



# Welcome to RMI's IRA Bootcamp for Economic Development Practitioners

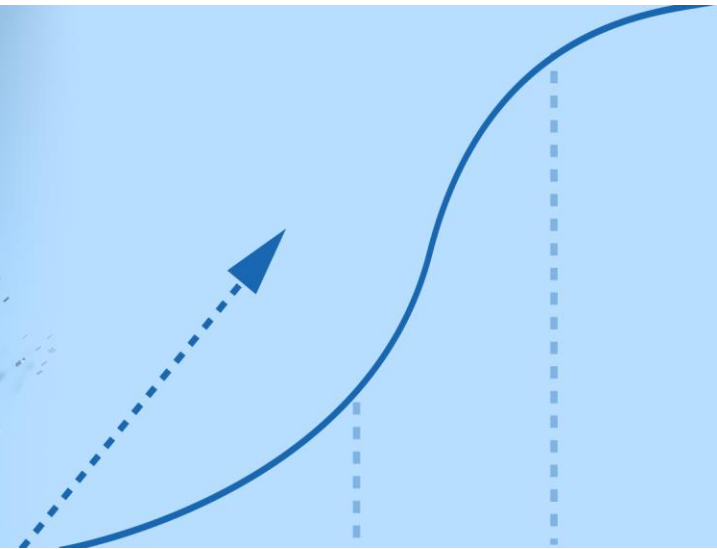


**RMI is an independent, nonprofit organization of experts accelerating the clean energy transition. We are transforming the global energy system to secure a clean, prosperous, zero-carbon future for all.**



# RMI's Formula for Impact

## Scaling Solutions Around the World



### BY Decarbonizing Key Sectors



Electricity



Buildings



Transportation



Industry

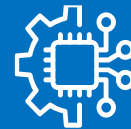
### USING Powerful Market Catalysts



Capacity Building  
+ Education



Policy



Technology



Communications



Climate  
Intelligence



Climate Aligned  
Finance



# Who's here?



EVANSVILLE  
REGIONAL  
ECONOMIC  
PARTNERSHIP



DEPARTMENT OF IRON RANGE  
RESOURCES & REHABILITATION



eco  
ENVIRONMENTAL  
COLLABORATION  
OFFICE  
ecoCITY of MILWAUKEE



INTERNATIONAL  
ECONOMIC DEVELOPMENT  
COUNCIL



ECONOMIC  
DEVELOPMENT  
PARTNERSHIP of  
NORTH CAROLINA



SOUTHWESTERN WISCONSIN  
REGIONAL PLANNING  
COMMISSION



THE HEINZ ENDOWMENTS  
HOWARD HEINZ ENDOWMENT • VIRA I. HEINZ ENDOWMENT



LED



LOUISIANA  
ECONOMIC  
DEVELOPMENT



MILWAUKEE 7



GREATER  
MSP  
Partnership



WORLD  
BUSINESS  
CHICAGO



GREATER  
MANKATO  
GROWTH



MISSOURI  
PARTNERSHIP



EGLE  
MICHIGAN DEPARTMENT OF  
ENVIRONMENT, GREAT LAKES, AND ENERGY



GP



GREATER PEORIA  
Economic Development Council



Charleston  
REGIONAL DEVELOPMENT ALLIANCE  
BERKELEY, CHARLESTON & DORCHESTER COUNTIES



MIDWEST  
CLIMATE  
COLLABORATIVE



TVA  
TENNESSEE  
VALLEY  
AUTHORITY



BN ECONOMIC  
DEVELOPMENT  
COUNCIL



ECONOMIC  
DEVELOPMENT  
CORPORATION  
MICHIGAN CITY, IN



KNOX COUNTY AREA PARTNERSHIP  
FOR ECONOMIC DEVELOPMENT



DRP  
Detroit  
Regional  
Partnership



dg  
DOWNERS GROVE  
Economic Development Corporation



GREAT LAKES  
ST. LAWRENCE  
GOVERNORS  
& PREMIERS



Ohio River  
Valley Institute



COUNTY OF DANE  
WISCONSIN  
1839



MARM



MADISON REGION  
ECONOMIC PARTNERSHIP



NEI  
NORTHEAST  
INDIANA  
PIONEER STARTS HERE



QUAD CITIES



C&B  
GREAT  
RIVER  
ENERGY



DISCOVER  
waseca  
CITY OF WASECA



WISCONSIN  
ECONOMIC DEVELOPMENT



JobsOhio



Illinois  
Department of Commerce  
& Economic Opportunity



African American  
Alliance of CDFI CEOs



KABA  
KENOSHA AREA  
BUSINESS ALLIANCE



DCEDC  
DEKALB COUNTY  
Economic Development Corporation



Pittsburgh Regional Alliance  
An affiliate of the Allegheny Conference



People's Energy  
Cooperative



APEX  
gets business



GREAT SEAL OF THE STATE OF WISCONSIN  
FORWARD



RCCDC  
Racine County Economic Development Corp.



new  
north  
creating, connecting & convening regional  
strategies for business & talent development

RMI – Energy. Transformed.



# Let's Meme...





# IRA Bootcamp Objectives

- ① Learn what matters the most with the IRA for your day-to-day needs
- ② Become the most knowledgeable person in your organization on IRA
- ③ Have the tools to immediately apply IRA & engage with companies





# Meet the RMI Team



**Aaron Brickman**



**Alisa Petersen**



**Lachlan Carey**



**Leia Guccione**



**Matthew Popkin**



**Nathan Iyer**



**Taylor Krause**



**Whitney Mann**



## Agenda – January 16, 2024 (Day 1)

<b>1:00 p.m.</b>	<b>Workshop Welcome</b>
<b>1:45 p.m.</b>	<b>IRA Overview</b>
<b>2:45 p.m.</b>	<b>Direct Pay, Transferability &amp; Electricity Tax Credits</b>
<b>3:55 p.m.</b>	<b>BREAK</b>
<b>4:05 p.m.</b>	<b>Permitting, Siting, Community Benefit Agreements</b>
<b>5:10 p.m.</b>	<b>Beverages and Barriers: Breaking Down Barriers to Investment</b>
<b>6:30 p.m.</b>	<b>Social Hour (Top Golf Lounge, 1<sup>st</sup> Floor Market Hall)</b>



# Agenda – January 17, 2024 (Day 2)

8:00 a.m.	Light Breakfast
8:30 a.m.	Opening Remarks
8:45 a.m.	Reinvesting in Brownfields & Energy Communities for the Clean Energy Economy
9:50 a.m.	BREAK
11:00 a.m.	Public Financing, Green Banks & Greenhouse Gas Reduction Fund
11:15 a.m.	Green Hydrogen & 45V
12:30 p.m.	LUNCH
1:15 p.m.	Cleantech manufacturing & 48C/45X
2:30 p.m.	Break
2:45 p.m.	Case Study Breakouts: Leveraging the IRA
3:45 p.m.	Workshop Wrap-Up
4:30 pm	End of Day



## Reminders

- **Housekeeping – restrooms; emergency meeting location; medical emergency**
- **Media Release**
- **Workshop Survey**
- **Speaker slides to be sent after session**





## Rules of Engagement



Be present



Respect confidentiality



Sharing needed



Peer collaboration



# Participant Introductions – Speed Mingling

Please share your **Name, Affiliation, City/Region**  
(2 mins each pair & then rotate)



# The Inflation Reduction Act

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soent: Clean energy projects and economic development Exasssnyys  
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U.S. Federal Government

*[Signature]*

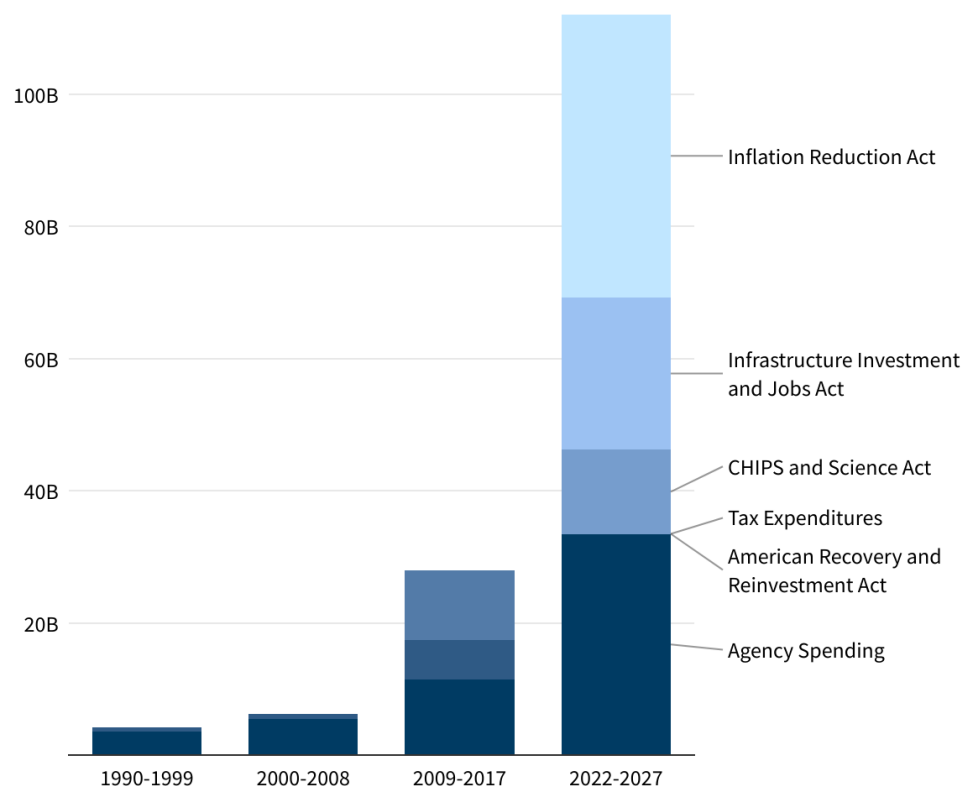


# IRA+IIJA+CHIPS:

Biden administration has passed arguably the most ambitious suite of climate policies anywhere

## Federal Spending on Climate Will Exceed \$100b Annually

Spending will more than triple historic levels.



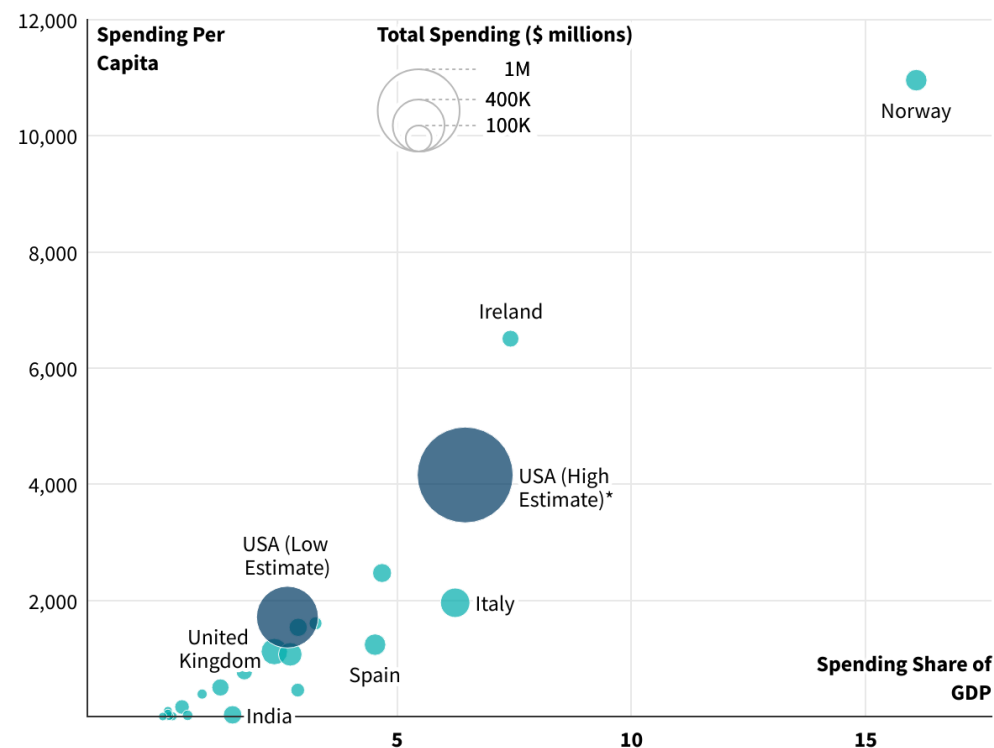
Average annual spending, adjusted for inflation. Note that the time periods shift from 2000-2008 to 2009-2017 to 1) consolidate the impact of the ARRA to one bar, and 2) address missing data between 2018-2021. Values are based on RMI estimates using agency spending data from the GAO, tax expenditure data from the JCT, and internal analysis on 2021-2022 legislation.

Source: RMI • Created with Datawrapper



## Clean Energy Spending Among Developed Countries since 2020

Even using the CBO's conservative estimates, the US has dedicated the most spending towards clean energy policies since Covid-19 and is among the largest relative to population and GDP. This grows significantly when accounting for uncapped tax credits.



Spending figures are for clean energy investment support only and exclude energy affordability measures. \*Uses the Goldman Sachs \$1.2 trillion estimate of overall IRA incentives, rather than the official CBO \$369 billion estimate.

Chart: RMI Graphic • Source: IEA Government Energy Spending Tracker



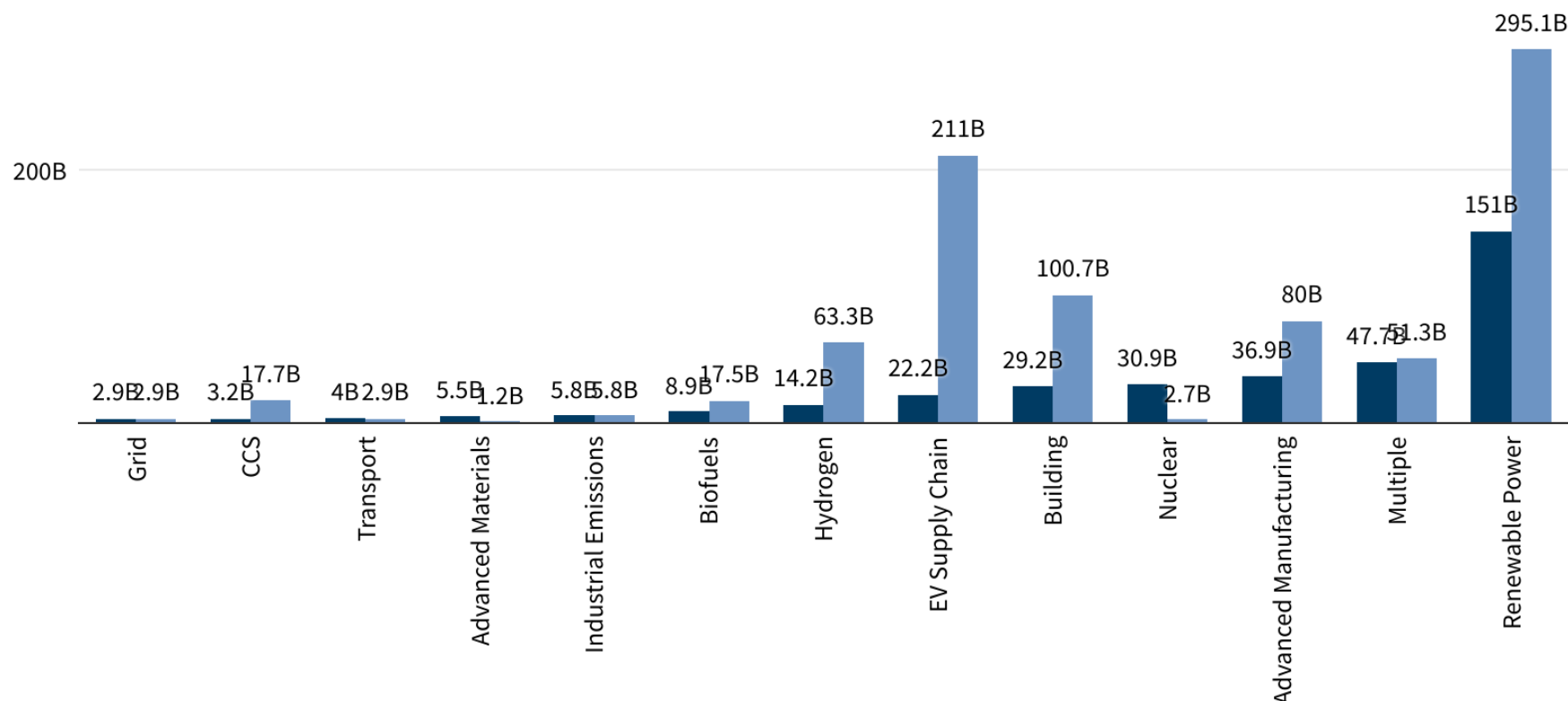
# The Headline Numbers Undersell its Potential:

Uncapped tax credits could lead to ~\$1 trillion spending bill

## High-Demand Sectors Could See Significantly Larger Funding Than Anticipated Thanks to Uncapped Tax Credits

Billions of US dollars

■ CBO Estimate ■ Climate-Aligned Estimate





# IRA supports clean energy across all sectors



## Buildings

- Made existing tax credits more generous
- Created new rebates for residential buildings



## Transportation

- Created new tax credits for EVs and EV chargers and made existing tax credits more stringent
- Developed new grants programs for heavy duty vehicles



## Electricity

- Created more generous tax credits for renewables
- Developed new loan and grant programs for transitioning energy communities



## Industry

- Created new hydrogen tax credit
- Created new manufacturing production tax credit



## System Level

- Created elective pay and transferability for tax credits
- \$27B for green financing



# IRA was designed to spur domestic manufacturing and a clean energy workforce



## Increase demand

- Must meet battery and critical mineral requirements to get credit (30D)
- Can only get direct pay if domestic content requirements are met (48/45)
- Only receive full value of credit if prevailing wage and apprenticeship requirements are met (48, 45, 179D, 45L, 45Q, 48C, 45U, 30C, 45V, 45Z)



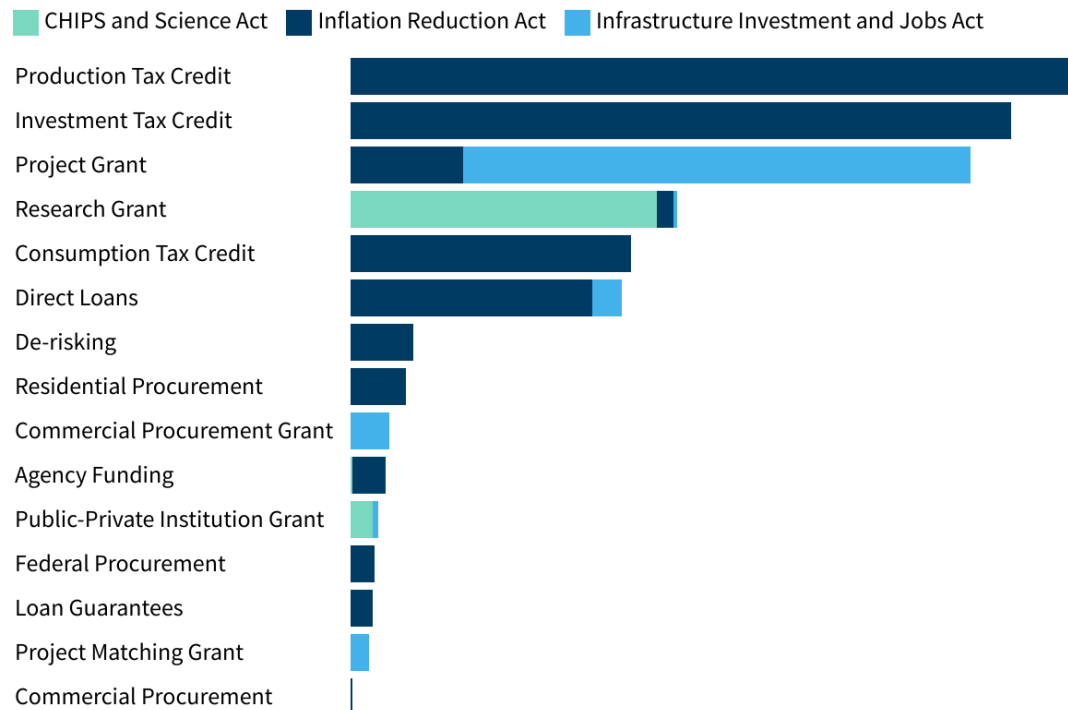
## Increase supply

- Generous manufacturing tax incentives (48C/45X)
- Bonus incentives for domestic content (48/45)
- Grants and loans for retooling existing manufacturing

# “Public led, private enabled”

Relies overwhelmingly on crowding in private investment through tax incentives and capital de-risking.

## Biden's Green Industrial Strategy by Legislation & Policy Instrument

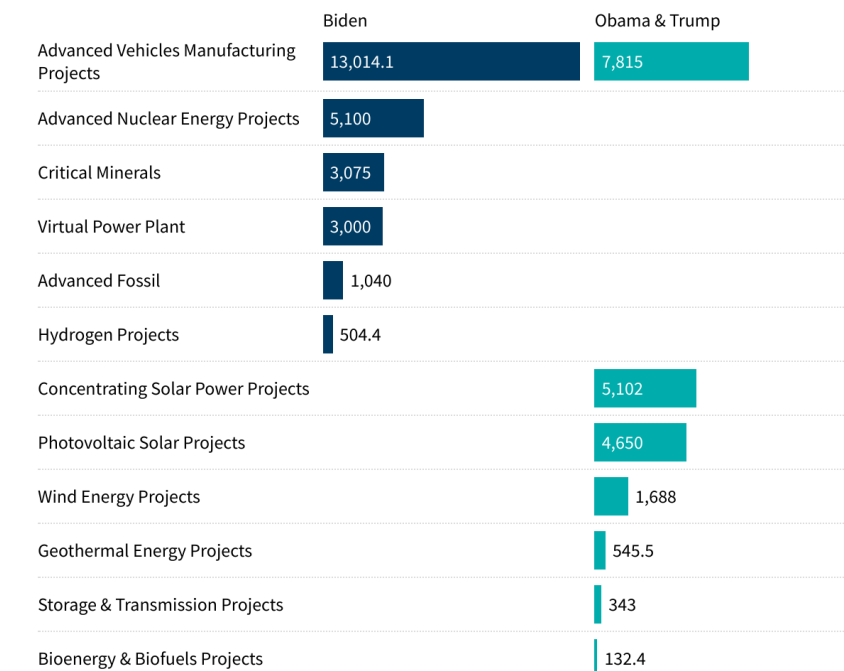


Created with Datawrapper



## Loan Program Office Projects, by Technology

Millions of dollars in loan guarantees & direct loans



As of August 3, 2023. Includes active conditional loan commitments.

Chart: RMI • Source: LPO • Created with Datawrapper





# Investment in the Clean Energy Transition is Taking Off

## Clean energy investment in the U.S. has quadrupled since 2018

In the Great Lakes, investment has increased over 800% from just \$1 billion in the first quarter of 2018, to \$8 billion in Q3 2023. Investment has grown 675% in the South, and nearly 500% in the Gulf.

Great Lakes Gulf Northeast Plains South Southeast  
Southwest West

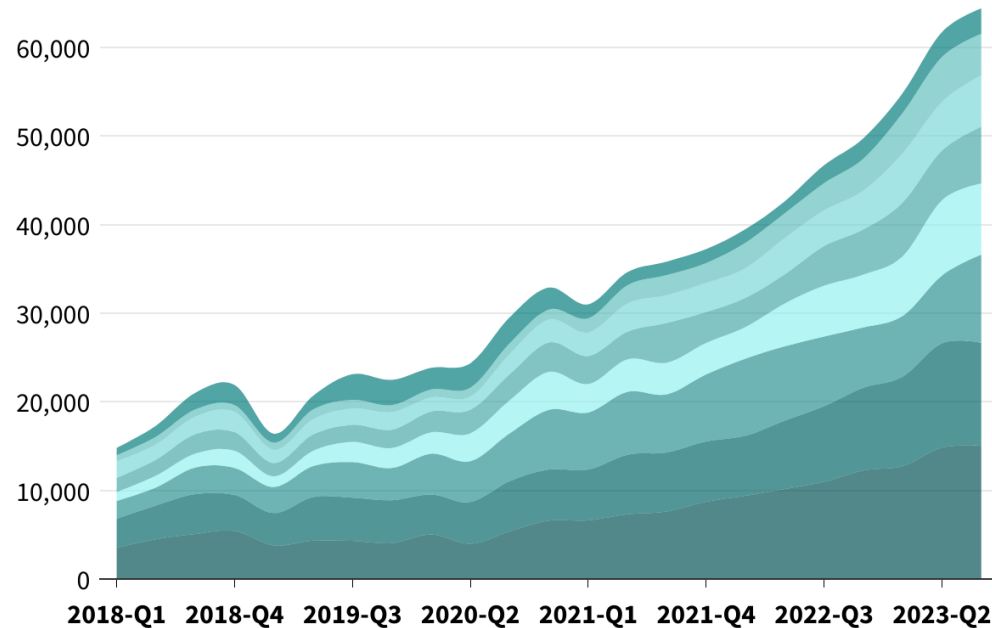


Chart: RMI Graphic • Source: Clean investment Monitor • Created with Datawrapper



## Solar and battery manufacturing have been the big winners since passage of the IRA

Growth in cumulative investment since 2018, indexed to Q2-2022. (2022-Q2=100)

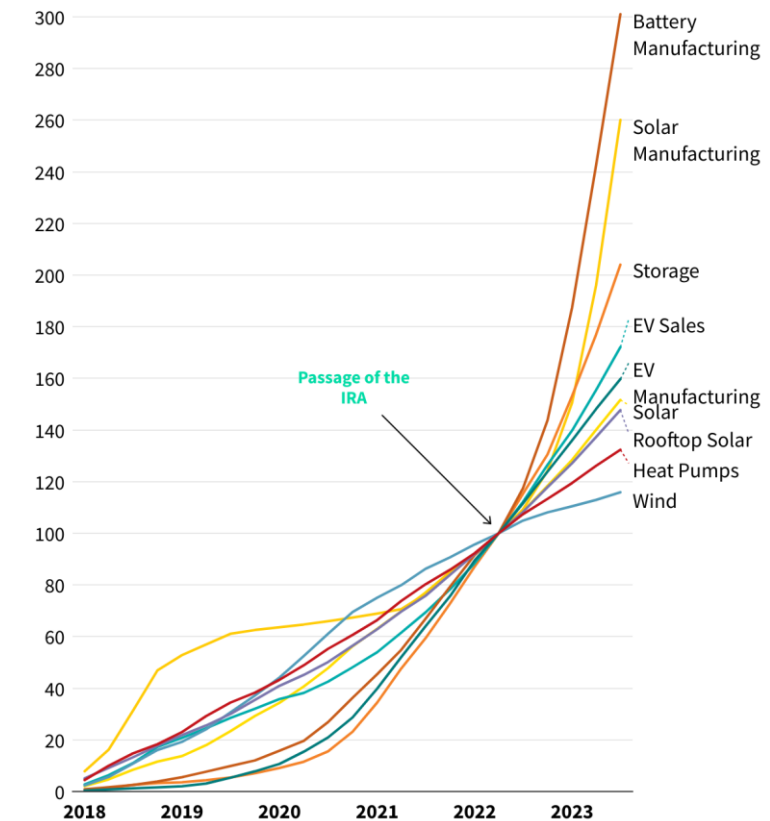


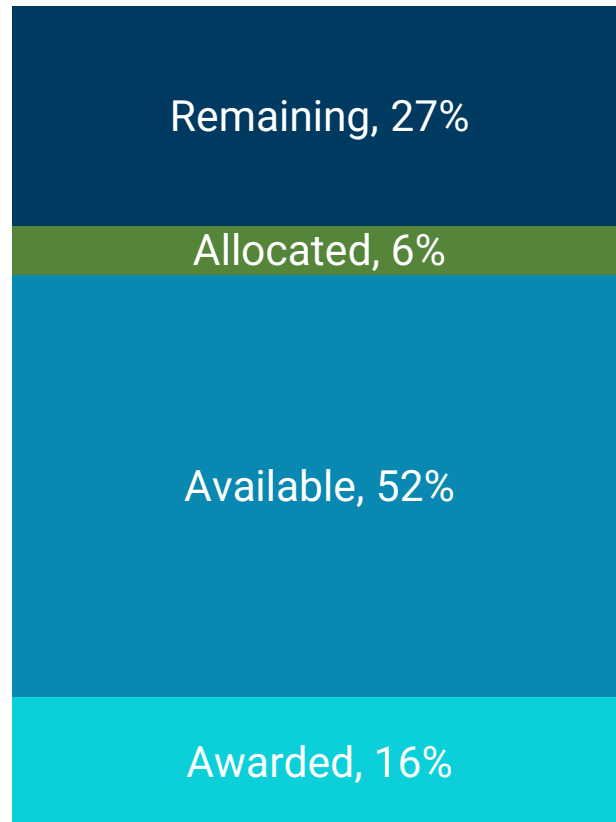
Chart: RMI Graphic • Source: Clean Investment Monitor • Created with Datawrapper



# Announcements first, funding later?

Most IRA-related spending to date are private investment announcements with the majority of public funding still on its way.

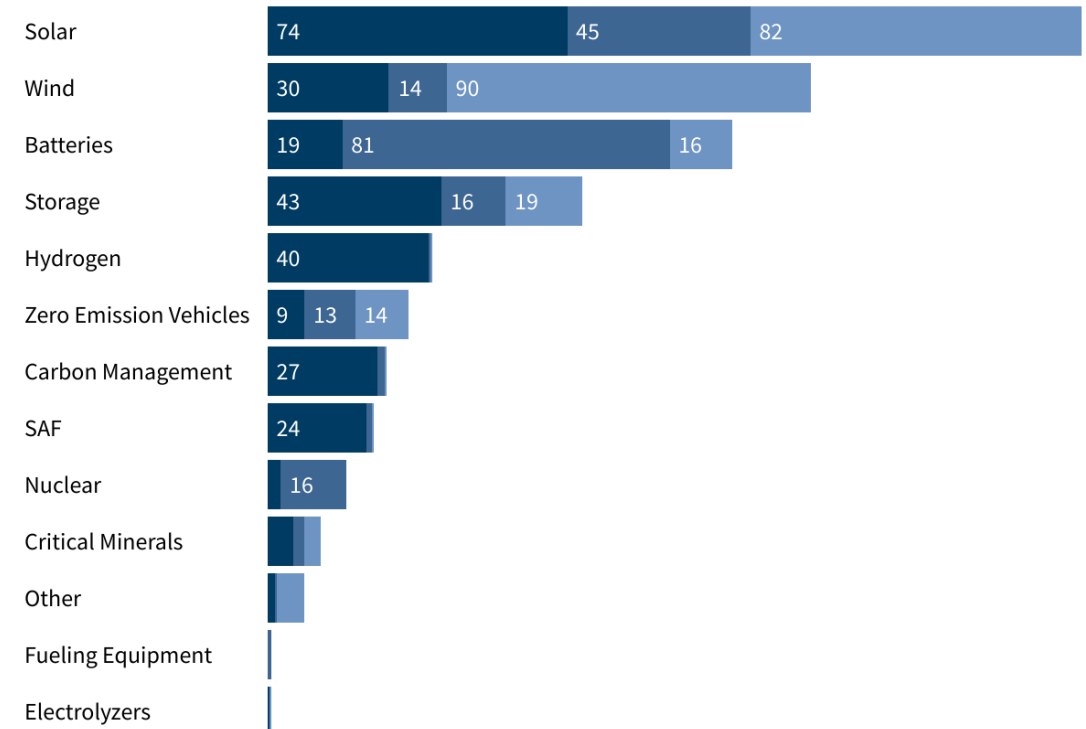
Just 16% of IRA (non-tax credit) funding has been released as of December 2023



## More than \$700bn in new investments, announcements, and construction in clean energy industries since 2018.

31% of new investments since 2018 (\$233bn) are already operating, while a further 25% (\$193bn) are under construction, and 37% (\$279bn) are only announced.

■ Announced ■ Under Construction ■ Operating

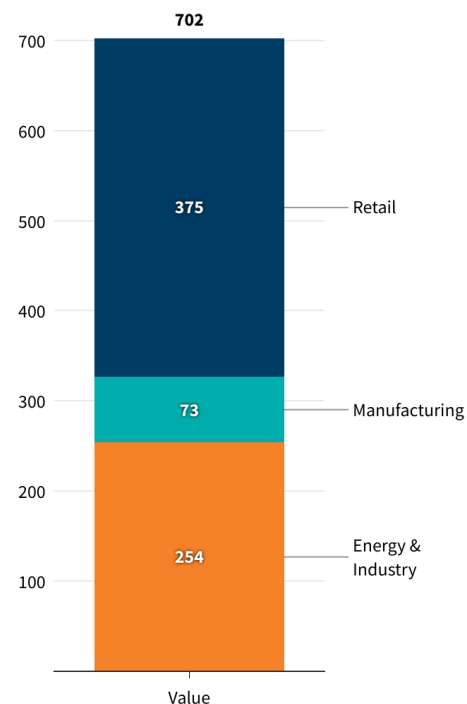


# Who are the early cleantech leaders?

Across retail, manufacturing, energy, and industry sectors, EV, battery and solar projects have seen the bulk of new investment.

## Despite the headlines, most clean energy investment since 2018 is in the retail sector

Only 10% of new investment since 2018 is in manufacturing.



"Manufacturing" indicates an investment in facilities or capacity to produce GHG-reducing technology. "Energy and Industry" refers to the deployment of technologies that reduce GHG emissions in the bulk production of energy or industrial goods or that capture ambient carbon dioxide. "Retail" refers to the purchase and installation of technology by individual households and businesses.

Chart: RMI Graphic • Source: Clean Investment Monitor



## Retail investment is led by electric vehicles and heat pumps

US consumers have spent nearly \$200 billion on battery and plug-in hybrid vehicles since early 2018, and a further \$100 billion on heat pumps.

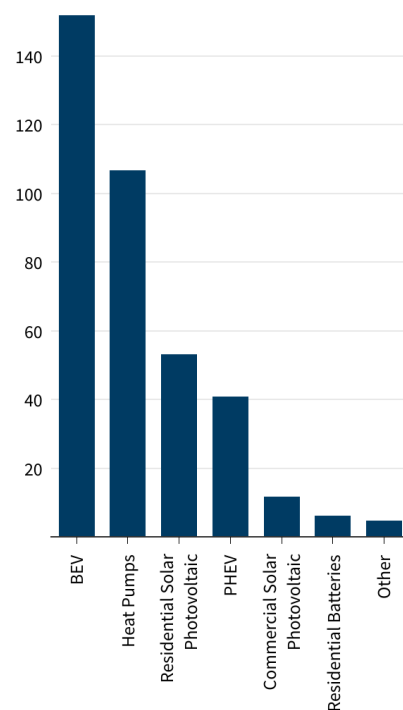


Chart: RMI Graphic • Source: Clean Investment Monitor



## Manufacturing investment is dominated by the EV supply chain

Companies have invested over \$100 billion on EV, battery, and critical minerals projects since early 2018.

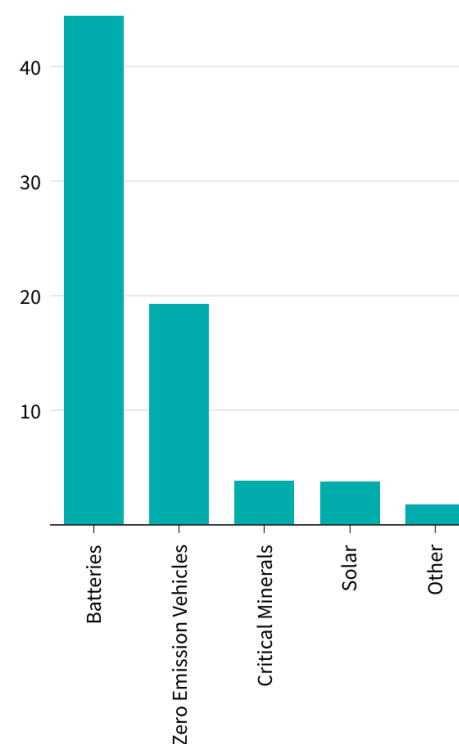


Chart: RMI Graphic • Source: Clean Investment Monitor



## Solar and wind projects make up the bulk of energy and industry investments.

Developers have invested roughly \$200 billion in solar and wind projects since early 2018, and a further \$31b in storage.

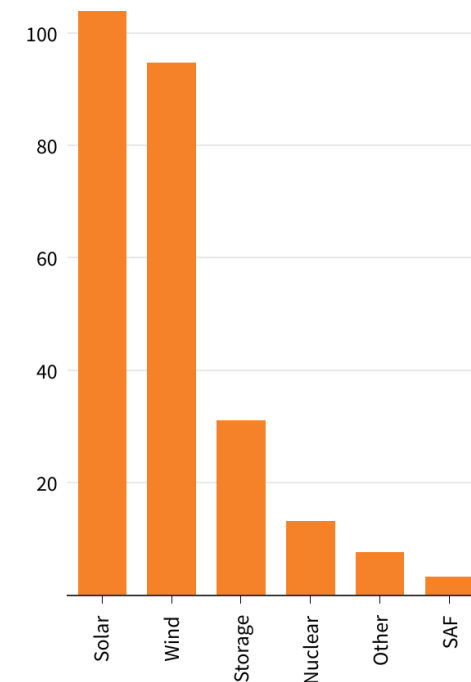


Chart: RMI Graphic • Source: Clean Investment Monitor



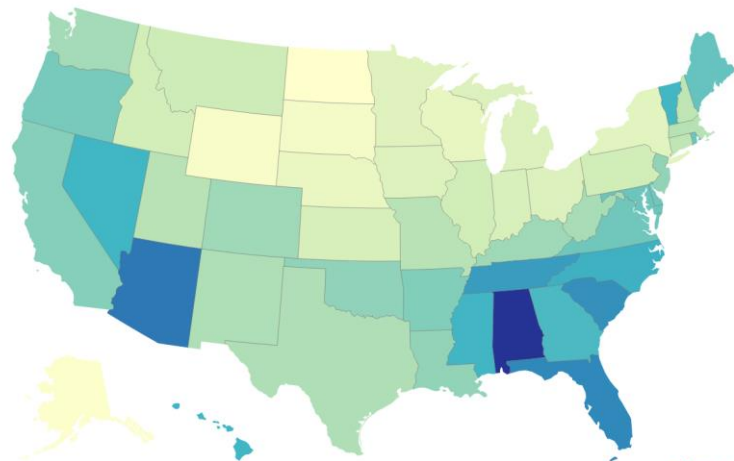


# Where is the investment going?

The geographic distribution of clean energy investment in the US differs by type of investment: retail is being led by the South, manufacturing by the Midwest and Southeast, and energy production by the Great Plains

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

Investment Share of GDP  
0 0.03

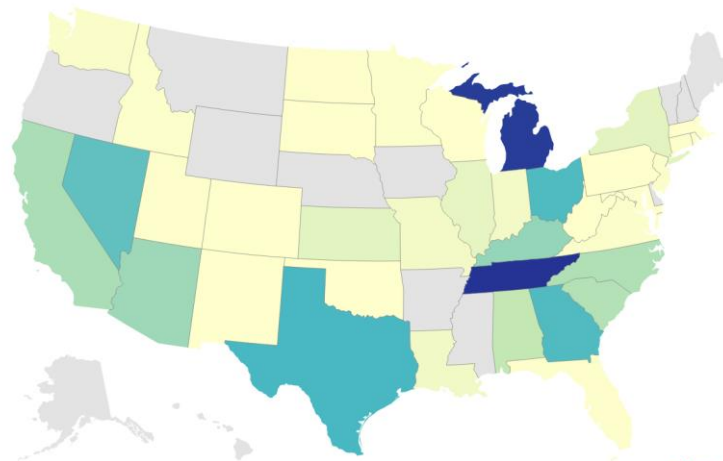


Map: RMI Graphic • Source: Clean Investment Monitor



Manufacturing investments are clustered around vehicle and electronics manufacturing hubs

Total Investment (\$m)  
0 250K

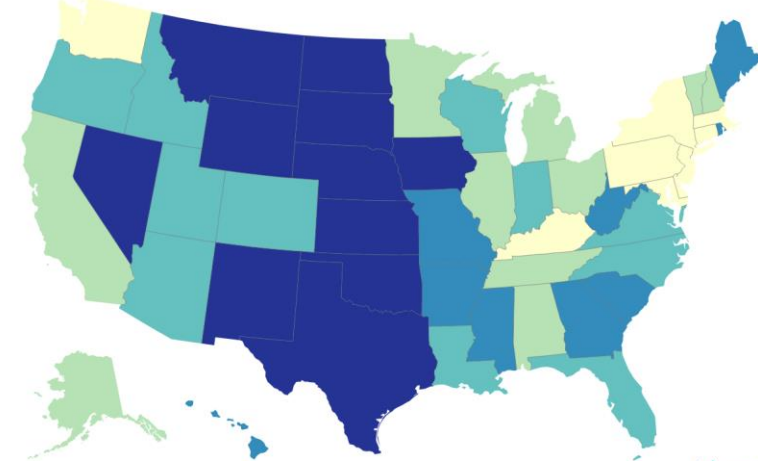


Map: RMI Graphic • Source: Clean Investment Monitor



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

Investment Share of GDP  
< 0 0-0.01 0.01-0.02 0.02-0.03 ≥ 0.03



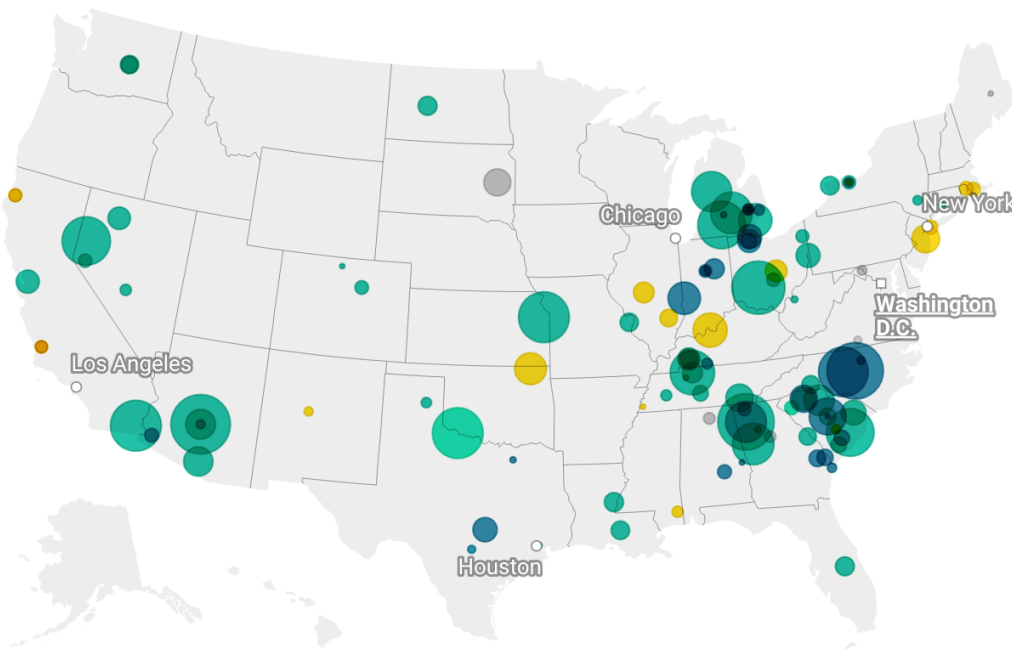
Map: RMI Graphic • Source: Clean Investment Monitor



# Manufacturing investment has so far been concentrated in select states

Over \$120 billion in new cleantech manufacturing investments have been announced since passage of the IRA

- Batteries
- Clean Tech
- Electric Vehicles
- Electrical Grid Distribution And Transmission
- Home energy efficiency and electrification
- Hydrogen
- Rail
- Renewables
- Renewables Manufacturing
- Sustainable Aviation Fuel
- Transmission & Grid



Source: Climate Power • Created with Datawrapper

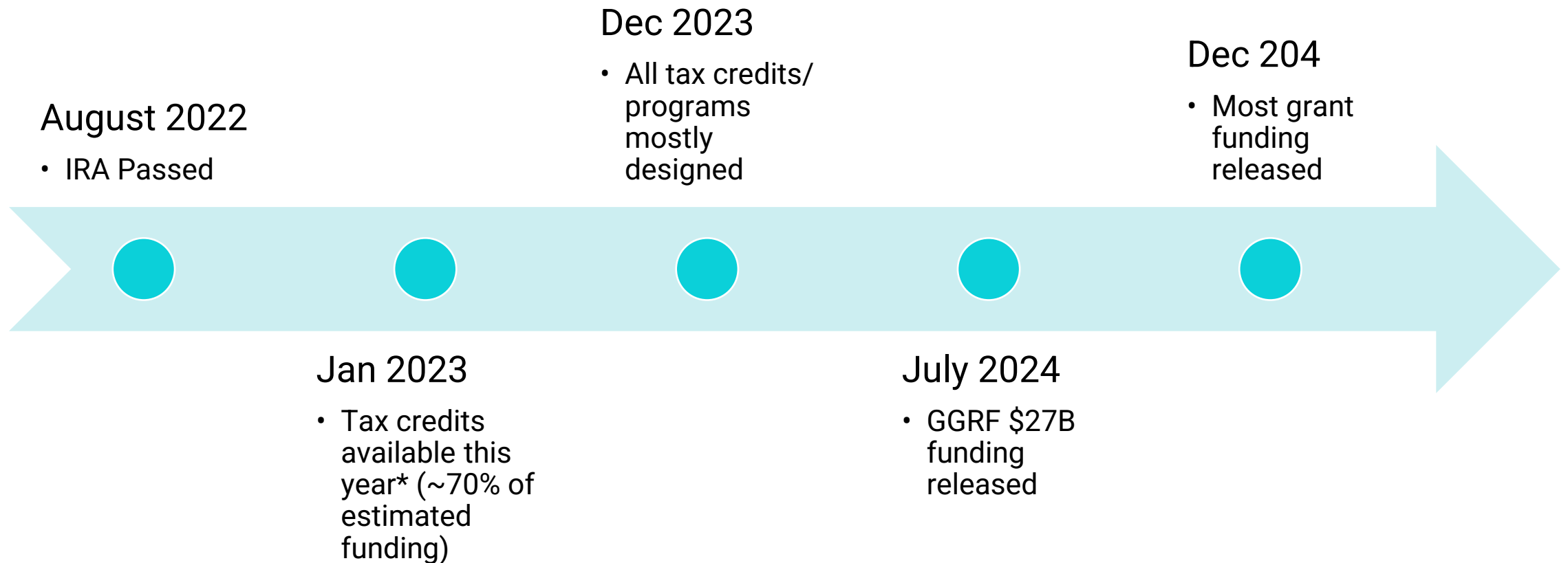
## Michigan, Georgia, and the Carolinas Have Been the Early Winners in the Cleantech Investment Bonanza

Announced investment and job numbers in cleantech projects since August 2022.

	Total Investment (\$b)	Permanent Jobs
Michigan	19,863,070,000	11,832
Georgia	13,300,000,000	11,188
South Carolina	10,500,000,000	9,155
North Carolina	9,590,525,233	3,240
Arizona	8,310,000,000	8,280
Ohio	7,762,514,939	4,550
Tennessee	5,600,800,849	3,850
California	5,457,100,000	3,300
Texas	4,953,700,000	1,243
Nevada	4,544,811,711	5,800
Kansas	4,000,000,000	4,100
Kentucky	3,269,564,400	1,503
Indiana	2,220,000,000	717

Source: Climate Power • Created with Datawrapper

# 2023 was all about designing IRA, 2024 is the year of project deployment





# Electricity Tax Credits, Direct Pay & Transferability



**What does the clean energy transition mean for jobs in my community?**

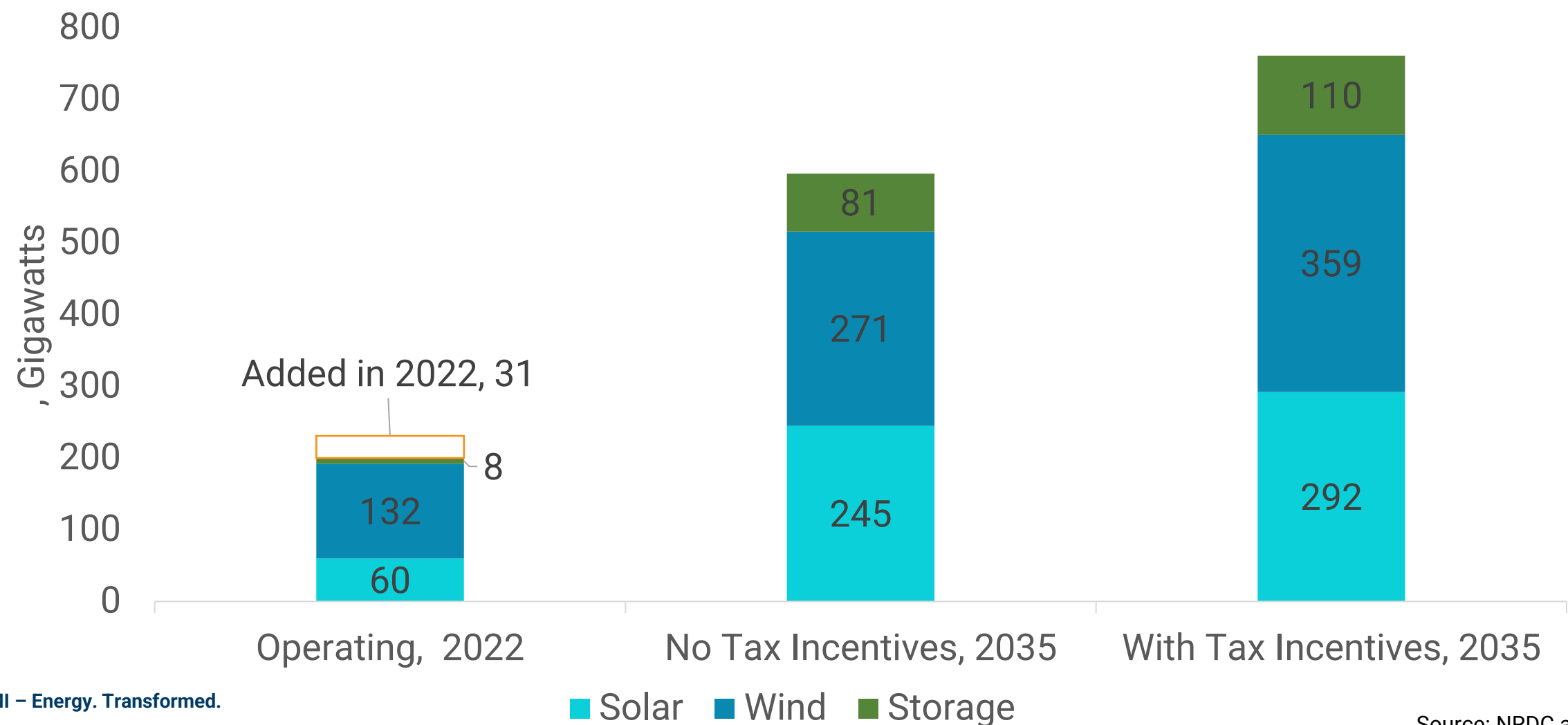
**How can my community attract the next data center from a major tech company?**

**What are communities thinking about?**

**Can we co-locate new energy technologies with new business opportunities to attract companies with ESG goals?**

**What types of new manufacturing will be created in my community?**

# Clean electricity capacity growth is expected to almost quadruple by 2035 due to IRA tax credits



# The IRA expanded the two tax credits that have been the primary economic drivers for renewable energy projects – and extended them to 2035



## **Production Tax Credit (45)**

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




## **Investment Tax Credit (48)**

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



# *IRA created direct pay – a gamechanger for tax-exempt entities pursuing clean energy projects*

## BEFORE

- Clean energy tax credits only available for entities with tax liability
  - Cities and other tax-exempt entities needed to create partnerships with entities with tax liabilities or sign third-party agreements to receive some of the benefits
  - This often resulted in fewer incentives passed on to the tax-exempt entity or fewer options to own your energy
- 

## NOW

- Direct Pay (aka Elective Pay) allows tax-exempt entities to receive the value of the credit as a direct payment from the IRS

# Entities not eligible for direct pay can utilize transferability, which lowers transaction fees

## BEFORE

- High transaction fees for lawyers and bankers to set up complicated tax equity deals
- Limited universe of tax equity investors meant entities seeking tax-equity had to forfeit a higher % of the credit
- IOUs had almost no tax liability so rarely owned renewables

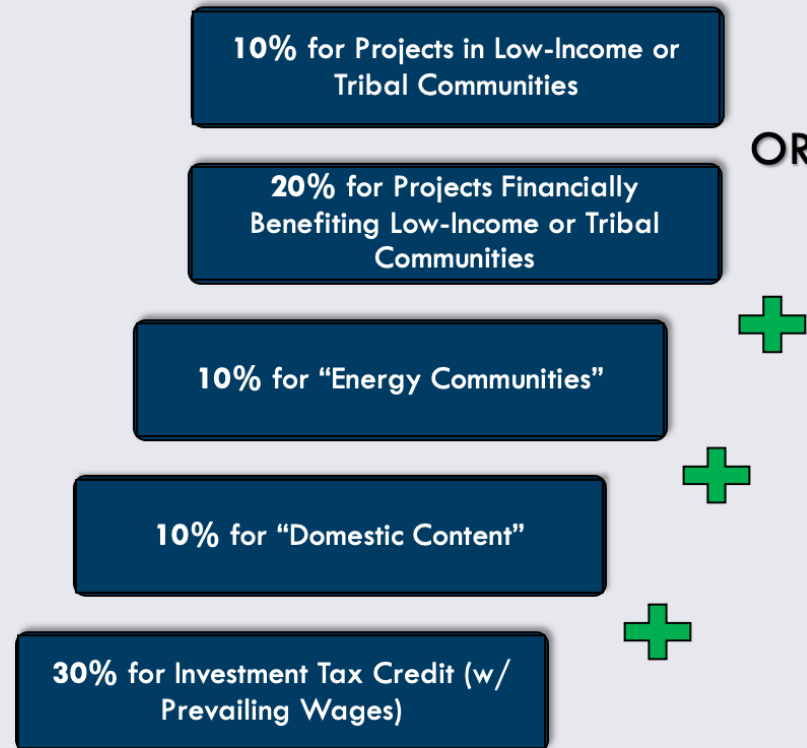


## NOW

- Simpler transactions through transferable credits market and lower transaction fees
- Tax equity market expands as other entities besides large banks can participate in transfer market

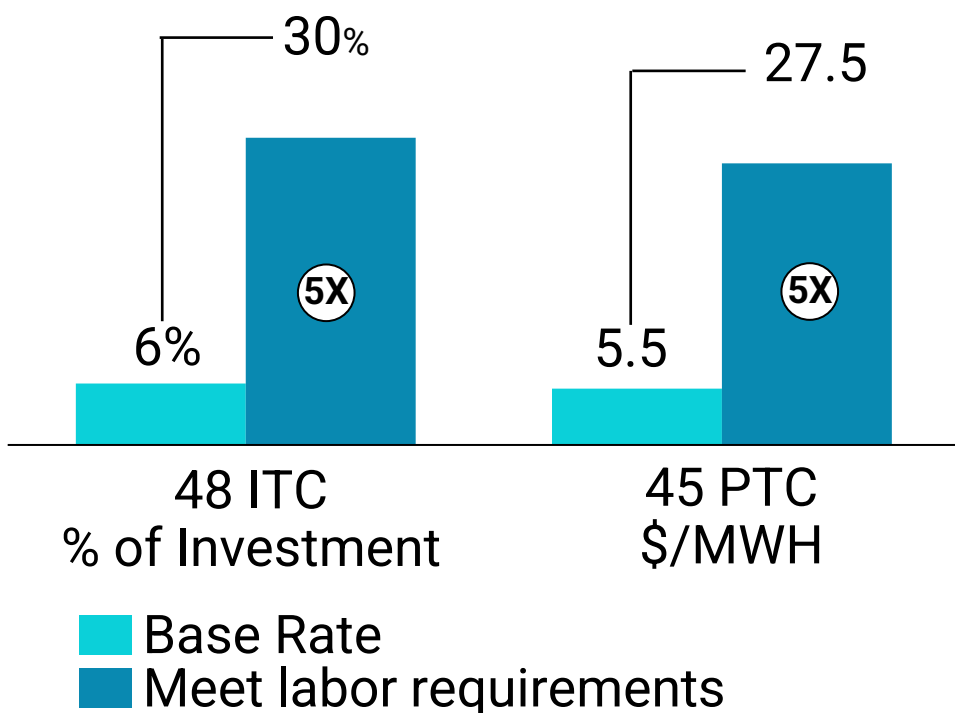
# New federal tax credit “adders” now incentivize projects that invest in US communities

## THE STACK OF IRA “ADDERS” FOR CLEAN ENERGY PROJECTS



*Note: While the PTC is calculated differently, the incentive ratios stack the same.*

# IRA electricity tax credits were designed to support the creation of new good-paying jobs



## 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



# How would new incentives impact a local project?

## Size:

- 2 MW

## Owner:

- City of Milwaukee

## Anticipated Project Start:

- Q1 2025

## Type of project:

- Community solar

## Structure of Community Solar:

- 100% of subscription goes to low-income households

## Location of project:

- Milwaukee Department of Public Works HQ

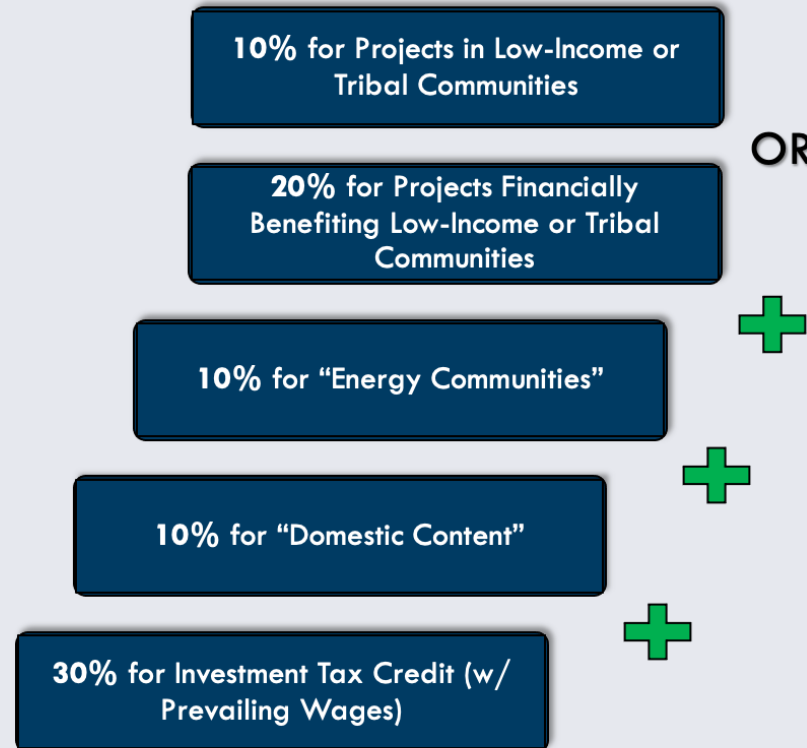
## Solar panel manufacturer:

- Helio Solar Works (manufactured in Milwaukee)



# Let's walk through the new clean energy incentive stack for Milwaukee's proposed project

## THE STACK OF IRA "ADDERS" FOR CLEAN ENERGY PROJECTS



*Note: While the PTC is calculated differently, the incentive ratios stack the same.*

# The “Domestic Content” incentive can be leveraged in 2 key ways – for your project and for your economy

## For Your Project

- **What:** “Domestic Content” incentivizes investments into US-made materials
- **How Much:** 10% credit for eligible clean energy project costs
- **Requirements:** All iron and steel for significant structural components + increasing amount of manufactured technical components (ex. solar trackers, panels, and inverters)

## For Your Economy

- **Why:** Intended to scale US manufacturing for iron, steel, and many other clean energy project components
- **Opportunity:** Plan now to attract energy sector-related businesses and manufacturing jobs where demand for US-sourced materials is expected to increase nationwide
- **Impact to date:** Since passage of IRA, more than **240 GW** of manufacturing capacity announced across solar supply chain, representing **22,000 potential jobs** and more than **\$12B** in announced investment

# Expect *demand* to rise quickly across the US energy sector for domestically manufactured components

## Inflation Reduction Act Domestic Content Requirements:

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%



# The requirements for “direct pay” further increase the economy-wide demand for domestic content

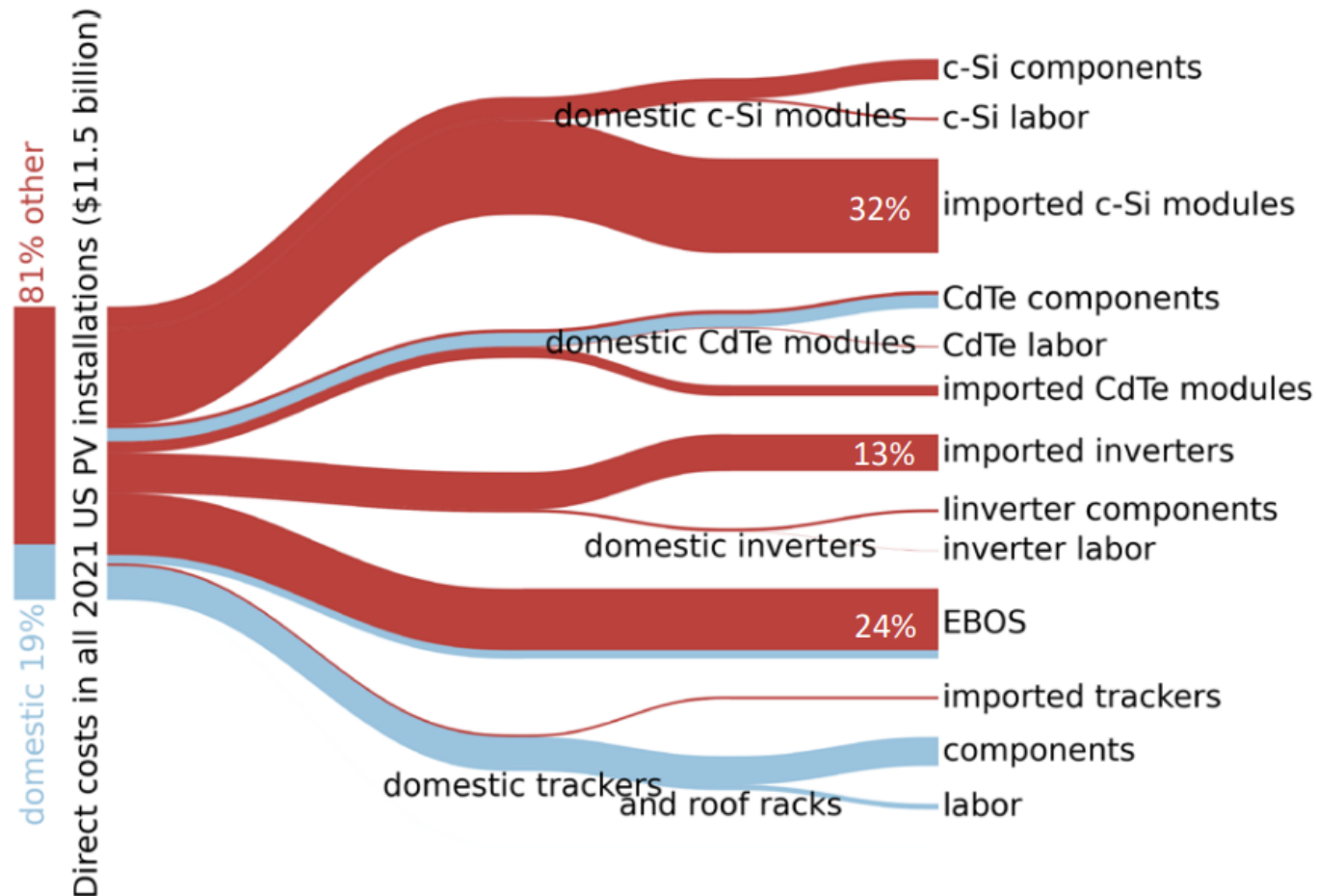
## What This Means

- Projects starting construction after 2025 that are larger than 1 MW must meet domestic content requirements or they will not be able to claim the clean energy tax credits

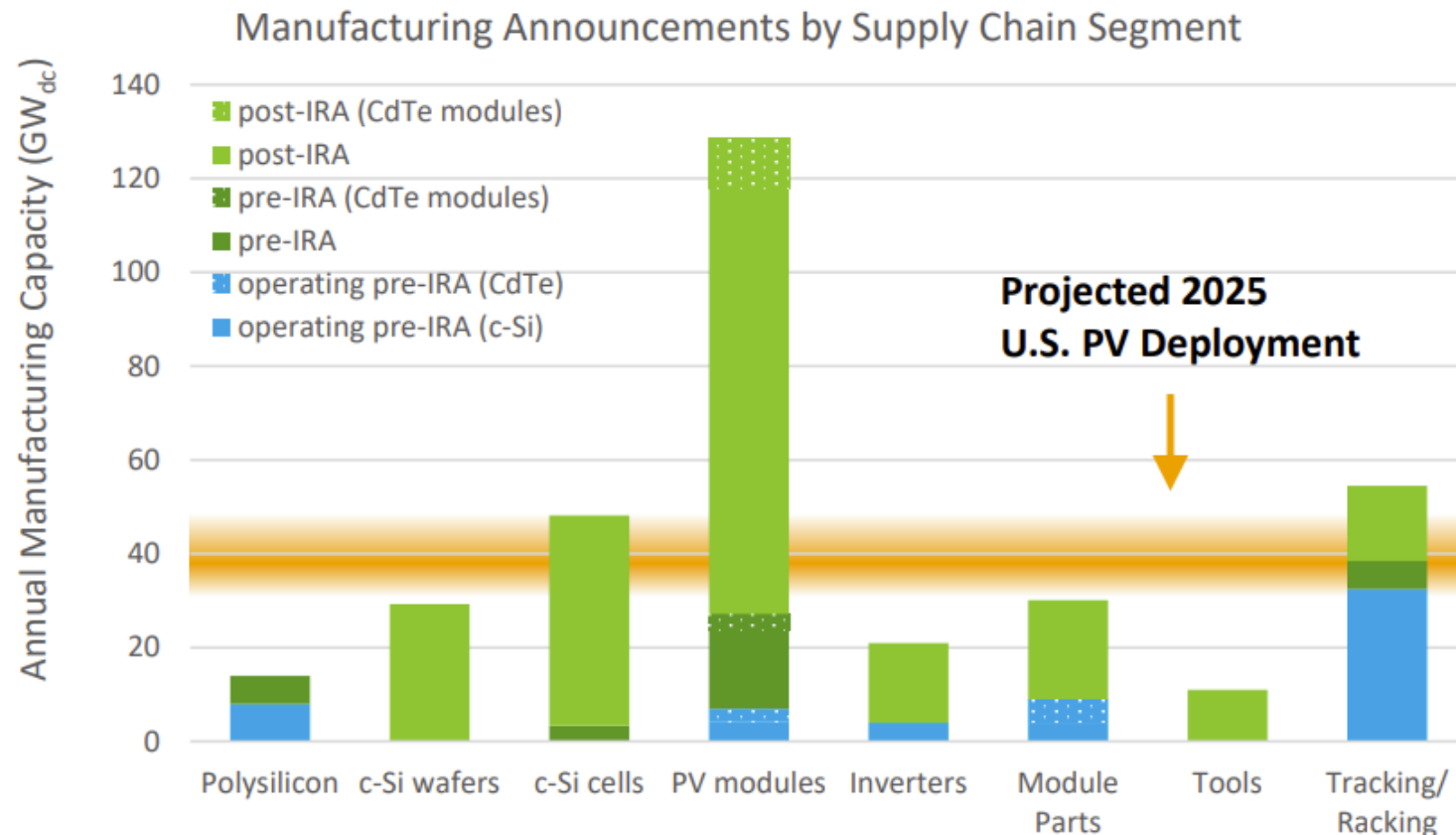
## Exemptions

- If product or component is unavailable
- If it increases the cost of the project by 25% or more

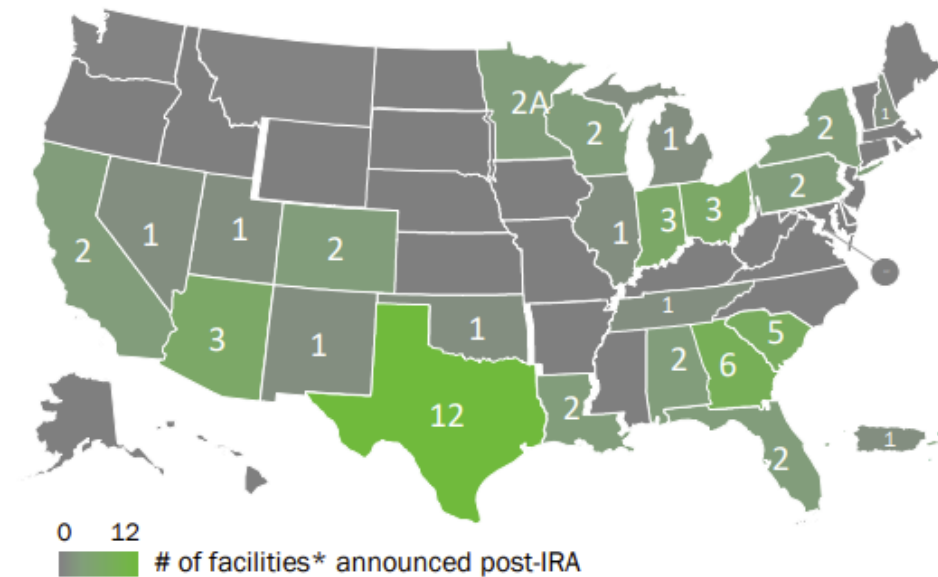
# The domestic manufacturing market must grow to meet this requirement



# Since IRA passed, \$12B of investments have been announced for manufacturing capacity across the solar supply chain, but more is needed



These announcements post-IRA represent potential investment in 23 states and Puerto Rico.



Sources: Internal DOE tracking of public announcements and BNEF Global PV Market Outlooks and Wood Mackenzie and SEIA Solar Market Insights Q2 2022 and Q2 2023.

\*Not all announcements include facility locations, job, or investment numbers. See: [Building America's Clean Energy Future](#) | [Department of Energy](#)

# Applying “domestic content” incentive and requirements to Milwaukee project

Are we eligible for 10% domestic content adder?

- Solar manufacturer: Helio Solar Works

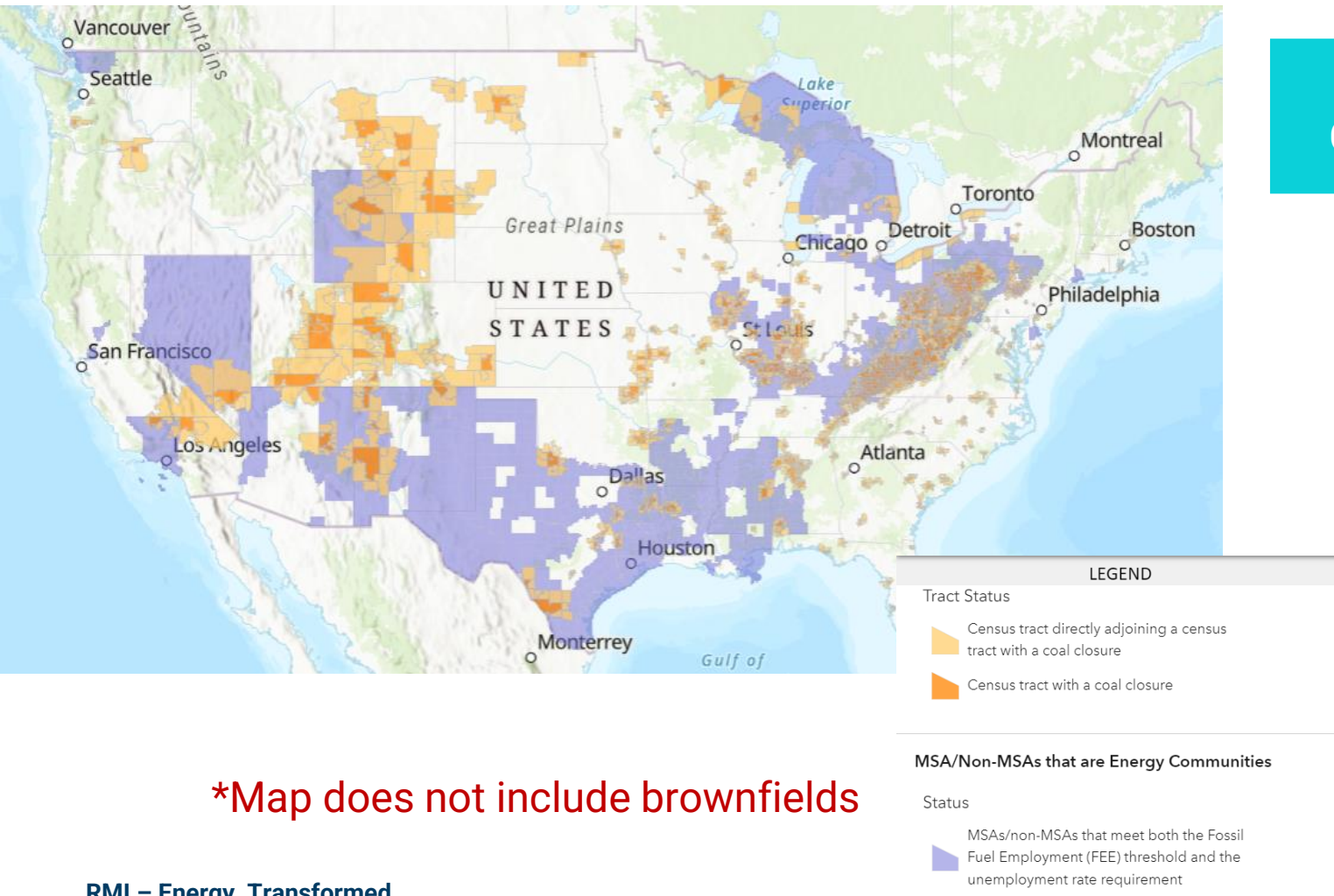
Are we concerned about losing direct pay?

- Owner: City of Milwaukee <--*eligible for direct pay*
- Project size: 2 MW <--*large enough to have to meet domestic content requirements to get direct pay*
- Anticipated project start: Q1 2025 ←*within timeframe where domestic content requirements is required*

*"Helios Solar Works is headquartered in Milwaukee, Wisconsin. We manufacture our modules using materials sourced from regional and U.S. suppliers **whenever possible**."*



# Energy Communities map 2023



Coal  
Closure

Brownfield  
Site

Employment

## Example Project:

Location: Milwaukee Department of Public Works HQ

Not eligible for 10% energy community bonus!



\*Map does not include brownfields

# The Low Income Communities Bonus is the only adder that is not guaranteed

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Maximum net output for projects is 5 MW

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Annual capacity limitation is capped at 1.8 GW

---

10-20% bonus depending on criteria

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Requires applying and being selected to receive credit

# The Low-Income Communities Bonus Credit Program 48(e) was oversubscribed in 2023

Category 1: Located in low-income community

10% Adder

2023 Allocation:  
700 MW

Applications:  
4,258 MW (608%)

Category 2: Located on Indian Land

10% Adder

2023 Allocation:  
200 MW

Applications: 42  
MW (21%)

Category 3:  
Qualified Low-Income Residential Building Project

20% Adder

2023 Allocation:  
200 MW

Applications: 160  
MW (80%)

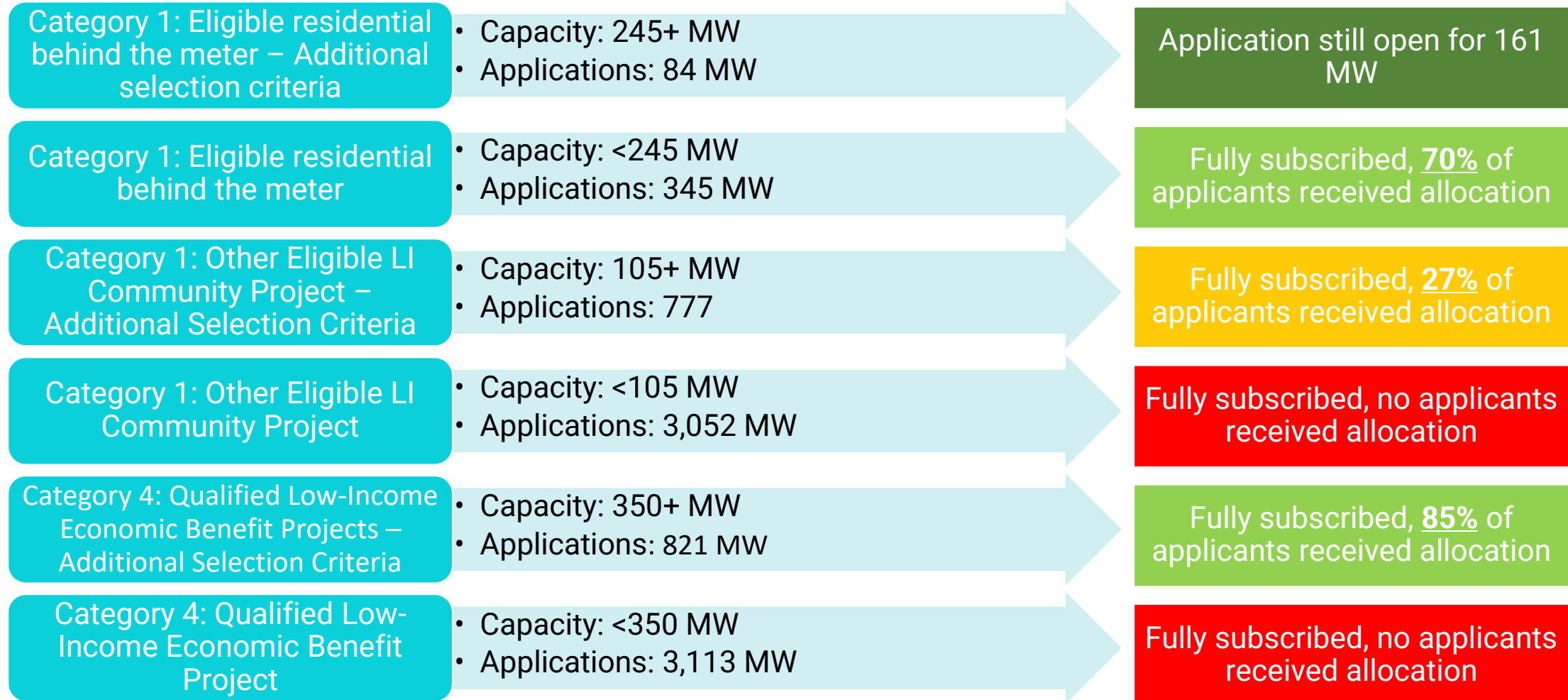
Category 4:  
Qualified Low-Income Economic Benefit Project

20% Adder

2023 Allocation:  
700 MW

Applications:  
3,934 MW (562%)

# Deep Dive on Category 1 and Category 4



# Meeting additional selection criteria is critical to receiving allocation

Meeting both additional selection criteria would almost guarantee allocation



## *Ownership criteria*

The ownership criteria is based on characteristics of the applicant that owns the qualified solar or wind facility.

- Tribal enterprise
- Alaska Native Corporation
- Renewable energy cooperative
- Qualified renewable energy company
- Qualified tax-exempt entity



## *Geographic criteria*

The geographic criteria is based on the county or census tract where the facility is located.

- Persistent Poverty County
- Climate and Economic Justice Screening Tool (CEJST) Energy Category



# Let's go back to this example project

Design decisions could be the difference between getting 20% off your project cost or not

**Does it meet low-income community requirements to qualify for category 1?**

Location of Project: Milwaukee  
Department of Public Works HQ



**Does it meet economic benefit requirements to qualify for category 4?**

Structure of community solar: 100% of subscription goes to low-income households

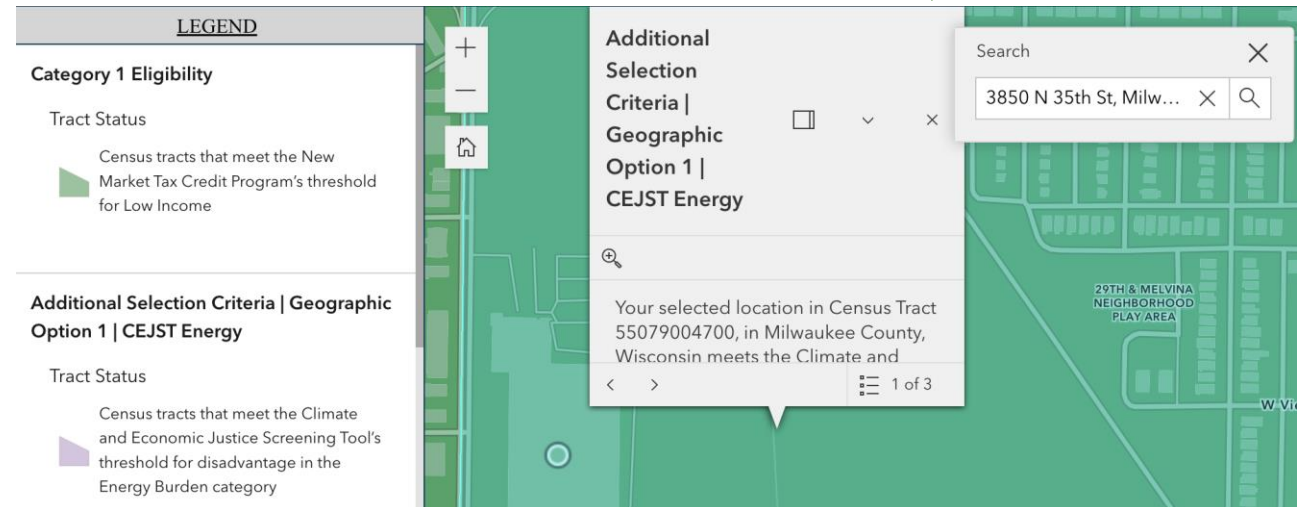
Yes, if project is structured to reduce energy bills by 20%



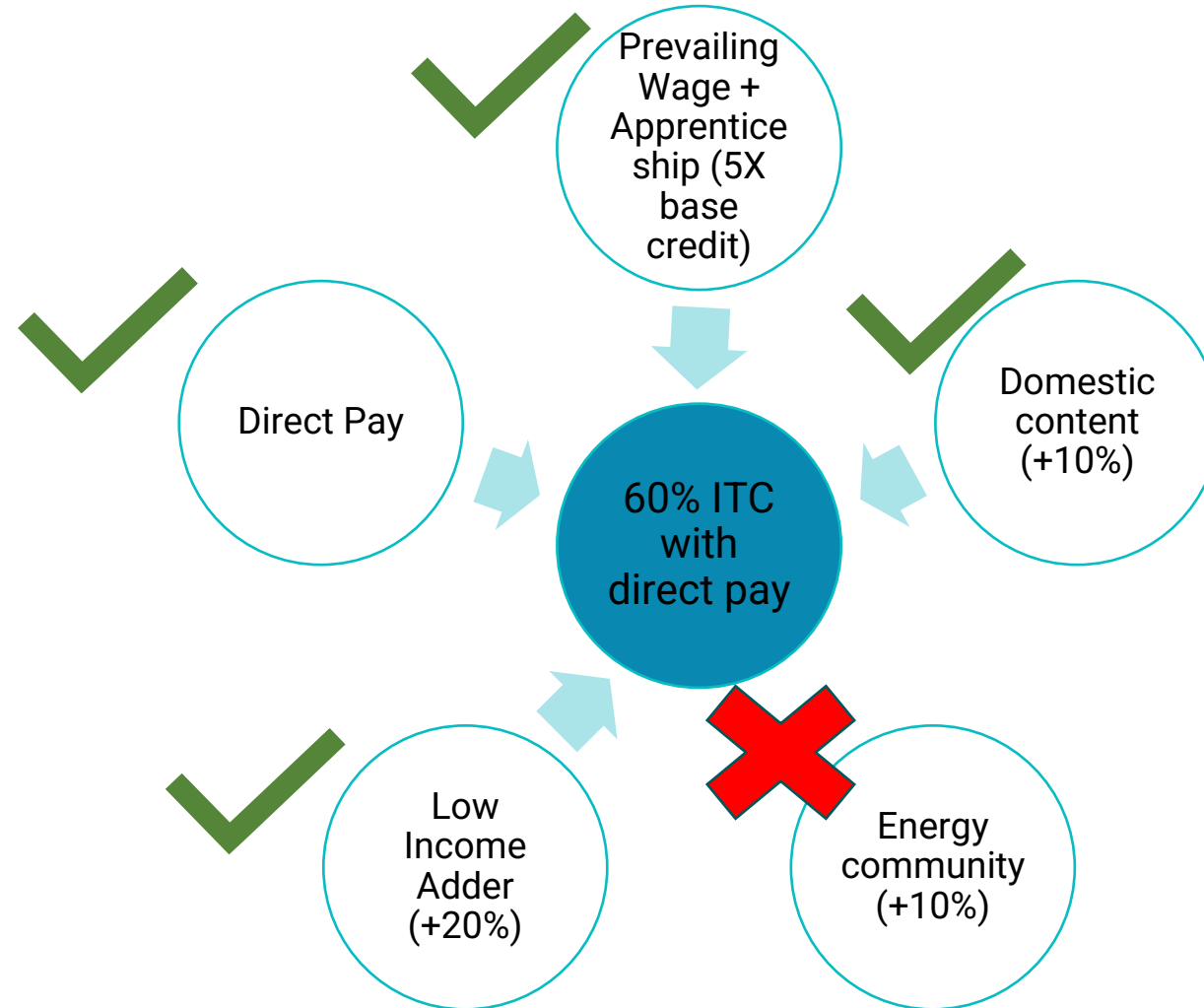
**Does it meet additional selection criteria to make the project more competitive?**

Location of Project: Department of Public Works HQ  
Owner: City of Milwaukee

Ownership Criteria? -- Yes, qualified tax exempt entity  
Location Criteria? -- Yes, in CEJST designated area



# This example project would likely get more than 2X as much funding as it would have before IRA



# Elective Pay treats the amount of the credit as a payment of tax and refunds any resulting overpayment

- **Eligible Entities:** All tax-exempt entities including economic development agencies, states, rural electric coops, municipal utilities, cities, counties, water districts, school districts, public universities hospitals, and tribal governments
- **Eligible Credits:**

Energy Credit (48)

Renewable Electricity  
Production Credit (45)

Commercial Clean  
Vehicle Credit (45W)

Zero-emission Nuclear  
Power Production  
Credit (45U)

Advanced  
Manufacturing  
Production Credit  
(45X)

Clean Hydrogen  
Production Credit  
(45V)

Clean Fuel Production  
Credit (45Z)

Carbon Oxide  
Sequestration Credit  
(45Q)

Credit for Alternative  
Fuel Vehicle Refueling  
/ Recharging Property  
(30C)

Qualifying Advanced  
Energy Project Credit  
(48C)

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



# Transferability allows entities to transfer all or a portion of credit to a third-party buyer in exchange for cash

- **Eligible Entities:** Entities not eligible for direct pay
- **Eligible Credits:**

Energy Credit (48)

Renewable Electricity  
Production Credit (45)

Commercial Clean  
Vehicle Credit (45W)

Zero-emission  
Nuclear Power  
Production Credit  
(45U)

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Production Credit  
(45X)

Clean Hydrogen  
Production Credit  
(45V)

Clean Fuel Production  
Credit (45Z)

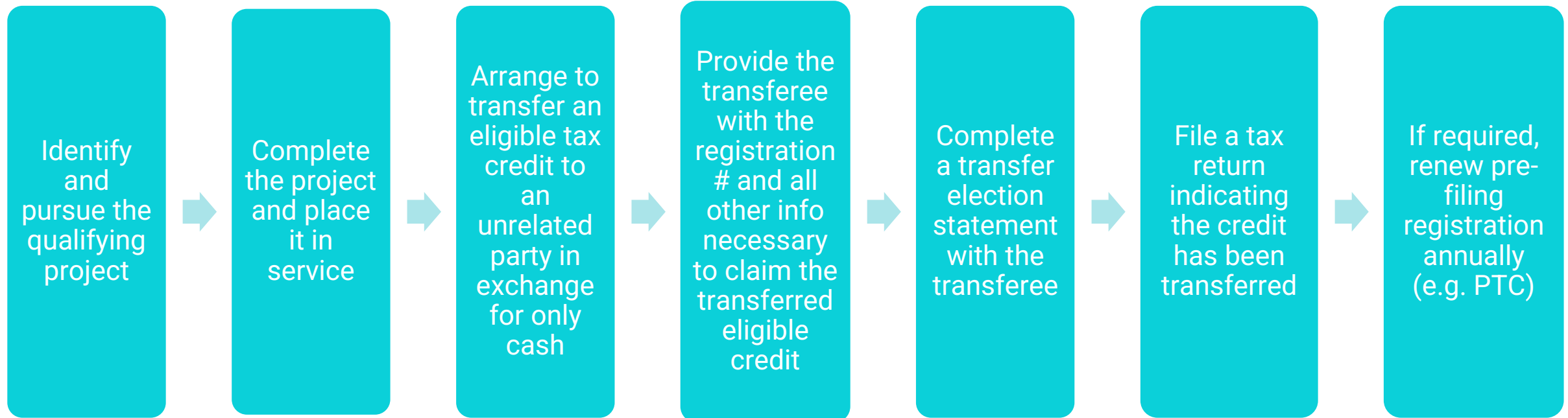
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Sequestration Credit  
(45Q)

Credit for Alternative  
Fuel Vehicle Refueling  
/ Recharging Property  
(30C)

Qualifying Advanced  
Energy Project Credit  
(48C)



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



# What are you thinking about now that we've covered the basics of the clean energy tax credits, direct pay, and transferability?

## 1. Relation to Current Role:

- I see a direct intersection between my job and most or all of these incentives
- I don't think any of this is relevant to my job

## 2. Community Readiness:

- My community is already planning with these in mind
- My community has not been planning with these in mind

## 3. Questions:

- This was a lot – I'm still trying to digest this and don't know what questions to ask yet
- I was already an expert in this and have zero questions
- I have many questions from this discussion

Questions?



# Break

Time Remaining

10.00


Start

Stop

Reset

mins: 10 secs:

0 type: None

 Breaktime for PowerPoint by Flow Simulation Ltd.

Pin controls when stopped ☒



# Permitting, Siting, Community Benefit Agreements



**Matthew Popkin and Nathan Iyer**

EMI – Energy. Transformed.



# How we build, where we build, and who is impacted from what we build can make or break a project

## Permitting

- How a project is built or developed (and/or what approvals are necessary to proceed)
- Level: Local, regional, state, federal

## Siting

- Where a project is built or developed
- Level: Local, regional

## Community Benefits Agreement

- A formal arrangement (i.e. contract) between a project developer and community-based organizations that represents those impacted by a project (and/or the broader community overall)
- Level: Local



# Session Objectives

1

## **Why does this matter?**

Explore how permitting, siting, and community engagement impact clean energy projects and clean energy manufacturing

2

## **What can we really do about it?**

Understand the realities of the current processes as well as best practices to factor into project planning to best position your community and/or region for success

3

## **What's already been done?**

Break down your roles in this process and learn from peers about how to navigate complex situations

# Seeing the forest for the trees

## Cost, Time, and Viability:

- How long a project takes to get approval, address community and stakeholder concerns, and resolve any legal issues impacts project cost and, potentially, even the project's viability
- This is not unlike other economic development projects – but there are a few differences

## Community Consent:

- Energy and transmission projects often require the consent of the communities in and around their area of operation
- Construction of transmission lines, in particular, often must run across private property

## Regional Approvals:

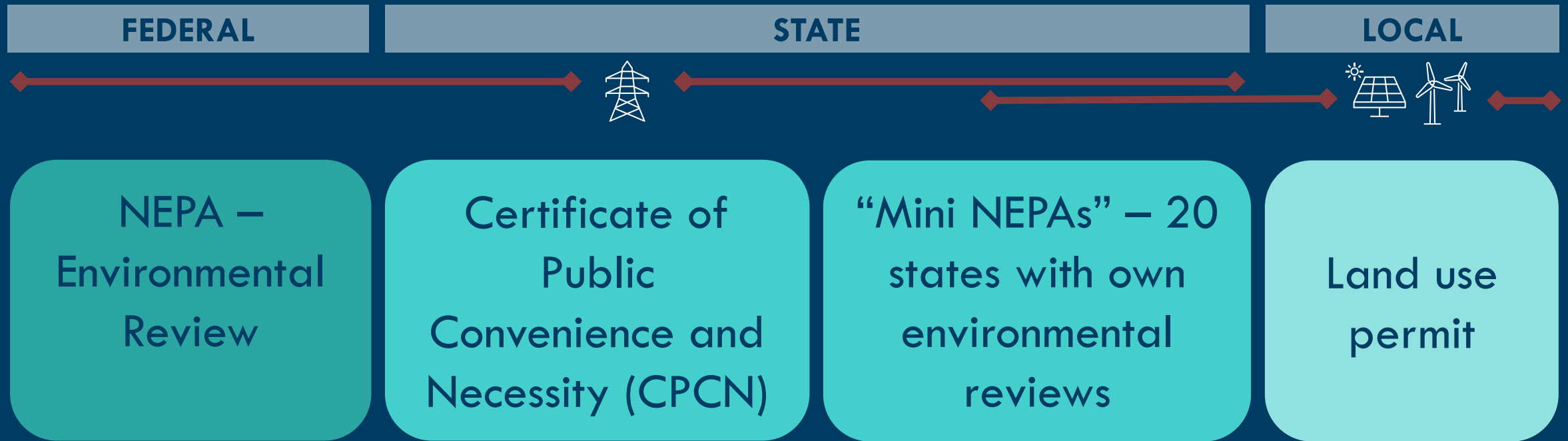
- A power-generating project requires approval from the transmission network to connect to the grid, creating another “permit” layer for the project
- Most transmission networks use a “queue” system, where developers’ interconnection applications are considered sequentially



**What governs where, what, and how you  
build new projects in your community?**



# Permitting for large energy projects occurs at federal, state, and local levels



# These permitting processes often include, if not require, a process for stakeholder engagement



NEPA requires considering alternative siting & final document proposes route



Environmental review & CPCN processes often articulate stakeholder engagement processes



Public and other stakeholder sentiment informs outcomes of NEPA and CPCNs



State CPCN issued only if project is deemed to be in the “public interest”



Local comprehensive plans and zoning should be informed by public input to shape longer term community growth

# But these processes can result in longer timelines that can jeopardize the economic and commercial viability of proposed projects



**Insufficient  
agency  
capacity**



**Lack of  
agency  
coordination**



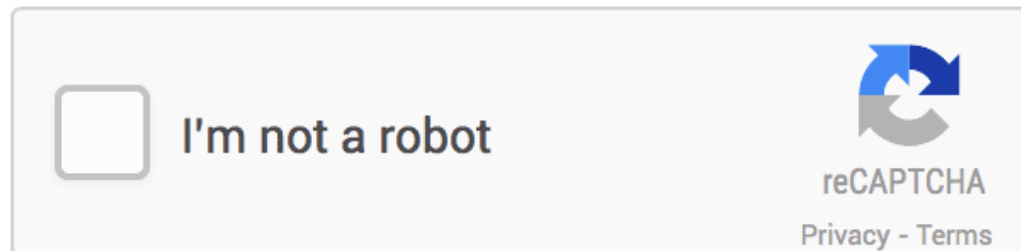
**State  
permitting  
decisions**



**Opposition &  
(fear of)  
litigation**

# Siting decisions are often influenced by multiple factors:

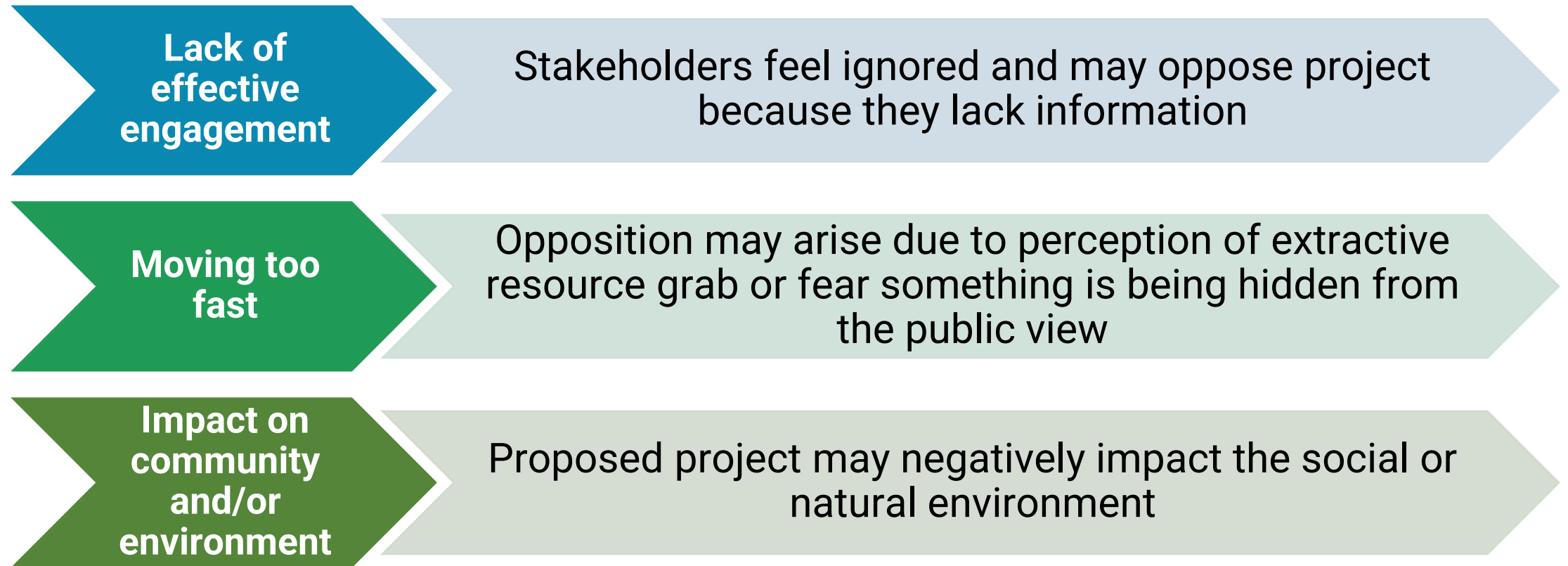
1. *Local land use regulations*
2. *Economic development priorities*
3. *Environmental stewardship*
4. *Cost of land*
5. *Proximity to and availability of existing infrastructure*



Select all squares with  
***existing energy transition infrastructure***  
If there are none, click skip



# The greatest tensions in siting result when there is misalignment between community goals and developer interests





# Potential solutions could improve agency processes and tackle political complexities



**Early  
engagement**



**Building agency  
capacity**



**Cross-agency  
coordination &  
streamlining**

# For *interstate* and *offshore* transmission projects, the US Department of Energy's Transmission Siting and Economic Development grants program may help

## Purpose:

- Transmission siting authorities on siting impact analyses;
- Actions to streamline approval or permitting process; or,
- Economic development activities for communities affected by the siting

## Types of Economic Development Activities:

- EV charging, clean energy, microgrids
- Community centers and green spaces
- Essential community facilities for public safety, healthcare, education, and improved transit
- Workforce development and job training

## Funding Available:

- Up to \$10,000,000 for siting and permitting awards
- Up to \$50,000,000 for economic development awards

## Notes:

- Economic development funds may only be released after the approval or commencement of construction of the covered transmission project
- Economic development offices cannot qualify for this on their own –rather they would partner with state, Tribal, or local government entities who apply for economic development funds



# Siting Checklist



## ***Strategic Land Use:***

- ☐ ***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?

## ***Strategic Engagement:***

- ☐ ***Are your development processes and procedures clearly communicated and easy to find?***
- ☐ ***Have community stakeholders already weighed in on goals, visioning, land use planning, and other processes?***
  - ☐ What types of pre-siting and community benefit agreements can be discussed before projects advance heavily?
- ☐ ***What depth of community engagement is encouraged and supported?***
  - ☐ Are community engagement processes designed to be inclusive?

# Making community benefits tangible can help drive consensus and develop comprehensive solutions

## Community Benefits Plan

- **What It Is:** Plan requested or required by federal agencies (potentially others too) when receiving federal funding
- **Goal:** Intended to advance community and labor engagement, support quality jobs and workforce development, promote diversity, equity, inclusion, and accessibility, and implement Justice 40 goals
- **What It Does:** Demonstrate a clear process for community and labor engagement
- **Notes:** Intentionally flexible mechanism for communities to leverage



# Making community benefits tangible can help drive consensus and develop comprehensive solutions



## Community Benefits Agreement

- **What It Is:** Contract negotiated between communities and project developers
- **Goal:** Intended to help build and sustain support for projects
- **What It Does:** Specify what benefits the community will receive in exchange for supporting the developer's project in their neighborhood(s)
- **Notes:** Benefits could include guaranteed minimums for local hiring, inclusion of affordable units in new housing, and enhancing parks or community facilities



# Regardless of which of these or other paths your community takes, it is important for developers and project planners to engage proactively and clearly

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3

## **What's already been done?**

Break down your roles in this process and learn from peers about how to navigate complex situations

Questions?



# Beverages & Barrier - Small Group Discussion

Time Remaining

40:00

Start

Stop

Reset

mins: 40

secs: 0

type: None



Breaktime for PowerPoint by Flow Simulation Ltd.

Pin controls when stopped ☒



# Welcome to Day 2: RMI's IRA Bootcamp for Economic Development Practitioners



# Agenda – January 17, 2023 (Day 2)

8:00 a.m.	Light Breakfast
8:30 a.m.	Opening Remarks
8:45 a.m.	Reinvesting in Brownfields & Energy Communities for the Clean Energy Economy
9:50 a.m.	Public Financing, Green Banks & Greenhouse Gas Reduction Fund
11:00 a.m.	BREAK
11:15 a.m.	Green Hydrogen & 45V
12:30 p.m.	LUNCH
1:15 p.m.	Cleantech manufacturing & 48C/45X
2:30 p.m.	Break
2:45 p.m.	Case Study Breakouts: Leveraging the IRA
3:45 p.m.	Workshop Wrap-Up
4:30 pm	End of Day



# Reinvesting in Brownfields and Energy Communities for the Clean Energy Transition





# **What are you hoping to get out of this session?**

- 1. I know nothing about this topic and want to learn more**
- 2. I manage a redevelopment or brownfields program and want to know what's possible for my community**
- 3. I/my community is starting to explore this type of project and I want to vet whether this is a good idea**
- 4. I'm an expert in this topic and intend to heavily critique this presentation**
- 5. This seemed like the best way digest breakfast**

**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

## **What?**

Establish baseline knowledge about brightfields and energy communities

2

## **Why?**

Understand the potential opportunity that exists

3

## **How?**

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



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



## Brownfield:

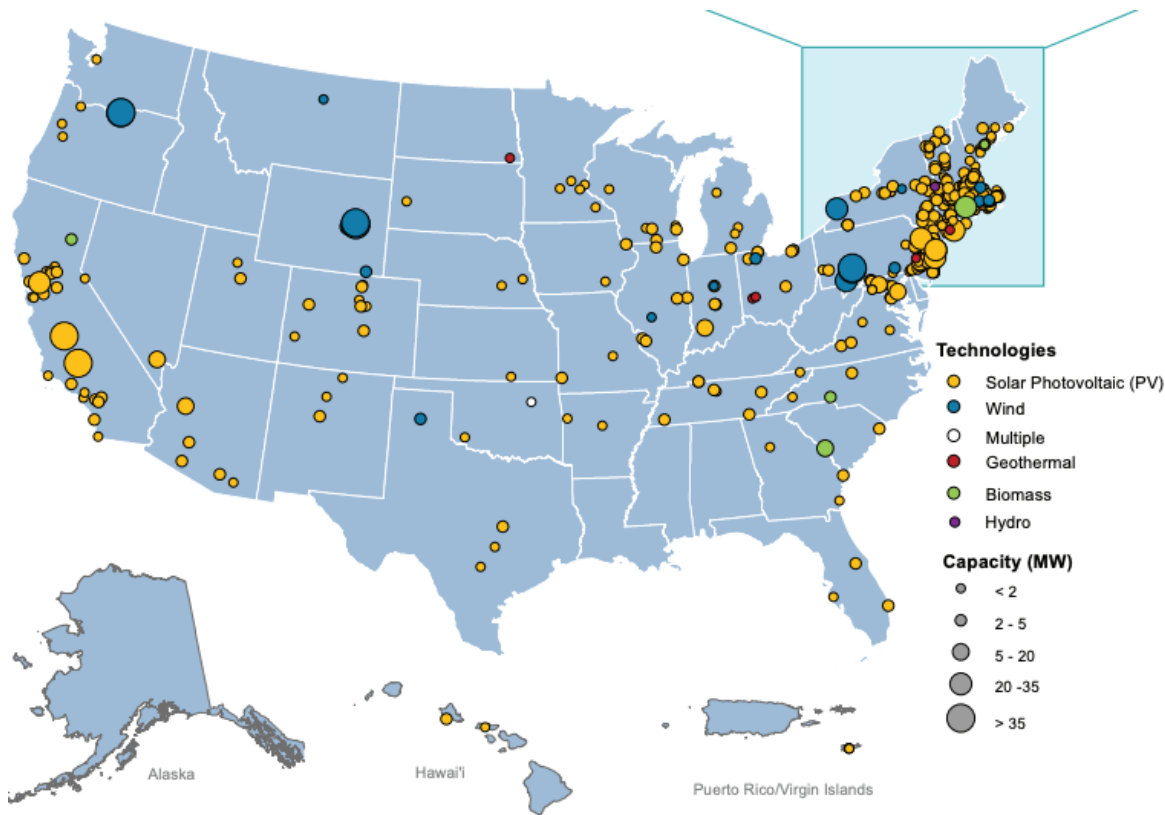
- A property where the expansion, redevelopment, or reuse may be complicated by the *presence or potential presence of a hazardous substance, pollutant, or contaminant*
- Common brownfields include former industrial sites, inactive landfills/dumps, old factories, abandoned mines, and closed power plants

## Brightfield:

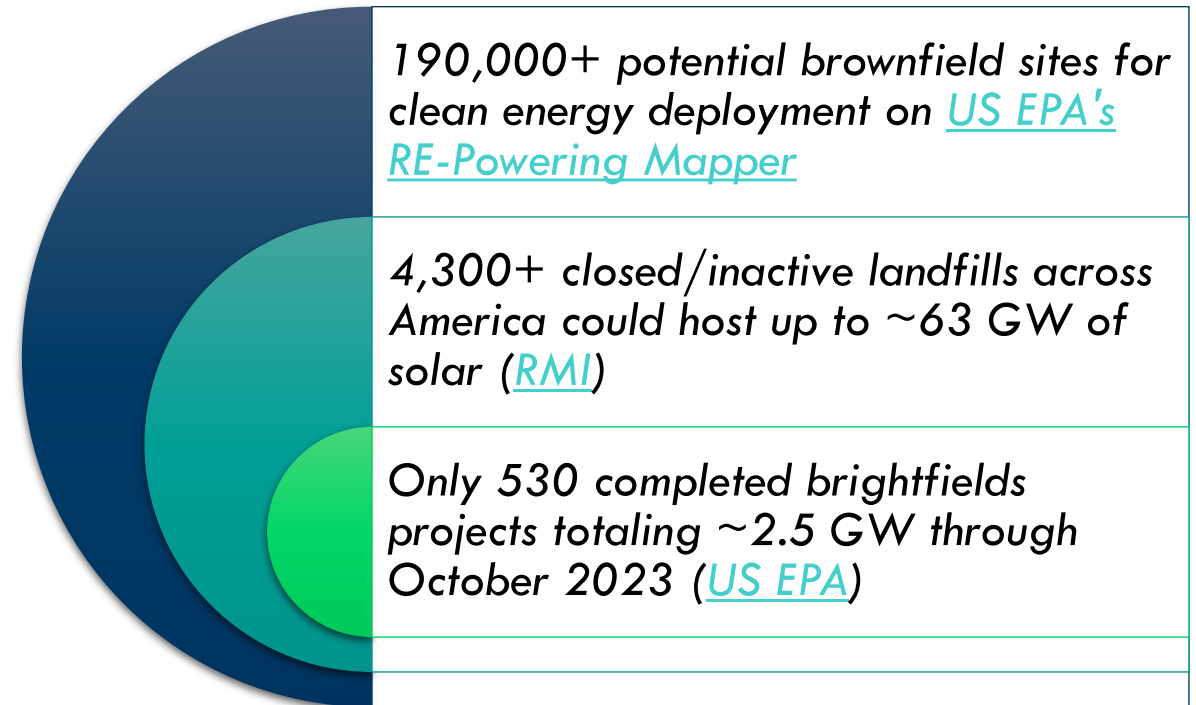
- A type of redevelopment where clean energy is built on a former brownfield or Superfund site.

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

*Brightfields Deployed Across US by Technology*



Source: [US EPA Re-Powering America's Land Tracking Matrix 2023](#)



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

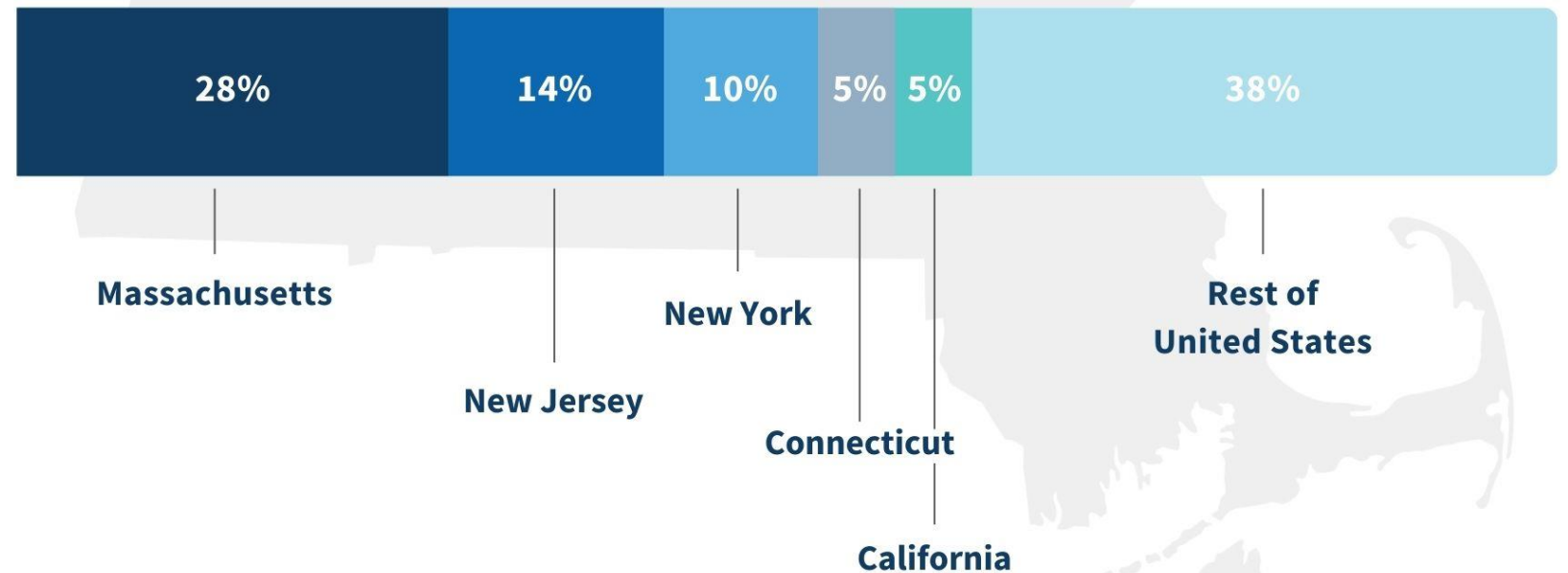


# Brightfields come in all shapes and sizes



**Brightfields are growing across the country, yet 62% of the progress has been in just 5 states**

### Geographic Concentration of Installed Brightfield Projects



Source: EPA's RE-Powering America's Lands Initiative: Project Tracking Matrix, October 2021



# While 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
- Project is spurring federal, local, and private investments in solar and STEM workforce training for 175+ residents





# 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

**TIME**

**U.S. Landfills Are Getting a Second Life as Solar Farms**

**pV magazine**

**Former Houston landfill set to become the country's largest urban solar project**

The 50 MW Sunnyside solar project is set to be constructed on 240 acres of former landfill land just outside of downtown Houston.

JANUARY 21, 2021 **TIM SYLVIA**

**COLUMBUS  
BUSINESS FIRST**





**Franklin County's former landfill will soon become a giant solar farm**

**The Highlight**  
BY **Vox**

**The wasted potential of garbage dumps**

Toxic landfills are emblems of environmental injustice across the US. Clean energy can remake them.

# Closed landfills are particularly promising sites for hosting solar energy

	<b><i>Conductive Site Conditions</i></b>	Landfills typically have good sun exposure and other characteristics that support solar energy installation
	<b><i>Limited Reuse Options</i></b>	Closed landfills have few, if any, competing redevelopment options, and using landfills avoids land-use conflict with other revitalization priorities
	<b><i>Environmental Justice</i></b>	Landfill solar offers a sustainable, non-hazardous reuse of sites that were often prior areas of environmental injustice
	<b><i>Potential for Revenue</i></b>	Landfill solar can breath 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 (\$100M+)
- 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. Intrigued but need to learn more**
- 3. Unsure/Skeptical**
- 4. Not interested/Not a fit for my community**
- 5. Still digesting breakfast**

# Recently created and enhanced incentives in the IRA will increase the financial opportunity for brightfields nationally

## With What:

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

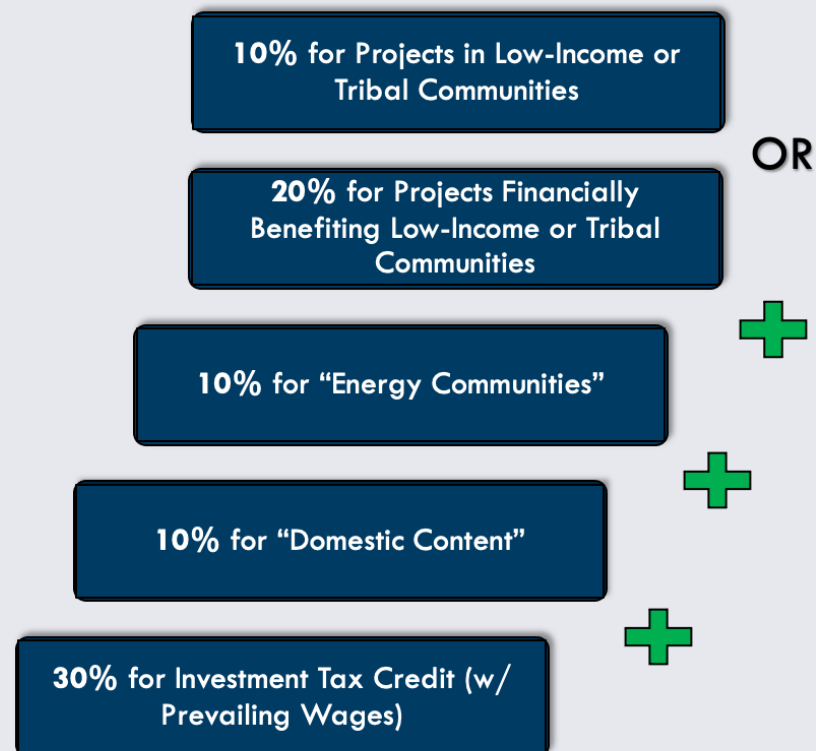
## Where:

- 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

## THE STACK OF IRA “ADDERS” FOR CLEAN ENERGY PROJECTS



*Note: While the PTC is calculated differently, the incentive ratios stack the same.*

# I want to...



**Incorporate clean energy as a reuse into my brownfields grants**

**Understand how I can leverage closed landfills or brownfields in my community to generate clean energy locally**

**Help my community repurpose aging power plant infrastructure with new, cost-effective clean energy**

**Reduce what my local government, businesses, or residents may have to pay in utility bills**

**Plan for a productive future of my brownfield that doesn't have a near-term option for economic development or conflict with other redevelopment plans**



*But 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?

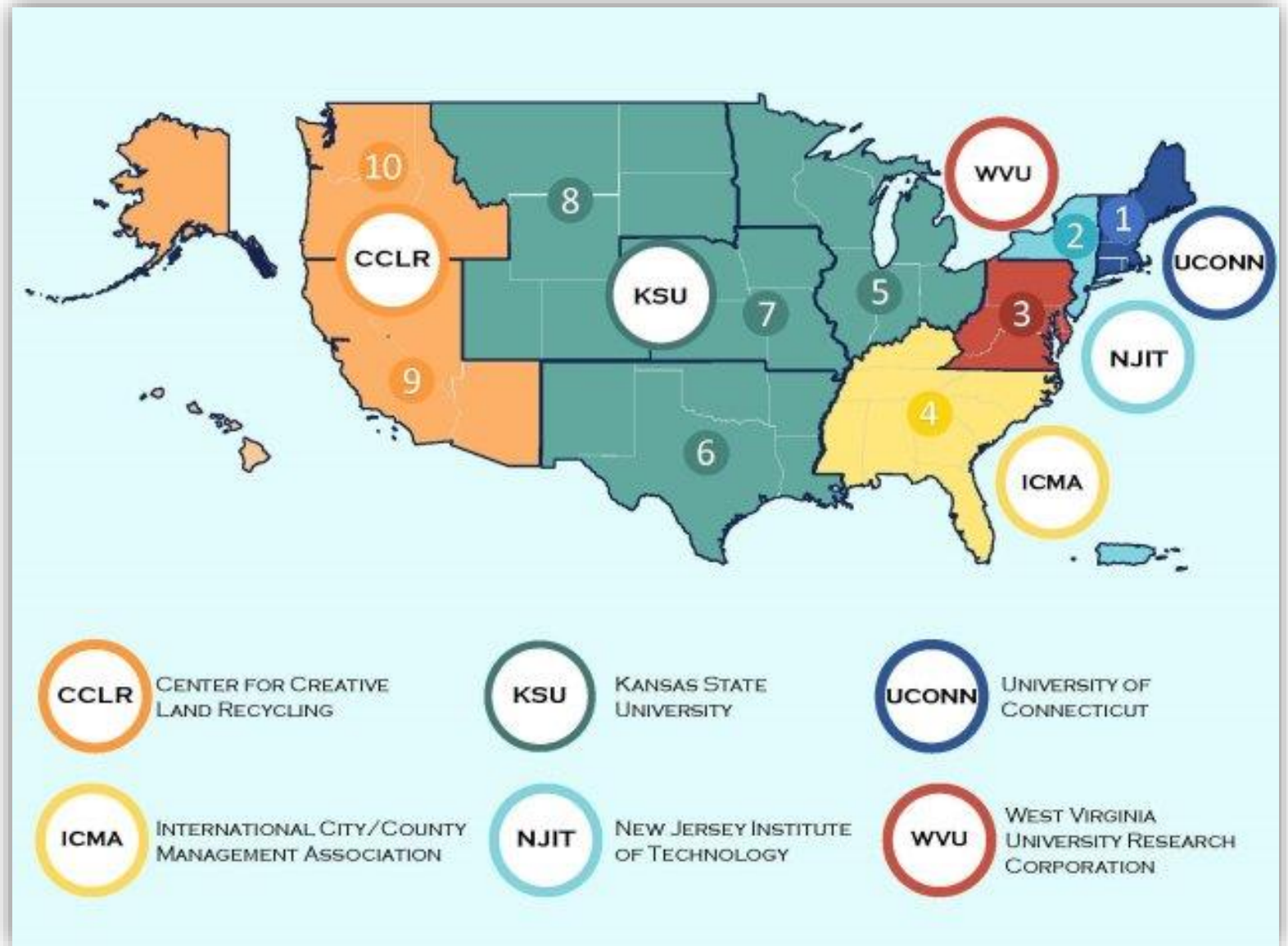
## Technical Reuse:

- ☐ *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”



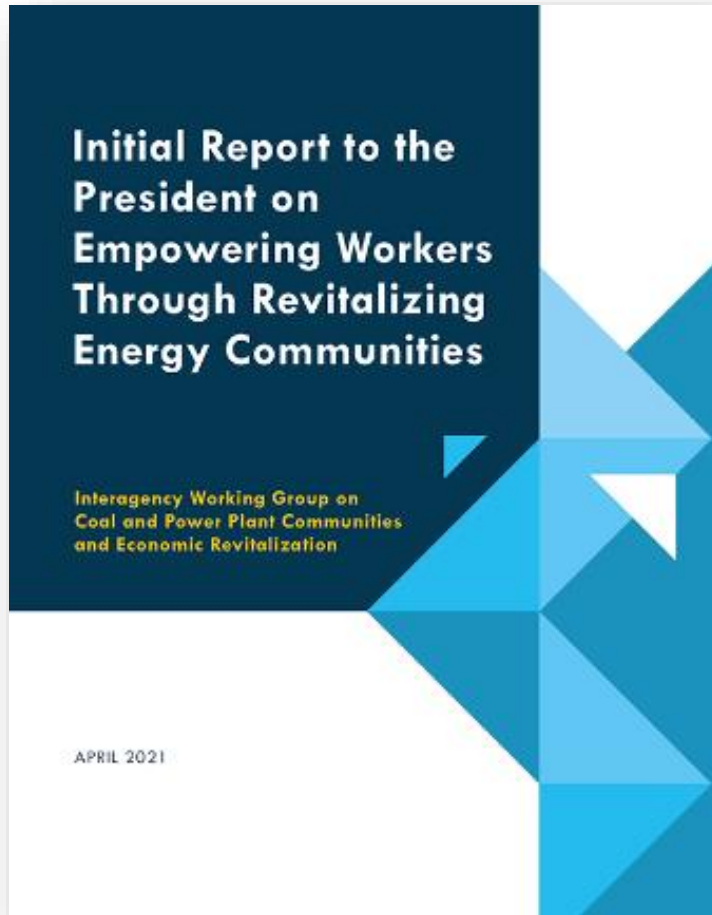
To ***provide other technical assistance and tools*** to help with reuse planning, funding, financing, and clean energy procurement



# *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

# So... what are “Energy Communities” exactly?

## Brownfields

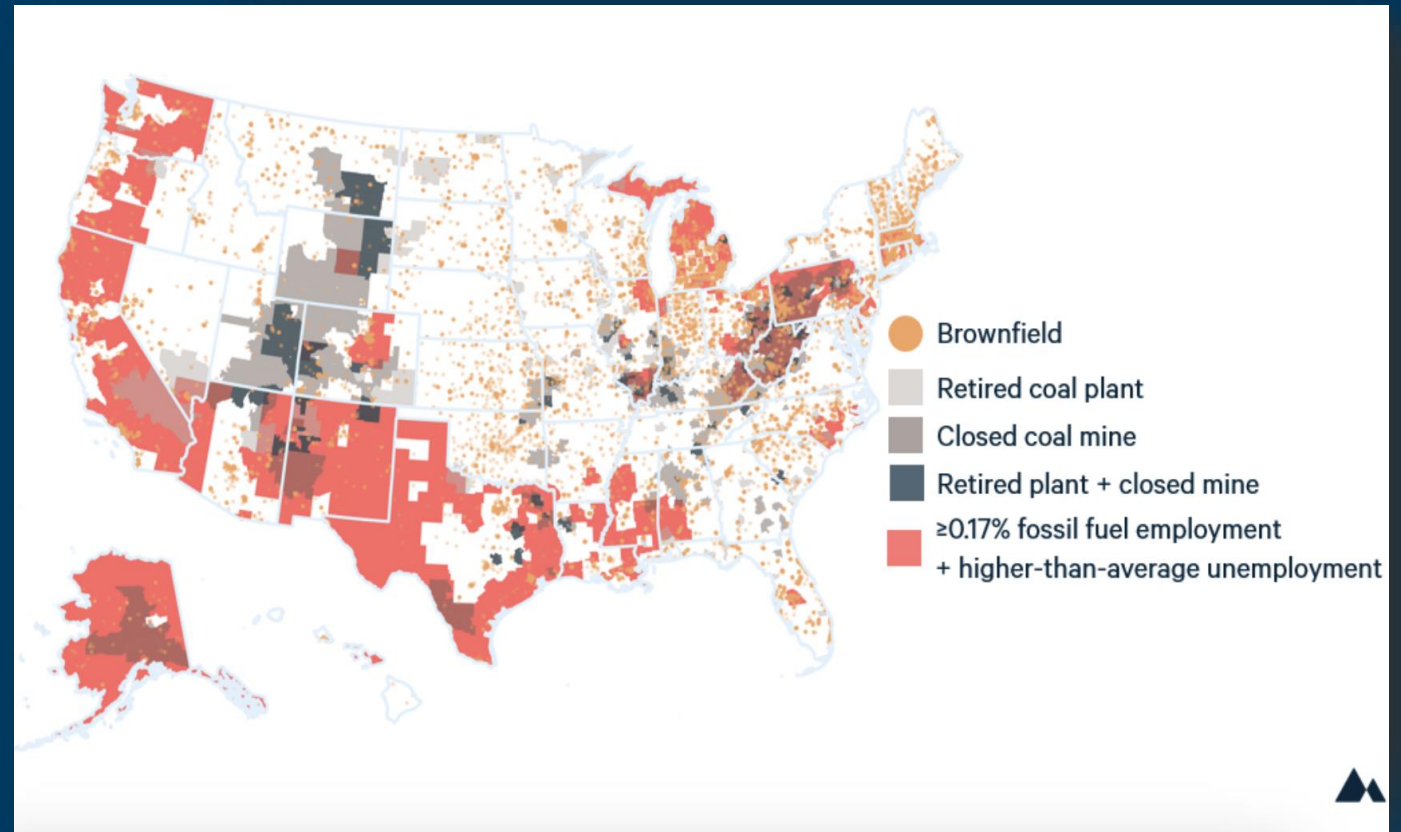
- Sites designated as “brownfields” that contribute to longer term community development legacies

## 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

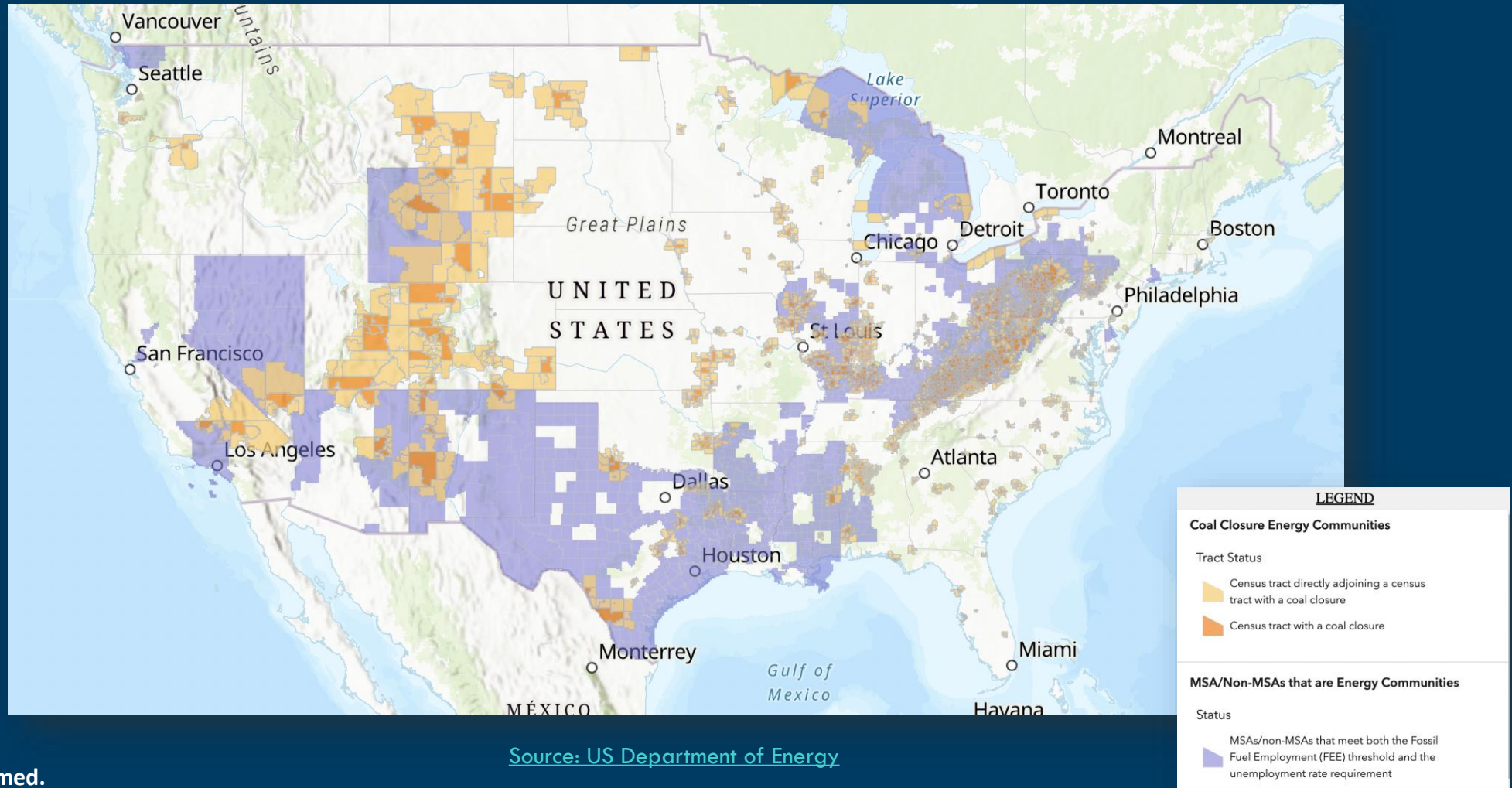
## Areas of Higher Fossil Fuel Economies

- 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



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



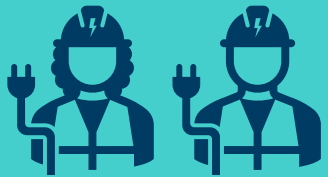
## Energy Infrastructure:

- 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:

- Retool, repower, repurpose, or replace legacy energy infrastructure
- Enable operating energy infrastructure to avoid, reduce, utilize or sequester air pollutants or GHGs



## Program Requirements to Benefit Energy Communities:

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



# These two examples illustrate what the range of projects that are possible

**Replacing a fossil fuel power plant with solar and storage**

**Replacing a power plant with energy-related industrial facility**

# The multi-step process for transforming a coal plant captures new incentives and drives drive long-term economic development



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

## Programs like:

- Clean Energy Tax Credits
- 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



*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.*



# This Session's Objectives

1

## **What?**

Establish baseline knowledge about brightfields and energy communities

2

## **Why?**

Understand the potential opportunity that exists

3

## **How?**

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



# 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

- ⑩ *“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?







# Public Financing, Green Banks, and the Greenhouse Gas Reduction Fund (GGRF)

Alisa Petersen, Lachlan Carey, Whitney Mann



# Session spark notes & takeaways

## Key takeaways:

- CDFIs & Green Banks promote financial activity – enabling more **green investments** in **underserved markets**
- **GGRF supercharges and reinforces these actors** to do more faster – providing **flexible capital** to overcome investment barriers

## Spark notes:

- Public and private financing both needed to meet US climate and economic development goals
- CDFIs and Green Banks key to crowding in private capital for those goals
- Greenhouse Gas Reduction Fund (GGRF) bolsters CDFIs and Green Banks

## Group discussion:

- What have current / previous CDFI and/or Green Bank engagements looked like?
- What could new types of engagement look like?

# Clean energy investment in the US is quickly outpacing fossil fuels

## Global clean energy investment is now 65% greater than fossil fuel investment

Billions of US dollars

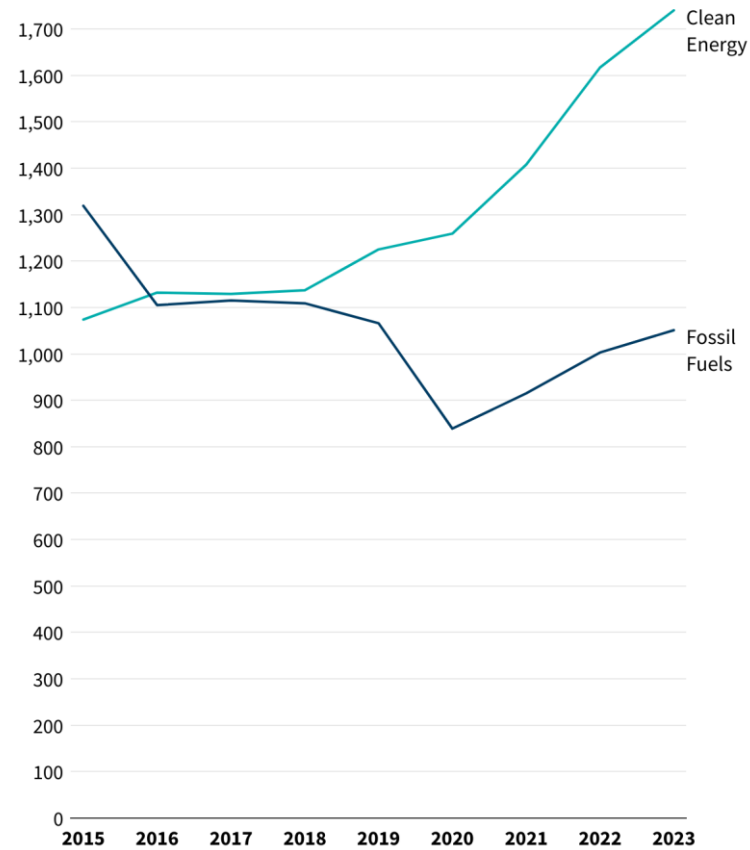


Chart: RMI Graphic • Source: International Energy Agency



## Clean energy investment has exceeded fossil fuels in North America since 2020

Billions of US dollars

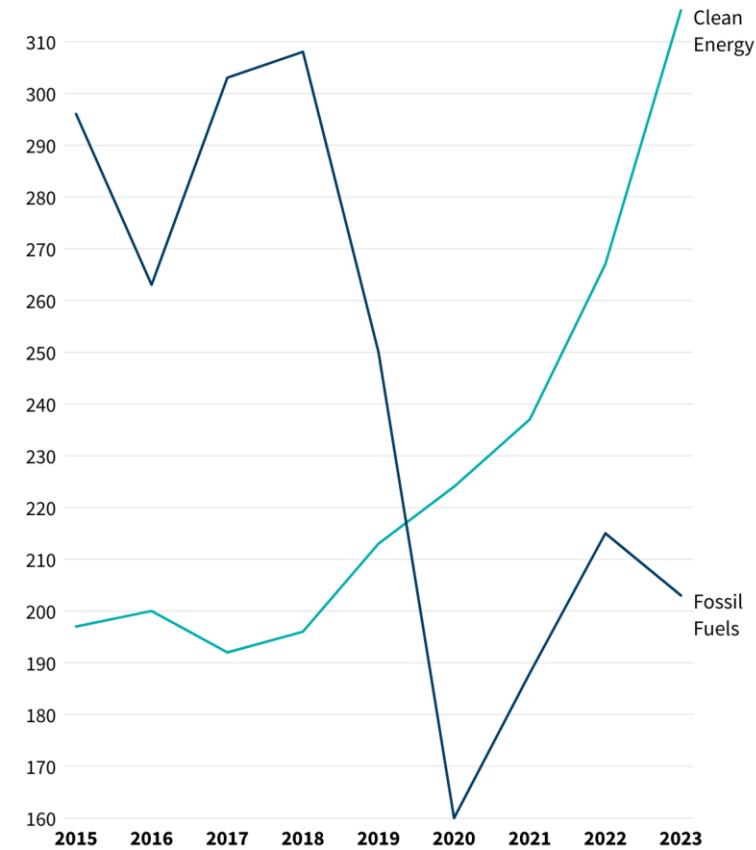


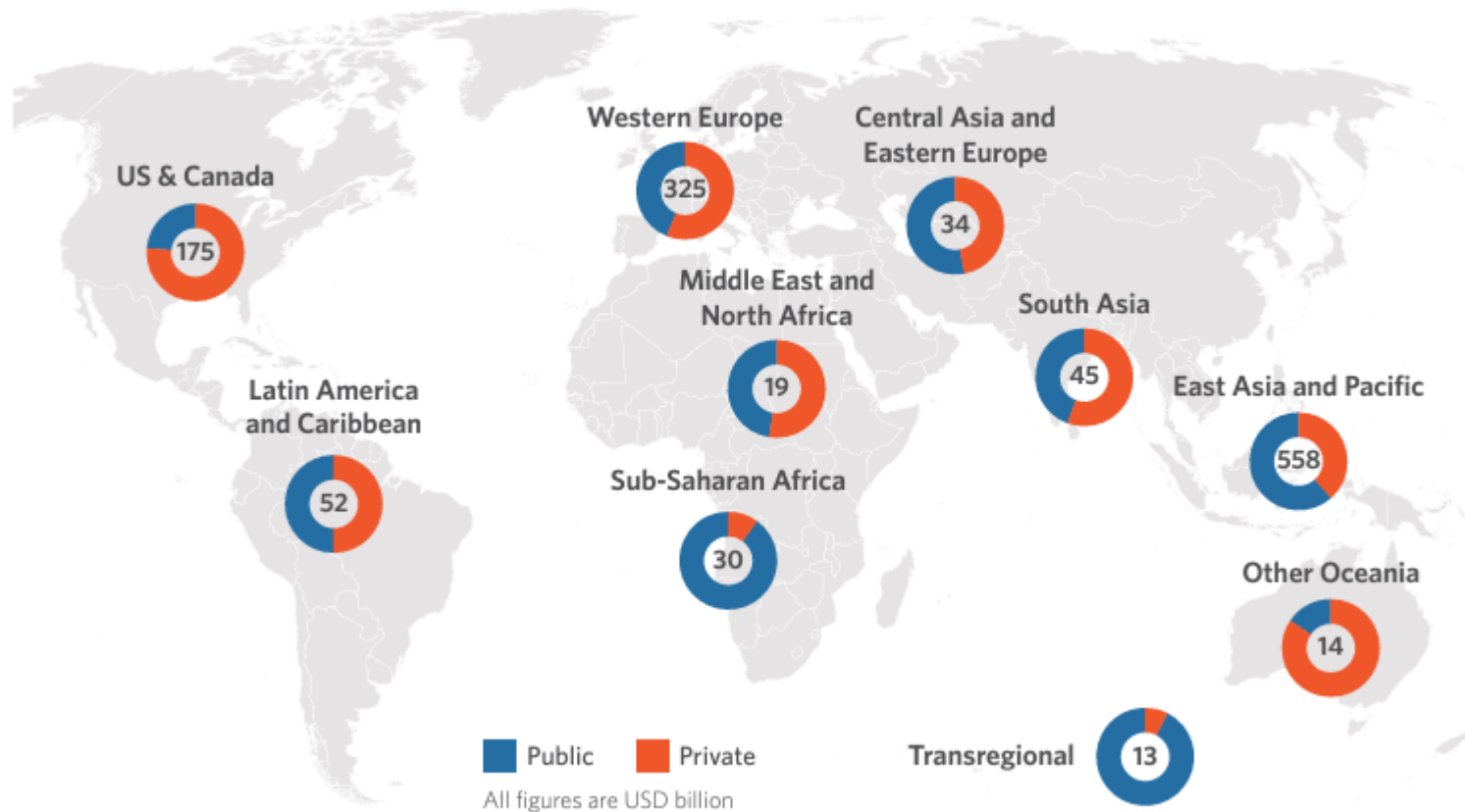
Chart: RMI Graphic • Source: International Energy Agency



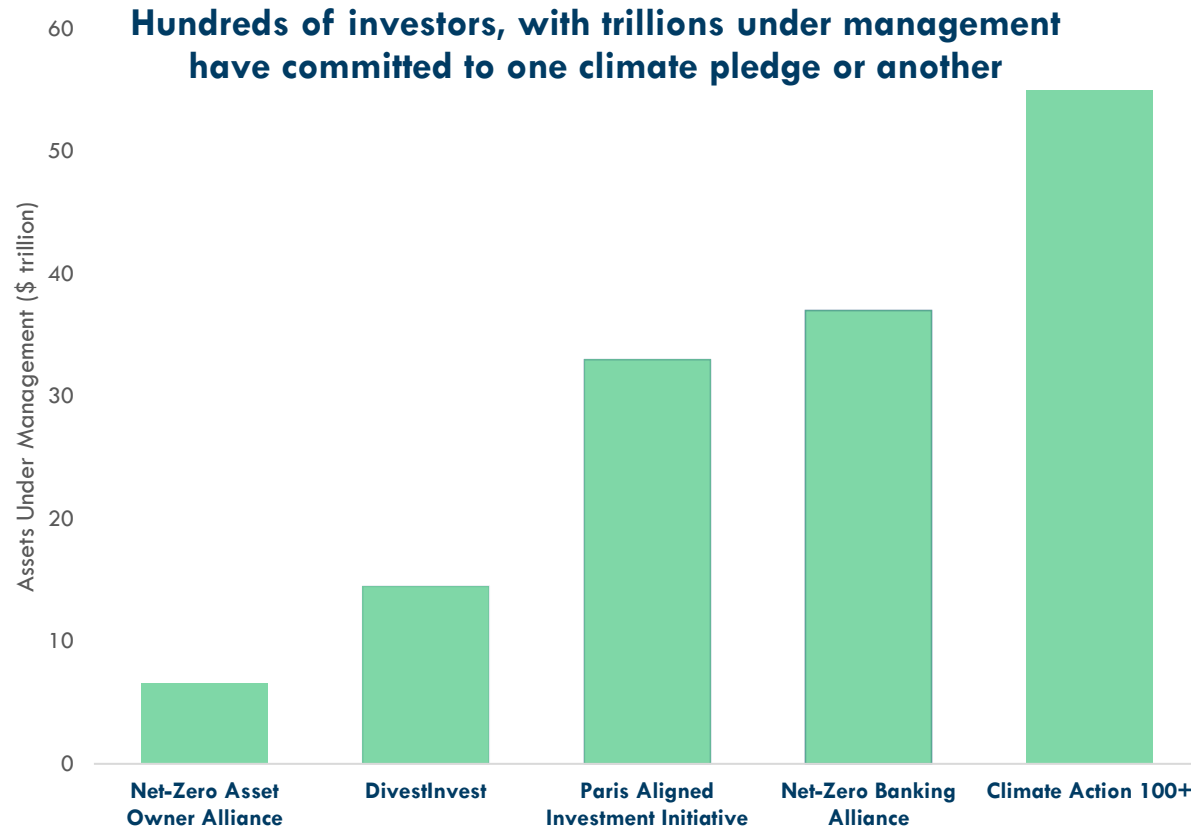


# Climate investment in the U.S is driven by the private sector more than other regions

Figure ES5: Public vs. private climate finance by region



# There is plenty of private capital and ambition to tap for climate solutions, but mobilizing that capital where and when it is needed most is complicated



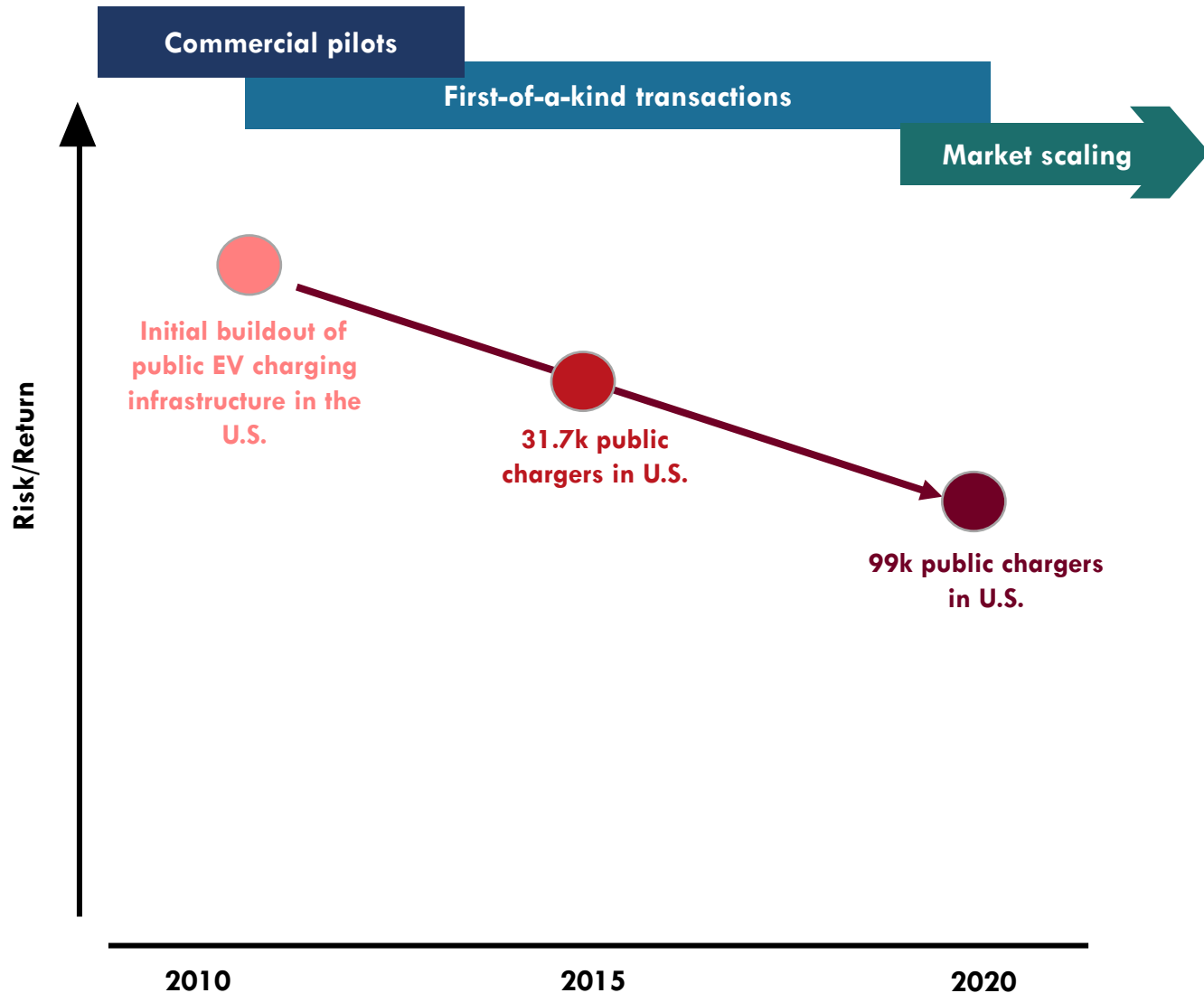
Source: RMI (2021)

- Financial markets are increasingly **committed to climate action**
- However, **investors lack investment opportunities** that meet capital allocation drivers
- Different types of investors **face different constraints** and **seek different investment opportunities** to translate commitments into investments
- The risk is **overestimating the amount of private capital available** today for climate investment by **neglecting the mismatch** between investment opportunities and capital allocation drivers of various investor types
- Different investor types can be mobilized for different financing needs by **designing effective public and concessional investment**

# Low-carbon solutions present different investment opportunities

1 In general, low-carbon solutions present different investment opportunities (e.g., risk / return, deal size, loan tenor or investment horizon) as they mature

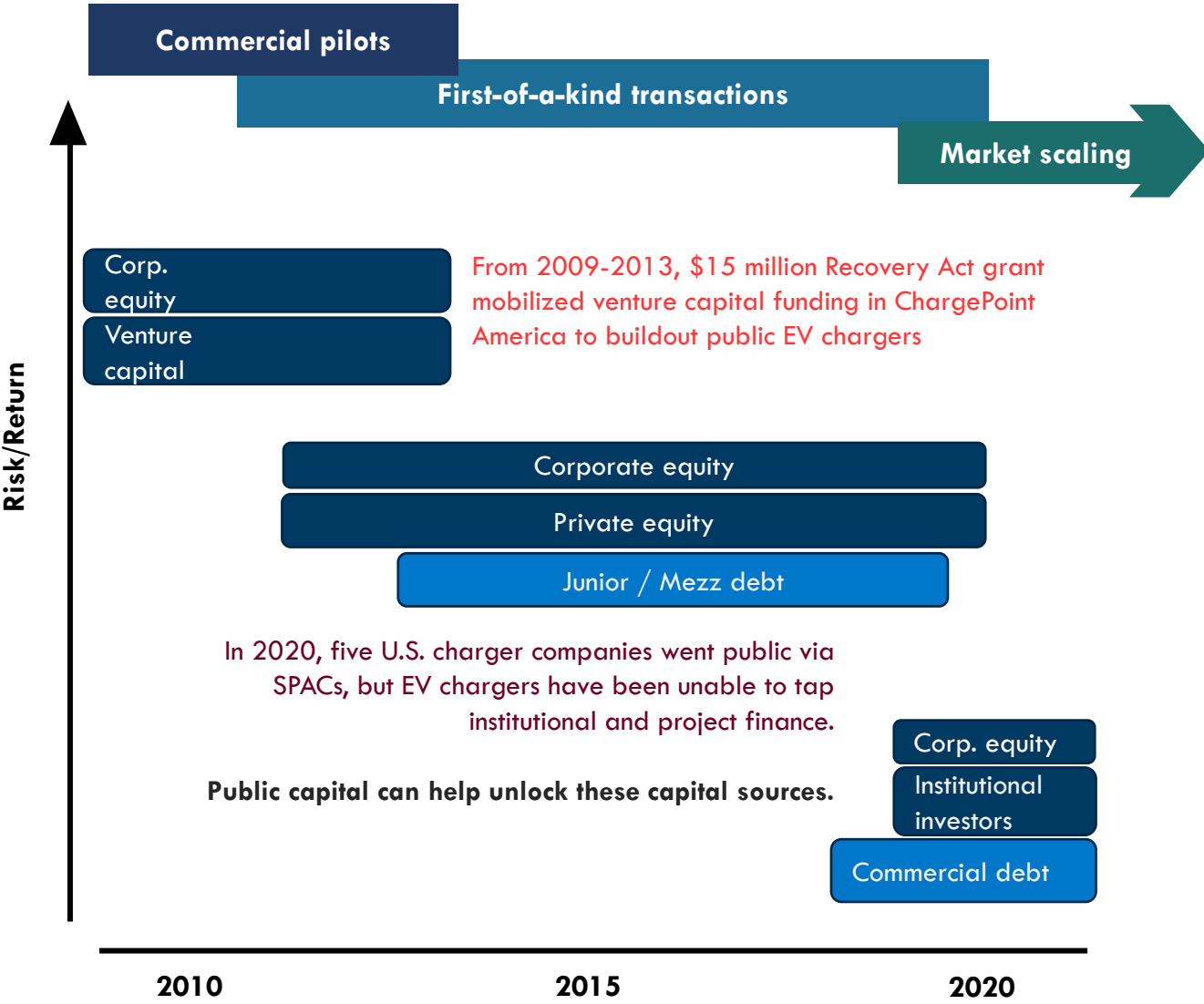
Illustrative evolution of EV charger commercialization progress



# Flexible public financing can match investments to private capital allocation drivers

- 1 In general, low-carbon solutions present different investment opportunities (e.g., risk / return, deal size, loan tenor or investment horizon) as they mature
- 2 Flexible, concessional financing can help technologies scale by tailoring solutions to overcome private market bottlenecks

Illustrative evolution of EV charger commercialization progress

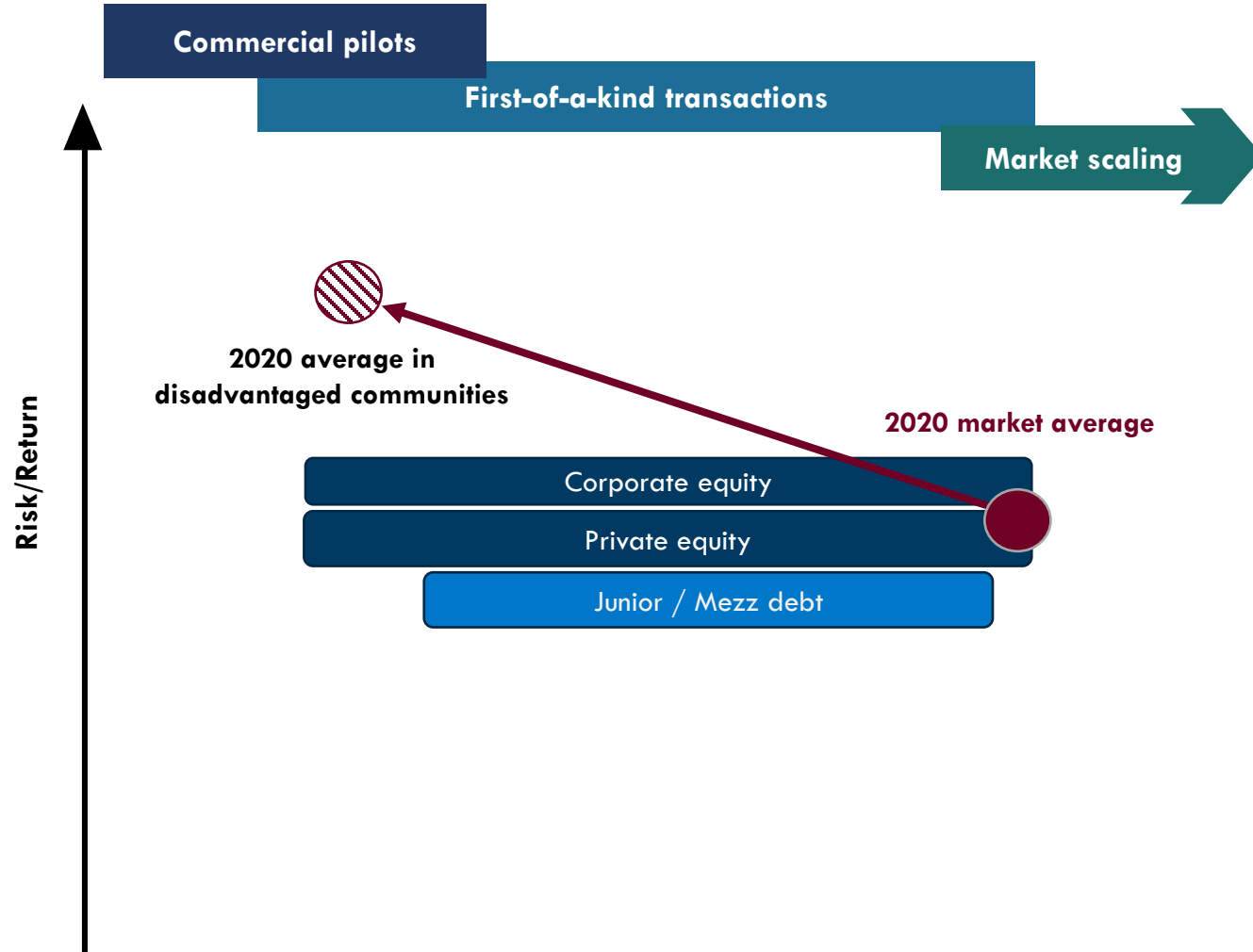




# Flexible solutions are especially important across market segments

Illustrative gap in 2020 EV charger investors across market segments

- 1 In general, low-carbon solutions present different investment opportunities (e.g., risk / return, deal size, loan tenor or investment horizon) as they mature
- 2 Flexible, concessional financing can help technologies scale by tailoring solutions to overcome private market bottlenecks
- 3 Low-carbon transformations happen at different paces across market segments, reinforcing the need for flexible financing solutions so no markets are left behind



# Public investment for expanded deployment of EV charger infrastructure

## investment opportunity:

- Scale charger deployment to support growing, but unproven demand
- Demonstrate revenue streams to mobilize participation of more investor types and capital sources (“market transformation”)
- Objective is tapping institutional and project finance, where long-term guaranteed offtake can be leveraged into upfront capital.
- Focus on historically disadvantaged & low-income communities where private capital assigns prohibitively high premiums.

## unmet private capital allocation drivers:

**Lack of debt financing at scale** due to:

### 1) revenue uncertainty

- Demand /market risk from unknown charger use
- Uncertain technology performance over asset life
- Long (approx. 10-yr) payback period for investments

### 2) high costs

- Insufficient assets to bundle into financeable portfolios for mature investors
- Fragmented and heterogeneous deals with diverse stakeholders & permitting needs

## public investment objectives & sample levers:

### 1. Mitigate demand & operating downside risk

- Credit enhancements
- First-loss equity

### 2. Address high cost of capital and long payback periods

- Low-cost loans & loan guarantees

### 3. Scale market coverage

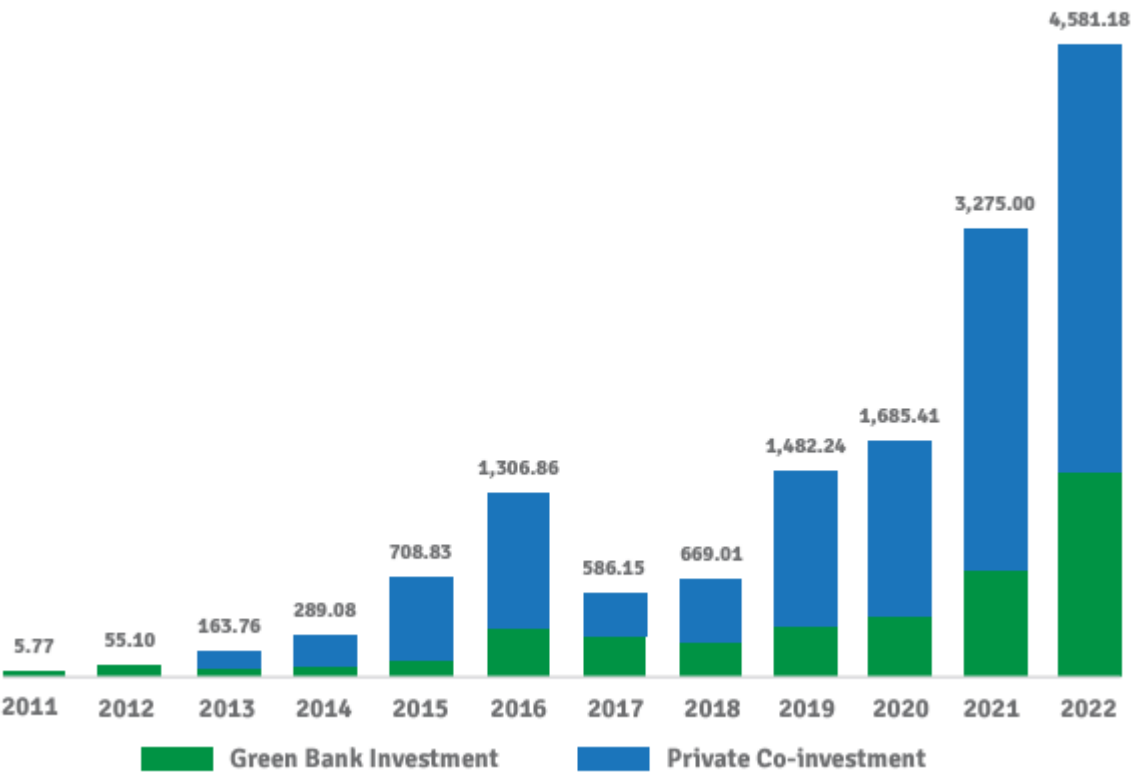
- Loan grace period
- Forgivable debt financing

### 4. Address transaction costs

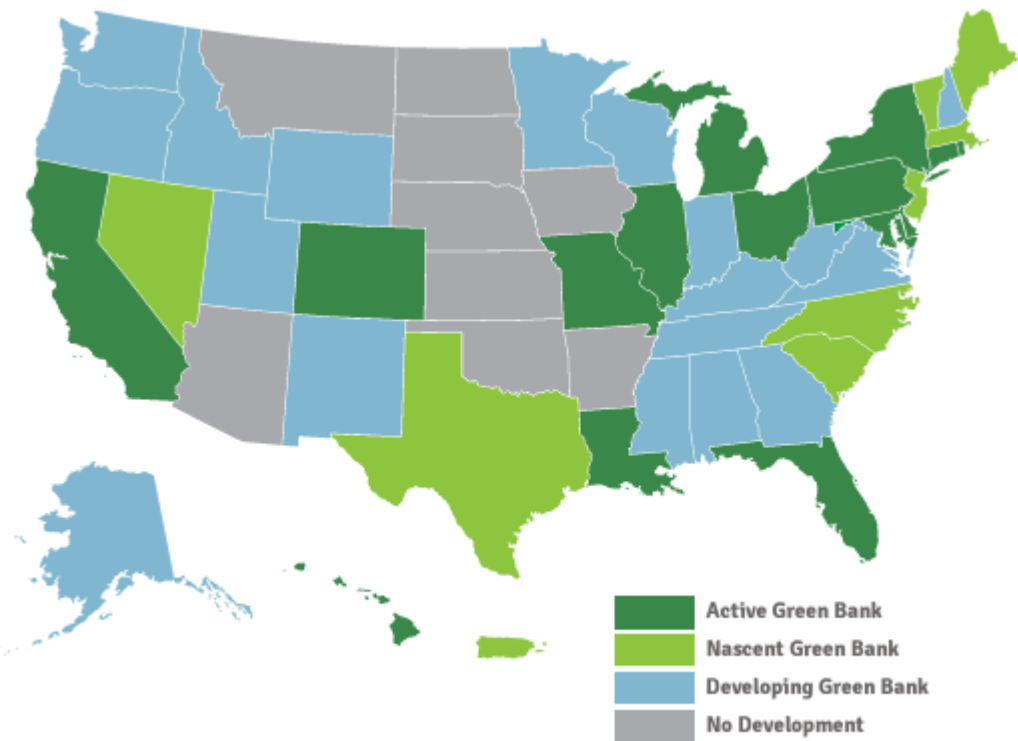
- Warehousing and aggregation
- Technical assistance grants

# To date, green banks play a big role mobilizing private dollars for climate

American Green Bank Investment by Year  
(\$, in millions)

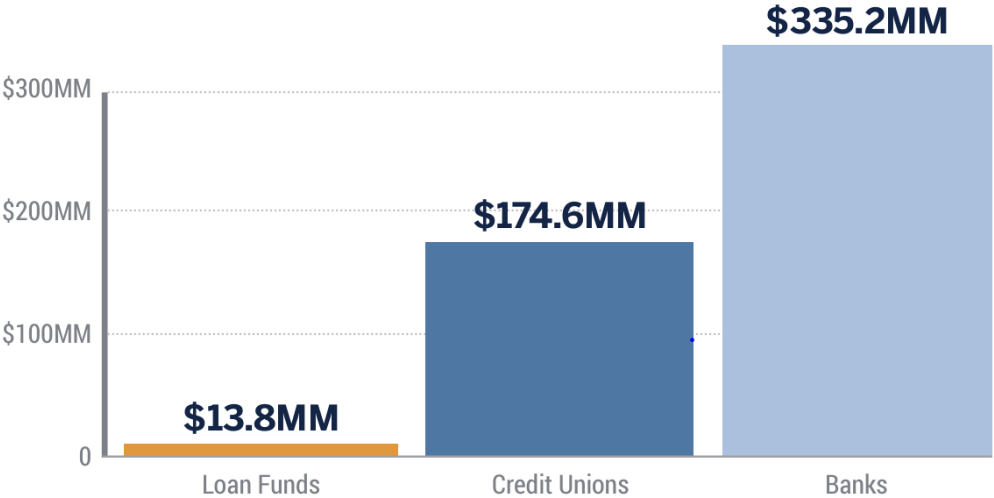


Existing and Developing Green Banks Across the U.S.



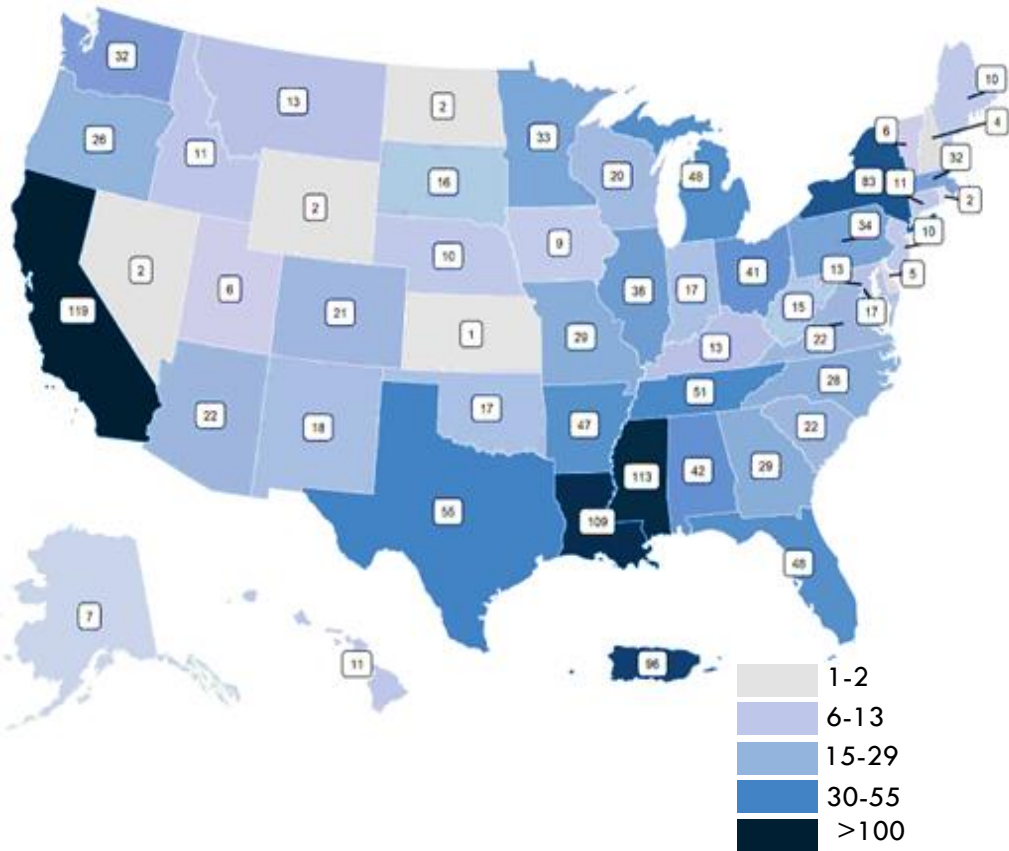
# Community Development Finance Institutions (CDFIs) also leverage private dollars 8:1, unlocking finance for underserved communities

CDFI Median Assets by Institution Type, 2020  
(\$, in millions)



Source: Sizing the CDFI Market: Understanding Industry Growth, Federal Reserve Bank of New York

Number of CDFIs Across the U.S.



Source: Sizing the CDFI Market: Understanding Industry Growth, Federal Reserve Bank of New York



## PROJECT SPOTLIGHT

### HiON Public Electric Vehicle Universal Fast Charging

Idaho Springs | Greenwood Village | Denver

**Project Investment:** \$1,483,595

The HiON EV projects were a set of three EV charging infrastructure projects across Idaho Springs, Greenwood Village, and Denver. These represented CCEF's first entry into supporting transportation electrification. HiON will be installing a total of 12 Level 3 (direct current or DC Fast Chargers), dual-port electric vehicle charging stations across the three sites. The stations will provide public and universal access for electric vehicle drivers across three high-traffic areas in Colorado.

The Colorado Energy Office, KeyBank, and Xcel Energy all collaborated with CCEF to provide a mix of direct funding, grants, and rebates to the HiON Group to get the three sites developed and installed.



**7,927 lbs.**

Carbon Monoxide  
(CO) avoided

**5 lbs.**

Nitrogen Oxides (NOx)  
avoided

**92 lbs.**

Fine Particulate Matter  
(PM 2.5) avoided



**259 MT CO2e**

GHG Emissions  
Avoided



**4,957 MMBtu**

Reduction in  
Energy Use



**\$23,480**

Public Health  
Savings<sup>8</sup>

## Green Bank Case Study: Colorado Clean Energy Fund

### • Commercial Product Offering Highlights

#### • Bridge Loan

- Up to \$500k, up to 36 month term, below market rate, flexible repayment, funding access within 30 days of application submission

#### • Clean Conversion Loan

- Up to \$1M, up to 15 year term, below market rates, senior or subordinate lien interest in subject property

#### • Energy Project Accelerator Loan

- Up to \$500k, 2-10 year term, below market rates, access to funding within 1 week of application submission

#### • Energy Service Agreement (ESA) Off-Balance Sheet

- Projects of \$500K and up, no interest rate payment based on ESA, no security required, funding access within 2-3 weeks of application submission

# Greenhouse Gas Reduction Fund bolsters CDFIs & green banks to mobilize finance for clean energy in underserved communities

- Greenhouse Gas Reduction Fund's (GGRF) provides \$27 billion in flexible, concessional financing
- This capital aims to fill market gaps, funding where private markets will not, and accelerating investment in deployment of net-zero buildings, transportation, and energy

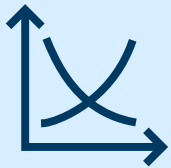
## GGRF projected to mobilize upwards of \$250 billion in first 10 years

Assuming \$250 billion in capital deployed

■ Disadvantaged communities ■ Rest of population

Total capital allocation, \$ billion	Household and community decarbonization	Deployment, <sup>4</sup> DAC vs total	Cumulative GHG reduction, MtCO <sub>2</sub> <sup>5</sup>	Jobs supported, <sup>6</sup> thousands	Cost savings, <sup>7</sup> \$ millions	Health improvements <sup>8</sup>
23	Residential rooftop solar <sup>1</sup>	HH: 800K 1.6M	17	90	7,500	●
52	Residential heat pumps	HH: 6.5M 13.0M	4 <sup>9</sup>	190	13,000 <sup>9</sup>	●
12	Heat pump water heaters	HH: 4.0M 8.0M	4	45	4,000	●
19	Community solar	HH: 1.2M 16.4M	85	86	30,000	●
<b>Business decarbonization</b>						
28	Commercial heat pumps	TJ: 110 380	4 <sup>9</sup>	98	3,400 <sup>8</sup>	●
38	Commercial rooftop solar <sup>1</sup>	GW: 9 29	55	170	32,000	●
10	Fleet depot EV <sup>2</sup> chargers <sup>3</sup>	115K 600K	185 <sup>3</sup>	60	95,000 <sup>3</sup>	●
<b>Energy system transformation</b>						
19	Transmission <sup>3</sup>	GW/km: 10 10	195 <sup>3</sup>	70	N/A	●
28	Offshore wind	GW: 2.5 13	65	180	12,000	●
19	Energy storage <sup>1</sup>	GWh: 27 140	0.3	120	N/A	●
2	Coal conversion	GW: 12 12	225 <sup>3</sup>	N/A	N/A	●

# By filling market gaps & crowding in private dollars, GGRF delivers economic development outcomes from 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 is the single largest investment in low-income and disadvantaged communities in the Inflation Reduction Act





# Solar for All

\$7B Solar Fund

EPA will grant:	Funding will serve:	Funding Uses	Possible Financial Support	Project Examples
<ul style="list-style-type: none"><li>• Up to 60 states, Tribal and municipal governments, and eligible non-profit entities</li></ul>	<ul style="list-style-type: none"><li>• 100% low income and disadvantaged communities</li></ul>	<ul style="list-style-type: none"><li>• Expand existing or create new low-income solar programs</li><li>• Fund new workforce training programs</li><li>• Technical assistance for project deployment</li><li>• Address regulatory barriers to solar</li></ul>	<ul style="list-style-type: none"><li>• Subsidies, rebates, and other incentives</li><li>• Debt (including loans, forgivable loans, etc.)</li></ul>	<ul style="list-style-type: none"><li>• Residential serving community solar</li><li>• Rooftop solar paired with heat pump and EE</li></ul>



# Clean Communities Investment Accelerator (CCIA)

\$6B Community-Focused Fund

## EPA will grant:

- 2-7 hub non-profits

## Funding will serve:

- 100% low income and disadvantaged communities

## Funding Uses

- Provide funding and technical assistance to a national network of community lenders to finance clean energy projects that reduce energy costs and create jobs

## Possible Financial Products

- Grantees pass-through 80-90% of awards to community lenders as subsidies or subgrants

## Project Examples

- Same as NCIF

# National Clean Investment Fund (NCIF)

**\$14B Fund for Direct Investment in Qualified Projects**

## EPA will grant:

- 2-3 national nonprofit hubs to create national clean financing institutions

## Funding will serve:

- At least 40% low income and disadvantaged communities

## Funding Uses

- Direct investment in qualified projects (financial assistance)
- Predevelopment & market-building activities

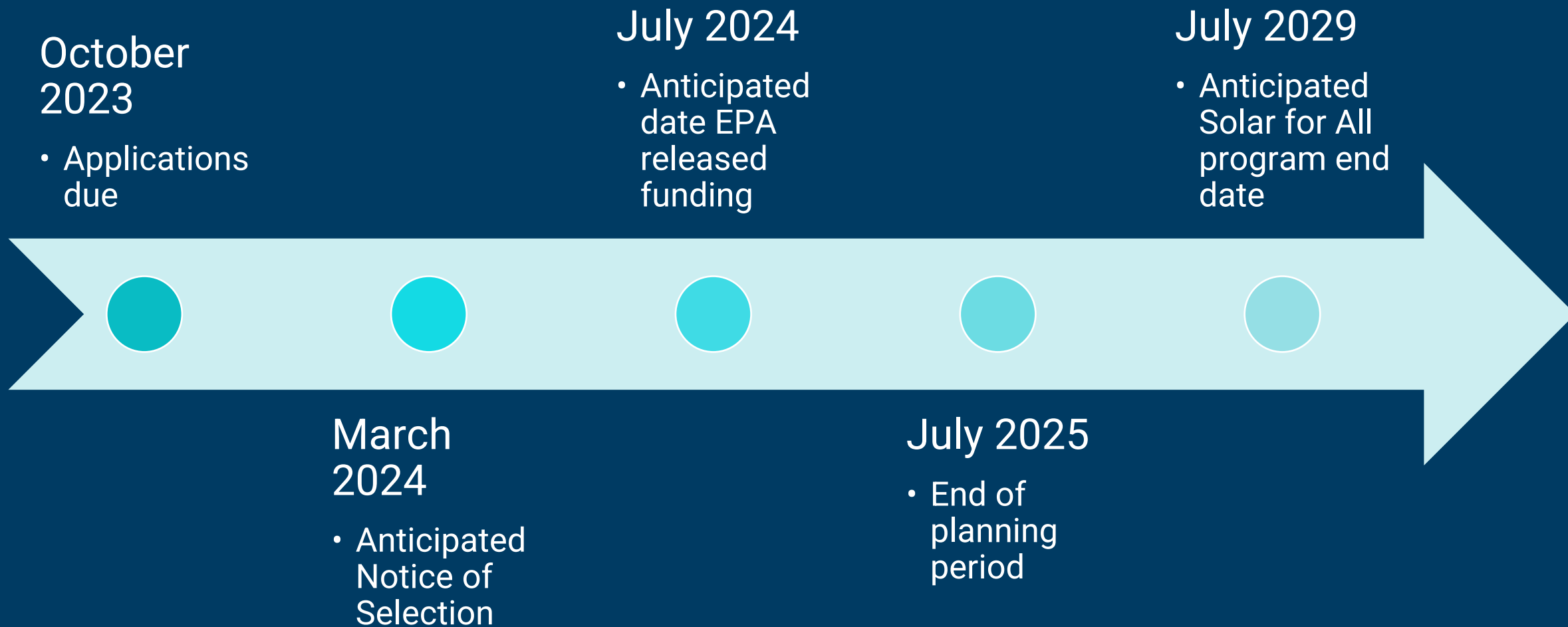
## Possible Financial Products:

- Debt
- Equity
- Hybrids
- Credit enhancements

## Project Examples

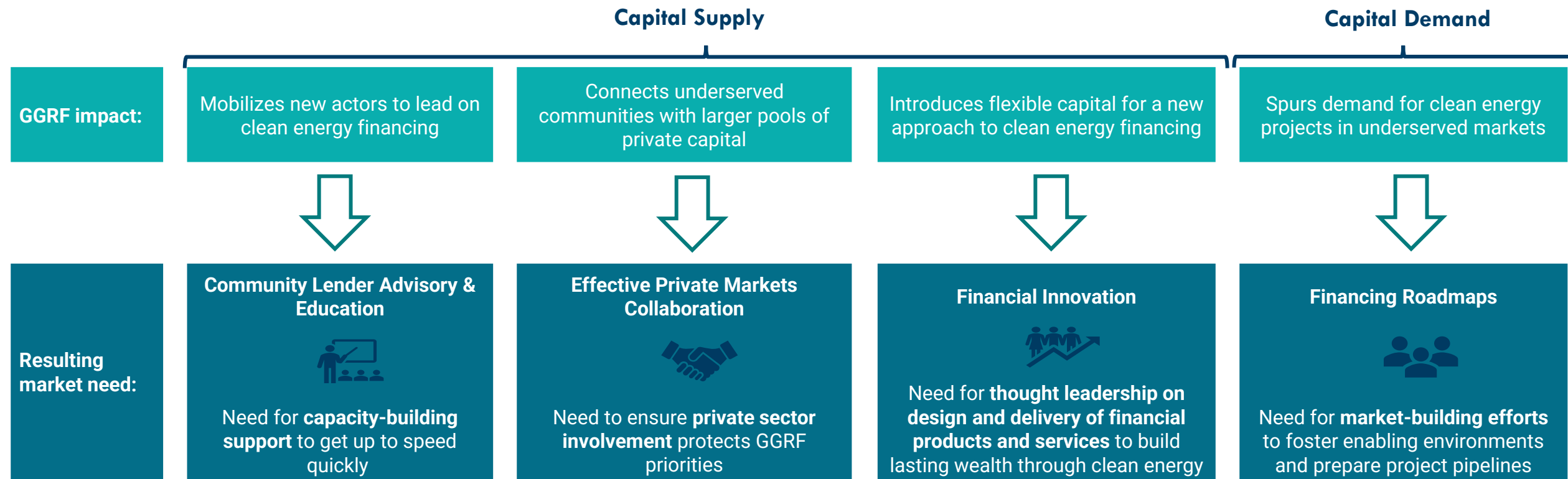
- Rooftop solar, solar-plus-storage, fuel cells
- Building retrofits and electrification
- New construction of net-zero buildings
- EV charging infrastructure
- Transit-oriented development

# GGRF funding should be live by July 2024, but offerings may still be in flux for some time



# Looking Ahead:

## Opportunity is much larger than GGRF





# RMI's Four Key Workstreams for GGRF:

## Capital Supply & Demand



### Community lender advisory and education

Set Market Ambition for Community Lenders as Climate Finance Leaders

Build Expertise through Tailored Advisory and Technical Capacity-Building Resources

Refine, Integrate, and Disseminate Learnings Over Time



### Effective private markets collaboration

Convene Stakeholders to Align around Shared Priorities

Refine, Integrate, and Disseminate Learnings Over Time



### Financial innovations to build wealth through clean energy

Cultivate Understanding and Demand of New, Scalable Models

Refine, Integrate, and Disseminate Learnings Over Time



### Community financing roadmaps

Identify Local Opportunities and Needs

Refine, Integrate, and Disseminate Learnings Over Time

Capital Supply

Capital Demand

# How should EDO's be engaging green financiers?

- **Group discussion:**

- Raise your hand if you're engaging with CDFIs and/or Green Banks?
- Have any of you been involved in any of the GGRF applications?
- What could new types of engagement look like to better capitalize on GGRF?



# Green Hydrogen



**Presenters: Nathan Iyer and Taylor Krause**



# Introduction to hydrogen



Aviation



Chemicals



Aluminum  
Steel



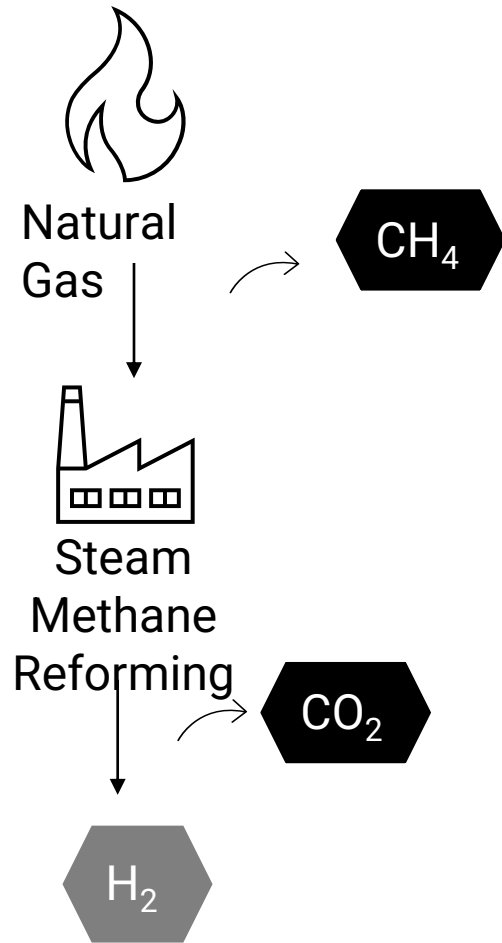
Trucking



Steel

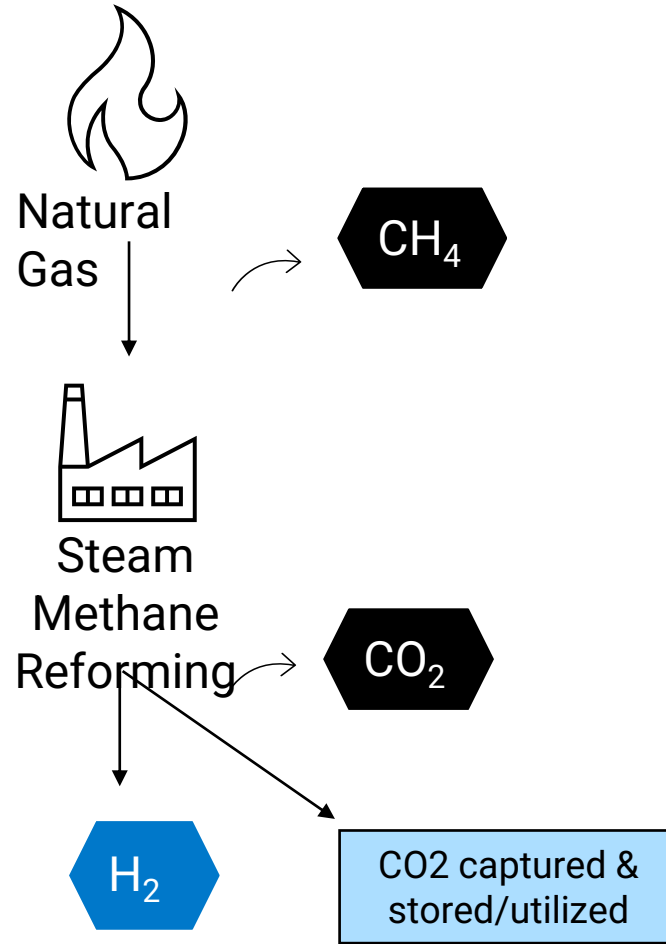
- **Hydrogen:** A versatile clean fuel that can be used in a wide range of heavy industry practices like heavy-duty transport, oil refinement, iron & steel-making, and chemical manufacturing
- **Today's Hydrogen:** Mostly used in making fertilizer and refining petroleum
- **Future of Hydrogen:** Shipping, aviation fuel, heavy-trucking

## Grey Hydrogen Pathway



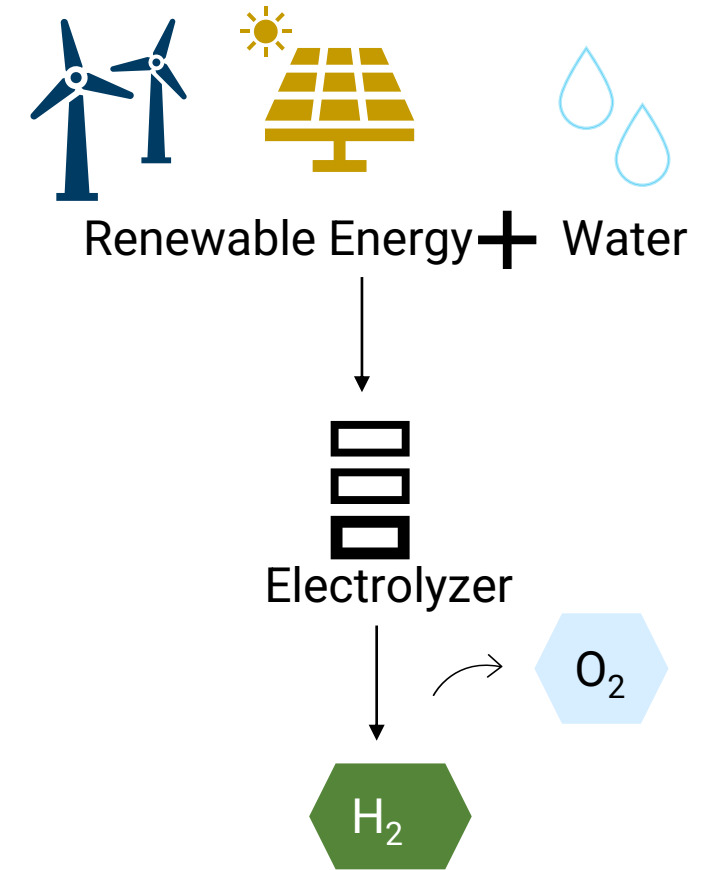
Emissions: ~10  
 $\text{kgCO}_2/\text{kgH}_2$

## Blue Hydrogen Pathway



Emissions: ~2-9  $\text{kgCO}_2/\text{kgH}_2$

## Green Hydrogen Pathway

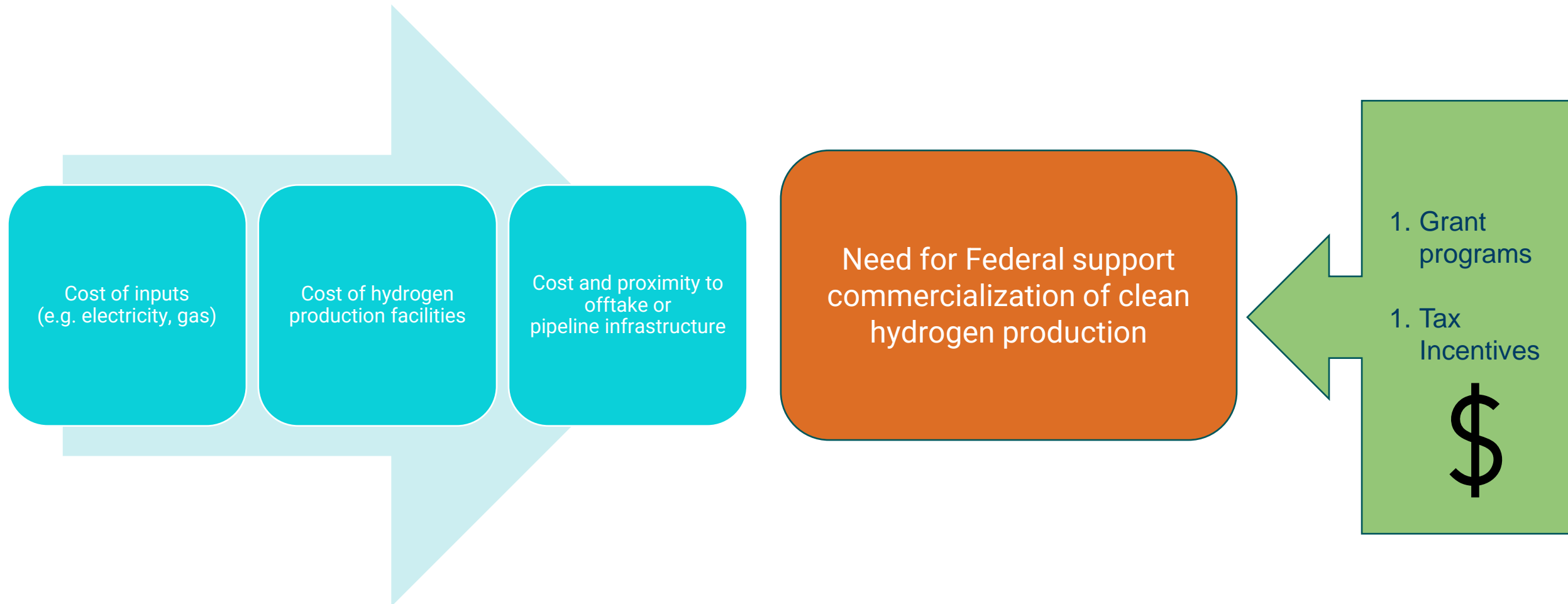


Emissions: 0  $\text{kgCO}_2/\text{kgH}_2$

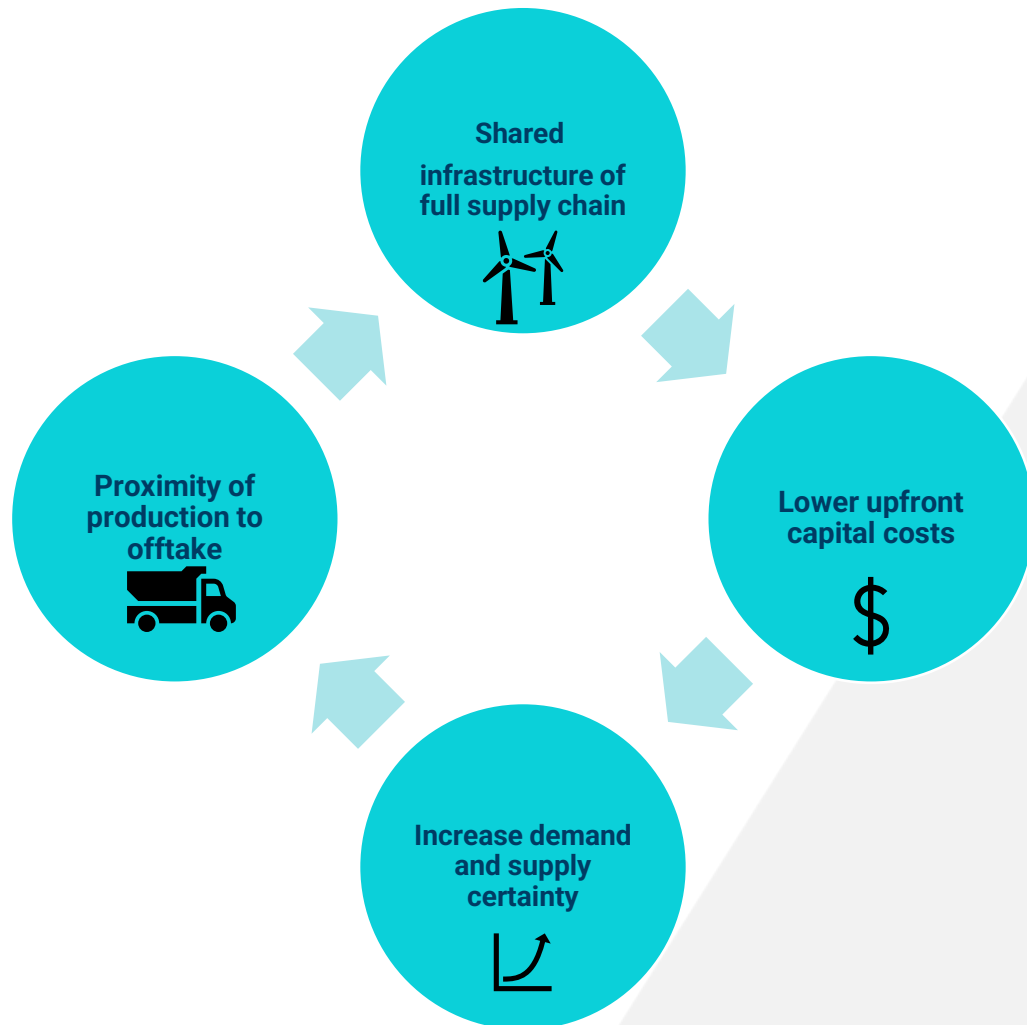
Today's approximate values shown, emissions dependent on efficiency of capture, upstream emissions, electricity sourcing.  
Capture rate used: 56-95%. Based on RMI analysis, the best blue (95% capture, 0.05% leakage) case still results in ~1.7 $\text{kgCO}_2/\text{kgH}_2$  based on a typical grid emissions.



# Clean Hydrogen Production is Expensive!



# What is a hub?



U.S. DEPARTMENT OF  
**ENERGY**

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

OCTOBER 13, 2023

## 7 Hydrogen Hub Project Awardees

1. Appalachian Hydrogen Hub
2. California Hydrogen Hub
3. Gulf Coast Hydrogen Hub
4. Heartland Hydrogen Hub
5. Mid-Atlantic Hydrogen Hub
6. Midwest Hydrogen Hub
7. Pacific Northwest Hydrogen Hub

# Clean Hydrogen provisions in the US's IRA - Eligibility and Details



Hydrogen Producers: Requires prevailing wage and apprenticeship requirements to be met to achieve full multiplier

## Clean Hydrogen Credit

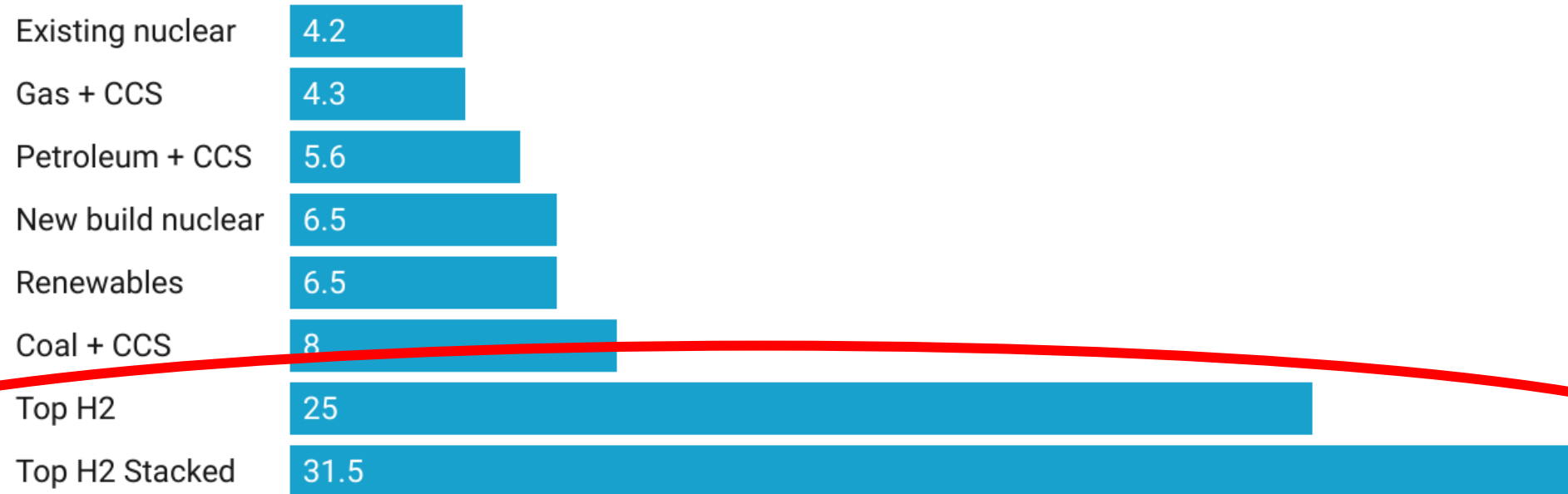
		Emissions intensity (kg CO <sub>2</sub> /kg H <sub>2</sub> )	Credit value (\$/kg H <sub>2</sub> )	5x multiplier for meeting wage req. (\$/kg H <sub>2</sub> )
This would require 90%+ capture and very low upstream leakage. →		4.0-2.5 (60-75%)	0.12	0.60
		2.5-1.5 (75-85%)	0.15	0.75
Electrolysis (w/ EACs) is the primary pathway for the top tier →		1.5-0.45 (85-95%)	0.20	1.00
		0.45-0.0 (95-100%)	0.60	3.00

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

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

# Hydrogen Production Tax Credit is a major driver in the IRA

## IRA Credit Comparison (\$/GJ)



Created with Datawrapper

**Key takeaway:**

**RMI analysis finds that the hydrogen tax credits  
are among the most valuable in the IRA**

# Three major pathways to achieve the top credit

Emissions intensity (kg CO <sub>2</sub> /kg H <sub>2</sub> )	Credit value (\$/kg H <sub>2</sub> )	5x multiplier for meeting wage req. (\$/kg H <sub>2</sub> )
4.0-2.5	0.12	0.60
2.5-1.5	0.15	0.75
1.5-0.45	0.20	1.00
<b>0.45-0.0</b>	<b>0.60</b>	<b>3.00</b>

## Behind-the-meter electrolysis

- Connect directly to new clean power

## Grid-connected electrolysis

- Develop a system that eliminates the GHG impact of hydrogen production on the grid
- This could require new clean power, transmission, and the ability to match hydrogen production with clean energy

## Renewable methane

- Requires biogenic sources of methane with low leakage

Hydrogen requires a large amount of electricity – states that can unlock and deliver clean power will accelerate federal and private investments.



# The difference between emissions pathways

Comparison of domestic hydrogen production pathways

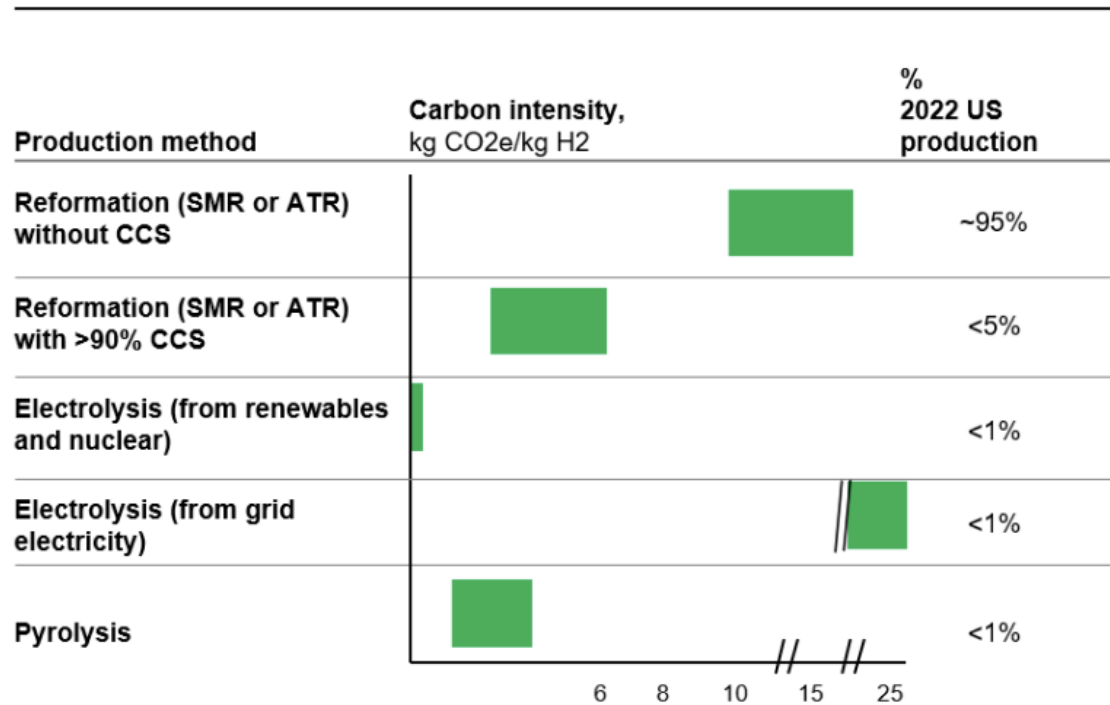


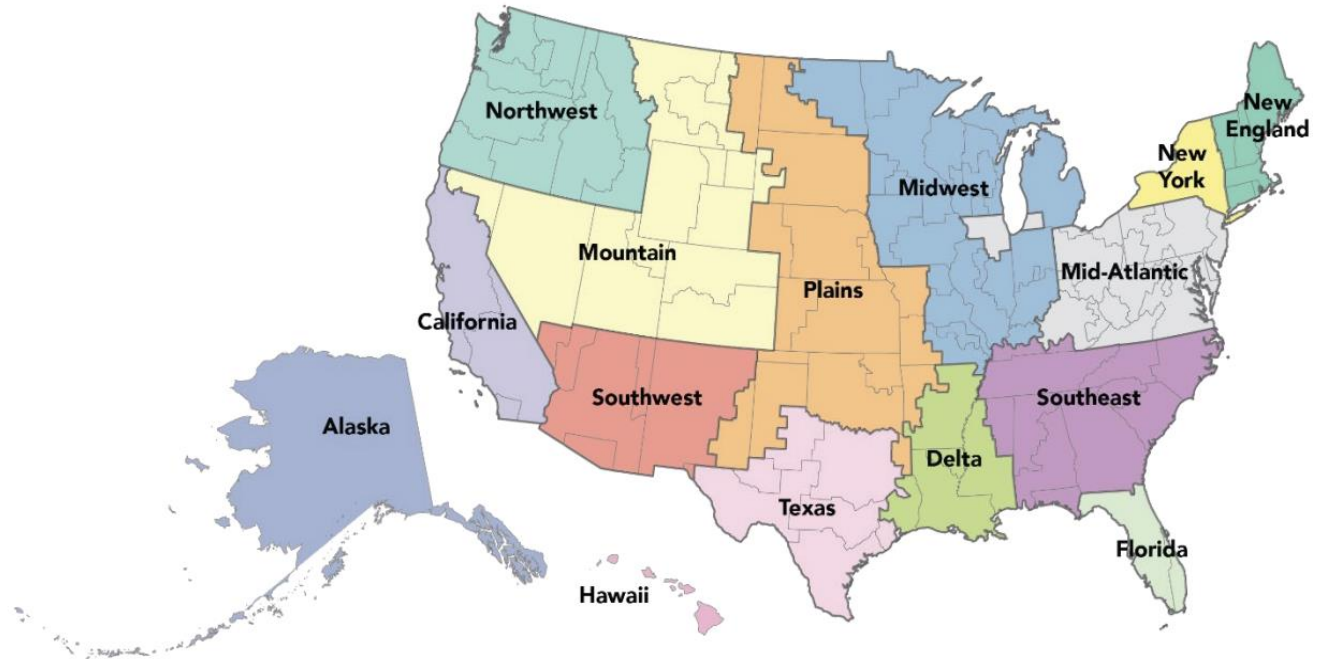
Figure 18: Well-to-gate carbon intensity of hydrogen from SMR with CCS and electrolysis pathways relative to current U.S. production, and emissions intensities that can access the clean hydrogen production tax credit. (Reproduced from Pathways to Commercial Liftoff: Clean Hydrogen.<sup>3</sup> Assumptions regarding modeled technologies are described further in Liftoff report and include modeled assumptions; real-world lifecycle emissions may vary beyond the ranges shown here.)

# Recent guidance includes pathways to demonstrate electricity is clean

**Incrementality:** Built within 3 years, additional exceptions being considered

**Deliverability:** In the same deliverability region

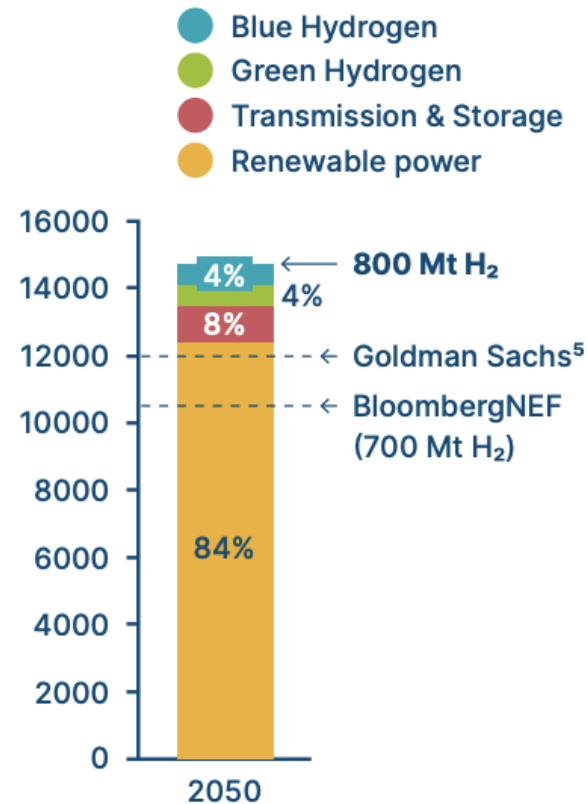
**Hourly matching:** starting in 2028, match on an hourly basis



*Deliverability regions (DOE)*

# Anatomy of an electrolysis project

Relative cost contributors  
\$ billion



Projects have four major components:

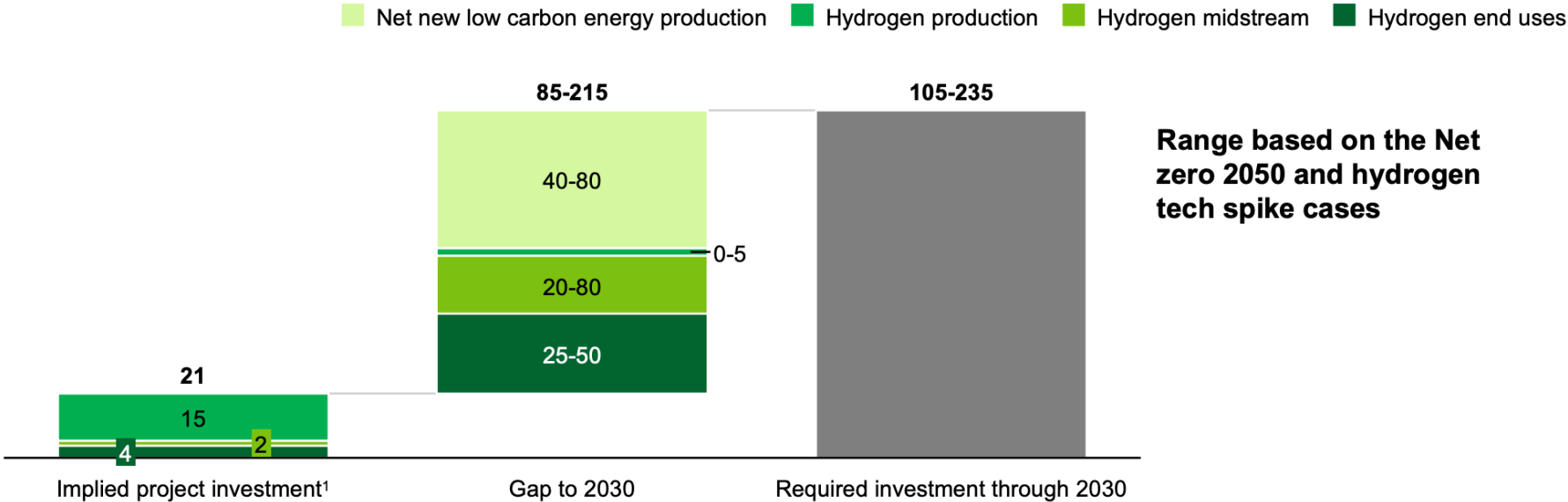
- Electrolyzer and hydrogen balance of plant
- Transmission and storage (see: 48)
- New low carbon power (see: 45Y)
- End-uses (see: industrial retrofit grants, 48C)

The relative magnitude of costs will change over time:

- When the technology is new, green hydrogen production plants will make up around 20-40% of the total project costs
- As the technology matures, the **vast majority** (84%) of investment will be upstream power generation

# Primary gaps are in low carbon energy production, midstream, and end-uses

Investments into hydrogen value chain, \$ B








<sup>1</sup> Excludes pre-feasibility study production projects  
Source: Hydrogen Council, McKinsey Hydrogen Investment Model

Figure 16: Announced hydrogen production investments are on track to meet 2030 requirements if projects pass final investment decision. However, an \$85–215B capital gap exists across midstream (distribution, storage) and end-use infrastructure, low carbon energy production.

# Hydrogen in the Midwest

The Midwest is well-poised for hydrogen buildout

 Aviation	SAF plants
 Chemicals	Zero emission ammonia plants
 Aluminum	Low carbon refineries and smelters
 Trucking	Zero emission trucks (hydrogen and electric)
 Steel	(near) Zero emission steel plants

According to **EPA facility-level data**, Midwestern states contain:

- Oil refineries
- Heavy trucking
- Integrated steel facilities
- Ethanol
- Ammonia fertilizer

**There are three major regional opportunities:**

- **Clean fuels:** use hydrogen as a feedstock for aviation/trans fuels
- **Decarbonize existing facilities and build new ones:** replace high emissions hydrogen production and natural gas (e.g. steel/ammonia)
- **Expansion of nearby hydrogen hubs** (e.g. Midwest and Heartland) use common carrier clean hydrogen infrastructure to connect end-uses to hydrogen production

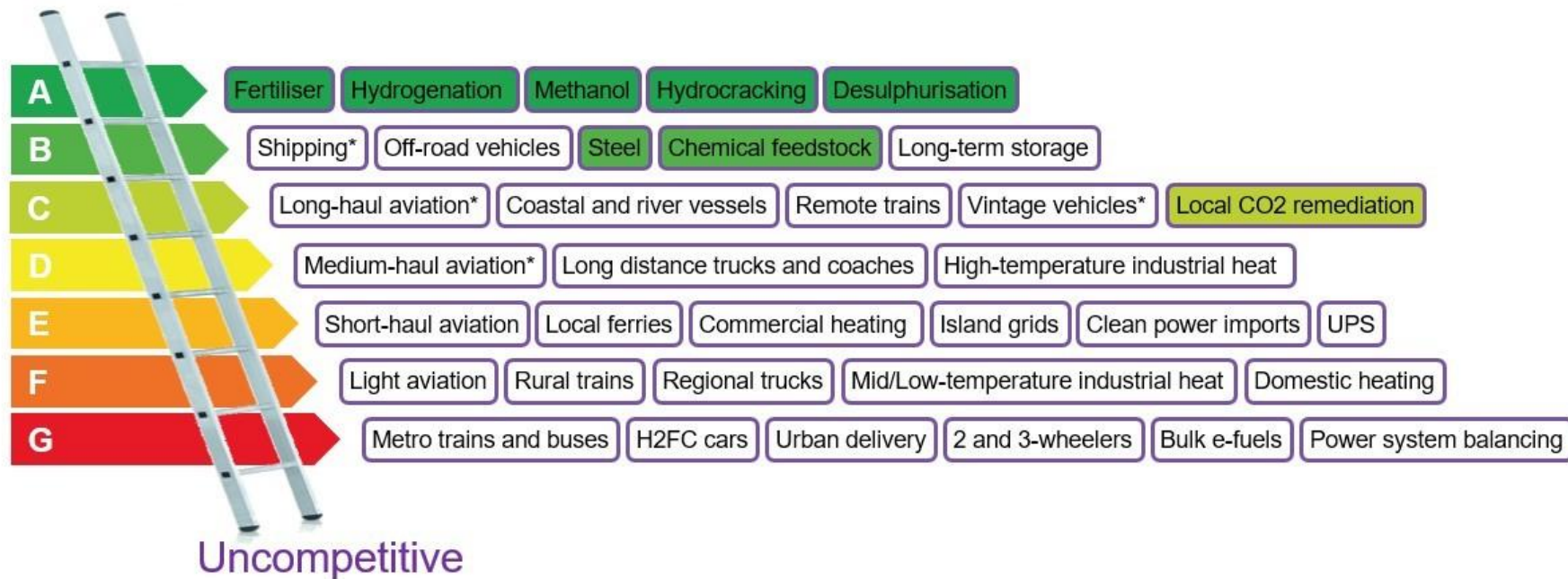


# Hydrogen can be used for many sectors, but only a few are economically competitive

## Clean Hydrogen Ladder: Chemicals & processes

Liebreich  
Associates

Unavoidable



\* Via ammonia or e-fuel rather than H2 gas or liquid

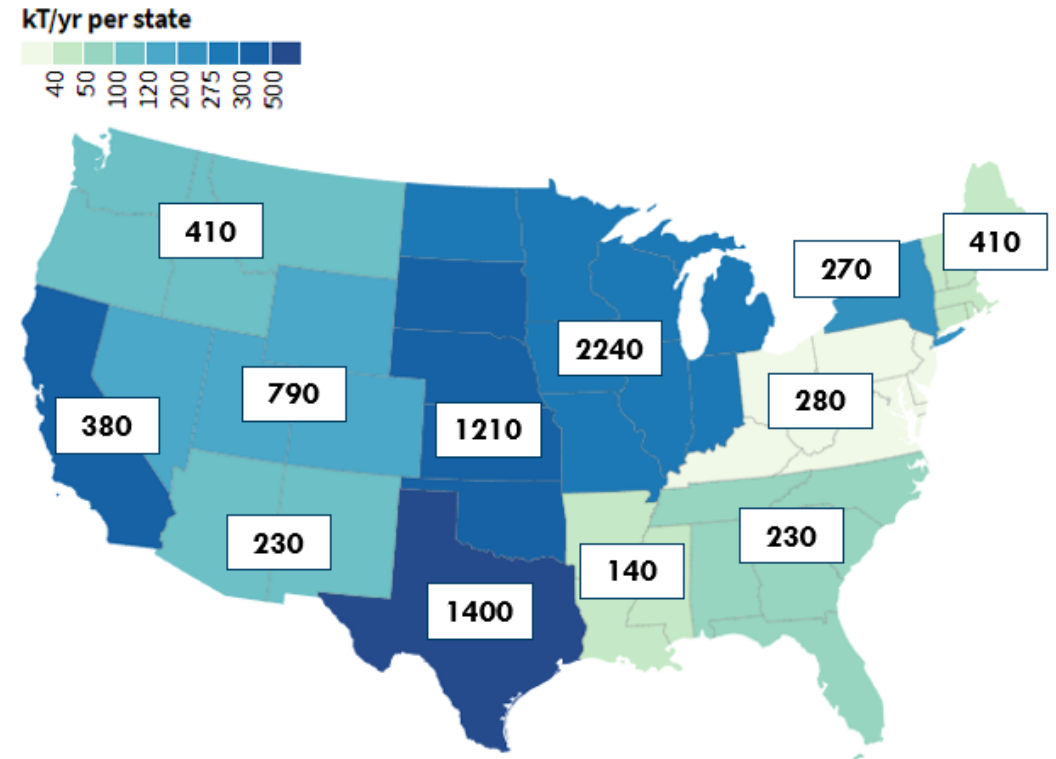
Source: Liebreich Associates (concept credit: Adrian Hiel/Energy Cities)

# Midwest and 45V

- To receive the top credit, producers will need to procure attributes from new clean power, in the same region, and on an hourly basis
- The Midwest is the most competitive region, with enough attributes for over 2 MMT of hydrogen production (20% of current US production) by 2030
- The regions that are the most competitive will have a balanced mix of new clean power resources

## Hydrogen supported by attributes distributed across regions (kT/yr) by 2030

Three pillar compliant production based on NREL REED IRA-mid case projections



# 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

# Why should you care?

- To receive the top credit, producers will need to procure attributes from new clean power, in the same region, and on an hourly basis
- The Midwest is the most competitive region, with enough attributes for over 2 MMT of hydrogen production (20% of current US production) by 2030
- The regions that are the most competitive will have a balanced mix of new clean power resources

# Activity: Evaluating Hydrogen Pitches

**#1) At your table, share hydrogen project concepts and evaluate them based on the "ladder position" and access to clean power.**

- **Discussion:** what features make the project competitive? Uncompetitive? What additional support could tip the balance?

**#2) What additional federal or state resources would be helpful to drive projects to completion? How can economic developers pull together all the parts to make a region most competitive for hydrogen projects?**



# Existing policies that can complement 45V

**Decarbonizing Industry Resource Tool (DIRT)**  
Get the DIRT on industrial decarbonization incentives

Search by policy name or keyword

**Industry Targeted**  
Industry Targeted...

**Funding Type**  
Funding Type

**Project Phase**  
Project Phase

**Location**  
Location

**California Low Carbon Fuel Standard**

Learn More	Location	Industry Targeted	Funding Type	Amount	Deadline
	CA	Aviation, Trucking, Shipping, Hydrogen, Battery	Credit Market	NA -- Credit trading market	Ongoing

**HVIP: California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project**

Learn More	Location	Industry Targeted	Funding Type	Amount	Deadline
	CA	Hydrogen, Battery, Trucking, Shipping	Investment subsidy/grant	\$1.7 billion total allocated	HVIP is open on 3/30/2022 and is a first-come, first-serve program

## DIRT TOOL:

<https://rmi.org/decarbonizing-industry-resource-tool-dirt/>

- Hydrogen is a feedstock and an intermediary product – other policies can be highly complementary
- Electricity tax credits, clean fuel subsidies, and industrial retrofit programs all provide additional revenue
- The



# Cleantech Manufacturing

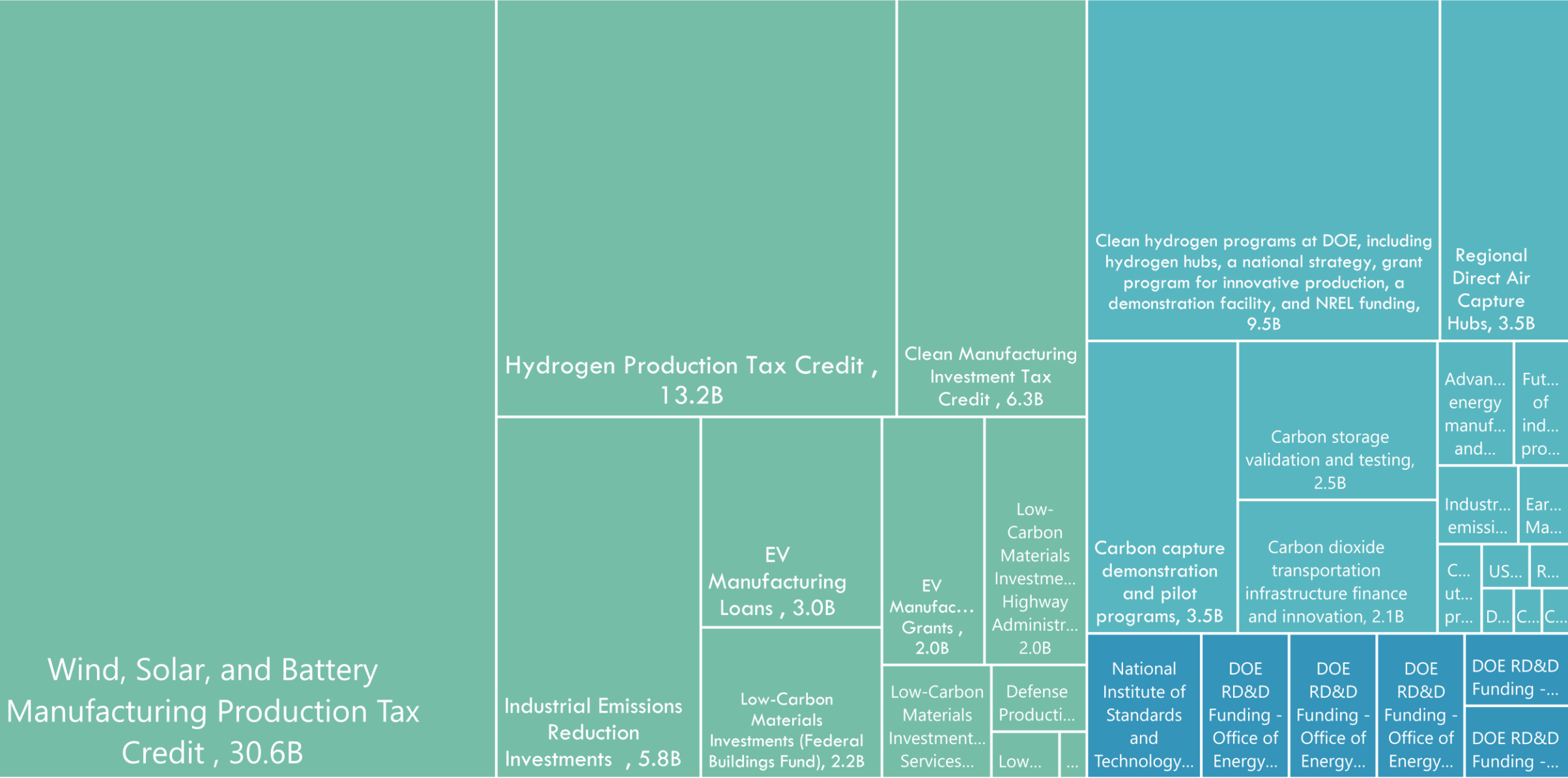


Nathan Iyer, Alisa Petersen, and Lachlan Carey

RMI – Energy. Transformed.



# Federal Firepower: >\$120 billion for clean industry initiatives alone

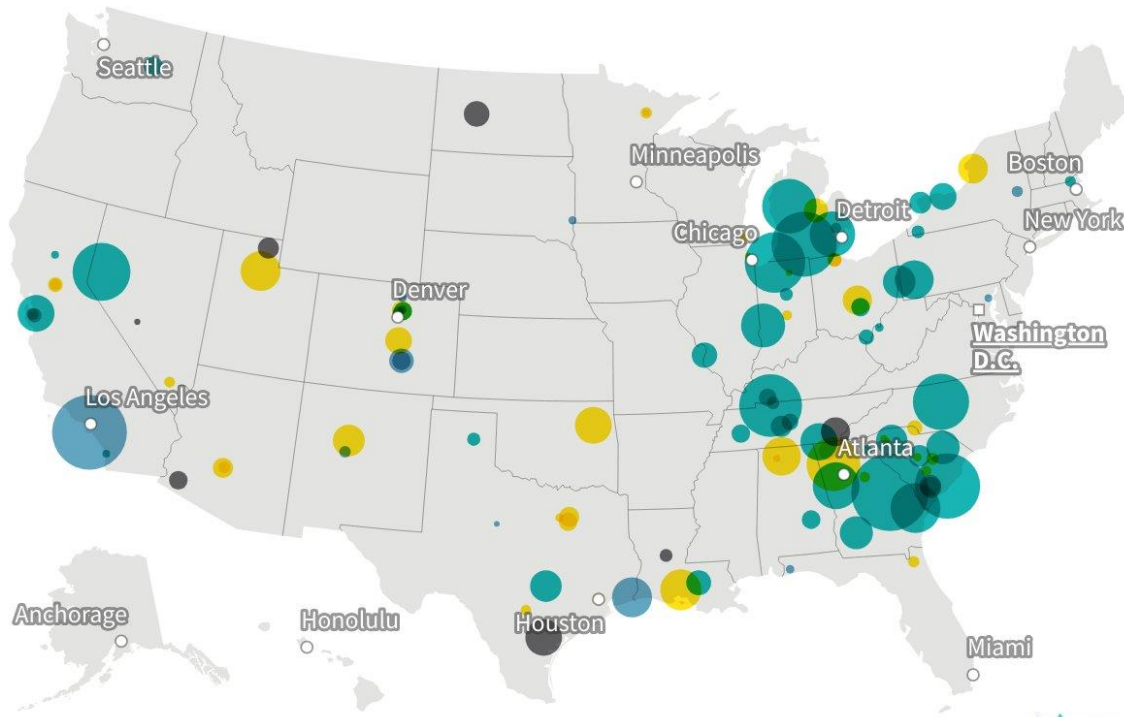


# This is a big deal.

These credits could inject >\$200 billion into US manufacturing at >1000 facilities nation-wide.

**\$65 billion of manufacturing announcements since passage of the IRA are likely to be eligible for 45X tax credits**

■ Batteries ■ Critical Minerals ■ Solar ■ Wind



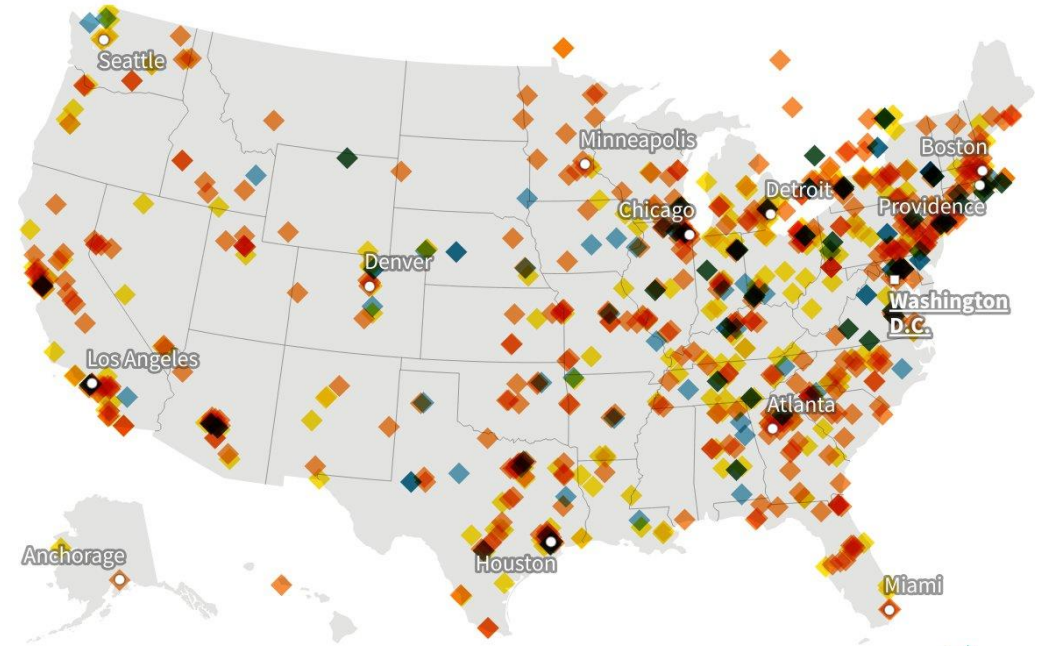
Map: RMI Graphic • Source: Clean Investment Monitor • Created with Datawrapper



**Existing US manufacturers of clean energy components that are likely eligible for 48C or 45X tax credits**

BlueGreen Alliance analysis of all known U.S. facilities that currently manufacture components for the solar, wind, energy storage/battery, electric grid, and building materials sectors.

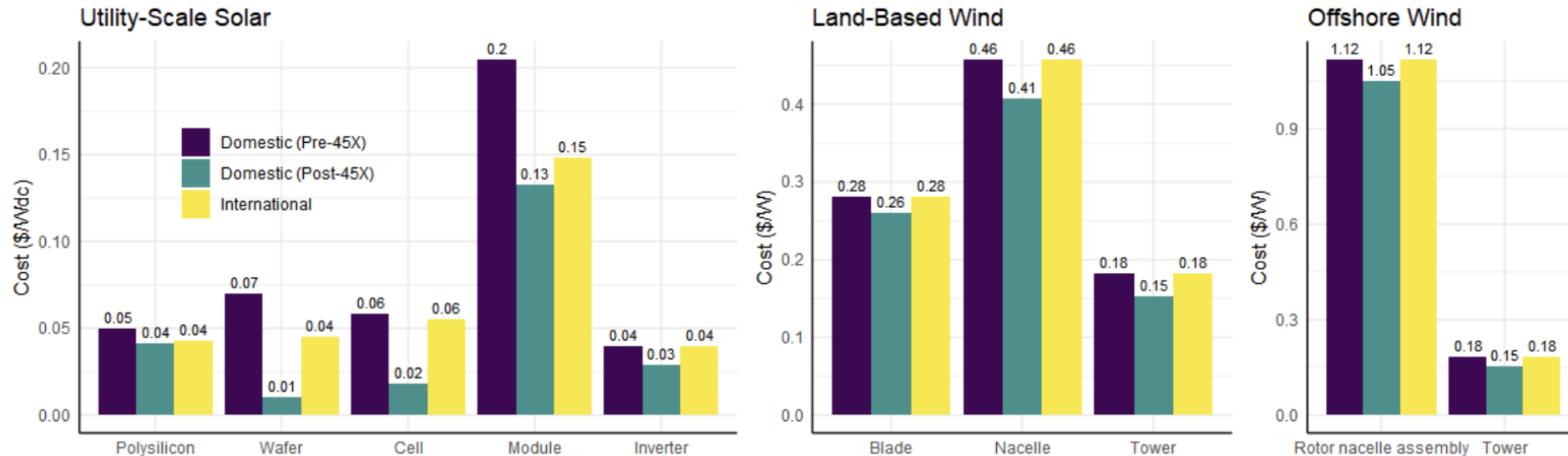
■ Buildings ■ Electric Grid ■ Energy Storage & Batteries ■ Offshore Wind ■ Onshore Wind ■ Solar Photovoltaics



Map: RMI • Source: BlueGreen Alliance • Created with Datawrapper



# US clean energy manufacturing is about to be globally competitive.



**Figure 1. Estimated production costs for solar and wind components that are globally- and domestically-produced. Costs for domestically-produced components are reported prior to and after receiving the 45X tax credit. Production costs may differ from final product pricing. Refer to SI Table S17 for details.**

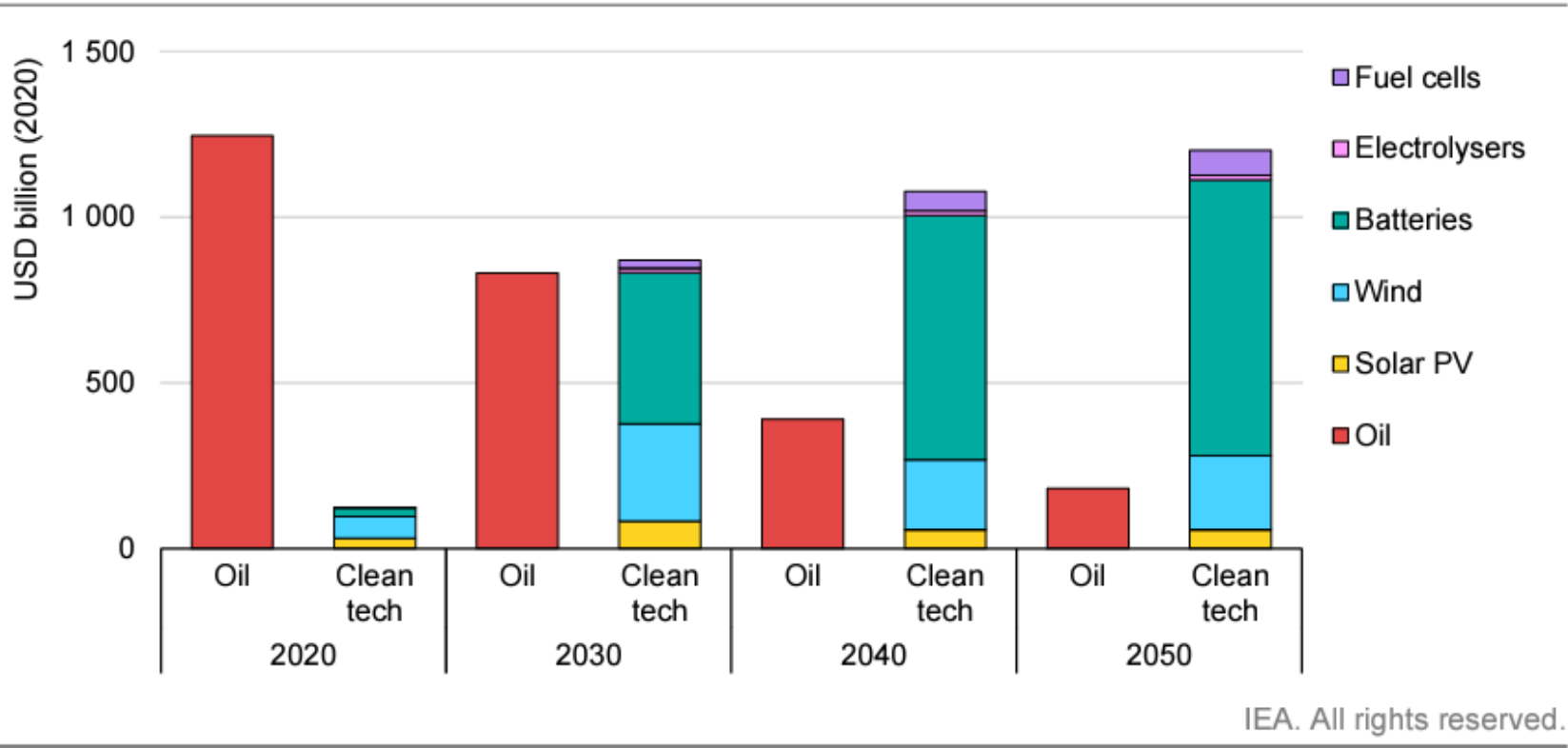
**Impacts of IRA incentives on levelized cost of electricity from wind and solar**



# In a rapidly growing global market.

In a Net Zero Scenario, Clean tech is projected to be a larger market than oil by 2030, and as large as today's oil industry by 2050.

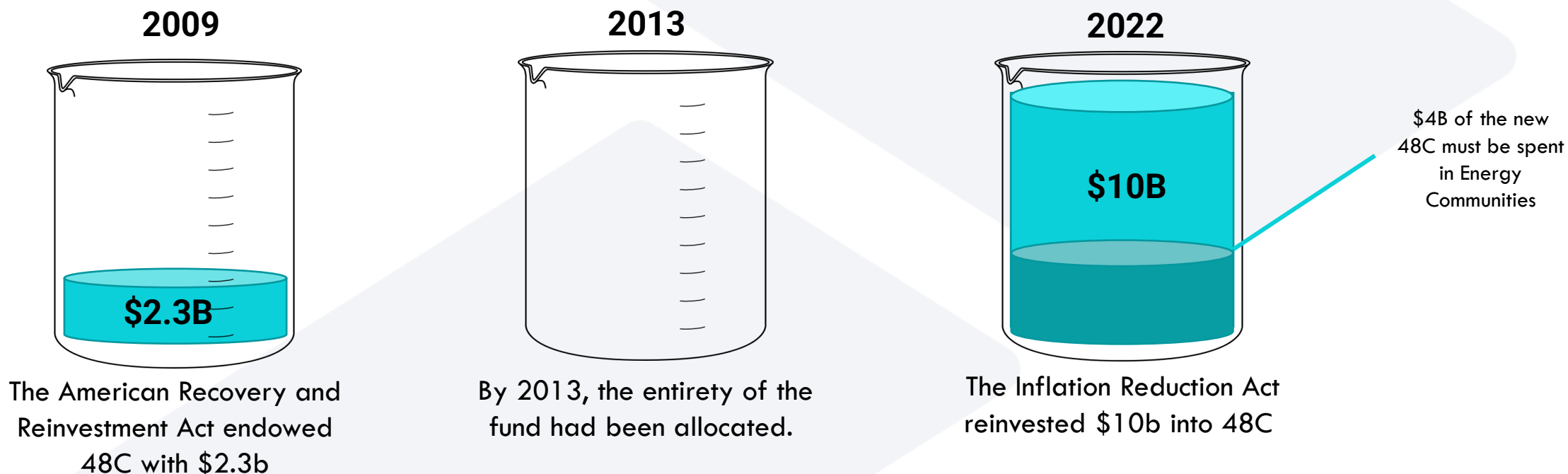
Estimated market sizes, by value, of oil and selected clean energy technologies in the Net Zero Emissions by 2050 Scenario



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# 48C: A closer look at the Advanced Energy Project Credit

**The 48C tax credit has existed since 2009, but the IRA significantly reinvested in it and added an energy community component, as well as expanding eligible recipients.**



# There are three categories under which projects can qualify for 48C



## **Clean Energy Manufacturing and Recycling Projects**

Re-equips, expands, or establishes an industrial or manufacturing facility for the production or recycling of specific clean technologies



## **Greenhouse Gas Emission Reduction Projects**

Re-equips any industrial or manufacturing facility with equipment designed to reduce greenhouse gas emissions by at least 20 percent through the installation of specific clean technologies



## **Critical Material Projects**

Re-equips, expands or establishes an industrial facility for the processing, refining or recycling of critical materials

**This credit can be worth up to 30% of the project investment amount, but that drops to just 6% if prevailing wage and labor standards are not met**

Project Details	Credit Worth
Project meets wage and apprenticeship requirements	30% of total project investment
Project does <u>not</u> meet wage and apprenticeship requirements	6% of total project investment



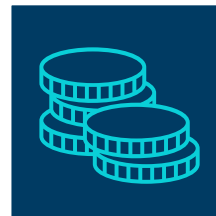
The first round of funding is closed, with the second round said to open early 2024

Treasury expects to allocate \$4 billion of credits in the first round (of at least two rounds)



40% must go towards energy communities

Direct pay is available to tax-exempt organizations



Transferability is available for organizations that can't claim direct pay



# DOE prioritized these project types for phase one



Clean Hydrogen (e.g. manufacturing electrolyzes)



Electric Grid (e.g. transformers)



Electric Heat Pumps (e.g. air source heat pumps)



Electric Vehicles (e.g. battery components)



Nuclear Energy (e.g. equipment for conversion)



Solar Energy (e.g. wafer production facilities)



Sustainable Aviation Fuel (e.g. feedstock handling equipment)



Wind Energy (e.g. recycling on wind blades)

**The phase one  
concept papers  
totaled 10X  
available phase  
one allocation,  
winners are  
announced  
March 2024**

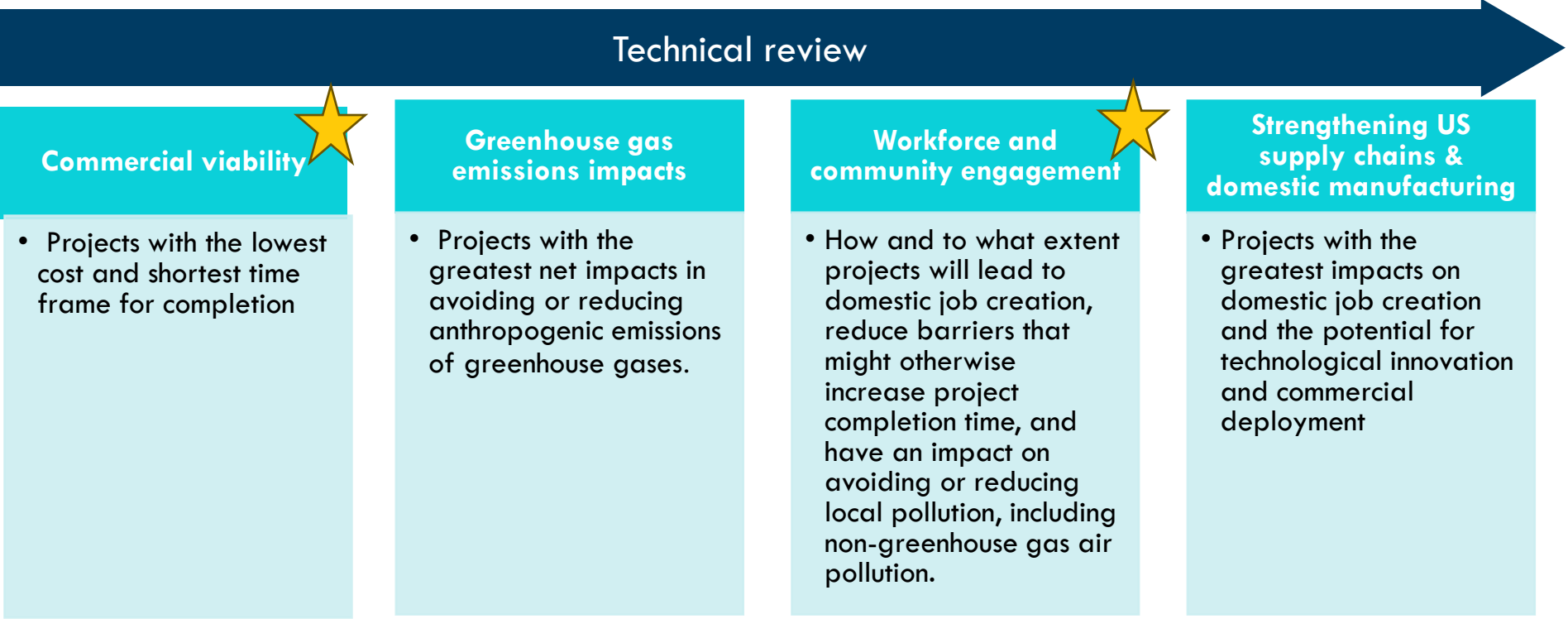
Applicants submitted concept papers seeking a total of nearly **\$42 BILLION** in funding across all categories of §48C projects, including nearly **\$11 BILLION** for projects in designated

**ENERGY COMMUNITIES.**



Together, these proposed projects identify over **\$142 BILLION** in potential investments to strengthen American industry and clean energy supply chains.

# Understanding how projects are evaluated will help to design more competitive projects



# Economic developers can help manufacturers in their state be more competitive in round 2

Economic developers can support with:

## Helping build business plan for commercial viability

- Potential for commercial deployment based on estimates of market share, market growth potential, and price competitiveness of the product
- Source and certainty of funding outside of 48C
- Strength of sales arrangements for the facilities products
- Degree to which the investment is profitable

## Creating realistic commitments for workforce and community engagement plans

- Commitment to wages above required Davis-Bacon prevailing wage
- Commitment to local hires, such as 50% of job
- Commitment to engaging with labor unions and worker organizations

# 45X: Advanced Manufacturing Production Credit



# 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



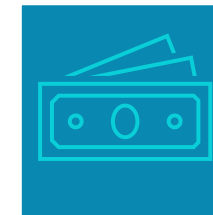
45X is permanent for critical materials--for other components it's available from 2023-29, phasing down to 2032

It is not eligible for any bonuses.



This credit is only available to domestic manufacturers.

There is no limit to the size of the 45X credit

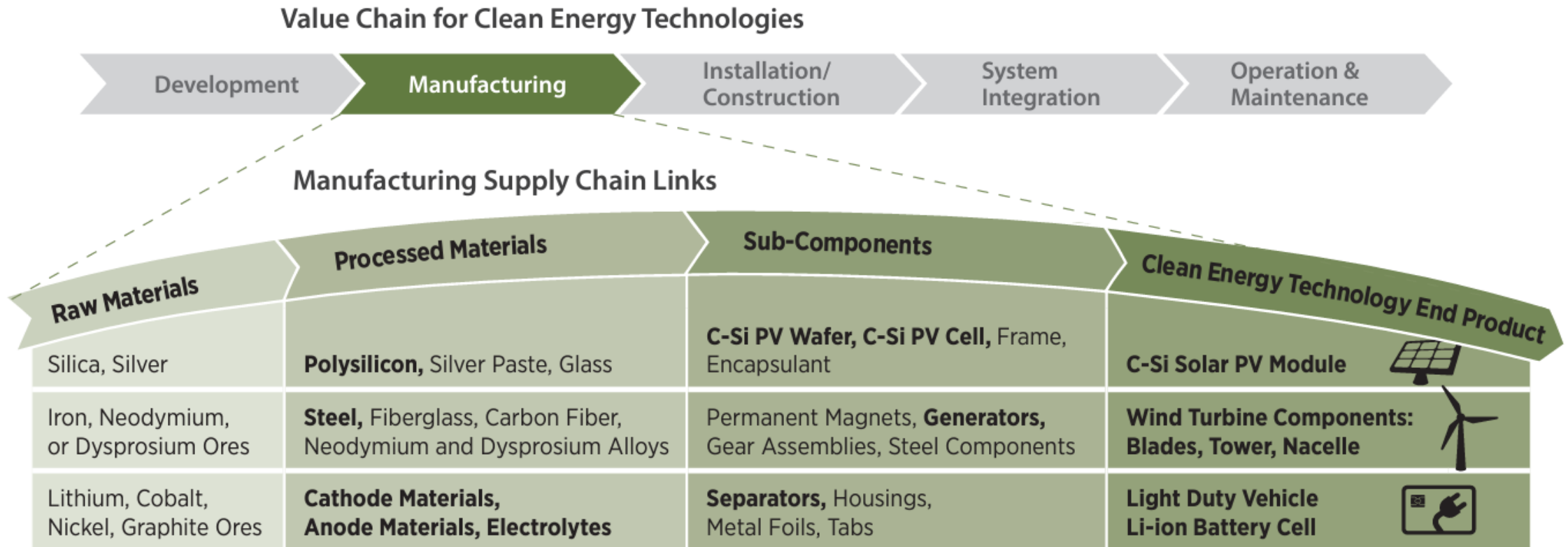


Direct pay is available to tax exempt organizations the entire time, and is available to others for five years.

# Advanced Manufacturing Production Credit (45X)

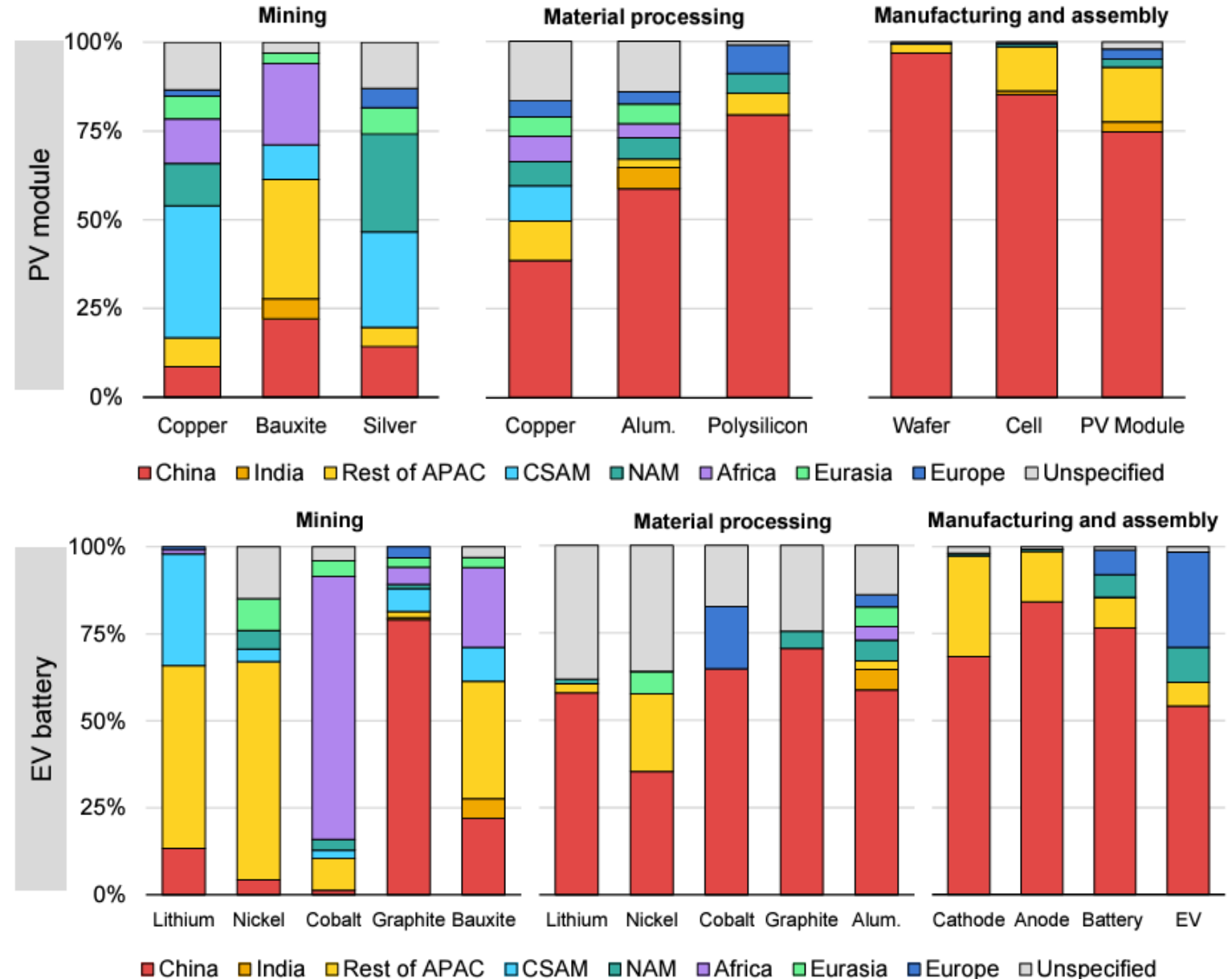
Clean Technology	Manufactured Component	Tax Credit	~% of Current Price
Solar	Thin film of crystalline solar cell	\$0.04/W	23.6%
	Solar cell or wafer	\$12/m <sup>2</sup>	
	Solar grade polysilicon	\$3/kg	10.6%
	Polymeric solar cell backsheet	\$0.40/m <sup>2</sup>	
	Solar Module	\$0.07/W	27.2%
	Torque tube	\$0.87/kg	
	Structural fastener	\$2.28/kg	
Wind	Offshore wind vessel component	10% of sales price	
	Wind turbine blade	\$0.02/W	9.9%
	Nacelle	\$0.05/W	9.8%
	Tower	\$0.03/W	14.7%
	Offshore foundation (fixed)	\$0.02/W	4.2%
	Offshore foundation (floating)	\$0.04/W	2%
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%
Batteries	Battery module	\$10/kWh	7%
	Battery module, no cells	\$45/kWh	23.4%
	Critical minerals	10% of production cost	

# 45X supports throughout the value chain



**But solar and battery industries are highly concentrated today**

Geographic concentration of selected clean energy technologies by supply chain stage and country/region, 2021



# Treasury released proposed guidance in December '23

NB: subject to a 60-day comment period

- **Key Takeaways:**

- **Broad eligibility to battery types** (electrochemical, thermal, flow) to enable stationary storage and industrial electrification
- Mineral refining provides a 10% processing tax credit that *excludes* the costs of the raw materials
- The guidance includes important definitions on qualifying manufacturing facilities qualify, details about each individual component, and guardrails that prevent gaming and fraud to ensure useful products are being manufactured
- Only US-based manufacturing qualifies. However, this does not extend to constituent elements, materials, or subcomponents, offering flexibility in sourcing.



# 45X is an opportunity for start-ups with new processes to break into these markets

US companies are more likely to be competitive with China in higher-value, high-tech manufacturing

- The \$45/kWh tax credit enables a wide range of technologies to produce competitive modules for 5 years
- Many battery companies that otherwise would be not cost-competitive now have an opportunity to scale and prove out their technology in the field; economies of scale offer the potential for long-term regional growth
- **Competitive regions** encourage manufacturing buildout, provide rapid electricity interconnection, and access to raw materials
- **Procurement** of these storage technologies is also an economic development opportunity – e.g. heat batteries enable the use of wind/solar power in industrial facilities for high quality heat

# 45X is also an opportunity for manufacturers in related fields to move into clean energy

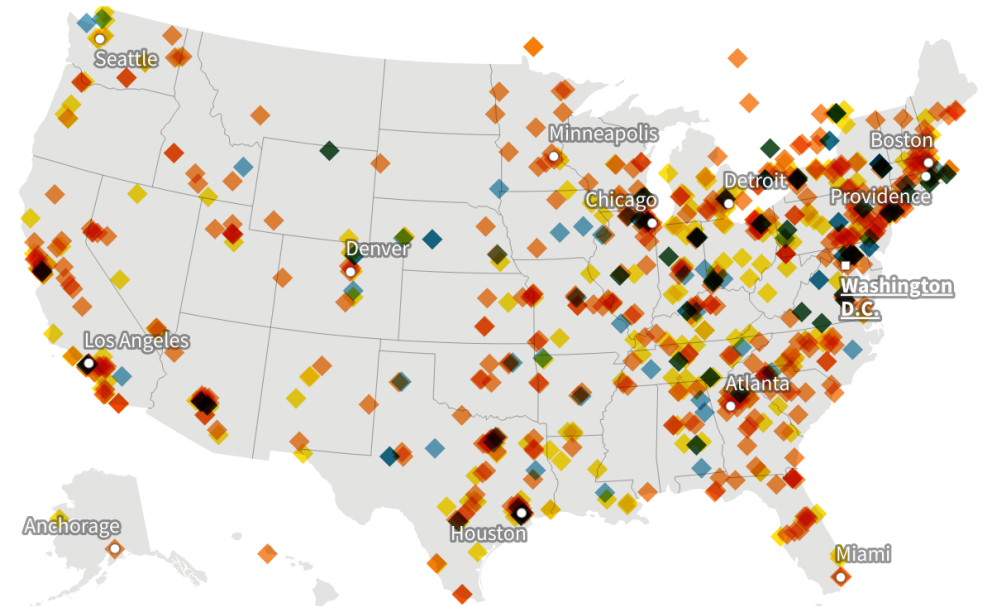
The size of these tax credits may make it profitable to invest in new product lines

- Thousands of manufacturers across the country already have the necessary skills, workforce, and capital equipment necessary to compete in these markets and benefit from 45X credits.

## Existing US manufacturers of clean energy components that are likely eligible for 48C or 45X tax credits

BlueGreen Alliance analysis of all known U.S. facilities that currently manufacture components for the solar, wind, energy storage/battery, electric grid, and building materials sectors.

Buildings Electric Grid Energy Storage & Batteries Offshore Wind  
Onshore Wind Solar Photovoltaics



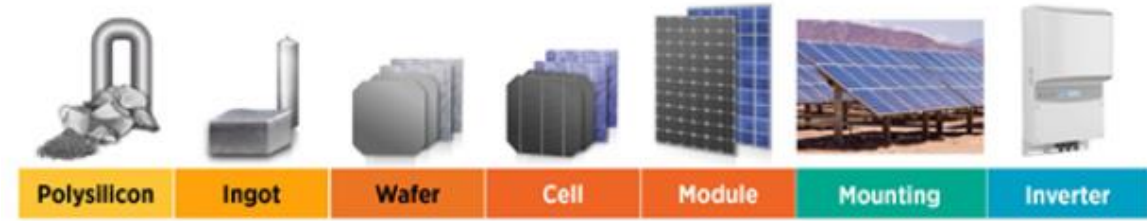
# So what can economic developers do?

Depends on the market and existing capacities.

	Solar	Wind	Batteries	Critical Minerals
<b>Key competitiveness factors</b>	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)
<b>Related industries</b>	Aluminum, polysilicon,	Steel production	Auto manufacturing, electric equipment manufacturing	Mining, upstream metals processing
<b>Risk Factors</b>	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.
<b>Development opportunity</b>	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

# Solar PV Manufacturing

## Key facts and trends



### Polysilicon

- Existing domestic polysilicon production facilities are mostly idle or supply to other industries. Requires domestic ingot production to restart.
- The Uyghur Forced Labor Prevention Act has complicated the polysilicon market significantly, which prohibits all products originating in Xinjiang

### Thin-film

- The U.S. is the largest producer of thin-film modules, which do not rely on materials from China.
- The thin-film supply chain is concentrated in Ohio

### Regional clusters

- Solar manufacturing in the U.S. is clustered in Alabama, Florida, Georgia, and Ohio

### Market outlook

- The U.S. is the world's second-largest PV market.
- Solar accounted for 48% of all new electricity-generating capacity in 2023 and grew at 35% yoy

### Price instability

- Average global solar module prices fell 30-40% in 2023, driven by excess capacity in China.
- Price instability was lower in the U.S - at 10-15% - thanks to various trade protections.

### Global concentration

- Most U.S. solar panels are imported.
- China will control over 80 percent of the world's production of polysilicon, wafers, cells, and modules

### Cost comparison

- Without financial support, U.S. solar manufacturing faces ~30-40% higher costs than Chinese producers

# Wind Manufacturing

## Key facts and trends

### Demand

- Slowing demand for wind projects has been providing limited motivation for new supply chain investments.
- Recent instability in the offshore wind market, in particular, has threatened the project pipeline.

### Cost Competitiveness

- Higher U.S. labor costs threaten US supplier competitiveness, especially in labor-intensive operations like blade manufacturing, where U.S. market share has declined in recent years.
- However, US remains one of only 5 countries that can produce all major components contained in a wind turbine.

### Technology evolution

- Rapid evolving technologies, particular growth in the size of wind turbine components, drives the need for continued facility upgrades and retooling and compounds transportation hurdles.

### Logistics

- Due to the size of wind turbine components, proximity to demand centers is crucial, and logistics networks for onshore wind are increasingly strained.
- Transportation of offshore wind components is limited by the significant challenges facing the offshore wind vessel industry, especially due to the Jones Act

### Mineral availability

- Shortages of rare earth magnets could disrupt supply chain activities, particularly for offshore wind projects

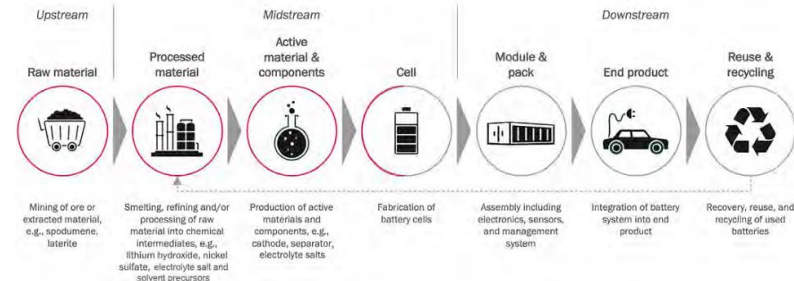
### Workforce

- Workforce demand is expected to be high, and skills shortages are expected to become more acute.
- Workforce development is likely to be a growing bottleneck, especially in offshore wind.



# Battery Manufacturing

## Key facts and trends



### Demand

- There are forecast to be more than 56 million passenger EVs on the road by 2040, and about 10 million in the US
- Growing consumer, shareholder, and policy pressures to decarbonize heavy industry are likely to create significant demand for thermal batteries

### Workforce

- US battery industry possesses limited skilled worker training in high-volume production, particularly in high-volume production.
- Estimated need for an additional 120,000 workers across the entire battery supply chain.

### Critical minerals

- U.S. manufacturing continues to rely on critical mineral production and processing from other countries, where market concentration is very high.
- Market participants expect materials shortages within a four-to-twelve year time frame

### Rate of Return

- US projects have historically had difficulty meeting high internal rate of return requirements of US investors, due to demand uncertainty and slow regulatory approval.
- Projects are highly capital intensive and require high initial investments in R&D, equipment, construction and expensive scale-up periods.

### Permitting and regulations

- Securing permits and approvals in the US, particularly for upstream projects, is highly unpredictable and costly relative to much of the developed world.

### Innovation and R&D

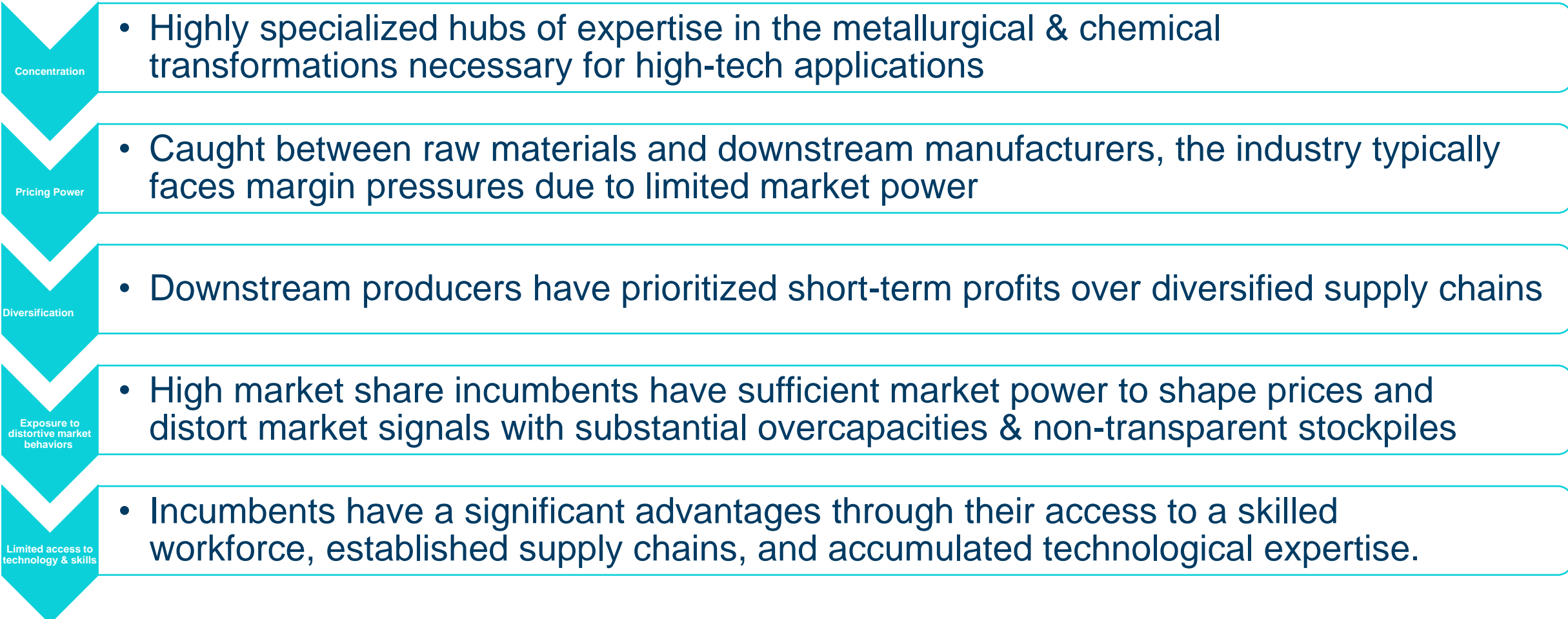
- Battery manufacturing is a highly intensive R&D process and much of the relevant innovation capacity is concentrated overseas.
- For example, there are a shortage of pre-commercial-scale production facilities at the R&D or pilot scales. Nor are there shared pilot-scale battery manufacturing facilities in the US.

### Site availability

- Access to reliable and clean electric power is a key requirement for battery manufacturing, however truly shovel-ready projects with large electricity demands are in short supply.
- Corporate decarbonization goals mean sites need large amounts of clean, reliable energy.

# Critical minerals refining & processing

## Key Facts and Trends



Questions?



# Break

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# **Case-Study Breakout Discussions**

**Group 1: IRA for Business Attraction**

**Group 2: IRA for Business Retention/Expansion**

**Group 3: IRA for Greater Stakeholder Engagement**

**Group 4: IRA for Greater Policy Alignment**





## **Priority Actions – Questions**

- 1. What is one key learning about IRA from this workshop that will be beneficial for your work?**
- 2. What is one priority action that you commit to moving forward in your community to help leverage IRA?**



## **What Next?**

- **State, regional, local engagement on IRA?**
- **Focused facilitation for projects?**
- **Layering & stacking of incentives?**
- **A second IRA bootcamp for EDOs?**
- **Focused training? Advisory?**



**Thank you !**