

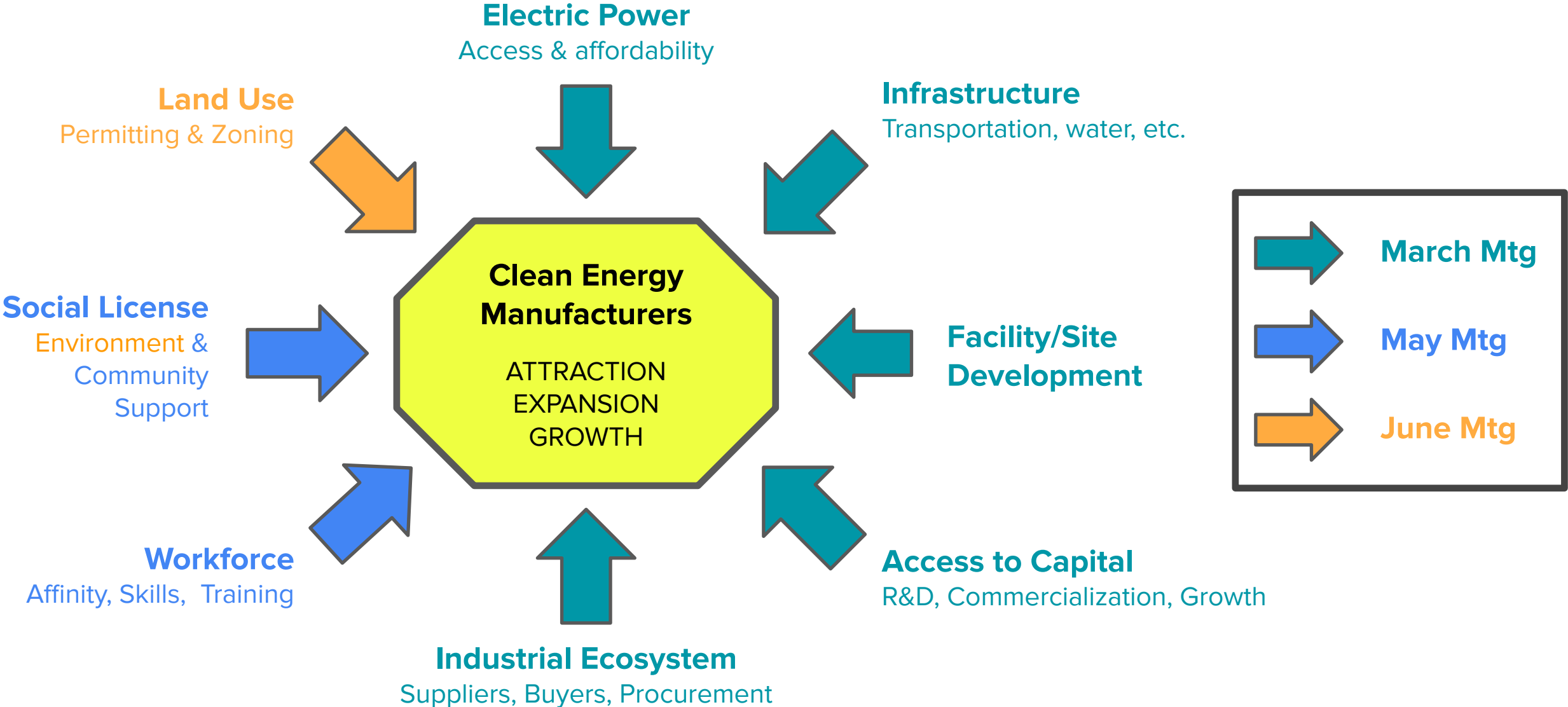
# Workforce and Community Benefits: Research Update and Policy Discussion

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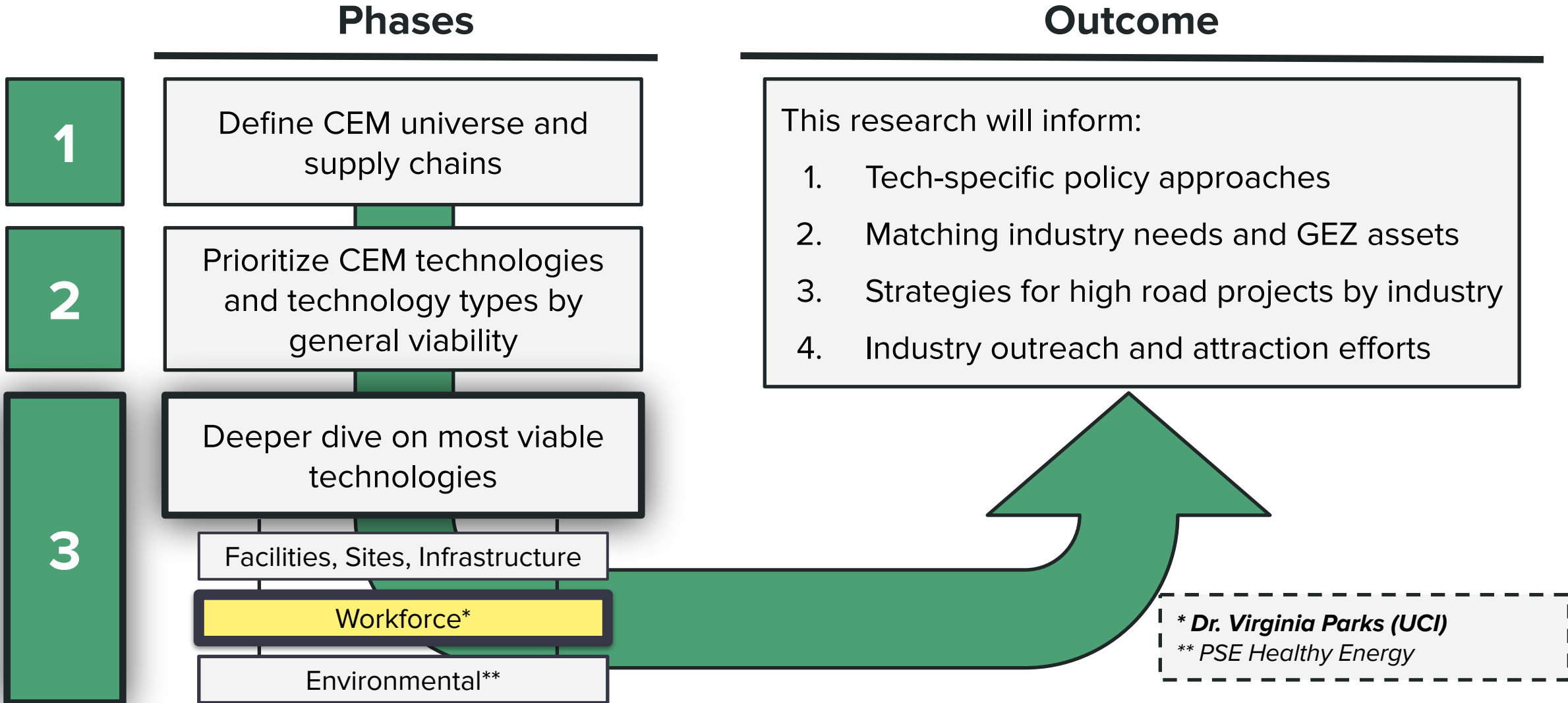
GEZ Board Meeting - 5/15/26

UC Berkeley Labor Center (UCB LC) and UC Irvine (UCI)

# Levers to develop clean energy manufacturing in GEZ



# Refresh: Technology research process and outcomes



# Plan for today

**1**

**Technology  
Research**

**CEM Workforce Analysis:  
Challenges and Opportunities**

**2**

**Policy  
Discussion**

- 1. Workforce Strategies**
- 2. Community Benefits**

**Context: Bay Area**

**Manufacturing Labor Market**

# Bay Area Manufacturing Overview

- Manufacturing employs over 300,000 workers in the Bay Area
- Manufacturing is the 6th largest industry in terms of employment in the Bay Area.
- It is a diverse sector in terms of types of production, ranging from food and beverage to pharmaceuticals to electronics and vehicles.
  - Many of these production processes are very well-aligned with clean energy manufacturing.
- The workforce is diverse: half foreign-born, 3 out of 10 are women.
- Just under half of the jobs that don't typically require a 4-year degree for entry.
- There is room for improvement and innovation – improve job quality and increase productivity

# Manufacturing wages vary by subsector

<b>Manufacturing subsector</b>	<b>Blue-collar production jobs: median hourly wage</b>	<b>Blue-collar production jobs: 75th percentile wage</b>
Textile Mills & Product Mills	\$18.70	\$24.00
Wood Product	\$21.40	\$30.60
Electrical Equipment, Appliance, etc	\$22.90	\$32.40
Printing and related support	\$23.20	\$32.70
Machinery	\$23.80	\$34.60
Beverage and Tobacco	\$24.50	\$33.90
Primary & Fabricated Metal	\$25.40	\$34.20
Nonmetallic Mineral	\$25.50	\$38.60
Transportation Equipment	\$26.00	\$38.10
Computer and Electronic Product	\$26.50	\$37.80
Chemical	\$30.30	\$48.90
Petroleum and Coal	\$48.60	\$62.40

*\*Bay Area  
wages*

## Union Density (Coverage and Membership), Manufacturing, California, 1983-2024

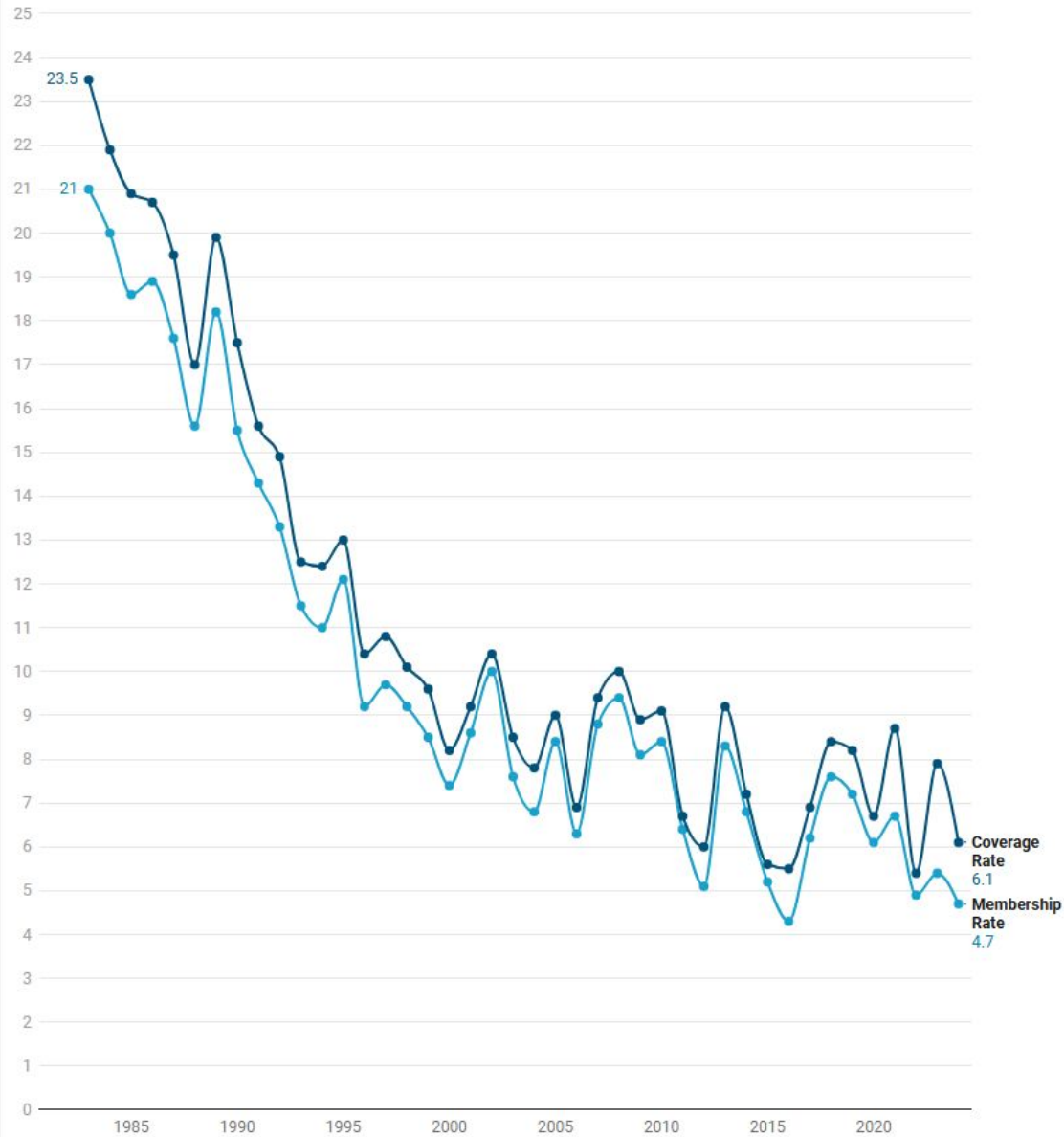


Chart: UC Berkeley Labor Center • Source: Hirsch, Macpherson, and Even (2026) • Get the data • Created with Datawrapper

Union density in California manufacturing has declined significantly in recent decades — over 20% in the 1980s to around 5% now.

# **CEM Technology Workforce Analysis**

Prepared by Dr. Virginia Parks

UC Irvine, Department of Urban Planning & Public Policy

# CEM Technology Workforce Analysis

## **Aims**

- Document what kinds of jobs exist in CEM
- Describe occupations and skills
- Gather information about job quality, including wages and benefits
- Explore connections to workforce development system

## **Study Design**

- 30 interviews with CEM firms
- Weighted toward firms with operations in CA; includes non-CA firms
- 6 interviews with local workforce development practitioners
- BLS data, O\*NET, academic literature

# Firm Types

1. **Start-ups:** Developing prototype product; strong R&D focus
2. **Transitional firms:** Taking prototype to market; continuing R&D
3. **Manufacturing-to-scale firms:** Full production and delivery to downstream vendors (e.g., OEMs)

## **Key takeaway:**

Bay Area has all three firm types. There is an additional draw for start-ups and transitional firms to locate, stay, and expand manufacturing operations in the Bay Area.

# CEM Firm Interviews: Occupations & Skills

## **Workforce composition varies across firm types:**

### Start-ups:

- PhD Engineers and Technicians comprise largest share of workforce
- Descriptions of technicians: engineering technicians, electrical/electronic technicians, mechanical technicians, maintenance technicians, production technicians, “skilled technicians”

### Transitional firms:

- “Operators” and “Production Techs” make up an increasingly larger share of workforce
- More specialized technician positions remain important

### Manufacturing-to-scale firms:

- Production assembly jobs comprise largest share of workforce

## **Key takeaway:**

Among manufacturing jobs that don't require a college degree, assembly production jobs predominate along with a smaller, but significant, number of technician jobs. Technician jobs are especially important for start-ups and transitional firms, and often cited as a reason for firms to remain in the Bay Area.

# CEM Firm Interviews: Technician Skills

## GENERAL SKILLS

Mechanical skills/aptitude  
Machine awareness (CNC, robotics, lathes)  
Facility with hand tools  
Safety protocol  
Reading blueprints, schematics, manuals  
Hands-on detailed work  
Hands-on problem solving  
Ability to communicate about  
mechanical/production process  
Soft skills: shift work, team work, work ethic

Past production experience: strong proxy for  
needed skills  
Multi-skills preferred

## SPECIALIZED SKILLS (CERTAIN TECH)

Precision machinery  
PLC systems  
Safety, i.e., flammables, heat, pressure  
Wiring  
Measuring: micrometer, calipers, other tools  
Testing: tensile strength, metering equipment  
Clean room  
Chemicals: follow instructions exactly,  
containment  
Handling powders  
High voltage  
Confined spaces, hoisting, climbing

# CEM Firm Interviews: Assembly Skills

## GENERAL SKILLS

Mechanical awareness

Hands-on detailed work

Attention to detail

Follows directions

Safety protocol

Some firms desire more mechanical skills for assembly workers

Soft skills: understands culture of shift schedules, team work, work ethic

Past production experience: proxy for skills and “trainability”

# CEM Firm Interviews: Wages & Benefits

## Wages

- Firms reported wages of production floor workers in “mid \$20’s” with starting wages of \$20 - \$24/hour
- Some firms reported specialized technician positions with wages in the \$30 - \$40 range

## Benefits

- All firms offered health insurance plus vision and dental
- Nearly all reported comprehensive benefits packages including retirement, paid sick leave, paid vacation
- Start-up firms stressed employee stock-option plans

# CEM Firm Interviews: Wages & Benefits (2)

## Key takeaways:

- Production wages are modest, and lowest for assembly positions. Based on interviews, entry-level technician wages are not much higher.
- Labor market data on median wages for technicians in the Bay Area manufacturing sector suggests possible pathways for advancement. Start-ups and R&D-focused firms may be willing to pay more to retain highly skilled technicians.
- Identified CEM jobs fall well below wage, benefit, and quality standards of unionized refinery production jobs.

# CEM Firm Interviews: Recruitment

- Firms reported minimal difficulty filling positions
- Local industrial base supplies workers that match firms' skills needs
  - Bay Area firms had hires from refineries, Tesla
  - Firms outside of Bay Area credited former presence of aerospace
- A few firms outside of CA recruit from community colleges
- Startups in CA largely unfamiliar with community colleges, apprenticeships, or other training providers

## **Key takeaways:**

- Firms located in regions with a strong manufacturing base reported few problems recruiting workers indicating a strong industrial skills alignment between CEM firms and other manufacturing activity, such as refineries.
- CEM firms, especially start-ups, lack knowledge of local workforce development system and how to utilize it for recruitment purposes.

# CEM Firm Interviews: Training

- All firms do some form of in-house training, primarily OTJ; a few cases of more intentional programs or “apprenticeships”
- Firms stress importance of “trainability”
- Start-ups and transitional CEM firms in CA largely unfamiliar with community colleges, apprenticeships, or other training providers
- These firms open to partnerships but don’t know where to start and have limited time/resources to “explore”

## **Key takeaways:**

- Firms rely upon prior experience and training of workers in local labor market; in-house training depends upon it.
- Firms expressed anxiety about continued access to skilled workers and resource-intensiveness of adequate in-house training. They are open to partnerships that address these concerns.

# Local Workforce Development System

## **Robust and multifaceted but also fragmented and opaque**

- Community college system is big: 28 schools, many programs
- Existence of established labor training programs and labor-management partnerships
- Several workforce boards
- Can be difficult for firms, especially new ones, to find and navigate

## **Workforce system challenges:**

- Rigid funding mechanisms discourage or disallow innovative programs
- Tension between “responsiveness” of workforce system and “fickleness” of firms

# CEM Technology Workforce Analysis: Conclusions

- CEM industry is located in Bay Area and growing.
- Workforce is a major attraction for all firm types—firms want to stay here, expand here, and move here to access workforce.

BUT...

- Intervention is needed to retain skilled workers, especially displaced workers.
- Intervention is needed to skill new workers and build pathways into jobs, especially for disadvantaged and young workers.
- Intervention is needed to improve quality of blue collar production jobs by raising wages, building a pathway to unionization, and protecting worker safety and health.

# CEM Technology Workforce Analysis: Conclusions (2)

- Opportunity to leverage and refine the region's robust workforce development system
  - Raise visibility and increase outreach to start-ups and relocating firms
  - Consolidate program information across skills sets—give firms and workers a clear map and help them navigate
  - Develop labor-management partnerships at the firm and sector levels as a bridge between workers, firms, and training programs
- Opportunity to leverage and expand existing funding for displaced workers (WIOA, DOGWF) and refine programming based on research and local experience (e.g. Marathon worker survey)
  - Certify skills; income supports; targeted re-skilling, not extensive training

# **Policy Research:**

Building a High Road Advantage

# Workforce Transition Policy

**Strategic Foundation:** Just transition programs succeed by **combining worker supports** (income, benefits, training) with **place-based investments** to create credible alternative employment.

## Planning & Governance

Outcomes depend on **advance planning** and **local governance capacity**.

It is not merely about whether training dollars exist, but if replacement jobs **match wages and identity**.

## Income & Training Synergy

**Wage Replacement** is a critical complement to training.

Training works best when workers can afford to complete it and income support **prevents forced early exit**.

## The "Destination Lens"

Connect payments to evidence of **job placement and wage outcomes** rather than simple enrollment.

Ensure training leads to a specific **economic destination** for the community.

# A Strategic Framework for High-Road Excellence

**Job Quality,  
Job Access, &  
Community  
Benefits**

1. Condition Incentives on Job Quality Standards
2. Reduce Barriers to Job Access
3. Adopt a Community Benefits Ordinance

**GEZ High  
Road  
Competitive  
Advantage**

1. Fund Training for Sectors, not Individual Firms
2. Tripartite Workforce Planning
3. Improve GEZ Firm Productivity


# GEZ Must Overcome a Deep Structural Problem to Realize High Road Advantage

## The Structural Problem

The U.S. labor market is overly optimized for **short-term flexibility** — a model that drives R&D and sustains innovation but systematically **undermines manufacturing productivity**.

## The High Road Strategic Mandate

GEZ must design structural incentives to promote stable, high-wage careers through **collective bargaining agreements, skill mastery**, and work organization of firms to **capture productivity benefits**.



Capturing and sustaining a High Road Advantage will be essential for success in globally-competitive markets

# Workforce Training vs. Work Organization

## Workforce Training

Systematic development of workers' job-specific skills and knowledge through structured instruction or apprenticeship.

## Work Organization

How tasks and responsibilities are structured: who does what, team configurations, and production process design.

**Empirical BLS Research (2025):** Productivity is driven by how skills are **deployed and organized** at the establishment level. This is especially pronounced in **high-tech manufacturing** sectors: the strongest productivity advantages accrue to the firms deploying workers in more comprehensive, less routinized roles.

## GEZ Takeaway: Training Alone is Insufficient

Policy that only delivers training without addressing firm organization will **systematically underperform**.  
GEZ should both provide support for **Skill Mastery** and Technical Assistance for **High Road Business Models**

# What Does Task Bundling Look Like in Manufacturing?

## Low Bundling

(Narrow, Taylorist)

A line worker who only performs routine manual tasks – feeding a machine, moving parts, repetitive assembly. One task category, narrow role.

## Higher Bundling

Routine manual + nonroutine manual + analytical

A production worker who operates equipment *and* troubleshoots malfunctions *and* monitors quality *and* communicates problems to engineers.

## Even Higher Bundling

Adds nonroutine interpersonal skills

A skilled trades worker or lead technician who diagnoses problems, trains workers, and interfaces with management on workflow.

## Key Impact on Productivity

Even Higher Bundling of Tasks into Occupations leads to **higher productivity**, especially in high-tech manufacturing. This is **what unions help with**— work organization and training – and why they are so valuable for firms seeking to scale production. Unions also structure the **sharing with workers the benefits** of higher productivity.

# Advanced Manufacturing: Battery Cell Manufacturing

## *A partial success and a warning*

- While it's possible to improve productivity with training and workplace culture, sustained productivity requires baking high road practices – including labor agreements – into the underlying business model.
- Improved productivity is fragile, unless the benefits are shared with workers in the form of higher wages and solidified through collective bargaining agreements.



## United Steelworkers Improve Productivity and Growth at Eos

“These are the jobs of the future,” said Hall. “And they are good, union jobs.” – USW District 10 Director [Bernie Hall](#)

Eos CEO Joe Mastrangelo **credited the facility’s union** workforce with improving the work environment at the facility. “The Steelworkers have been a great partner to us, **helping us grow** and become more professional.”

“Being part of this whole thing basically intrigued me and interested me and made me want to continue on. Everything was new. **Everybody was learning something,**” she said of her early days at Eos, recalling the **input she and other front-line workers** had into company processes.



# Manufacturing Union Training Programs



United Auto Workers



United Steelworkers



International Brotherhood of Electrical Workers



Sheet Metal, Air, Rail and Transportation



Partnership for Advanced Manufacturing Apprenticeship  
AFL-CIO



Machinists Institute

# U.S. Manufacturing: The Race to the Bottom

## The Labor Gap

Manufacturers often cite a shortage of workers as a primary challenge.

### The actual diagnosis:

The inability to find workers at the **wages and work conditions** currently being offered.

## The Productivity Pivot

With thin margins, simply raising wages is often not viable for business survival.

### The necessary shift:

Firms must **transform business models** and aggressively improve productivity to remain competitive.

## Equitable Distribution

Increased profitability doesn't automatically reach the workforce.

### The critical mechanism:

**Collective bargaining agreements** are the essential key to sustaining productivity and ensuring benefits are shared with workers.

Transitioning from low-road competition to high-road industrial performance.

# Step 1. Set a Floor for Labor and Community Standards

## Job Quality

Incentives should be tied to fair labor practices:

- Prevailing wage (construction) or high wages (75th-90th percentile for manufacturing) + benefits
- Investments in apprenticeship or training;
- Health and safety
- Labor agreements, labor peace, or neutrality/card check commitment.

## Access to Opportunity

Opportunities afforded for local and disadvantaged residents and small businesses to access jobs and contracting opportunities:

- Pre-apprenticeship partnerships
- Targeted recruitment
- Training with supportive services
- Supplier diversity goals

## Community Benefits

Adopt a Community Benefits Ordinance so that GEZ projects address concerns and priorities, eg:

- Affordable housing contributions
- Environmental mitigation (air quality, emissions, etc.)
- Infrastructure or community facility funding
- Labor standards/training

## Step 2. Build a High Road Advantage

### Sector Strategies

Focus **training sectorally**, leading to **transferable, industry-recognized credentials** that support regional competitiveness and success.

### Tripartite Collaboration

Coordinated tripartite **industry-labor-government collaboration** is valuable for mapping **employer needs** to training pathways and occupations that support **worker advancement**.

*Ex. DOE Battery Workforce Initiative*

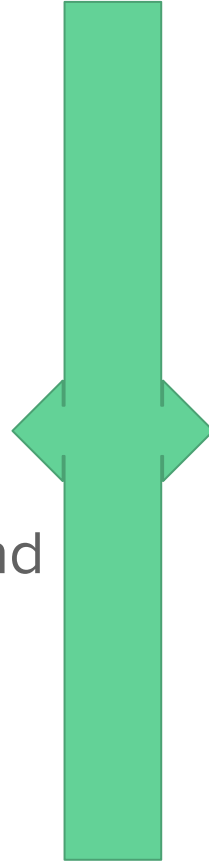
### Innovation Support

Support for individual firms may be needed to **reduce risks of innovation** and **enhance productivity** — for example, high-road training pilots, worker-augmenting technology, or new apprenticeships; not basic training.

# Use Carrots... and More Carrots for High Road Outcomes

## Incentives with Conditions

- Conditional entitlements (zoning, permits, approvals)
- Development agreements and infrastructure financing
- Streamlined review processes for projects
- Explicit integration into planning and permitting frameworks
- Training Funds



## Support for Success

- Independent oversight or joint governance body for accountability
- Transparent performance tracking
- Technical assistance for high road firms around work organization
- Tripartite work organization and training planning
- Technical assistance for Community Benefits Agreements

Set the standards, provide robust incentives, align institutional resources to make it work

# Workforce Models: Initiatives for Manufacturing

- 1 Community Colleges** South Carolina / Georgia (LPTC) vs NY
- 2 Industry Consortium** Michigan / Ohio
- 3 Intermediary & Financial Mandate** Australia / UK / Wisconsin
- 4 Conditioned Tax Incentive or Other Public Funding** Inflation Reduction Act/CHIPS/Infrastructure Investment & Jobs Act
- 5 Labor-Management Training Partnerships; Apprenticeship; OJT** Japan / South Korea / Germany US Labor-Management Training Partnerships / CA High Road Training Partnerships
- 6 Tripartite Sector Strategies** France / US Battery Workforce Initiative
- 7 High Road Alignment** GEZ!

# Summary

## Implementation Strategy

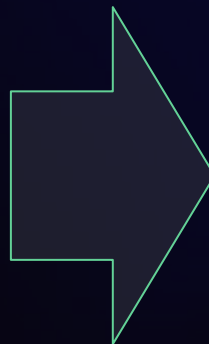
1 CEM Targeted Attraction Strategy

2 Dislocated Worker Supports

3 Broad Incentives with Labor & Community Conditions

4 Train for Higher Productivity

5 Workforce System Alignment



## Results

Local Job Retention & Creation

Higher Wage Jobs & Career Pathways

Manufacturing Innovation Cycle

Higher Productivity & Profitability

Continuous Process Improvements

Shared Prosperity & Economic Resilience

# Can the GEZ Compete in Globally-Competitive Clean Energy Manufacturing?

**Yes! If you are deliberate and strategic.**

GEZ and surrounding area has research institutions, innovative firms, and the workforce potential to compete.

**High-Road manufacturing model isn't just appealing, it's productivity-enhancing... the secret to success**

GEZ needs coherence, alignment, and commitment between incentives, permitting, coordination, workforce training, as well as with broader policy.

GEZ must set the stage for high-road manufacturing by developing and incentivizing training for skill mastery and high road work organization models.



# EPA Community Benefits Calculator

## Evaluating Green Empowerment Zone (GEZ) Projects for Public Investment

### Financial Impact

Estimates the net financial cost or gain of a project relative to the investment of public money.

### Risk Assessment

Provides a high-level assessment of financial risk associated with the project development.

### Strategic Alignment

Evaluates how well a proposed project aligns with specific community-defined goals and priorities.

**Target Audience:** Designed for local policy makers deciding on public funding and incentives for community-beneficial investment.

## Community Benefits Ordinance Hub

### What is a Community Benefits Ordinance?

- A law passed by a city council. It applies to all qualifying projects going forward
- Creates a binding, enforceable floor for corporate accountability
- Applies to future projects, not just the one that triggered it
- Can mandate revenue sharing, community advisory boards, hiring preferences, and environmental standards
- Much harder for corporations to walk away from once it is law
- Sets a precedent that protects communities even when political leadership changes

**Target Audience:** Designed for advocates but useful for policy makers



Includes:  
Example ordinance language, community education guide, advisory board setup, and more

# Questions and Discussion