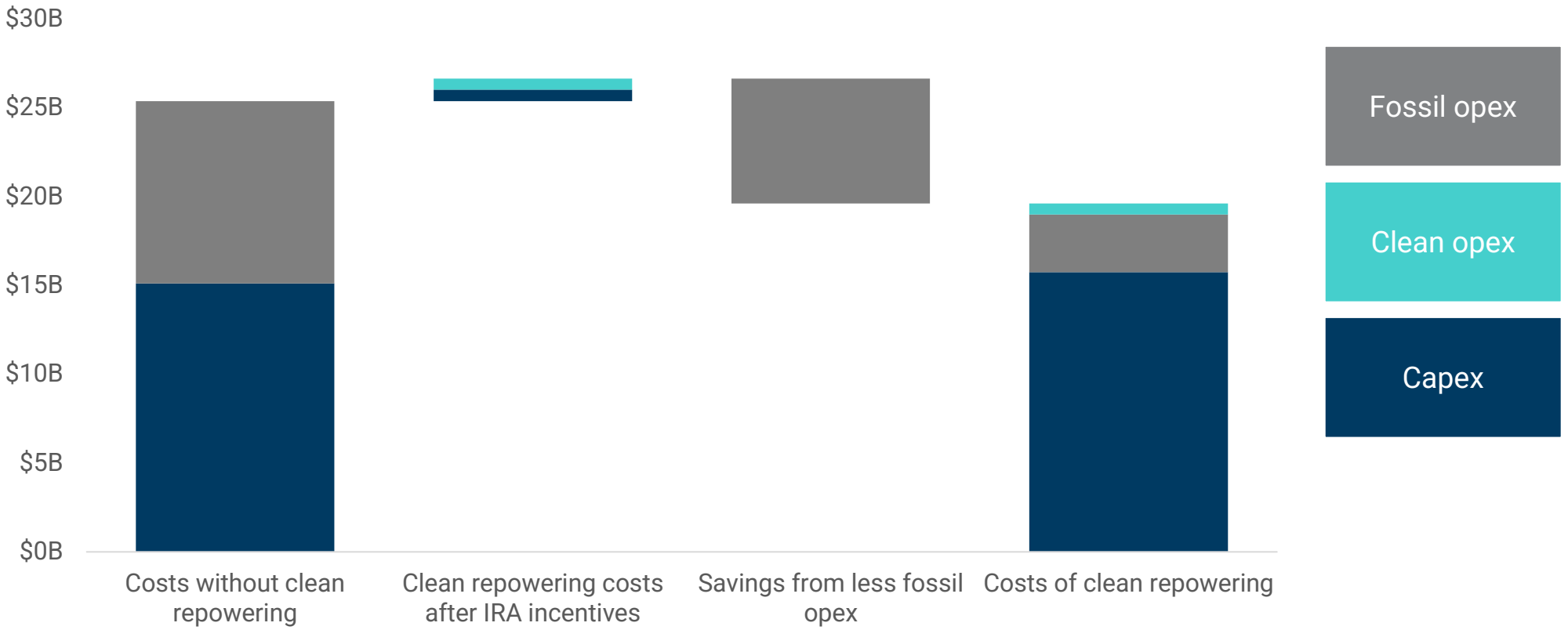
MN utilities by clean repowering opportunity

MISO clean repowering sites



Minnesota savings

Cost impact of clean repowering



Total regional annualized savings	$ 63 million
Total reduction in annual carbon emissions	11 MMT
Average Annual Household Bill Savings	$14.29

Negative savings indicate cost increases. A generation owner's levelized cost or annualized generation cost can increase with clean repowering because of an increase in that owner's total generation or a change in the composition of its generation.

There are multiple avenues for Minnesota to accelerate efforts for clean repowering

- EIR applications must be approved by September 2026
- Coordinate with MISO and PUC to place a greater emphasis on clean repowering in long-term planning processes
- Local government support is essential to ease permitting processes and support additional economic development

Focus Area 3
GGRF Preparedness

Putting together the pieces: GGRF, clean investment, economic development, and community development

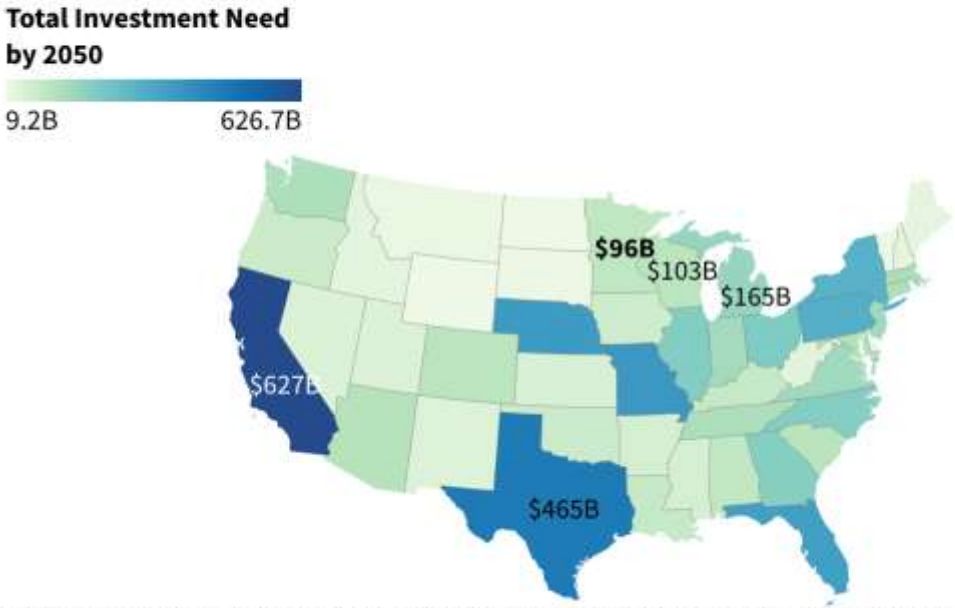
- Minnesota needs to get in the game on green finance. Markets are shifting to net-zero investments, and regions have to get on board or be left behind.
- GGRF can help overcome market challenges and deliver needed financing.
- Minnesota needs to position itself to capture GGRF funding.

MN needs >$6.5B annual investment in GGRF priority projects over the next decade

Projects, financing, workforce, and complementary infrastructure need to come together quickly

GGRF Investment Need, 2020-2035

Estimated climate-aligned investment need in GGRF priority project categories: rooftop solar, buildings appliances, vehicles, and vehicle charging



Source: Climate Policy Initiative. 2023. "Implementing the Greenhouse Gas Reduction Fund: Investment needs, barriers, and opportunities: Interim Report."

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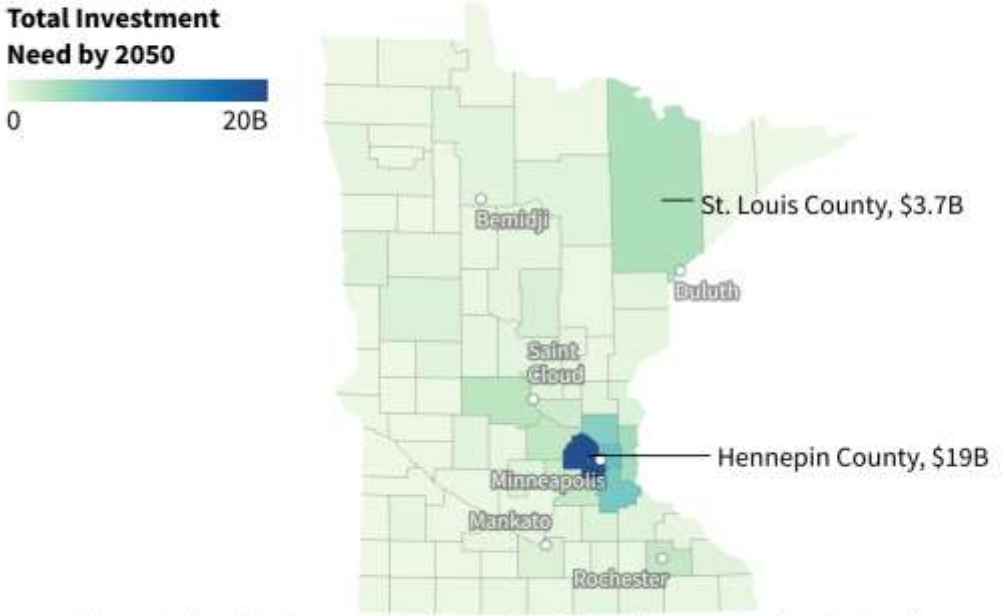
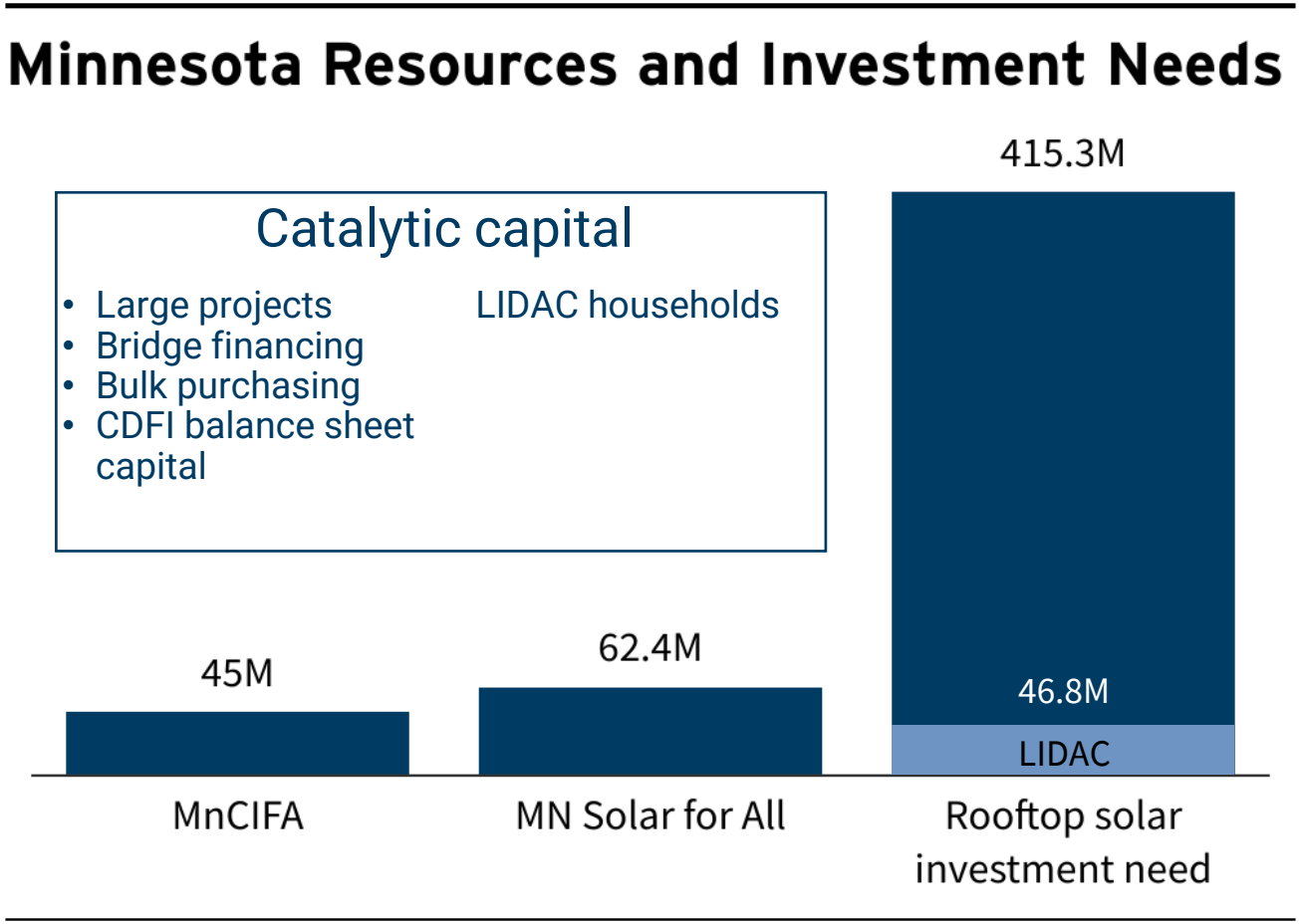


Source: Climate Policy Initiative. 2023. "Implementing the Greenhouse Gas Reduction Fund: Investment needs, barriers, and opportunities: Interim Report."

Finance: Existing resources build capacity and crowd in investment



Local know-how

SUNRISE BANKS

GREATER MINNESOTA HOUSING FUND

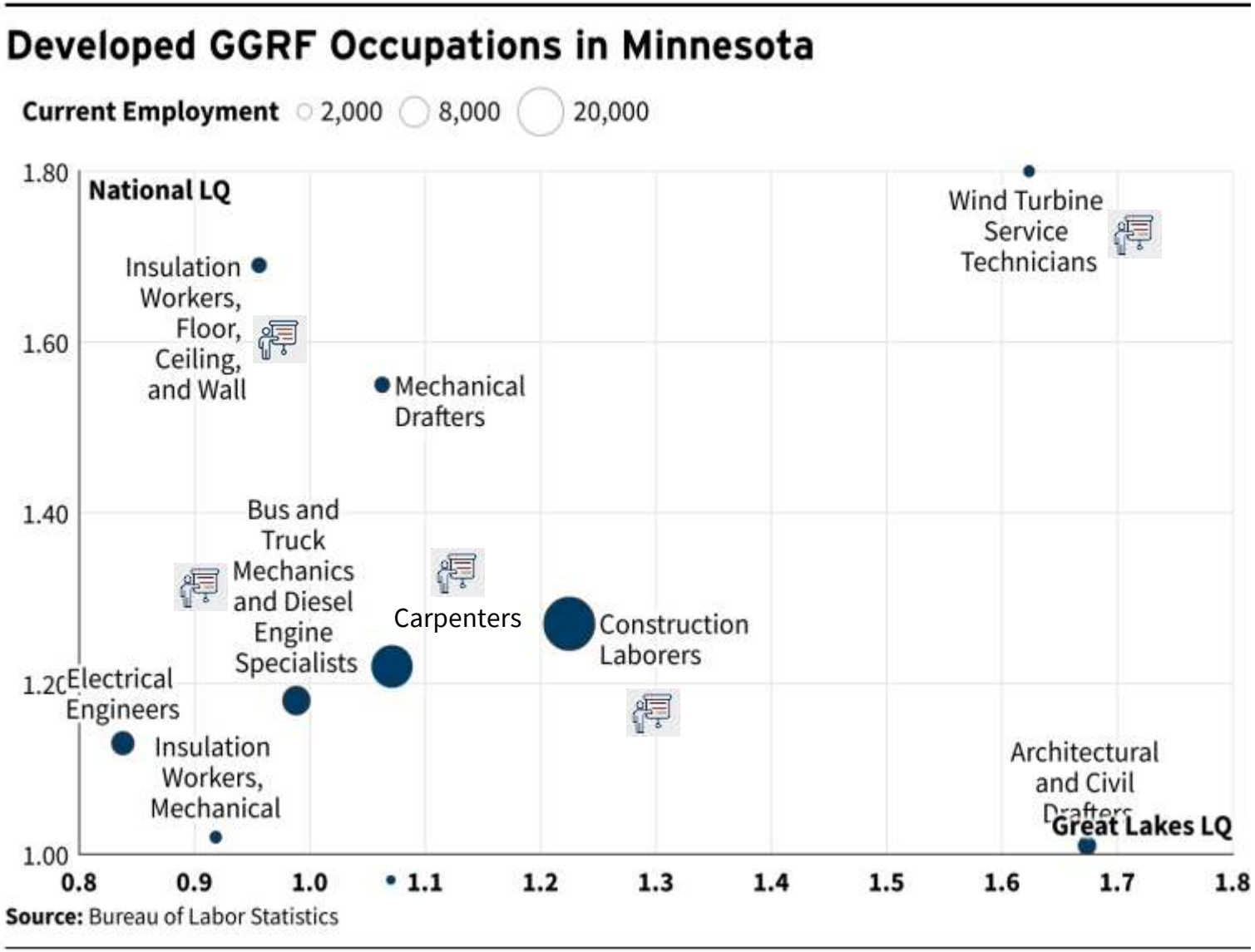
National GGRF capacity building

OPPORTUNITYFINANCE NETWORK

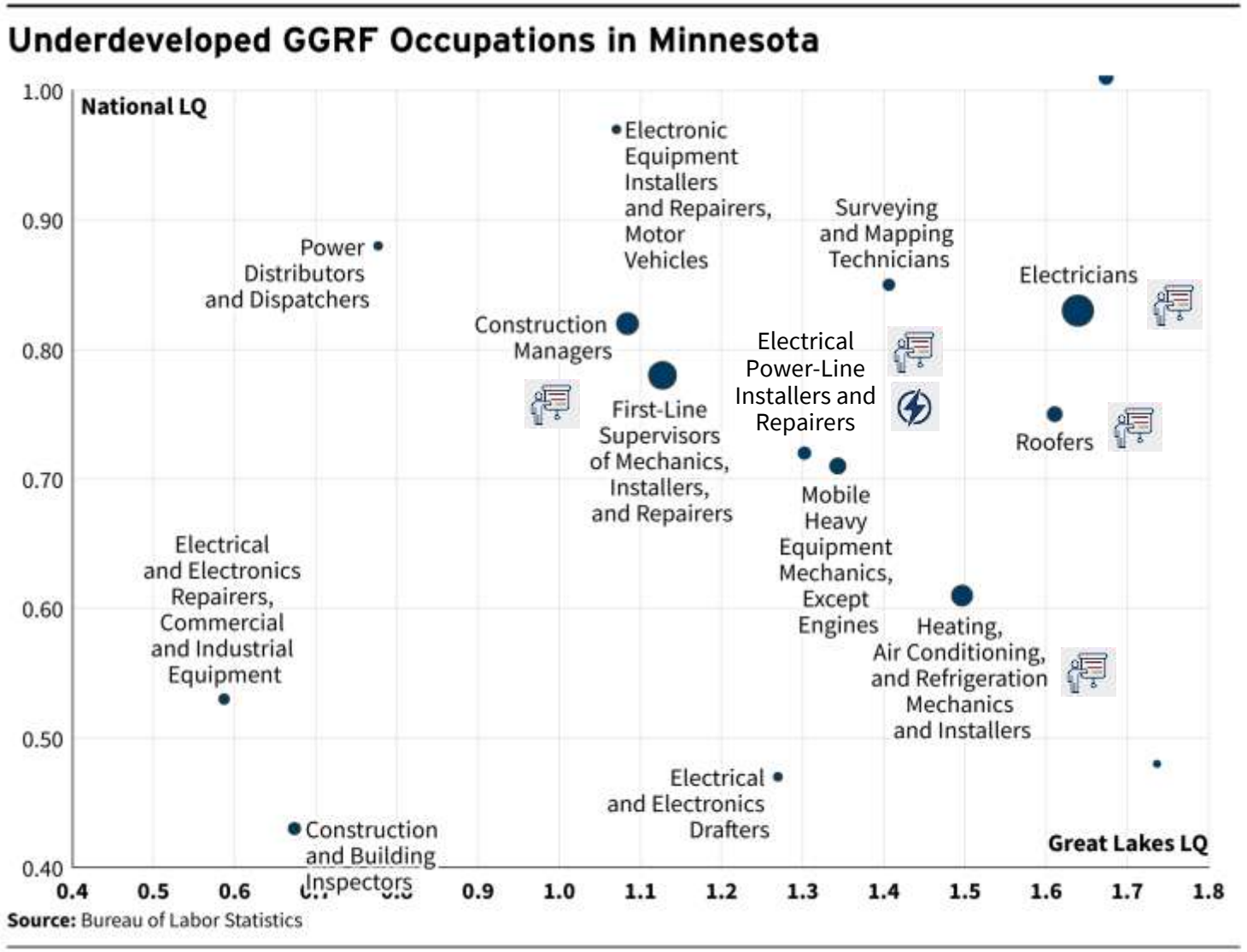
/ inclusiv /

NATIVE CDFI NETWORK

Workforce: Minnesota is ahead in some areas



Workforce: Existing programs can help address gaps



CLEAN ECONOMY EQUITABLE WORKFORCE TRAINING

What Minnesota needs to do now to capture GGRF funding

Identify and promote the projects that will deliver the greatest economic and community development benefits

Present a cohesive picture of plans and opportunities to NCIF awardees

Bring pipeline projects to NCIF awardees

Work with national capacity-building groups in supporting CDFIs to build project pipeline and make first loans

What’s next? It’s up to you